PUMP GENIUS
Simplex *Plus*
CFW-11

Application Manual

Language: English
Document: V 11
Publication date: 06/2021
Series: CFW11

CONTENTS

ABOUT THE MANUAL

This manual provides the necessary information for the configuration of a Pump Genius Simplex (One Pump) application developed with the CFW-11 inverter SoftPLC function. This application manual must be used together with the CFW-11 user's manual, the SoftPLC function manual and the WLP software manual.

ABBREVIATIONS AND DEFINITIONS

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

NUMERICAL REPRESENTATION

Decimal numbers are represented by means of digits without suffix. Hexadecimal numbers are represented with the letter 'h' after the number.

QUICK PARAMETER REFERENCE, FAULTS AND ALARMS

Parameter	Description	Adjustable Range	Factory Setting	User Setting	Properties	Groups	Page
P1010	Pump Genius Simplex Plus Version	0.00 to 10.00			ro	50	84
P1011	Control Setpoint	-32768 to 32767 [Eng. Unit 1	4.00		rw	50	39
P1012	Multi Setpoint Control Setpoint 1	-32768 to 32767 [Eng. Unit 1				50	40
P1013	Multi Setpoint Control Setpoint 2	-32768 to 32767 [Eng. Unit 1				50	40
P1014	Multi Setpoint Control Setpoint 3	-32768 to 32767 [Eng. Unit 1				50	40
P1015	Multi Setpoint Control Setpoint 4	-32768 to 32767 [Eng. Unit 1				50	40
P1016	Control Process Variable Actual	-32768 to 32767 [Eng. Unit 1			ro	50	84
P1017	Control Auxiliary Variable Actual	0 to 32767 [Eng. Unit 2]			ro	50	84
P1018	PID Manual Mode fixed speed	0 to 18000 rpm	0 rpm			50	41
P1019	Pump Genius Simplex Logic Status 1	Bit 0 = Sleep Mode Active (A750) Bit 1 = Pipe Charging (A752) Bit 2 = Sleep Boost Active (A756) Bit 3 = Low Level PV (A770) Bit 4 = Low Level PV (F771) Bit 5 = High Level PV (A772) Bit 6 = High Level PV (F773) Bit 7 = Low Level Auxiliary Variable (A774) Bit 8 = Dry Pump (A780) Bit 9 = Dry Pump (F781) Bit 10 = Sensor DI6 Protection Alarm (A782) Bit 11 = External Sensor Protection (F783) Bit 12 = External Pump Running Bit 13 = Deragging in Execution (A794) Bit 14 = Pump Clogging detected (A790) Bit 15 = Excess of Clogging (F791)			ro	50	84
P1020	Control Setpoint Selection Source	**1** = Setpoint via Analog Input AI1 **2** = Setpoint via Analog Input AI2 **3** = Setpoint via Analog Input AI3 **4** = Setpoint via Analog Input AI4 **5** = Setpoint via HMI or Communication Networks (P1011) **6** = Two Setpoints via Digital Input DI4 (P1012 and P1013) **7** = Three Setpoints via Digital Inputs DI4 and DI5 (P1012, P1013 and P1014) **8** = Four Setpoints via Digital Inputs DI4 and DI5 (P1012, P1013, P1014 and P1015)	5			50	40
P1021	Control Process Variable Selection Source	**0** = Without Control Process Variable (Disable the PID Controller) **1** = Control Process Variable via Analog Input AI1 **2** = Control Process Variable via difference between Analog Input AI1 and AI2 (AI1 – AI2)	1			50	36
P1022	Control Process Variable Sensor Minimum Level	-32768 to 32767 [Eng. Unit 1	0			50	**38**
P1023	Control Process Variable Sensor Maximum Level	-32768 to 32767 [Eng. Unit 1	400			50	38
P1024	Value for Low Level Alarm for the Control Process Variable	-32768 to 32767 [Eng. Unit 1	100			50	57

Parameter	Description	Adjustable Range	Factory Setting	User Setting	Properties	Groups	Page
P1025	Time Delay for Low Level Fault for the Control Process Variable (F771)	0 to 32767 s	0 s			50	57
P1026	Value for High Level Alarm for the Control Process Variable	-32768 to 32767 [Eng. Unit 1	350			50	58
P1027	Time Delay for High Level Fault for the Control Process Variable (F773)	0 to 32767 s	0 s			50	58
P1028	Selection of Control Action of the PID Controller	**0** = Disable the PID Controller **1** = Direct Mode **2** = Reverse Mode	1			50	42
P1029	Operation Mode of the PID Controller	**0** = Manual **1** = Automatic **2** = Manual or Automatic Selection via DI3	1			50	42
P1030	Automatic Adjustment of the PID Controller Setpoint	**0** = P1011 Off and P1018 Off **1** = P1011 On and P1018 Off **2** = P1011 Off and P1018 On **3** = P1011 On and P1018 On	0			50	43
P1031	PID Proportional Gain – Control process variable	0.000 to 32.000	1.000			50	44
P1032	PID Integral Gain – Control process variable	0.000 to 32.000	5.000			50	44
P1033	PID Derivative Gain – Control process variable	0.000 to 32.000	0.000			50	44
P1034	Control Process Variable Deviation to Wake up the Pump Genius	-32768 to 32767 [Eng. Unit 1	30			50	45
P1035	Control Process Variable Level for Starting the Pump Genius	-32768 to 32767 [Eng. Unit 1	180			50	45
P1036	Time Delay to Wake up or Starting by Level the Pump Genius	0 to 32767 s	5 s			50	45
P1037	Pump Motor Speed below which Pump Genius goes to Sleep Mode	0 to 18000 rpm	1250 rpm			50	46
P1038	Time Delay before Pump Genius goes to Sleep Mode (Speed Level)	0 to 32767 s	10 s			50	46
P1039	Sleep Boost Offset	-32768 to 32767 [Eng. Unit 1]	0			50	48
P1040	Sleep Boost Maximum Time	0 to 32767 s	15 s			50	48
P1041	Pipe Charging Time	0 to 65535 m	1 m			50	52
P1042	Pipe Charging Time Base	0 to 1	s/m			50	52
P1043	Motor Speed for Dry Pump	0 to 18000 rpm	1650 rpm			50	59
P1044	Motor Torque for Dry Pump	0.0 to 100.0 %	20.0 %			50	59
P1045	Time Delay for Dry Pump Fault (F781)	0 to 32767 s	0 s			50	59
P1046	Spare						
P1047	Control Auxiliary Variable Selection Source for Pump Protection	**0** = Without Protection via Control Auxiliary Variable **1** = Control Auxiliary Variable via Analog Input AI2	0			50	61
P1048	Control Auxiliary Variable Sensor Maximum Level (Range)	0 to 32767 [Eng. Unit 2]	1000			50	63
P1049	Value to detect Low Level of Control Auxiliary Variable	0 to 32767 [Eng. Unit 2]	250			50	64
P1050	Control Setpoint in Low Level	-32768 to 32767 [Eng. Unit 1	160			50	64
P1051	Hysteresis to reactivate the Control Setpoint	0 to 32767 [Eng. Unit 2]	100			50	64
P1052	Execution Mode of the Deragging Function	**0** = Not Execute Deragging Function **1** = Executes with Command to Run the Pump **2** = Executes with Command via Digital Input DI2 **3** = Executes when the Clogging of Pump is Detected	0			50	73
P1053	Number of Cycles for Deragging	0 to 100	5			50	73
P1054	Speed Reference for Deragging	0 to 18000 rpm	600 rpm			50	74
P1055	Deragging Run Time	0 to 32767 s	10 s			50	74
P1056	Deragging Stop Time	0 to 32767 s	10 s			50	74
P1057	Motor Current to detect Clogging of Pump	0.0 to 3200.0 A	20.0 A			50	74

Parameter	Description	Adjustable Range	Factory Setting	User Setting	Properties	Groups	Page
P1058	Time Delay to detect Clogging of Pump	0 to 32767 s	60 s			50	74
P1059	Number of consecutives Clogging to generate the Fault (F791)	0 to 100	5			50	75
P1060	Control Process Variable Level for Stopping the External Pump	-32768 to 32767 [Eng. Unit 1]	195			50	55
P1061	Control Process Variable Level for Starting the External Pump	-32768 to 32767 [Eng. Unit 1]	185			50	55
P1062	Time Delay for Starting the External Pump	0 to 32767 s	5 s			50	55
P1063	Time Delay for the Auxiliary Process Variable Low Level Alarm to Fault (F775)	0 to 32767 s	0			50	65
P1064	Simplex *plus* logic status 2	Shows the pump status (an extension of P1019) Bit 0 = Low level auxiliary fault (F775) Bit 1 = Pump control flow restriction active (A) Bit 2 = Daily flow limit flow restriction active Sleep mode (A751) Bit 3 = PID Ramp Active (A753) Bit 4 = Sensor DI2 Protection Alarm (A784) Bit 5 = Sensor DI3 Protection Alarm (A786) Bit 6 = Sensor DI2 Protection Fault (F785) Bit 7 = Sensor DI3 Protection Fault (F787) Bit 8 = Sensor DI6 Protection Fault (F783) Bit 9 = Spare Bit 10 = Spare Bit 11 = Spare Bit 12 = Spare Bit 13 = Spare Bit 14 = Spare Bit 15 = Spare				50	86
P1065	Minimum pressure to change from pipe charge to PID ramp	0 to 32767 (Eng. Unit 1)	0			50	53
P1066	PID Proportional Gain – Flow PV	0 to 32.000	1.000			50	83
P1067	PID Integral Gain – Flow PV	0 to 32.000	5.000			50	83
P1068	PID Derivative Gain – Flow PV	0 to 32.000	0.000			50	83
P1069	Enable Flow limitation	**0** = No flow limitation **1** = With Flow limitation	0			50	80
P1070	Flow sensor range	0 to 32767 (Eng. Unit 4)	0			50	81
P1071	Flow limitation Set point	0 to 32767 (Eng. Unit 4)	0			50	82
P1072	Flow process variable (Actual flow)	0 to 32767 (Eng. Unit 4)	280		RO	50	87
P1073	PID Ramp time	0 to 32767s	30			50	53
P1074	Time/Hour daily total flow resets	0 to 24hr	0			50	82
P1075	Maximum total flow daily allowance	0 to 32767 (Eng. Unit 4)	140			50	82
P1076	Total daily flow actual	0 to 32767 (Eng. Unit 4)			RO	50	87
P1077	Sleep Mode Power/Flow	0 to 1	0			50	47
P1078	Sleep Mode Power Level	0 to 32767 s	0			50	47
P1079	Sleep Mode Flow Level	0 to 32767 (Eng. Unit 4)	0			50	47
P1080	Ext. S DI2 Fault Time	0 to 32767 s	0			50	66
P1081	DI2 = NO or NC	0 to 1				50	66
P1082	Ext. S DI3 Fault Time	0 to 32767 s	0			50	67
P1083	DI3 = NO or NC	0 to 1				50	67
P1084	Ext. S DI6 Fault Time	0 to 32767 s	0			50	68
P1085	DI6 = NO or NC	0 to 1				50	69
P1086	DI2 Fault Message	0 to 16	0			50	67
P1087	DI3 Fault Message	0 to 16	0			50	68

Parameter	Description	Adjustable Range	Factory Setting	User Setting	Properties	Groups	Page
P1088	DI6 Fault Message	0 to 16	0			50	69
P1089	Sleep Flow/Power Time	0 to 32767 s	0				47
P1090	MAN Time out (DI3)	0 to 32767 m	0				43
P1091	LOC Time Out (HMI)	0 to 32767 m	0				44
P1092	Spare						
P1093	Spare						
P1094	Spare						
P1095	Spare						
P1096	Spare						
P1097	Spare						
P1098	HALO Enabled	0 to 1	0				39
P1099	HALO Control	0 to 1	0				39

PUMP GENIUS *PLUS* ALARMS AND FAULTS

Fault / Alarm	Description	Possible Causes
A750: Sleep Mode Active	It indicates that the Pump Genius is in the sleep mode	Value of the pump motor speed is below the threshold programmed in P1037 during the time programmed in P1038
A751: Over Daily Limit	It indicates that the Pump Genius has stopped due to reaching its total daily flow limit.	System has reached daily total limit, P1076 has reached P1075 before P1074 has reset.
A752: Pipe Charging	It indicates that the process of pipe charging is being executed	The Run/Stop command was executed in the CFW-11 inverter with the pipe charging enabled
A753: PID Ramp Active	It Indicated when the PID Ramp is being executed	The PID Ramp is being executed during the time set in User Parameter P1073 – Set Point Ramp Time
A754 Active Flow Restriction	It indicates that the pump is in flow restriction mode and the control PV is being reduced to restrict flow	The actual flow (P1072) is above the setpoint (P1071)
A756: Sleep Boost Active	It indicates that the sleep boost is in execution	Motor speed was below the value set in P1037 during the time set in P1038, but before going into sleep mode applies a boost in the control setpoint to increase the process variable
A760: DI3 not programmed for PID in Manual / Automatic	It indicates that the parameter of digital input DI3 (P0265) was not programmed to select the PID controller in Manual (0) / Automatic (1)	PID Controller was enabled to have selection Manual / Automatic (P1029 =2) and the digital input DI3 wasn't programmed correctly (P0265≠21)
A770: Low Level of the Control Process Variable	It indicates that the control process variable (P1016) is in low level	The control process variable (P1016) is lower than the value programmed in P1024
A772: High Level of the Control Process Variable	It indicates that the control process variable (P1016) is in high level	The control process variable (P1016) is higher than the value programmed in P1026
A774: Low Level of Auxiliary Control Variable Alarm	It indicates that the control auxiliary variable (P1017) is in low level and the control setpoint was changed to the value of P1050	The control auxiliary variable (P1017) is lower than the value programmed in P1049
A780: Dry Pump	It indicates that the dry pump condition was detected	Value of the pump motor speed is above of the threshold programmed in P1043 and motor torque is below the threshold programmed in P1044
A782: Sensor DI6 Protection	It indicates that protection via external sensor (DI6) is actuated	Pump in operation and digital input DI6 is at logic level "0" or "1" depending on setting in User Parameter P1085 - DI6 = NO or NC
A784: Sensor DI2 Protection	It indicates that protection via external sensor (DI2) is actuated	Pump in operation and digital input DI2 is at logic level "0" or "1" depending on setting in User Parameter P1081 – DI2 = NO or NC
A786: Sensor DI3 Protection	It indicates that protection via external sensor (DI3) is actuated	Pump in operation and digital input DI3 is at logic level "0" or "1" depending on setting in User Parameter P1083 – DI3 = NO or NC
A790: Clogging Detected	It indicates that the clogging of pump was detected due the high current in the pump motor	Deragging was configured to execute when clogging is detected (P1052=3) and the motor current was greater than the motor current to detect the pump clogging (P1057) during a time to detect the pump clogging (P1058).
A792: Deragging Configuration Error	It indicates that the deragging couldn't be executed due the forward/reverse selection in REMOTE mode (P0226) not be configured to be via SoftPLC	Speed reference in REMOTE mode was programmed to SoftPLC (P0222=12), the CFW-11 frequency inverter is on REMOTE mode, but the forward/reverse selection in REMOTE mode wasn't programmed to SoftPLC (P0226=12 or 13)
A794: Deragging is in Execution	It indicates that the deragging function is in execution	The deragging function is enabled (P1052≠0) and in execution
A796: Deragging not Executed	It indicates that the deragging couldn't be executed due to the CFW-11 inverter be in LOCAL mode	The deragging function is enabled (P1052≠0), but couldn't be executed due to the CFW-11 inverter be operating in LOCAL mode

Fault / Alarm	Description	Possible Causes
F771: Low Level of the Control Process Variable	It indicates that the pump was stopped due to low level of the control process variable	The control process variable (P1016) remained for a time (P1025) at a value lower than the threshold programmed in P1024
F773: High Level of the Control Process Variable	It indicates that the pump was stopped due to high level of the control process variable	The control process variable (P1016) remained for a time (P1027) at a value higher than the threshold programmed in P1026
F775: Low level Auxiliary Control Variable Fault	It indicates that the pump was stopped due to low level of the Auxiliary control process variable	Value of the Auxiliary variable is below the threshold programmed in P1049 during the time programmed in P1063
F781: Dry Pump	It indicates that the pump was stopped due to dry pump protection	During a time (P1045) the value of the pump motor speed remains above of the threshold programmed in P1043 and motor torque remains below the threshold programmed in P1044
F783: Sensor DI6 Protection	It indicates that the pump was stopped due to protection via external sensor (DI6)	Pump in operation and digital input DI6 remained at logic level “0” or “1” for longer than the time set in User Parameter P1084 - Ext. S DI6 Fault Time
F785: Sensor DI2 Protection	It indicates that the pump was stopped due to protection via external sensor (DI2)	Pump in operation and digital input DI2 remained at logic level “0” or “1” for longer than the time set in User Parameter P1080 - Ext. S DI2 Fault Time
F787: Sensor DI3 Protection	It indicates that the pump was stopped due to protection via external sensor (DI3)	Pump in operation and digital input DI3 remained at logic level “0” or “1” for longer than the time set in User Parameter P1082 - Ext. S DI3 Fault Time
F788: AI1 Wire Fault	It indicates that the pump was stopped due to wire break on Analog Input AI1	Drive Parameter P0233 AI1 Signal Type was programmed for 4 – 20mA and there is an open current loop
F791: Excess of Clogging	It indicates that the pump was stopped due an excess number of clogging detected	Deragging was configured to execute when clogging is detected (P1052=3) and the number of clogging detected was equal to the value defined as limit to generate a fault by consecutives clogging (P1059)
F799: Incompatible Software Version	It Indicates that the software version of the CFW-11 inverter is not compatible with the software version required to use the Pump Genius Simplex application	The value of the P0023 parameter that indicates the software version of the CFW-11 inverter is less than 5.30 or greater than 5.39

1 INTRODUCTION TO THE PUMP GENIUS SIMPLEX *PLUS* APPLICATION

The Pump Genius Simplex *Plus* application developed for the CFW-11 inverter SoftPLC function provides the user with flexibility in the operation and configuration. Tools, already developed for the WLP programming software, are being used together with configuration wizards and monitoring dialogs boxes.

1.1 PUMPS

Pumps are hydraulic operating machines that transfer energy to the fluid for the purpose of transporting it from one point to another. They receive energy from a motor source and transfer part of it to the fluid in the form of pressure energy, kinetic energy, or both, i.e., increase the fluid's pressure or speed, or both quantities.

Commonly used ways to drive pumps are:

- Electric motors,
- Internal combustion motors,
- Turbines.

Pumps can be classified into two wide categories:

- Centrifugal pumps or turbo pumps,
- Volumetric pumps or positive displacement pumps.

1.1.1 Centrifugal Pumps

The operating based on the principle of transferring kinetic energy to the fluid to be pumped; this kinetic energy is transformed into potential energy (pressure). The rotational movement of a rotor inserted into a casing is the functional part responsible for this transformation.

Depending on the types and shapes of rotors, centrifugal pumps can be classified as follows:

- **Radial or pure,** when the direction of the pumped fluid is perpendicular to the rotating axle;
- **Mixed flow or semi-axial,** when the direction of the pumped fluid is inclined in relation to the rotating axle;
- **Axial flow,** when the direction of the pumped fluid is parallel in relation to the rotating axle.

1.1.2 Positive Displacement Pumps

The operating principle of this type of pump is based on the direct transfer of mechanical work (of a motor shaft rotation against a load torque) into potential energy (pressure energy). This transfer is obtained by the movement of a mechanical apparatus of the pump (piston, diaphragm, gears, screws, etc.), which forces the fluid to execute the same movement.

The liquid cyclical fills and then is ejected from a given volume of space inside the pump, a process which is responsible for the name "Volumetric Pump".

Variations of these mechanical apparatuses permit the classification of volumetric or positive displacement pumps:

- **Piston or alternative pumps,** when the apparatus which produces the movement of the fluid is a piston which moves in alternating directions and expels the pumped fluid,
- **Rotary pumps,** when the apparatus which produces the movement of the fluid is driven by rotational movement, like a screw, gear, flakes, lobes, etc.

1.2 GENERAL CHARACTERISTICS OF THE PUMP GENIUS SIMPLEX *PLUS* APPLICATION

The main characteristic of the Pump Genius *Plus* Simplex *Plus* application developed for the CFW-11 inverter SoftPLC function is the control of one pump using for this a frequency inverter that will control your speed as required by the user demand.

Each is notable for the following characteristics:

- Control of only one pump driven by CFW-11 inverter,
- Acceleration and deceleration ramps for the pump driven by inverter,
- Maximum and minimum speed limits for the pump driven by inverter,
- Selection of the control setpoint via analog input, CFW-11 HMI, logical combination of the two digital inputs DI4 and DI5 (maximum of 4 setpoints),
- Selection of the control process variable via analog input AI1or the difference between analog input AI1 and AI2 (AI1 – AI2); allows also not have the control process variable so disabling the PID controller,
- Selection of the engineering unit and range of the control process variable sensor via CFW-11 parameters,
- Gain, offset and filter adjustments for the control signals via analog inputs,
- PID controller gains setting of the pumping control via HMI parameters,
- Control action of the PID controller configured for direct mode or reverse mode, or can be disabled,
- Selection of operation mode of the PID controller in Manual or Automatic, and may be selecting via digital input DI3 or via parameter,
- Enable or not of the sleep mode with the PID controller enabled,
- Enable or not of the sleep boost before to going into sleep mode,
- Wake up mode or start level mode for starting the pump with the PID controller enabled,
- Initiate the pumping with pipe charging through time and/or pressure,
- Smooth transition of the pumping from pipe charging through to PID control with the use of PID ramp,
- Adjustment of the motor current limitation during the pipe charging process,
- Enable or not the use of an external pump for jockey pump function (control the pumping when the demand is minimal) via digital input DI1 and command via digital output DO1,
- Low level protection for the control process variable (pipe breaking),
- High level protection for the control process variable (pipe obstruction),
- Indication of pump protection faults via digital output DO3,
- Dry pump protection through evaluation of motor torque and pump speed,
- Pump protection via external sensor (NO or NC) via digital inputs DI2, DI3 and DI6,
- Selection of an analog input as a control auxiliary variable for pump protection,
- Selection of an analog input as a Flow auxiliary variable for pump/system protection,
- Pump cavitation protection via low level limitation for the control auxiliary variable,
- Flow limitation/control via the Flow auxiliary variable,
- Detection clogging of a pump driven by the inverter via high current in the motor,
- Execution of the deragging of the pump via a command in the digital input DI2, or a command to start the pump or when the clogging of pump is detected,
- Possibility to enable the pump driven by the frequency inverter via HMI (local mode),
- Possibility of implementation or modification of the application by the user through the WLP software.

2 PUMP GENIUS SIMPLEX *PLUS* CONFIGURATION

In the Pump Genius Simplex application developed for the CFW-11 SoftPLC function several possibilities of use or configuration were implemented: have only one pump, associated on external pump, protect the pump using an analog variable or a digital sensor, enable the PID controller in automatic or manual via digital input DI3, enable the functionality for deragging the pump, define that the control setpoint or the speed reference acts according to weekly schedule defined by the user, etc.

NOTE!
The Pump Genius Simplex Plus application only works on CFW-11 inverter with **special firmware version Ve.5.3x**. So, upgrading the CFW-11 inverter firmware to the working of this application is required.

2.1 CONTROL SETPOINT VIA HMI OR REMOTE SYSTEM

The user can configure the Pump Genius Simplex application to having one pump and the control setpoint adjusted via HMI of the CFW-11 inverter or via a cloud based remote platform (an additional hardware is to be added to the system).
It basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (P1),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- Command for Run/Stop (S1),
- Status light for inverter fault (H1),
- Status light for motor running (H2),
- Status light for low- or high-level protection for the control process variable (H3).

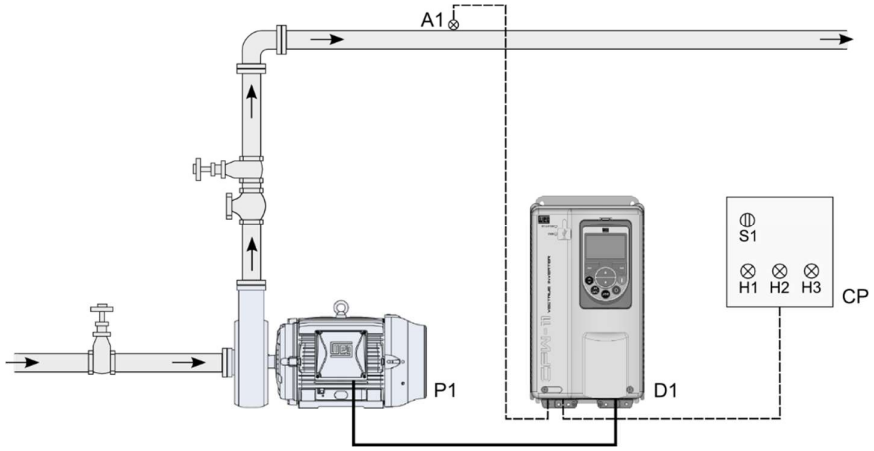
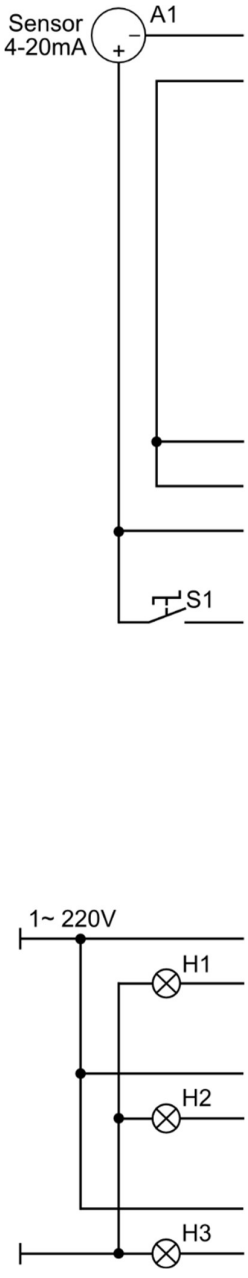


Figure 2.1 *– Pump Genius Simplex Plus application and control setpoint via HMI*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter with control setpoint via HMI. See chapter 5 for more details on the configuration wizard.

NOTE!
The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius with control setpoint via HMI. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.2 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter to have the control setpoint adjusted via HMI.



XC1 Terminal Strip		Default Function for Control Setpoint via HMI
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): No function
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: No function
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Run/Stop
16	DI2	Digital input 2: No function
17	DI3	Digital input 3: No function
18	DI4	Digital input 4: No function
19	DI5	Digital input 5: No function
20	DI6	Digital input 6: No function
21	NC1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): N > Nx
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): A770/A772 or F771/F773 (SoftPLC)
28	C3	
29	NO3	

Figure 2.2 *– Terminal strip XC1 for control setpoint via HMI*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

2.2 CONTROL SETPOINT VIA ANALOG INPUT

The user can configure the Pump Genius Simplex application to having one pump and the control setpoint adjusted via one analog input of the CFW-11 inverter, which basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (P1),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- 01 Potentiometer for adjusting the control setpoint via input analog (R1),
- Command for Run/Stop (S1),
- Status light for inverter fault (H1),
- Status light for motor running (H2),
- Status light for low- or high-level protection for the control process variable (H3).

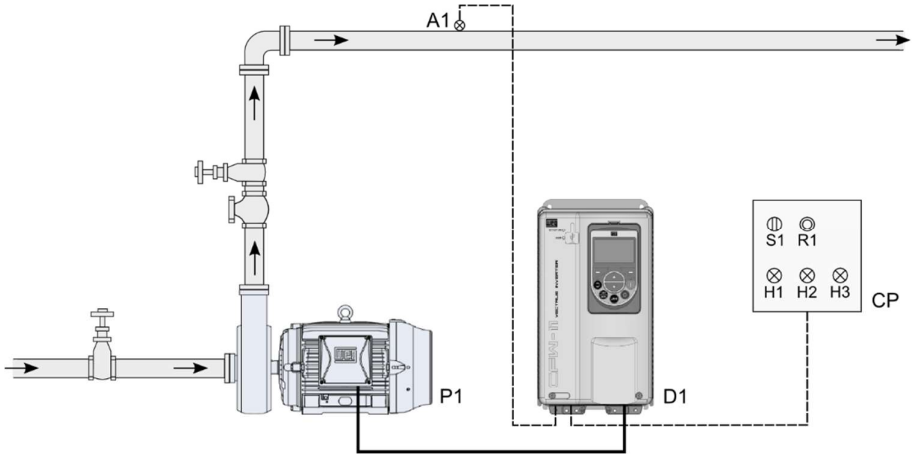
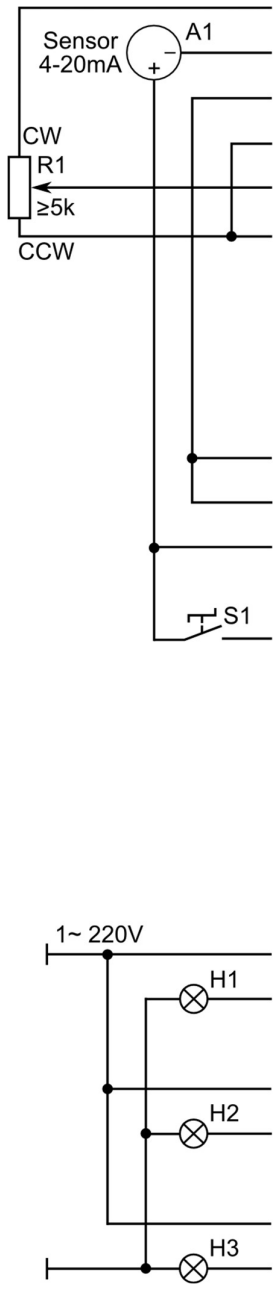


Figure 2.3 *– Pump Genius Simplex Plus application and control setpoint via analog input*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter with control setpoint via analog input. See chapter 5 for more details on the configuration wizard.

NOTE!
The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius with control setpoint via analog input. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.4 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter to have the control setpoint via analog input.



XC1 Terminal Strip		Default Function for Control Setpoint via Analog Input
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): Control setpoint
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: No function
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Run/Stop
16	DI2	Digital input 2: No function
17	DI3	Digital input 3: No function
18	DI4	Digital input 4: No function
19	DI5	Digital input 5: No function
20	DI6	Digital input 6: No function
21	NC1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): N > Nx
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): A770/A772 or F771/F773 (SoftPLC)
28	C3	
29	NO3	

Figure 2.4 *– Terminal strip XC1 for control setpoint via analog input*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

2.3 CONTROL SETPOINT VIA LOGICAL COMBINATION OF THE DIGITAL INPUTS DI4 AND DI5

The user can configure the Pump Genius Simplex application to having one pump and the control setpoint adjusted via logical combination of digital inputs DI4 and DI5 which basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (P1),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- Command for Run/Stop (S1),
- Switch of "n" positions for selection of the control setpoint (S4),
- Status light for inverter fault (H1),
- Status light for motor running (H2),
- Status light for low- or high-level protection for the control process variable (H3).

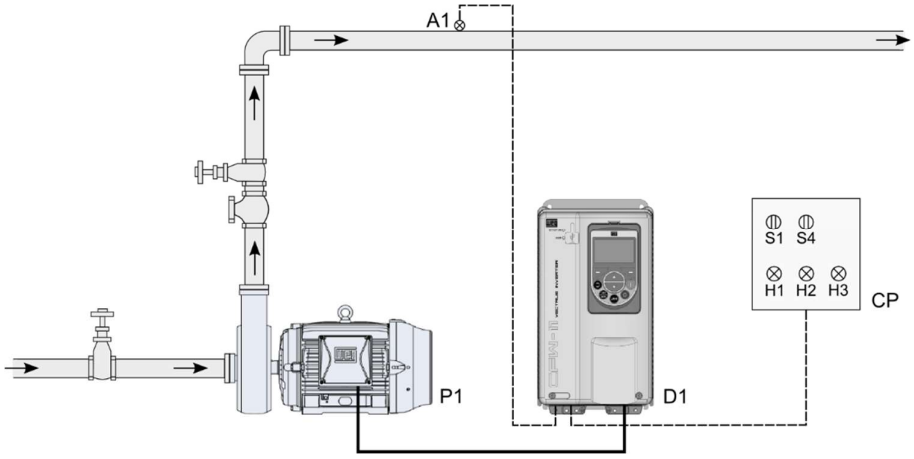
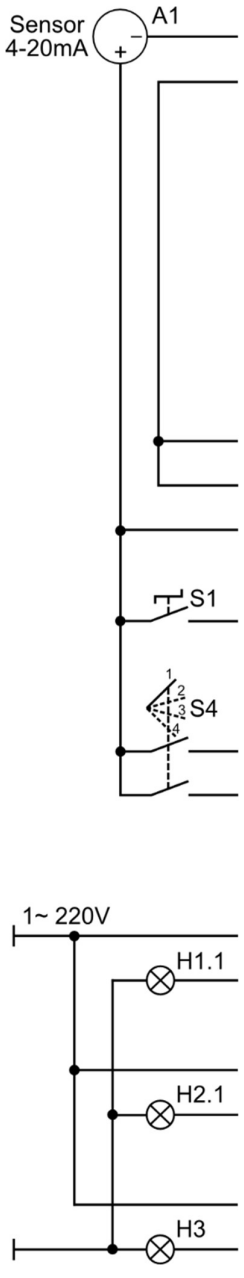


Figure 2.5 *– Pump Genius Simplex Plus application and control setpoint via logical combination of the digital inputs DI4 and DI5*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter with control setpoint via logical combination of the digital inputs DI4 and DI5. See chapter 5 for more details on the configuration wizard.

NOTE!
The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius with control setpoint via logical combination of the digital inputs DI4 and DI5. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.6 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter to have the control setpoint via logical combination of digital inputs DI4 and DI5.



XC1 Terminal Strip		Default Function for Control Setpoint via Logical Combination of the DI´s
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): No function
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: No function
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Run/Stop
16	DI2	Digital input 2: No function
17	DI3	Digital input 3: No function
18	DI4	Digital input 4: 1st DI for control setpoint selection
19	DI5	Digital input 5: 2nd DI for control setpoint selection
20	DI6	Digital input 6: No function
21	NC1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): N > Nx
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): A770/A772 or F771/F773 (SoftPLC)
28	C3	
29	NO3	

Figure 2.6 *– Terminal strip XC1 for control setpoint via logical combination of the digital inputs DI4 and DI5*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

2.4 SELECTION OF PID CONTROLLER IN MANUAL OR AUTOMATIC VIA DIGITAL INPUT DI3

The user can configure the Pump Genius Simplex application to having one pump and the selection of PID controller operation mode in manual or automatic via digital input DI3 which basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (B1),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- Command for Run/Stop (S1),
- Manual (0) / Automatic (1) commutation switch to select the operation mode of the PID controller (S3),
- Status light for inverter fault (H1),
- Status light for motor running (H2),
- Status light for low- or high-level protection for the control process variable (H3).

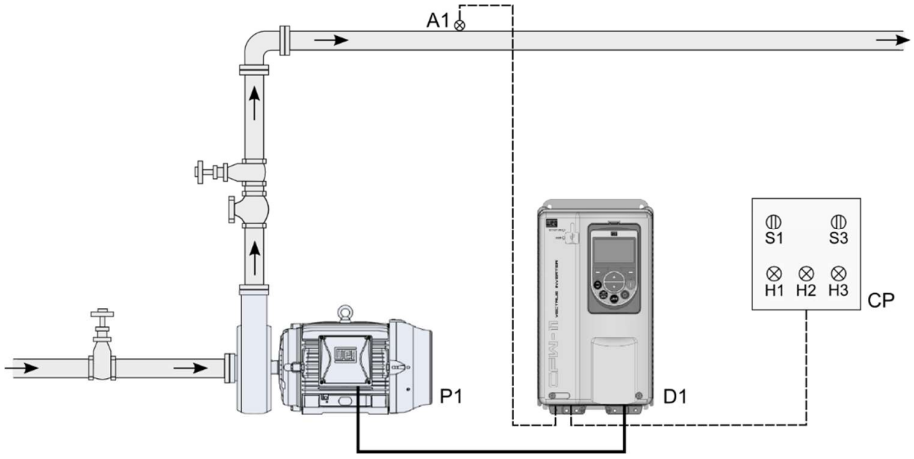
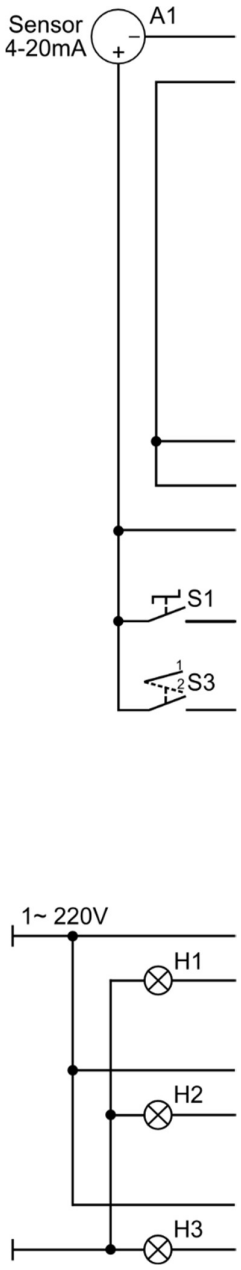


Figure 2.9 *– Pump Genius Simplex Plus application and selection of PID controller in manual or automatic via digital input DI3*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter with selection of PID controller in manual or automatic via digital input DI3. See chapter 5 for more details on the configuration wizard.

NOTE!
The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius with selection of PID controller in manual or automatic via digital input DI3. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.10 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter to have the selection of PID controller in manual or automatic via digital input DI3.



XC1 Terminal Strip		Default Function for Selection of the PID controller in Man/Auto via DI3
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): No function
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: No function
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Run/Stop
16	DI2	Digital input 2: No function
17	DI3	Digital input 3: Selection of the PID controller in manual (0) or automatic (1)
18	DI4	Digital input 4: No function
19	DI5	Digital input 5: No function
20	DI6	Digital input 6: No function
21	NC1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): N > Nx
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): A770/A772 or F771/F773 (SoftPLC)
28	C3	
29	NO3	

Figure 2.10 *– Terminal strip XC1 for selection of PID controller in manual or automatic via digital input DI3*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

2.5 EXTERNAL PUMP FOR JOCKEY PUMP FUNCTION

The user can configure the Pump Genius Simplex application to having one pump and be able to command another pump (external) of lesser capacity for jockey pump function, i.e., control the pumping when the demand is minimal which basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (P1),
- 01 Electric motor and external pump (EP),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- Command to enable the use of the external pump (S1),
- Command for Run/Stop (S2),
- Status light for external pump running (H1),
- Status light for inverter fault (H2),
- Status light for motor running (H3).

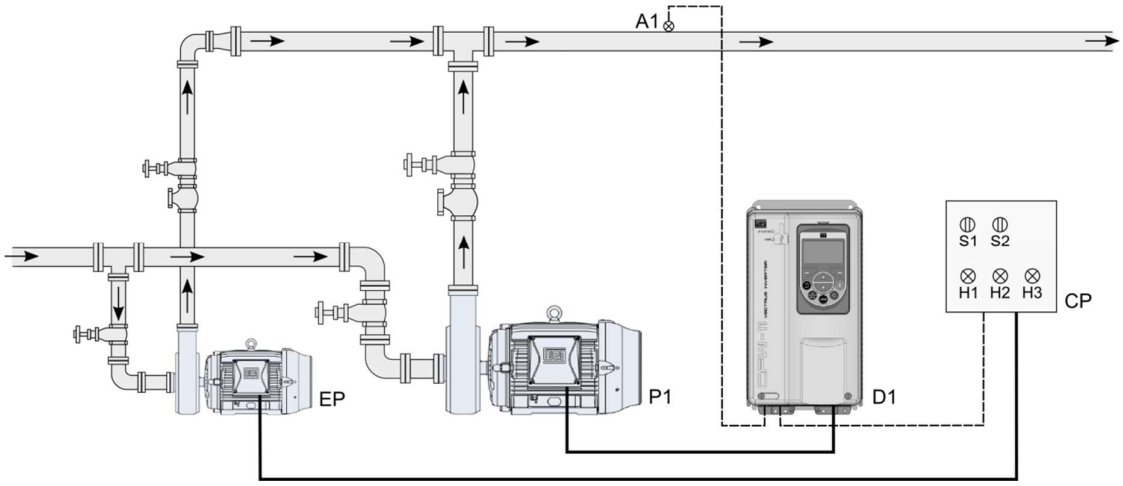
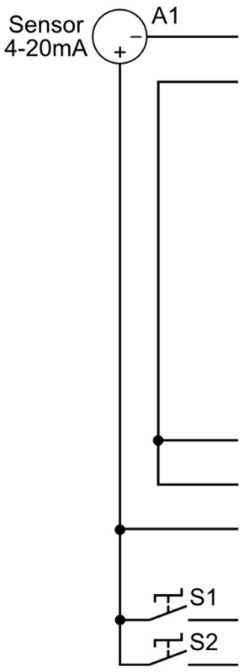


Figure 2.11 *– Pump Genius Simplex Plus application and an external pump for jockey pump function*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter with an external pump for jockey pump function. See chapter 5 for more details on the configuration wizard.

NOTE!
The external pump can be driven by a contactor (direct online or star delta start), a soft-starter, a smart relay, etc. The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius with an external pump for jockey pump. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.12 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter to have an external pump for jockey pump function.



XC1 Terminal Strip		Default Function for use an External Pump
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): No function
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: No function
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Enable the use of external pump
16	DI2	Digital input 2: Run/Stop
17	DI3	Digital input 3: No function
18	DI4	Digital input 4: No function
19	DI5	Digital input 5: No function
20	DI6	Digital input 6: No function
21	NC1	Digital output 1 DO1 (RL1): Start External Pump
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): No fault
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): N > Nx
28	C3	
29	NO3	

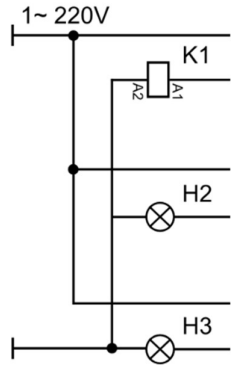


Figure 2.12 *– Terminal strip XC1 for use an external pump for jockey pump function*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

2.6 PUMP PROTECTION VIA EXTERNAL SENSORS IN THE DIGITAL INPUT DI2, DI3 AND/OR DI6.

The user can configure the Pump Genius Simplex *Plus* application to having one pump and protect it via up to 3 external sensors installed in the digital input DI2, DI3 and/or DI6 which basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (P1),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- 01 Sensor with “NO” or “NC” contact for pump protection (S6),
- 01 Sensor with “NO” or “NC” contact for pump protection (S7),
- 01 Sensor with “NO” or “NC” contact for pump protection (S8),
- Command for Run/Stop (S1),
- Status light for inverter fault (H1),
- Status light for motor running (H2),
- Status light for low- or high-level protection for the control process variable (H3).

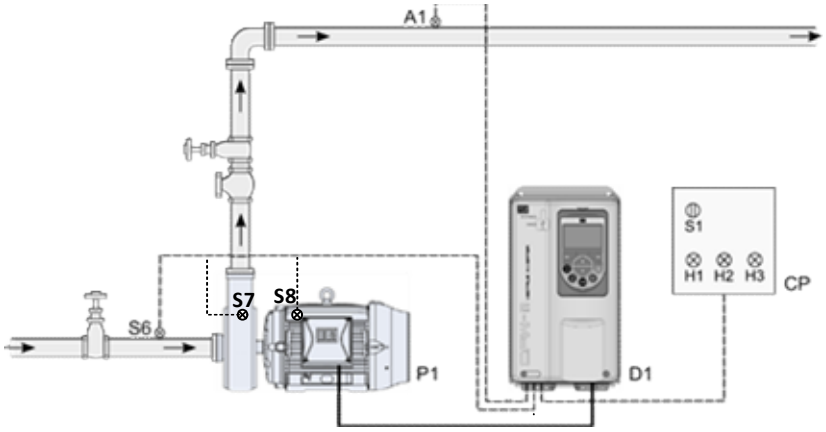
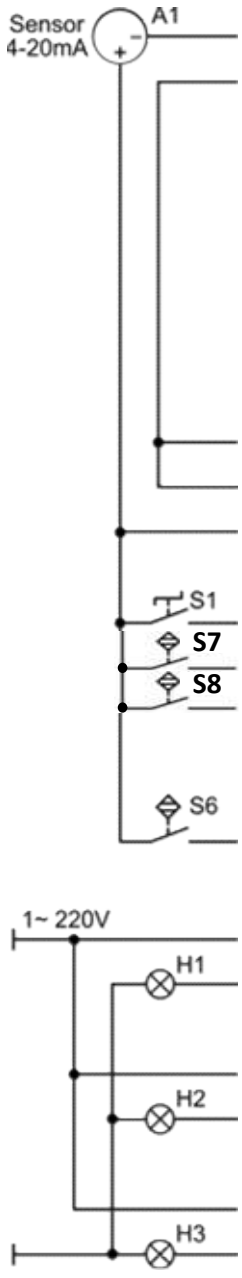


Figure 2.13 *– Pump Genius Simplex Plus application and pump protection via external sensor in the digital input DI2, DI3 and DI6*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter and pump protection with an external sensor via digital inputs DI2, DI3 and DI6. See chapter 5 for more details on the configuration wizard.

NOTE!
The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius and pump protection with an external sensor via digital input DI6. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.14 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter to have the pump protection via external sensor in the digital input DI6.



XC1 Terminal Strip		Default Function for Pump Protection via External Sensor in the DI6
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): Motor speed
6	AI2-	
7	AO1	Analog output 1: No function
8	AGND	
9	AO2	Analog output 2: No function
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Run/Stop
16	DI2	Digital input 2: No function
17	DI3	Digital input 3: No function
18	DI4	Digital input 4: No function
19	DI5	Digital input 5: No function
20	DI6	Digital input 6: External sensor
21	NC1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): N > Nx
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): A770/A772 or F771/F773 (SoftPLC)
28	C3	
29	NO3	

Figure 2.14 *– Terminal strip XC1 for pump protection via external sensor in the digital input DI6*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

2.7 PUMP PROTECTION VIA CONTROL AUXILIARY VARIABLE

The user can configure the Pump Genius Simplex application to having one pump and protect it via a sensor with analog output signal for measure the control auxiliary variable via an analog input which basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (P1),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- 01 Sensor with analog output signal for measurement of the control auxiliary variable (A2),
- Command for Run/Stop (S1),
- Status light for inverter fault (H1),
- Status light for motor running (H2),
- Status light for low- or high-level protection for the control process variable (H3).

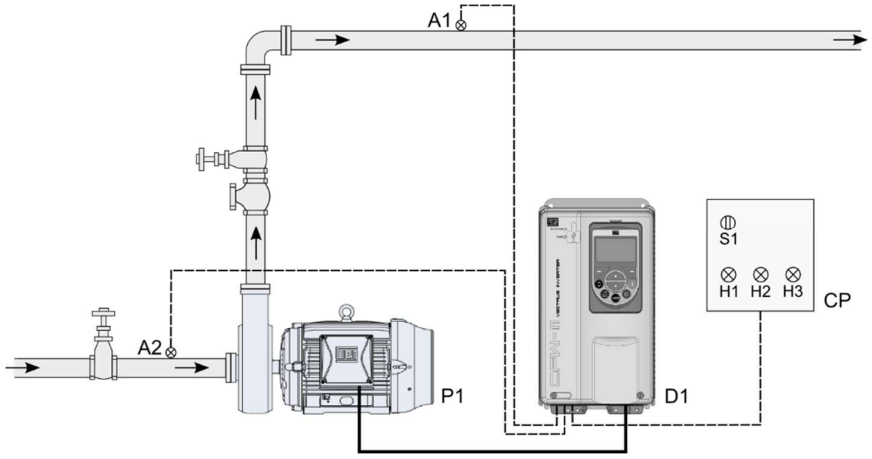
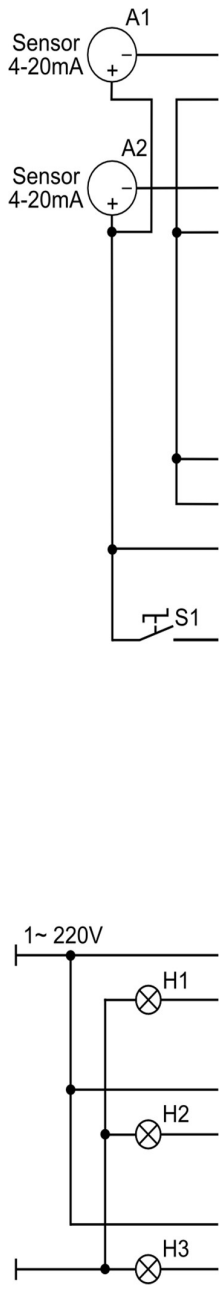


Figure 2.15 *– Pump Genius Simplex Plus application and pump protection via control auxiliary variable read by analog input*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter and pump protection via control auxiliary variable read by analog input. See chapter 5 for more details on the configuration wizard.

NOTE!
The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius and pump protection via control auxiliary variable read by analog input. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.16 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter for pump protection via control auxiliary variable read by analog input.



XC1 Terminal Strip		Default Function for Pump Protection via Control Auxiliary Variable
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (4-20 mA): Control auxiliary variable
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: Motor current
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Run/Stop
16	DI2	Digital input 2: No function
17	DI3	Digital input 3: No function
18	DI4	Digital input 4: No function
19	DI5	Digital input 5: No function
20	DI6	Digital input 6: No function
21	NC1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): N > Nx
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): A770/A772 or F771/F773 (SoftPLC)
28	C3	
29	NO3	

Figure 2.16 *– Terminal strip XC1 for pump protection via control auxiliary variable read by analog input*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

2.8 DERAGGING FUNCTION WITH COMMAND VIA DIGITAL INPUT DI2

The user can configure the Pump Genius Simplex application to having one pump and execute the deragging function through a command via digital input DI2 which basically comprises:

- 01 CFW-11 inverter (D1),
- 01 Electric motor and pump (P1),
- 01 Sensor with analog output signal for measurement of the control process variable (A1),
- Command for Run/Stop (S1),
- Command to execute the deragging function (S2),
- Status light for inverter fault (H1),
- Status light for motor running (H2),
- Status light for low- or high-level protection for the control process variable (H3).

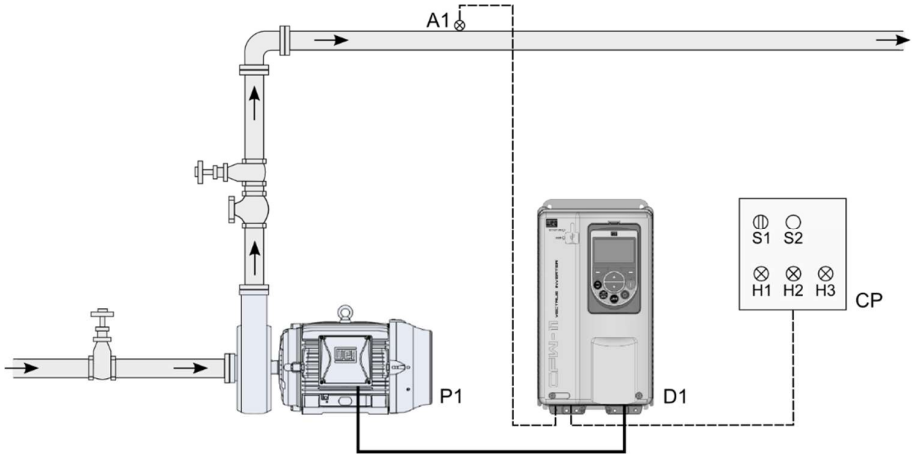
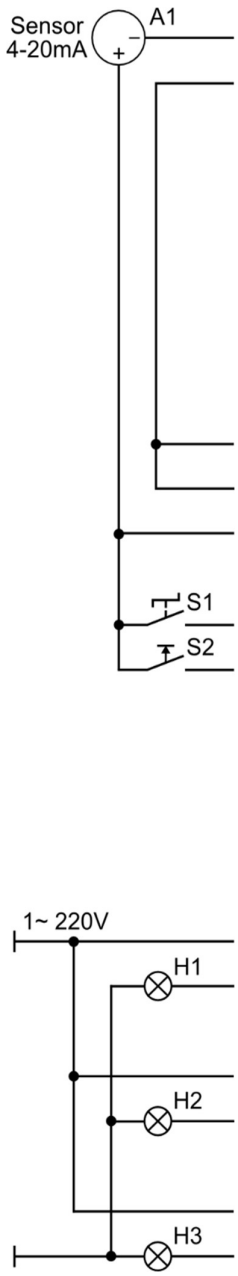


Figure 2.17 *– Pump Genius Simplex Plus application and deragging function with command via digital input DI2*

NOTE!
Using the **Pump Genius *Plus* Simplex** configuration wizard to configure the pump driven by CFW-11 inverter and the deragging function with command via digital input DI2. See chapter 5 for more details on the configuration wizard.

NOTE!
The indicating lights H1, H2 and H3 are not necessary for the operation of the Pump Genius and the deragging function with command via digital input DI2. They only indicate the condition of the pump operation at the command panel (CP).

The figure 2.18 presents the control connections (analog inputs/outputs, digital inputs/outputs) that must be made at the CC11 control board terminal strip XC1 of the CFW-11 inverter to have the deragging function with command via digital input DI2.



XC1 Terminal Strip		Default Function for Deragging Function with command via DI2
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (4-20 mA): Control process variable
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (4-20 mA): No function
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: Motor current
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VDC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Run/Stop
16	DI2	Digital input 2: Command to execute the deragging function
17	DI3	Digital input 3: No function
18	DI4	Digital input 4: No function
19	DI5	Digital input 5: No function
20	DI6	Digital input 6: No function
21	NC1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NO1	
24	NC2	Digital output 2 DO2 (RL2): N > Nx
25	C2	
26	NO2	
27	NC3	Digital output 3 DO3 (RL3): A770/A772 or F771/F773 (SoftPLC)
28	C3	
29	NO3	

***Figure 2.18** – Terminal strip XC1 for deragging function with command via digital input DI2*

NOTE!
Refer to the CFW-11 inverter manual for more information on the connections.

3 PARAMETERS DESCRIPTION

The CFW-11 inverter parameters (P0000 to P0999) and the SoftPLC function parameters (P1000 to P1099) for the Pump Genius Simplex application will be presented next.

NOTE!
The Pump Genius Simplex Plus application only works on CFW-11 inverter with **special firmware version Ve.5.3x**. So upgrading the CFW-11 inverter firmware to the working of this application is required.

NOTE!
The adjustable range of the CFW-11 parameters has been customized for the Pump Genius Simplex application. Refer to the CFW-11 programming manual for more details on the parameters.

Symbols for property description:

CFG	Configuration parameter, value can be programmed only with motor stopped
RO	Read-only parameter
RW	Read and write parameter

3.1 ORIGIN OF COMMANDS

This group of parameters allows the user to configure the origin of the CFW-11 inverter commands. For this application, the speed reference in LOCAL situation can be via HMI, and in REMOTE situation has to be via SOFTPLC to do the Pump Genius software works properly.

LOCAL Situation:
It allows the user to command the pump driven by the CFW-11 inverter disregarding the control of the speed reference from the Pump Genius logic.

NOTE!
The parameter P0205 (Reading Parameter Selection 1) is automatically changed to "1 - Speed-Reference #" when the CFW-11 inverter operates in LOCAL mode.

REMOTE Situation:
It enables the control of the speed reference from the Pump Genius logic according to the programming performed by the user.

NOTE!
The parameter P0205 (Reading Parameter Selection 1) is automatically changed to "22 – P1011 Control Setpoint #" when the CFW-11 inverter operates in REMOTE mode.

P0220 – LOCAL/REMOTE Selection Source

P0221 – Speed Reference Selection – LOCAL Situation

P0222 – Speed Reference Selection – REMOTE Situation

P0223 – FORWARD/REVERSE Selection - LOCAL Situation

P0226 – FORWARD/REVERSE Selection - REMOTE Situation

P0224 – Run/Stop Selection – LOCAL Situation

P0227 – Run/Stop Selection – REMOTE Situation

P0225 – JOG Selection – LOCAL Situation

P0228 – JOG Selection – REMOTE Situation

NOTE!
Refer to the CFW-11 inverter programming manual for more information on the command origin parameters. Some parameter options have been removed from the configuration wizard.

3.2 RAMPS

This group of parameters allows the user to adjust the inverter ramps, so that the motor can be accelerated or decelerated at a faster or slower rate.

P0100 – Acceleration Time

Adjustable Range:	0.0 to 999.0 s	Factory Setting:	20.0 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 20 Ramps		

Description:
This parameter determines the time of linear acceleration between zero and maximum speed (defined in P0134).

P0101 – Deceleration Time

Adjustable Range:	0.0 to 999.0 s	Factory Setting:	20.0 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 20 Ramps		

Description:
This parameter determines the time of linear deceleration between the maximum speed (defined in P0134) and zero.

NOTE!
Refer to the CFW-11 programming manual for more information on the ramp parameters.

3.3 SPEED LIMITS

This group of parameters allows the user to configure the motor speed limits.

P0133 – Minimum Speed Reference Limit

Adjustable Range:	0 to 18000 rpm	Factory Setting:	1200 rpm
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 22 Speed Limits		

Description:
This parameter defines the minimum value for the motor speed reference when the inverter is enabled.

P0134 – Maximum Speed Reference Limit

Adjustable Range:	0 to 18000 rpm	Factory Setting:	1800 rpm
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 22 Speed Limits		

Description:
This parameter defines the maximum value for the motor speed reference when the inverter is enabled.

NOTE!
Refer to the CFW-11 programming manual for more information on the speed limit parameters. With the CFW-11 inverter programmed to scalar (V/f) mode, the motor slip is disregarded.

3.4 DIGITAL INPUTS

This group of parameters allows the user to configure the command function of each digital input in the Pump Genius Simplex application.

P0263 – DI1 Function

Adjustable Range:	0 to 31 / 21 = (PLC Use) Run/Stop Also can be used start the Jockey Pump		Factory Setting: 1
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS └ 40 Digital Inputs	or	07 I/O CONFIGURATION └ 40 Digital Inputs

Description:
This parameter configures the function of the digital input DI1 in the application ladder as enable the use of the external pump for jockey pump function (control the pumping when the demand is minimal). Additional switching elements can be inserted into the wiring of this digital input in order to perform protection functions, such as: a protection sensor for pump or motor, etc.

Logic level “0”, disable the use of the external pump for jockey pump function.

Logic level “1”, enable the use of the external pump for jockey pump function.

NOTE!
Refer to the section 3.13 for more information on the use of an external pump for jockey pump function.

P0264 – DI2 Function

Adjustable Range:	0 to 31 / 21 = (PLC Use) Execute Deragging Function Also Run/Stop if Jockey pump is used		Factory Setting: 0
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS └ 40 Digital Inputs	or	07 I/O CONFIGURATION └ 40 Digital Inputs

Description:
This parameter configures the function of the digital input DI2 in the application ladder as the command to execute the Deragging function or External Sensor Fault.

When Deragging function via DI2 is selected:

When the transition from logic level "0" to "1" in the digital input DI2 occurs, it initiates the logic to execute the deragging function. At the end of the number of cycles set in P1053 parameter, the Pump Genius returns to normal operation.

NOTE!
Refer to the section 3.19 for more information on the deragging function.
The deragging function selection takes precedent over the use of the external sensor on DI2.

When External Sensor via DI2 is selected:

If the Deragging function is not selected, this parameter can also configure the function of the digital input DI2 in the application ladder as enabling the pump protection via an external sensor.
Depending on the sensor function (NO or NC) selected in Parameter P1081. Logic level “0” or “1” indicates that an external sensor for pump protection is actuated. When the pump is running, the alarm A784: “Sensor DI2 Protection” will be generated. After the programmed time in P1080 elapses, the fault F785: “Text selected in Parameter P1086” will be generated, and the pump will be disabled.

NOTE!
Refer to the section 3.17 for more information on the pump protection via an external sensor.
The deragging function selection takes precedent over the use of the external sensor on DI2.

P0265 – DI3 Function

Adjustable Range:	0 to 31 / 21 = (PLC use) Select Control in Manual (0) or Auto (1)		Factory Setting:	0
Properties:	CFG			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs	or	07 I/O CONFIGURATION ∟ 40 Digital Inputs	

Description:
This parameter configures the function of the digital input DI3 in the application ladder as the selection the operation mode of PID controller in manual or automatic or External Sensor Fault.

When PID controller in manual or automatic is selected:

Logic level “0”, defines that the control (i.e., the PID controller) will operate in manual mode.
Logic level “1”, defines that the control (i.e., the PID controller) will operate in automatic mode.

When External Sensor via DI3 is selected:

If the PID controller in manual or automatic is not selected, this parameter can also configure the function of the digital input DI3 in the application ladder as enabling the pump protection via an external sensor.
Depending on the sensor function (NO or NC) selected in Parameter P1083. Logic level “0” or “1” indicates that an external sensor for pump protection is actuated. When the pump is running, the alarm A786: “Sensor DI3 Protection” will be generated. After the programmed time in P1082 elapses, the fault F787: “Text selected in Parameter P1087” will be generated, and the pump will be disabled.

NOTE!
Refer to the section 3.9 for more information on operation mode of PID controller.
The PID Control in Manual or Automatic function selection takes precedent over the use of the external sensor on DI3.

P0266 – DI4 Function

Adjustable Range:	0 to 31 / 21 = (PLC use)1st DI for multiple Setpoint Selection		Factory Setting:	0
Properties:	CFG			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs	or	07 I/O CONFIGURATION ∟ 40 Digital Inputs	

Description:
This parameter configures the function of the digital input DI4 in the application ladder as the 1st digital input of the logical combination which defines the multiple control setpoint of the Pump Genius.

P0267 – DI5 Function

Adjustable Range:	0 to 31 / 21 = (PLC use) 2nd DI for multiple Setpoint Selection		Factory Setting: 0
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs	or	07 I/O CONFIGURATION ∟ 40 Digital Inputs

Description:
This parameter configures the function of the digital input DI5 in the application ladder as the 2nd digital input of the logical combination which defines the multiple control setpoint of the Pump Genius.

NOTE!
Refer to the section 3.8 for more information on the control setpoint via logical combination of the digital inputs DI4 and DI5.

P0268 – DI6 Function

Adjustable Range:	0 to 31 / 21 = (PLC Use) External Sensor		Factory Setting: 0
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs	or	07 I/O CONFIGURATION ∟ 40 Digital Inputs

Description:
This parameter can also configure the function of the digital input DI6 in the application ladder as enabling the pump protection via an external sensor.
Depending on the sensor function (NO or NC) selected in Parameter P1085. Logic level “0” or “1” indicates that an external sensor for pump protection is actuated. When the pump is running, the alarm A782: “Sensor DI6 Protection” will be generated. After the programmed time in P1084 elapses, the fault F783: “Text selected in Parameter P1088” will be generated, and the pump will be disabled.
.

NOTE!
Refer to the section 3.17 for more information on the pump protection via an external sensor.

P0269 – DI7 Function

P0270 – DI8 Function

Adjustable Range:	0 to 31		Factory Setting: 0
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs	or	07 I/O CONFIGURATION ∟ 40 Digital Inputs

Description:
These parameters configure the function of digital input DI7 and DI8. It has no specific function in the Pump Genius Simplex application. It is necessary to install the IOB-01 accessory module to get access to these digital inputs.

NOTE!
Refer to the CFW-11 programming manual for more information on the digital inputs parameters. Some parameter options have been removed from the configuration wizard.

3.5 DIGITAL OUTPUTS

This group of parameters allows the user to configure the command function of each digital output in the Pump Genius Simplex application.

P0275 – DO1 Function (RL1)

Adjustable Range:	0 to 36 / 28 = Start Extenal Pump (SoftPLC)	Factory Setting:	13
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS → 41 Digital Outputs	or	07 I/O CONFIGURATION → 41 Digital Outputs

Description:
This parameter defines the function of the digital output DO1. If you selected the "28 = Start External Pump (SoftPLC)", the output assumes the function to start the external pump for jockey pump function. According to the section 2.6, a NO contact of the relay digital output must be used.

P0276 – DO2 Function (RL2)

Adjustable Range:	0 to 36 / 28 = Error in the RTC (Real Time Clock)	Factory Setting:	2
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS → 41 Digital Outputs	or	07 I/O CONFIGURATION → 41 Digital Outputs

Description:
This parameter defines the function of the digital output DO2. If you selected the "28 = Error in RTC (SoftPLC)", the output assumes the function to indicate the existence of an error on the real time clock (RTC) of the CFW-11 inverter. This error may be related to HMI of the CFW-11 inverter is poorly connected or the alarm "A181: Invalid Clock Value " have occurred.

P0277 – DO3 Function (RL3)

Adjustable Range:	0 to 36 / 28 = With fault F771/F773/F775/F781/F783/F785/ F787/F791 (SoftPLC)	Factory Setting:	1
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS → 41 Digital Outputs	or	07 I/O CONFIGURATION → 41 Digital Outputs

Description:
This parameter defines the function of the digital output DO3. If you selected the "28 = Alarm A770/A772 or Fault F771/F773 active (SoftPLC)", the output assumes the function of indicating that the alarm “A770: Low Level Alarm for the Control Process Variable” or “A772: High Level Alarm for the Control Process Variable” or “F771: Low Level Fault for the Control Process Variable” or “F773: High Level Fault for the Control Process Variable” is active or F785: Sensor DI2 Protection or F787: Sensor DI3 Protection or F783: DI6 Protection. According to the chapter 2, a NO contact of the relay digital output must be used.

P0278 – DO4 Function

P0279 – DO5 Function

Adjustable Range:	0 to 36	Factory Setting:	P0278 = 0 P0279 = 0
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS → 41 Digital Outputs	or	07 I/O CONFIGURATION → 41 Digital Outputs

Description:
These parameters define the function of the digital outputs DO4 and DO5. It has no specific function in the Pump Genius Simplex application. It is necessary to install the IOB-01 accessory module to get access to the digital outputs DO4 and DO5.

NOTE!
Refer to the CFW-11 programming manual for more information on the digital outputs parameters.

3.6 ANALOG INPUTS

This group of parameters allows the user to configure the function of each analog input in the Pump Genius Simplex application.

P0231 – AI1 Signal Function

P0236 – AI2 Signal Function

P0241 – AI3 Signal Function

P0246 – AI4 Signal Function

Adjustable Range:	0 to 7 / 7 = (PLC use) Control Setpoint (P1020 = 1 to 4)	Factory Setting:	P0231 = 7
	0 to 7 / 7 = (PLC use) Control Process Variable (P1021 = 1 to 5)		P0236 = 0
	0 to 7 / 7 = (PLC use) Control Auxiliary Variable (P1047 = 1 to 4)		P0241 = 0
	0 to 7 / 7 = (PLC use) Control Flow Variable (P1069 = 0 or 1)		P0246 = 7
Properties:	CFG		
Access groups via HMI:	01 PARAMETER GROUPS → 38 Analog Inputs	or	07 I/O CONFIGURATION → 38 Analog Inputs

Description:
These parameters configure the function of the analog inputs AI1, AI2, AI3 and AI4 in the Pump Genius Simplex application as reading of the control setpoint (P1020=1 to 4), or as control process variable (P1021=1 to 5) or as control auxiliary variable (P1047=1 to 4).

P0233 – AI1 Signal Type

P0238 – AI2 Signal Type

P0243 – AI3 Signal Type

P0248 – AI4 Signal Type

Adjustable Range:	0 = 0 to 10 V / 20 mA	Factory Setting:	0
	1 = 4 to 20 mA		
	2 = 10 V / 20 mA to 0		
	3 = 20 to 4 mA		
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS → 38 Analog Inputs	or	07 I/O CONFIGURATION → 38 Analog Inputs

Description:
These parameters configure the type of signal (voltage or current) that will be read at each analog input, as well as its range. According to the selected option adjust the DIP switch S1.4 (AI1) and S1.3 (AI2) of the CFW-11 control board, and the DIP switch S3.1 (AI3) and S3.2 (AI4) of the IOB-01 accessory module.

P0232 – AI1 Gain

P0237 – AI2 Gain

P0242 – AI3 Gain

P0247 – AI4 Gain

Adjustable Range:	0.000 to 9.999	Factory Setting:	1.000
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS	or	07 I/O CONFIGURATION

	∟ 38 Analog Inputs	∟ 38 Analog Inputs

Description:
These parameters apply a gain to the value read at the analog inputs AI1, AI2, AI3 and AI4, i.e., the value obtained at the analog input is multiplied by the gain, thus allowing adjustments in the measured variable.

P0234 – AI1 Offset

P0239 – AI2 Offset

P0244 – AI3 Offset

P0249 – AI4 Offset

Adjustable Range:	-100.00 to +100.00 %	Factory Setting:	0.00 %
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs	or	07 I/O CONFIGURATION ∟ 38 Analog Inputs

Description:
These parameters add to the measured quantity a value, in percentage, in order to adjust the read variable.

P0235 – AI1 Filter

P0240 – AI2 Filter

P0245 – AI3 Filter

P0250 – AI4 Filter

Adjustable Range:	0.00 to 16.00 s	Factory Setting:	0.25 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs	or	07 I/O CONFIGURATION ∟ 38 Analog Inputs

Description:
These parameters configure the 1st order filter time constant that will be applied to the analog inputs AI1, AI2, AI3 and AI4.

NOTE!
Refer to the CFW-11 programming manual for more information on the analog inputs parameters. Some parameter options have been removed from the configuration wizard.

3.7 CONTROL PROCESS VARIABLE

This group of parameters allows the user to configure the control process variable in the Pump Genius Simplex application.

P1021 – Control Process Variable Selection Source

Adjustable Range:	0 = Without Control Process Variable (Disable the PID Controller) 1 = Control Process Variable via Analog Input AI1 2 = Control Process Variable via difference between Analog Input AI1 and AI2	Factory Setting:	1
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description: This parameter defines the source of the Pump Genius control process variable.

***Table 3.1** – Description of the control process variable source*

P1021	Description
0	It defines that there is no source for the control process variable of the Pump Genius, thereby disabling the PID controller.
1	It defines that the source of the control process variable of the Pump Genius is the value read by the analog input AI1. The value is converted according to engineering unit 1 and displayed in parameter P1016.
2	It defines that the source of the control process variable of the Pump Genius is the value read by the analog input AI1 subtracted from the value read by the analog input AI2. The value of AI1 – AI2 is converted according to engineering unit 1 and displayed in parameter P1016.

3.7.1 Engineering Unit Configuration

This group of parameters allows the user to configure the engineering unit of the Pump Genius control process variable.

P0510 – Engineering Unit 1

Adjustable Range: Factory Setting: 22

0 = None	32 = in
1 = V	33 = ft
2 = A	34 = m³
3 = rpm	35 = ft³
4 = s	36 = gal/s
5 = ms	37 = GPM (= gal/min)
6 = N	38 = gal/h
7 = m	39 = L/s
8 = Nm	40 = L/min
9 = mA	41 = L/h
10 = %	42 = m/s
11 = °C	43 = m/min
12 = CV	44 = m/h
13 = Hz	45 = ft/s
14 = HP	46 = ft/min
15 = h	47 = ft/h
16 = W	48 = m³/s
17 = kW	49 = m³/min
18 = kWh	50 = m³/h
19 = H	51 = ft³/s
20 = min	52 = CFM (=ft³/min)
21 = °F	53 = ft³/h
22 = bar	54 = kgf
23 = mbar	55 = kgfm
24 = psi	56 = lbf
25 = Pa	57 = lbfft
26 = kPa	58 = ohm
27 = MPa	59 = rpm/s
28 = mwc (meter of water column)	60 = mH
29 = mca	61 = ppr
30 = gal	62 = °
31 = L (litre)	63 = rot

Access groups via HMI: 01 PARAMETER GROUPS
└ 30 HMI

Description:
This parameter selects the engineering unit that will be displayed in the SoftPLC user parameter that is associated with it. I.e., any SoftPLC user parameter that is associated with the engineering unit 1 will be displayed in this format on the CFW-11 inverter HMI.

NOTE!
The parameters P1011, P1012, P1013, P1014, P1015, P1016, P1022, P1023, P1024, P1026, P1034, P1035, P1039, P1050, P1060 and P1061 are associated with the engineering unit 1.

P0511 – Decimal Point of Engineering Unit 1

Adjustable Range: 0 = xywz, 1 = xyw.z Factory Setting: 2

2 = xy.wz
3 = x.ywz

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
∟ 30 HMI

Description:
This parameter selects the decimal point that will be displayed in the SoftPLC user parameter that is associated with it. I.e., any SoftPLC user parameter that is associated with the decimal point of engineering unit 1 will be displayed in this format on the CFW-11 inverter HMI.

NOTE!
The parameters P1011, P1012, P1013, P1014, P1015, P1016, P1022, P1023, P1024, P1026, P1034, P1035, P1039, P1050, P1060 and P1061 are associated with decimal point of engineering unit 1.

3.7.2 Sensor Scale Configuration

This group of parameters allows the user to configure the scaling of the Pump Genius control process variable.

P1022 – Control Process Variable Sensor Minimum Level

Adjustable Range: -32768 to 32767 [Eng. Unit 1] Factory Setting: 0

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
∟ 50 SoftPLC

Description:
This parameter defines the minimum level of the Pump Genius control process variable sensor according to its engineering unit.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1023 – Control Process Variable Sensor Maximum Level

Adjustable Range: -32768 to 32767 [Eng. Unit 1] Factory Setting: 400

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
∟ 50 SoftPLC

Description:
This parameter defines the maximum level of the Pump Genius control process variable sensor according to its engineering unit.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

Through the minimum and maximum level of control process variable sensor and the value of analog input AIx, we have the line equation for conversion of the Pump Genius control process variable:

$$P1016 = (P1023 - P1022) \times AIx + P1022$$

Where,

P1016 = Control process variable;

P1022 = Minimum level of control process variable sensor;
P1023 = Maximum level of control process variable sensor;
AIx = Value of analog input AI1, AI2, AI3, AI4 or difference between AI1 and AI2 (AI1 – AI2) in %.

3.8 CONTROL SETPOINT

This group of parameters allows the user to configure the control setpoint in the Pump Genius Simplex application.

P1011 – Control Setpoint

Adjustable Range:	-32768 to 32767 [Eng. Unit 1]	Factory Setting:	200
Properties:	RW		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the setpoint value in automatic mode for the Pump Genius in engineering units when the control setpoint source was programmed to be via HMI or communication networks (P1020 = 5). When the control setpoint source was programmed to be another source (P1020 ≠ 5), it is indicating the actual control setpoint in automatic mode of the Pump Genius.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1098 – HALO Enabled

Adjustable Range:	0 = Setpoint via HMI 1 = Setpoint via HALO	Factory Setting:	0
Properties:	RW		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines if the Setpoint is going to be from the drive HMI or via cloud-based platform.

***Table 3.8** – Description of the control setpoint source*

P1020	Description
0	Setpoint can be set via drive HMI.
1	Setpoint will be set remotely via HALO

NOTE!
A HALO module must be installed in a panel to allow cloud base access.

P1099 – HALO Control

Adjustable Range:	0 = Remote Stop 1 = Remote Run	Factory Setting:	0
Properties:	RO		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
Via this parameter the HALO system starts and stops the pump remotely when P1098 is set to 1.

***Table 3.81** – Description of the control setpoint source*

P1020	Description
0	Stop via remote command.
1	Start via remote command.

NOTE!
Digital Input 1 (DI1 – Run/Stop) must be ON for HALO drive control.
This parameter is Read Only.

P1012 – Control Setpoint 1

P1013 – Control Setpoint 2

P1014 – Control Setpoint 3

P1015 – Control Setpoint 4

Adjustable Range: -32768 to 32767 [Eng. Unit 1]

Factory Setting: P1012 = 200, P1013 = 230, P1014 = 180, P1015 = 160

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
└ 50 SoftPLC

Description:
These parameters define the value of the control setpoint in automatic mode of the Pump Genius in engineering units when the control setpoint source was programmed to be via logical combination of digital inputs DI4 and DI5 (P1020=6, 7 or 8) according to the table 3.3.

NOTE!
These parameters are displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1020 – Control Setpoint Selection Source

Adjustable Range:
1 = Setpoint via Analog Input AI1
2 = Setpoint via Analog Input AI2
3 = Setpoint via Analog Input AI3
4 = Setpoint via Analog Input AI4
5 = Setpoint via HMI and/or Communication Networks incl. the **HALO** system(P1011)
6 = Two Setpoints via Digital Input DI4 (P1012 and P1013)
7 = Three Setpoints via Digital Inputs DI4 and DI5 (P1012, P1013 and P1014)
8 = Four Setpoints via Digital Inputs DI4 and DI5 (P1012, P1013, P1014 and P1015)

Factory Setting: 5

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
└ 50 SoftPLC

Description:
This parameter defines the source of the Pump Genius control setpoint.

***Table 3.2** – Description of the control setpoint source*

P1020	Description
1	It defines that the source of the control setpoint in automatic mode of the Pump Genius is the value read by the analog input AI1. The value is converted according to engineering unit 1 and displayed in parameter P1011.
2	It defines that the source of the control setpoint in automatic mode of the Pump Genius is the value read by the analog input AI2. The value is converted according to engineering unit 1 and displayed in parameter P1011.
3	It defines that the source of the control setpoint in automatic mode of the Pump Genius is the value read by the analog input AI3. The value is converted according to engineering unit 1 and displayed in parameter P1011.
4	It defines that the source of the control setpoint in automatic mode of the Pump Genius is the value read by the analog input AI4. The value is converted according to engineering unit 1 and displayed in parameter P1011.

5	It defines that the source of the control setpoint in automatic mode of the Pump Genius is the value programmed in the parameter P1011 via CFW-11 inverter HMI or writing via communication networks including the **HALO** system.
6	It defines that there are two control setpoints in automatic mode of the Pump Genius selected via logical combination of the digital input DI4. The control setpoint value selected is displayed in parameter P1011.
7	It defines that there are three control setpoints in automatic mode of the Pump Genius selected via logical combination of the digital inputs DI4 and DI5. The control setpoint value selected is displayed in parameter P1011.
8	It defines that there are four control setpoints in automatic mode of the Pump Genius selected via logical combination of the digital inputs DI4 and DI5. The control setpoint value selected is displayed in parameter P1011.

When the control setpoint is via logical combination of the digital inputs DI4 and DI5, the following truth table should be applied for obtaining the control setpoint of the Pump Genius:

Table 3.3 *– Truth table for control setpoint via logical combination of the digital inputs DI4 and DI5*

	P1012 – Control Setpoint 1	P1013 – Control Setpoint 2	P1014 – Control Setpoint 3	P1015 – Control Setpoint 4
Digital Input DI4	0	1	0	1
Digital Input DI5	0	0	1	1

3.9 PID Controller

This group of parameters allows the user to adjust the operating conditions of the PID controller for controlling the pumping.

The PID controller can control the motor (pump) speed driven by CFW-11 inverter through the comparison of the control process variable (feedback) with the control setpoint required by the user.

The PID controller will be set up to operate from 0.0 to 100.0 %, where 0.0 % equates to minimum speed programmed in P0133 and 100.0 % equates to maximum speed programmed in P0134.

The control process variable is read via an analog input, which requires the chosen input to be appropriately configured for the purpose.

The "Academic" structure has been adopted as algorithm for the PID controller. It obeys the following equation:

$$u(k) = i(k-1) + Kp \cdot [(1 + Ki \cdot Ts + (Kd/Ts)) \cdot e(k) - (Kd/Ts) \cdot e(k-1)]$$

Where,

u(k) = PID controller output
i(k-1) = integral part in the previous sampling instant
Kp = proportional gain
Ki = integral gain
Kd = derivative gain
Ts = cyclic sampling time (fixed at 50ms)
e(k) = error in the present sampling instant (setpoint – process variable (direct), or process variable – setpoint (reverse))
e(k-1) = error in the previous sampling instant

P1018 – Setpoint of the PID Controller in Manual mode

Adjustable Range:	0 to 18000 rpm	Factory Setting:	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the PID controller setpoint value when it is operating in manual mode. When the PID controller operates in manual mode, the speed value set in parameter P1018 (setpoint in manual mode) is transferred directly to the PID controller output, thus defining the speed reference of the pump driven by the CFW-11 inverter.

P1028 – Selection of Control Action of the PID Controller

Adjustable Range:	0 = Disable the PID Controller 1 = Direct Mode 2 = Reverse Mode	Factory Setting: 1
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the control action of the PID controller for the Pump Genius when it is enabled. I.e. it defines how will be the error signal.

***Table 3.6** – Description of the control action of the PID controller*

P1028	Description
0	It defines that the PID controller will be disabled. I.e., will not have control of the process variable.
1	It defines that the control or regulation action of the PID controller will be in direct mode. I.e., the error is the control setpoint value (P1011) minus the control process variable value (P1016).
2	It defines that the control or regulation action of the PID controller will be in reverse mode. I.e., the error is the control process variable value (P1016) minus the control setpoint value (P1011).

NOTE!
The PID control action should be set to direct mode, when, in order to increase the control process variable value, it is necessary to increase the PID output. Ex: Pump driven by the inverter is filling a reservoir. Raising the reservoir level (control process variable), requires a higher flow rate, which is achieved by increasing the motor speed.
The PID control action should be selected to reverse mode, when, in order to increase the control process variable value, it is necessary to reduce the PID output. Ex: Pump driven by the inverter is removing fluid from a reservoir. In order to increase the fluid level in the reservoir (control process variable), it is necessary to reduce the pump speed by reducing the motor speed.

P1029 – Operation Mode of the PID Controller

Adjustable Range:	0 = Manual 1 = Automatic 2 = Manual or Automatic selection via digital input DI3	Factory Setting: 1
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the operation mode of the PID controller for the Pump Genius.

***Table 3.7** – Description of operation mode of the PID controller*

P1029	Description
0	It defines that the PID controller will operate in manual mode. I.e., the process variable will not be controlled as the control setpoint required by the user and the PID controller output value will be the setpoint value in manual mode set in parameter P1018.
1	It defines that the PID controller will operate in automatic mode. I.e., the process variable will be controlled as the control setpoint required by the user and the output value of the PID controller will behave as the setting defined by de user.
2	It defines that the PID controller can operate in manual or automatic mode according to the state of digital input DI3. I.e., if the digital input is in logic level "0", the PID controller will operate in manual mode; if the digital input is in logic level "1" the PID controller will operate in automatic mode. This mode disables the External Sensor on DI3 option.

NOTE!
The change from one operation mode to another with the Pump Genius in operation can cause disturbances in the pumping control. This can be optimized as the automatic adjustment of the PID controller setpoint defined in P1030 parameter together with the bumpless transfer characteristic from manual to automatic mode of the SoftPLC PID block.

The Bumpless transfer is merely making the transfer from the manual mode to the automatic mode without causing variation in the PID controller output. I.e., when the transition occurs from the manual mode to the automatic mode, the PID controller output value in manual mode is used to start the integral part of the PID controller. That ensures that the output will start from this value.

P1030 – Automatic Adjustment of the PID Controller Setpoint

Adjustable Range:	0 = P1011 Off and P1018 Off 1 = P1011 On and P1018 Off 2 = P1011 Off and P1018 On 3 = P1011 On and P1018 On	Padrão: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines if the setpoint of the PID controller in automatic mode (P1011) and / or manual mode (P1018) will be changed or adjusted automatically in change of operation mode of the PID controller.

NOTE!
The adjustment of the control setpoint in automatic mode is only valid when the control setpoint source is set to HMI or communication networks (P1020 = 5). For other control setpoint sources, the automatic adjust of the control setpoint is not executed.

***Table 3.8** – Description of automatic adjustment of the PID controller setpoint*

P1030	Description
0	It defines that in the transition of the PID controller operation mode from manual too automatic, the control setpoint value (P1011) is **not** loaded with the current value of the control process variable (P1016); and that in the transition of the PID controller operation mode from automatic to manual, the PID controller setpoint value in manual mode (P1018) is **not** loaded with the current value of the pump motor speed (P0002).
1	It defines that in the transition of the PID controller operation mode from manual too automatic, the control setpoint value (P1011) **will be** loaded with the current value of the control process variable (P1016); and that in the transition of the PID controller operation mode from automatic to manual, the PID controller setpoint value in manual mode (P1018) is **not** loaded with the current value of the pump motor speed (P0002).
2	It defines that in the transition of the PID controller operation mode from manual too automatic, the control setpoint value (P1011) is **not** loaded with the current value of the control process variable (P1016); and that in the transition of the PID controller operation mode from automatic to manual, the PID controller setpoint value in manual mode (P1018) **will be** loaded with the current value of the pump motor speed (P0002).
3	It defines that in the transition of the PID controller operation mode from manual too automatic, the control setpoint value (P1011) **will be** loaded with the current value of the control process variable (P1016); and that in the transition of the PID controller operation mode from automatic to manual, the PID controller setpoint value in manual mode (P1018) **will be** loaded with the current value of the pump motor speed (P0002).

P1090 – MAN Time Out (DI3)

Adjustable Range:	0 to 32767 minutes	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the time in which the PID controller is automatically set back into Automatic mode after it is put in Manual via Digital Input 3 (DI3).
This option can be used when there is the chance that the operator sets the PID in Manual and forgets to put it back into Automatic.

NOTE!
This function is disabled when the value in parameter P1090 is “0”.

P1091 – LOC Time Out (HMI)

Adjustable Range:	0 to 32767 minutes	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the time in which the drive is automatically set back to Remote (REM) mode after it is put in Local (LOC) via the HMI soft button LOC/REM.
This option can be used when there is the chance that the operator sets the drive in Local mode and forgets to put it back into Remote mode.

NOTE!
This function is disabled when the value in parameter P1091 is “0”.

P1031 – PID Proportional Gain

Adjustable Range:	0.000 to 32.000	Factory Setting: 1.000
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the proportional gain value of the PID controller of the Pump Genius.

P1032 – PID Integral Gain

Adjustable Range:	0.000 to 32.000	Factory Setting: 5.000
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the integral gain value of the PID controller of the Pump Genius.

P1033 – PID Derivative Gain

Adjustable Range:	0.000 to 32.000	Factory Setting: 0.000
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the derivative gain value of the PID controller of the Pump Genius.

NOTE!
The PID controller of the standard Pump Genius Simplex application is of the academic type. Should a different structure be adopted for the PID controller (through WLP), then the controller gains must be re-optimized by the user. PID block input arguments can only be changed in the ladder application developed with the WLP. Refer to the WLP programming software help topics for more information on the PID block.

3.10 START UP MODES

It defines the conditions to startup the Pump Genius.

3.10.1 Wake up and Start Level Mode

This group of parameters allows the user to set the conditions to startup and control the pumping, and it may be:

- **Wake up Mode:** Configures the Pump Genius to start the pump and resume control of the pumping when the deviation between the control process variable and the control setpoint reaches a programmed threshold;
- **Start Level Mode:** Configures the Pump Genius to start the pump and resume control of the pumping when the control process variable reaches a programmed threshold;

P1034 – Control Process Variable Deviation to Wake up the Pump Genius

Adjustable Range:	-32768 to 32767 [Eng. Un. 1]	Factory Setting:	30
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value to be reduced (direct PID) or increased (reverse PID) to the control setpoint for starting the pump and resuming control of the pumping. Becoming this value is compared with the control process variable and, if the value of the control process variable is less (direct PID) or greater (reverse PID) than this value, the condition to wake up is enabled.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1035 – Control Process Variable Level for Starting the Pump Genius

Adjustable Range:	-32768 to 32767 [Eng. Un. 1]	Factory Setting:	180
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the control process variable level for starting the pump and resuming control of the pumping. With a Direct Mode PID controller, the pumping control will be enabling to start when the control process variable drops lower than P1035. With a Reverse Mode PID controller it will be enabling to start when the process variable rises above P1035.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1036 – Time Delay to Wake up or Starting by Level the Pump Genius

Adjustable Range:	0 to 32767 s	Factory Setting:	5 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the waiting time after the condition for wake up mode or start level mode becomes true, as follows:

■ **Wake up Mode:** The Wake up condition, as defined in P1034, must remain TRUE continuously for the time programmed in P1036, in order for the pump to start and pumping control to resume. The P1036 waiting time restarts from zero, if the Wake up condition momentarily becomes FALSE.
■ **Start Level Mode:** The control process variable Start Level condition, as defined in P1035, must remain TRUE continuously for the time programmed in P1036, in order for the pump to start and pumping control to resume. The P1036 waiting time restarts from zero, if the Start Level condition momentarily becomes FALSE.

NOTE!
If in enabling of the Pump Genius operation (command Run/Stop active), the condition for Wake up or Start by Level is active, the time set in P1036 is not awaited, and thus, the pump will start operating immediately.

3.10.2 Sleep Mode and Sleep Boost

This group of parameters allows the user to set the conditions to stop the pump, and it may be:

■ **Sleep Mode:** Configures the Pump Genius to stop the pump when the pump motor speed or power drops below a programmed threshold (low control demand). Even though apparently the pumping control is off, the control process variable is still monitored for wake up or start level conditions.
■ **Sleep Boost:** Configures the Pump Genius so before stopping the pump when the pump motor speed or power drops below a programmed threshold (low demand control), i.e., enable the sleep mode, to be added to the control setpoint a value to increase the control process variable with the purpose of the pump will remain in sleep mode longer.

P1037 – Pump Motor Speed below which Pump Genius goes to low Speed Sleep Mode

Adjustable Range:	0 to 18000 rpm	Factory Setting:	1250 rpm
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of the pump motor speed below which the Pump Genius will stop the pump keeping the control active, i.e., will sleep.

NOTE!
A setting of “0 rpm” disables the sleep mode, it means that the pump will be started or stopped according to the status of the command "Run/Stop”.

P1038 – Time Delay for Pump Genius goes to low Speed Sleep Mode

Adjustable Range:	0 to 32767 s	Factory Setting:	10 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the waiting time with the value of the pump motor speed should remain below the value set in P1037 for sleep mode to be activated and the pump to be stopped.

NOTE!
The alarm message "A750: Sleep Mode Active" will be generated on the HMI of the CFW-11 inverter to alert that the Pump Genius is in sleep mode.

P1077 – Sleep Mode Power/Flow

Adjustable Range:	0 = Power to Sleep (kW) 1 = Flow to Sleep [Eng. Un. 4]	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines if kW or Flow reference will be used to stop the pump keeping the control active, i.e., will sleep.

***Table 3.10** – Description of sleep mode reference*

P1030	Description
0	It defines that the pump is going to sleep based on the kW read from Drive parameter P0010.
1	It defines that the pump is going to sleep based on the Flow Process variable.

P1078 – Sleep Mode Power Level

Adjustable Range:	0 to 1000 kW	Factory Setting: 1kW
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the value of the pump motor power below which the Pump Genius will stop the pump keeping the control active, i.e., will sleep.

NOTE!
A setting of “0 kW” disables the low Power sleep mode, it means that the pump will be started or stopped according to the status of the command "Run/Stop”.

P1079 – Sleep Mode Flow Level

Adjustable Range:	0 to 32767 [Eng. Un. 4]	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the value of the Flow below which the Pump Genius will stop the pump keeping the control active, i.e., will sleep.

NOTE!
A setting of “0” disables the Flow sleep mode, it means that the pump will be started or stopped according to the status of the command "Run/Stop”.

P1089 – Time Delay for Pump Genius goes to low Power or low Flow Sleep Mode

Adjustable Range:	0 to 32767 s	Factory Setting: 10 s
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the waiting time with the value of the pump motor Power or Flow (depending on setting in parameter P1077) should remain below the value set in P1078 or P1079 for sleep mode to be activated and the pump to be stopped.

NOTE!
The alarm message "A750: Sleep Mode Active" will be generated on the HMI of the CFW-11 inverter to alert that the Pump Genius is in sleep mode.

P1039 – Sleep Boost Offset

Adjustable Range:	-32768 to 32767 [Eng. Un. 1]	Factory Setting:	0
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value to be added to the control setpoint in automatic mode to increase the control process variable before the Pump Genius go into sleep mode. When the control process variable reaches the control setpoint value added to the sleep boost offset, the Pump Genius will go into sleep mode.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511). A setting of “0” disable the sleep boost. This function is only enabled to use for control action of the PID controller in direct mode (P1028=1).

NOTE!
The alarm message “A756: Sleep Boost Active” will be generated on the HMI of the CFW-11 inverter to alert that the Pump Genius is executing the sleep boost.

P1040 – Sleep Boost Maximum Time

Adjustable Range:	0 to 32767 s	Factory Setting:	15 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the maximum time that the control process variable has to reach the control setpoint value added to the sleep boost offset, i.e., the maximum time that the sleep boost will be active. If the control process variable does not reach the control setpoint value added to the sleep boost offset during this time, the Pump Genius will go into sleep mode.

The figure 3.10 presents a timing analysis of the Pump Genius operation with a direct mode PID controller when it is configured for Wake up Mode and Sleep Mode with Sleep Boost disabled.

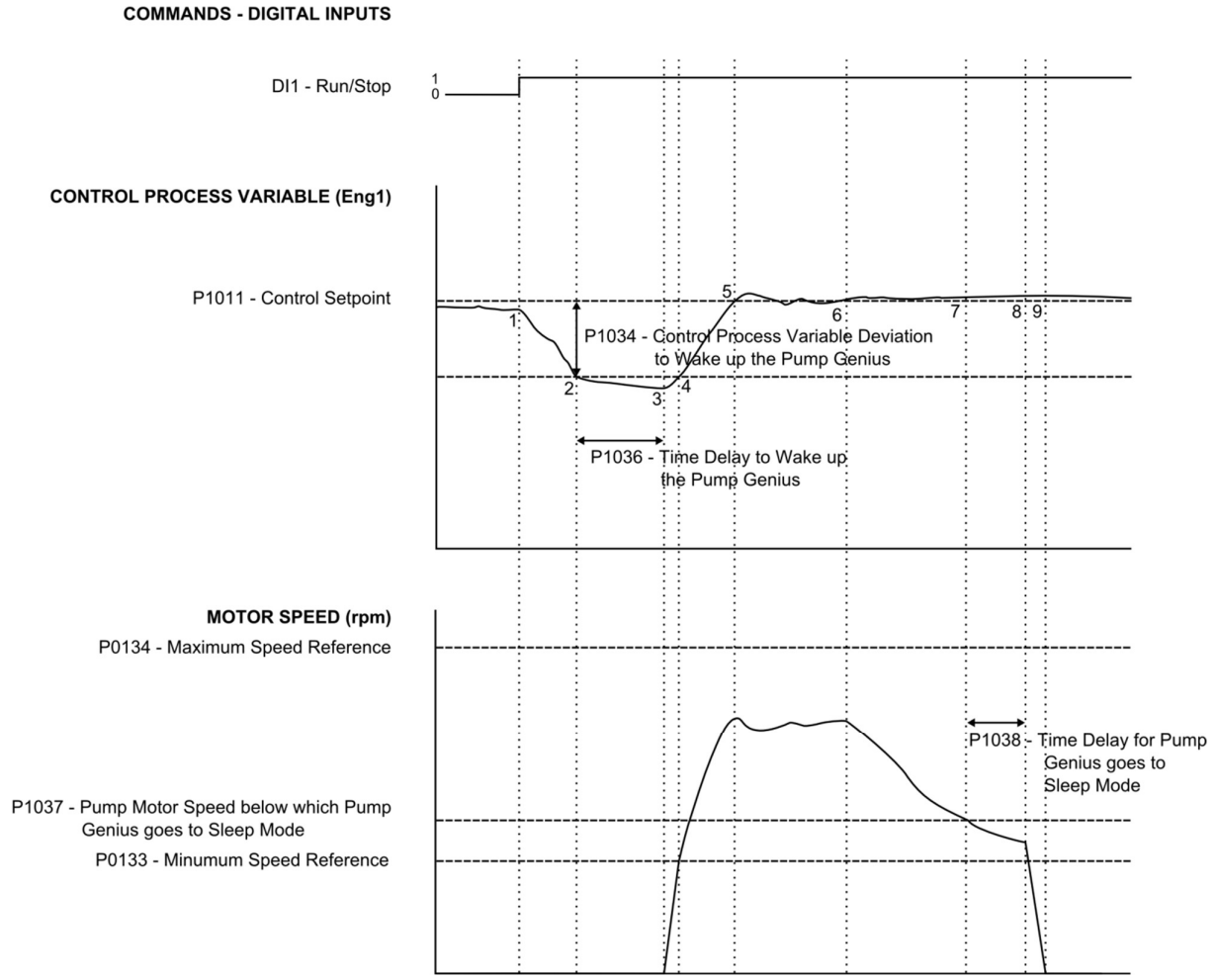


Figure 3.10 *– Operation of the Pump Genius for wake up mode and sleep mode*

1 – The Run/Stop command via digital input DI1 enables starting the motor, but also enables the operation of Pump Genius. As the condition to wake up was not detected, the pumping control remains in the sleep mode and the pump remains stopped;

2 – The control process variable begins to decrease and is lower than the control process variable deviation programmed to wake up the Pump Genius (P1034); in this moment the time count to wake up (P1036) is initiated;

3 – The control process variable remains smaller than the control process deviation to wake up the Pump Genius (P1034) and the time delay to wake up (P1036) is elapsed; at this moment the control issues the command to start the pump and resumes controlling the pumping with variable speed;

4 – The inverter accelerates the pump up to the minimum speed (P0133). After that, the PID controller is enabled and starts controlling the pump speed;

5 – The resumed Pump Genius allows the value of the control process variable to catch up with the control setpoint required by the user. The PID controller output increases during the catch-up phase, raising the pumping speed. A stabile phase with constant pumping speed may follow;

6 – The value of the control process variable continues above the setpoint due to a decrease in demand and pump speed begins to decrease;

7 – The pump motor speed output drops below the speed for Pump Genius goes to sleep mode threshold (P1037); the time count for Pump Genius goes to sleep mode (P1038) is initiated;

8 – The pump motor speed remains below the speed for Pump Genius goes to sleep mode threshold (P1037) and the time delay for Pump Genius goes to sleep mode (P1038) is elapsed; at this moment the control issues the command to stop the pump;

9 – The inverter driven pump reaches "zero" speed, and remains stopped; at this moment the Pump Genius goes into sleep mode.

The figure 3.11 presents a timing analysis of the Pump Genius operation with a Direct Mode PID controller when it is configured for Start Level Mode and Sleep Mode with Sleep Boost Disabled:

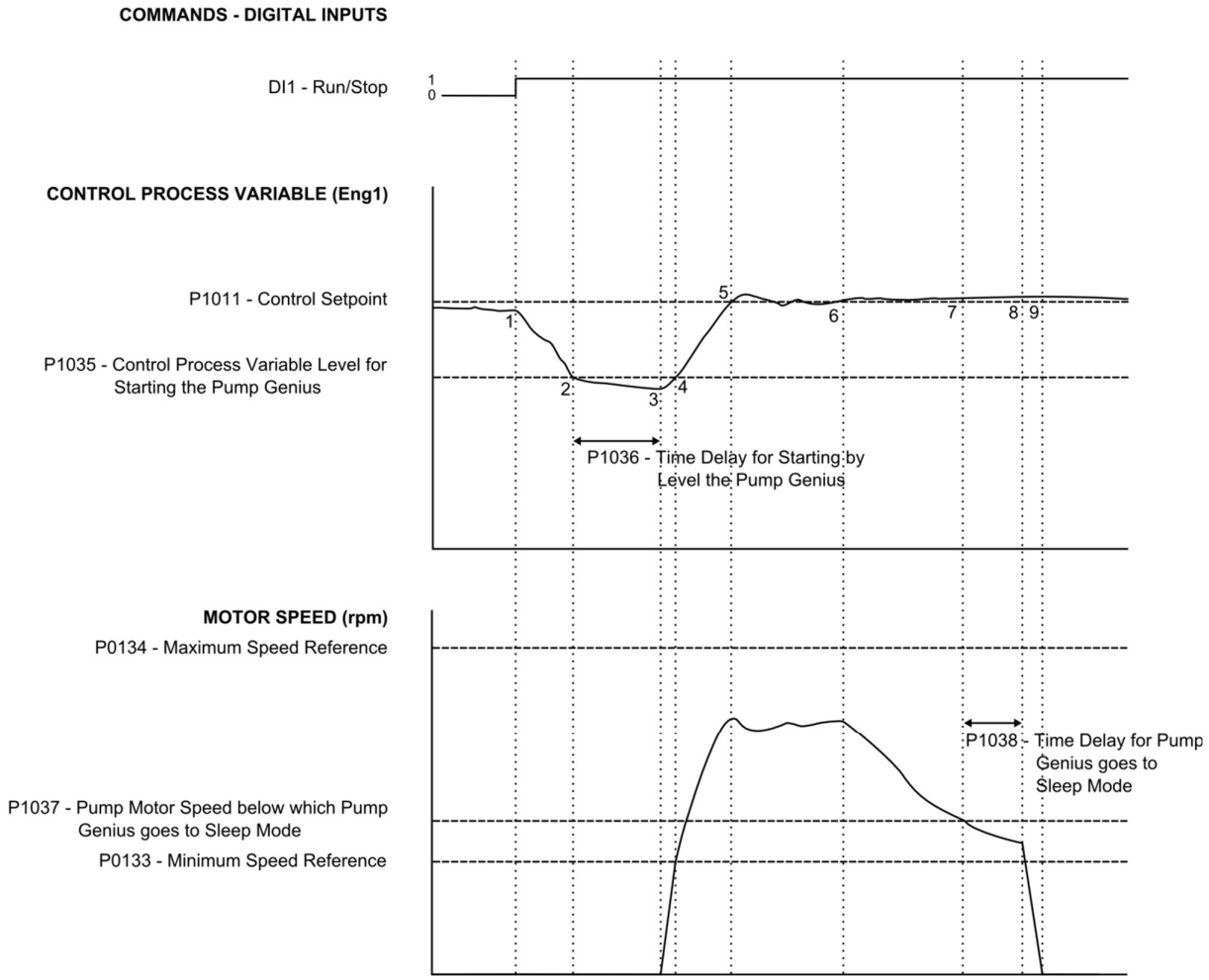


Figure 3.11 *– Operation of the Pump Genius for start level mode and sleep mode*

1 – The Run/Stop command via digital input DI1 enables starting the motor, but also enables the operation of Pump Genius. As the control process variable level condition to start the Pump Genius was not detected, the Pump Genius remains in the sleep mode and the pump remains stopped;

2 – The control process variable begins to decrease and is lower than the control process variable threshold programmed starting the Pump Genius (P1035); in this moment the time count for starting by level the Pump Genius (P1036) is initiated;

3 – The control process variable remains smaller than the threshold for starting the Pump Genius (P1035) and the time delay for starting by level the Pump Genius (P1036) is elapsed; at this moment the control issues the command to start the pump and resumes controlling the pumping with variable speed;

4 – The inverter accelerates the pump up to the minimum speed (P0133). After that, the PID controller is enabled and starts controlling the pump speed;

5 – The resumed Pump Genius allows the value of the control process variable to catch up with the control setpoint required by the user. The PID controller output increases during the catch-up phase, raising the pumping speed. A stabile phase with constant pumping speed may follow;

6 – The value of the control process variable continues above the setpoint due to a decrease in demand and pump speed begins to decrease;

7 – The pump motor speed output drops below the speed for Pump Genius goes to sleep mode threshold (P1037); the time count for Pump Genius goes to sleep mode (P1038) is initiated;

8 – The pump motor speed remains below the speed for Pump Genius goes to sleep mode threshold (P1037) and the time delay for Pump Genius goes to sleep mode (P1038) is elapsed; at this moment the control issues the command to stop the pump;

9 – The inverter driven pump reaches "zero" speed, and remains stopped; at this moment the Pump Genius goes into sleep mode.

The figure 3.12 presents a timing analysis of the Pump Genius operation with a Direct Mode PID controller when it is configured for Wake up Mode and Sleep Mode with Sleep Boost enabled:

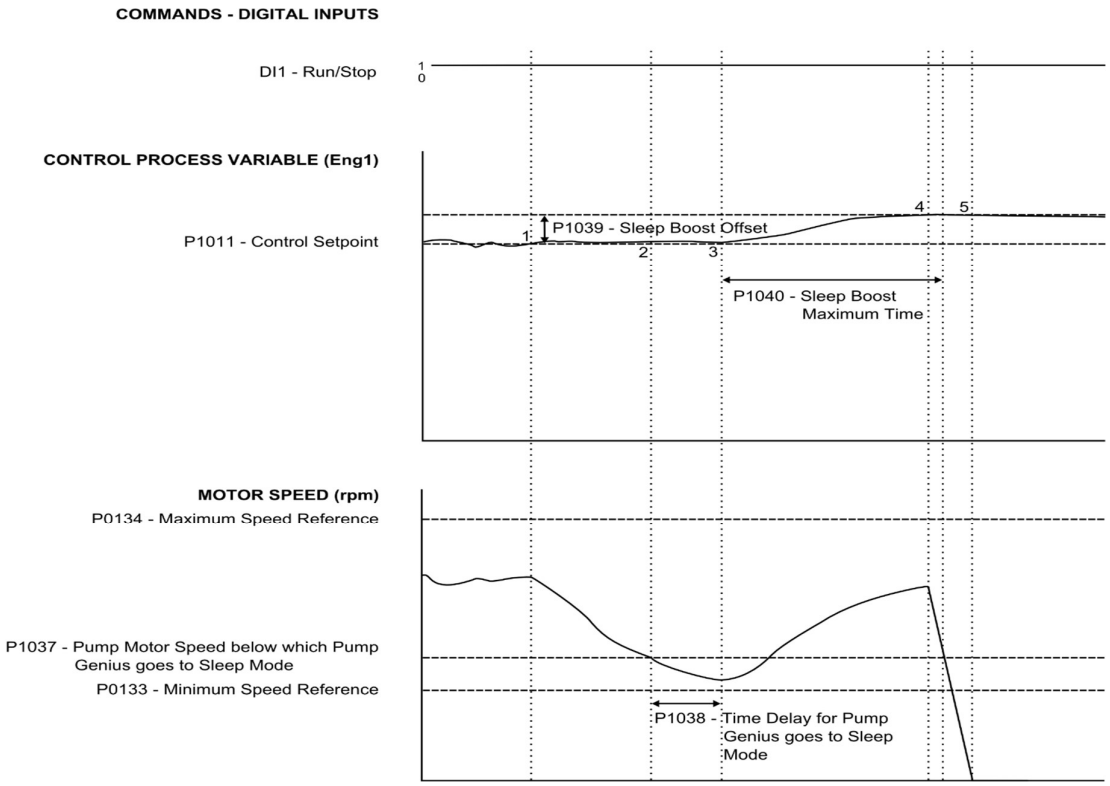


Figure 3.12 *– Operation of the Pump Genius for sleep mode with sleep boost enabled*

1 – The Pump Genius is keeping the system controlled as the control setpoint required by the user. At this moment the value of the control process variable begins to increase and the speed motor begins to decrease;

2 – The pump motor speed output drops below the speed for Pump Genius goes to sleep mode threshold (P1037); the time count for the Pump Genius go to sleep mode (P1038) is initiated;

3 – The pump motor speed remains below the speed for Pump Genius goes to sleep mode threshold (P1037) and the time delay for Pump Genius goes to sleep mode (P1038) is elapsed; at this moment, as the sleep boost is enabled will not be made the command to stop the pump. It will be added the sleep boost offset (P1039) to the control setpoint for increase the control process variable; at this moment the count of the sleep boost maximum time (P1040) is initiated;

4 – The inverter accelerates the pump again as the action of the PID controller and the control process variable reaches the control setpoint value added to the sleep boost active; at this moment the control issues the command to stop the pump before the count of the sleep boost maximum time be elapsed;

5 – The inverter driven pump reaches "zero" speed, and remains stopped; at this moment the Pump Genius goes into sleep mode.

3.11 PIPE CHARGING AND PID RAMP

This group of parameters allows the user to configure the Pump Genius to execute the pipe charging sequence using the pump driven by the CFW-11 inverter.

The Pipe Charging assures that the pumping pipe is charged gradually, thus avoiding the "water hammer" pressure shock at the instant the pipe is filled with fluid. It is executed every time the Pump Genius receives a new enable, either via enable command or an exit from a disabled by fault state. If the control process variable in the newly enabled Pump Genius is already at a certain value, and it enters sleep mode, the pipe charging sequence is not executed.
The PID Ramp assures that the process variable will gradually increase to the control setpoint when leaving Pipe Charge mode, reducing the possible effects of overshoot and water hammer in the system

NOTE!
If in enabling the Pump Genius operation (command Run/Stop active) it enters into sleep mode, the pipe charging process will not be executed.

P0105 – Enable Pipe Charging (1st/2nd Ramp Selection)

Adjustable Range:	0 = Disable (1st Ramp) 6 = Enable (SoftPLC)	Factory Setting: 6
Properties:	CFG	
Access groups via HMI:	01 PARAMETER GROUPS ∟ 20 Ramps	

Description:
This parameter allows enabling of the pipe charging sequence (assigns to the SoftPLC function the ramp selection command) using the pump driven by CFW-11 inverter.

NOTE!
The alarm message "A752: Pipe Charging" will be generated in the HMI of the CFW-11 inverter providing an alert that the Pump Genius control is in the pipe charging sequence.

P1041 – Pipe Charging Time

Adjustable Range:	0 to 65535 s	Factory Setting: 60 s
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the time for pump genius to be running in pipe charging mode.

P1042 – Pipe Charging Time Base

Adjustable Range:	0 to 1	Factory Setting: 0.0 A
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the time base for the pipe charge time set in P1041.

P1042	Description
0	It defines that the time base for pipe charge is in seconds.
1	It defines that the time base for pipe charge is in minutes.

P1065 – Minimum process Variable (pressure) to change from Pipe Charge to PID Ramp

Adjustable Range:	0 to 32767 [Eng. Unit 1]	Factory Setting:	0
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the minimum process variable (pressure) for pump genius to leave Pipe Charge mode and begin PID Ramp mode.

P1073 – PID Ramp time

Adjustable Range:	0 to 32767 s	Factory Setting:	30 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the time for pump genius to be running in PID Ramp mode. PID ramp will start after the time set in P1041 (Pipe charging time) or when the control process variable (P1016) reaches the point set in P1065 (minimum pressure to change from pipe charge to PID ramp)

NOTE!
The alarm message “A753: PID Ramp Active” will be generated in the HMI of the CFW-11 inverter providing an alert that the Pump Genius control is in the PID ramp sequence.

NOTE!
A setting of “0 sec” disables PID ramp.

P0102 – Acceleration Time 2

Adjustable Range:	0.0 to 999.0 s	Factory Setting:	40.0 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 20 Ramps		

Description:
This parameter defines a second acceleration time for the pump driven by CFW-11 inverter, it is the initial ramp rate for the purpose of pipe charging.

NOTE!
Set this time short if application is using a submersible pump requiring high initial thrust.

NOTE!
Refer to the CFW-11 inverter programming manual for more information on the ramp parameters.

The figure 3.13 presents a timing analysis of the Pump Genius operation when is configured for execution of the pipe charging and PID ramp sequence (the PID controller shown in this example is Direct Mode, which is, however, irrelevant for the pipe charging sequence):

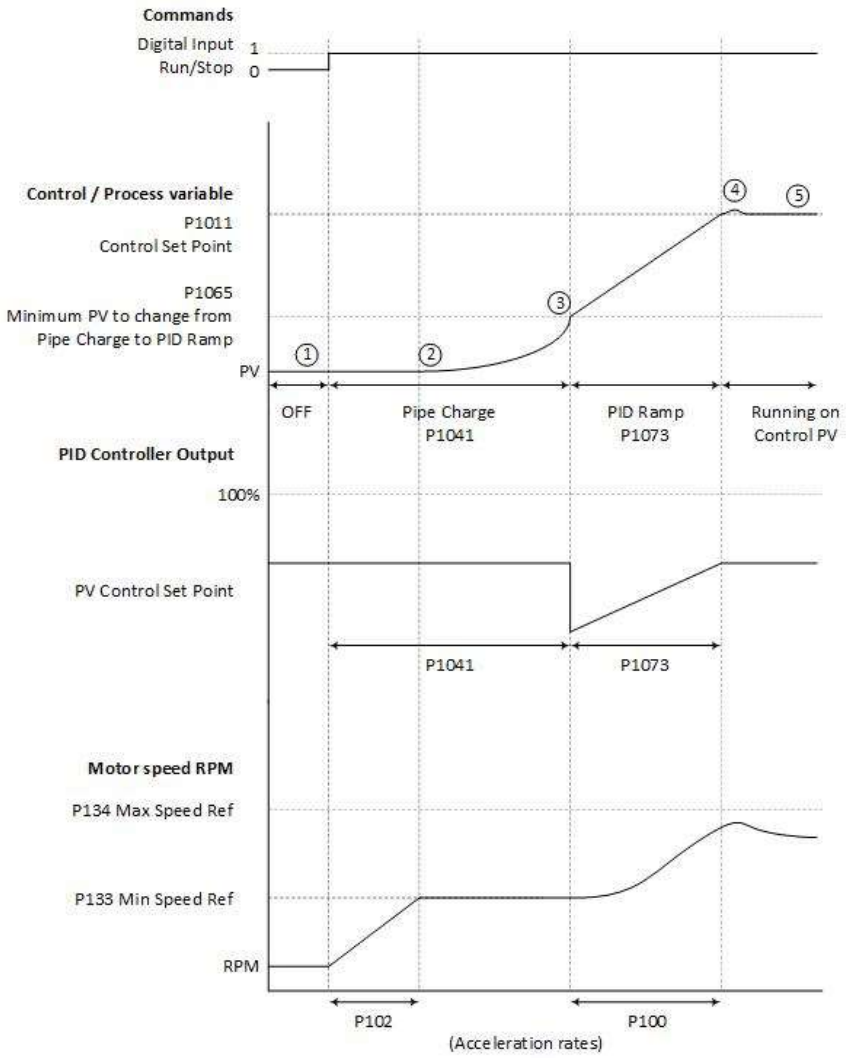


Figure 3.13 *– Operation of the Pump Genius with pipe charge and PID Ramp enabled*

1 – The Run/Stop command via digital input DI1 enables starting the motor, but also enables the operation of Pump Genius. As the control process variable is lower than the control process deviation for Pump Genius to wake up (P1034), the time delay to wake up (P1036) is ignored and the command to run is issued. As pipe charging is enabled (P0105), the time count (P1041) is initiated, while the PID controller remains disabled. The pump is accelerated to the minimum speed (P0133) with a slower ramp in order to avoid the “water hammer” or a faster ramp time with a submersible pump requiring high initial thrust.

2 – The pump speed reaches the value programmed for minimum speed (P0133) and continues at this speed during the time for pipe charging (P1041). During this time, the PID controller is disabled. If the value of the maximum output current during the pipe charging (P1042) is not zero, this value is used in the motor current limit instead of what is set in P0135 during the pipe charging;

3 – The time for pipe charging (P1041) is elapsed or in this case, the minimum pressure to change to PID Ramp is reached (P1065) PID Ramp then ramps the control process variable up proportionally using the difference between the Process Variable actual and the Process Variable user setpoint over the time period set (P1073)

4 – at this moment the PID controller is enabled and begins to increase or decrease the pump speed in order for the control process variable to align with the control setpoint required by the user;

5 – A short time later the control process variable stabilizes and pumping continues at steady speed.

3.12 EXTERNAL PUMP

This group of parameters allows the user to configure an external pump commands for a digital output of the CFW-11 inverter to control the pumping when the demand is minimal, i.e., as a jockey pump.

> NOTE!
> Enabling the use of an external pump is done by programming the digital input DI1 on "21 = Enable External Pump" and programming the digital output DO1 on "28 = Start External Pump".

The use of External Pump for Jockey Pump Function allows the use of a lower power pump to execute the control of the pumping when the demand is minimal. This external pump can be started and stopped several times, thus preventing the pump driven by the CFW-11 inverter is started when the consumption is low.

P1060 – Control Process Variable Level for Stopping the External Pump

Adjustable Range:	-32768 to 32767 [Eng. Unit 1]	Factory Setting:	195
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of control process variable above which the external pump will be stopped.

P1061 – Control Process Variable Level for Starting the External Pump

Adjustable Range:	-32768 to 32767 [Eng. Unit 1]	Factory Setting:	185
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of control process variable below which the external will be started.

> NOTE!
> Parameters P1060 and P1061 are displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1062 – Time Delay for Starting the External Pump

Adjustable Range:	0 a 32767 s	Factory Setting:	5 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the waiting time with the control process variable lower than the level for starting the external pump (P1061) to start the external pump for jockey pump function.

The figure 3.14 presents a timing analysis of the external pump for jockey pump function.

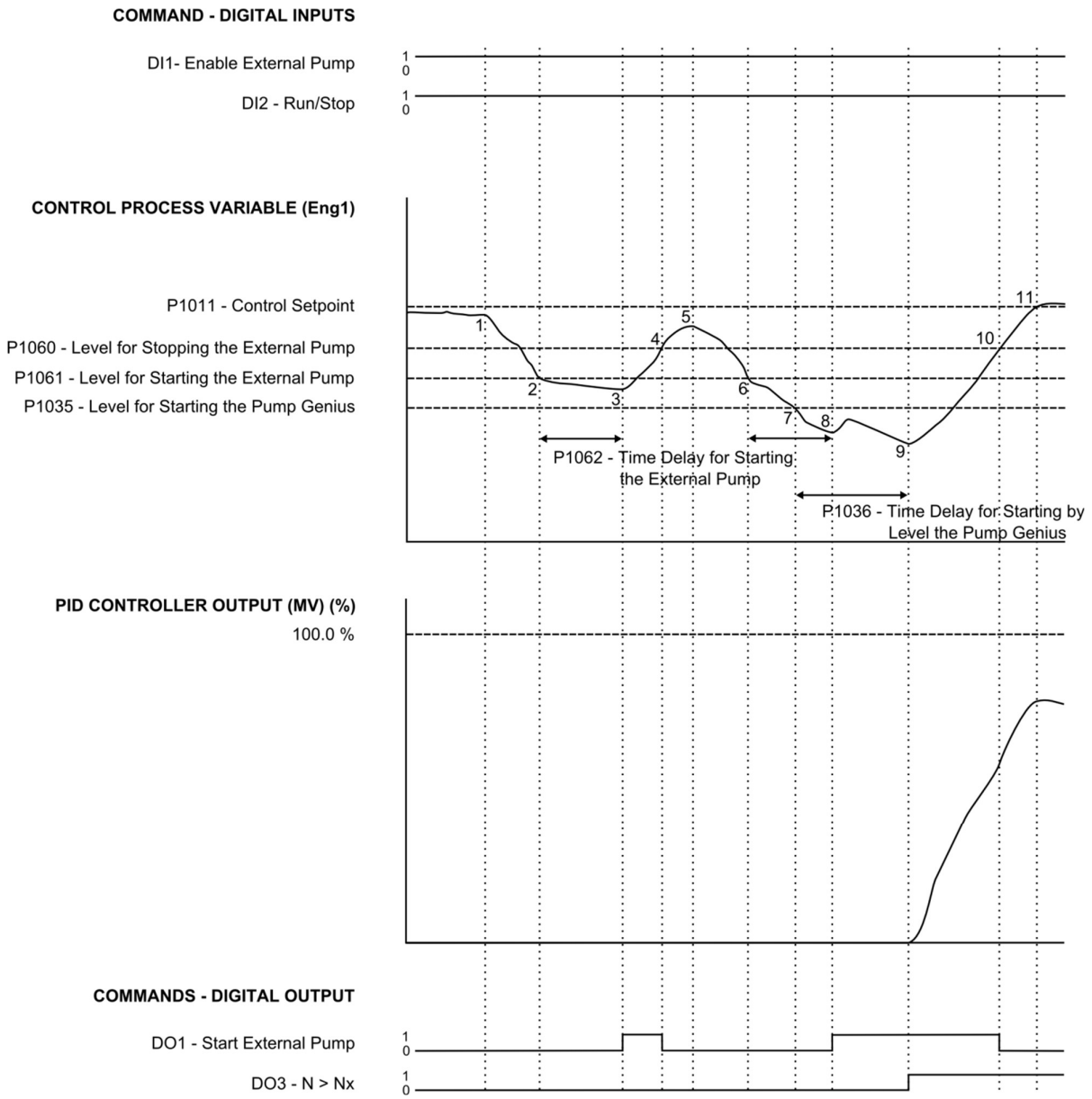


Figure 3.14 *– External pump operation for jockey pump function*

1 – The Pump Genius is enabled and in sleep mode; the control process variable begins to decrease;

2 – The control process variable continues to decrease and is lower than the level programmed for starting the external pump (P1061); the time count for starting the external pump (P1062) is initiated;
3 – The control process variable continues smaller than the level for starting the external pump (P1061) and the time delay for starting the external pump (P1062) is elapsed; in this moment is done the command to start the external pump via digital output DO1;

4 – With the external pump started, the control process variable is increased. The control process variable is greater than the level for stopping the external pump (P1060); in this moment is done the command to stop the external pump via digital output DO1;

5 – The value of the control process variable begins to decrease due to increased demand;

6 – The control process variable continues to decrease and is lower than the level programmed for starting the external pump (P1061); the time count for starting the external pump (P1062) is initiated;

7 – The control process variable continues to decrease and is lower than the level of control process variable for starting the Pump Genius (P1035); in this moment the time count for starting by level (P1036) is initiated;

8 – The control process variable continues smaller than the level for starting the external pump (P1061) and the time for starting the external pump (P1062) is elapsed; in this moment is done the command to start the external pump via digital output DO1;

9 – Even starting the external pump, the control process variable continues smaller than the level of control process variable for starting the Pump Genius (P1035) and the time for starting the Pump Genius (P1036) is elapsed; in this moment is done the run command in the CFW-11 inverter to run the pump driven by the CFW-11 inverter to control the pumping;

10 – The control process variable is greater than the level for stopping the external pump (P1060); in this moment is done the command to stop the external pump via digital output DO1; due to increased demand, the pump speed of the pump driven by CFW-11 inverter is increased to control the pumping as the control setpoint required by the user;

11 – With increasing the pump speed is achieved stabilize the control process variable as the control setpoint required by the user.

3.13 LOW LEVEL PROTECTION FOR THE CONTROL PROCESS VARIABLE (PIPE BREAKING)

This group of parameters allows the user to configure the conditions for alarm and failure to detect low level for the control process variable. This allows detecting non-ideal conditions of the pumping operation, for example, a pipe breaking.

P1024 – Value for Low Level Alarm for the Control Process Variable

Adjustable Range:	-32768 to 32767 [Eng. Un. 1]	Factory Setting:	100
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value below which a low level alarm will be generated for the control process variable of the pumping control (A770).

NOTE!
A setting of “0” disables the low level alarm and fault for the control process variable.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1025 – Time Delay for Low Level Fault for the Control Process Variable (F771)

Adjustable Range:	0 to 32767 s	Factory Setting:	0 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the waiting time with the low level alarm (A770) for the control process variable active, before the fault “F771: Low Level Fault for the Control Process Variable” is generated.

NOTE!
A setting of “0 s” disables the low level fault for the control process variable.

3.14 HIGH LEVEL PROTECTION FOR THE CONTROL PROCESS VARIABLE (PIPE OBSTRUCTION)

This group of parameters allows the user to configure the conditions for alarm and failure to detect high level for the control process variable. This allows detecting non-ideal conditions of the pumping operation, for example, a pipe obstruction.

P1026 – Value for High Level Alarm for the Control Process Variable

Adjustable Range:	-32768 to 32767 [Eng. Un. 1]	Factory Setting:	350
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value above which a high level alarm will be generated for the control process variable of the Pump Genius control (A772).

NOTE!
A setting of “0” disables the high level alarm and fault for the control process variable.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1027 – Time Delay for High Level Fault for the Control Process Variable (F773)

Adjustable Range:	0 to 32767 s	Factory Setting:	0 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the waiting time with the high level alarm (A772) for the control process variable active, before the fault “F773: High Level Fault for the Control Process Variable” is generated.

NOTE!
A setting of “0 s” disables the high level fault for the control process variable.

3.15 DRY PUMP PROTECTION

This group of parameters allows the user to configure dry pump detection, to protect the inverter driven pump.

P1043 – Motor Speed for Dry Pump

Adjustable Range:	0 to 18000 rpm	Factory Setting:	1650 rpm
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the pump motor speed threshold value, above which evaluation of actual motor torque to detect the dry pump condition (P1044) is enabled.

P1044 – Motor Torque for Dry Pump

Adjustable Range:	0.0 to 100.0 %	Factory Setting:	20.0 %
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the pump motor torque threshold value, below which the dry pump condition is detected, resulting in the alarm message “A780: Dry Pump”.

P1045 – Time Delay for Dry Pump Fault (F781)

Adjustable Range:	0 to 32767 s	Factory Setting:	0 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the waiting time with the dry pump condition (A780) active, before the dry pump fault “F781: Dry Pump” is generated.

NOTE!
A setting of “0 s” disables the dry pump fault.

The figure 3.15 on the next page presents a timing analysis of the Pump Genius operation when a Dry Pump Fault is detected:

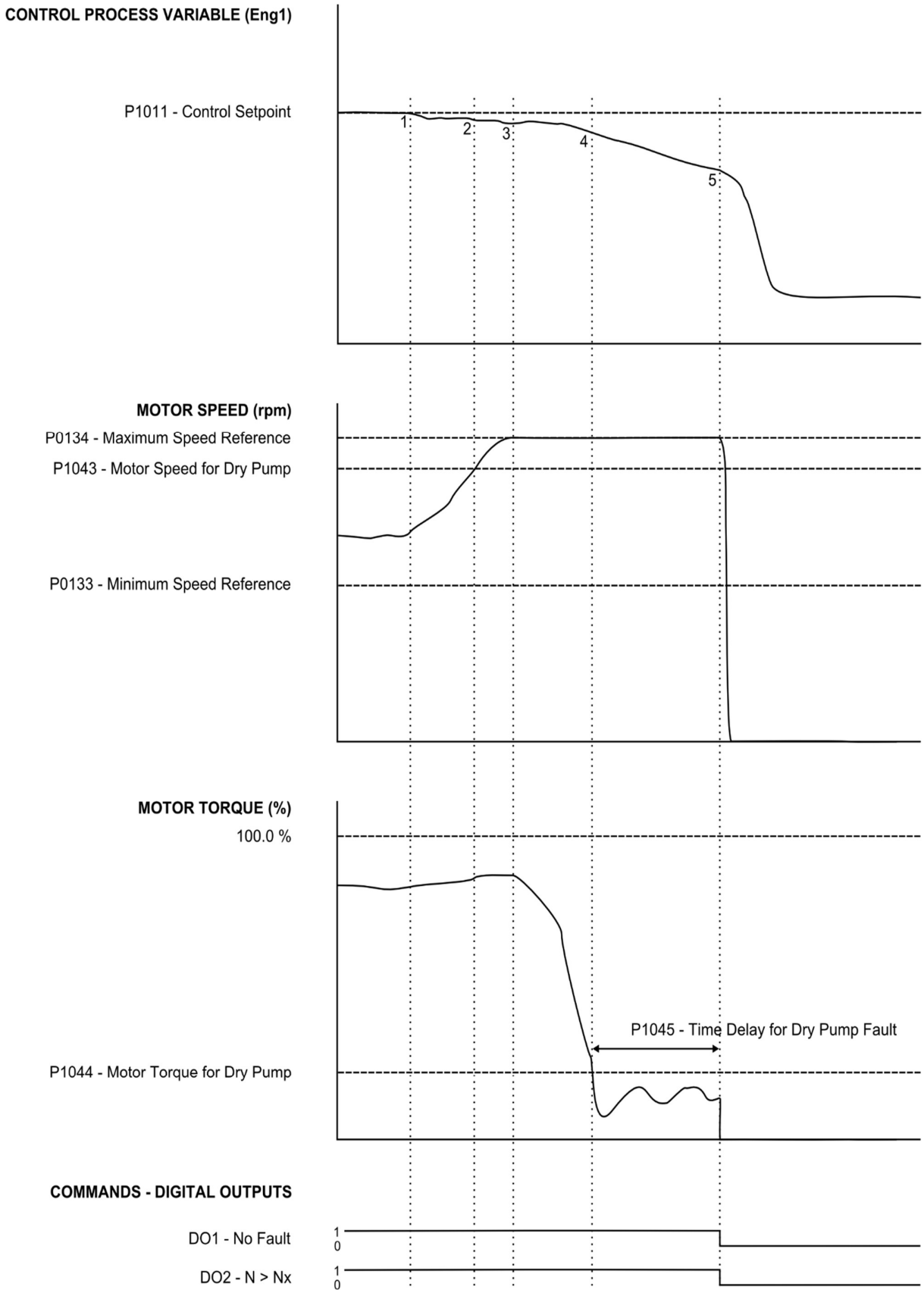


Figure 3.15 *– Operation of the Pump Genius for dry pump protection*

1 – The Pump Genius is running at a speed satisfying the control setpoint required by the user. At this moment the value of the control process variable begins to decrease and pump speed begins to increase;

2 – The pump speed continues to increase and becomes greater than the threshold programmed for detecting dry pump (P1043);

3 – The pump speed continues to increase and reaches the maximum speed programmed for the pump (P0134), but as the pump motor torque is still greater than the threshold programmed to detect dry pump (P1044), pumping continues while the value of the control process variable continues to decrease;

4 – As the pump continues to operate at maximum speed, and the process variable continues to decrease, the pump motor torque drops below the threshold programmed to detect dry pump (P1044). At this moment the time count to generate Dry Pump Fault (P1045) is initiated and the alarm message "A780: Dry Pump" is generated to alert the user, that the protection for dry pump is about to act and disable the inverter driven pump;

5 – The pump continues to operate at maximum speed, and the control process variable continues to decrease, while the pump motor torque remains below the threshold programmed to detect Dry Pump (P1044). At this moment the time delay to generate Dry Pump Fault (P1045) is elapsed, and the fault "F781: Dry Pump" is generated, disabling the inverter driven pump.

3.16 CONTROL AUXILIARY VARIABLE FOR PUMP PROTECTION

This group of parameters allows the user to configure a control auxiliary variable for the protection of pump. This protection is accomplished by reading a sensor installed on an analog input, and comparing its value with low level conditions. The low level condition is directly associated with pump cavitation protection.

Cavitation is a phenomenon that occurs in a pump when the pressure at the inlet side of the rotor drops below the vapor pressure of the pumped liquid, resulting in evaporation with the formation of small vapor bubbles (cavities) in the liquid part. When these cavities, formed in the low pressure region of the rotor, reach the high pressure region at the outlet side of the rotor, they immediately collapse, returning to the liquid phase. The rapid implosion of the cavities results in violent shock waves and momentary huge temperature gradients between the bubble surface and the surrounding liquid (10000°C have been measured). If, prior to their collapse, these bubbles adhere to rotor surfaces, their implosion produces micro jets, which impact the surface with sufficient energy to remove microscopic amounts of material. Immediate negative consequences of cavitation and its cumulative effects over extended periods of time are as follows:

- Operation with high level of noise and vibration;
- Impairment of performance, changing the pump characteristics;
- Premature wear of the rotor by removal of metal particles.

Occurrence of pump cavitation can be prevented by avoiding operation with insufficient liquid at the inlet of the pump. Installing an external sensor in the suction part, for example a level sensor, which measures the inlet reservoir fluid level, can help detect conditions that lead to cavitation. When this level is below a certain threshold, the control setpoint is changed to a value that reduces pump suction, thus lowering the pressure difference between the inlet and outlet of the pump.

P1047 – Control Auxiliary Variable Selection Source for Pump Protection

Adjustable Range:	0 = Without Protection via Control Auxiliary Variable 1 = Control Auxiliary Variable via Analog Input AI2	Factory Setting: 0

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
└ 50 SoftPLC

Description:
This parameter defines the source of the control auxiliary variable for pump protection.

***Table 3.9** – Description of control auxiliary variable source for pump protection*

P1047	Description
0	It defines that there is no pump protection via control auxiliary variable.
1	It defines that the source of the control auxiliary variable for pump protection is the value read by the analog input AI2. The value is converted according to engineering unit 2 and displayed in parameter P1017.

3.16.1 Engineering Unit Configuration

This group of parameters allows the user to configure the engineering unit of the control auxiliary variable for pump protection.

P0512 – Engineering Unit 2

Adjustable Range: Factory Setting: 10

0 = None	32 = in
1 = V	33 = ft
2 = A	34 = m³
3 = rpm	35 = ft³
4 = s	36 = gal/s
5 = ms	37 = GPM (= gal/min)
6 = N	38 = gal/h
7 = m	39 = L/s
8 = Nm	40 = L/min
9 = mA	41 = L/h
10 = %	42 = m/s
11 = °C	43 = m/min
12 = CV	44 = m/h
13 = Hz	45 = ft/s
14 = HP	46 = ft/min
15 = h	47 = ft/h
16 = W	48 = m³/s
17 = kW	49 = m³/min
18 = kWh	50 = m³/h
19 = H	51 = ft³/s
20 = min	52 = CFM (=ft³/min)
21 = °F	53 = ft³/h
22 = bar	54 = kgf
23 = mbar	55 = kgfm
24 = psi	56 = lbf
25 = Pa	57 = lbfft
26 = kPa	58 = ohm
27 = MPa	59 = rpm/s
28 = mwc (meter of water column)	60 = mH
29 = mca	61 = ppr
30 = gal	62 = °
31 = L (litre)	63 = rot

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
└ 30 HMI

Description:
This parameter selects the engineering unit that will be displayed in the SoftPLC user parameter that is associated with it. I.e., any SoftPLC user parameter that is associated with the engineering unit 2 will be displayed in this format on the CFW-11 inverter HMI.

NOTE!
The parameters P1017, P1048, P1049 and P1051 are associated with engineering unit 2.

P0513 – Decimal Point of Engineering Unit 2

Adjustable Range:	0 = xywz 1 = xyw.z 2 = xy.wz 3 = x.ywz	Factory Setting: 1
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 30 HMI	

Description:
This parameter selects the decimal point that will be displayed in the SoftPLC user parameter that is associated with it. I.e., any SoftPLC user parameter that is associated with the decimal point of engineering unit 2 will be displayed in this format on the CFW-11 inverter HMI.

NOTE!
The parameters P1017, P1048, P1049 and P1051 are associated with engineering unit 2.

3.16.2 Sensor Scale Configuration

This group of parameters allows the user to configure the scale of the control auxiliary variable for pump protection.

P1048 – Control Auxiliary Variable Sensor Maximum Level (Range)

Adjustable Range:	0 to 32767 [Eng. Unit 2]	Factory Setting: 1000
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the maximum level (or range) of the control auxiliary variable sensor for pump protection according to its engineering unit.

NOTE!
The minimum level of the control auxiliary variable sensor is “0”.

NOTE!
This parameter is displayed according to the selection of the engineering unit 2 parameters (P0512 and P0513).

The relationship between the analog input, AI2, configured for control auxiliary variable sensor, and the display value, P1017, in engineering units, is as follows:

$$P1017 = P1048 \times AIx$$

Where,
P1017 = Control auxiliary variable;
P1048 = Maximum level (or range) of the control auxiliary variable sensor;
AI2 = Value of analog input AI2 in %.

3.16.3 Pump Protection Configuration

This group of parameters allows the user to configure the protection of pump via control auxiliary variable.

P1049 – Value to detect Low Level of Control Auxiliary Variable

Adjustable Range:	0 to 32767 [Eng. Unit 2]	Factory Setting:	250
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the control auxiliary variable threshold below which the control setpoint will be changed to the value programmed in P1050. I.e., when low level is detected, the control setpoint can be changed to a different value (lower), thus assuring a decrease in consumption of the pump, preventing it to operate in cavitation for example.

NOTE!
The alarm message "A774: Low Level of Control Auxiliary Variable" will be generated in the HMI of the CFW-11 inverter, to alert that the control auxiliary variable is in low level.

NOTE!
This parameter is displayed according to the selection of the engineering unit 2 parameters (P0512 and P0513).

P1050 – Control Setpoint in Low Level (low level recovery Setpoint)

Adjustable Range:	-32768 to 32767 [Eng. Unit 1]	Factory Setting:	160
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of the control setpoint in automatic mode for the Pump Genius, when a low level of the control auxiliary variable is detected enabling the system a chance to recover.

NOTE!
The control setpoint should be adjusted to an appropriate value that reduces the consumption of the pump to prevent the cavitation.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1051 – Hysteresis to reactivate the Control Setpoint

Adjustable Range:	0 to 32767 [Eng. Unit 2]	Factory Setting:	100
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of control auxiliary variable hysteresis to be applied for the reset of its low or high level condition, after which the Pump Genius returns to operate with the control setpoint required by the user.

NOTE!
This parameter is displayed according to the selection of the engineering unit 2 parameters (P0512 and P0513).

The figure 3.16 presents a timing analysis of the Pump Genius operation when low level of the control auxiliary variable is detected:

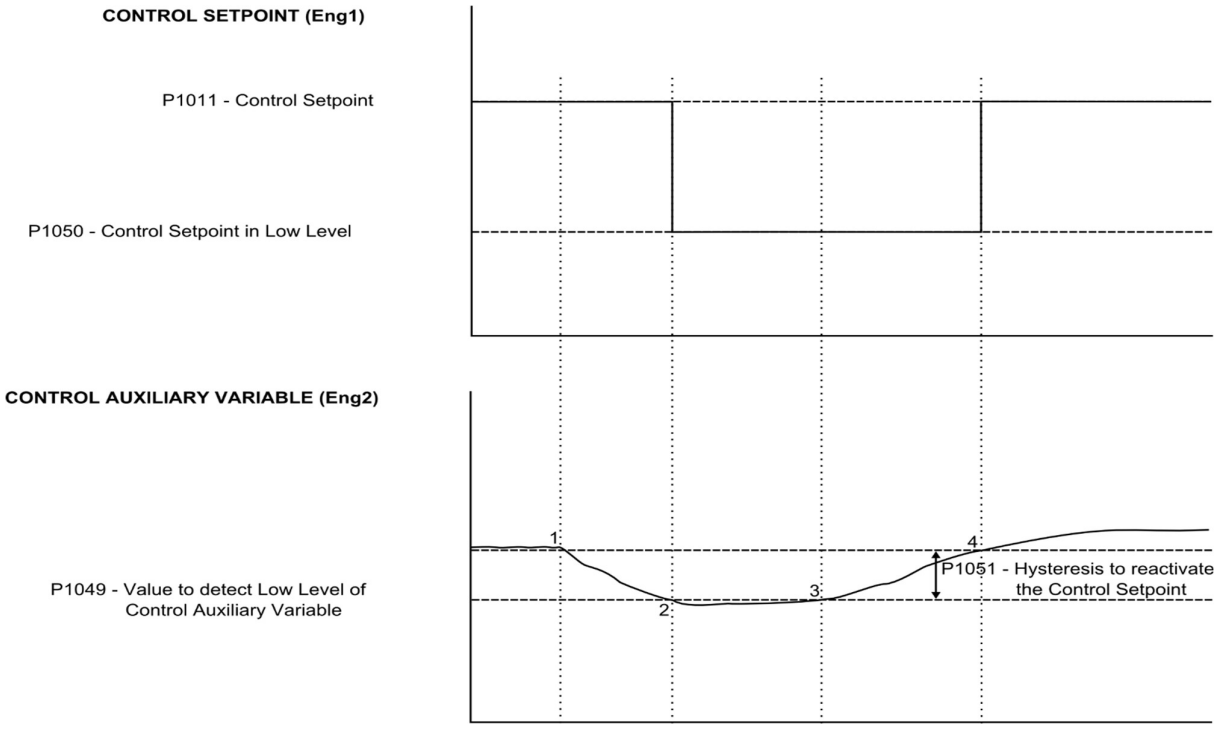


Figure 3.16 *– Pump Genius operation with pump protection via control auxiliary variable*

1 – The Pump Genius is running at a speed satisfying the control setpoint required by the user. At this moment, the value of the auxiliary variable begins to decrease;

2 – The control auxiliary variable drops below the threshold programmed to detect low level of the control auxiliary variable (P1049). At this moment, the value of the control setpoint is changed to the value programmed as control setpoint in low level (P1050);

3 – The change of control setpoint results in an increase of the control auxiliary variable and the same reaches the value programmed to detect low level of control auxiliary variable (P1049), but to reactivate the control setpoint is necessary to be greater than the value set in hysteresis to reactivate the control setpoint (P1051);

3 – At this moment, its value exceeds the programmed hysteresis threshold (P1051), and the control setpoint is reset back to the value required by the user, according to the value programmed in P1011.

P1063 – Time delay before Low Level of Control Auxiliary Variable Fault (F775)

Adjustable Range:	0 to 32767s	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS	
	∟ 50 SoftPLC	

Description:
This parameter defines the time delay before the Pump Genius stops in fault condition. This is in relation to auxiliary variable low level situation, as per P1049,1050and 1051.

NOTE!
The fault message "F775: Low Level of Control Auxiliary Variable" will be generated on the HMI of the CFW-11 inverter, to alert that the control auxiliary variable was in low level and Pump Genius has stopped operating after the time above elapsed.

3.17 PUMP PROTECTION VIA EXTERNAL SENSOR

This group of parameters allows the user to configure an external sensor (pressure switch, level sensor, etc.) to protect the inverter driven pump. The sensor or sensors must be installed at the digital input DI6.

NOTE!
Enabling the use of an external sensor for pump protection is accomplished by programming the digital input DI6 in “21=External Sensor”, as described in section 3.4.

P1080 – Time Delay for Pump Protection Fault via External Sensor on DI2 (F785)

Adjustable Range:	0 to 32767 s	Factory Setting: 0 s
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the time delay between the activation of the sensor connected to DI2 while the pump is running, and the external sensor fault F785: “Text selected in Parameter P1086” is generated.
Detection of the sensor on DI2 is done at logic level “0” or “1”, depending on the sensor function (NO or NC) selected in Parameter P1081.

NOTE!
A setting of “0 s” disables the pump protection fault via external sensor (DI2).
This function is also disabled when DI2 is used for Deragging.

P1081 – Sensor on DI2 is NO or NC

Adjustable Range:	0 to 1 0 = Sensor is NC 1 = Sensor is NO	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines if the contact of the sensor connected to DI2 is Normally Closed or Normally Open.

P1081	Description
0	It defines that the contact in the external sensor used is Normally Closed (NC).
1	It defines that the contact in the external sensor used is Normally Open (NO).

NOTE!
This fiction will be disabled if Deragging using DI2 is selected.

P1086 – DI2 Fault Message

Adjustable Range:	0 = DI2 Fault 1 = Filter Fault 2 = Filter Obstructed 3 = High Pump Temperature 4 = Hight Discharge Pressure 5 = Low Discharge Pressure 6 = Jockey Pump Fault 7 = Lift Pump Fault 8 = Low Flow Fault 9 = Low Suction Pressure 10 = Low Water Level 11 = High Water Level 12 = Screen Fault 13 = High Salinity Level 14 = External Pump Fault 15 = Spare	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines what text is going to be displayed on the keypad when F785 is generated.

NOTE!
These texts can be changed if required.

P1082 – Ext. Sensor on DI3 Fault Time

Adjustable Range:	0 to 32767 s	Factory Setting: 0 s
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the time delay between the activation of the sensor connected to DI3 while the pump is running, and the external sensor fault F787: “Text selected in Parameter P1087” is generated.
Detection of the sensor on DI3 is done at logic level “0” or “1”, depending on the sensor function (NO or NC) selected in Parameter P1083.

NOTE!
A setting of “0 s” disables the pump protection fault via external sensor (DI3).
This function is also disabled when DI3 is used for PID Control in Manual or Automatic.

P1083 – Sensor on DI3 is NO or NC

Adjustable Range:	0 to 1 0 = Sensor is NC 1 = Sensor is NO	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines if the contact of the sensor connected to DI3 is Normally Closed or Normally Open.

P1083	Description
0	It defines that the contact in the external sensor used is Normally Closed (NC).
1	It defines that the contact in the external sensor used is Normally Open (NO).

NOTE!
This fiction will be disabled if DI3 is used for PID Control in Manual or Automatic.

P1087 – DI3 Fault Message

Adjustable Range:
0 = DI2 Fault
1 = Filter Fault
2 = Filter Obstructed
3 = High Pump Temperature
4 = Hight Discharge Pressure
5 = Low Discharge Pressure
6 = Jockey Pump Fault
7 = Lift Pump Fault
8 = Low Flow Fault
9 = Low Suction Pressure
10 = Low Water Level
11 = High Water Level
12 = Screen Fault
13 = High Salinity Level
14 = External Pump Fault
15 = Spare

Factory Setting: 0

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
∟ 50 SoftPLC

Description:
This parameter defines what text is going to be displayed on the keypad when F787 is generated.

NOTE!
These texts can be changed if required.

P1084 – Ext. Sensor on DI6 Fault Time

Adjustable Range: 0 to 32767 s

Factory Setting: 0 s

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
∟ 50 SoftPLC

Description:
This parameter defines the time delay between the activation of the sensor connected to DI6 while the pump is running, and the external sensor fault F783: “Text selected in Parameter P1088” is generated.
Detection of the sensor on DI6 is done at logic level “0” or “1”, depending on the sensor function (NO or NC) selected in Parameter P1085.

NOTE!
A setting of “0 s” disables the pump protection fault via external sensor (DI6).

P1085 – Sensor on DI6 is NO or NC

Adjustable Range:	0 to 1 0 = Sensor is NC 1 = Sensor is NO	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines if the contact of the sensor connected to DI8 is Normally Closed or Normally Open.

P1085	Description
0	It defines that the contact in the external sensor used is Normally Closed (NC).
1	It defines that the contact in the external sensor used is Normally Open (NO).

P1088 – DI6 Fault Message

Adjustable Range:	0 = DI2 Fault 1 = Filter Fault 2 = Filter Obstructed 3 = High Pump Temperature 4 = Hight Discharge Pressure 5 = Low Discharge Pressure 6 = Jockey Pump Fault 7 = Lift Pump Fault 8 = Low Flow Fault 9 = Low Suction Pressure 10 = Low Water Level 11 = High Water Level 12 = Screen Fault 13 = High Salinity Level 14 = External Pump Fault 15 = Spare	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines what text is going to be displayed on the keypad when F783 is generated.

NOTE!
These texts can be changed if required.

3.17.1 CHANGE OF FAULT MESSAGE FOR EXTERNAL SENSOR

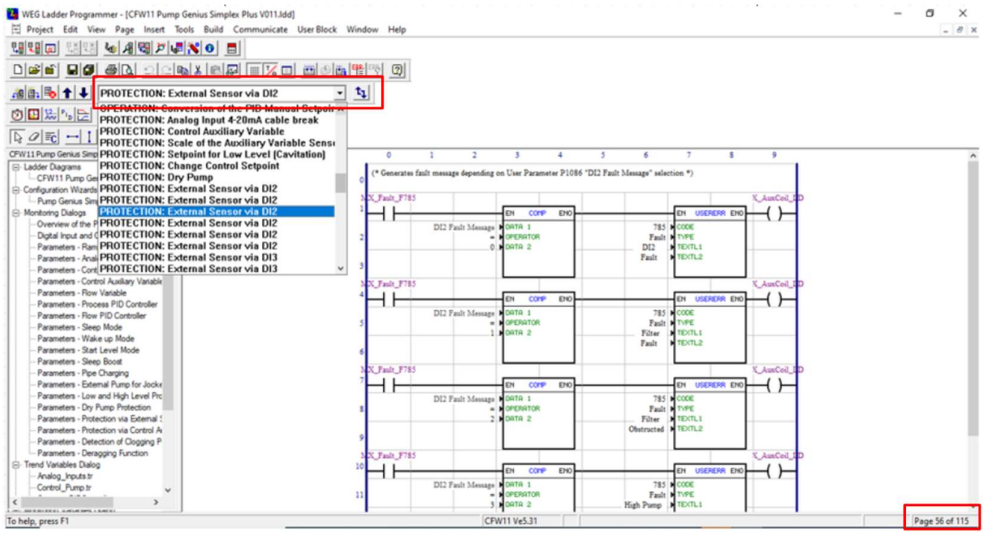
The messages generated by the external sensor(s) fault are preprogrammed into the “Pump Genius Simplex Plus” SoftPLC program.
The user can change these messages if required.
The messages are generated by user error function blocks “USERERR” that generates a Fault number and the Fault message on the HMI of the CFW11 Frequency Drive.
These messages can also be changed in the drop box on step 20 of 32 of the Configuration Wizard for further use.

To change these messages from the USERERR function blocks please follow the steps of the example below:

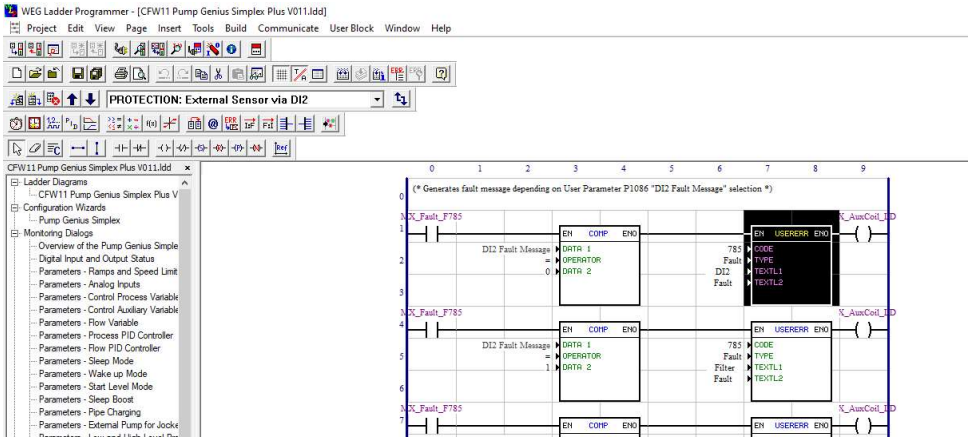
In this example we will change the first message of the External Fault connected to Digital Input 2 (DI2).

3.17.1.1. Open the WLP program and select the “Pump Genius Simplex Plus V011” project.

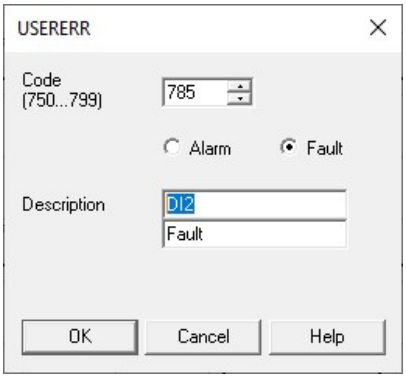
3.17.1.2. Click on the page drop-box and select the page with title “PROTECTION: External Sensor via DI2” page 56 of 115.



3.17.1.3. Double click on the user error function block “USERERR” on line 1 column 7.

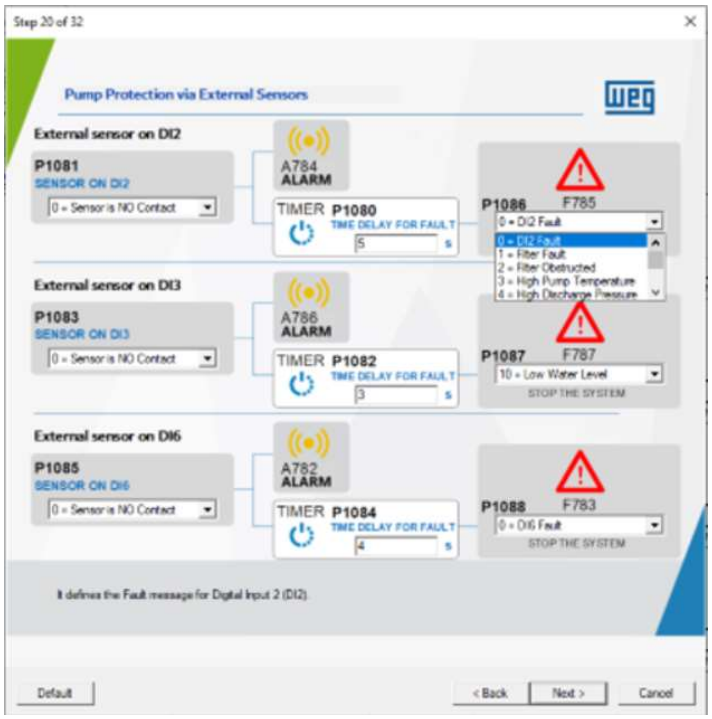


3.17.1.4. Change the description in
- TEXTL1 – Error text – line 1 (12 characters)
- TEXTL2 – Error text – line 2 (12 characters)
And press OK.



To change the messages in the Configuration wizard, follow the steps below:

One can also change the message selection when setting up the Pump Genius via the Configuration Wizard.



3.17.1.5. If the WLP software was installed and placed in its default file. Open Window Explorer and follow the WEG WLP path as shown below.

C:\WEG\WLP V11.10\PROJECTS\CFW11 Pump Genius Simplex Plus V011\CONFIG

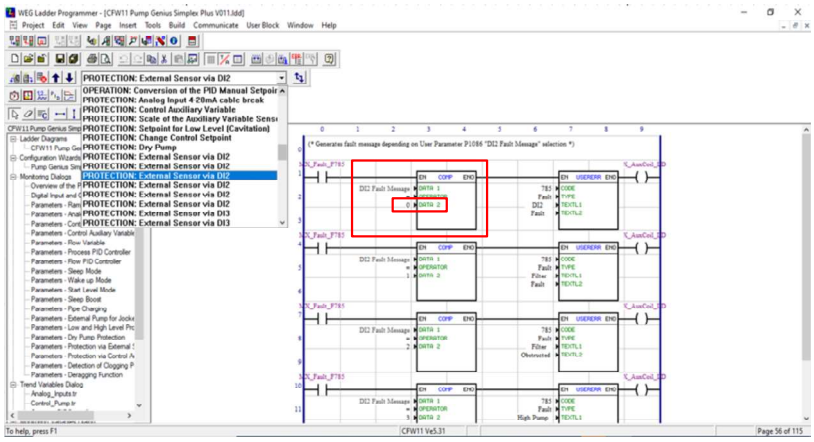
3.17.1.6. Open the file “Step20_PPDI6_PG76_Pg93” using Microsoft “Notepad”

3.17.1.7. Change the Fault Message on the line that shows the Value “0”.

```
<CONTROL type="6" absolute="1" x="-83" y="96" cx="110" default="1">
        <OPTION value="0" >0 = Sensor is NO Contact</OPTION>
        <OPTION value="1" >1 = Sensor is NC Contact</OPTION>
        <INFO></INFO>
        <INFO>            It defines the operation mode of the Sensor contact connected to
        <SAVE tag="DI2 = NO or NC" datatype="%UW" address="1081" multiplier="1"></SAVE>
</CONTROL>


<CONTROL type="6" absolute="1" x="205" y="105"  cx="110" default="0">
        <OPTION value="0" >0 = DI2 Fault</OPTION>
        <OPTION value="1" >1 = Filter Fault</OPTION>
        <OPTION value="2" >2 = Filter Obstructed</OPTION>
        <OPTION value="3" >3 = High Pump Temperature</OPTION>
        <OPTION value="4" >4 = High Discharge Pressure</OPTION>
        <OPTION value="5" >5 = Low Discharge Pressure</OPTION>
        <OPTION value="6" >6 = Jockey Pump Fault</OPTION>
        <OPTION value="7" >7 = Lift Pump Fault</OPTION>
        <OPTION value="8" >8 = Low Flow Fault</OPTION>
        <OPTION value="9" >9 = Low Suction Pressure</OPTION>
        <OPTION value="10" >10 = Low Water Level</OPTION>
        <OPTION value="11" >11 = High Water Level</OPTION>
        <OPTION value="12" >12 = Screen Fault</OPTION>
        <OPTION value="13" >13 = High Salinity Level</OPTION>
        <OPTION value="14" >14 = External Pump Fault</OPTION>
        <OPTION value="15" >15 = Spare</OPTION>
        <INFO></INFO>
        <INFO>            It defines the Fault message for Digital Input 2 (DI2).</INFO>
        <SAVE tag="DI2 = NO or NC" datatype="%UW" address="1086" multiplier="1"></SAVE>
</CONTROL>
```

Note that this value “0” corresponds to the setting number for User Parameter P1086 and is compared in the WLP ladder program to activate the respective USERERR function block.



3.18 DERAGGING FUNCTION

This group of parameters allows the user to enable the logic to execute the deragging function in the inverter driven pump to prevent it becoming clogged, and thus preventing it operating.

Its basic principle is running the pump in the reverse pumping direction to remove the accumulated debris, and thus, the pump can run again.

NOTE!
This function should only be enabled on a pump that can run with rotation in the reverse pumping direction; otherwise, it may cause damage to it.

P1052 – Execution Mode of the Deragging Function

Adjustable Range:	0 = Not Execute Deragging Function 1 = Executes with Command to Run the Pump 2 = Executes with Command via Digital Input DI2 3 = Executes when the Clogging of Pump is Detected	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the execution mode of the deragging function for the pump driven by the CFW-11 inverter.

***Table 3.10** – Description of execution mode of the deragging function*

P1052	Description
0	It defines that the deragging function will not be executed, i.e., is disabled.
1	It defines that the deragging function will be enabled and executed every time there is a command to run the pump driven by CFW-11 inverter. This command can be from HMI, a digital input, via communications networks, etc.
2	It defines that the deragging function will be enabled and executed every time the digital input DI2 receives a command, i.e., change the logic level “0” to logic level “1”. This function disables the External Sensor via DI2 function.
3	It defines that the deragging function will be enabled and executed every time that the clogging of pump is detected via high motor current.

NOTE!
Order to be able execute the deragging function, it is necessary that the SoftPLC function controls the motor speed direction to do with the pump operates in reverse pumping direction. Thus, was defined that the deragging function only will operate with the CFW-11 inverter operating in REMOTE mode. Beyond that, is too necessary program the P0226 parameter in 12 (SoftPLC FWD) or in 13 (SoftPLC REV) to defines the motor speed direction in remote mode. When in 12, defines that the speed direction for pumping will be FOWARD and for deragging will be REVERSE. When in 13, defines that the speed direction for pumping will be REVERSE and for deragging will be FOWARD.

P1053 – Number of Cycles for Deragging

Adjustable Range:	0 to 100	Factory Setting: 5
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the number of times (cycles) that the pump will operate in reverse pumping direction to execute the deragging function for the pump driven by CFW-11 inverter.

P1054 – Speed Reference for Deragging

Adjustable Range:	0 to 18000 rpm	Factory Setting:	600 rpm
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the speed reference value for the pump to execute the deragging function. This speed is used in the pumping direction as the deragging direction.

P1055 – Deragging Run Time

Adjustable Range:	0 to 32767 s	Factory Setting:	10 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of time that the pump will run (with speed reference for deragging) in the deragging cycle execution. This time is used in the pumping direction as the deragging direction.

P1056 – Deragging Stop Time

Adjustable Range:	0 to 32767 s	Factory Setting:	10 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of time that the pump remains stopped in the deragging cycle execution.

P1057 – Motor Current to detect Clogging of Pump

Adjustable Range:	0.0 to 3200.0 A	Factory Setting:	20.0 A
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of motor current above which will be considered that the pump is running at high current, i.e., the pump is in clogging process.

P1058 – Time Delay to detect Clogging of Pump

Adjustable Range:	0 to 32767 s	Factory Setting:	60 s
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the waiting time with the condition of high current in the pump motor to detect that it is in clogging process, being thus generated the alarm message “A790: Clogging Detected” to indicate this situation.

P1059 – Number of consecutives Clogging to generate the Fault (F791)

Adjustable Range:	0 to 100	Factory Setting: 5
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the number of consecutives clogging detected to generate the fault “F791: Excess of Clogging Detected”.

NOTE!
A setting of “0” disables the fault by excess of clogging detected. Every time that the Pump Genius is disabled or goes to sleep mode, i.e., the pump is stopped, the count of clogging is reset.

3.18.1 Deragging with Command to Run the Pump (P1052=1)

Selecting the execution mode of the deragging function (P1052) in 1 is defined that the deragging is enabled and it is executed every time there is a command to run the pump. This command can be from HMI, a digital input, via communications networks, etc.

The figure 3.17 presents a timing analysis of the deragging function operation when occurs a command to run the pump driven by the CFW-11 inverter.

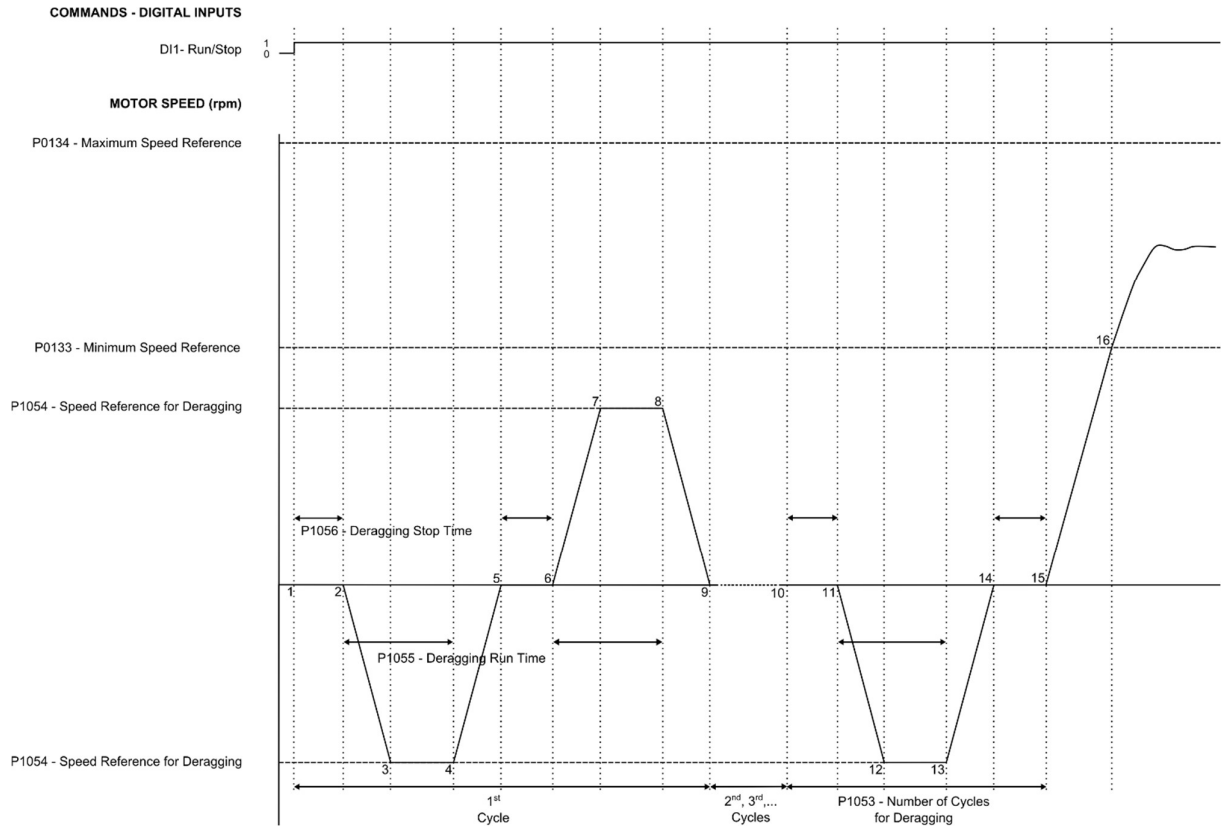


Figure 3.17 *– Deragging pump operation with command to run the pump*

1 – The command Run/Stop via digital input DI1 enables run the motor, as well as, enable the operation of Pump Genius. In this moment, initiate the count of the first cycle to deragging the pump and the counting time of pump stopped (P1056) is initiated;

2 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the reverse direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated;

3 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

4 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in reverse direction of the pumping;

5 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counting time of pump stopped (P1056) is initiated;

6 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated;

7 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

8 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in direction of the pumping;

9 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counter of cycles is increased and the counting time of pump stopped (P1056) is initiated; the steps 2 to 9 occur again until that the number of cycles is equal to the number of cycles for deragging (P1053);

10 – The number of cycles arrives to the number of cycles for deragging (P1053) programmed and the last cycle is initiated; thus, the deragging stop time (P1056) is initiated;

11 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the reverse direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated

12 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

13 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in reverse direction of the pumping;

14 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counting time of pump stopped (P1056) is initiated

15 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump and control the pumping again, i.e., the deragging function was finished;

16 – The pump is accelerated until the minimum speed reference. After this the PID controller is enabled and starts to control the pump speed in order for the control process variable to catch up with the control setpoint required by the user.

3.18.2 Deragging with Command via Digital Input DI2 (P1052=2)

Selecting the execution mode of the deragging function (P1052) in 2 is defined that the deragging is enabled and it is executed every time there is a command via digital input DI2, i.e., the digital input DI2 change the logic level “0” to logic level “1”.

The figure 3.18 presents a timing analysis of the deragging function operation when occurs a command in the digital input DI2.

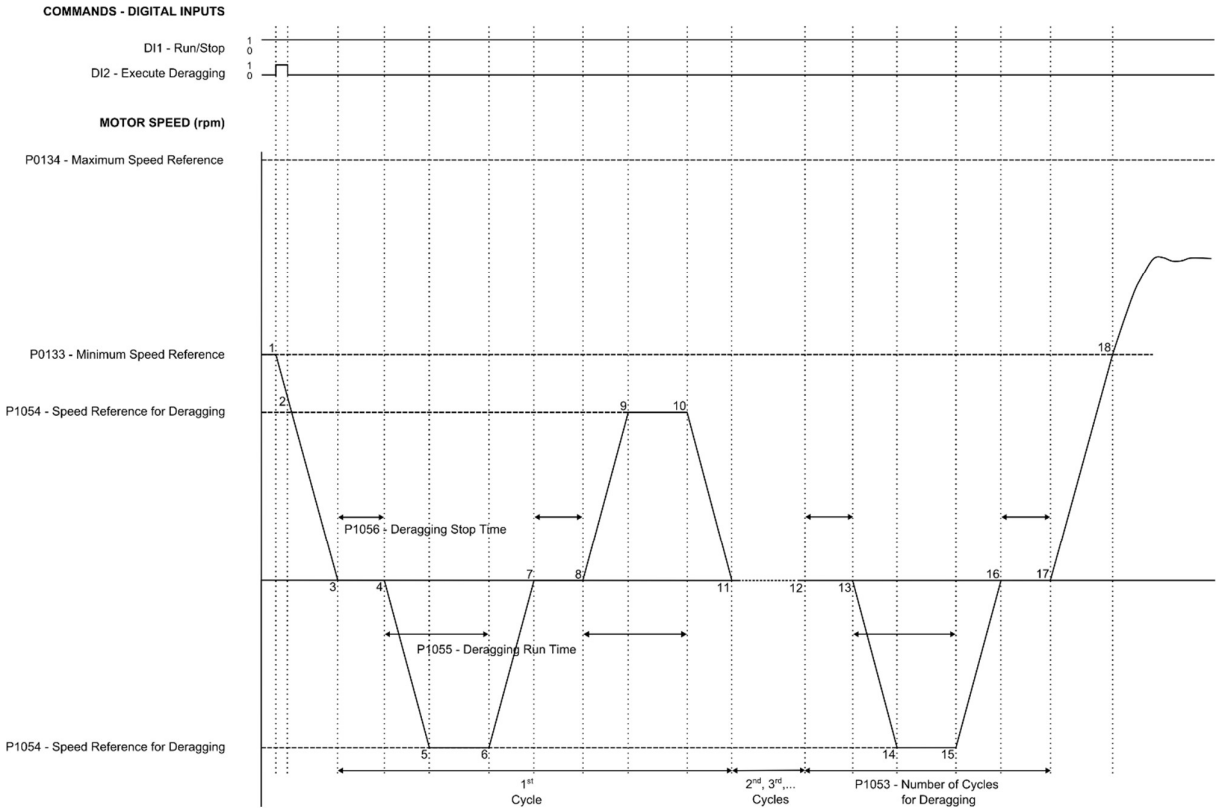


Figure 3.18 *– Deragging pump operation with command via digital input DI2*

1 – The Pump Genius is enabled to run through the command Run/Stop via digital input DI1 and is controlling the pump driven by the CFW-11 inverter. In this moment, a command is done in the digital input DI2 to execute the deragging function, i.e., the digital input DI2 goes from logic level "0" to logic level "1". So, it is done the command to stop the pump and starts the deragging function;

2 – The digital input DI2 goes to logic level “0”, because the command to execute the deragging function is done when the pump change the logic level of “0” to “1”, i.e., when execute a pulse in the digital input DI2. The pump continues in deceleration process;

3 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment initiate the count of the first cycle to deragging the pump and the counting time of pump stopped (P1056) is initiated;

4 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the reverse direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated;

5 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

6 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in reverse direction of the pumping;

7 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counting time of pump stopped (P1056) is initiated;

8 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated;

9 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;
10 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in direction of the pumping;

11 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counter of cycles is increased and the counting time of pump stopped (P1056) is initiated; the steps 2 to 9 occur again until that the number of cycles is equal to the number of cycles for deragging (P1053);

12 – The number of cycles arrives to the number of cycles for deragging (P1053) programmed and the last cycle is initiated; thus, the deragging stop time (P1056) is initiated;

13 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the reverse direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated

14 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

15 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in reverse direction of the pumping;

16 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counting time of pump stopped (P1056) is initiated

17 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump and control the pumping again, i.e., the deragging function was finished;

18 – The pump is accelerated until the minimum speed reference. After this the PID controller is enabled and starts to control the pump speed in order for the control process variable to catch up with the control setpoint required by the user.

3.18.3 Deragging when Clogging of Pump is detected (P1052=3)

Selecting the execution mode of the deragging function (P1052) in 3 is defined that the deragging is enabled and it is executed when the clogging of pump is detected.

The figure 3.19 presents a timing analysis of the deragging function operation when occurs a clogging of pump.

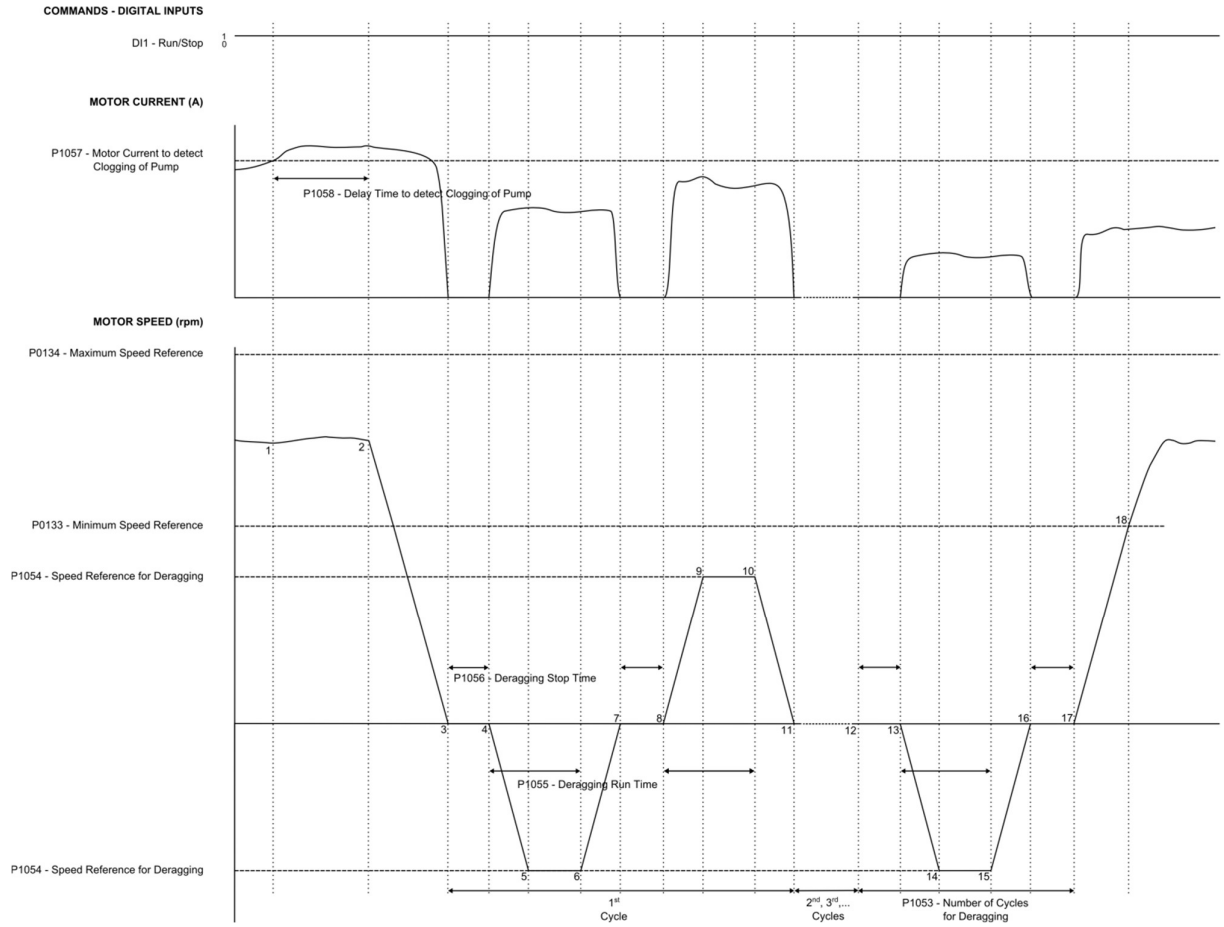


Figure 3.19 *– Deragging pump operation when a clogging of pump is detected*

1 – The Pump Genius is enabled to run through the command Run/Stop via digital input DI1 and is controlling the pump driven by the CFW-11 inverter. In this moment the motor current is greater than the motor current to detect clogging of pump (P1057) and the counting time to detect clogging of pump (P1058) is initiated;

2 – The motor current remains greater than the motor current to detect clogging of pump (P1057) and the time to detect clogging of pump (P1058) is elapsed; in this moment is done the command to stop the pump and starts the deragging function;

3 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment, initiate the count of the first cycle to deragging the pump and the counting time of pump stopped (P1056) is initiated;

4 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the reverse direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated;

5 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

6 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in reverse direction of the pumping;

7 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counting time of pump stopped (P1056) is initiated;

8 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated;

9 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

10 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in direction of the pumping;

11 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counter of cycles is increased and the counting time of pump stopped (P1056) is initiated; the steps 2 to 9 occur again until that the number of cycles is equal to the number of cycles for deragging (P1053);

12 – The number of cycles arrives to the number of cycles for deragging (P1053) programmed and the last cycle is initiated; thus, the deragging stop time (P1056) is initiated;

13 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump in the reverse direction of the pumping and with the speed reference to deragging (P1054); the PID controller stays disabled. In this moment the counting time of pump running (P1055) is initiated

14 – The pump is accelerated until the speed reference for deragging (P1054) with the acceleration ramp set in P0100 parameter and stays in this speed until that the counting time of pump running (P1055) is elapsed;

15 – The deragging run time (P1055) is elapsed; in this moment is done the command to stop the pump in reverse direction of the pumping;

16 – The pump is decelerated to the zero speed as the deceleration ramp set in the P0101 parameter and stays stopped. In this moment the counting time of pump stopped (P1056) is initiated

17 – The deragging stop time (P1056) is elapsed; in this moment is done the command to run the pump and control the pumping again, i.e., the deragging function was finished;

18 – The pump is accelerated until the minimum speed reference. After this the PID controller is enabled and starts to control the pump speed in order for the control process variable to catch up with the control setpoint required by the user.

3.19 FLOW LIMITING

This group of parameters allows the user to enable the logic to execute the Flow limiting function in the pumping system.

Its basic principle is to at all times monitor the flow while maintaining a PV setpoint, it will cap the flow in real time by reducing the PV to maintain the flow setpoint, it will achieve this seamlessly avoiding hammer or flipping between control methods.

P1069 – Enable Flow limitation function.		
Adjustable Range:	0 = Without Protection via Flow Auxiliary Variable 1 = Flow Auxiliary Variable via Analog Input AI4	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the source of the control auxiliary variable for pump protection.

***Table 3.11** – Description of control auxiliary variable source for pump protection*

P1069	Description
0	It defines that there is no pump protection via flow auxiliary variable.
1	It defines that the source of the flow auxiliary variable for pump protection is the value read by the analog input AI4. The value is converted according to engineering unit 4 and displayed in parameter P1072.

P0516 – Engineering Unit 4

Adjustable Range: Factory Setting: 0

0 = None
36 = gal/s
37 = GPM (= gal/min)
38 = gal/h
39 = L/s
40 = L/min
41 = L/h
48 = m³/s
49 = m³/min
50 = m³/h
51 = ft³/s
52 = CFM (=ft³/min)
53 = ft³/h

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
∟ 30 HMI

Description:
This parameter selects the engineering unit that will be displayed in the SoftPLC user parameter that is associated with it. I.e., any SoftPLC user parameter that is associated with the engineering unit 4 will be displayed in this format on the CFW-11 inverter HMI.

NOTE!
The parameters P1070, P1071, P1072, P1075, P1076 and P1079 are associated with engineering unit 4.

P1070 – Flow Auxiliary Variable Sensor Maximum Level (Range)

Adjustable Range: 0 to 32767 [Eng. Unit 4] Factory Setting: 0

Properties:

Access groups via HMI: 01 PARAMETER GROUPS
∟ 50 SoftPLC

Description:
This parameter defines the maximum level (or range) of the control auxiliary variable sensor for pump protection according to its engineering unit.

NOTE!
The minimum level of the Flow auxiliary variable sensor is “0”.

NOTE!
This parameter is displayed according to the selection of the engineering unit 4 parameters (P0516 and P0517).

The relationship between the analog input, AI4, configured for flow auxiliary variable sensor, and the display value, P1072, in engineering units, is as follows:

$$P1072 = P1070 \text{ x } AIx$$

Where,

P1072 = Control auxiliary variable;
P1070 = Maximum level (or range) of the flow auxiliary variable sensor;
AI4 = Value of analog input AI4 in %.

P1071 – Flow limitation setpoint

Adjustable Range:	0 to 32767 [Eng. Unit 2]	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the Flow auxiliary variable setpoint above which the control setpoint will be changed to restrict the flow. I.e., when high flow is detected, the control setpoint will be reduced to a different value (lower), until the flow is equal to this setpoint (P1071) assuring a decrease in consumption of the pump, preventing the system from operating beyond its flow constraints.

NOTE!
The alarm "A754: Flow is Restricted " and the actual Flow (1072) will be represented on the third line of the HMI of the CFW-11 inverter to alert that the flow auxiliary variable is in control of the system.

NOTE!
This parameter is displayed according to the selection of the engineering unit 4 parameters (P0516 and P0517).

P1074 – Set Time/Hour for daily total flow allowance reset.

Adjustable Range:	0 to24hr	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter defines the time/hour that the daily total flow accumulated will reset, restarting the flow count (P1076) for the following 24hr period.

NOTE!
This parameter is displayed according to the selection of the engineering unit 4 parameters (P0516 and P0517).

P1075 – Maximum total daily flow allowance

Adjustable Range:	0 to 32767 [Eng. Unit 4]	Factory Setting: 0
Properties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter sets the maximum total daily flow allowance setpoint above which (in a 24hr period) the pump genius system will go to “sleep”. The system will “wake up” once the time reaches the reset time P1074.

NOTE!
The alarm message "A751: over daily limit" will be generated in the HMI of the CFW-11 inverter, to alert that the maximum total daily flow allowance has been reached.

NOTE!
This parameter is displayed according to the selection of the engineering unit 4 parameters (P0516 and P0517).

P1066 – PID Proportional Gain – Flow PV

Adjustable Range:	0.000 to 32.000	Factory Setting:	1.000
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the proportional gain value of the FLOW PID controller of the Pump Genius.

P1067 – PID Integral Gain – Flow PV

Adjustable Range:	0.000 to 32.000	Factory Setting:	5.000
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the integral gain value of the FLOW PID controller of the Pump Genius.

P1068 – PID Derivative Gain – Flow PV

Adjustable Range:	0.000 to 32.000	Factory Setting:	0.000
Properties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the derivative gain value of the FLOW PID controller of the Pump Genius.

NOTE!
The FLOW PID controller of the Pump Genius *Plus* Simplex application is of the academic type. Should a different structure be adopted for the PID controller (through WLP), then the controller gains must be re-optimized by the user. PID block input arguments can only be changed in the ladder application developed with the WLP. Refer to the WLP programming software help topics for more information on the PID block.

3.20 HMI MONITORING

This parameter group allows the user to configure which parameters will be shown on the HMI display in the monitoring mode.

P0205 – Reading Parameter Selection 1

P0206 – Reading Parameter Selection 2

P0207 – Reading Parameter Selection 3

NOTE!
Refer to the CFW-11 programming manual for more information about the HMI parameters. Some parameter options have been removed from the configuration wizard.

3.21 READING PARAMETERS

P1010 – Pump Genius Simplex Plus Application Version

Adjustable Range:	0.00 to 10.00	Factory Setting: -
Properties:	RO	
Access groups via HMI:	01 PARAMETER GROUPS	
	∟ 50 SoftPLC	

Description:
This parameter indicates the version of the Pump Genius Simplex Plus application.

P1016 – Control Process Variable

Adjustable Range:	-32768 to 32767 [Eng. Un. 1]	Factory Setting: -
Properties:	RO	
Access groups via HMI:	01 PARAMETER GROUPS	
	∟ 50 SoftPLC	

Description:
This parameter indicates the value of the Pump Genius control process variable according to the source of the control process variable selected by P1021.

NOTE!
This parameter is displayed according to the selection of the engineering unit 1 parameters (P0510 and P0511).

P1017 – Control Auxiliary Variable

Adjustable Range:	0 to 32767 [Eng. Un. 2]	Factory Setting: -
Properties:	RO	
Access groups via HMI:	01 PARAMETER GROUPS	
	∟ 50 SoftPLC	

Description:
This parameter indicates the value of the Pump Genius control auxiliary variable according to the source of the control auxiliary variable selected by P1047.

NOTE!
This parameter is displayed according to the selection of the engineering unit 2 parameters (P0512 and P0513).

P1019 – Pump Genius Simplex Logical Status 1

Adjustable Range:	0000h to FFFFh	Factory Setting: -
Proprieties:	RO	
Access groups via HMI:	01 PARAMETER GROUPS	
	∟ 50 SoftPLC	

Description:
This parameter allows the monitoring of the Pump Genius Simplex application status. Each bit corresponds to one state.

***Table 3.12** – Description of Pump Genius Simplex status word*

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Excess of Clogging (F791)	Pump Clogging detected (A790)	Deragging in Execution (A794)	External Pump Running	External Sensor Protection (F873)	Sensor on DI6 Protection (A782)	Dry Pump (F781)	Dry Pump (A780)	Low Level Auxiliary Variable (A774)	High Level Process Variable (F773)	High Level Process Variable (A772)	Low Level Process Variable (F771)	Low Level Process Variable (A770)	Sleep Boost Active (A756)	Pipe Charging (A752)	Sleep Mode Active (A750)

Bits	Values
Bit 0 Sleep Mode Active (A750)	**0**: No alarm indication. **1**: It indicates that the Pump Genius is in the sleep mode (A750).
Bit 1 Pipe Charging (A752)	**0**: No alarm indication. **1**: It indicates that the process of pipe charging is being executed (A752).
Bit 2 Sleep Boost Active (A756)	**0**: No alarm indication. **1**: It indicates that the Pump Genius is executing the Sleep Boost before to sleep (A756).
Bit 3 Low Level Process Variable (A770)	**0**: No alarm indication. **1**: It indicates that the control process variable (P1016) is in low level (A770).
Bit 4 Low Level Process Variable (F771)	**0**: No fault indication. **1**: It indicates that the Pump Genius was stopped due to low level of the control process variable (F771).
Bit 5 High Level Process Variable (A772)	**0**: No alarm indication. **1**: It indicates that the control process variable (P1016) is in high level (A772).
Bit 6 High Level Process Variable (F773)	**0**: No fault indication. **1**: It indicates that the Pump Genius was stopped due to high level of the control process variable (F773).
Bit 7 Low Level Auxiliary Variable (A774)	**0**: No alarm indication. **1**: It indicates that the control auxiliary variable (P1017) is in low level and the control setpoint was changed to the value of P1048 (A774).
Bit 8 Dry Pump (A780)	**0**: No alarm indication. **1**: It indicates that the dry pump condition was detected (A780).
Bit 9 Dry Pump (F781)	**0**: No fault indication. **1**: It indicates that the pump was stopped due to dry pump protection (F781).
Bit 10 External Sensor Protection (A782)	**0**: No alarm indication. **1**: It indicates that protection via external sensor (DI6) is actuated (A782).
Bit 11 External Sensor Protection (F783)	**0**: No fault indication. **1**: It indicates that the pump was stopped due to protection via external sensor (DI6) (F783).
Bit 12 External Pump Running	**0**: It indicates that the external pump is stopped or is not enabled. **1**: It indicates that the external pump is running.
Bit 14 Deragging in Execution (A794)	**0**: No alarm indication. **1**: It indicates that the deragging process is in execution (A794).
Bit 14 Pump Clogging detected (A790)	**0**: No alarm indication. **1**: It indicates it has detected clogging the pump to operate with high current (A790).
Bit 15 Excess of Clogging (F791)	**0**: No fault indication. **1**: It indicates that the pump was stopped due an excessive number of clogging detected (F791).

P1064 – Pump Genius *Plus* Simplex Logical Status 2

Adjustable Range:	0000h to FFFFh	Factory Setting: -
Proprieties:	RO	
Access groups via HMI:	01 PARAMETER GROUPS	
	∟ 50 SoftPLC	

Description:
This parameter allows the monitoring of the Pump Genius Simplex *Plus* application status. Each bit corresponds to one state.

Table 3.13 *– Description of Pump Genius Plus Simplex status word*

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Spare	Spare	Spare	Spare	Spare	Spare	Spare	Sensor on DI6 Protection (F783)	Sensor on DI3 Protection (F787)	Sensor on DI2 Protection (F785)	Sensor on DI3 Protection (A786)	Sensor on DI2 Protection (A784)	PID Ramp Active	Daily flow limit reached (A751)	Pump control flow restriction on (A)	Low level Auxiliary Variable Fault (F775)

Bits	Values
Bit 0 Low level Auxiliary Variable Fault (F775)	**0**: No fault indication. **1**: It indicates that the Pump Genius was stopped due to low level of the Auxiliary process variable (F775).
Bit 1 Pump control flow restriction on (A)	**0**: No alarm indication. **1**: It indicates that the drive is currently restricting the process variable and limiting the flow to the setpoint P1071 (A754).
Bit 2 Daily flow limit reached (A751)	**0**: No alarm indication. **1**: It indicates that the flow calculated within the 24hr period and before the reset time (P1074) has reached its maximum flow limit (P1075) it indicates sleep mode until it reaches the reset time (P1074)
Bit 3 PID Ramp Active	**0**: PID Ramp is not active. **1**: PID Ramp is active.
Bit 4 Sensor DI2 Protection (A784)	**0**: No alarm indication. **1**: It indicates that protection via DI2 is actuated (A784).
Bit 5 Sensor on DI3 Protection (A786)	**0**: No alarm indication. **1**: It indicates that protection via DI3 is actuated (A786).
Bit 6 Sensor on DI2 Protection (F785)	**0**: No fault indication. **1**: It indicates that the pump was stopped due to protection via external sensor on DI2 (F785).
Bit 7 Sensor on DI3 Protection (F787)	**0**: No fault indication. **1**: It indicates that the pump was stopped due to protection via external sensor on DI3 (F787).
Bit 8 Sensor on DI6 Protection (F783)	**0**: No fault indication. **1**: It indicates that the pump was stopped due to protection via external sensor on DI6 (F783).
Bit 9 Spare	**0**: **1**:
Bit 10 Spare	**0**: **1**:
Bit 11 Spare	**0**: **1**:
Bit 12 Spare	**0**: **1**:
Bit 14 Spare	**0**: **1**:
Bit 14 Spare	**0**: **1**:
Bit 15 Spare	**0**: **1**:

P1072 – Flow Process Variable

Adjustable Range:	0 to 32767 [Eng. Un. 4]	Factory Setting: -
Properties:	RO	
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter indicates the value of the Pump Genius Flow auxiliary process variable according to the source of the control variable Analog input AI4.

NOTE!
This parameter is displayed according to the selection of the engineering unit 4 parameters (P0516 and P0517).

P1076 – Total daily Flow (total units of flow calculated from the reset time set in P1074)

Adjustable Range:	0 to 32767 [Eng. Un. 4]	Factory Setting: -
Properties:	RO	
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC	

Description:
This parameter indicates the current total units of the Pump Genius Flow auxiliary process variable, calculated from the source of the control auxiliary variable Analog input AI4 and the reset time set in P1074.

NOTE!
This parameter is displayed according to the selection of the engineering unit 4 parameters (P0516 and P0517).

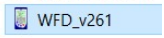
4 DRIVE UPDATE, RESTORATION AND DOWNLOAD THE APPLICATION

To configure the CFW-11 inverter for Pump Genius Simplex *Plus* application, it is necessary to download the Special Firmware for Pump Genius program into the CFW11 drive.

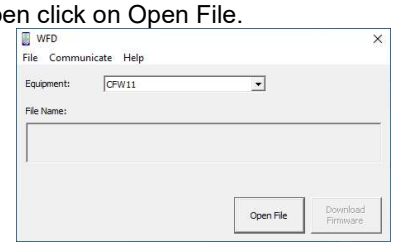
NOTE!
The Pump Genius Simplex Plus application only works on CFW-11 inverter with **special firmware version Ve.5.3x that can be downloaded into the CFW11 drive using the WFD Software**.
Please contact TRind for this firmware if Pump Genius is not pre-Installed.

4.1 How to download the Pump Genius Firmware onto the CFW11 drive:

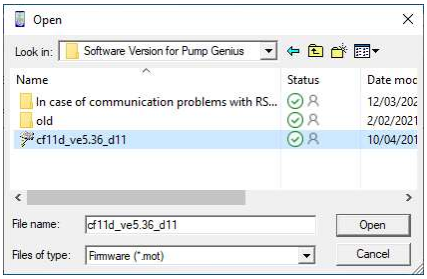
1st Step: Open the WFD Software.



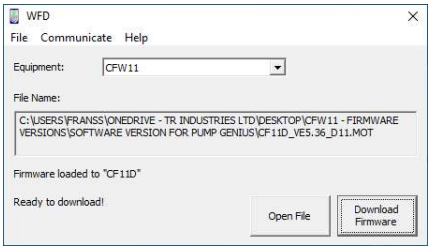
2nd Step: With the WFD software open click on Open File.



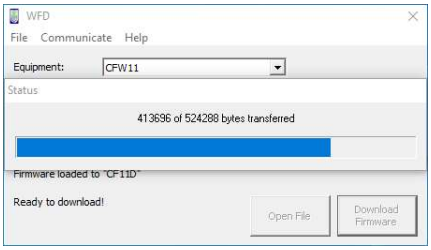
3rd Step: Browse for the Firmware that is saved somewhere on your computer and click on Open.



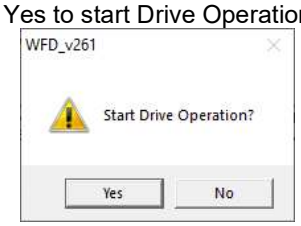
4th Step: With the right Firmware version selected click on Download Firmware.



It takes some minutes until the Firmware is downloaded.



When the download is finished. Click on Yes to start Drive Operations. And close the WFD software.



5th Step: At this stage, the drive will automatically reset, and it may be that Portuguese is the language on the HMI.
In that case change the language to English and reset the drive to factory defaults 50Hz. Otherwise just reset the drive to factory default 50Hz:

Changing the language.
- Press menu,
- Select “TODOS PARÂMETROS”,
- Set Parameter P0000 – “Acesso aos Parâmetros” to 5,
- Set Parameter P0201 – “Idioma” to [1] = English,

Resetting to factory default 50Hz.
- Set Parameter P0204 – “Load/Save Parameters” to [6] = Load 50Hz.

Now the drive is ready for the Pump Genius Program.

4.2 How to download the Pump Genius Simplex Plus onto the CFW11 drive:

Open the ladder application on the WLP, restore the backup file “CFW11 Pump Genius Simplex Plus V011.bkp” and download it to the SoftPLC function of the CFW-11 inverter, as well as the parameter values configured on the configuration wizard.

The following steps show how to restore the backup and configure the Pump Genius Simplex Plus application in the WLP and how to transfer it to the CFW-11 inverter.

1st Step: Restore the backup file “CFW11 Pump Genius Simplex Plus V011.bkp”.

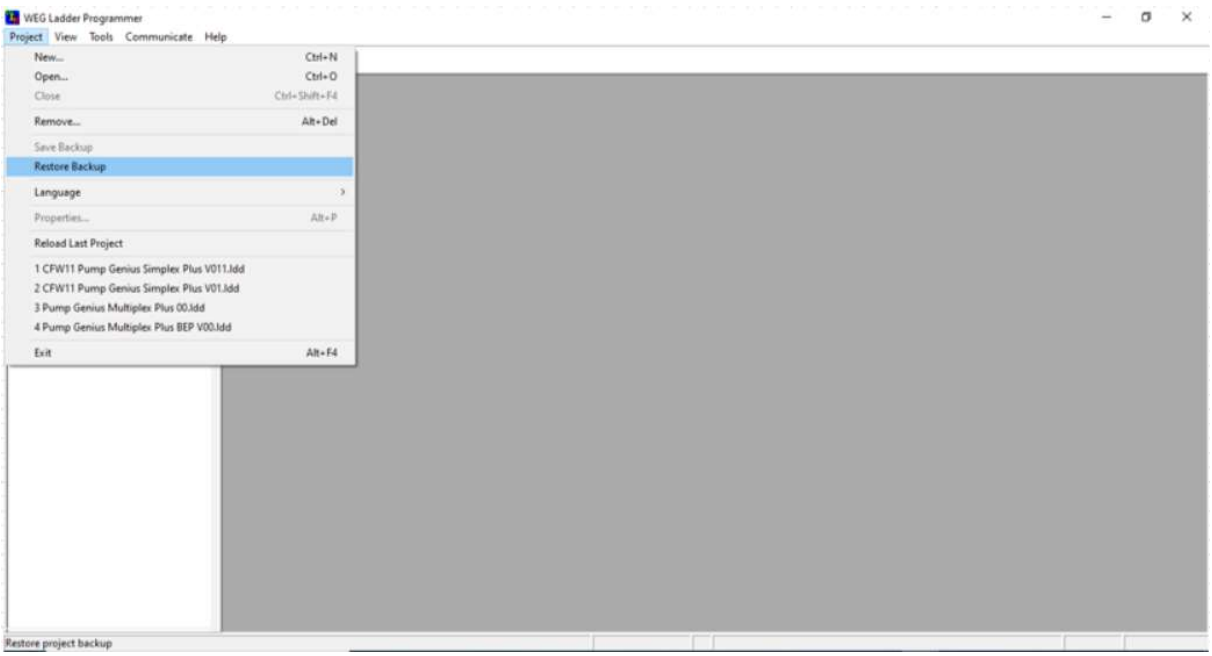


Figure 4.1 *– Download the backup File “CFW11 Pump Genius Simplex Plus V011.bkp” in the WLP Software*

2nd Step: Press Yes on restoration prompt.

Figure 4.2 *– Dialog to Restoration prompt*

3rd Step: Adjust the configuration of the WLP communication interface with the equipment, can be via serial port (COM1..COM8) or via USB. For this, select Communicate and then click Configuration (Shift + F8);

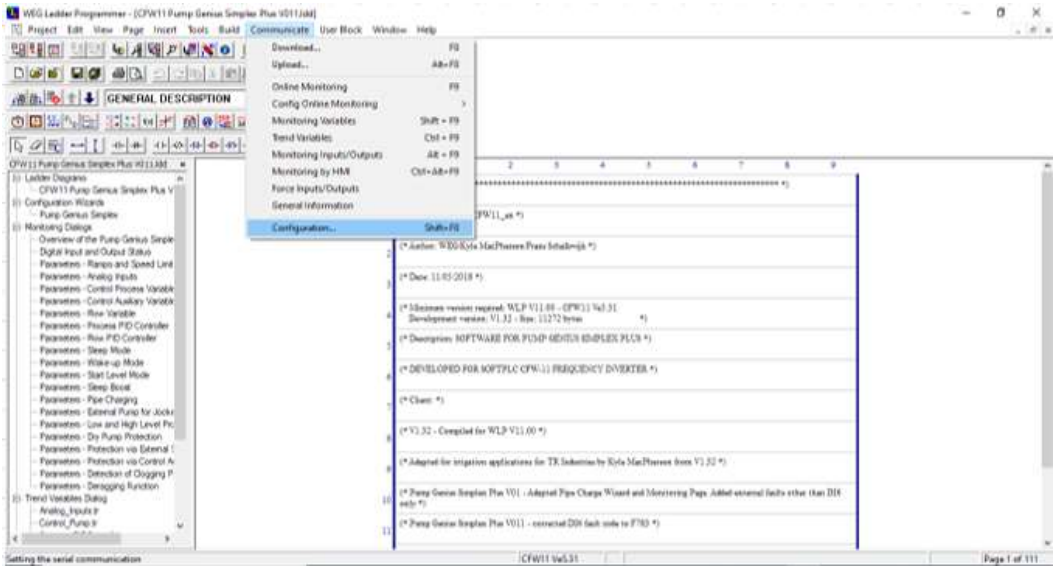


Figure 4.3 *– Adjust the communication interface in the new project*

4th Step: Download the ladder application and user's parameter. For this, select Communicate and then click Download (F8);

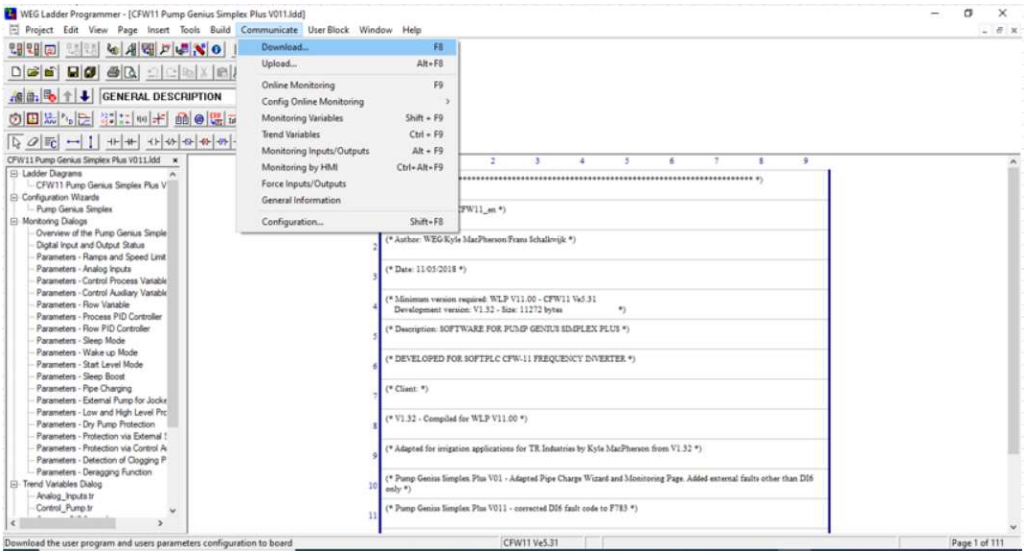


Figure 4.4*– Download the new project*

5th Step: Select “User Program” and “Users Parameters Configuration” in the download dialog. Then click “Ok” to start the transfer to the CFW-11 inverter;

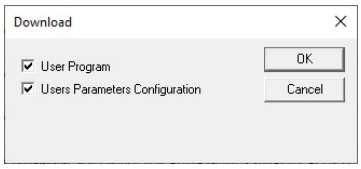


Figure 4.5 *– Ladder application download dialog*

6th Step: Download the ladder application to the CFW-11 inverter. For this, after the project is compiled and the CFW-11 inverter is identified, click "Yes" to start the download;

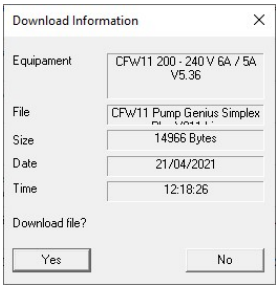


Figure 4.6 *– User program download dialog*

7th Step: Enable the execution of the SoftPLC user program after the download of the ladder application to the CFW-11 inverter. Click "Yes" to enable the execution of the SoftPLC user program.

Figure 4.7 *– Enabling dialog of the SoftPLC user’s program*

8th Step: Download the user’s parameters configuration of the ladder application to the CFW-11 inverter. For this, click “Download” in the user parameters configuration dialog; and then, click "Yes" to start the download;

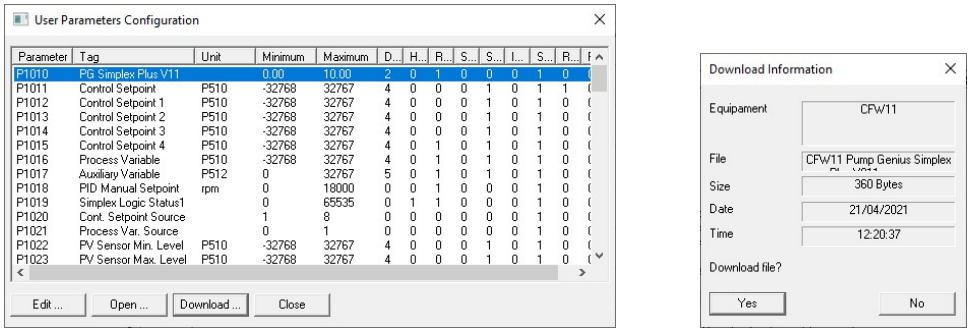


Figure 4.8 *– User parameters download dialogs*

9th Step: Start the configuration wizard setup for Pump Genius Simplex application. For this, click the Configuration Wizard “Pump Genius Simplex Plus” in the project tree bar and follow the steps described in chapter 5;

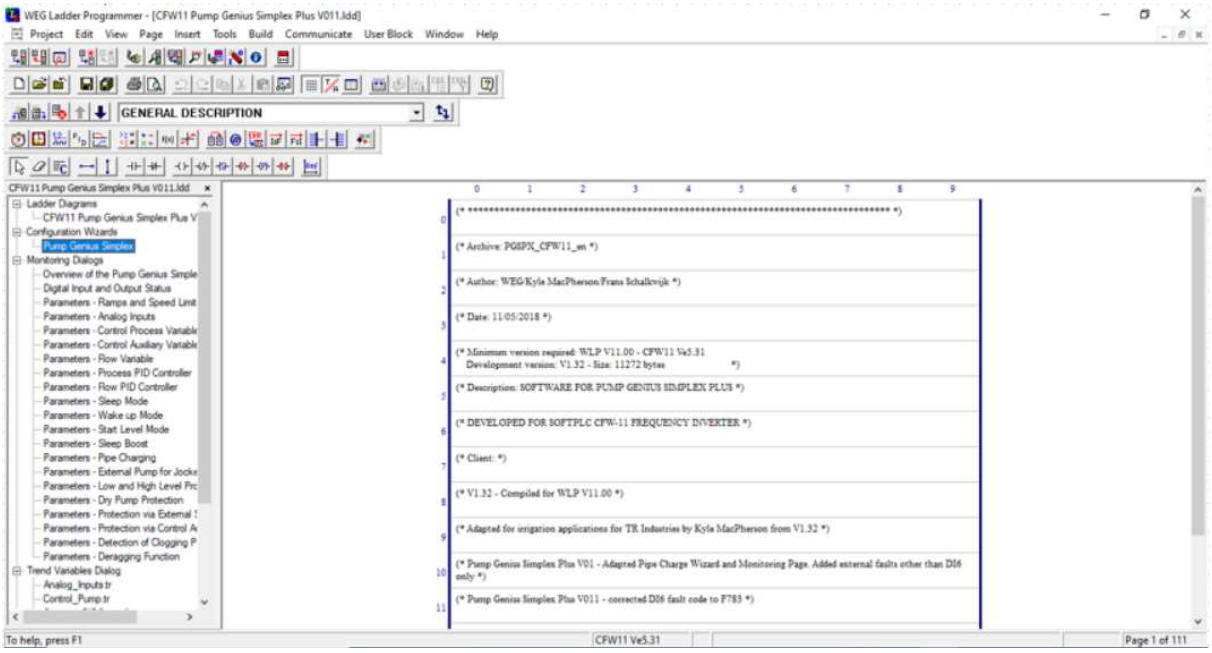


Figure 4.9 *– Select the configuration wizard for Pump Genius Simplex*

10th Step: Click "Finish" in the summary of Pump Genius Simplex Plus configuration;

Figure 4.10 *– Summary of Pump Genius Plus Simplex Plus configuration*

11th Step: Send the values of the parameters configured in the configuration wizard of Pump Genius Simplex Plus for the CFW-11 inverter. For this, click "Yes" to start sending the values.

Figure 4.11 *– Dialog for download the values of configuration wizard*

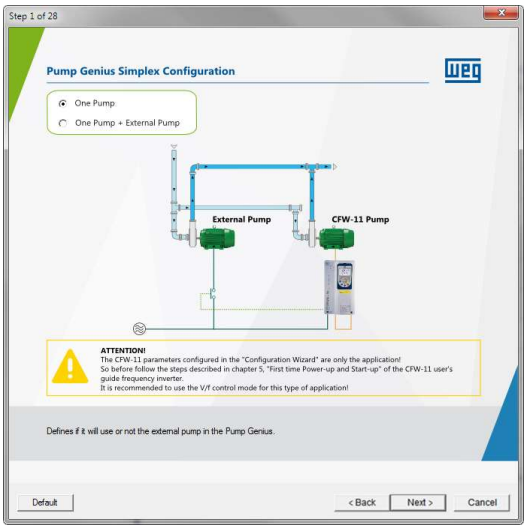
NOTE!
After performing these steps, the CFW-11 inverter is configured for Pump Genius *Plus* Simplex application.

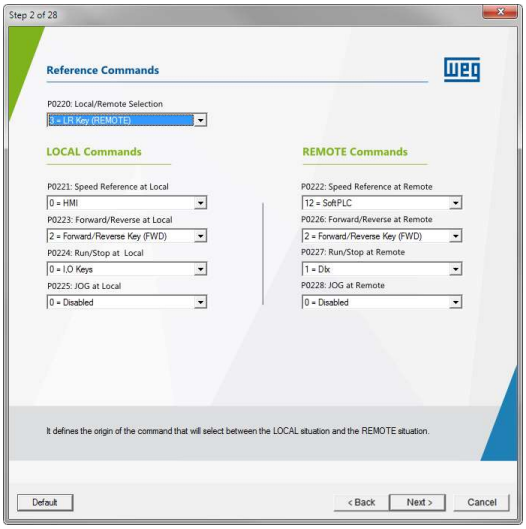
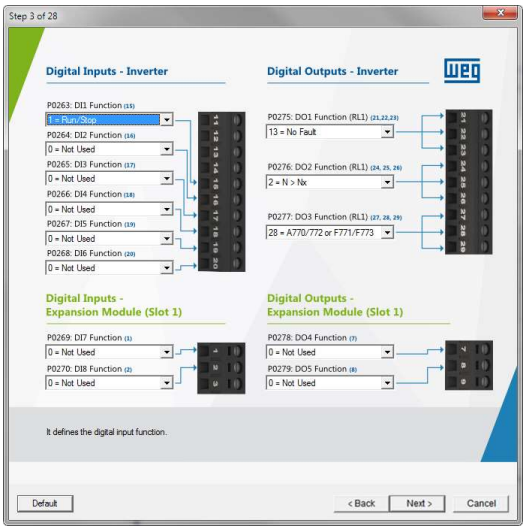
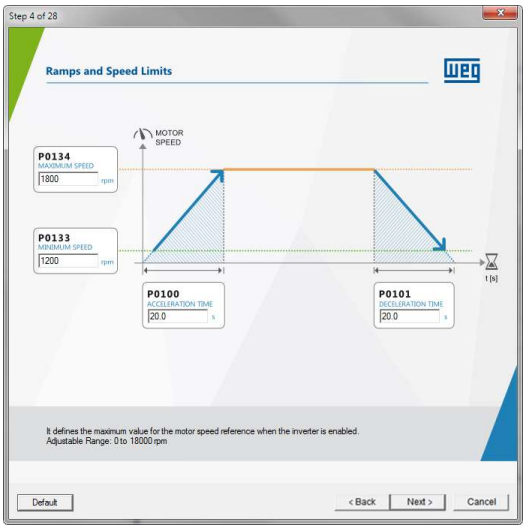
5 APPLICATION CONFIGURATION WIZARD

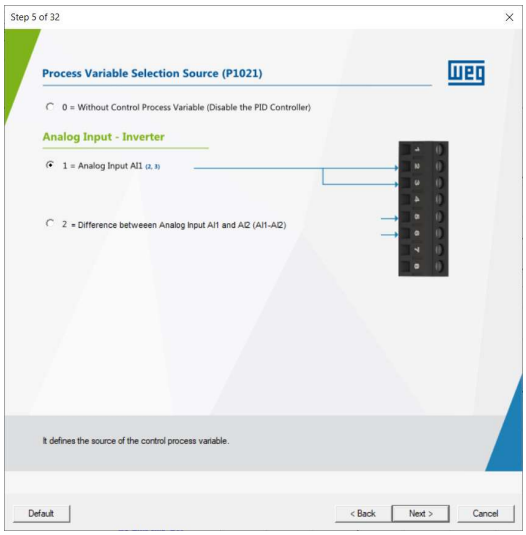
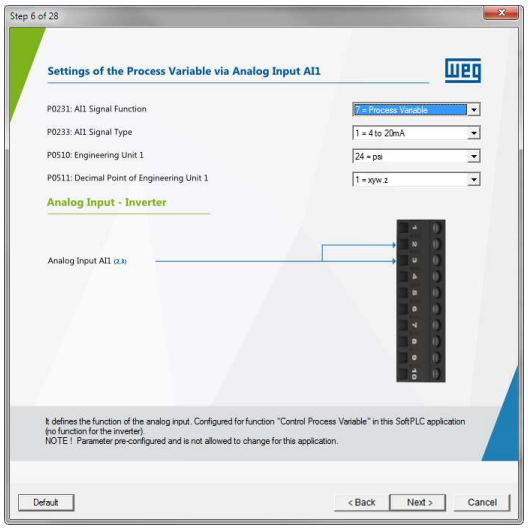
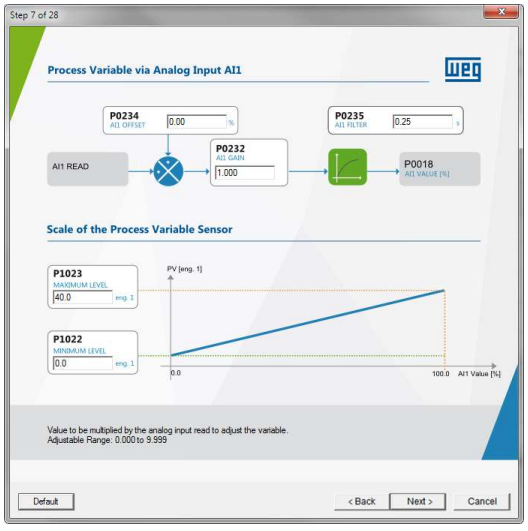
The Pump Genius Simplex application can be configured with the WLP (**W**EG **L**adder **P**rogrammer) software using the “Pump Genius Simplex” configuration wizard, which consists of an oriented step by step guide for the configuration of the parameters regarding the application.

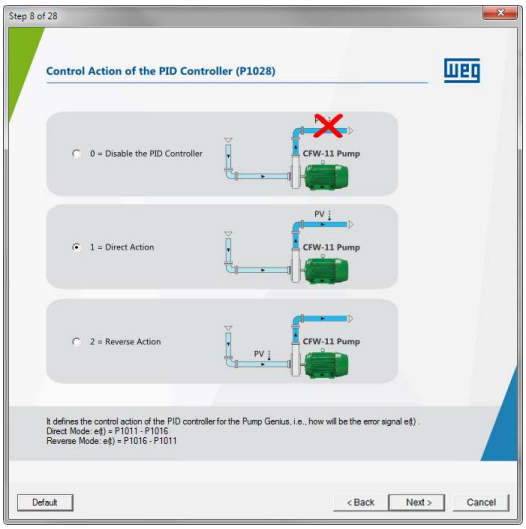
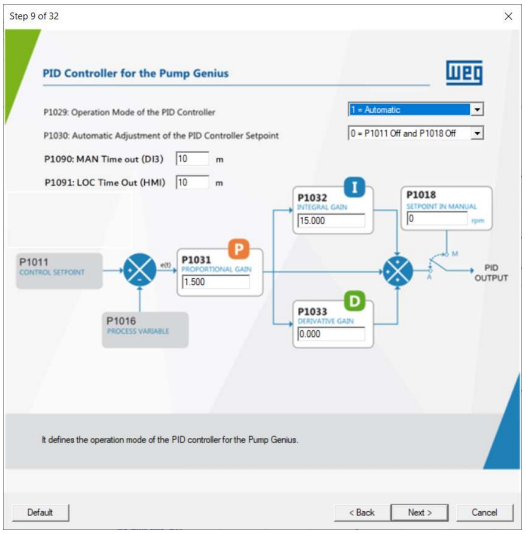
NOTE!
When powering up the inverter for the first time follow the steps described in the chapter 5 “First time Power-up and Start-up” of the CFW-11 user´s guide inverter.
It is recommended to use the V/f control mode for this type of application!

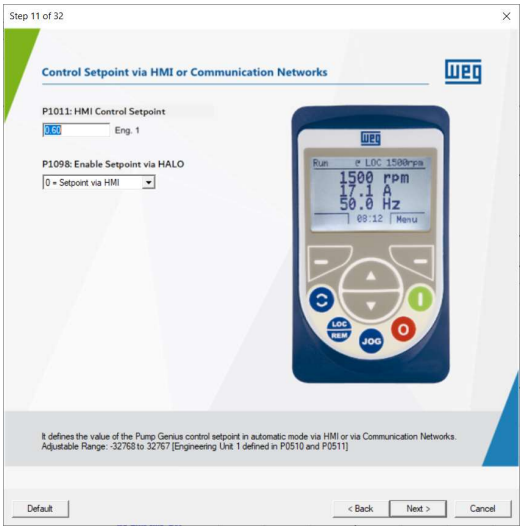
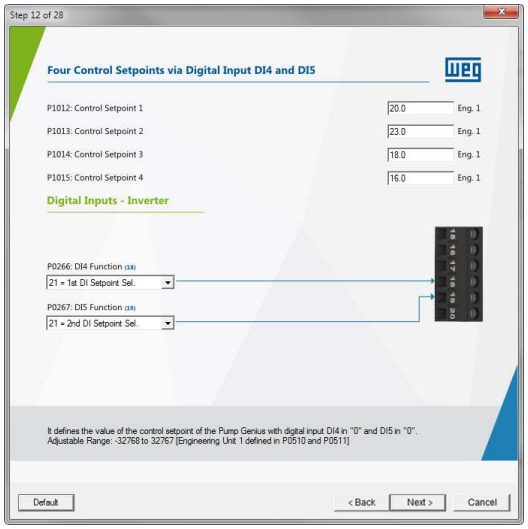
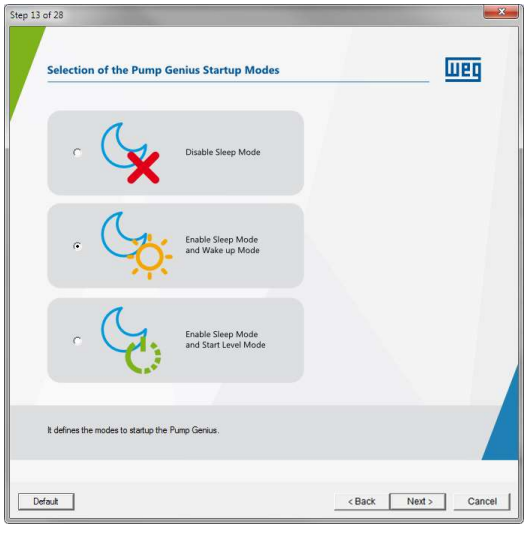
Table 5.1 *– Configuration wizard for Pump Genius Simplex Plus application*

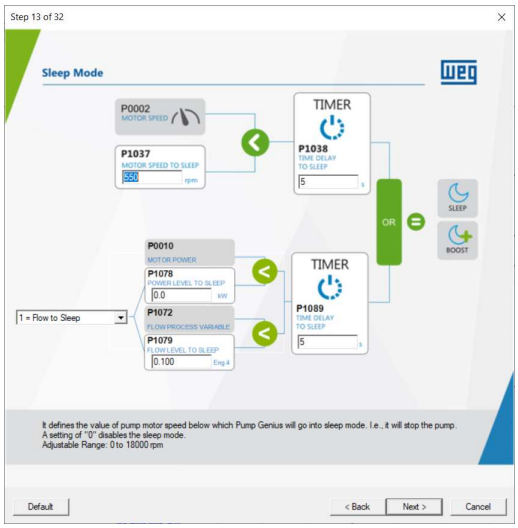
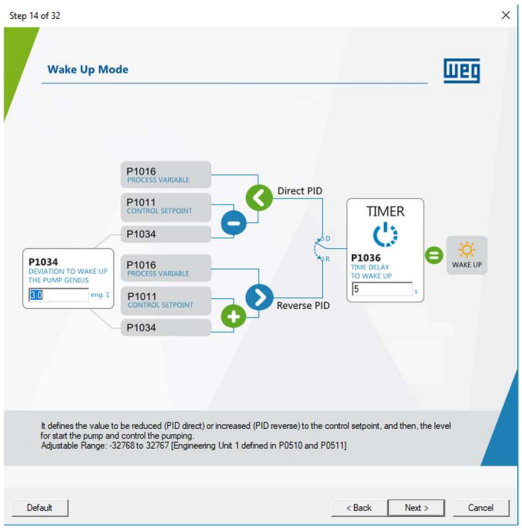
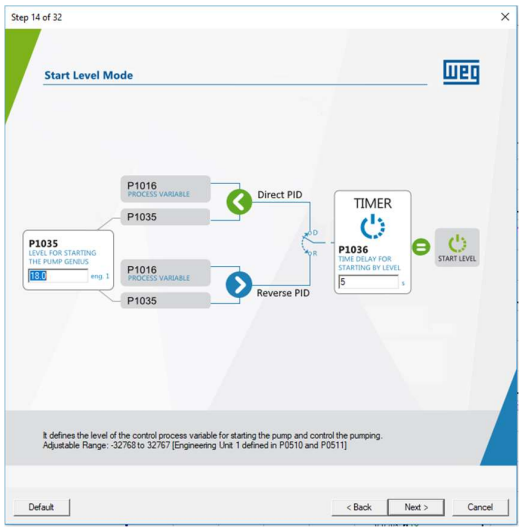
Step	Description	WLP Configuration Wizard
	General presentation of the Pump Genius Simplex Plus configuration wizard.	
1	It presents to select whether there will be an external pump in Pump Genius.	

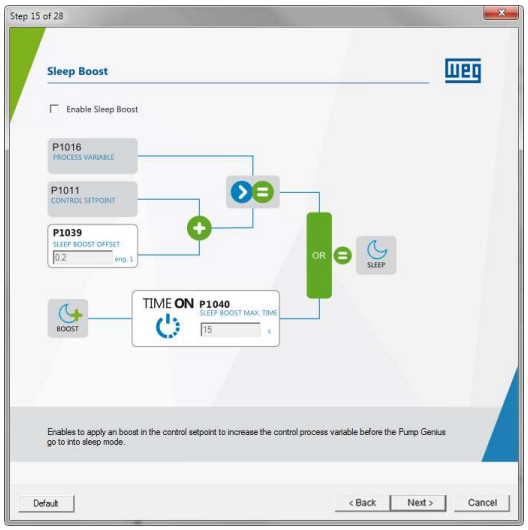
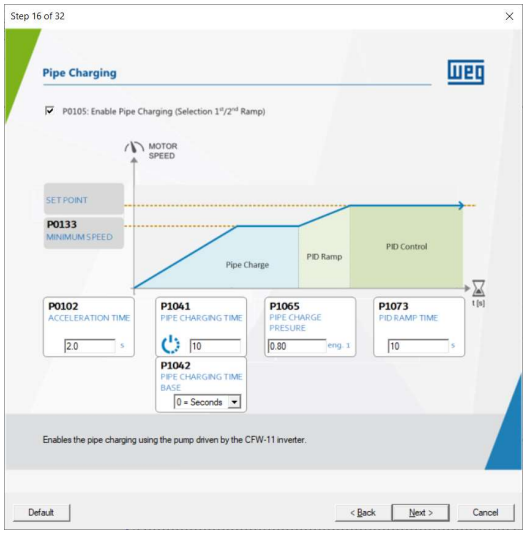
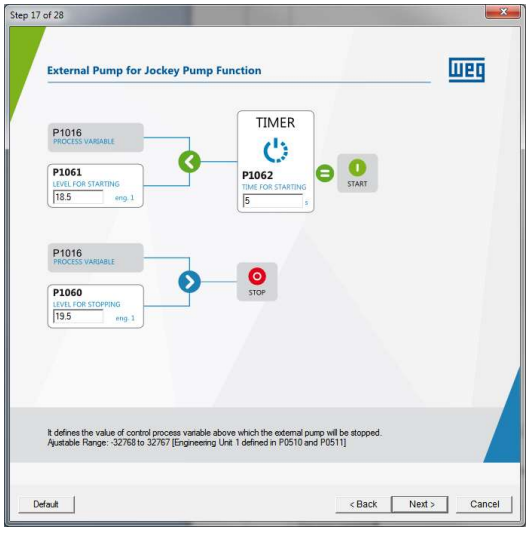
2	It presents the parameters for the configuration of the origin of the commands: P0220: Local/Remote Selection Source P0221: Speed Reference Selection - Local Situation P0222: Speed Reference Selection - Remote Situation P0223: Forward/Reverse Selection - Local Situation P0224: Run/Stop Selection - Local Situation P0225: JOG Selection - Local Situation P0226: Forward/Reverse Selection - Remote Situation P0227: Run/Stop Selection - Remote Situation P0228: JOG Selection - Remote Situation	
3	It presents the parameters for the configuration of the functions of the CFW-11 digital inputs and outputs: P0263: DI1 Function P0264: DI2 Function P0265: DI3 Function P0266: DI4 Function P0267: DI5 Function P0268: DI6 Function P0269: DI7 Function P0270: DI8 Function P0275: DO1 Function (RL1) P0276: DO2 Function (RL2) P0277: DO3 Function (RL3) P0278: DO4 Function P0279: DO5 Function	
4	It presents the parameters for the configuration of the CFW-11 ramps and speed limits of the motor driven by the CFW-11: P0100: Acceleration Time P0101: Deceleration Time P0133: Minimum Speed Reference Limit P0134: Maximum Speed Reference Limit	

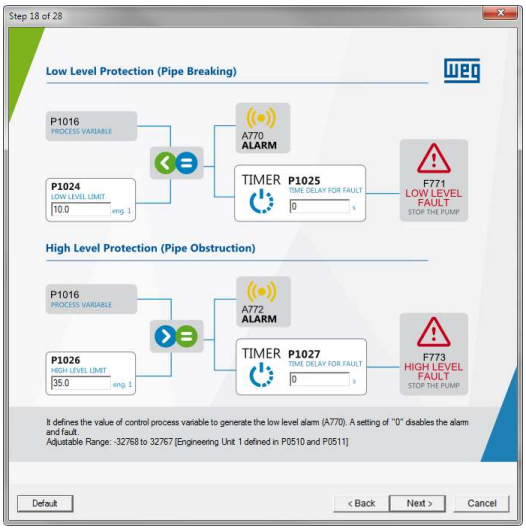
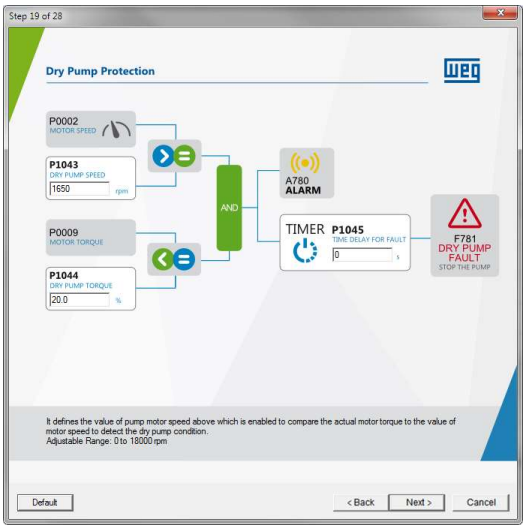
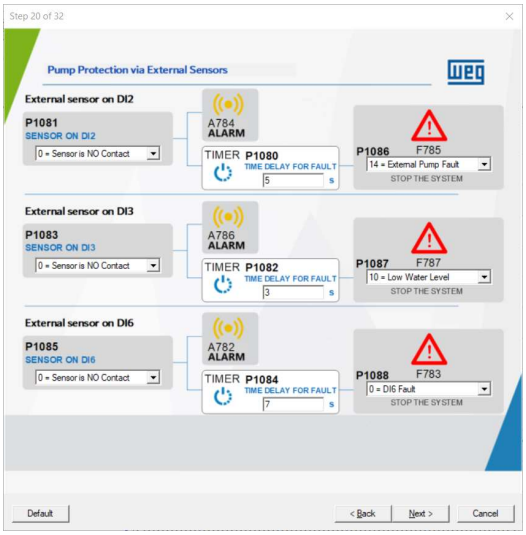
5	It presents the parameter for the source selection of the control process variable: P1021: Control Process Variable Selection Source	
6	It presents the parameters for the configuration of the control process variable via analog input AI1 and the engineering unit of the control process variable: P0231: AI1, Signal Function P0233: AI1, Signal Type P0510: Engineering Unit 1 P0511: Decimal Point of Engineering Unit 1	
7	It presents the parameters for the configuration of the control process variable via analog input AI1, and of the scale of the control process variable sensor: P0232: AI1, Gain P0234: AI1, Offset P0235: AI1, Filter P1022: Control Process Variable Sensor Minimum Level P1023: Control Process Variable Sensor Maximum Level	

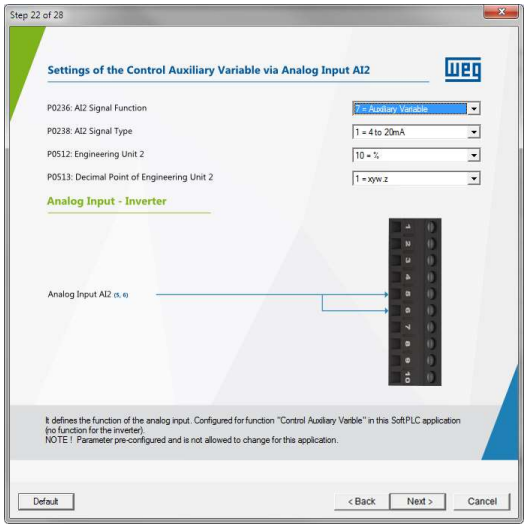
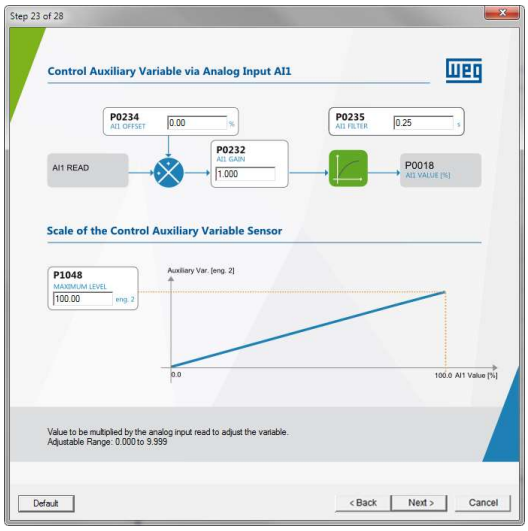
8	It presents the parameter for selection the control action of the Pump Genius controller: P1028: Control Action of the PID Controller	
9	It presents the parameters for the configuration of the PID controller for the Pump Genius: P1018: Setpoint of the PID Controller in Manual mode P1029: Operation Mode of PID Controller P1030: Automatic Adjustment of the PID Controller Setpoint P1090: Time out that returns the PID to Automatic after PID is set to Manual mode P1091: Time out that returns the CFW11 drive to Remote after drive is set to Local mode P1031: PID Proportional Gain P1032: PID Integral Gain P1033: PID Derivative Gain	
10	It presents the parameter for the source selection of the Pump Genius control setpoint in automatic mode: P1020: Control Setpoint Selection Source	

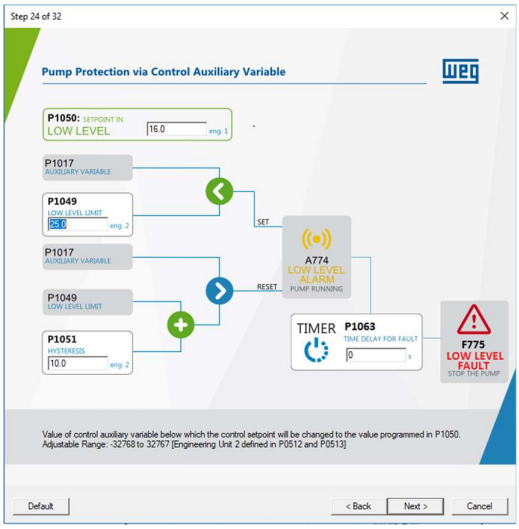
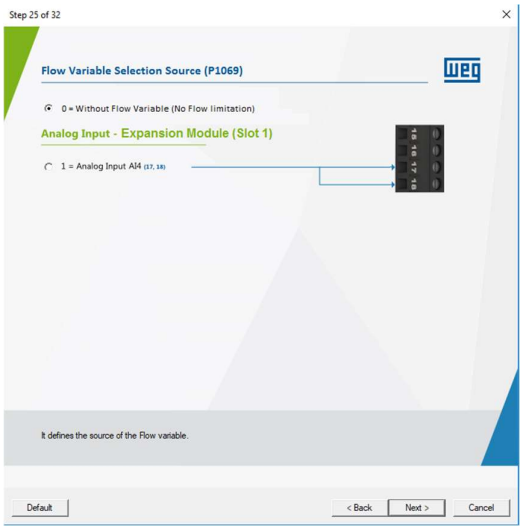
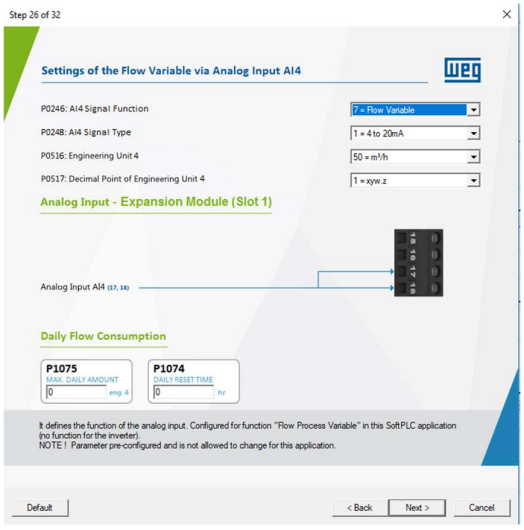
11 – 5	It presents the parameter for the configuration of the control setpoint via HMI or Communication Networks: P1011: Control Setpoint HMI P1098: Selection for Setpoint via HMI or HALO System	
11 – 6 to 11 – 8	It presents the parameters for the configuration of the control setpoint via logical combination of digital inputs DI4 and DI5: P0266: DI4 Function P0267: DI5 Function P1012: Control Setpoint 1 P1013: Control Setpoint 2 P1014: Control Setpoint 3 P1015: Control Setpoint 4	
12	It presents the modes or conditions to startup the Pump Genius.	

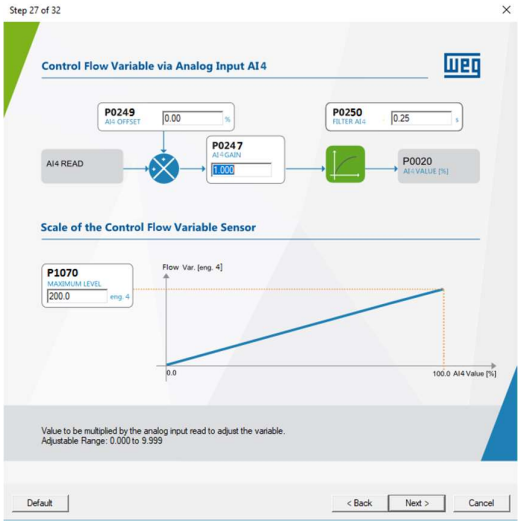
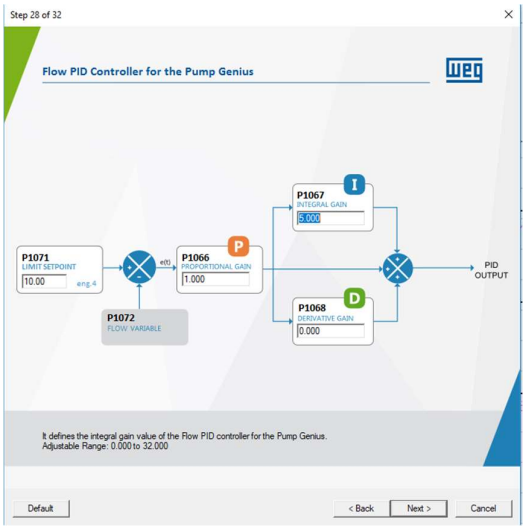
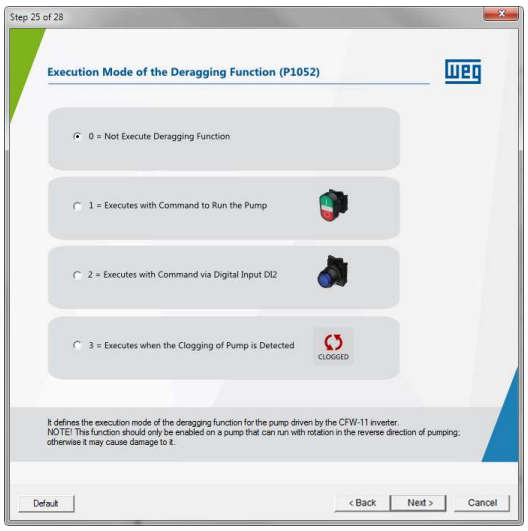
13 – 1 And 13 – 2	It presents the parameters for the configuration of the sleep mode: P1037: Pump Motor Speed below which Pump Genius goes to Sleep Mode P1038: Time Delay for Pump Genius goes to Speed Sleep Mode P1078: Pump Power below which Pump Genius goes to Sleep Mode P1079: Flow Process Variable below which Pump Genius goes to Sleep Mode P1089: Time Delay for Pump Genius goes to Power or Flow Sleep Mode	
14 -1	It presents the parameters for the configuration of the wake up mode: P1034: Control process variable deviation to wake up the Pump Genius. P1036: Time Delay to wake up the Pump Genius	
14 - 2	It presents the parameters for the configuration of the start level mode: P1035: Control process variable deviation to wake up the Pump Genius. P1036: Time Delay for starting by level the Pump Genius	

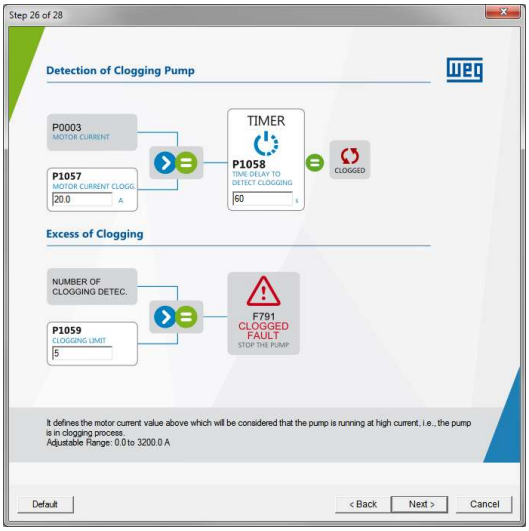
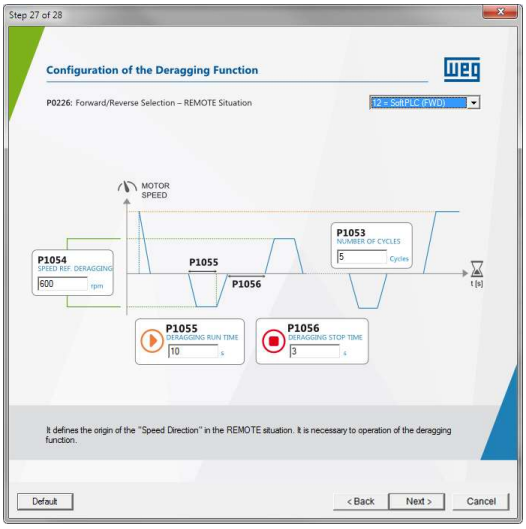
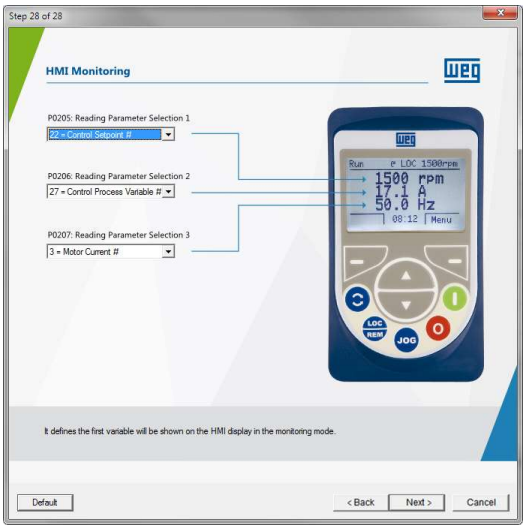
15	It presents the parameters for configuration of the sleep boost: P1039: Sleep Boost Offset P1040: Sleep Boost Maximum Time	
16	It presents the parameters for the configuration of pipe charging and PID Ramp using the pump driven by CFW-11 inverter: P0105: Enable Pipe Charging (1st / 2nd Ramp Selection) P0102: Acceleration Time 2 P1041: Pipe Charging Time P1042: Pipe Charge Time Base (s or m) P1065: Minimum pressure to change from Pipe Charge mode to PID Ramp Mode P1073: PID Ramp Time	
17	It presents the parameters for the configuration of the external pump for jockey pump function: P1060: Process Variable Level for Stopping the External Pump P1061: Process Variable Level for Stating the External Pump P1062: Time Delay for Starting the External Pump	

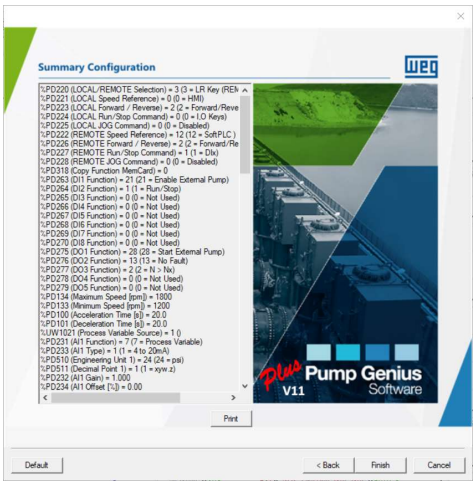
18	It presents the parameters for the configuration of the low level protection for the control process variable (pipe breaking) and high level protection for process variable (pipe obstruction): P1024: Value for Low Level Alarm for the Control Process Variable P1025: Time Delay for Low Level Fault for the Control Process Variable (F771) P1026: Value for High Level Alarm for the Control Process Variable P1027: Time for High Level Fault for the Control Process Variable (F773)	
19	It presents the parameters for the configuration of the dry pump protection: P1043: Motor Speed for Dry Pump P1044: Motor Torque for Dry Pump P1045: Time Delay for Dry Pump Fault (F781)	
20	It presents the parameters for the configuration of the pump protection via external sensors (DI2, DI3 and DI6): P1081: Sensor on DI2 is NO or NC P1080: Time Delay for Pump Protection via External Sensor on DI2 Fault (F785) P1086: Text selection for fault P1083: Sensor on DI3 is NO or NC P1082: Time Delay for Pump Protection via External Sensor on DI3 Fault (F787) P1087: Text selection for fault P1085: Sensor on DI6 is NO or NC P1084: Time Delay for Pump Protection via External Sensor on DI6 Fault (F783) P1088: Text selection for fault	

21	It presents the parameter for the source of the control auxiliary variable for pump protection: P1047: Control Auxiliary Variable Selection Source for Pump Protection	
22	It presents the parameters for the configuration of the control auxiliary variable for pump protection via analog input AI2 and the engineering unit of the control auxiliary variable: P0236, AI2 Signal Function P0238, AI2 Signal Type P0512: Engineering Unit 2 P0513: Decimal Point of Engineering Unit 2	
23	It presents the parameters for the configuration of the control auxiliary variable for pump protection via analog input AI2 and the scale of the control auxiliary variable sensor for pump protection: P0237, AI2 Gain P0239, AI2 Offset P0240, AI2 Filter P1048: Control Auxiliary Variable Sensor Maximum Level	

24	It presents the parameters for the configuration of the pump protection via control auxiliary variable: P1049: Value to detect Low Level of Control Auxiliary Variable P1050: Control Setpoint in Low Level P1051: Hysteresis to reactivate the Control Setpoint	
25	It presents the parameter for the source of the Flow auxiliary variable for pump protection, enabling flow protection: P1069: Flow Auxiliary Variable Selection Source	
26	It presents the parameters for the configuration of the Flow auxiliary variable for Flow Limitation via analog input AI4 and the engineering unit of the control auxiliary variable, the maximum total daily flow allowed by the system and the hour/time that the calculated total resets. P0246, AI4 Signal Function P0248, AI4 Signal Type P0516: Engineering Unit 4 P0517: Decimal Point of Engineering Unit 4 P1074: Daily reset time P1075: Max Daily amount	

27	It presents the parameters for the configuration of the Flow auxiliary variable for system flow protection via analog input AI4 and the scale of the control auxiliary variable sensor for pump protection: P0247, AI4 Gain P0249, AI4 Offset P0250, AI4 Filter P1070: Control Auxiliary Variable Sensor Maximum Level	
28	It presents the parameters for the configuration of the Flow PID controller for the Pump Genius: P1071: Setpoint/level for the Flow PID Controller for Flow Limitation mode P1066: PID Proportional Gain – Flow PV P1067: PID Integral Gain – Flow PV P1068: PID Derivative Gain – Flow PV	
29	It presents the parameter for selection the execution mode of the deragging function: P1052: Execution Mode of the Deragging Function	

30	It presents the parameters for configuration of the pump clogging detection (P1052=3): P1057: Motor Current to detect the Clogging of Pump P1058: Time Delay to detect the Clogging of Pump P1059: Number of consecutives Clogging to generate the Fault (F791)	
31 – 1 to 31 – 3	It presents the parameters for configuration of the deragging function: P0222: Speed Reference Selection – Remote Situation P0226: Forward/Reverse Selection – Remote Situation P1053: Number of Cycles for Deragging P1054: Speed Reference for Deragging P1055: Deragging Run Time P1056: Deragging Stop Time	
32	It presents the parameters that define which variables will be shown on the HMI display in the monitoring mode: P0205: Reading Parameter Selection 1 P0206: Reading Parameter Selection 2 P0207: Reading Parameter Selection 3	

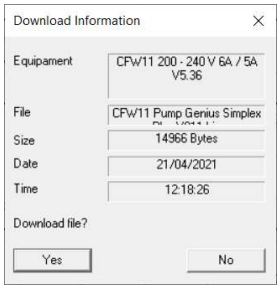
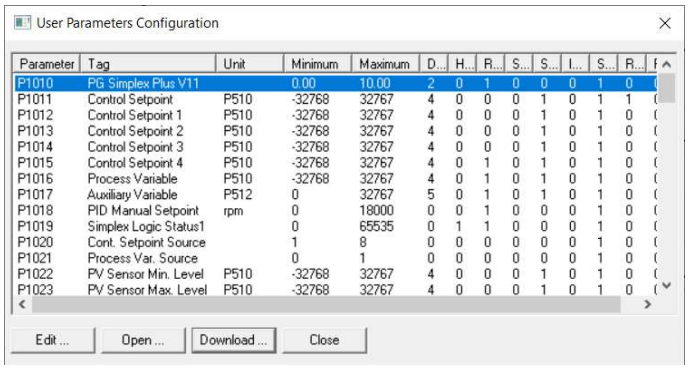
	It presents a summary with all the parameters configured by the Pump Genius Simplex configuration wizard.	

6 DOWNLOAD DIALOG BOXES

Through the WLP it is possible to download the user´s ladder program, the configuration of user´s parameters and the values configured in the configuration wizard. Below is a presentation of the main download dialogs to the CFW-11 inverter.

NOTE!
Refer to the help topics in the WLP programming software for more details on the download.

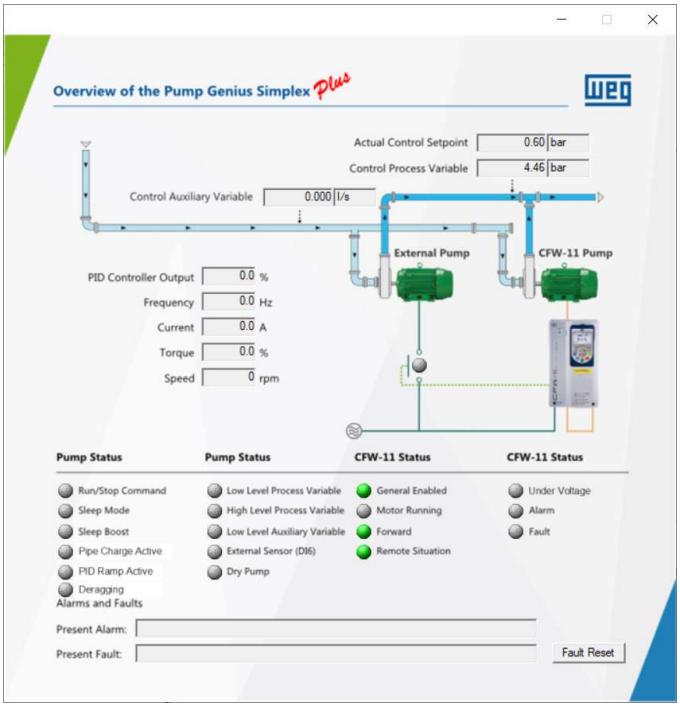
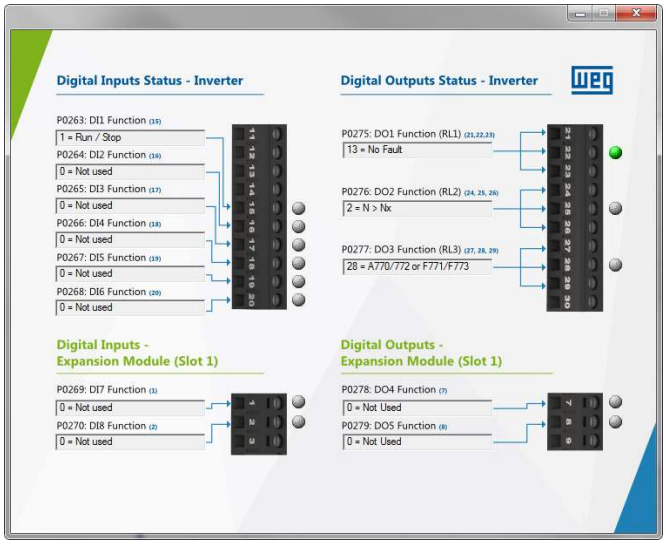
***Table 6.1** – Download dialog box for the Pump Genius Simplex application*

Description	WLP Download Dialog Box
Download dialog box of the application developed with the WLP containing the following options: ■ User Program; ■ Configuration of the User's Parameters.	
User program download dialog box containing: ■ Characteristics of the connected equipment; ■ Name of the file to be downloaded; ■ Size of the application to be downloaded; ■ File compilation date; ■ File compilation hour; ■ Command to transfer or not the compiled application.	
Configuration of the user parameters dialog box containing: ■ Parameter number; ■ Name assigned to the parameter by the user; ■ Unit assigned to the parameter by the user; ■ Minimum and maximum values; ■ Number of decimal positions; ■ Options for visualization in hexadecimal format, with sign, ignoring the password, visualization on the HMI, retentive and for change confirmation; ■ Commands for opening, editing, performing the download and for closing the dialog box of the user parameters.	
Dialog box for the download of the values configured with the Pump Genius Simplex configuration wizard.	

7 MONITORING DIALOG BOXES

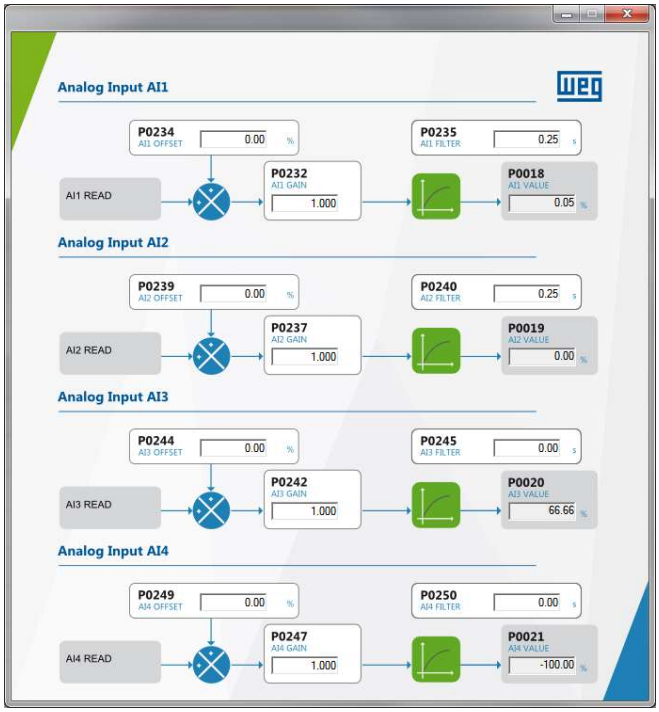
It is possible to monitor and change the parameters of the Pump Genius Simplex application through the WLP.

***Table 7.1** – Monitoring dialogs of the Pump Genius Simplex application*

Description	WLP Monitoring Dialog
Monitoring of the pump driven by CFW-11 inverter in the Pump Genius Simplex application. It permits visualization of the following variables: ■ Actual control setpoint and control process variable displayed as engineering unit 1 ■ Control auxiliary variable displayed as engineering unit 2; ■ Frequency, current, torque and speed of pump driven by CFW-11 inverter ■ PID controller output ■ Command for starting the external pump via digital output DO1 ■ Status of the pump indicating: Run/Stop Command, command for sleep mode, sleep boost in execution, pipe charging in execution, deragging in execution, low level and high level of the control process variable, low level of the control auxiliary variable, status of external sensor (DI6) and dry pump condition ■ Status of CFW-11 inverter indicating: general enabled, motor running, forward, remote situation, undervoltage, alarm active and fault active ■ Present alarm and fault ■ Command for reset of faults.	
Monitoring of the status of commands made at the pump driven by CFW-11 inverter. It permits the visualization of the following variables: ■ Present status of CFW-11 digital inputs ■ Function of digital inputs for Pump Genius ■ Present status of CFW-11 digital outputs ■ Function of digital outputs for Pump Genius.	

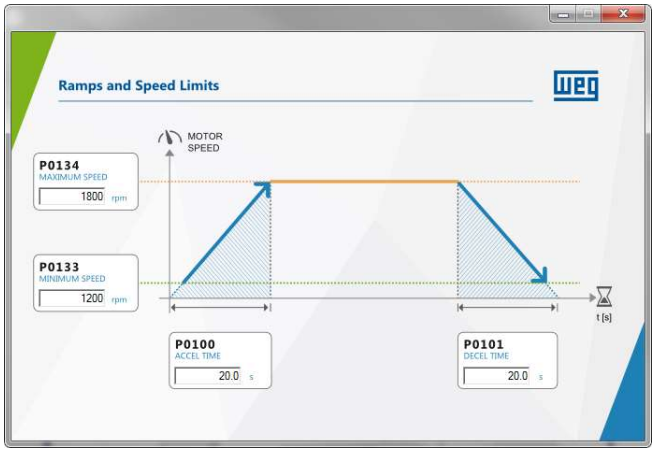
It shows the parameters for reading the Pump Genius control signals via the CFW-11 analog inputs. It permits the modification and visualization of the following variables:

- P0018: AI1 Value
- P0019: AI2 Value
- P0029: AI3 Value
- P0021: AI4 Value
- P0232: AI1 Gain
- P0234: AI1 Offset
- P0235: AI1 Filter
- P0237: AI2 Gain
- P0239: AI2 Offset
- P0240: AI2 Filter
- P0242: AI3 Gain
- P0244: AI3 Offset
- P0245: AI3 Filter
- P0247: AI4 Gain
- P0249: AI4 Offset
- P0250: AI4 Filter.



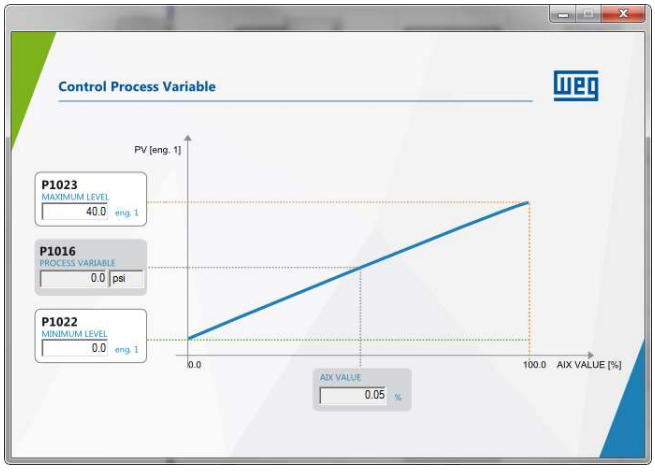
It shows the ramps and the speed limit parameters of the CFW-11 inverter, configured for the pump. It permits the modification of the following variables:

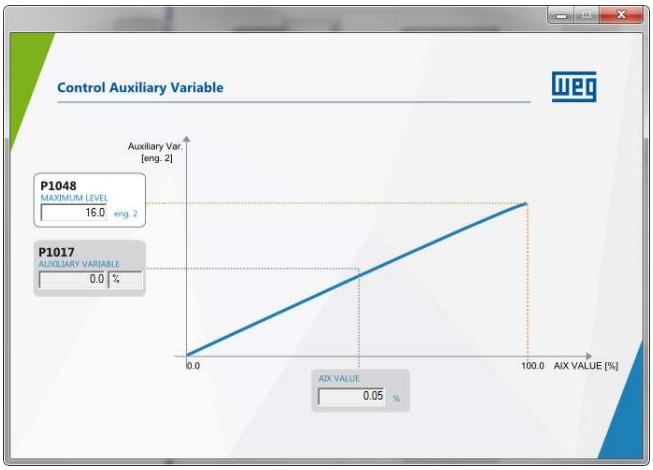
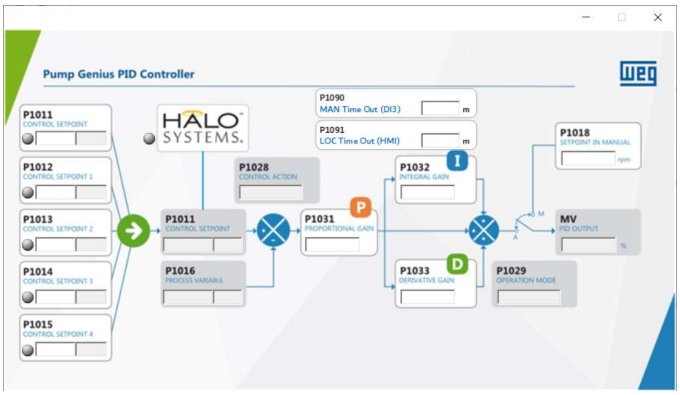
- P0100: Acceleration Time
- P0101: Deceleration Time
- P0133: Minimum Speed Reference Limit
- P0134: Maximum Speed Reference Limit.

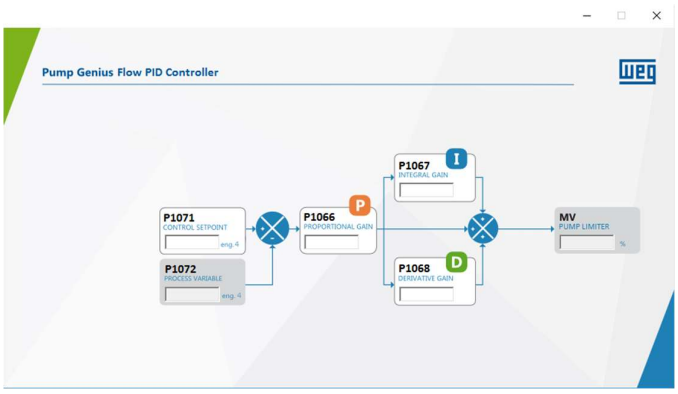
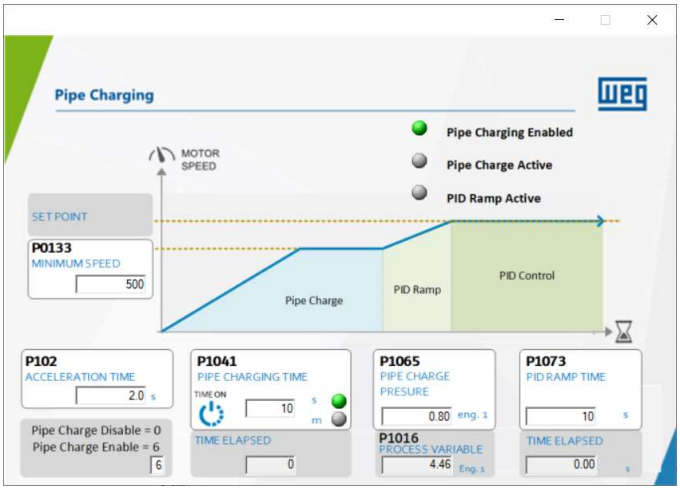
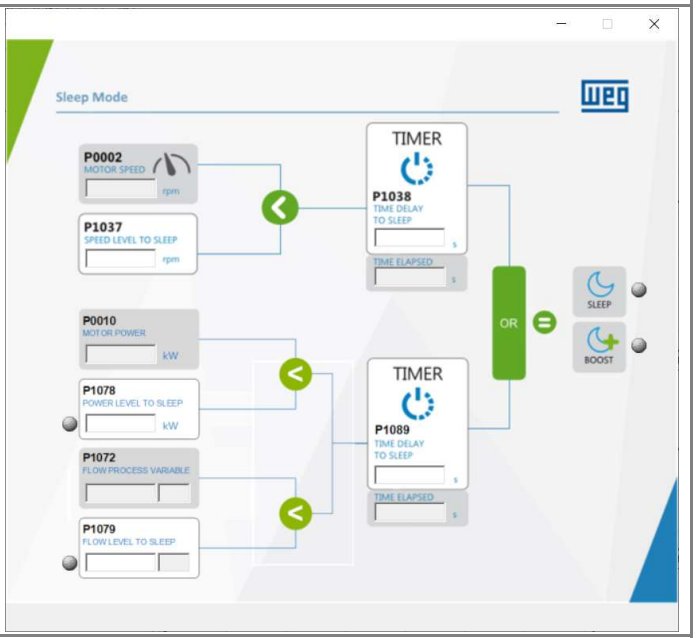


It shows the setting parameters of the control process variable. It permits the change and visualization of the following variables:

- P1022: Control Process Variable Sensor Minimum Level
- P1023: Control Process Variable Sensor Maximum Level
- Value of control process variable (P1016) displayed as engineering unit 1
- Value of analog input selected for control process variable in %.

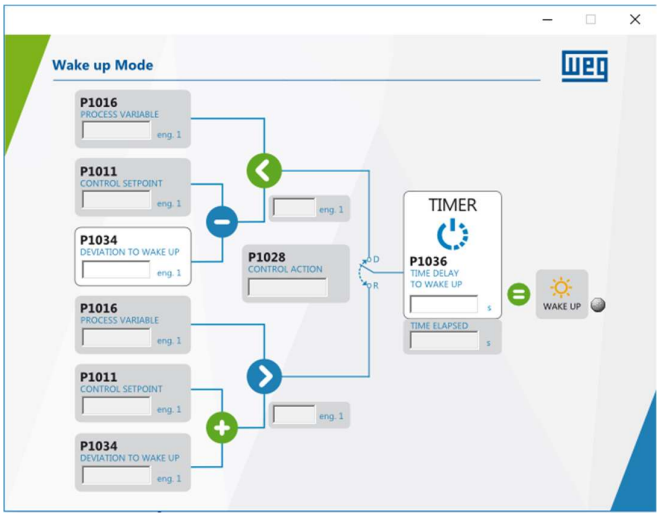


It shows the parameter settings s of the control auxiliary variable. It permits the change and visualization of the following variables: ■ P1048: Control Auxiliary Variable Sensor Maximum Level (Range) ■ Value of control auxiliary variable (P1017) as engineering unit 2 ■ Value of analog input selected for control auxiliary variable in %.	
It shows the parameters settings of the Flow auxiliary variable. It permits the change and visualization of the following variables: ■ P1070: Flow Auxiliary Variable Sensor Maximum Level (Range) ■ Value of the Flow auxiliary variable (P1072) as engineering unit 4 ■ Value of analog input 4 Flow auxiliary variable in %. ■ Value of the maximum total daily consumption (P1075) as engineering unit 4 ■ Actual Value of the total daily consumption (P1076) as engineering unit 4	
It shows the Pump Genius control's academic PID controller adjustment and operation parameters. It permits the modification and visualization of the following variables: ■ P1011: Control Setpoint (read and write) Via HMI or HALO System. ■ P1012: Control Setpoint 1 ■ P1013: Control Setpoint 2 ■ P1014: Control Setpoint 3 ■ P1015: Control Setpoint 4 ■ P1016: Control Process Variable ■ P1018: Setpoint of the PID Controller in Manual mode ■ P1028: Control Action of the PID Controller (disabled, direct mode or reverse mode) ■ P1029: Operation Mode of the PID Controller (manual or automatic) ■ P1031: PID Proportional Gain ■ P1032: PID Integral Gain ■ P1033: PID Derivative Gain ■ Output (MV) of academic PID controller in %.	

It shows the Pump Genius Flow academic PID controller adjustment and operation parameters. It permits the modification and visualization of the following variables: ■ P1071: Control Setpoint (read and write) ■ P1072: Control Process Variable ■ P1066: PID Proportional Gain – Flow PV ■ P1067: PID Integral Gain – Flow PV ■ P1068: PID Derivative Gain – Flow PV ■ Output (MV) of academic Flow PID controller in %.	
It shows the operation parameters for pipe charging using the pump driven by CFW-11 inverter. It permits the modification and visualization of the following variables: ■ P0102: Acceleration Time 2 ■ P0133: Minimum Speed Reference Limit ■ P1041: Pipe Charging Time ■ Value of the time elapsed of the pipe charging ■ Indication of pipe charging enabled. ■ P1065: Minimum reference for pressure level, reference for Pump Genius to go from Pipe Charge to PID Ramp ■ P1073: Time duration of the PID Ramp before PID controller takes over.	
It shows the operation parameters for executing the stops of the Pump Genius with Sleep Mode configuration. It permits the modification and visualization of the following variables: ■ P0002: Motor Speed ■ P1037: Pump Motor Speed below which Pump Genius goes to Sleep Mode ■ P1038: Time Delay for Pump Genius goes to Speed Sleep Mode ■ Value of the time elapsed for Pump Genius goes to Speed sleep mode ■ P1010: Motor Power ■ P1078: Pump Motor Power below which Pump Genius goes to Sleep Mode ■ P1089: Time Delay for Pump Genius goes to Power Sleep Mode ■ Value of the time elapsed for Pump Genius goes to Power sleep mode ■ Indication of sleep mode or sleep boost active.	

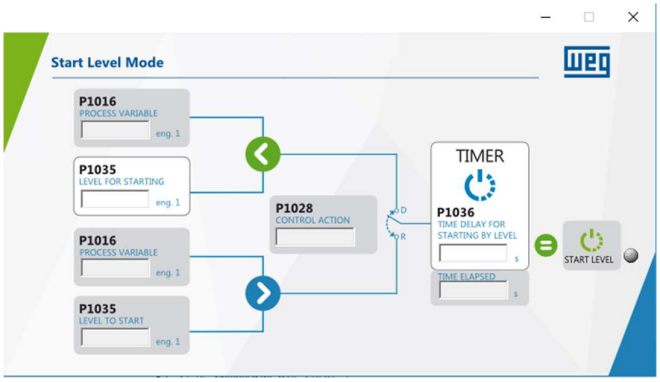
It shows the operation parameters for executing the start of the Pump Genius with Wake up Mode configuration. It permits the modification and visualization of the following variables:

- P1011: Control Setpoint
- P1016: Control Process Variable
- P1028: Control Action of the PID Controller (disabled, direct mode or reverse mode)
- P1034: Control Process Variable Deviation to Wake up the Pump Genius
- P1036: Time Delay to Wake up the Pump Genius
- Value of the time elapsed to wake up the Pump Genius
- Indication of wake up mode active.



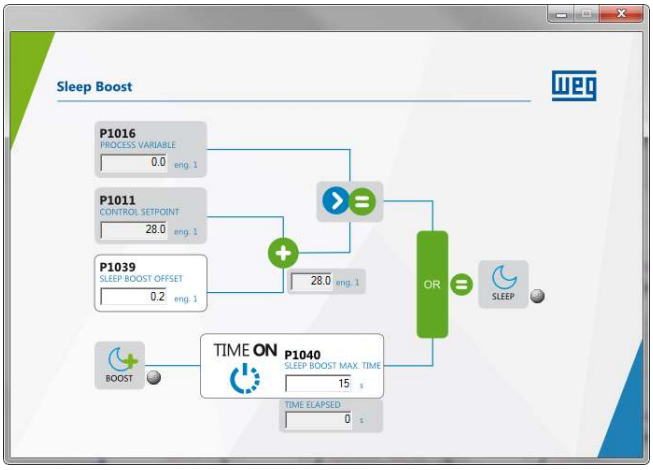
It shows the operation parameters for executing the start of the Pump Genius with Start Level Mode configuration. It permits the modification and visualization of the following variables:

- P1016: Control Process Variable
- P1028: Control Action of the PID Controller (disabled, direct mode or reverse mode)
- P1035: Control Process Variable Level for Starting the Pump Genius
- P1036: Time Delay for Starting by Level the Pump Genius
- Value of the time elapsed for starting by level the Pump Genius
- Indication of start level mode active.



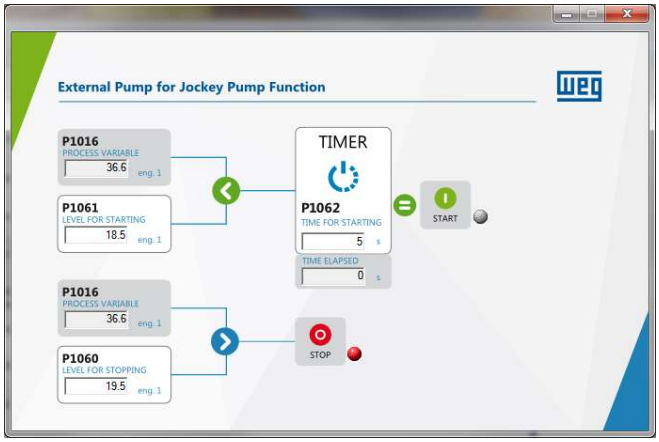
It shows the operation parameters of sleep boost function. It permits the modification and visualization of the following variables:

- P1011: Control Setpoint
- P1016: Control Process Variable
- P1039: Sleep Boost Offset
- P1040: Sleep Boost Maximum time
- Maximum time value elapsed of sleep boost
- Indication of the sleep mode and sleep boost active.



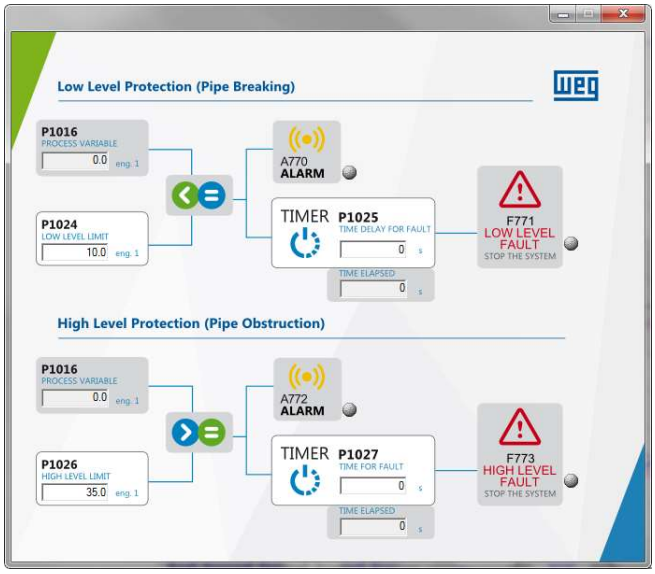
It shows the operation parameters of an external pump for jockey pump function. It permits the modification and visualization of the following variables:

- P1016: Control Process Variable;
- P1060: Process Variable Level for Stopping the External Pump
- P1061: Process Variable Level for Starting the External Pump
- P1062: Time Delay for Starting the External Pump
- Value of the time elapsed for starting the external pump
- Indication of command for start and stop the external pump via digital output DO1.



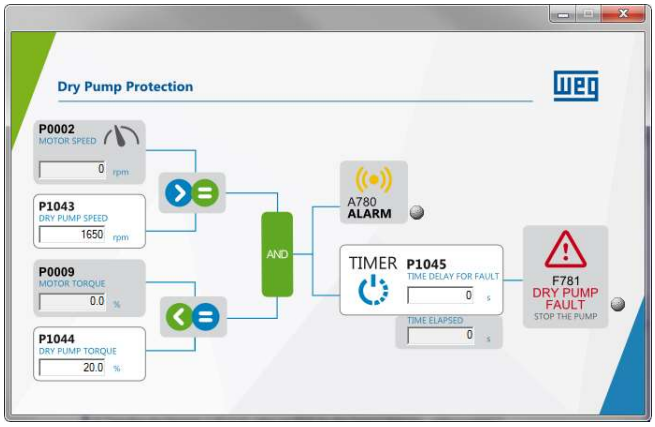
It shows the adjustment parameters of the low and high level protection for the control process variable. It permits the change and visualization of the following variables:

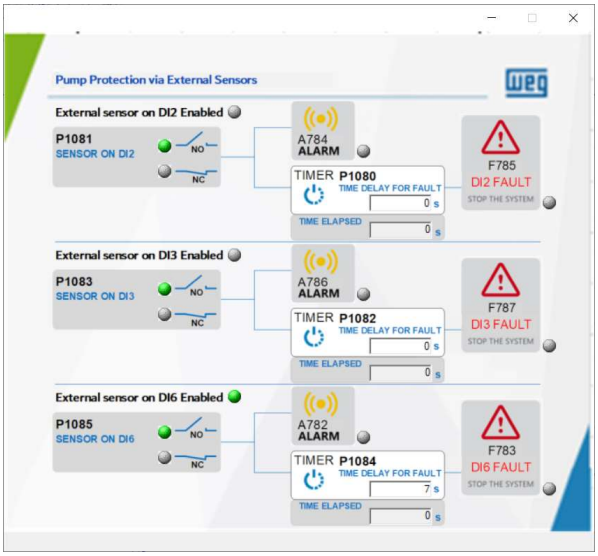
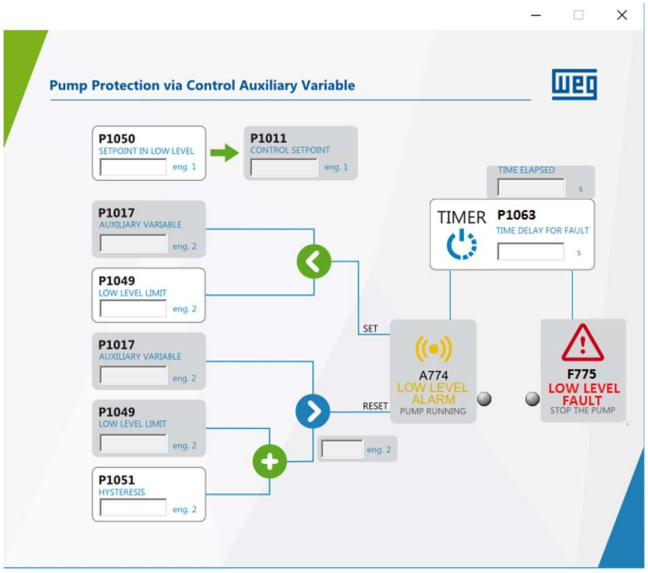
- P1016: Control Process Variable
- P1024: Value for Low Level Alarm for the Control Process Variable
- P1025: Time Delay for Low Level Fault for the Control Process Variable (F771)
- P1026: Value for High Level Alarm for the Control Process Variable
- P1027: Time Delay for High Level Fault for the Control Process Variable (F773)
- Value of the time elapsed to generate the low level and high level fault for the control process variable
- Indication of active alarms and faults.

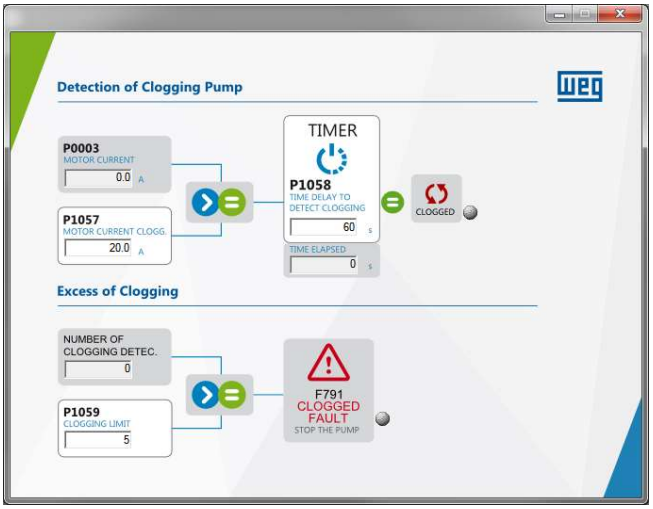
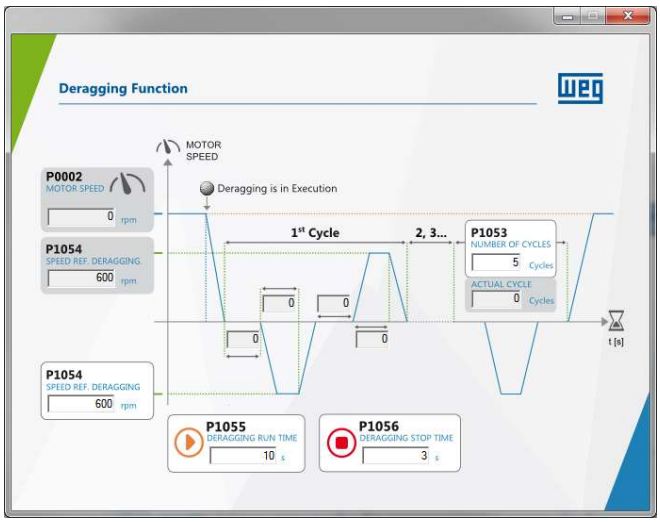


It shows the adjustment parameters for dry pump protection. It permits the change and visualization of the following variables:

- P0002: Actual Motor Speed in rpm
- P0009: Actual Motor Torque in %
- P1043: Motor Speed for Dry Pump
- P1044: Motor Torque for Dry Pump
- P1045: Time Delay for Dry Pump Fault (F781)
- Value of the time elapsed for generate the dry pump fault (F781)
- Indication of active alarm and fault.



It shows the adjustment parameters for pump protection via external sensors in digital input DI2, DI3 and DI6. It permits the change and visualization of the following variables: ■ Indication of sensor on DI2 enabled, ■ Indication of contact type of sensor on DI2, ■ P1080: Time Delay for Pump Protection via External Sensor Fault on DI2 (F785), ■ Value of the time elapsed for generate the fault F785, ■ Indication of active alarm and fault for DI2. ■ Indication of sensor on DI3 enabled, ■ Indication of contact type of sensor on DI3, ■ P1082: Time Delay for Pump Protection via External Sensor Fault on DI3 (F787), ■ Value of the time elapsed for generate the fault F787, ■ Indication of active alarm and fault for DI3. ■ Indication of sensor on DI6 enabled, ■ Indication of contact type of sensor on DI6, ■ P1084: Time Delay for Pump Protection via External Sensor Fault on DI3 (F783), ■ Value of the time elapsed for generate the fault F783, ■ Indication of active alarm and fault for DI6.	
It shows the adjustment parameters for pump protection via control auxiliary variable. It permits the change and visualization of the following variables: ■ P1011: Control Setpoint; ■ P1017: Control Auxiliary Variable ■ P1049: Value to detect Low Level of Control Auxiliary Variable ■ P1050: Control Setpoint in Low Level ■ P1051: Hysteresis to reactivate the Control Setpoint ■ Indication of active alarm. ■ P1063: Time delay for Control Auxiliary variable fault ■ Low level control auxiliary variable fault indication.	

It shows the adjustment parameters of deragging via Detection Clogging. It permits the change and visualization of the following variables: ■ P0003: Actual Motor Current in A ■ P1057: Motor Current to detect Clogging of Pump ■ P1058: Time Delay to detect Clogging of Pump ■ P1059: Number of consecutives Clogging to generate the Fault (F791) ■ Value of the time elapsed for clogging detection ■ Value of the number of clogging detected ■ Indication of the clogging detected ■ Indication of active fault.	
It shows the adjustment parameters of the deragging function. It permits the change and visualization of the following variables: ■ P0002: Actual Motor Speed in rpm ■ P1053: Number of Cycles for Deragging ■ P1054: Speed Reference for Deragging ■ P1055: Deragging Run Time ■ P1056: Deragging Stop Time ■ Value of the deragging counter cycles ■ Value of the time elapsed for each step of the deragging function ■ Indication of the deragging function is in execution.	

8 TREND VARIABLES DIALOG BOXES

It is possible to monitor variables of the Pump Genius Simplex application through the WLP.

PID Controller Settings:
It permits the visualization of the values for the Pump Genius control's PID controller settings.

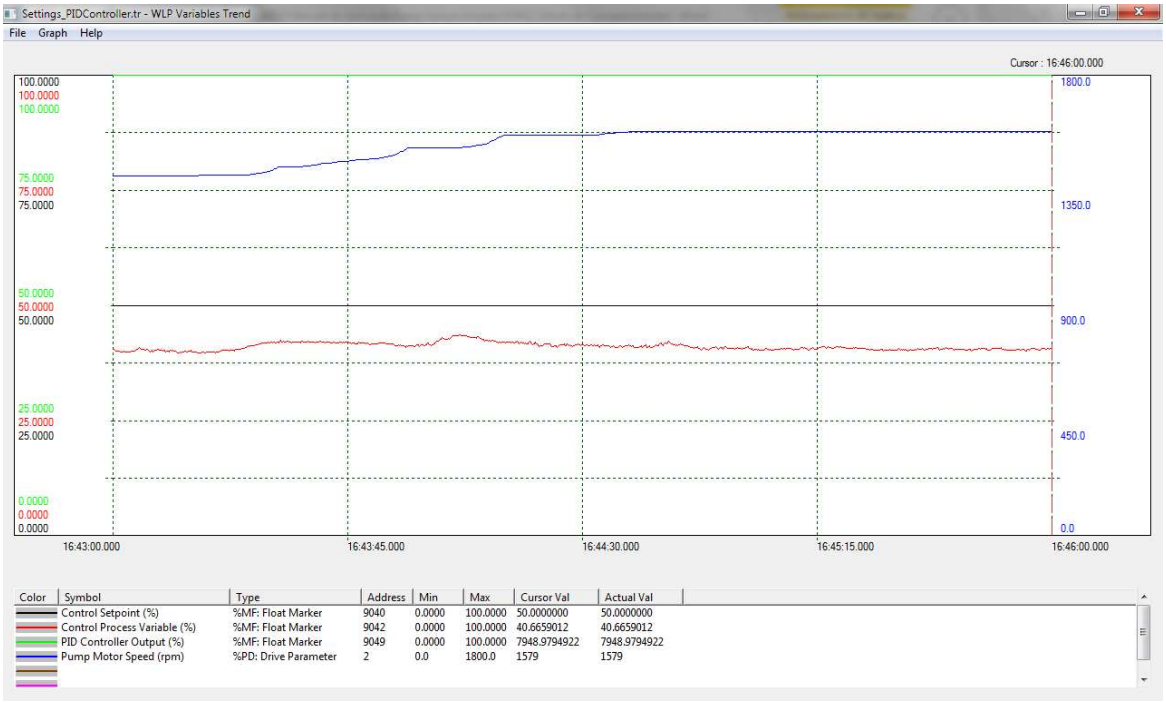


Figure 8.1 *– Trend variable dialog for PID controller settings*

Control of the Pump driven by CFW-11 Inverter:
It permits the visualization of control values of the pump driven by CFW-11 inverter.

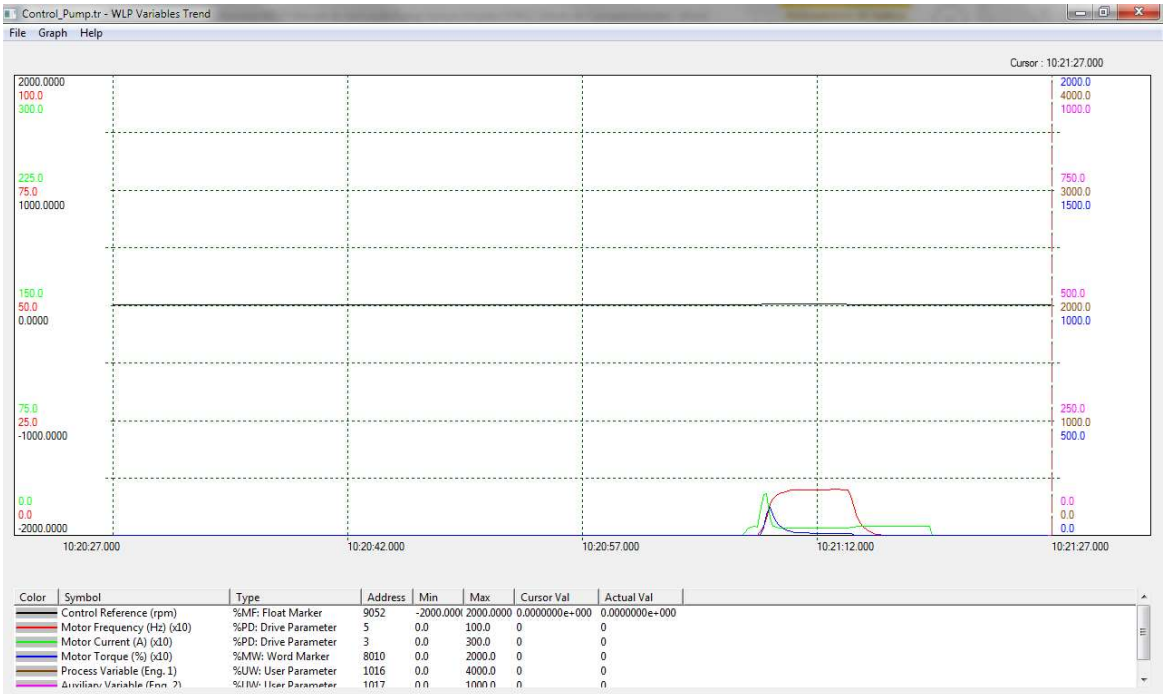


Figure 8.2 *– Trend variable dialog for control values of the pump driven by CFW-11 inverter*

Analog Inputs:

It permits the visualization of the analog inputs values for an analysis of the response throughout the operation time.

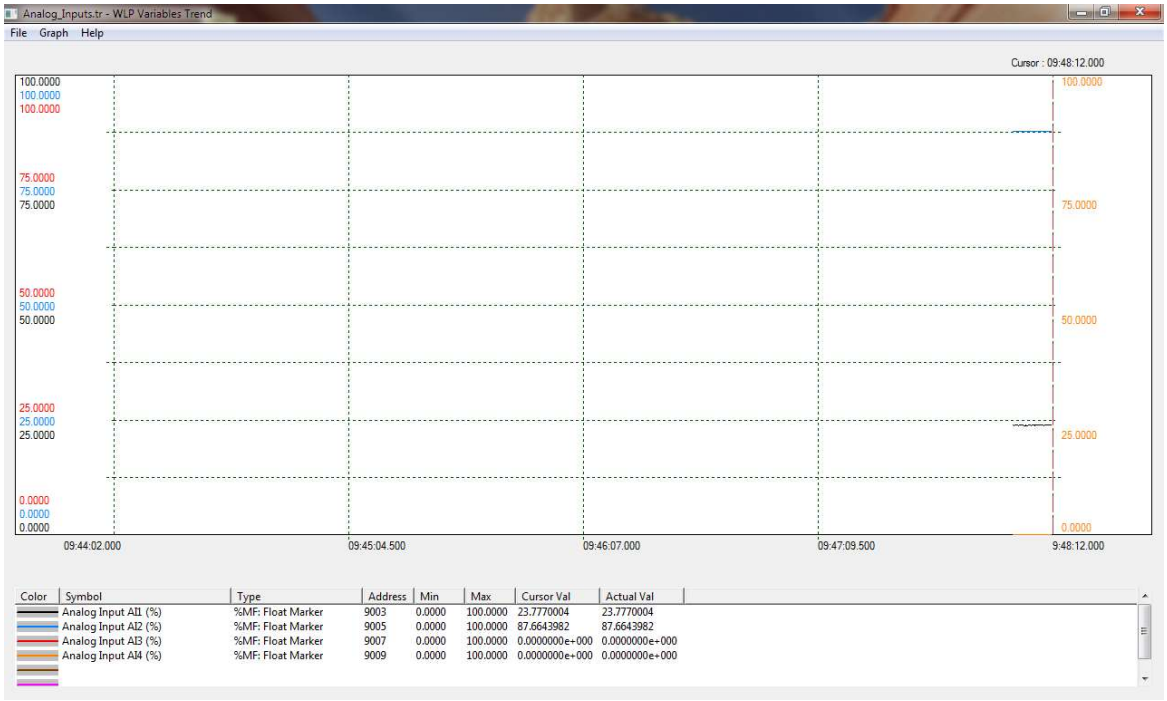


Figure 8.3 *– Trend variable dialog for analog inputs*

NOTE!
Refer to the WLP programming software help topics for more information on the use of the trend variables.

9 PARAMETER VALUE DIALOG

It is possible to save the parameters of the pump configured in the Pump Genius Simplex Plus application through the WLP.

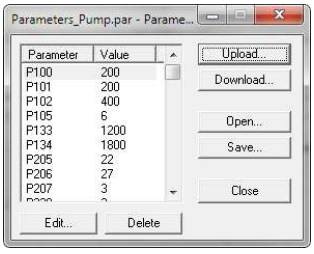


Figure 9.1 *– Parameter value dialog*

NOTE!
Refer to the WLP programming software help topics for more information on the use of the parameter value dialog box.