

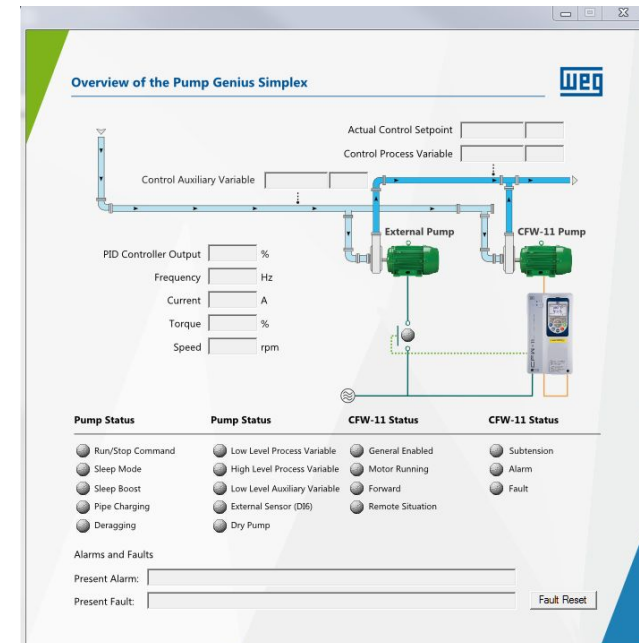
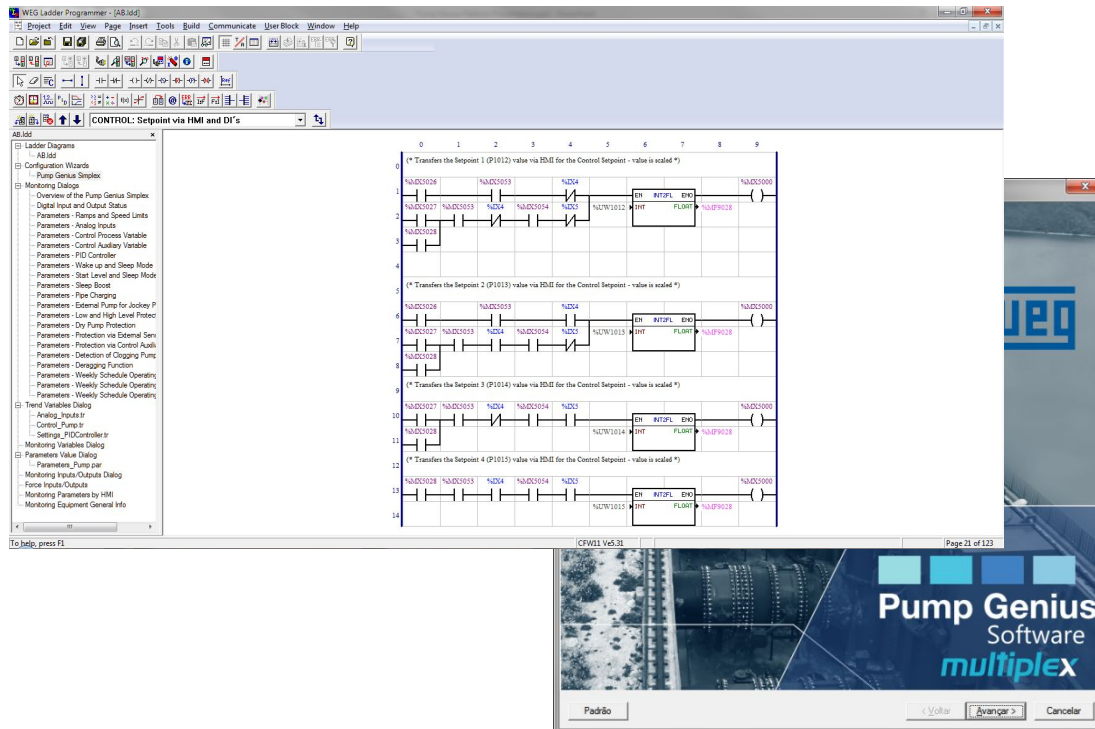


Pump Genius Application

Functionalities for control of Pumps

Objective

- Provide the user with flexibility and fast setup process when configuring drive + SoftPLC function towards the control of pumps applications.
- It uses tools of ladder language offered by WLP along with configuration and monitoring assistants.



Pump Genius Platform

■ **SIMPLEX**

- Only one pump with speed controlled
- It uses only one drive
- Start/Stop commands for external pump (low demand) using drive output relay.

■ **MULTIPUMP**

- It controls the speed of only one parallel pump.
- It uses only one drive
- Start/Stop commands for parallel pumps via output relays.

■ **MULTIPLY**

- Each of the parallel pumps has speed control.
- Up to 6 drives can be used.
- Each parallel pump is drive driven and it can be configured as master/slave(lead/lag).

Functionalities per product

	Simplex		Multipump		Multiplex
	CFW500	CFW11	CFW500	CFW11	CFW11
Firmware Version	>1.50	Ve5.31	>1.50	Ve5.31	Ve5.31
Maximum number of Pumps	1	1	4 (fixed) or 3 (floating)	6 (fixed) or 5 (floating)	6
Symbinet	-	-	-	-	<input type="checkbox"/>
Master / Slave	-	-	-	-	<input type="checkbox"/>
Fixed / Floating Control	-	-	<input type="checkbox"/>	<input type="checkbox"/>	-
Proc. Variable with Eng. Units	<input type="checkbox"/> *	<input type="checkbox"/>	<input type="checkbox"/> *	<input type="checkbox"/>	<input type="checkbox"/>
Setpoint via HMI or Comm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Setpoints via DI's	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 Setpoints with time Schedule	-	<input type="checkbox"/>	-	-	-

Functionalities per product

	Simplex		Multipump		Multiplex
	CFW500	CFW11	CFW500	CFW11	CFW11
Pump to be driven based on sequence	-	-	<input type="checkbox"/>	<input type="checkbox"/>	-
Pump to be driven based on operation time	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PID Control mode Direct / Reverse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manual / Automatic PID control	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-
Wake-up mode or Start by level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleep mode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleep Boost Function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pipe filling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Functionalities per product

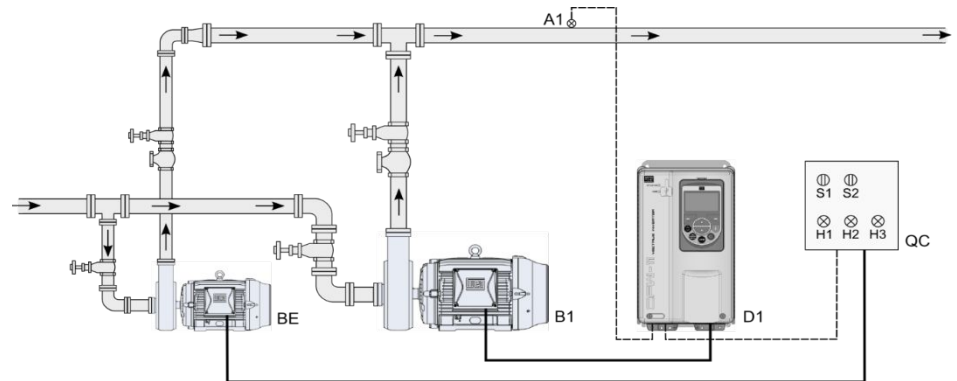
	Simplex		Multipump		Multiplex
	CFW500	CFW11	CFW500	CFW11	CFW11
External Pump	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-
Turn-on/off of parallell pumps	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low/High Level of process variable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dry Pump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
External Sensor protection via DI6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low Level protection Protection of Low level by auxiliary variable	-	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>
Force Pump Rotation	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anti-clogging Function	<input type="checkbox"/>	<input type="checkbox"/>	-	-	-

Functionalities per product

	Simplex		Multipump		Multiplex
	CFW500	CFW11	CFW500	CFW11	CFW11
Run Pump on local mode (HMI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Broken wire alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

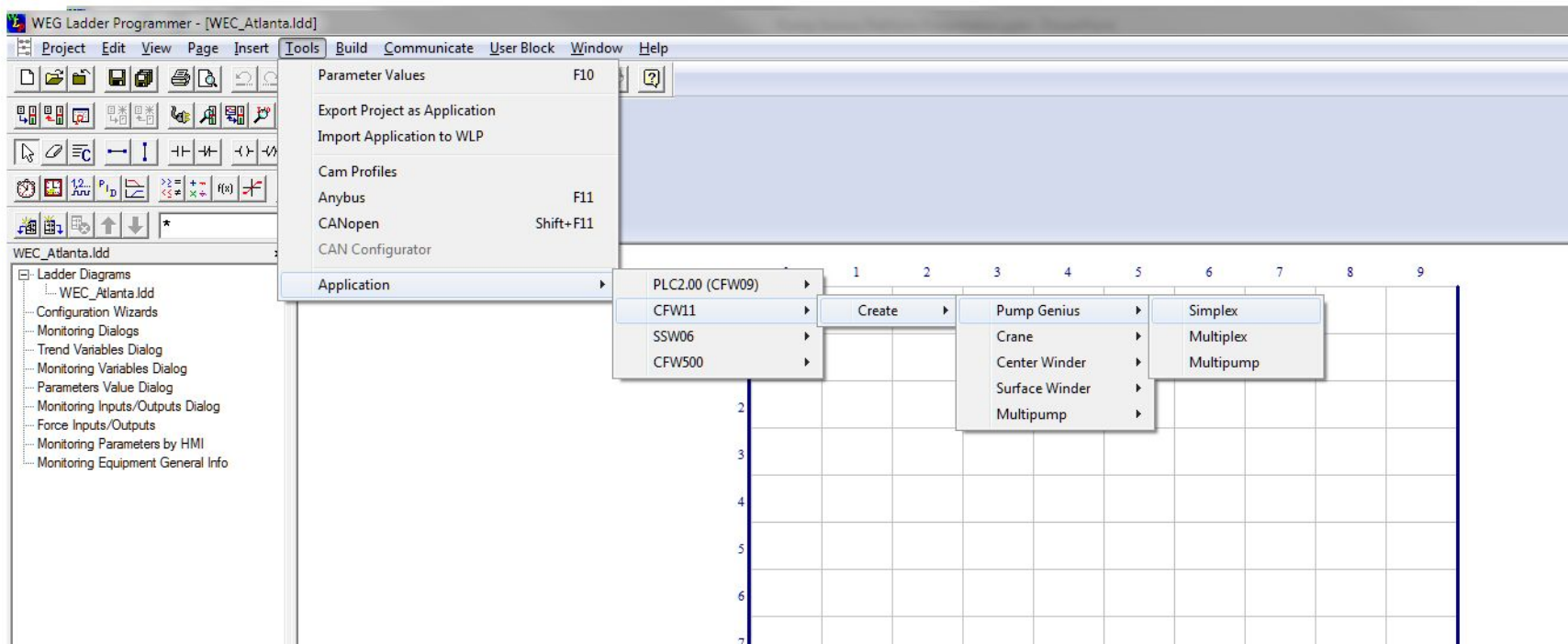
Pump Genius Simplex

- Pump control where there is only one pump driven by its own VFD with the possibility to command an external pump via output relay.
- Main features:
 - Control Setpoint can be via logical combination of DI4/DI5), AI, HMI, Weekly scheduled based.
 - Sleep Boost function
 - Logic to start an external pump at low demand situations(jockey pump)
 - Process Variable can be through one AI or Differential
 - Several Engineering Units to choose
 - PID control
 - Sleep/Wake-up Mode and Start by Level
 - Pipe filling function
 - Broken and Clogged Pipe Functions
 - Deragging Function
 - Dry Pump protection
 - High/Low Level alarms
 - Open application for customer's customization
 - Possibility for 12 different Control Setpoints based on scheduled time.



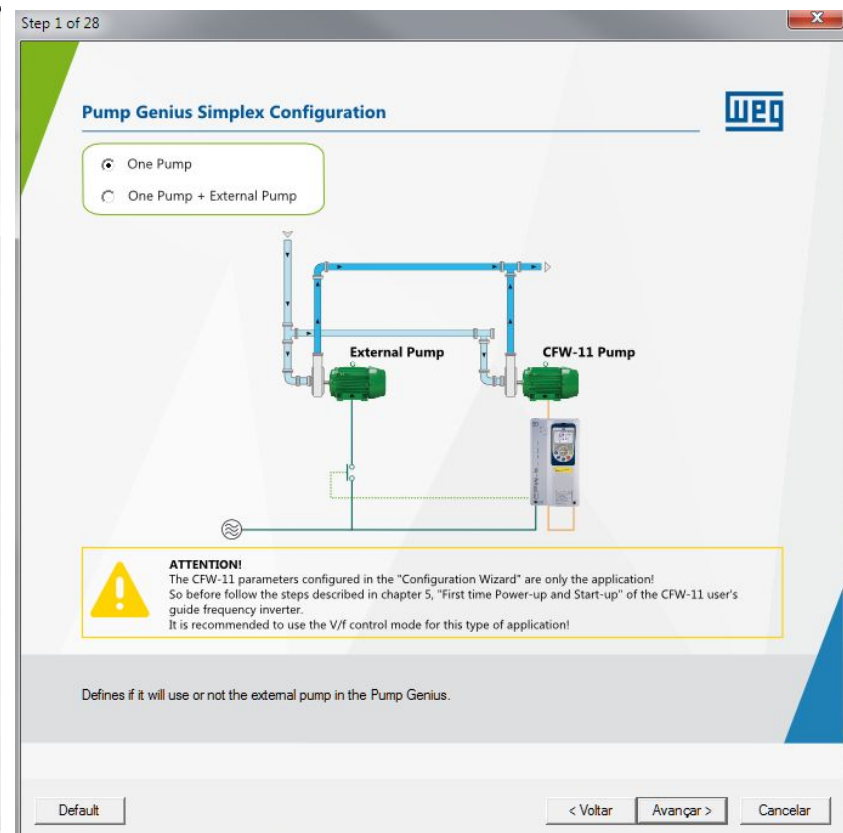
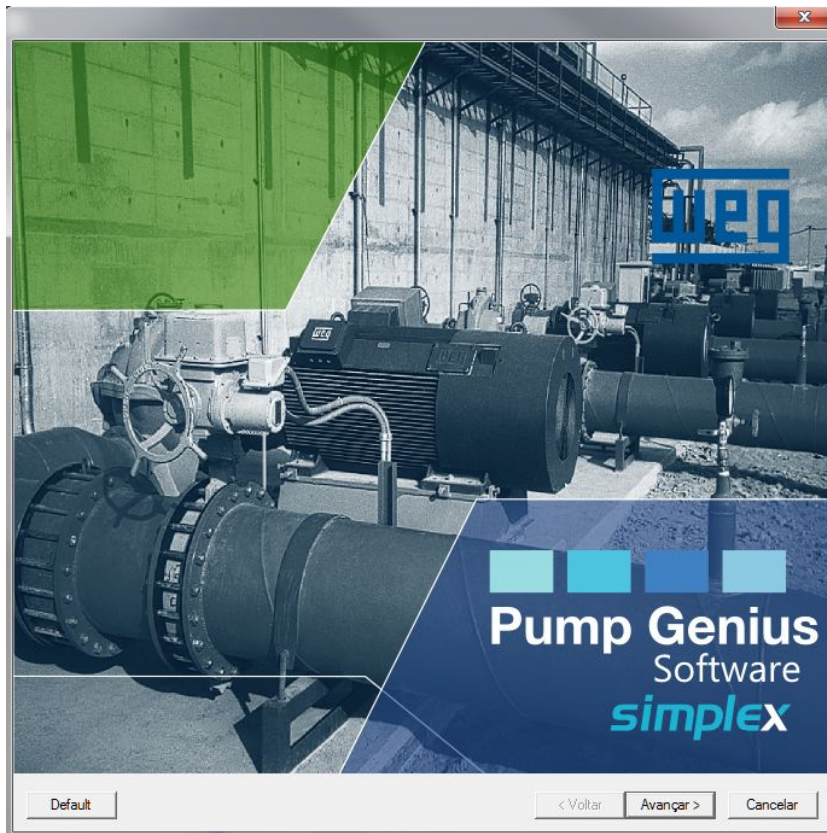
Configuration Wizard

- How to open the application Pump Genius Simplex



Configuration Wizard

- Introduction Screen
- Selection of external Pump



Source of commands e I/Os

- Local/Remote Source of commands for the drive
- Function of I/Os

Step 2 of 28

Reference Commands

P0220: Local/Remote Selection

LOCAL Commands

P0221: Speed Reference at Local

P0223: Forward/Reverse at Local

P0224: Run/Stop at Local

P0225: JOG at Local

REMOTE Commands

P0222: Speed Reference at Remote

P0226: Forward/Reverse at Remote

P0227: Run/Stop at Remote

P0228: JOG at Remote

It defines the origin of the command that will select between the LOCAL situation and the REMOTE situation.

Default < Voltar Avançar > Cancelar

Step 3 of 28

Digital Inputs - Inverter

P0263: DI1 Function (15)

P0264: DI2 Function (16)

P0265: DI3 Function (17)

P0266: DI4 Function (18)

P0267: DI5 Function (19)

P0268: DI6 Function (20)

Digital Outputs - Inverter

P0275: DO1 Function (RL1) (21,22,23)

P0276: DO2 Function (RL1) (24, 25, 26)

P0277: DO3 Function (RL1) (27, 28, 29)

Digital Inputs - Expansion Module (Slot 1)

P0269: DI7 Function (1)

P0270: DI8 Function (2)

Digital Outputs - Expansion Module (Slot 1)

P0278: DO4 Function (7)

P0279: DO5 Function (8)

It defines the digital input function.

Default < Voltar Avançar > Cancelar

Process Variable

- Source of the process variable via Analog Input

Step 5 of 28

Process Variable Selection Source (P1021)

☐ 0 = Without Control Process Variable (Disable the PID Controller)

Analog Input - Inverter

☒ 1 = Analog Input AI1 (2, 3)

☐ 2 = Analog Input AI2 (5, 6)

☐ 3 = Difference between Analog Input AI1 and AI2 (AI1-AI2)

Analog Input - Expansion Module (Slot 1)

☐ 4 = Analog Input AI3 (15, 16)

☐ 5 = Analog Input AI4 (17, 18)

It defines the source of the control process variable.

Default < Voltar Avançar > Cancelar

Process Variable

- Type of Signal in the AI (4-20mA / 0-10V)
- Engineering Unit and Sensor scale
- Adjustments in the AI

Step 6 of 28

Settings of the Process Variable via Analog Input AI1

P0231: AI1 Signal Function: **Z = Process Variable**

P0233: AI1 Signal Type: **1 = 4 to 20mA**

P0510: Engineering Unit 1: **24 = psi**

P0511: Decimal Point of Engineering Unit 1: **1 = xyw.z**

Analog Input - Inverter

Analog Input AI1 (2.3)

It defines the function of the analog input. Configured for function "Control Process Variable" in this SoftPLC application (no function for the inverter).
NOTE ! Parameter pre-configured and is not allowed to change for this application.

Default < Voltar Avançar > Cancelar

Step 7 of 28

Process Variable via Analog Input AI1

P0234: AI1 OFFSET: **0.00** %

P0232: AI1 GAIN: **1.000**

P0235: AI1 FILTER: **0.25** s

P0018: AI1 VALUE [%]

Scale of the Process Variable Sensor

P1023: MAXIMUM LEVEL: **40.0** eng. 1

P1022: MINIMUM LEVEL: **0.0** eng. 1

Value to be multiplied by the analog input read to adjust the variable.
Adjustable Range: 0.000 to 9.999

Default < Voltar Avançar > Cancelar

PID Function

- Control mode (disable, direct and reverse)
- Operation mode and setpoint (manual / automatic)
- Gains: Proportional, Integral and Derivative

Step 8 of 28

Control Action of the PID Controller (P1028)

☐ 0 = Disable the PID Controller

CFW-11 Pump

☒ 1 = Direct Mode

CFW-11 Pump

☐ 2 = Reverse Mode

CFW-11 Pump

It defines the control action of the PID controller for the Pump Genius, i.e., how will be the error signal $e(t)$.
 Direct Mode: $e(t) = P1011 - P1016$
 Reverse Mode: $e(t) = P1016 - P1011$

Default < Voltar Avançar > Cancelar

Step 9 of 28

PID Controller for the Pump Genius

P1029: Operation Mode of the PID Controller 1 = Automatic

P1030: Automatic Adjustment of the PID Controller Setpoint 0 = P1011 Off and P1018 Off

P1011 CONTROL SETPOINT

P1016 PROCESS VARIABLE

P1031 PROPORTIONAL GAIN 1.000

P1032 INTEGRAL GAIN 5.000

P1033 DERIVATIVE GAIN 0.000

P1018 SETPOINT IN MANUAL 0 rpm

PID OUTPUT

It defines the operation mode of the PID controller for the Pump Genius.

Default < Voltar Avançar > Cancelar

Control Setpoint

- Source of the control setpoint
- Type of signal and adjustments of gains to the AI for the control setpoint.

Step 10 of 28

Control Setpoint Selection Source (P1020)

☐ 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 Input DI4 and DI5 (P1012, P1013 and P1014)
☐ 8 = Four Setpoints via Digital Input DI4 and DI5 (P1012, P1013, P1014 and P1015)
☐ 9 = Setpoint according to Weekly Schedule

Default < Voltar Avançar > Cancelar

Step 12 of 28

Control Setpoint via Analog Input AI2

P0236: AI2 Signal Function 7 = Control Setpoint
 P0238: AI2 Signal Type 0 = 0 to 10V/20mA

Analog Input AI2 (5, 6)

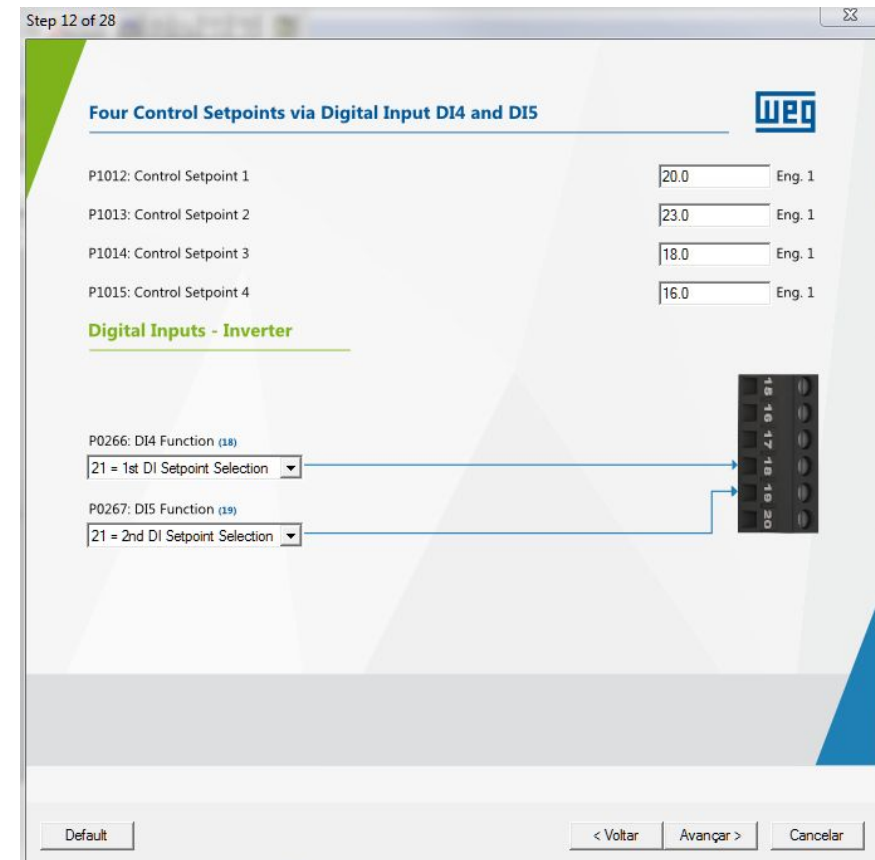
P0239 AI2 OFFSET 0.00 %
 P0240 AI2 GAIN 0.25 s
 P0237 AI2 GAIN 1.000
 P0019 AI2 VALUE (%)

AI2 READ

Default < Voltar Avançar > Cancelar

Control Setpoint

- Setpoint via HMI or Communication
- Setpoint via combination of DI's 4 and 5.





Weekly Schedule (setpoint)


- Configuration of the schedule.
- Definition of Control setpoint based on scheduled time.


Step 11 de 28

Schedules According to the Day of Week (P1063)

0 = Disable Weekly Schedule 

1 = Schedules 1 to 12 from Monday to Sunday 

2 = Schedules 1 to 6 from Monday to Friday and Schedules 7 to 12 on Saturday and Sunday 

3 = Schedules 1 to 4 from Monday to Friday and Schedules 5 to 8 on Saturday and Schedules 9 to 12 on Sunday 

Default < Voltar Avançar > Cancelar

Step 12 de 28

Weekly Schedule - Control Setpoint

Schedule 1	Schedule 2	Schedule 3	Schedule 4
4 : 0	9 : 0	17 : 0	22 : 0
20.0	24.0	28.0	14.0

Schedule 5	Schedule 6	Schedule 7	Schedule 8
24 : 0	24 : 0	24 : 0	24 : 0
0.0	0.0	0.0	0.0

Schedule 9	Schedule 10	Schedule 11	Schedule 12
24 : 0	24 : 0	24 : 0	24 : 0
0.0	0.0	0.0	0.0

It defines the value of the hour to start the Schedule 1 and the value of the hour to the end of the Schedule 12.
Adjustable Range: 0 to 23 h

Default < Voltar Avançar > Cancelar

Weekly Schedule (Speed reference)

- Configuration of the schedule.
- Definition of Speed Reference based on scheduled time.

Step 11 of 28

Schedules According to the Day of Week (P1063)

☒ 1 = Schedules **1 to 12** from Monday to Sunday

☐ 2 = Schedules **1 to 6** from Monday to Friday and Schedules **7 to 12** on Saturday and Sunday

☐ 3 = Schedules **1 to 4** from Monday to Friday and Schedules **5 to 8** on Saturday and Schedules **9 to 12** on Sunday

It defines how the schedules 1 to 12 will be divided to compose the weekly schedule of change the Pump Genius control setpoint in automatic mode.

Default < Voltar Avançar > Cancelar

Passo 12 de 28

Programação Horária Semanal - Referência de Velocidade

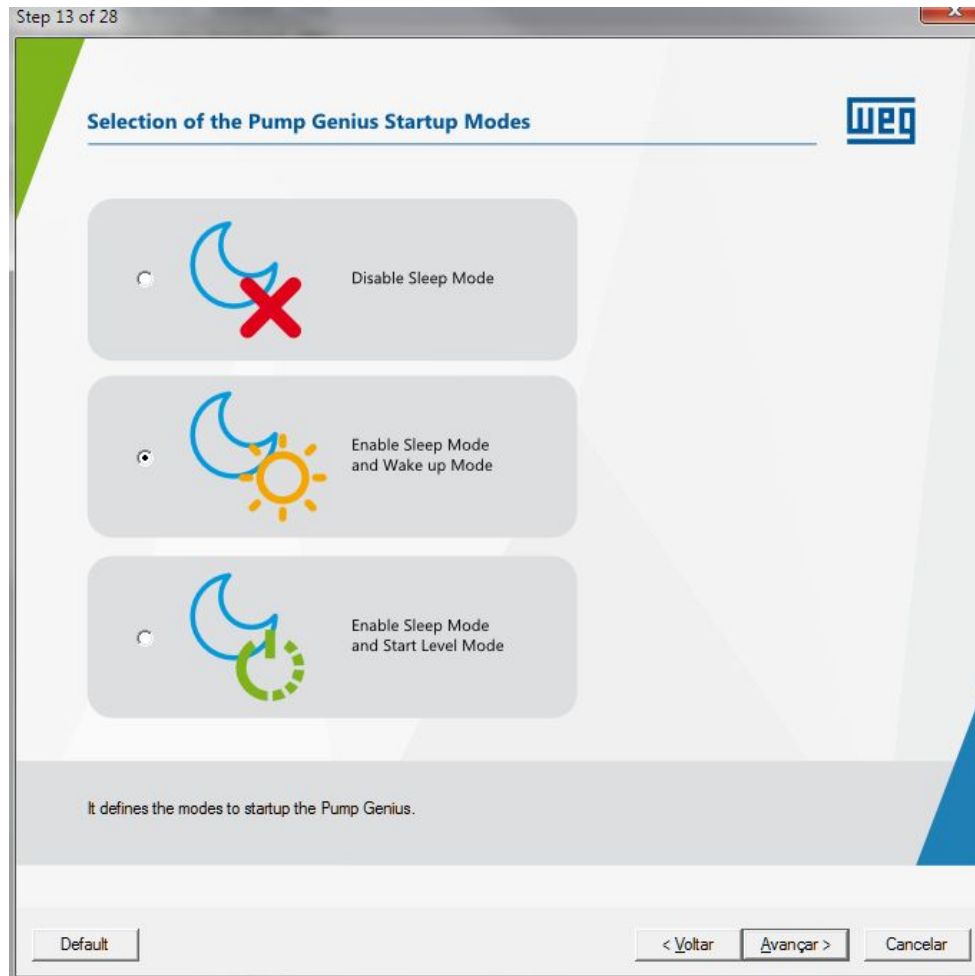
Horário 1	Horário 2	Horário 3	Horário 4
4 : 0	9 : 0	17 : 0	22 : 0
1400	1600	1800	1000
Horário 5	Horário 6	Horário 7	Horário 8
24 : 0	24 : 0	24 : 0	24 : 0
0	0	0	0
Horário 9	Horário 10	Horário 11	Horário 12
24 : 0	24 : 0	24 : 0	24 : 0
0	0	0	0

Defina o valor da hora para início do Horário 1 e o valor da hora para o fim do Horário 12.
Faixa de Valores: 0 a 23 h

Default < Voltar Avançar > Cancelar

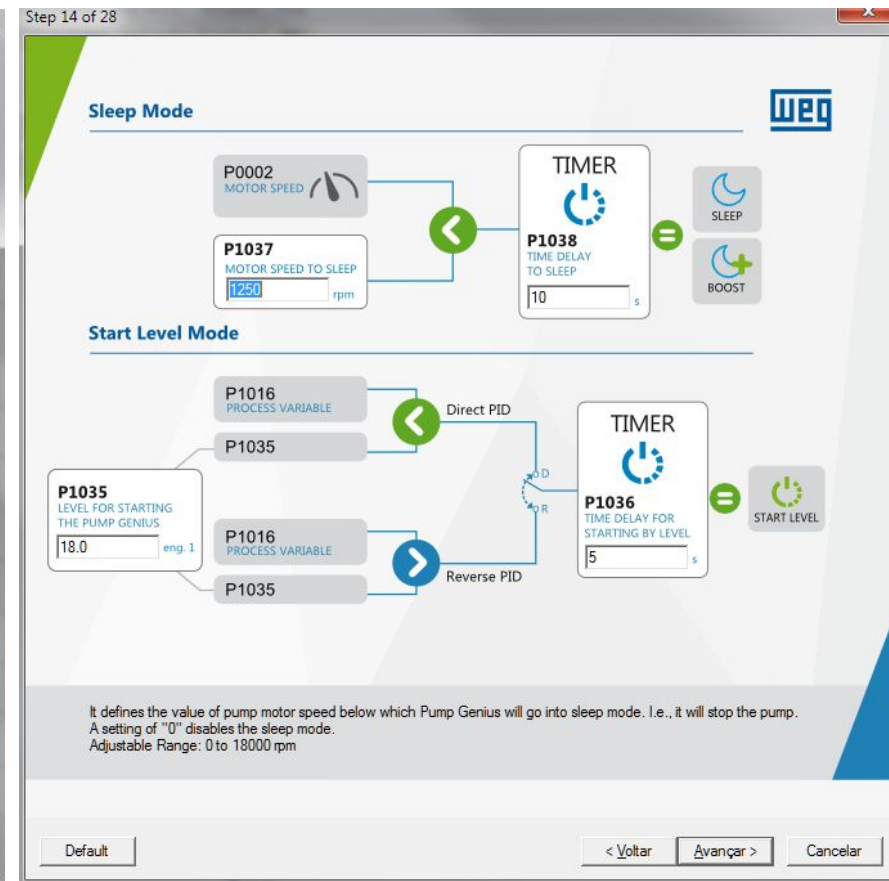
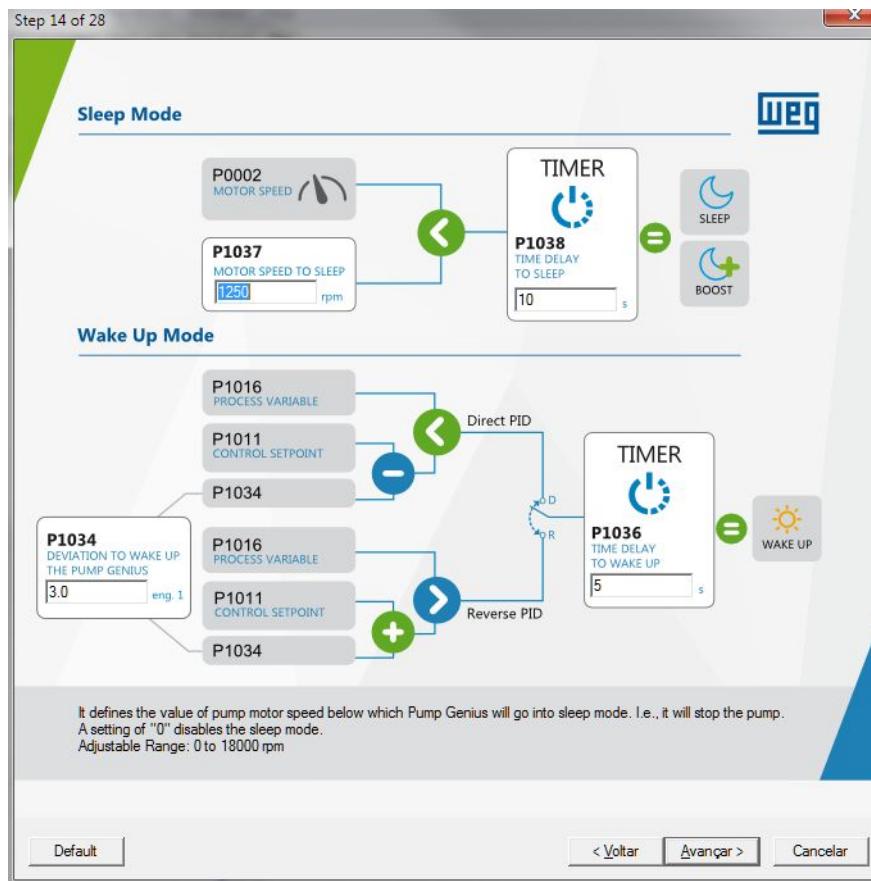
Starting Modes

- It enables the sleep/Wake-up modes and start by level.



Starting Modes

- It Configures Sleep and Wake-up modes.
- It Configures Sleep mode and Start by level.



Boost and Pipe Charging Function

- It enables the boost function (sleep boost).
- It enables the Pipe charging function.

Step 15 of 28

Sleep Boost

☐ Enable Sleep Boost

P1016
PROCESS VARIABLE

P1011
CONTROL SETPOINT

P1039
SLEEP BOOST OFFSET
2.0 eng. 1

BOOST

TIME ON P1040
SLEEP BOOST MAX. TIME
15 s

SLEEP

Enables to apply an boost in the control setpoint to increase the control process variable before the Pump Genius go to into sleep mode.

Default < Voltar Avançar > Cancelar

Step 16 of 28

Pipe Charging

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

P1042: Maximum Output Current during the Pipe Charging 0.0 A

P0133
MINIMUM SPEED

P0102
ACCELERATION TIME
40.0 s

TIME ON P1041
PIPE CHARGING TIME
60 s

MOTOR SPEED

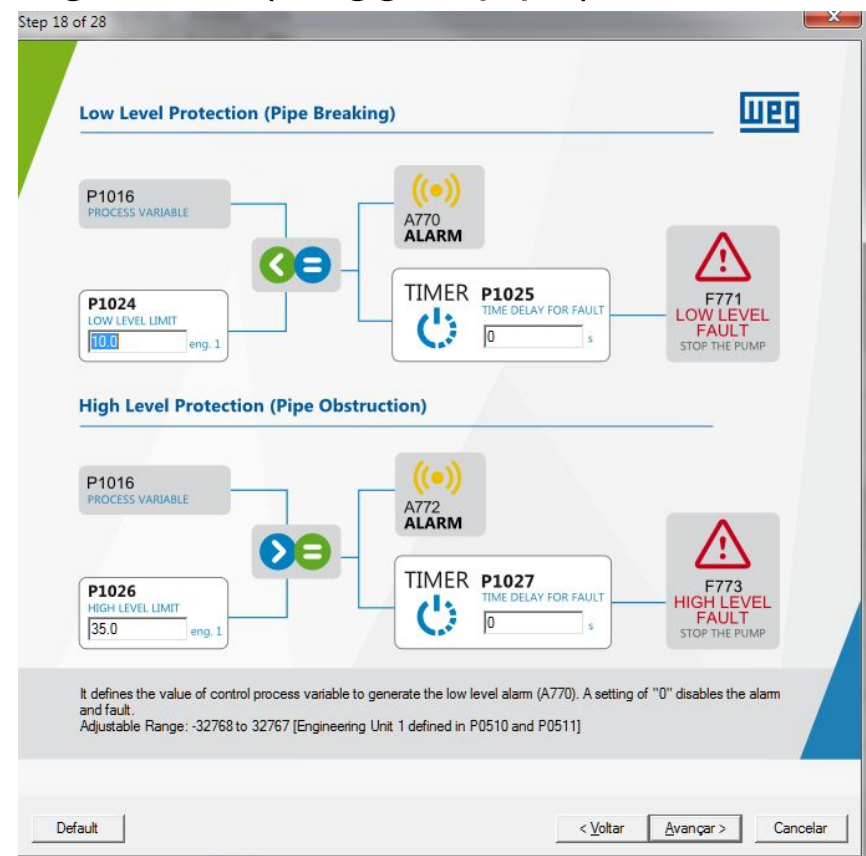
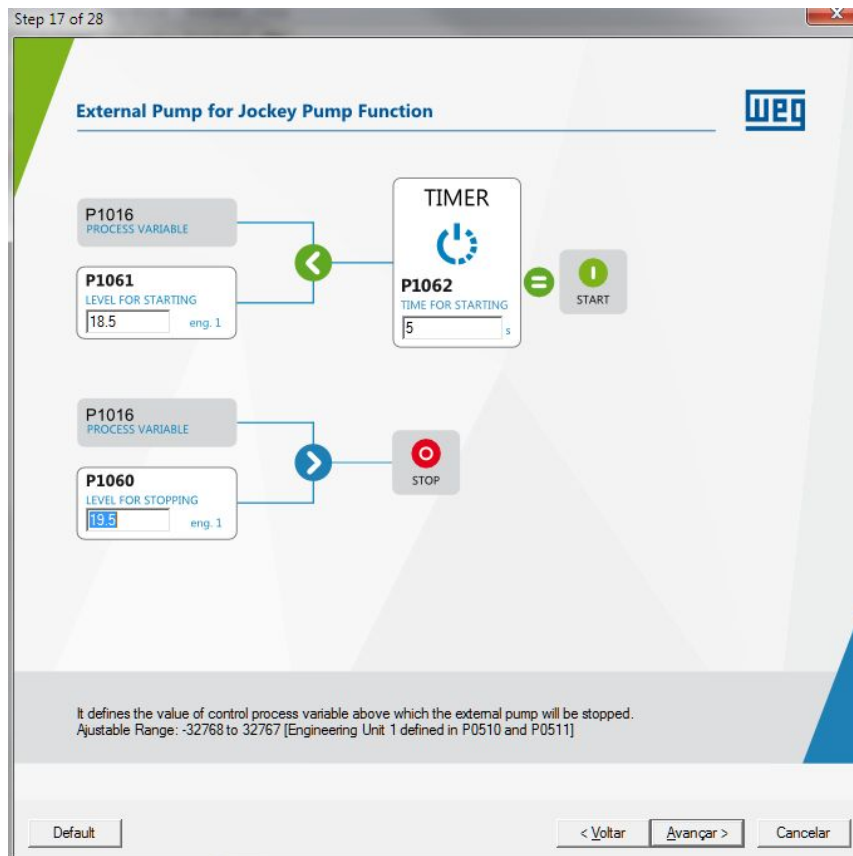
t [s]

Enables the pipe charging using the pump driven by the CFW-11 inverter.

Default < Voltar Avançar > Cancelar

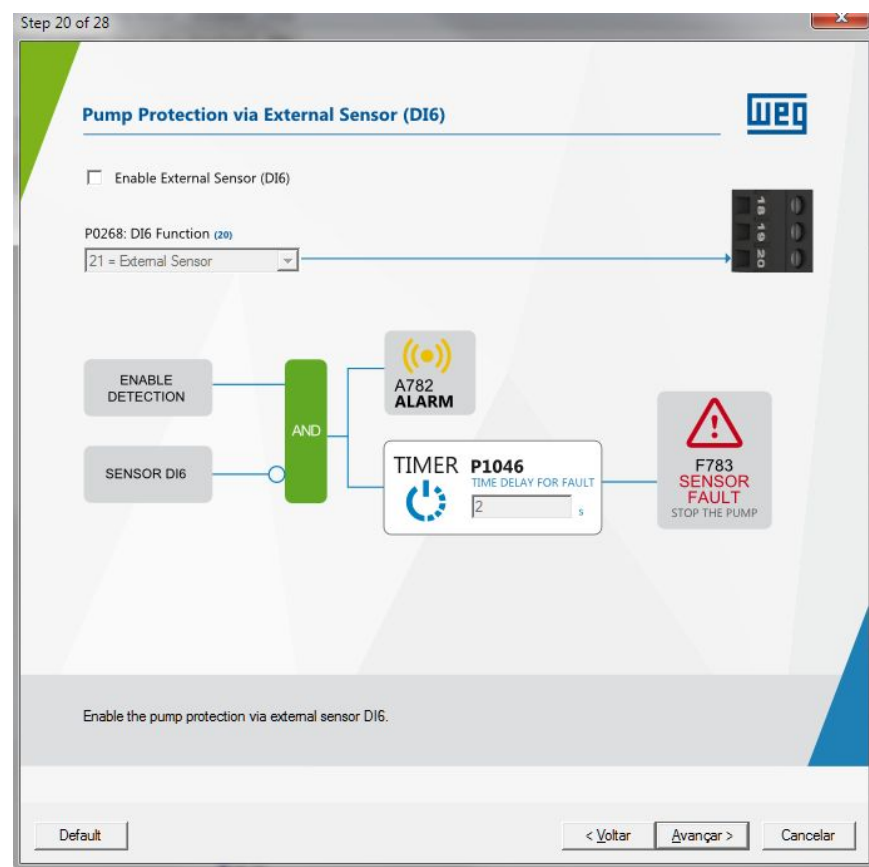
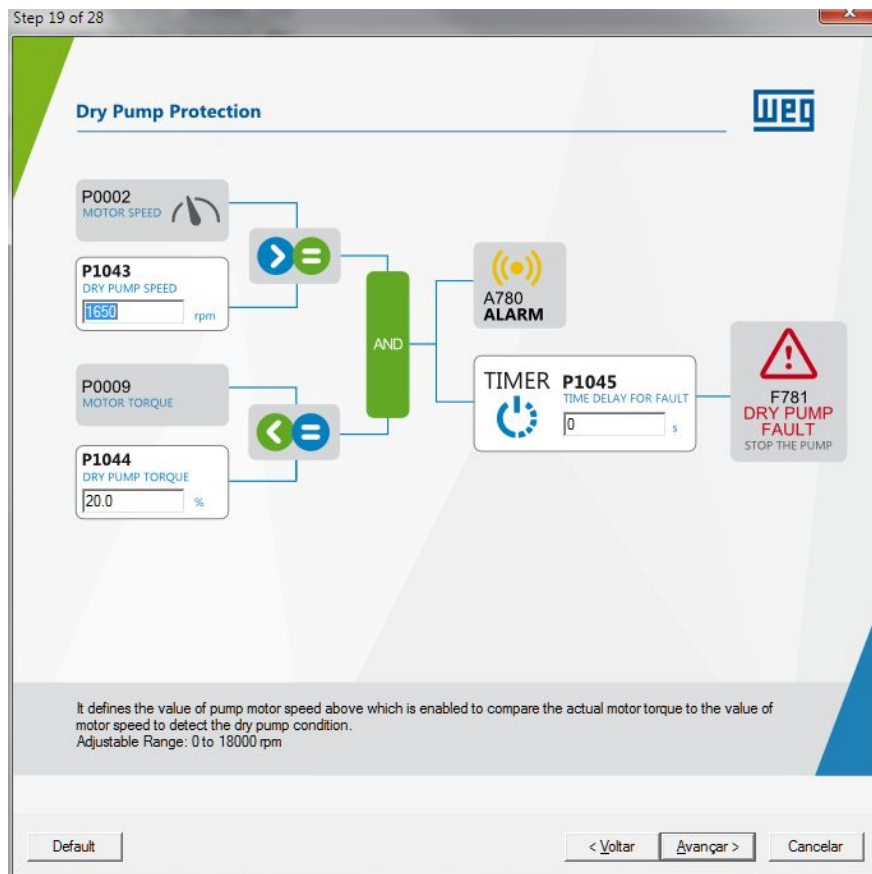
External Pump and Pump protection by Process Variable Level

- The external pump(small pump) is commanded for low demand (jockey pump).
- It enables alarm/fault due to low level(broken pipe).
- It enables alarm/fault due to low high level (clogged pipe).



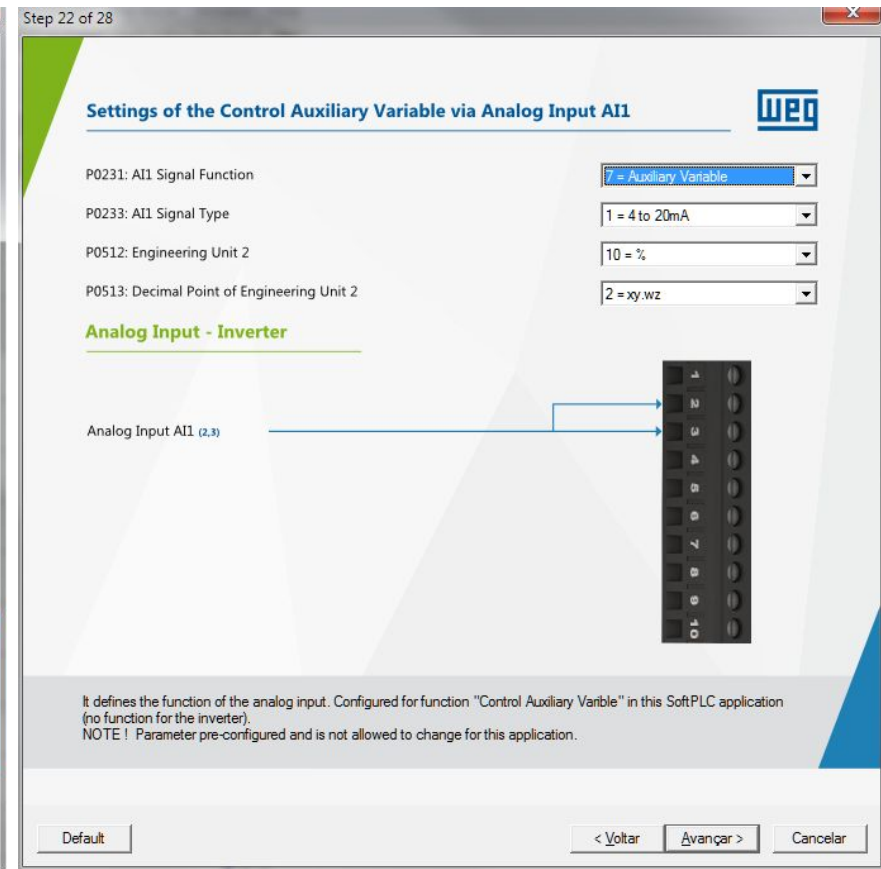
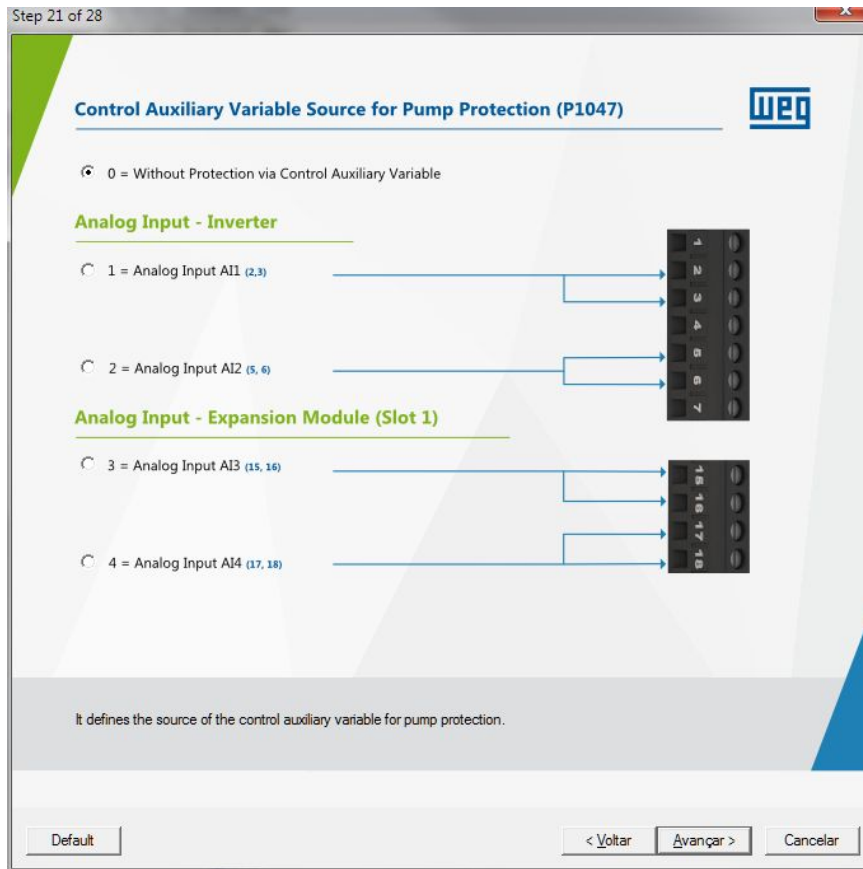
Dry Pump protection and Protection with External Sensor via DI6

- It configures the Dry Pump protection function
- It enables protection with external sensor via DI6



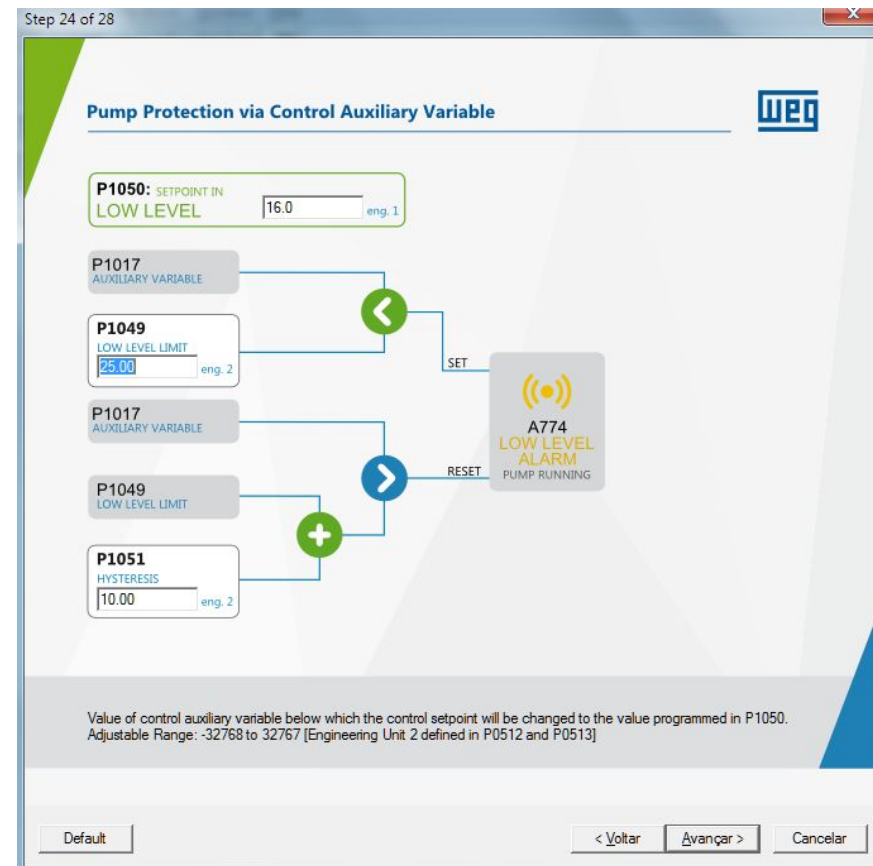
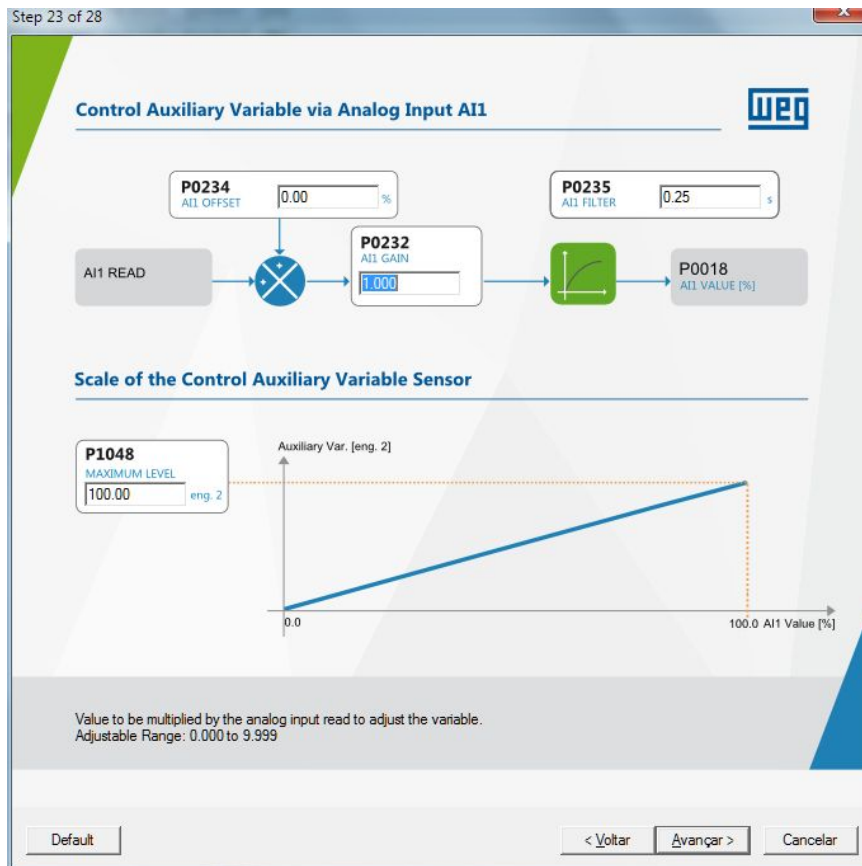
Control Auxiliary Variable

- Source of control auxiliary variable via AI
- Type of the signal in the AI
- Engineering Unit of the sensor



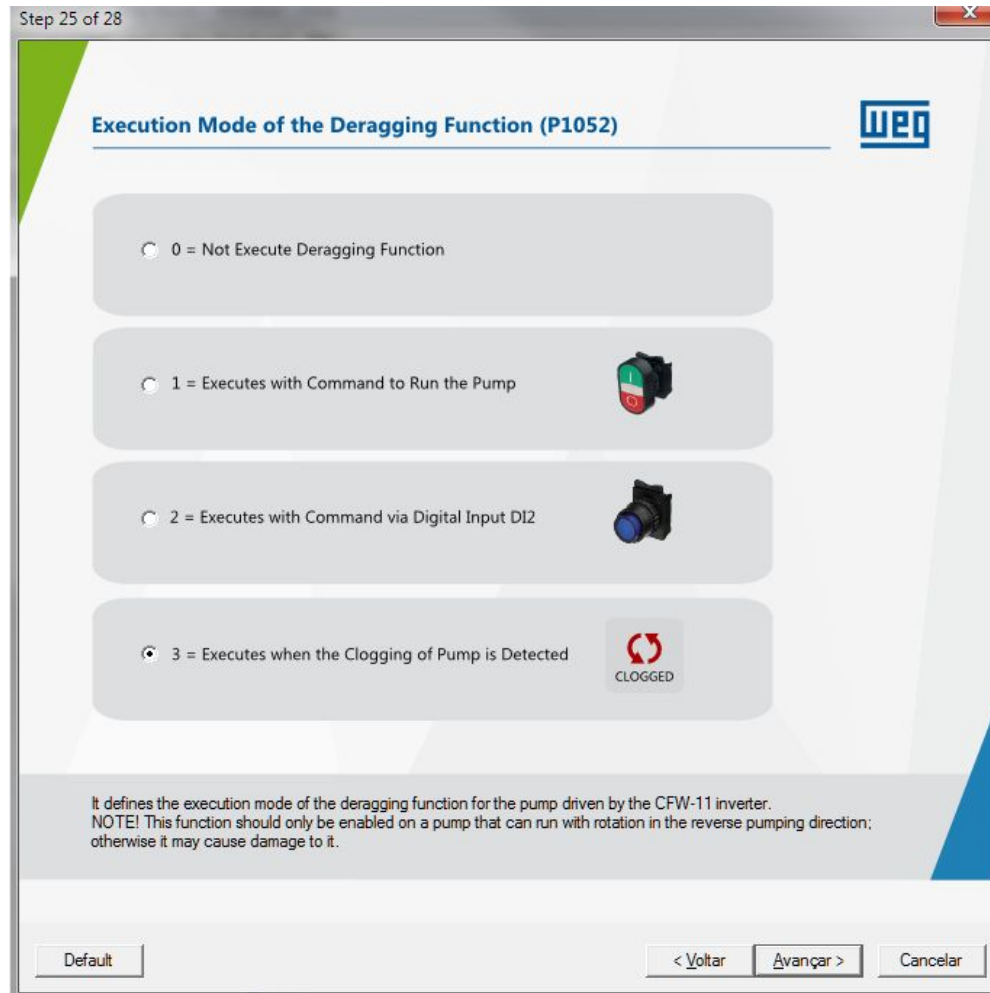
Control Auxiliary Variable

- It adjusts the readings in the AI(gains).
- Scaling of the sensor.
- It configures the pump protection against Cavitation.



Pump Unclogg function

- It executes a process of unclogging the pump.



Pump Unclogg function

- It configures the detection of the clogging.
- It enables the fault by excess of clogging.
- It configures the unclog function

Step 26 of 28

Detection of Clogging Pump

The diagram shows two input boxes on the left: 'P0003 MOTOR CURRENT' and 'P1057 MOTOR CURRENT CLOGG.' with a value of 20.0 A. These are connected by a greater-than sign (>) to an equals sign (=), which then connects to a 'TIMER' box labeled 'P1058 TIME DELAY TO DETECT CLOGGING' with a value of 60 s. This timer box is connected by an equals sign (=) to a 'CLOGGED' fault icon.

Excess of Clogging

The diagram shows two input boxes on the left: 'NUMBER OF CLOGGING DETEC.' and 'P1059 CLOGGING LIMIT' with a value of 5. These are connected by a greater-than sign (>) to an equals sign (=), which then connects to a fault icon labeled 'F791 CLOGGED FAULT STOP THE PUMP'.

It defines the motor current value above which will be considered that the pump is running at high current, i.e., the pump is in clogging process.
Adjustable Range: 0.0 to 3200.0 A

Default < Voltar Avançar > Cancelar

Step 27 of 28

Configuration of the Deragging Function

P0226: Forward/Reverse Selection – REMOTE Situation 12 = SoftPLC (FWD)

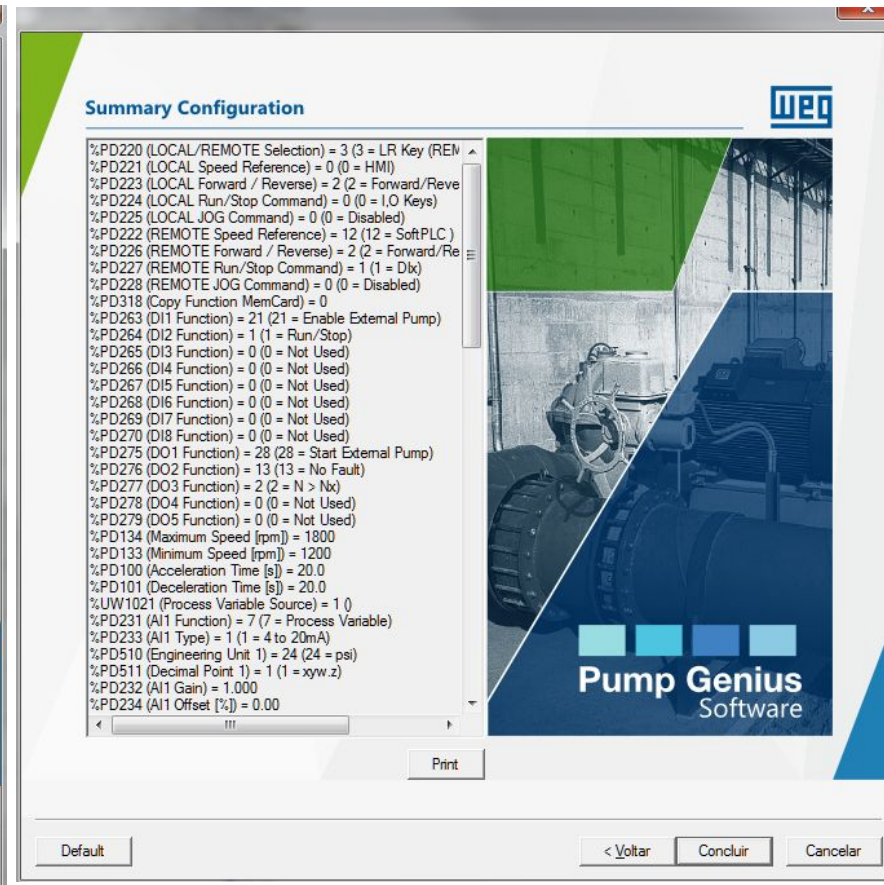
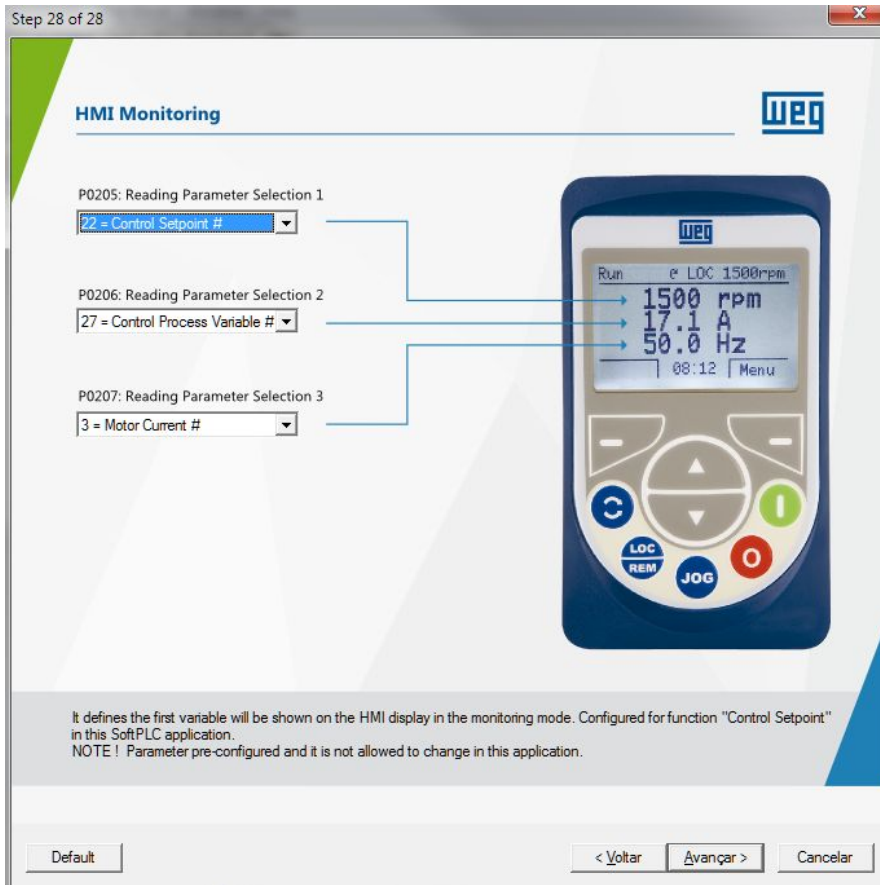
The diagram shows a graph of 'MOTOR SPEED' vs 't [s]'. The speed starts at a high level, drops to zero, and then rises again. The drop is labeled 'P1054 SPEED REF. DERAGGING' with a value of 600 rpm. The drop is also labeled 'P1055' and 'P1056'. The rise is labeled 'P1053 NUMBER OF CYCLES' with a value of 5 Cycles. Below the graph, there are two boxes: 'P1055 DERAGGING RUN TIME' with a value of 10 s and 'P1056 DERAGGING STOP TIME' with a value of 3 s.

It defines the origin of the "Speed Direction" in the REMOTE situation. It is necessary to operation of the deragging function.

Default < Voltar Avançar > Cancelar

Monitoring Screen via HMI and Summary

- It configures parameters to be shown on the keypad
- It summarizes the programming to be loaded in the drive.



System Operation – Use of Jockey Pump

COMMAND - DIGITAL INPUTS

DI1- Enable External Pump

DI2 - Run/Stop

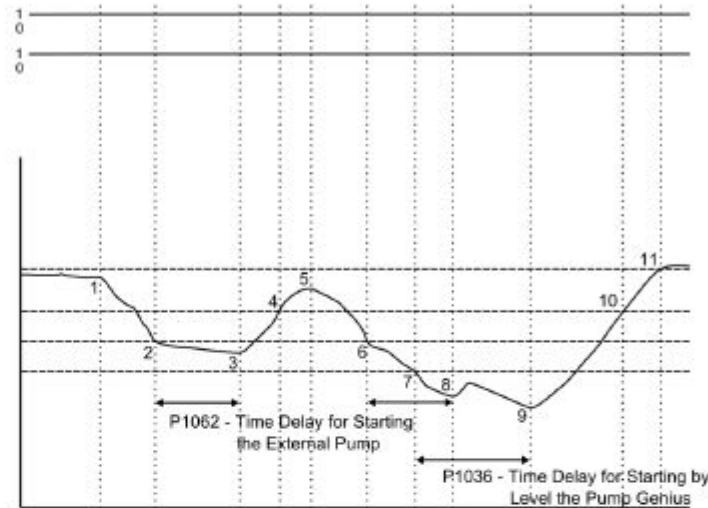
CONTROL PROCESS VARIABLE (Eng1)

P1011 - Control Setpoint

P1060 - Level for Stopping the External Pump

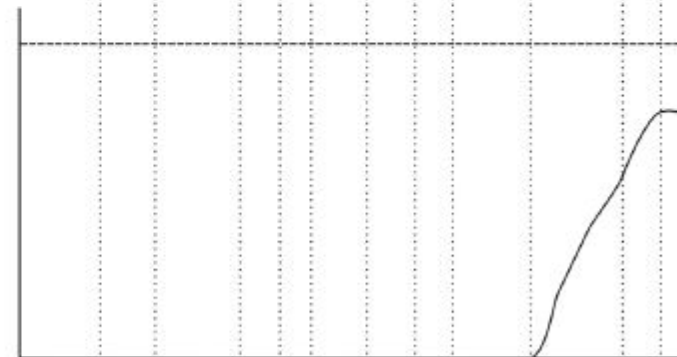
P1061 - Level for Starting the External Pump

P1035 - Level for Starting the Pump Genius



PID CONTROLLER OUTPUT (MV) (%)

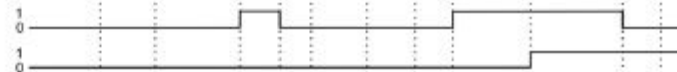
100.0 %



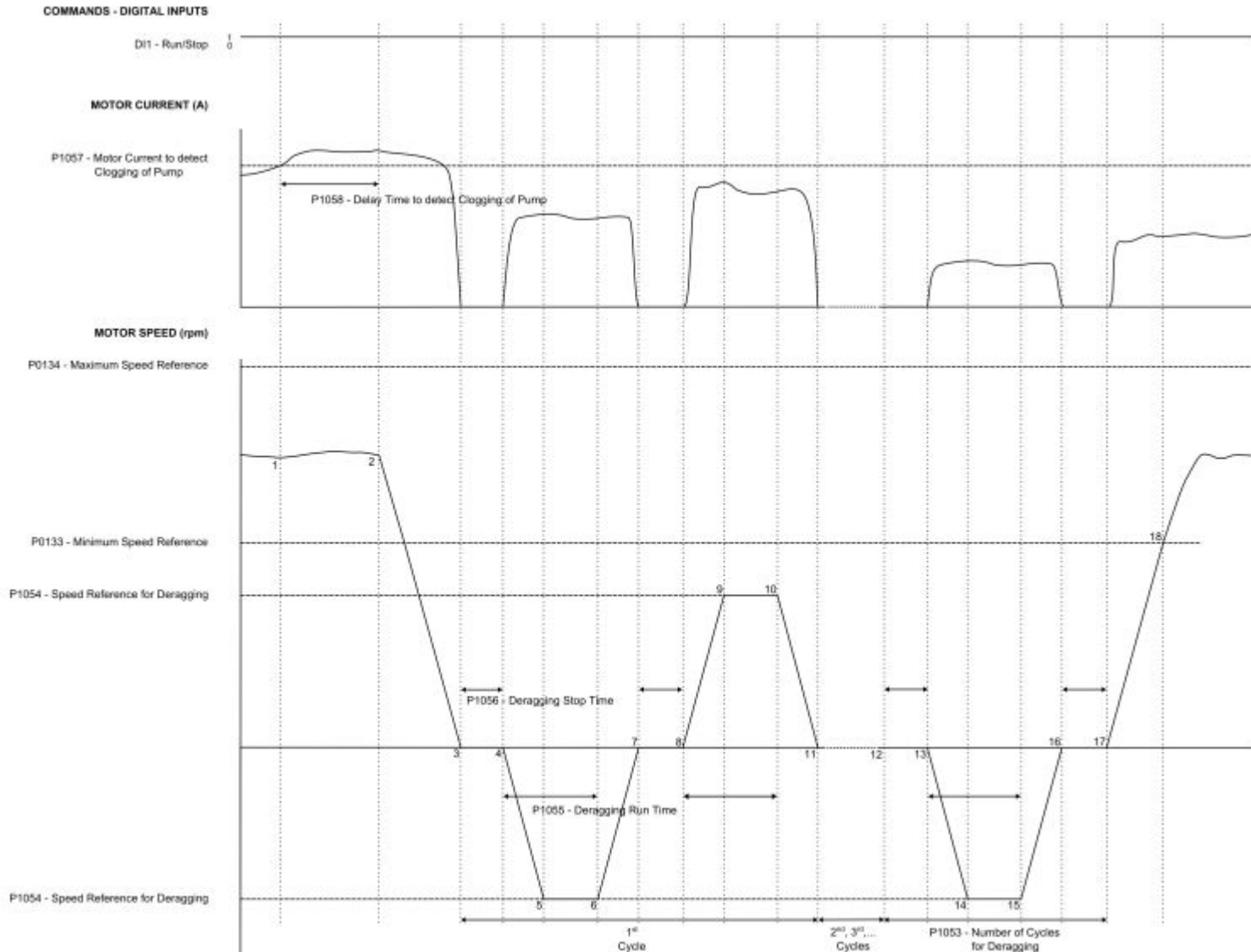
COMMANDS - DIGITAL OUTPUT

DO1 - Start External Pump

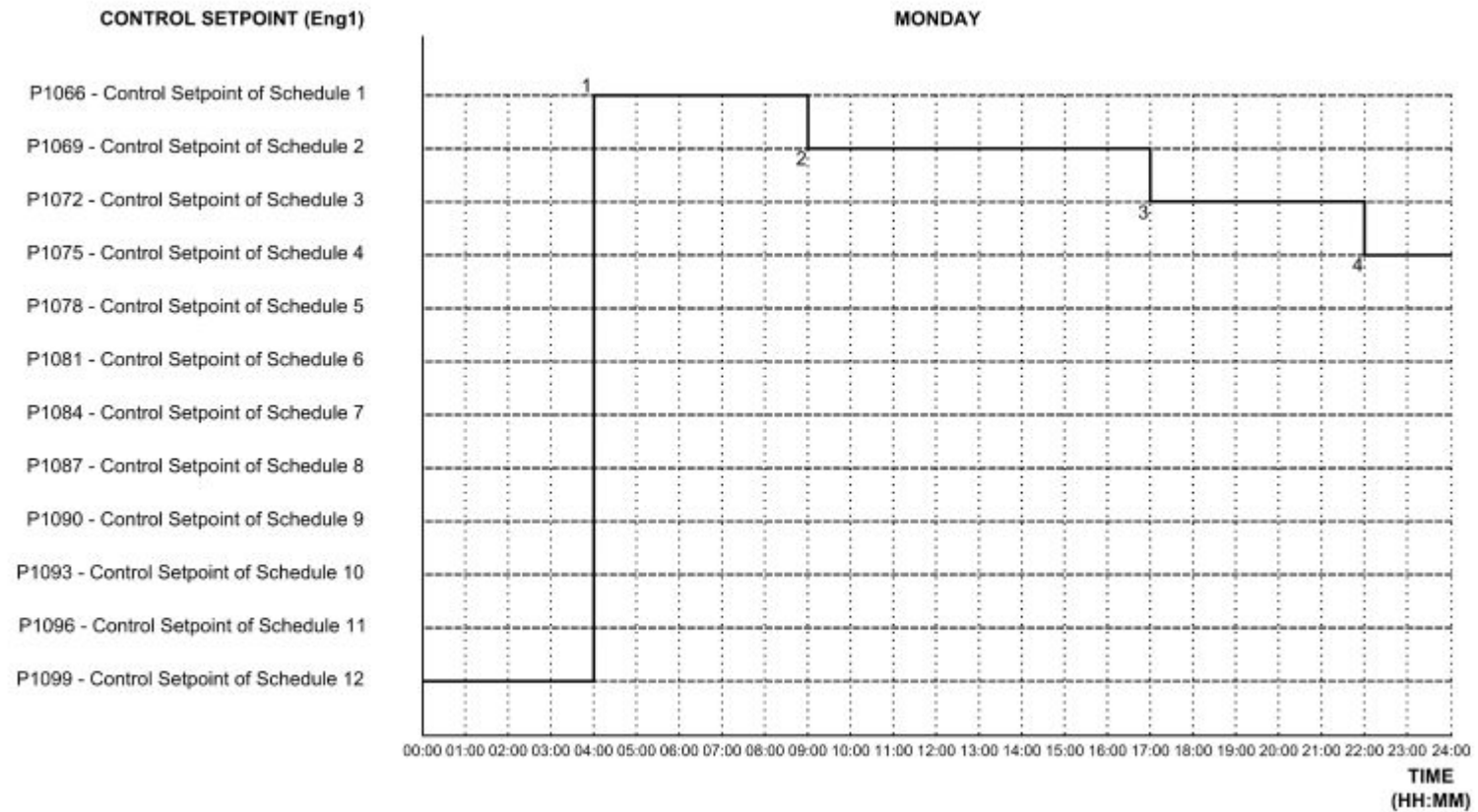
DO3 - N > Nx



System Operation – Unclogg function

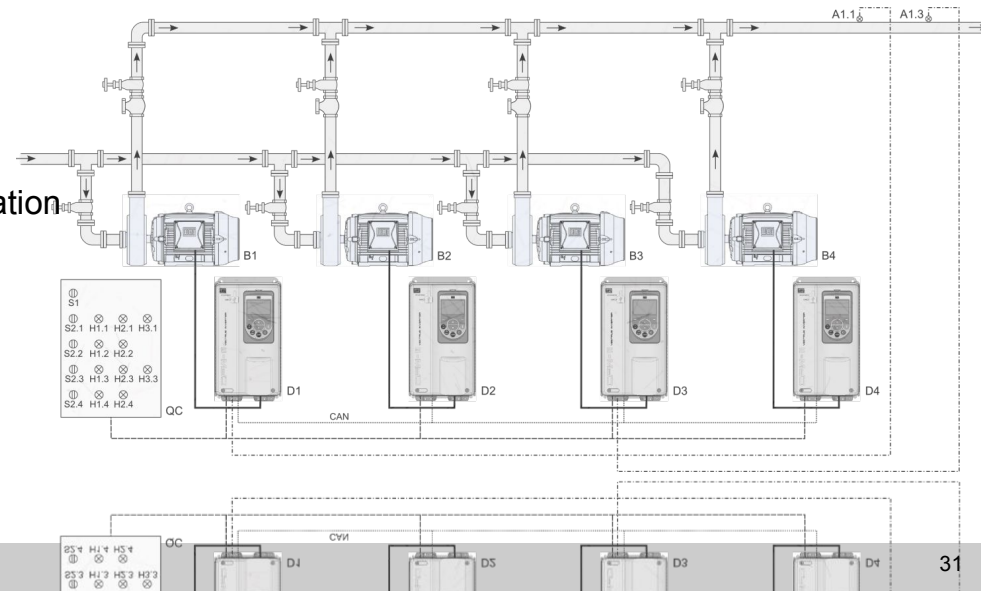


System Operation – Setpoint based in time scheduled

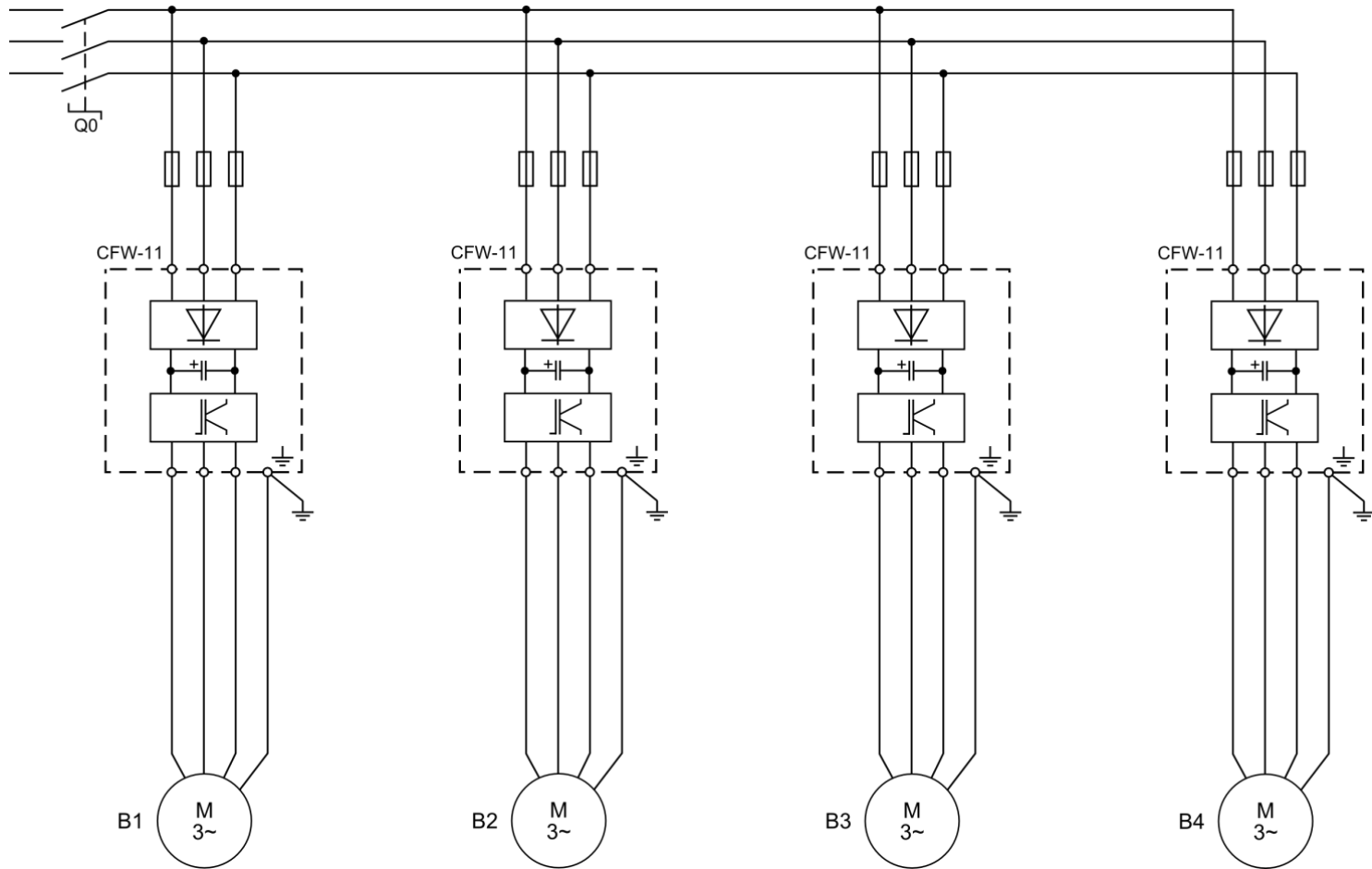


Pump Genius Multiplex

- Pump control where each of the pump is driven by its own VFD with the capability for each of the pumps to work as master/slave (lead/lag configuration).
- Main features:
 - Control of up to 6 pumps in parallel.
 - Control Setpoint can be via logical combination of DI's(DI4/DI5), AI, HMI.
 - Communication between pumps via RS-485/CAN interface
 - Configuration of each pump to be Master/Slave or Slave
 - Logic to guarantee equal use of all pumps
 - Master Swap in case communication loss is detected or broken sensor wire.
 - PID control
 - Sleep/Wake-up Mode and Start by Level
 - Pipe filling function
 - Process Variable can be through one AI or Differential
 - Several Engineering Units to choose
 - Broken /Clogged Pipe Functions
 - Force Rotation function
 - Dry Pump protection
 - High/Low Level alarms
 - Open application for customer's customization

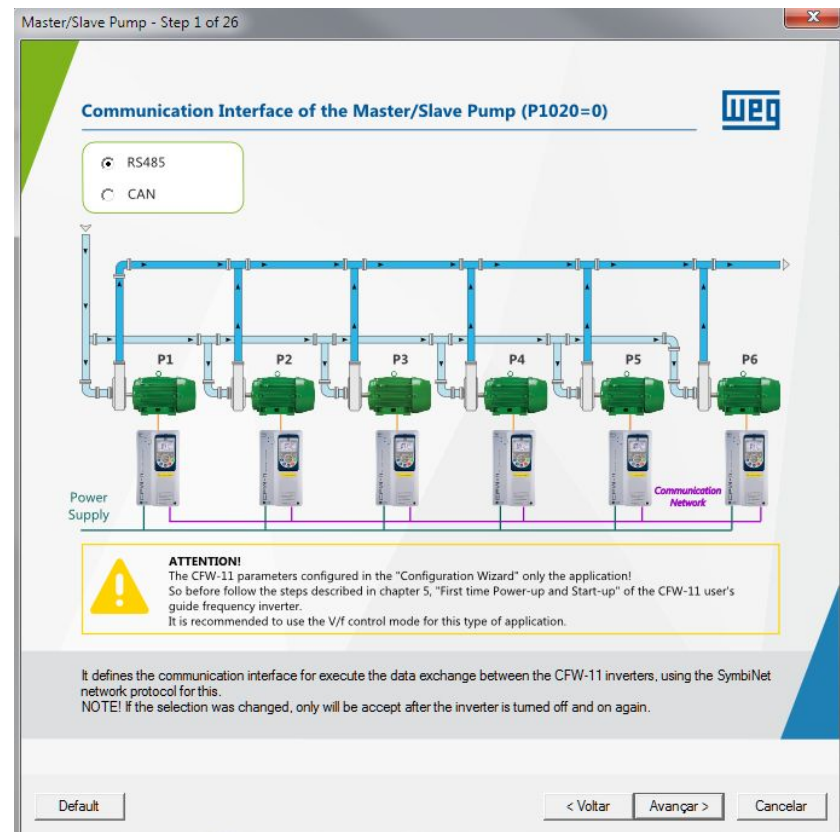


Power Diagram



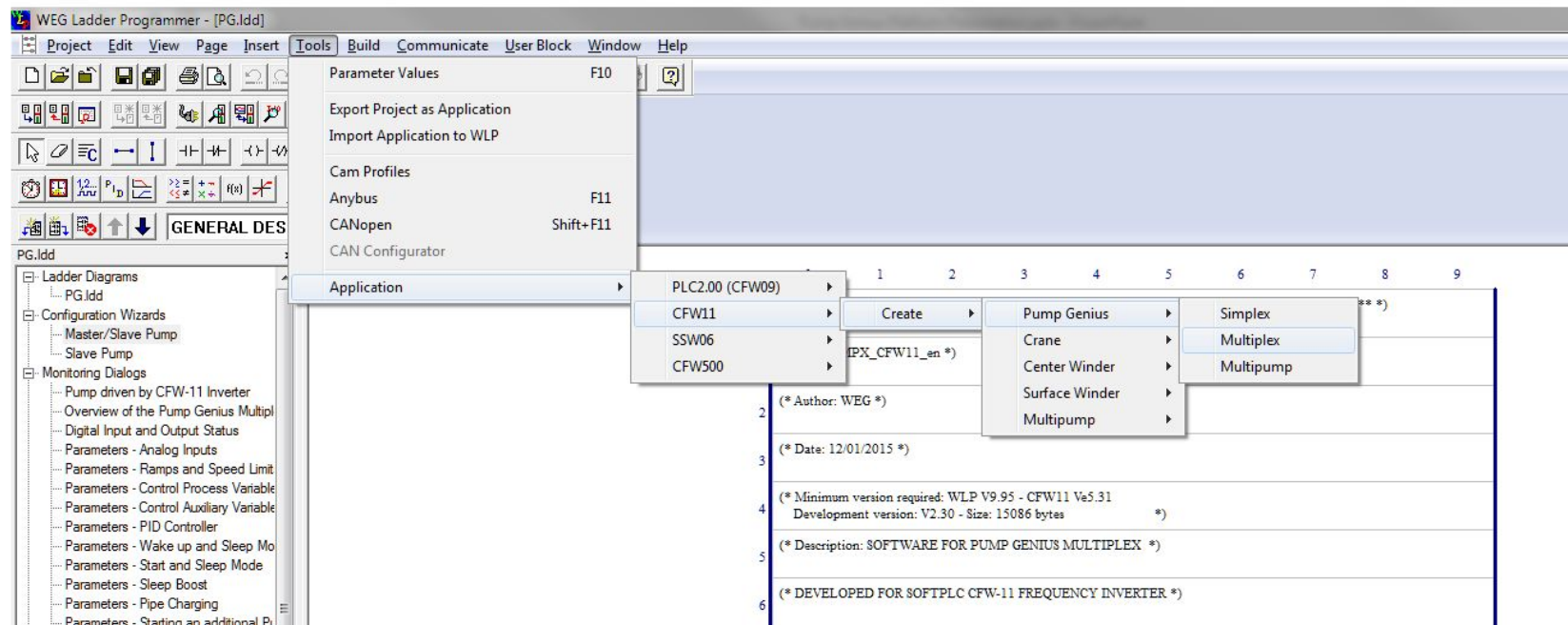
Configuration Wizard

■ Introduction Screen



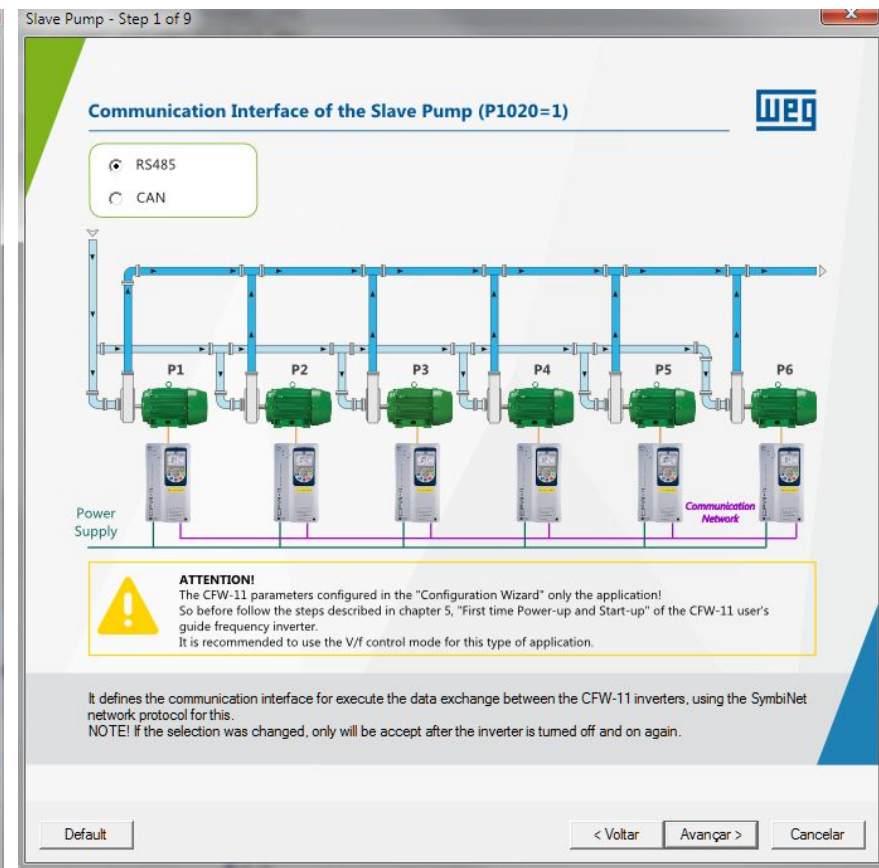
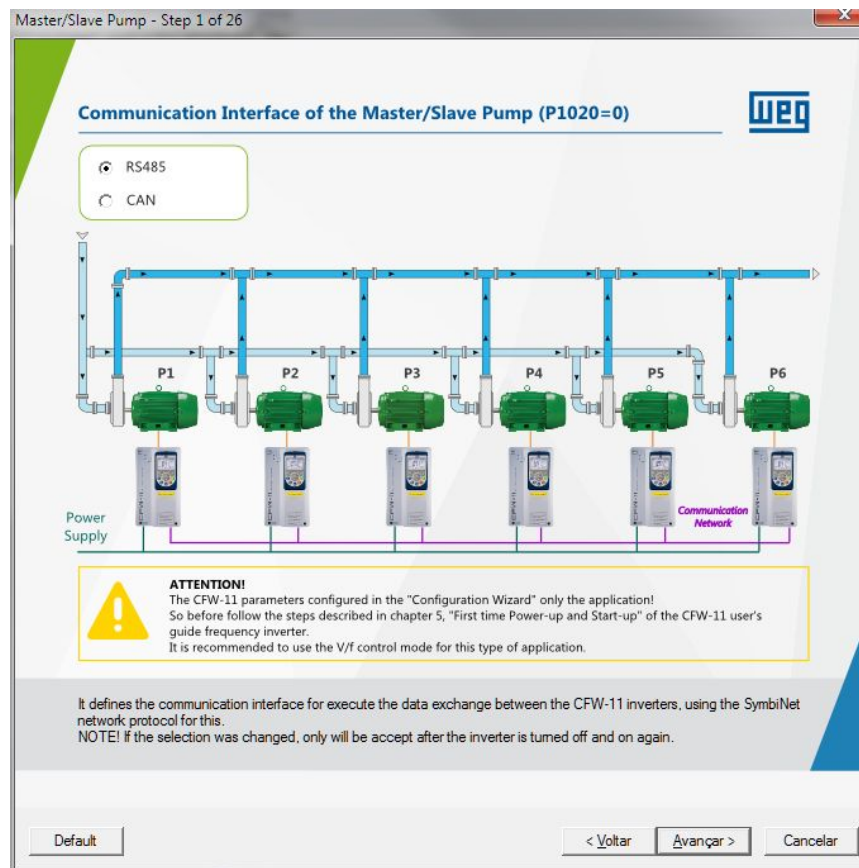
Configuration Wizard

- How to open the application Pump Genius Multiplex



Configuration Wizard

- It selects the pump to be Master/Slave and Communication interface.
- It selects the pump to be Slave and Communication interface.



Communication Interface(Symbinet)

- It configures the Communication with RS-485.
- It configures the Communication with CAN.

Slave Pump - Step 2 of 9

RS485 Communication Interface

P0308: Serial Address

P0310: Serial Communication Rate

P0311: Serial Interface Byte Configuration

P0312: Serial Protocol

P0313: Communication Error Action

P0314: Serial Watchdog s

A-Line (-)
B-Line (+)
GND 0V
Ground

It defines the inverter address used for the serial communication. It is necessary that each device of the SymbiNet network has an address different from the others.

Default < Voltar Avançar > Cancelar

Slave Pump - Step 2 of 9

CAN Communication Interface

P0701: CAN Address

P0700: CAN Protocol

P0702: CAN Baud Rate

P0703: CAN Buss Off Reset

P0313: Communication Error Action

V+ (Power Supply)
CAN_H
Shield
CAN_L
V- (Power Supply)

It defines the inverter address used for the CAN communication. It is necessary that each device of the SymbiNet network has an address different from the others.

Default < Voltar Avançar > Cancelar

Activation of pumps in the system and Source of commands



- It configures the address of each pump in the Symbinet communication.
- It configures the time for swapping master automatically.
- Source of commands at Local and Remote modes to the VFD.

Master/Slave Pump - Step 3 of 26

Activation of Pumps in the SymbiNet Network

☒ P0768: Enable Pump 1 Address
☒ P0772: Enable Pump 2 Address
☒ P0776: Enable Pump 3 Address
P1021: Automatic Change Time
2 s

☒ P0780: Enable Pump 4 Address
☒ P0784: Enable Pump 5 Address
☒ P0788: Enable Pump 6 Address
P0796: Highest Allowed Address
6

Reference Commands

P0220: Local/Remote Selection
12 = SoftPLC REMOTE

P0221: Speed Reference at Local
0 = HMI

P0223: Forward/Reverse at Local
2 = Forward/Reverse Key (FWD)

P0224: Run/Stop at Local
0 = Keys I/O

P0225: JOG at Local
0 = Disabled

P0222: Speed Reference at Remote
12 = SoftPLC

P0226: Forward/Reverse at Remote
0 = Forward

P0227: Run/Stop at Remote
5 = SoftPLC

P0228: JOG at Remote
0 = Disabled

It defines the SymbiNet network address of the pump that will send registers, i.e., enable the pump 1 in the SymbiNet Protocol.

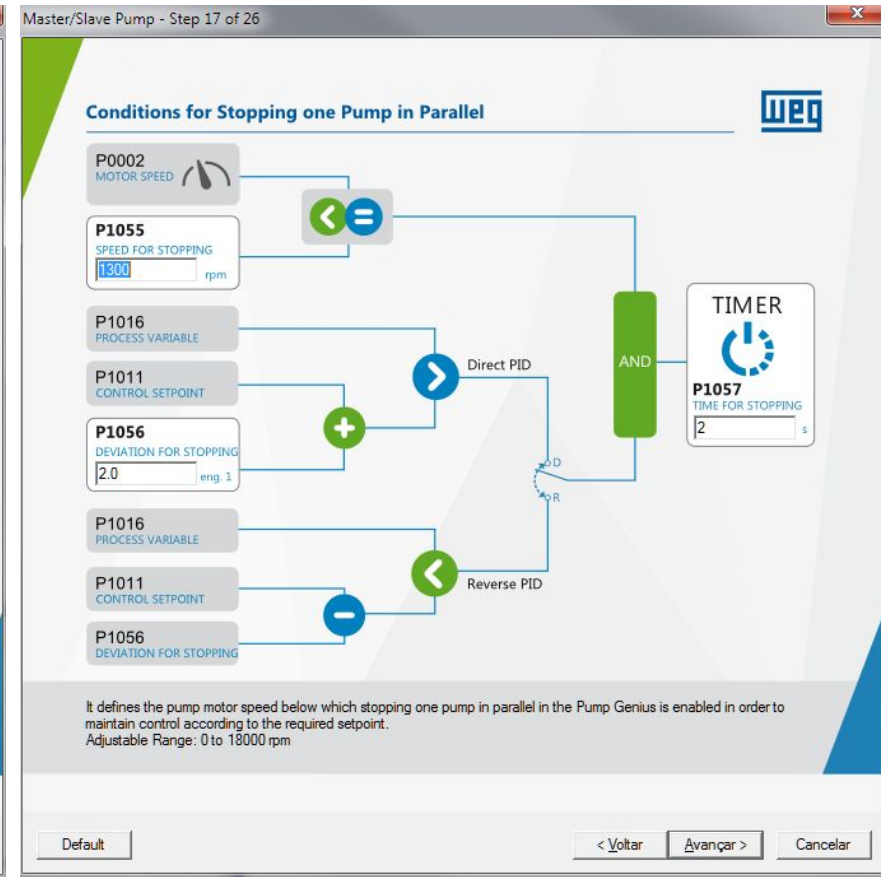
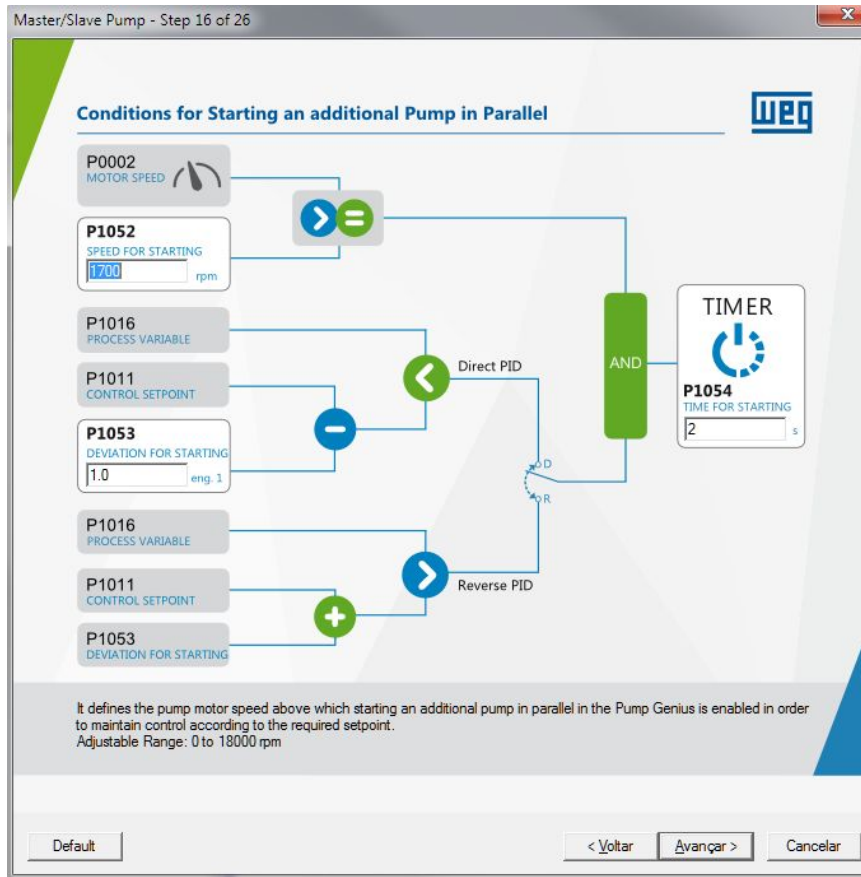
Default < Voltar Avançar > Cancelar

Master Pump Swapping

- In case there is a communication loss with the pump configured as Master a message(A758) will come on the keypad “Change Master Pump? Y(Yes)/N(No)”. For the pumps configured as Slave a message(A762) will come on the keypad “loss of master”.
- The master swapping can be setup to happen through the HMI or automatically based on the time defined by P1021.
- When a command for swapping master is recognized a reset is generated and a routine of acknowledgment of the Symbinet communication is performed(A764).
- Based on the priority pump 1> pump 2> pump 3> pump 4> pump 5> pump 6) a verification for another pump to become the master is performed. Only pumps programmed as master/slave(P1020=0) and that have the Analog Input setup to be process variable can be nominated master.

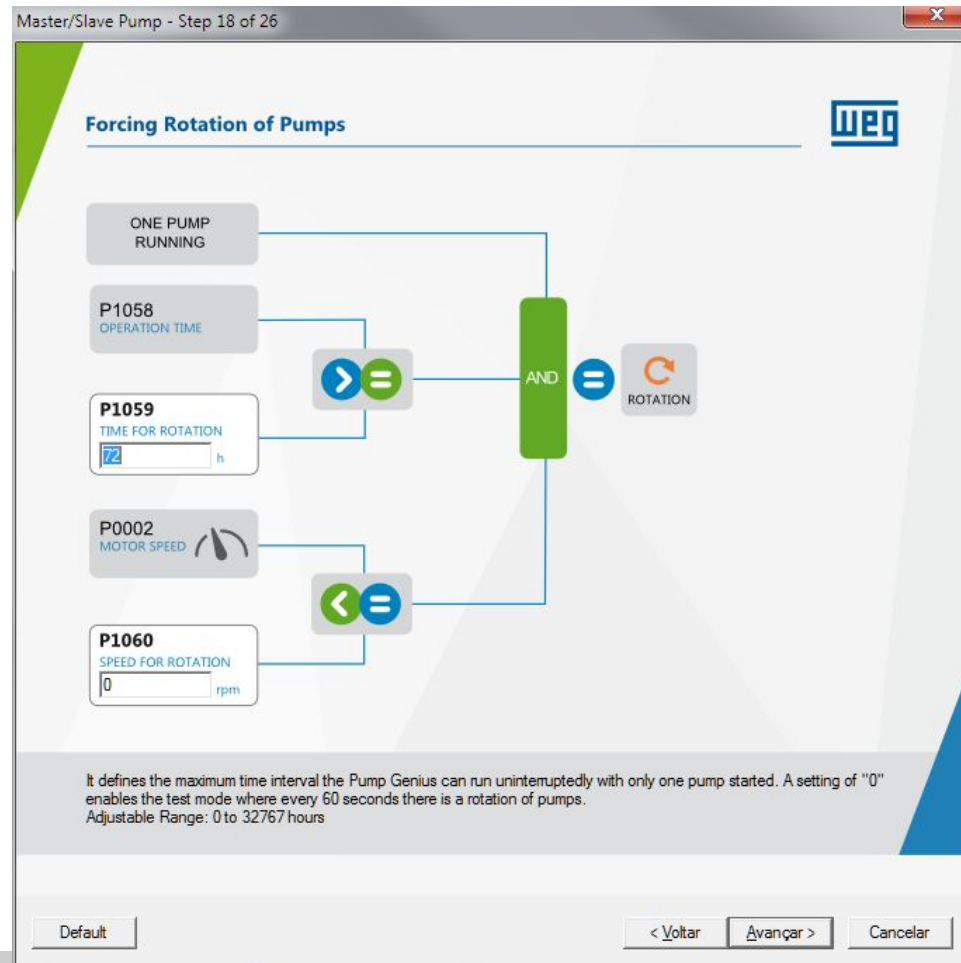
Turn on/off Paralell Pumps

- Conditions to turn the paralell pump on and off.



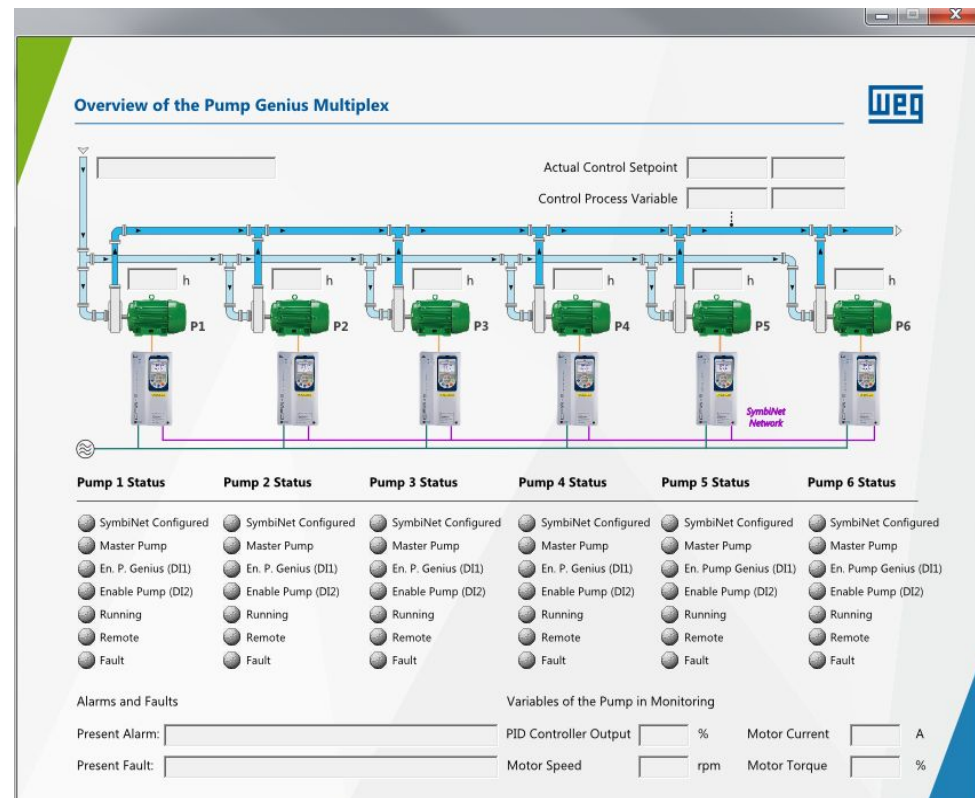
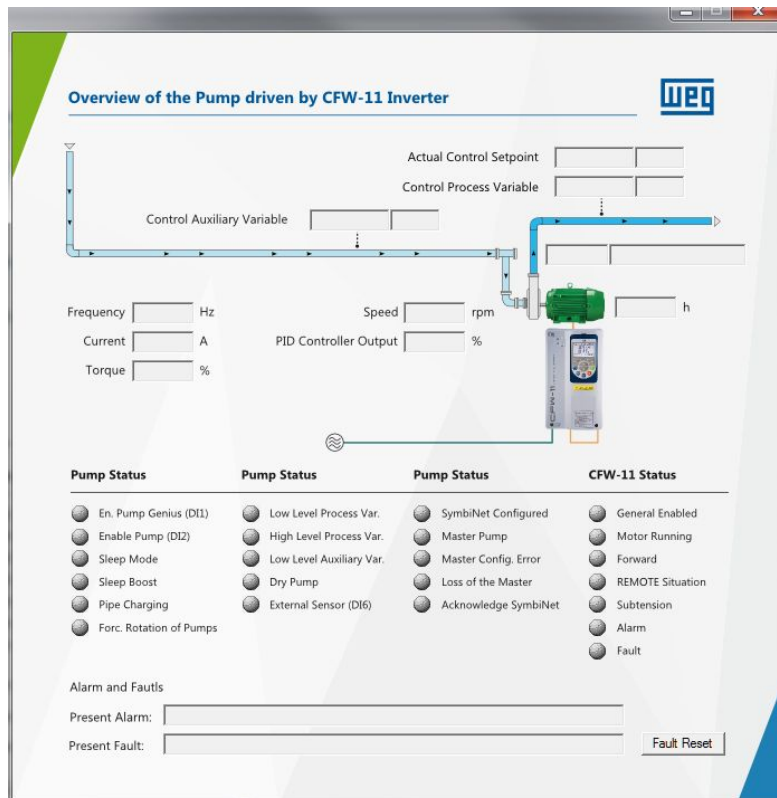
Force Rotation of Pumps

- It configures the conditions to force rotation of the pumps. All the pumps are turned off and the one that has run the least is started.

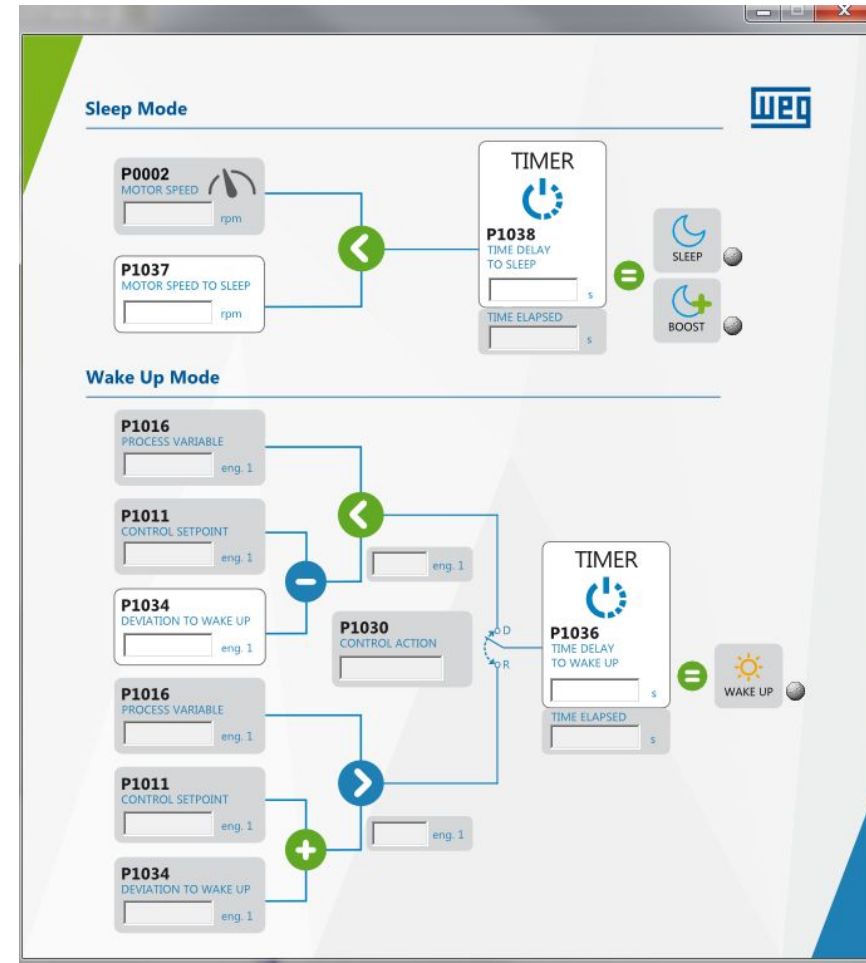
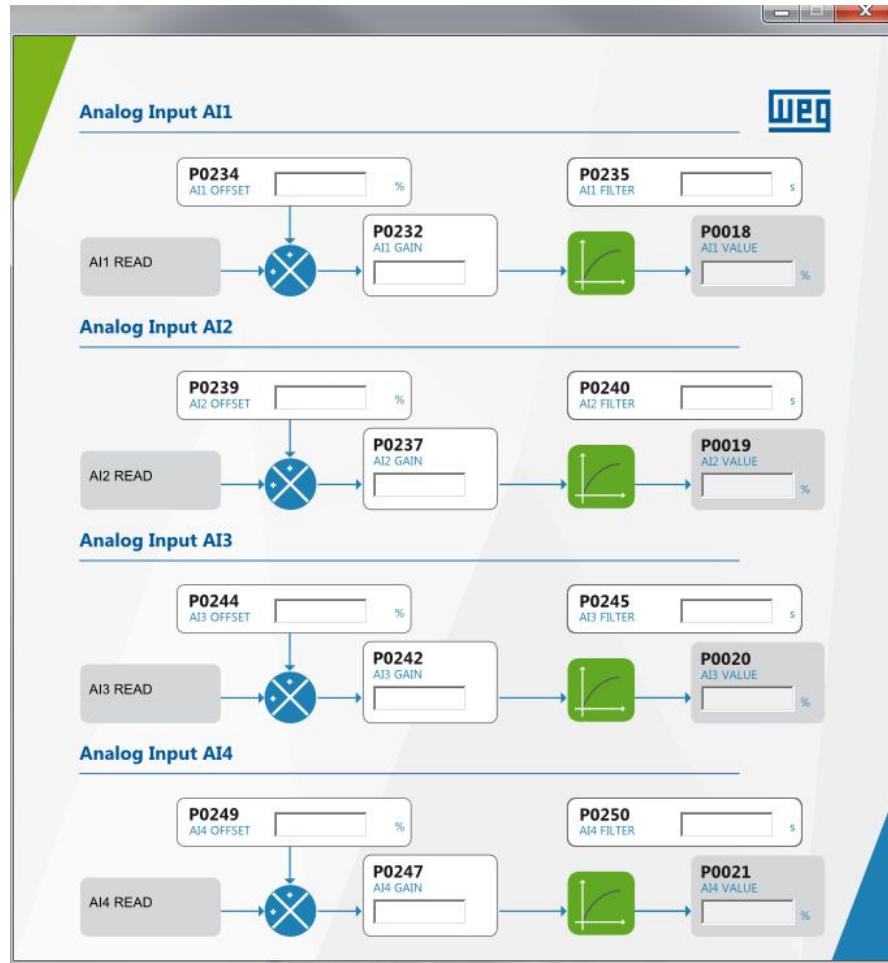


Monitoring Window

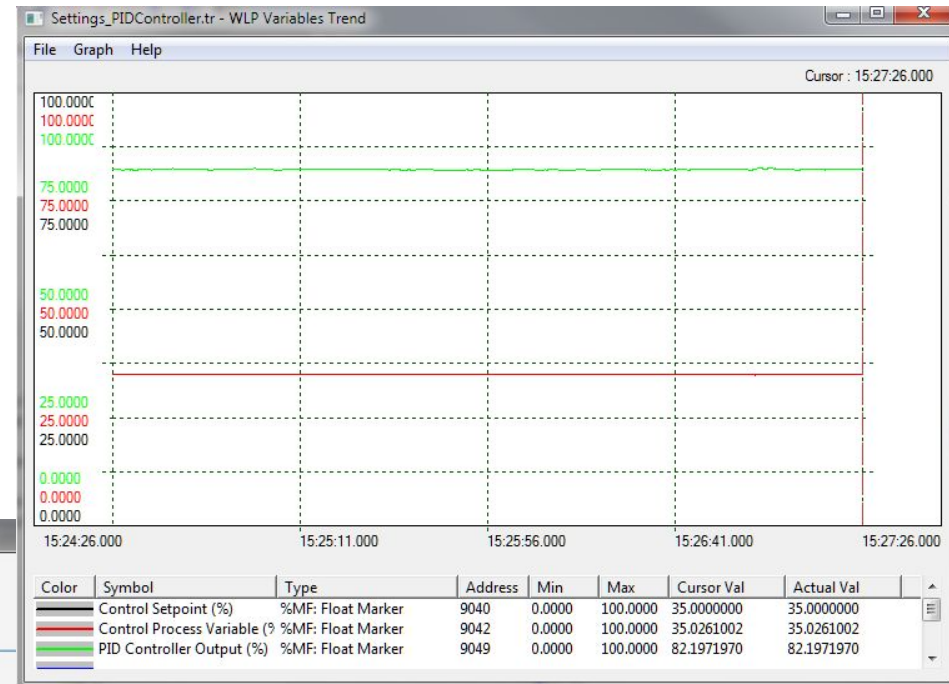
- It guides the user during the commissioning bringing to the screen the most important control variables, status of the system as well as on-line operation.



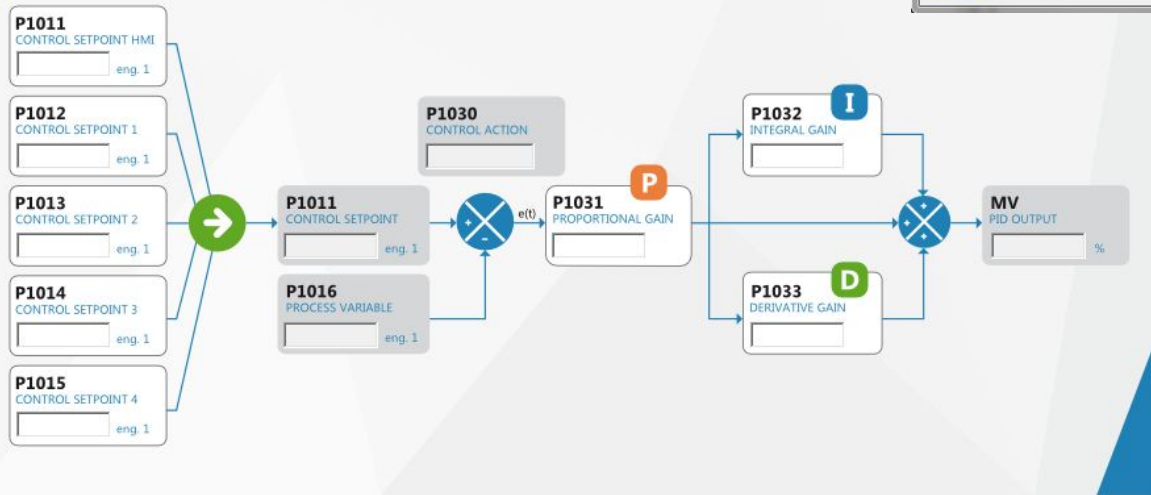
Monitoring Window



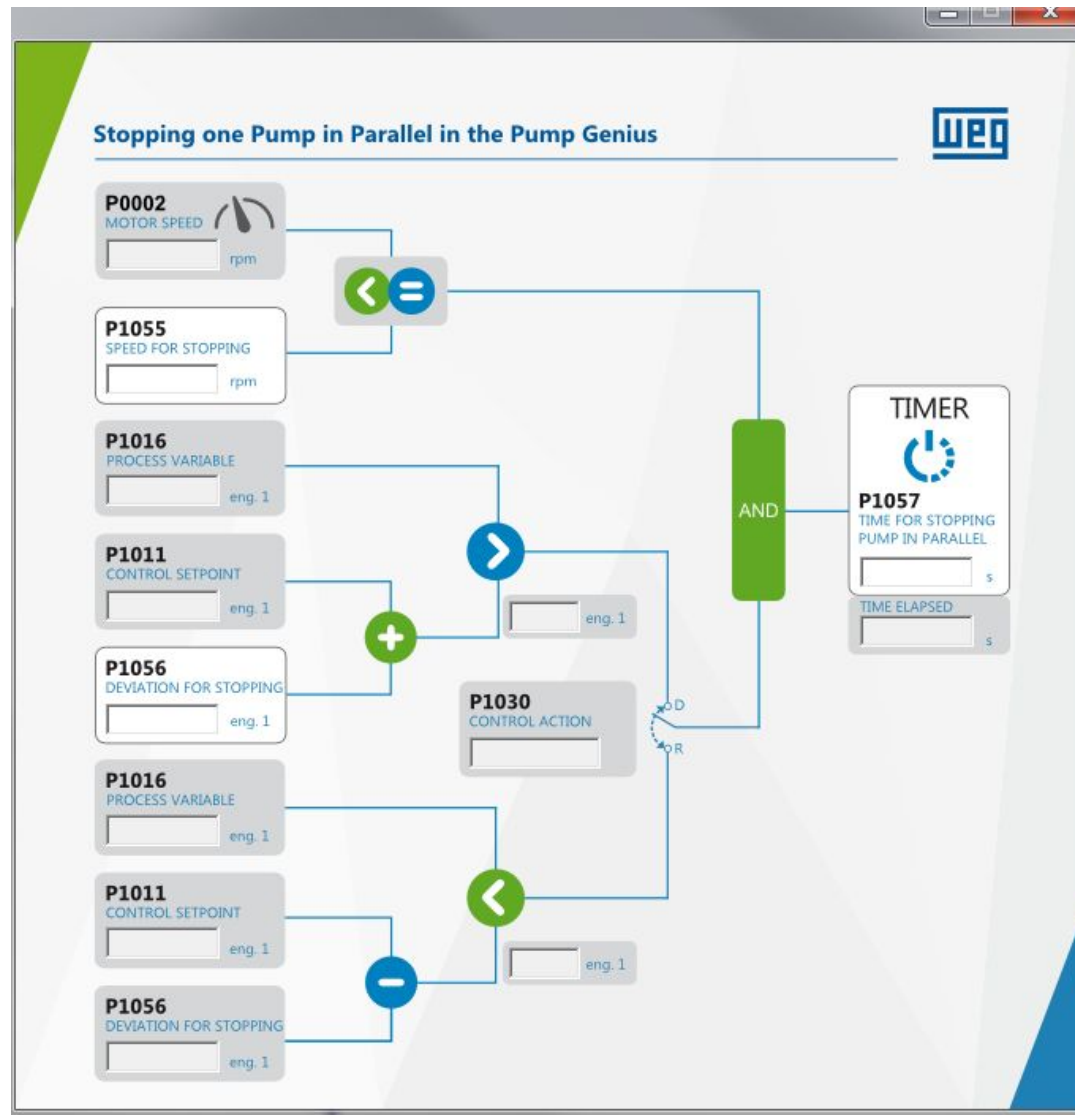
Monitoring Window



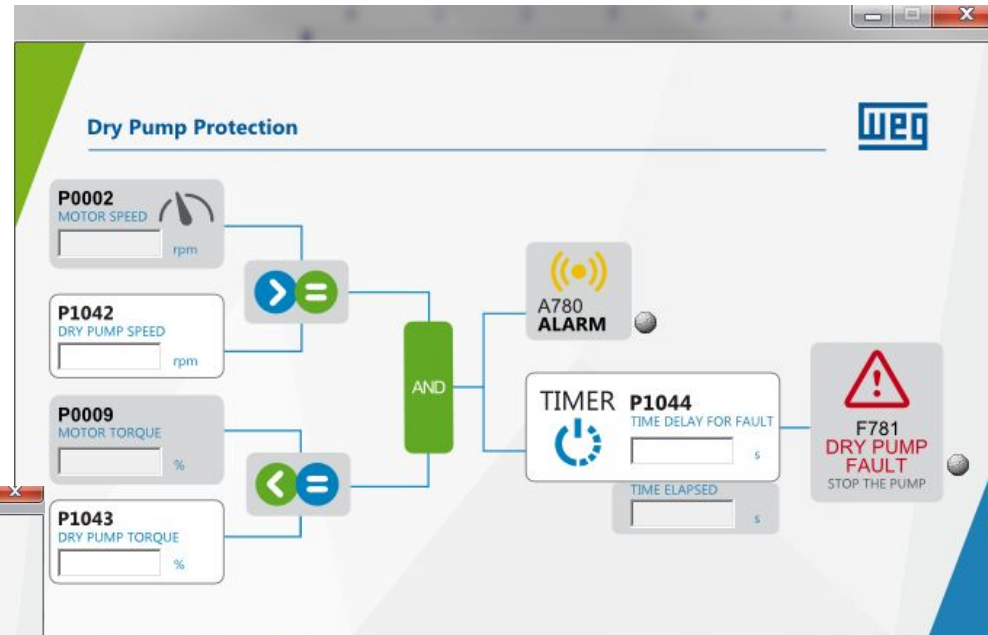
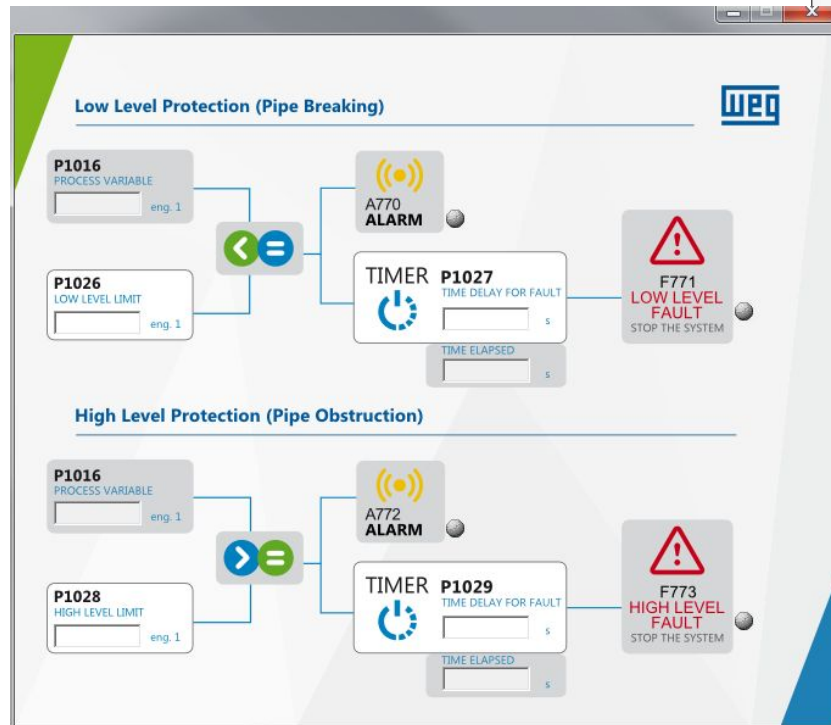
Pump Genius PID Controller



Monitoring Window

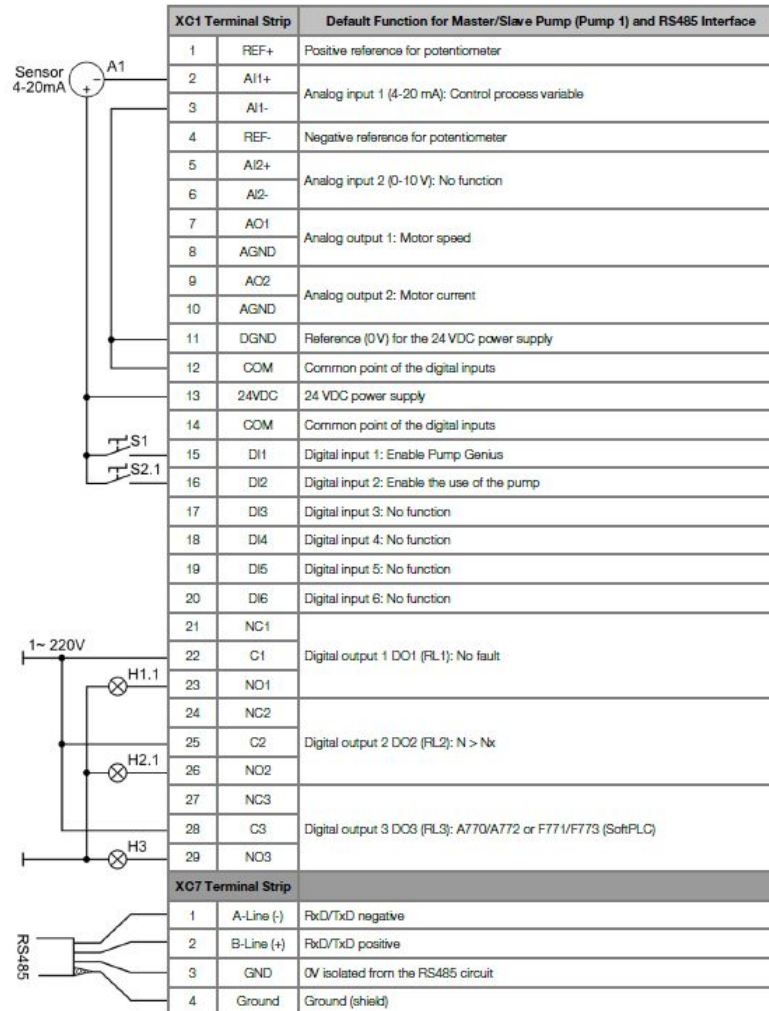


Monitoring Window

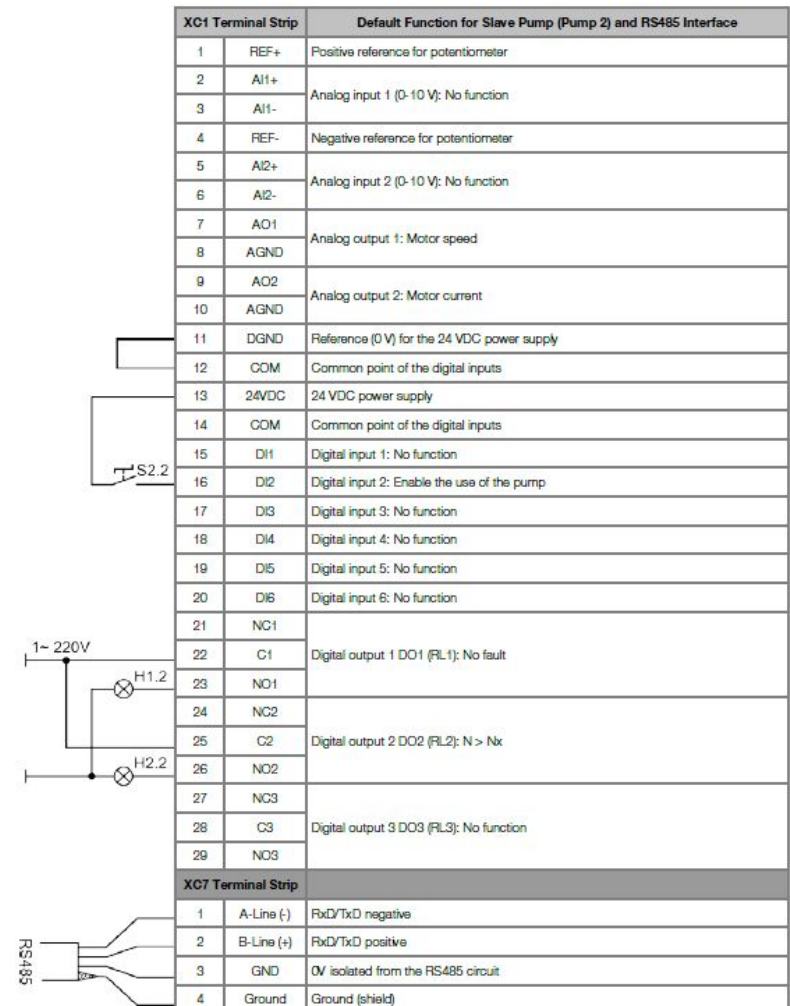


System Operation – One Master one Slave

■ Control Schematic for Master



■ Control Schematic for Slave



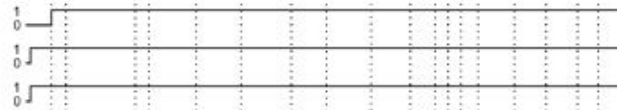
System Operation – One Master one Slave

COMMANDS - DIGITAL INPUTS

S1- Enable Pump Genius

S2.1 - Enable Pump 1

S2.2 - Enable Pump 2



COMMANDS - SYMBINET NETWORK

Start Pump 1

Start Pump 2



SPEED OF PUMP 1 (rpm)

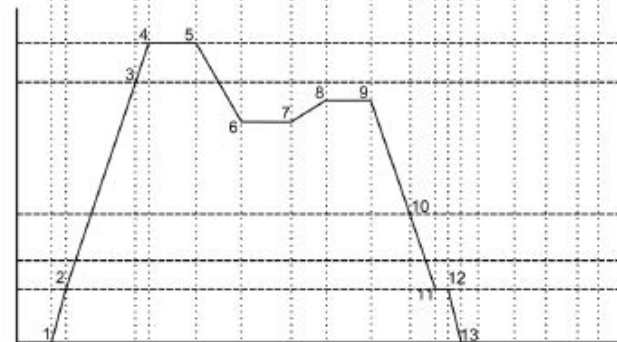
P0134 - Maximum Speed Reference

P1052 - Pump Motor Speed for Starting an additional Pump in Parallel

P1055 - Pump Motor Speed for Stopping one Pump in Parallel

IP1037 - Pump Motor Speed below which Pump Genius goes to Sleep

P0133 - Minimum Speed Reference



SPEED OF PUMP 2 (rpm)

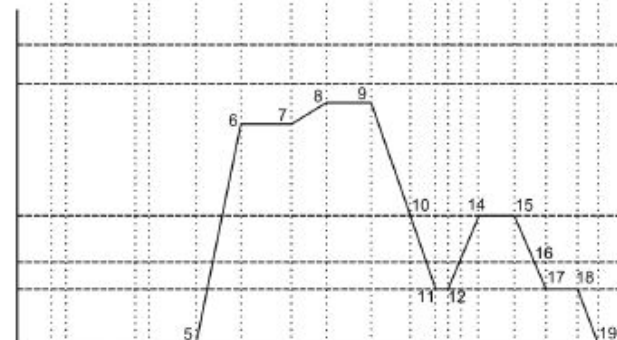
P0134 - Maximum Speed Reference

P1052 - Pump Motor Speed for Starting an additional Pump in Parallel

P1055 - Pump Motor Speed for Stopping one Pump in Parallel

IP1037 - Pump Motor Speed below which Pump Genius goes to Sleep

P0133 - Minimum Speed Reference



System Operation – One Master Two Slaves

■ Control Schematic for Master

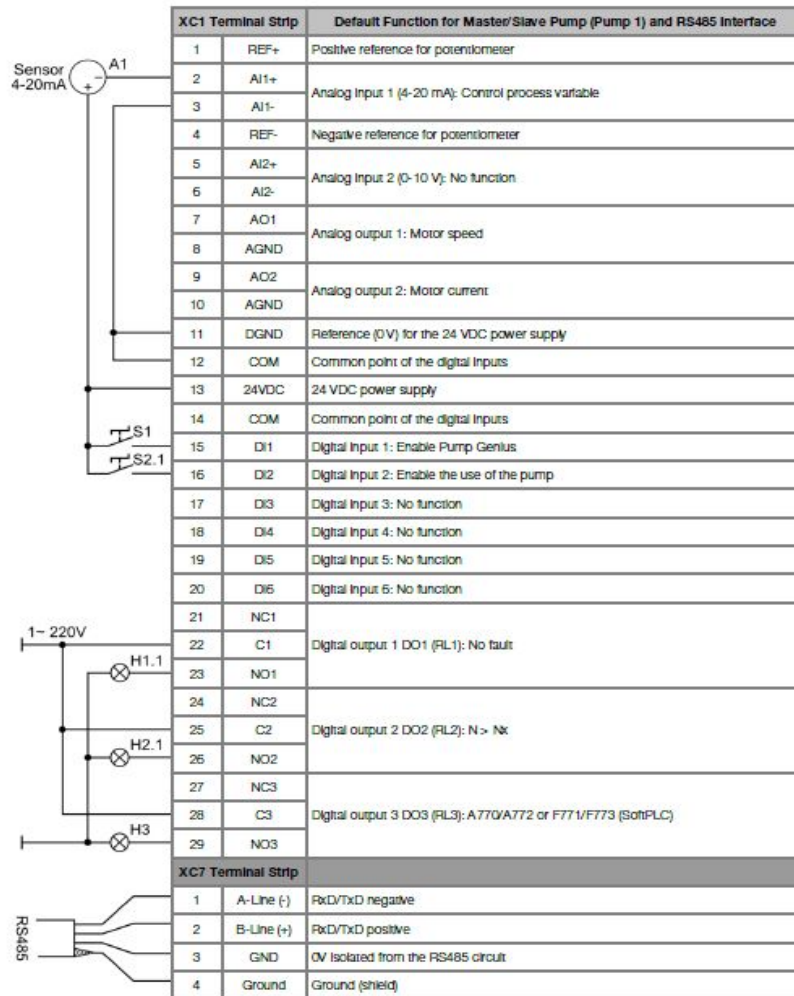
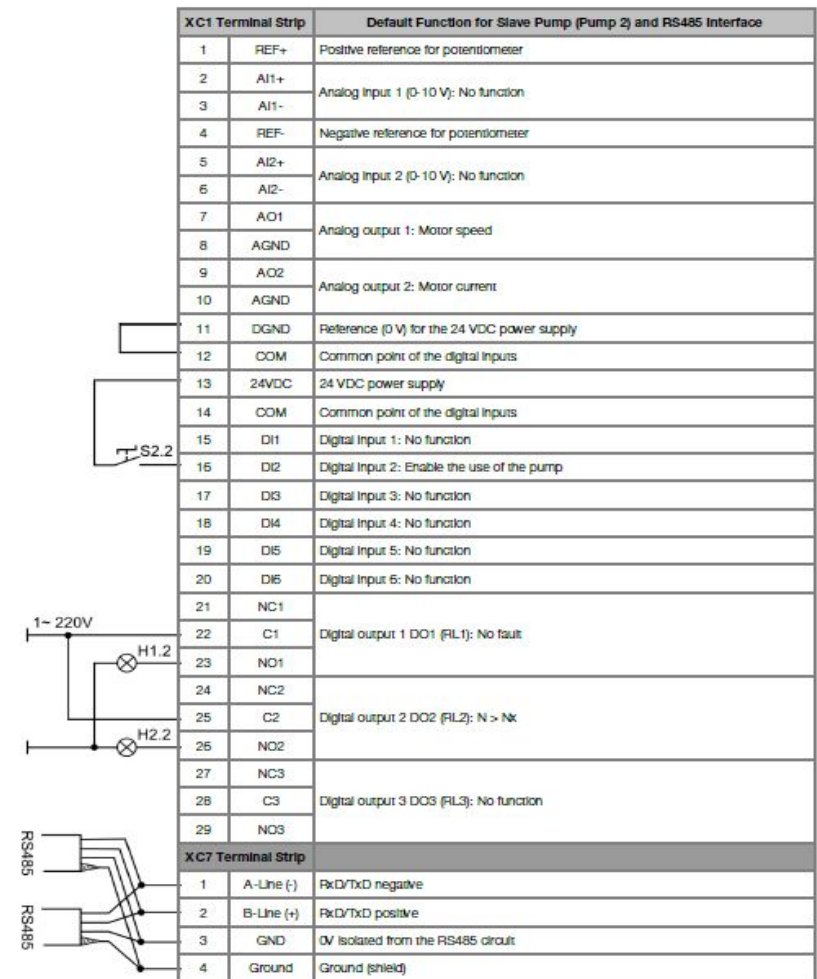


Figure 2.8 – Terminal strip XC1 and XC7 for master/slave pump (Pump 1) and RS485 interface

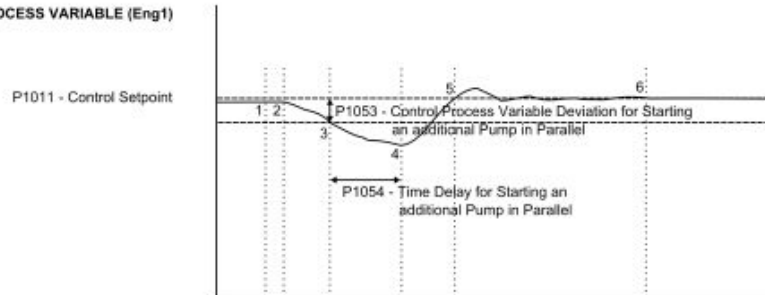
■ Control Schematic for Slaves



System Operation – One Master Two Slaves

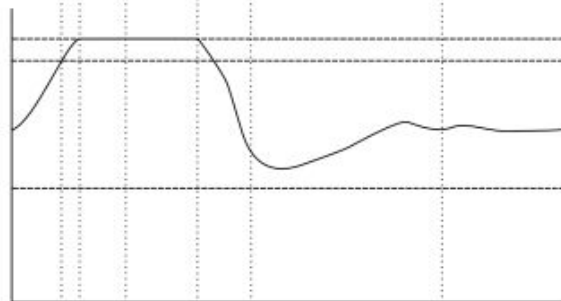
Starting the Pumps

CONTROL PROCESS VARIABLE (Eng1)



SPEED OF PUMP (rpm)

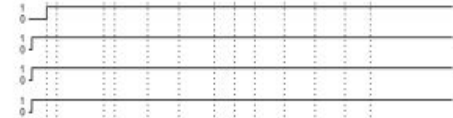
P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel



P0133 - Minimum Speed Reference

COMMANDS - DIGITAL INPUTS

S1 - Enable Pump Genius
S2.1 - Enable Pump 1
S2.2 - Enable Pump 2
S2.3 - Enable Pump 3



COMMANDS - SYMBINET NETWORK

Start Pump 1
Start Pump 2
Start Pump 3



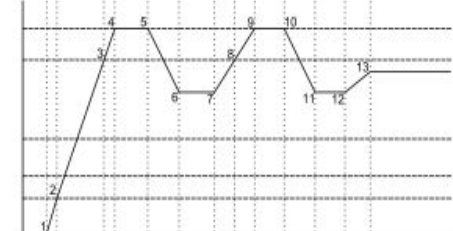
SPEED OF PUMP 1 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



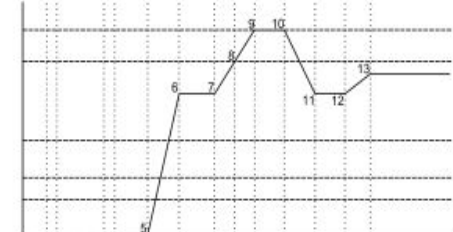
SPEED OF PUMP 2 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



SPEED OF PUMP 3 (rpm)

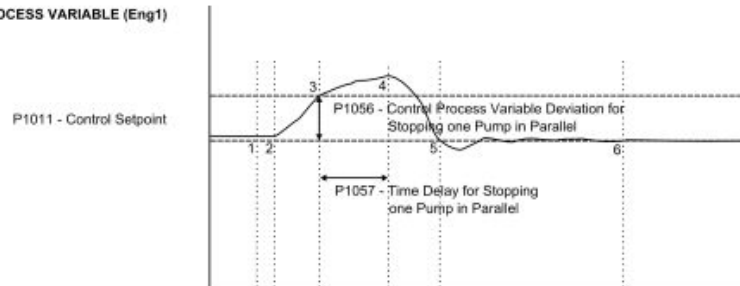
P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



System Operation – One Master Two Slaves

■ Stopping the Pumps

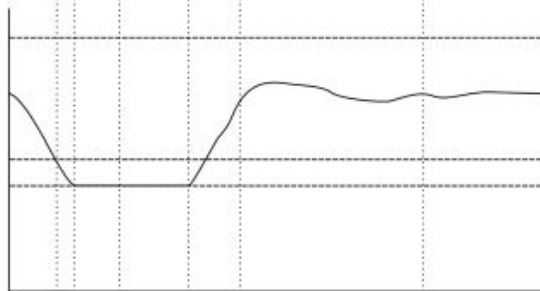
CONTROL PROCESS VARIABLE (Eng1)



SPEED OF PUMPS (rpm)

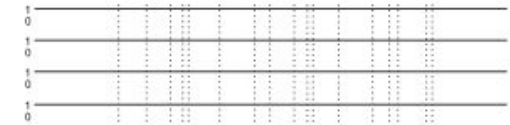
P0134 - Maximum Speed Reference

P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P0133 - Minimum Speed Reference



COMMANDS - DIGITAL INPUTS

S1 - Enable Pump Genius
S2.1 - Enable Pump 1
S2.2 - Enable Pump 2
S2.3 - Enable Pump 3



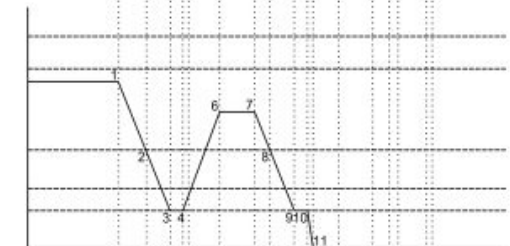
COMMANDS - SYMBINET NETWORK

Start Pump 1
Start Pump 2
Start Pump 3



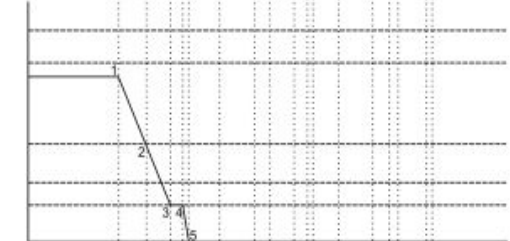
SPEED OF PUMP 1 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



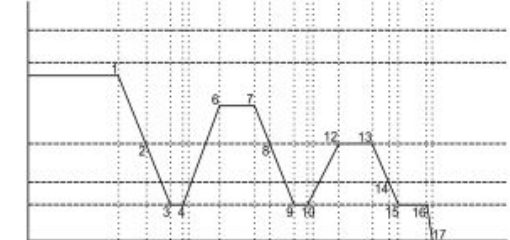
SPEED OF PUMP 2 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



SPEED OF PUMP 3 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



System Operation – Two Masters Two Slaves

■ Control Schematic for Masters

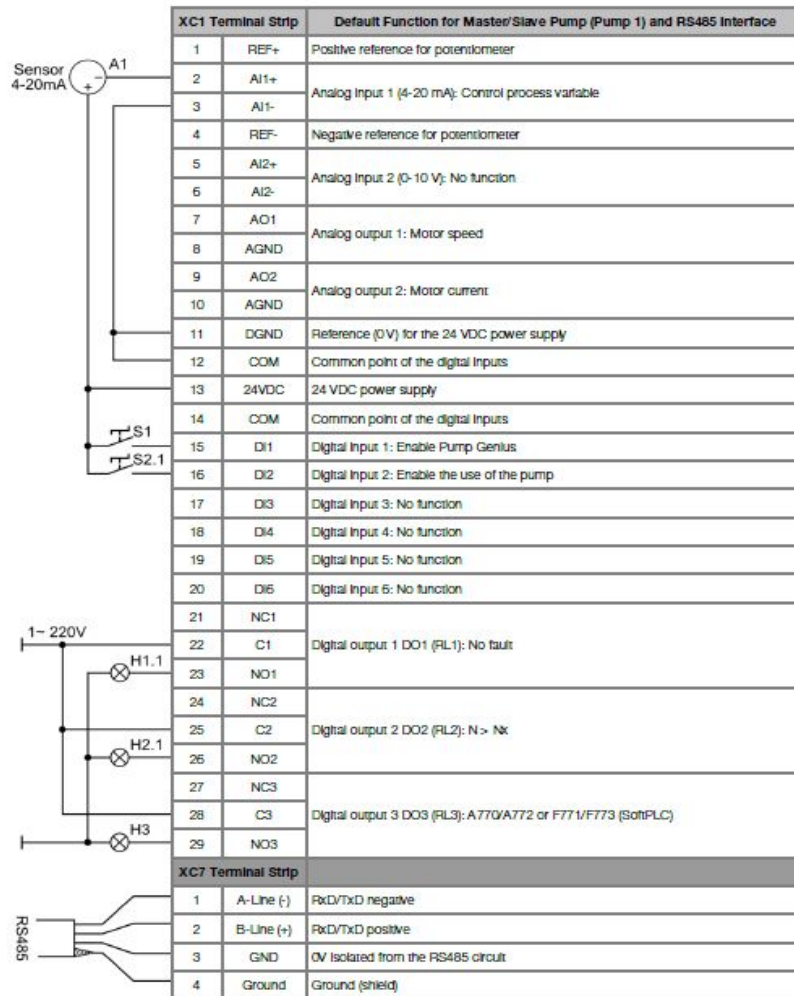
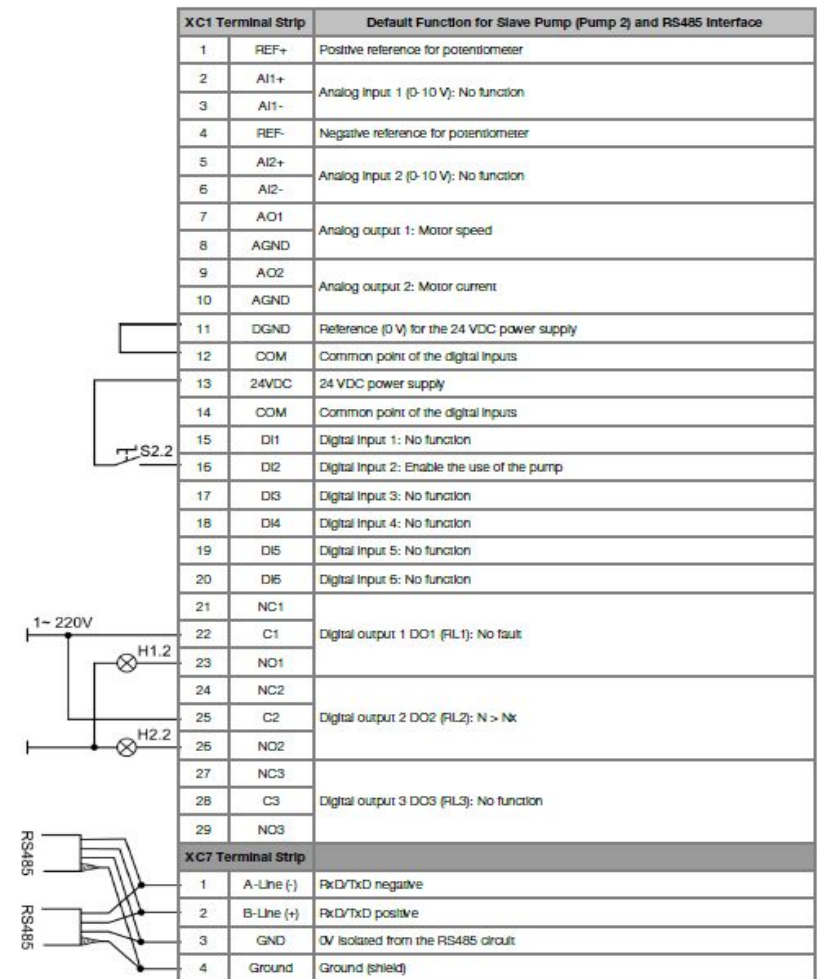


Figure 2.8 – Terminal strip XC1 and XC7 for master/slave pump (Pump 1) and RS485 interface

■ Control Schematic for Slaves

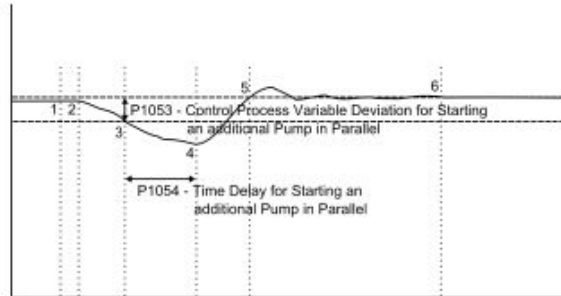


System Operation – Two Masters Two Slaves

Starting the Pumps

CONTROL PROCESS VARIABLE (Eng1)

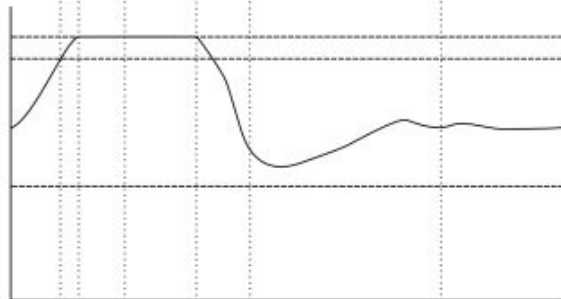
P1011 - Control Setpoint



SPEED OF PUMP (rpm)

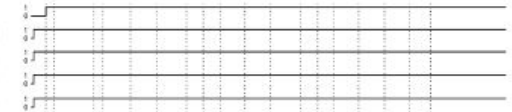
P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting
an additional Pump in Parallel

P0133 - Minimum Speed Reference



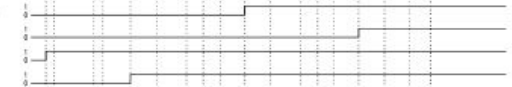
COMMANDS - DIGITAL INPUTS

S1 - Enable Pump Genius
S2.1 - Enable Pump 1
S2.2 - Enable Pump 2
S2.3 - Enable Pump 3
S2.4 - Enable Pump 4



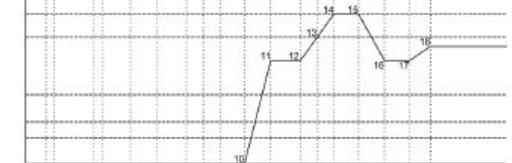
COMMANDS - SYMBINET NETWORK

Start Pump 1
Start Pump 2
Start Pump 3
Start Pump 4



SPEED OF PUMP 1 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting
an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping
one Pump in Parallel
P1037 - Pump Motor Speed below which
Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



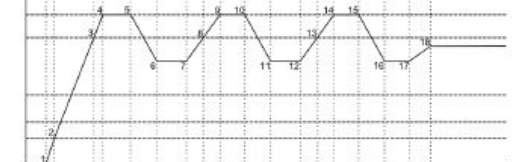
SPEED OF PUMP 2 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting
an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping
one Pump in Parallel
P1037 - Pump Motor Speed below which
Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



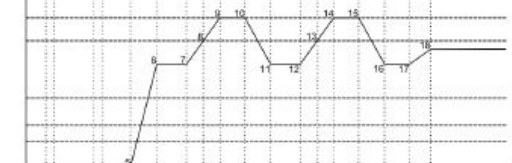
SPEED OF PUMP 3 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting
an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping
one Pump in Parallel
P1037 - Pump Motor Speed below which
Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



SPEED OF PUMP 4 (rpm)

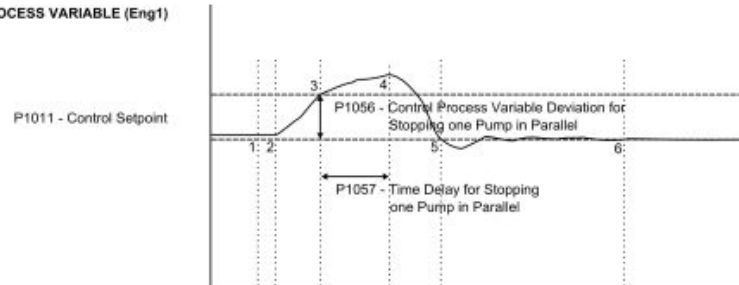
P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting
an additional Pump in Parallel
P1055 - Pump Motor Speed for Stopping
one Pump in Parallel
P1037 - Pump Motor Speed below which
Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



System Operation – Two Masters Two Slaves

■ Stopping the Pumps

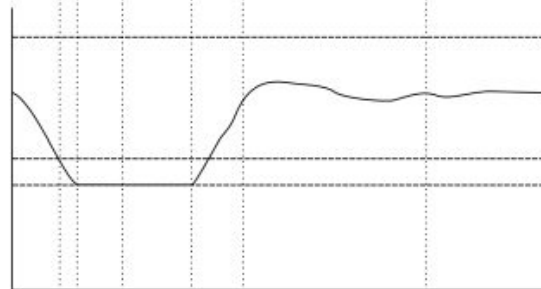
CONTROL PROCESS VARIABLE (Eng1)



SPEED OF PUMPS (rpm)

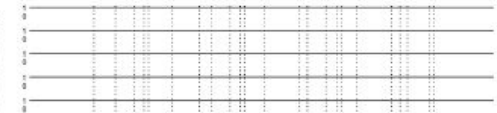
P0134 - Maximum Speed Reference

P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P0133 - Minimum Speed Reference



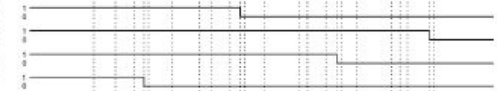
COMMANDS - DIGITAL INPUTS

S1 - Enable Pump Genius
S2.1 - Enable Pump 1
S2.2 - Enable Pump 2
S2.3 - Enable Pump 3
S2.4 - Enable Pump 4



COMMANDS - SYMBINET NETWORK

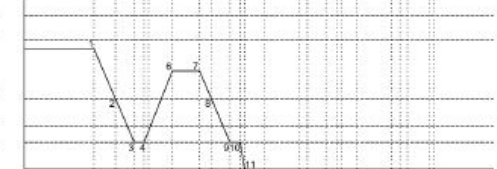
Start Pump 1
Start Pump 2
Start Pump 3
Start Pump 4



SPEED OF PUMP 1 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel

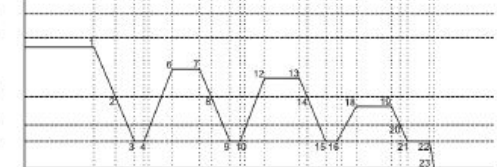
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



SPEED OF PUMP 2 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel

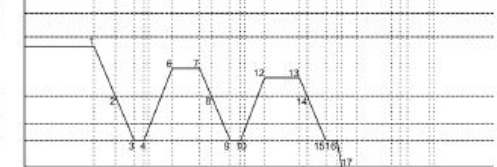
P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



SPEED OF PUMP 3 (rpm)

P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel

P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference



SPEED OF PUMP 4 (rpm)

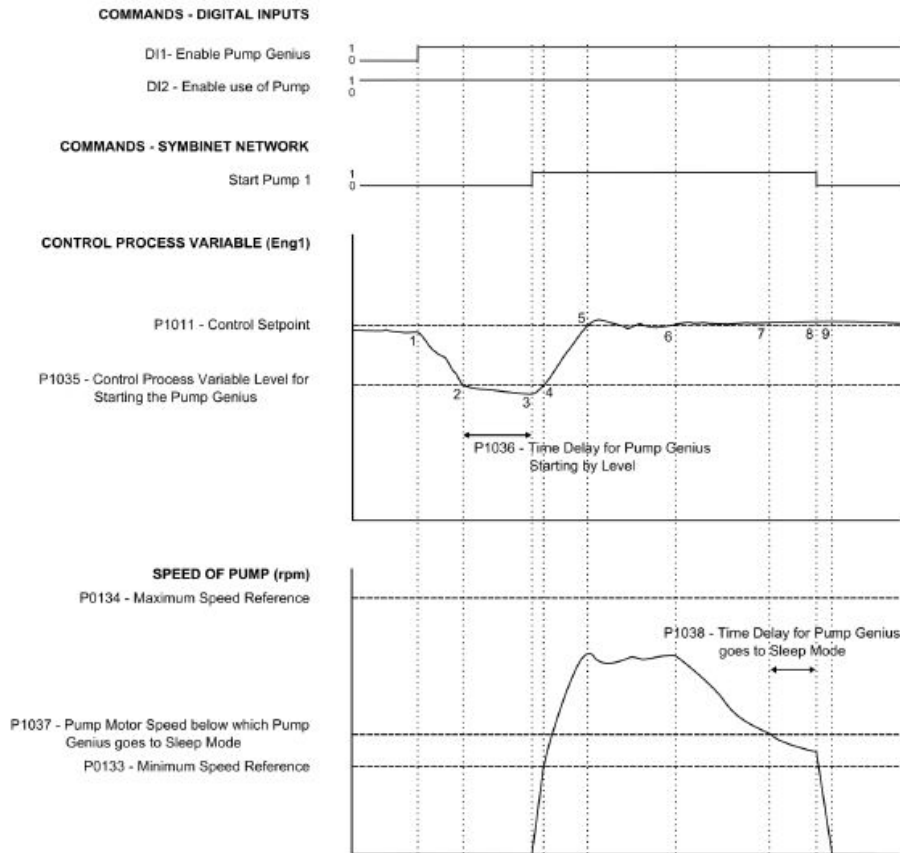
P0134 - Maximum Speed Reference
P1052 - Pump Motor Speed for Starting an additional Pump in Parallel

P1055 - Pump Motor Speed for Stopping one Pump in Parallel
P1037 - Pump Motor Speed below which Pump Genius goes to Sleep
P0133 - Minimum Speed Reference

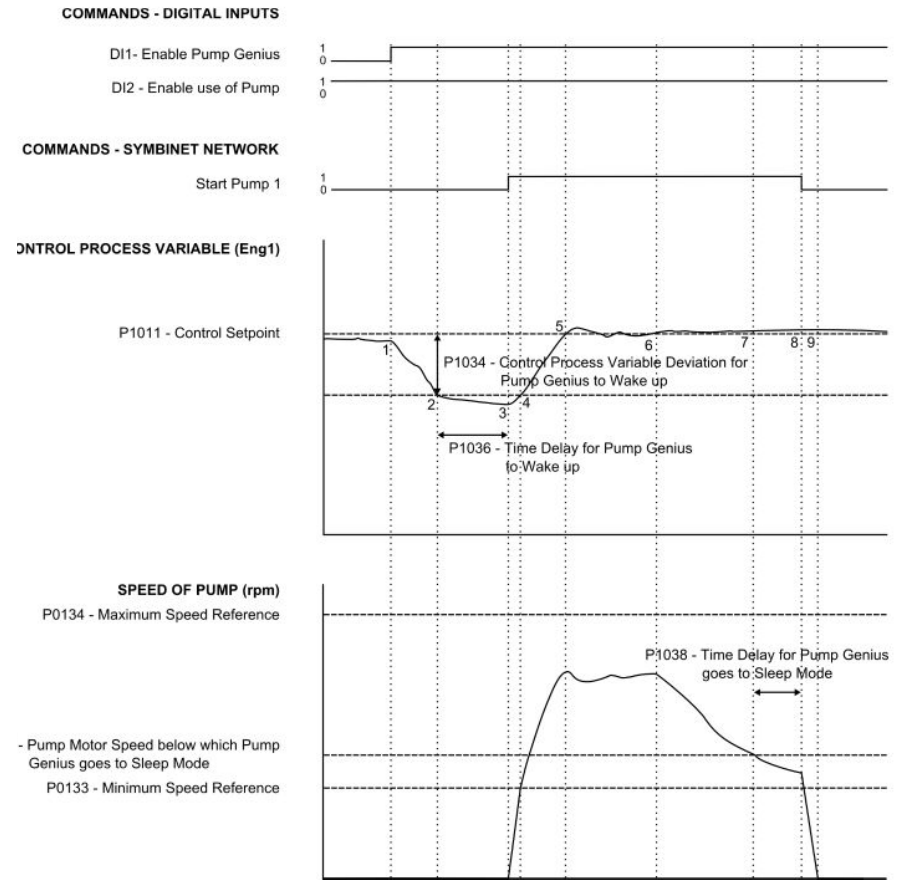


System Operation – Sleep/Wake-up Modes

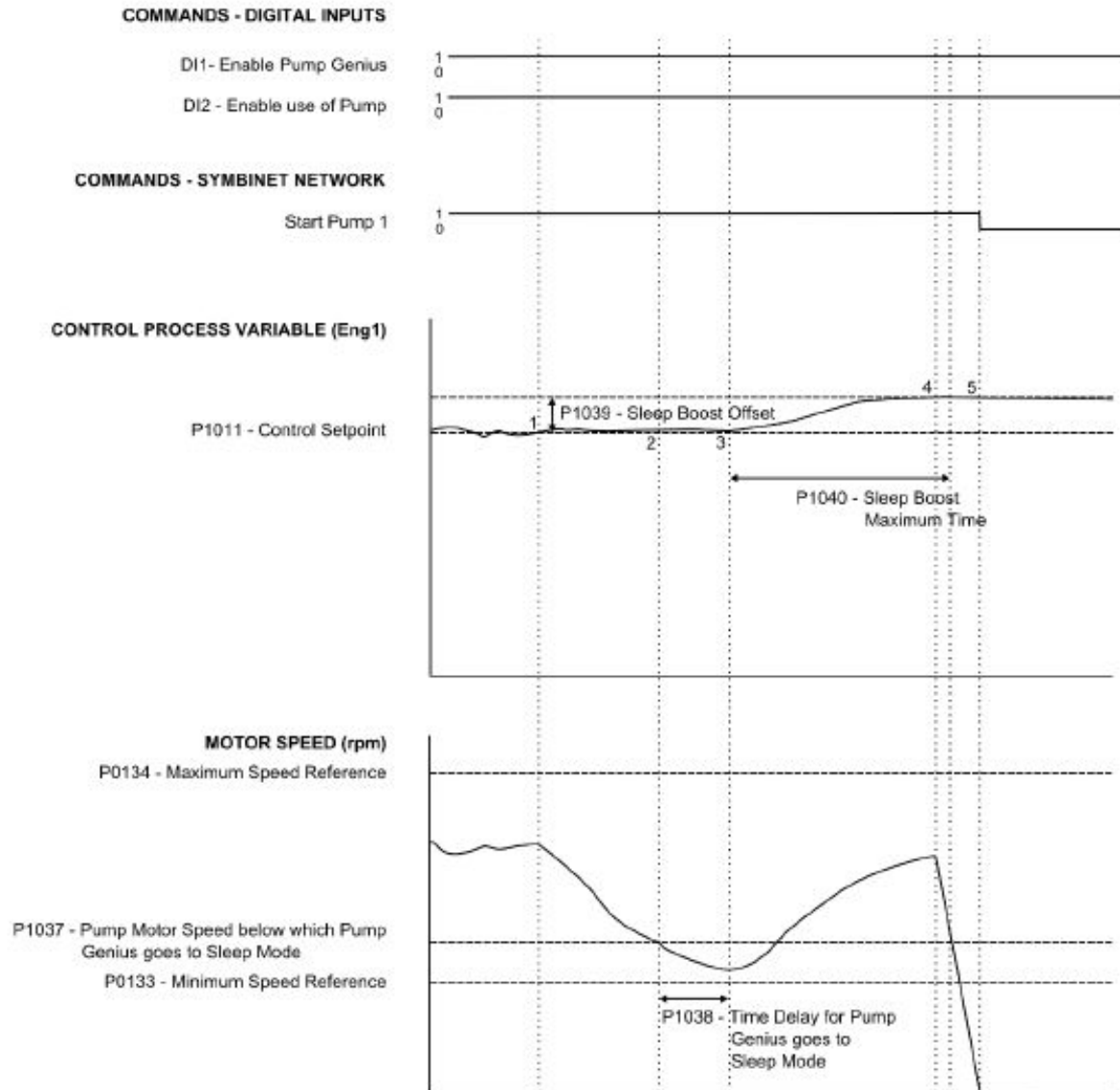
■ Start by Level and Sleep mode



■ Wake-up and Sleep mode



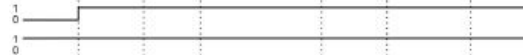
System Operation – Sleep mode w/ Sleep boost enabled



System Operation – PID Control

COMMANDS - DIGITAL INPUTS

DI1- Enable Pump Genius
DI2 - Enable use of Pump



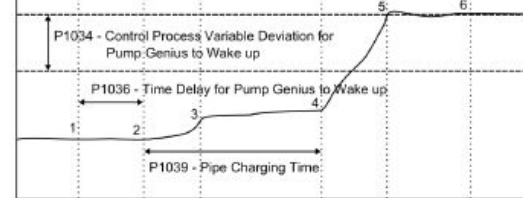
COMMANDS - SYMBINET NETWORK

Start Pump 1



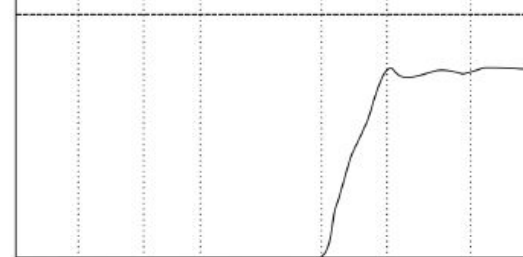
CONTROL PROCESS VARIABLE (Eng1)

P1011 - Control Setpoint



PID CONTROLLER OUTPUT (MV) (%)

100.0 %



SPEED OF PUMP (rpm)

P0134 - Maximum Speed Reference

P1037 - Pump Motor Speed below which Pump Genius goes to Sleep Mode

P0133 - Minimum Speed Reference

