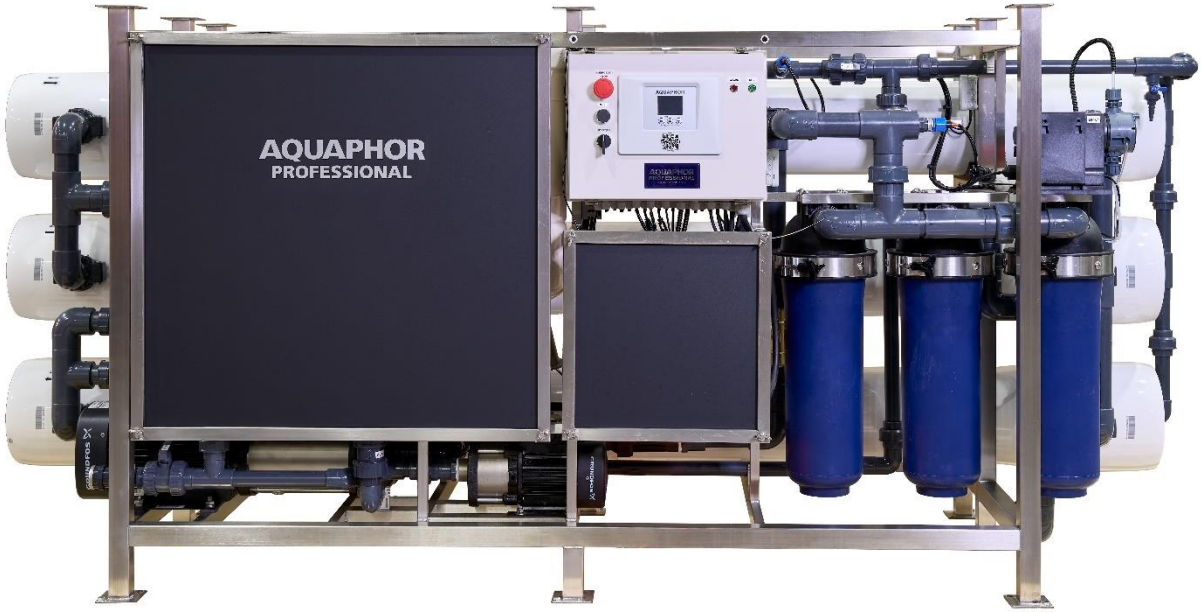
AQUAPHOR
PROFESSIONAL

APRO 3000/4000/6000 LPH HP

MANUAL



Document	Original operation manual
Ident. No.	JOB No.: 2202-2022
Revision	02
Date	20.01.2023
Postal address	Aquaphor International Kadastiku 33a 21004 Narva Estonia
Factory & office	Aquaphor Kadastiku 33a 21004 Narva Estonia
Telephone	+3723562204
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Technical modification	Revision No 2

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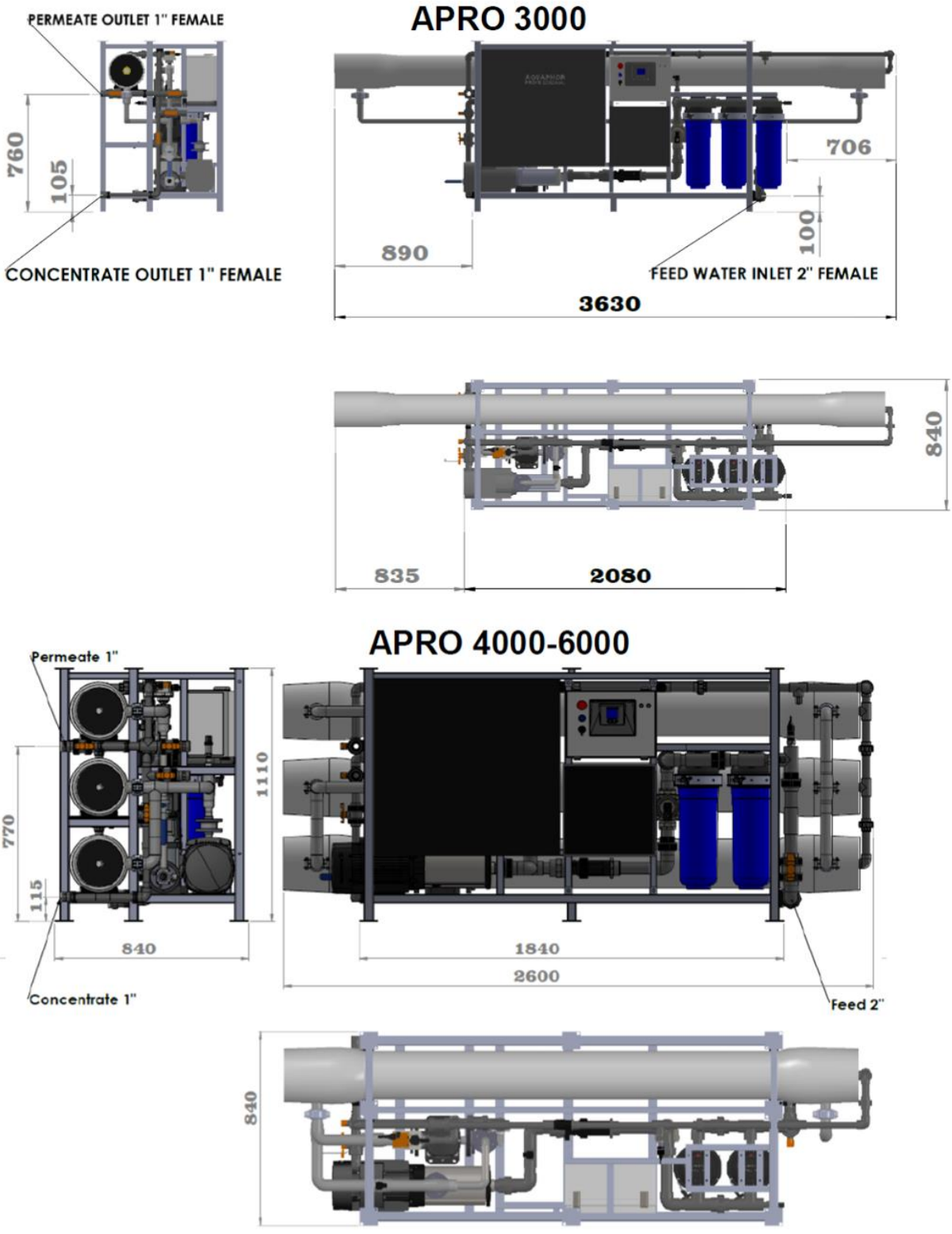
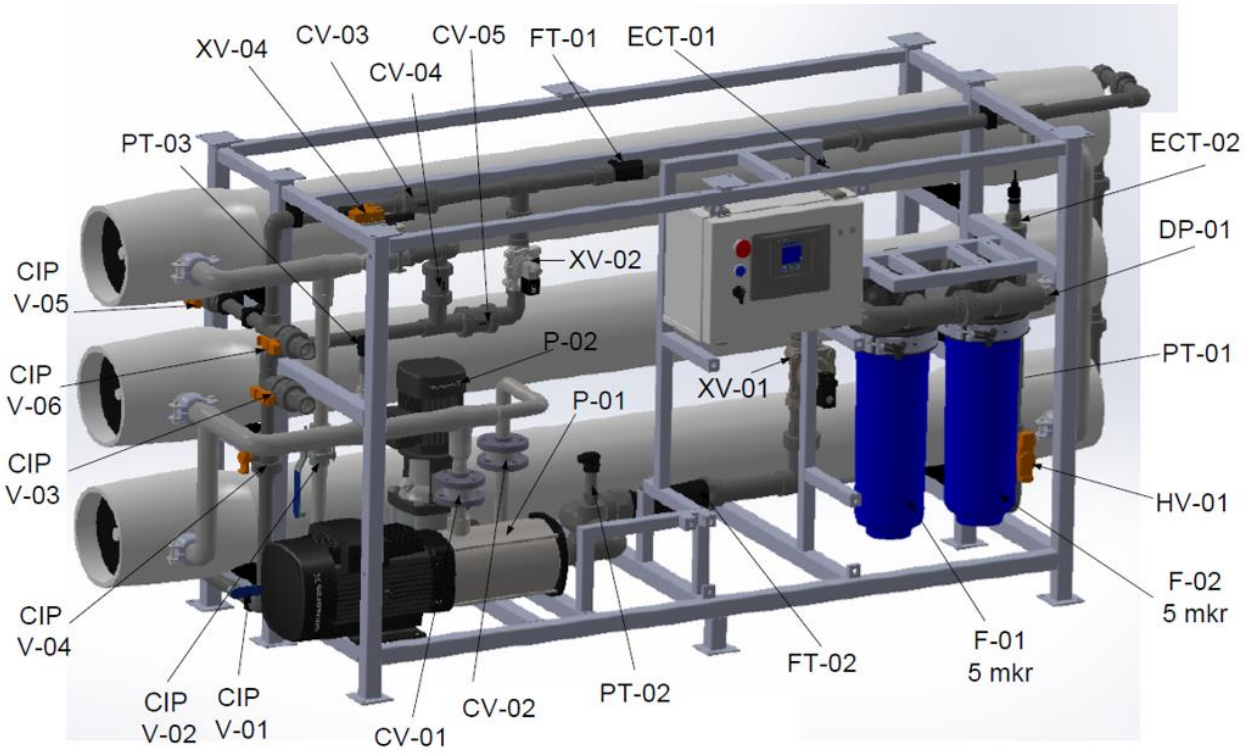
1. System Overview

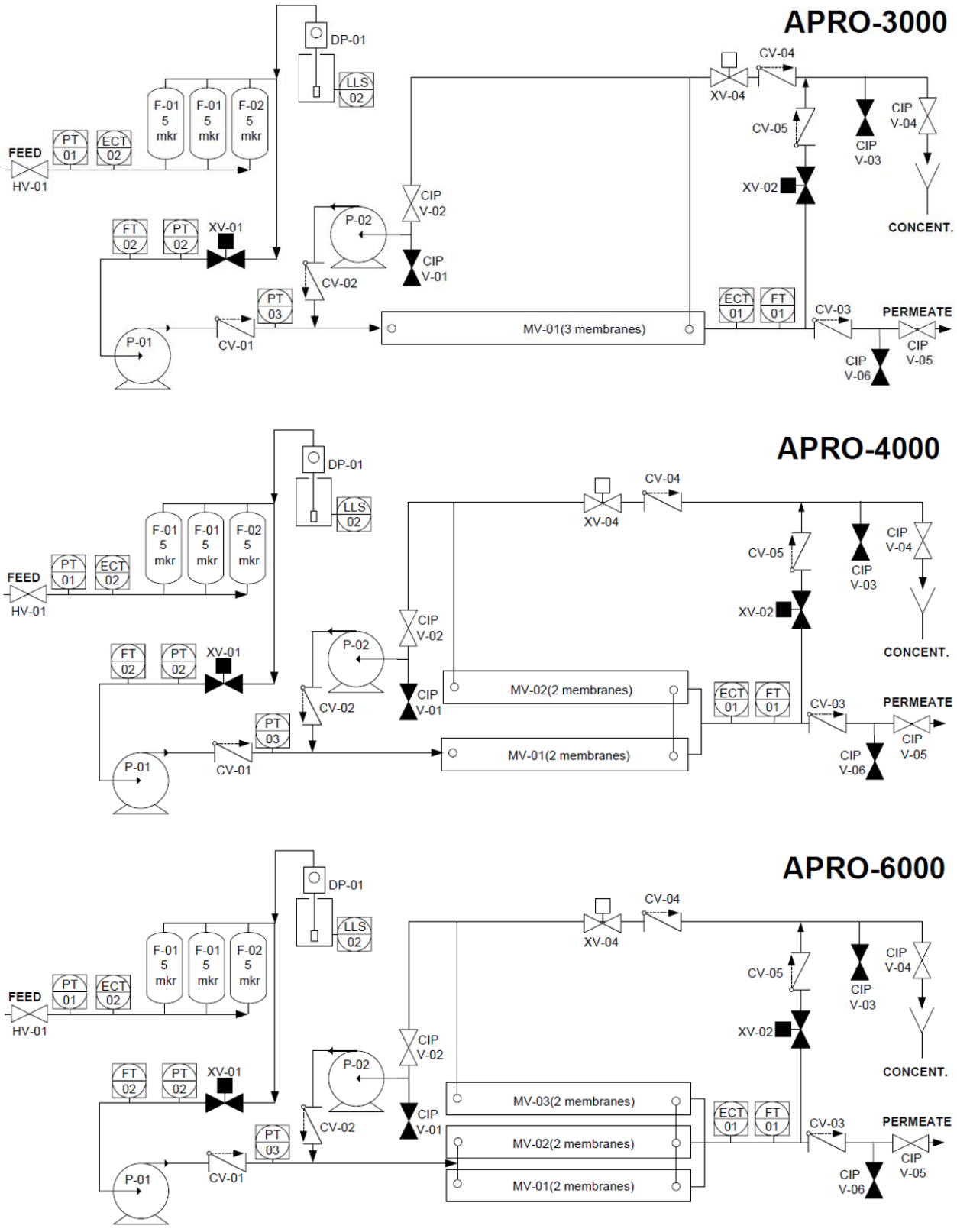
1.1. System's dimensions



1.2. System's equipment



1.3. Process scheme



1.4. Table of system's equipment

Tag	Name	Function
HV-01	Ball Valve	Ball Valve.
PT-01	Pressure Transmitter	Feed pressure transmitter.
ECT-02	Feed Conductivity sensor	Feed Conductivity probe.
F-01	Cartridge Filter Housing	Feed water filtration cartridge (5 mkr).
F-02	Cartridge Filter Housing	Feed water filtration cartridge (5 mkr).
DP-01	Dosing Pump	Dosing pump antiscalant. Doses feed water antiscalant.
LLS-02	Low level switch	Antiscalant low level switch. Protects DP-01 from dry running.
XV-01	Feed Valve	The valve for supplying feed water to the reverse osmosis system.
PT-02	Pressure Transmitter	Reverse osmosis feed pressure sensor.
FT-02	Flow Transmitter	Feed flow transmitter. Inlet water flow sensor.
P-01	Pressure Pump	Reverse osmosis pump. Builds up pressure and supply water to reverse osmosis membranes.
HV-02	Ball Valve	Ball valve.
CV-01	Check Valve	
PT-03	Pressure Transmitter	Reverse osmosis pump pressure sensor.
CV-02	Check Valve	
P-02	Recirculation Pump	Concentrate recirculation pump. Serves to recirculate concentrate through the osmotic membranes.
CIP V-01	CIP Valve	Ball valve
CIP V-02	CIP Valve	Ball valve
CIP V-03	CIP Valve	Ball valve
CIP V-04	CIP Valve	Ball valve
CV-03	Check Valve	Concentrate check valve.
XV-04	Concentrate Valve	Concentrate valve.
CT-01	Concentrate Tank	Serves for the accumulation of concentrate.
CV-04	Check Valve	Check and pack pressure valve.
CV-05	Check Valve	Permeate drainage check valve.
XV-02	Drainage Valve	First permeate drainage.
MV-01/03	Membrane Housing	2 membranes each.
CIP V-05	CIP Valve	Ball valve
CIP V-06	CIP Valve	Ball valve
ECT-01	Permeate conductivity sensor	Reverse osmosis permeate conductivity probe.
FT-01	Permeate flow sensor	Permeate flow transmitter.
CV-06	Check Valve	Permeate supply check valve.
XV-05	Flushing valve	Stand-by permeate membrane flushing valve.
HPT-01	High pressure transmitter	RO high pressure transmitter

2. Electrical Circuit

- All elements of the electrical circuit are assembled and require no additional intervention except for the connection of additional equipment. The unit is equipped with fully automated control. It can supply purified water using the logic con-troller, water level, and pressure sensors, based on an adjustable algorithm, standardized for the reverse osmosis systems manufactured by Aquaphor.
- The controller program works as part of the AFE-002-000 electronic complex and controls the reverse osmosis systems of various APRO configurations.

The connection of auxiliary equipment must be carried out by certified specialists with the appropriate knowledge, skills, and experience working on this equipment. The manual setting of additional installation modes is possible only with the help of the switchboard and controller.

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Technical data

Current type:	AC	AC/DC
Voltage Rating:	Un	400VAC
Frequency Rating:	fr.	50Hz
Rated short-time withstand current:	Icw	10KA
Rated conditional short-circuit current:	Icc	10KA
Rated peak withstand current:	Ipk	10KA
Operating voltage:	Ue	400/230V
Circuit current rating (main switch):	Inc	20A
Protection category IP to IEC 60 529:		IP-55
IK Code:	IK(1-10)	IK09
Installation:		INDOOR
ECP dimensions (H,W,D) mm:		400/300/200
Total weight:		4Kg
Separation:		FORM 1
Grounding method:		TNS
Type of building (installed equipment):		F,F,F
Electromagnetic compatibility (EMC):		A
Doors:		With.

List of Drawings	
Page Num.	Description
1	Technical data
2-3	Circuit diagram of the distribution network
4	Configuration PLC
5-6	Reley Outputs Power Board
7-8	Digital Inputs Switching Board
9	High-speed Counter Inputs Switching Board
10	Transistor Outputs,RS485 Switching Board
11	Analog Input, Cond. Electrodes Sw. Board
12	Analog Inputs Expansion Board
13	Build of materials
14	General view ECP
15	Terminals

Pollution Degree Rating:	3
Rated Insulation Voltage Ui:	1000V
The nominal current of the ECP:	16A
Rated Impulse Withstand Voltage U	4kV
Diversity factor RDF:	0.7
Environmental temperature:	30°
Type ECP:	mobile/fixed
Structure ECP:	closed
Operators:	skilled/unskilled
Wire Colors	
Brown	400/230 VAC
Blue	N230VAC
Yellow/green	grounding - PE
Red	+24VDC
Black	-24VDC
Orange	PLC - OUTPUT
Purple	PLC - INPUT
White	PLC - DRY CONTACT
Shielded red (cable)	+.....
Black Shielded (cable)	-.....

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CUSTOMER:

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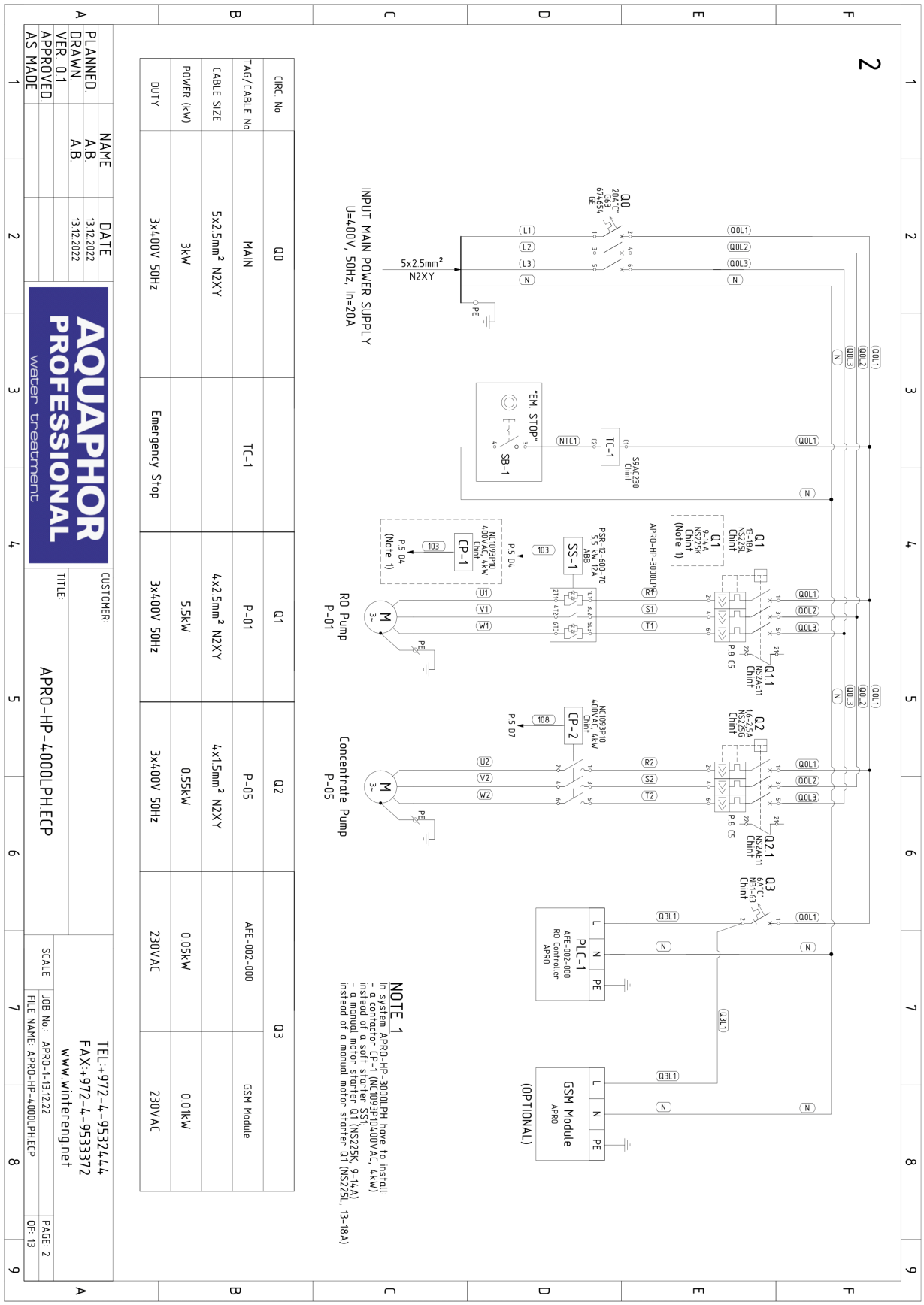

CIRC No	Q0		Q1	Q2		Q3	
TAG/CABLE No	MAIN	TC-1	P-01	P-05	AFE-002-000	GSM Module	
CABLE SIZE	5x2.5mm² N2XY		4x2.5mm² N2XY	4x1.5mm² N2XY			
POWER (kW)	3kW		5.5kW	0.55kW	0.05kW	0.01kW	
DUTY	3x400V 50Hz	Emergency Stop	3x400V 50Hz	3x400V 50Hz	230VAC	230VAC	

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CODE	Model	Designation
PLC	CPU AFE-002-000	AQUAPHOR
	Power board AFE-006-100	10 Reley Outputs (active)
	Switching board AFE006-500	2 Conductivity electrodes 1 Analog Input 16 Digital Inputs 4 High-speed Counter Inputs 5 Transistor outputs (pnp) 2 Chanels RS485 (modbus)
Expansion Board	AFE-007-000	4 Analog Input
PLC		230 VAC Power Supply

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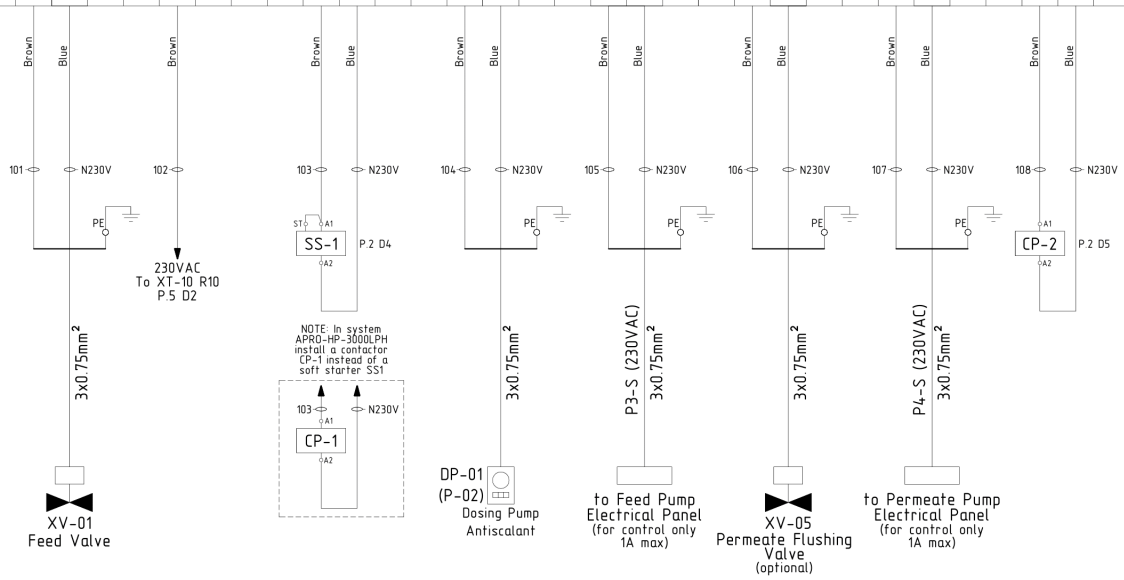
Manufacturer: AQUAPHOR Card: AFE006-100 Type: RO CPU (Power Board)

TAG Nº	XV1-O	XV4-O	P1-S	DP1-S	P3-S	XV5-O	P4-S	P5-S
Service	Feed Valve XV-01 Open	Concentrate Valve XV-04 Open	RO Pump P-01 Start	DP-01 (P-02) Dosing Pump Antiscalant Start	Feed Pump P-03 Start	Permeate Flush. Valve XV-05 Open	Permeate Pump P-04 Start	Concentrate Pump P-05 Start
	XT-5	XT-5	XT-6	XT-6	XT-7	XT-7	XT-8	XT-8
Connector Nº	R1 RN	R2 RN	R3 RN	R4 RN	R5 RN	R6 RN	R7 RN	R8 RN



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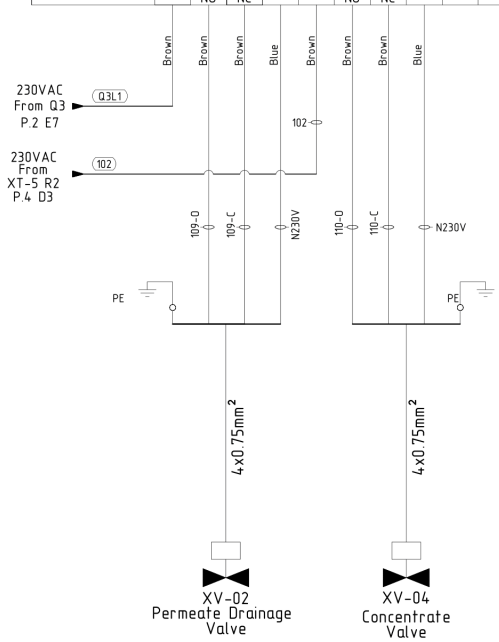
Manufacturer: AQUAPHOR	Card: AFE006-100	Type: RO	CPU (Power Board)

TAG Nº	XV2-0	XV4-0
Service	Permeate Drainage Valve XV-02 Open	Concentrate Valve XV-04 Open
	XT-9	XT-10
Connector Nº	R9 / R9 NO / R9 NC / RN	R10 / R10 NO / R10 NC / RN



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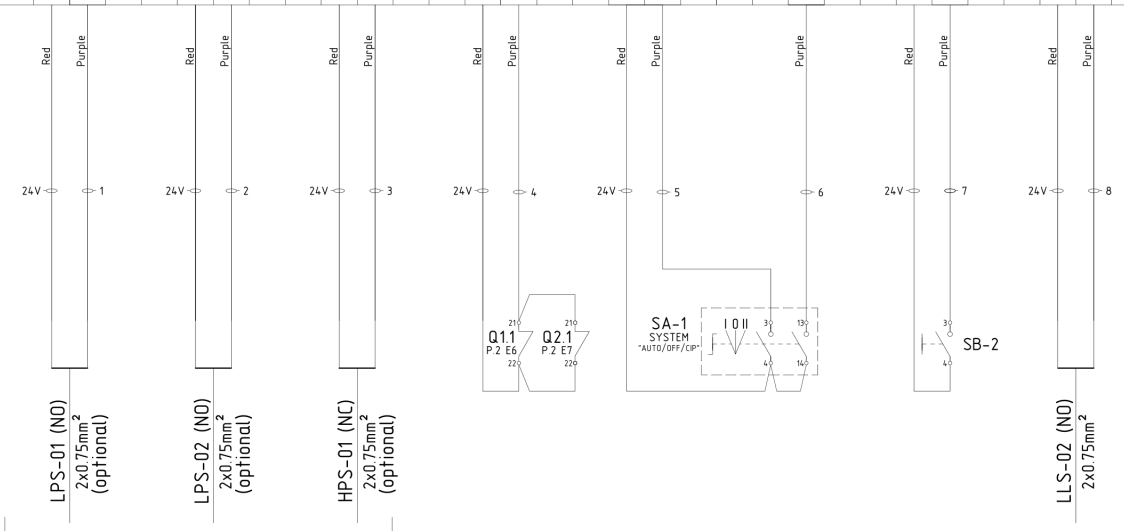
Manufacturer: AQUAPHOR	Card: AFE006-500	Type: DI	CPU (Switching Board)

TAG Nº	LPS-01	LPS-02	HPS-01	P1-F, P5-F	SYS-A	SYS-M	RESET	LLS-02
Service	Low Feed Pressure Switch	Low RO Inlet Pressure Switch	High Pressure Switch	Pumps P-01, P-05 Overload Fault	System Selector Switch - AUTO	System Selector Switch - CIP	Alarms Reset Push Button	Antiscalant Low Level Switch
	XT-1	XT-1	XT-2	XT-2	XT-3	XT-3	XT-4	XT-4
Connector Nº	24V I1	24V I2	24V I3	24V I4	24V I5	24V I6	24V I7	24V I8



NOTE: In the case of using an analog input board (expansion board AFE-007-000), jumpers must be installed on the digital inputs I1,I2,I3

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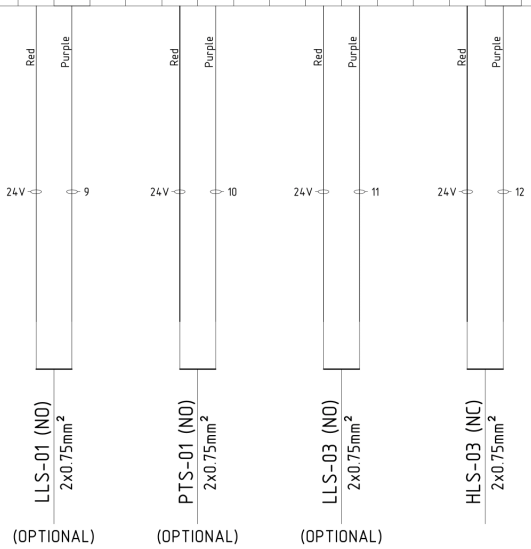
Manufacturer: AQUAPHOR	Card: AFE006-500	Type: DI	CPU (Switching Board)				
TAG Nº	LLS-01	PTS-01	LLS-03	HLS-03	Spare	Spare	Spare	Spare
Service	Feed Tank Low Level Switch	Pretretment Backwash Switch	Permeate Tank Low Level Switch	Permeate Tank High Level Switch				
	XT-5	XT-5	XT-6	XT-6	XT-7	XT-7	XT-8	XT-8
Connector Nº	24V I9	24V I10	24V I11	24V I12	24V I13	24V I14	24V I15	24V I16



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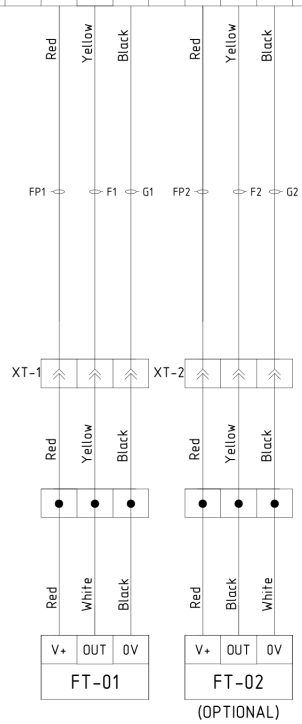
Manufacturer: AQUAPHOR	Card: AFE006-500	Type: HSCI (High-speed Counter Inputs)	CPU (Switching Board)

TAG Nº	FT-01	FT-02	Spare	Spare				
Service	Permeate Flow Transmitter	Feed Flow Transmitter						
Connector Nº	XT-13: FP, F1, G	XT-14: FP, F2, G	XT-15: FP, F3, G	XT-16: FP, F1, G				



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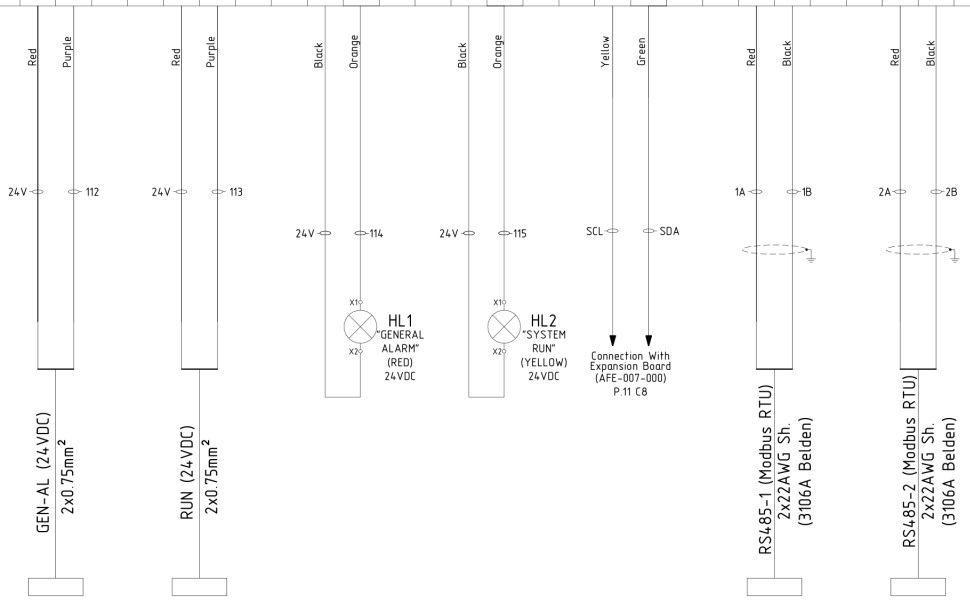
Manufacturer: AQUAPHOR Card: AFE006-500 Type: TO (Transistor Outputs), RS485 CPU (Switching Board)

TAG Nº	Spare	GEN-AL	RUN	HL-4	HL-5	I2C	RS485-1	RS485-2
Service		General Alarm Output	System Run Output	General Alarm LED	Run LED	I2C Communication Protocol	Interface RS485-1 (Modbus RTU)	Interface RS485-2 (Modbus RTU)
	XT-17	XT-17	XT-18	XT-18	XT-19	XT-19 XT-20	XT-20	XT-21
Connector Nº	24V S1	24V S2	24V S3	24V S4	24V S5	SCL SDA	1A 1B	2A 2B



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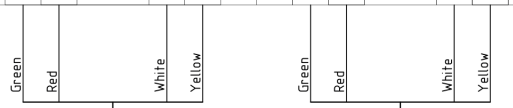
Manufacturer: AQUAPHOR	Card: AFE006-500	Type: AI (Conductivity electrodes)			CPU (Switching Board)	
TAG Nº	ECT-01	ECT-02		Spare		
Service	Permeate Conductivity Probe	Feed Conductivity Probe		Analog Input		
Connector Nº	XT-9: T1, GA — XT-12: T10, T11	XT-9: T2, GA — XT-11: T20, T21		XT-10: 5V, GA, AD0		



ECT-01

ECT-02

(OPTIONAL)

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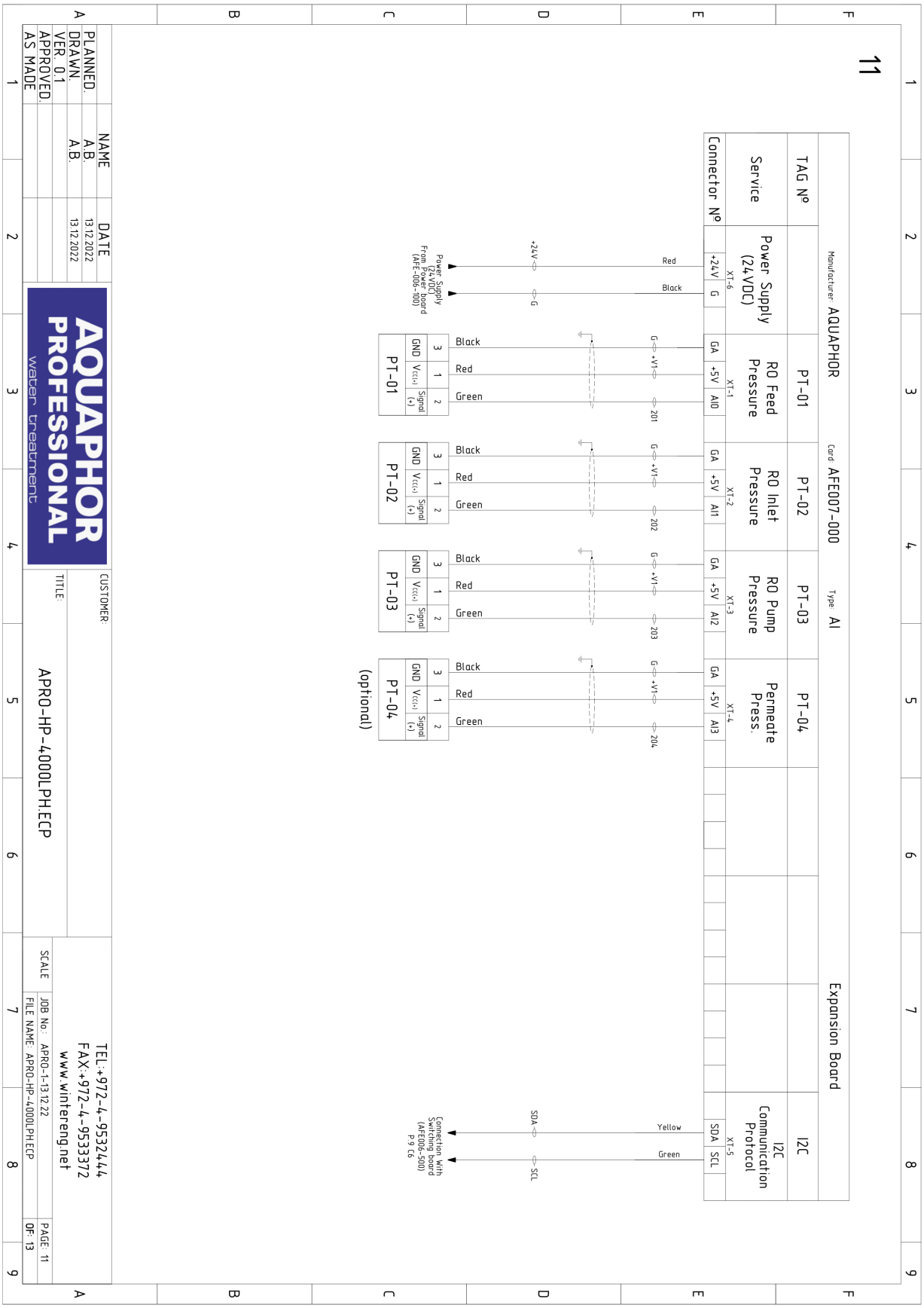
11
Manufacturer: AQUAPHOR
Card: AFE007-000
Type: AI
Expansion Board
TAG Nº
Service
Connector Nº
Power Supply (24VDC)
RO Feed Pressure
RO Inlet Pressure
RO Pump Pressure
Permeate Press.
I2C Communication Protocol
PT-01
PT-02
PT-03
PT-04
I2C
XT-6
XT-1
XT-2
XT-3
XT-4
XT-5
+24V
G
GA
+5V
AI0
AI1
AI2
AI3
SDA
SCL
Red
Black
Yellow
Green
Power Supply (24 VDC) From Power board (AFE-006-100)
Connection With Switching board (AFE006-500) P.9 C6
+V1
201
202
203
204
Black
Red
Green
GND
Vcc(+)
Signal (+)
PT-01
PT-02
PT-03
PT-04
(optional)
CUSTOMER:
TITLE:
APRO-HP-4000LPH.ECP
PLANNED:
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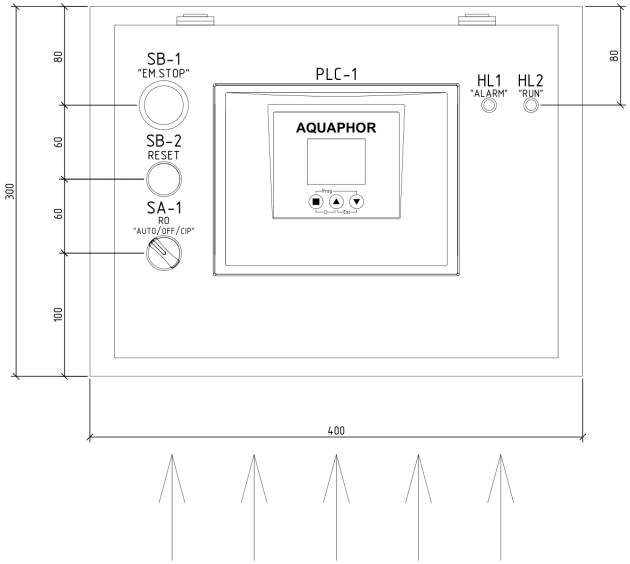
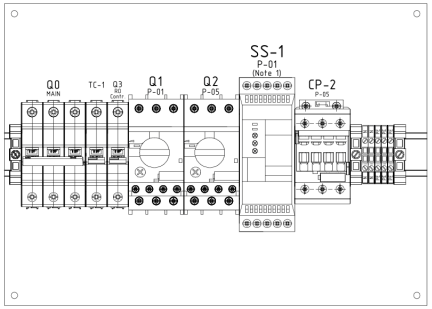
TIBOX TJ-TC-3040-1 400x300x210

Front View With Doors



Field Incomming Connections
At This Area

Front View Without Doors



Note 1:
In system APRO-HP-3000LPH have to install:
- a contactor CP-1 (NC1093P10400VAC, 4kW) instead of a soft starter SS1;
- a manual motor starter Q1 (NS225K, 9-14A) instead of a manual motor starter Q1 (NS225L, 13-18A)

Note 2:
Make all incoming field connections with cable glands PG type IP68

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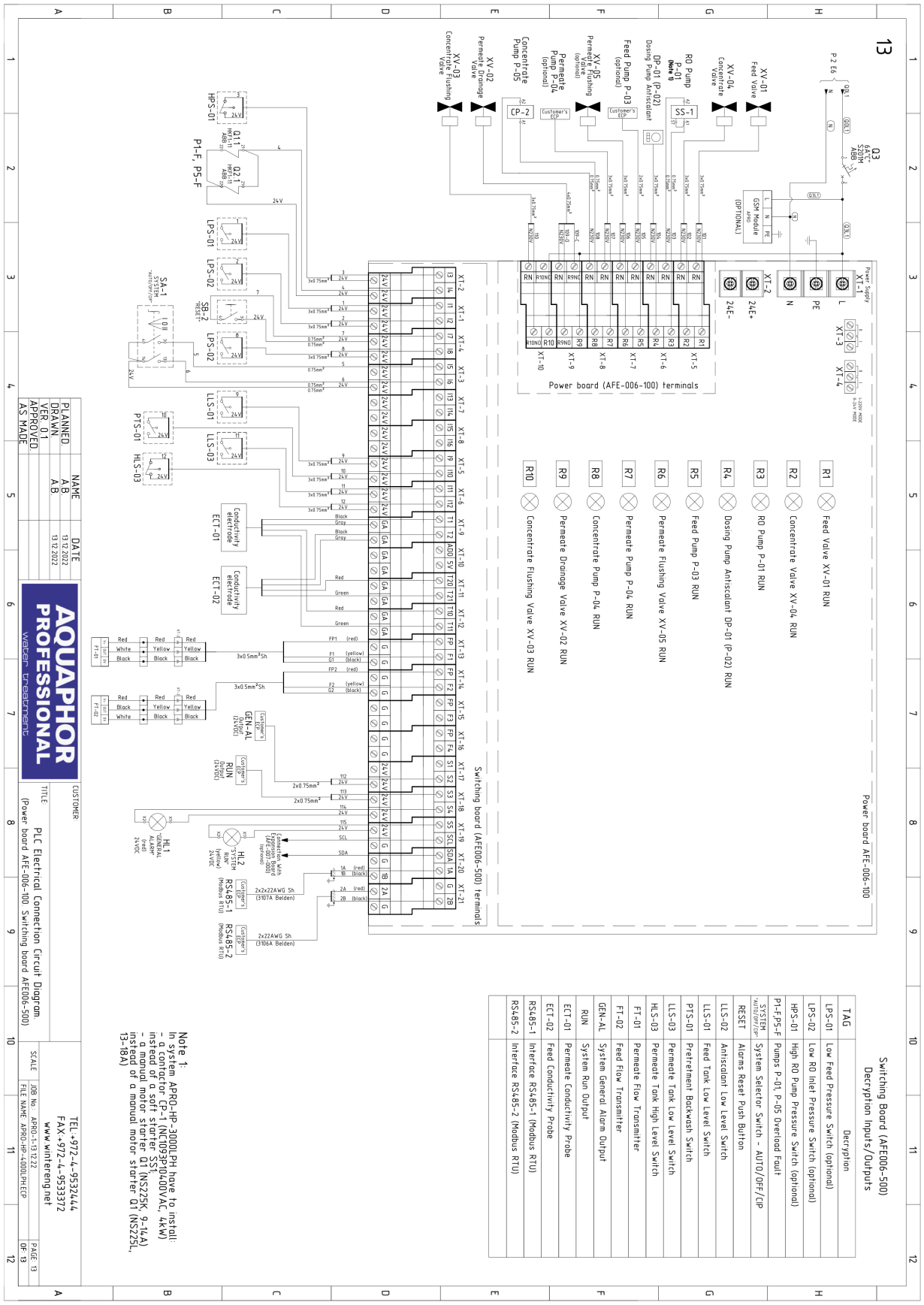


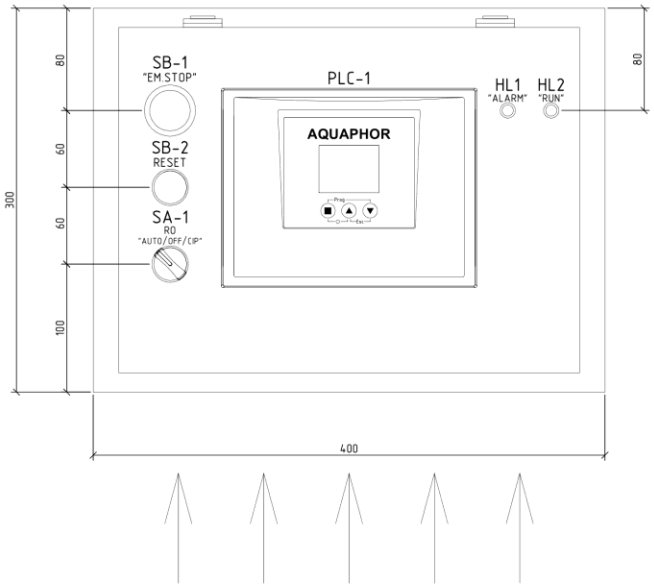
TAG	Decryption
LPS-01	Low Feed Pressure Switch (optional)
LPS-02	Low RO Inlet Pressure Switch (optional)
HPS-01	High RO Pump Pressure Switch (optional)
P1-F,P5-F	Pumps P-01, P-05 Overload Fault
SYSTEM "AUTO/OFF/CIP"	System Selector Switch - AUTO/OFF/CIP
RESET	Alarms Reset Push Button
LLS-02	Antiscalant Low Level Switch
LLS-01	Feed Tank Low Level Switch
PTS-01	Prefreshment Backwash Switch
LLS-03	Permeate Tank Low Level Switch
HLS-03	Permeate Tank High Level Switch
FT-01	Permeate Flow Transmitter
FT-02	Feed Flow Transmitter
GEN-AL	System General Alarm Output
RUN	System Run Output
ECT-01	Permeate Conductivity Probe
ECT-02	Feed Conductivity Probe
RS485-1	Interface RS485-1 (Modbus RTU)
RS485-2	Interface RS485-2 (Modbus RTU)

Switching Board (AFE006-500)
Decryption Inputs/Outputs

Note 1:
In system APRO-HP-3000LPH have to install
- a contactor CP-1 (NC1093P10400VAC 4kW)
instead of a soft starter SS1.
- a manual motor starter Q1 (NS25SK 9-14A)
instead of a manual motor starter Q1 (NS25SL
13-18A)

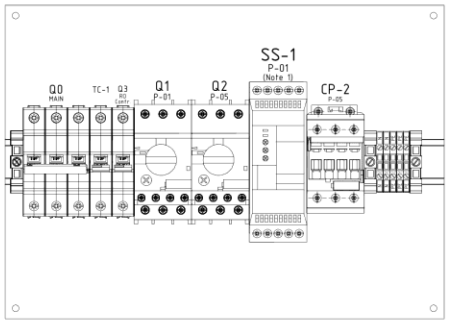
TIBOX TJ-TC-3040-1 400x300x210

Front View With Doors



Field Incomming Connections
At This Area

Front View Without Doors

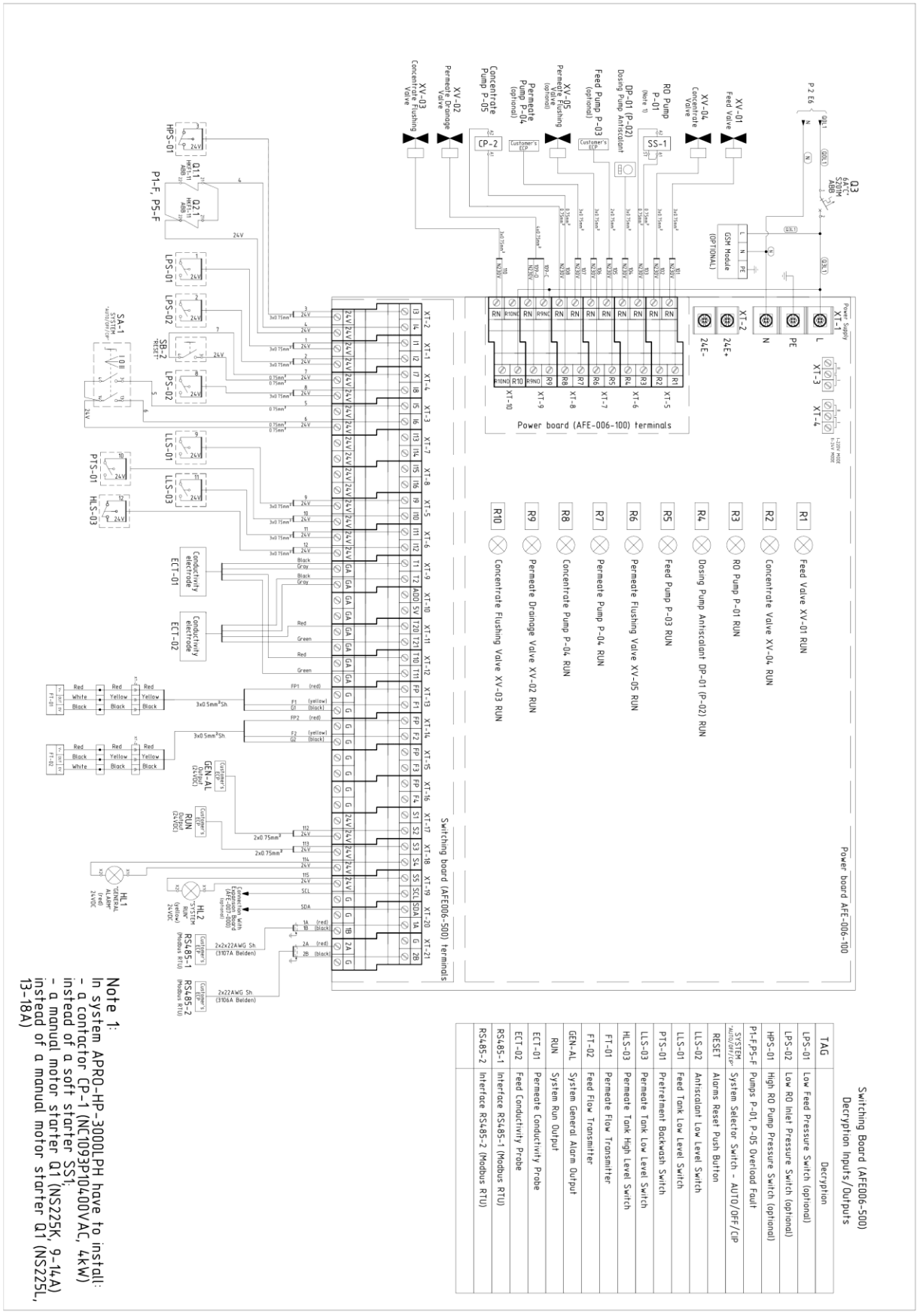


Configuration PLC

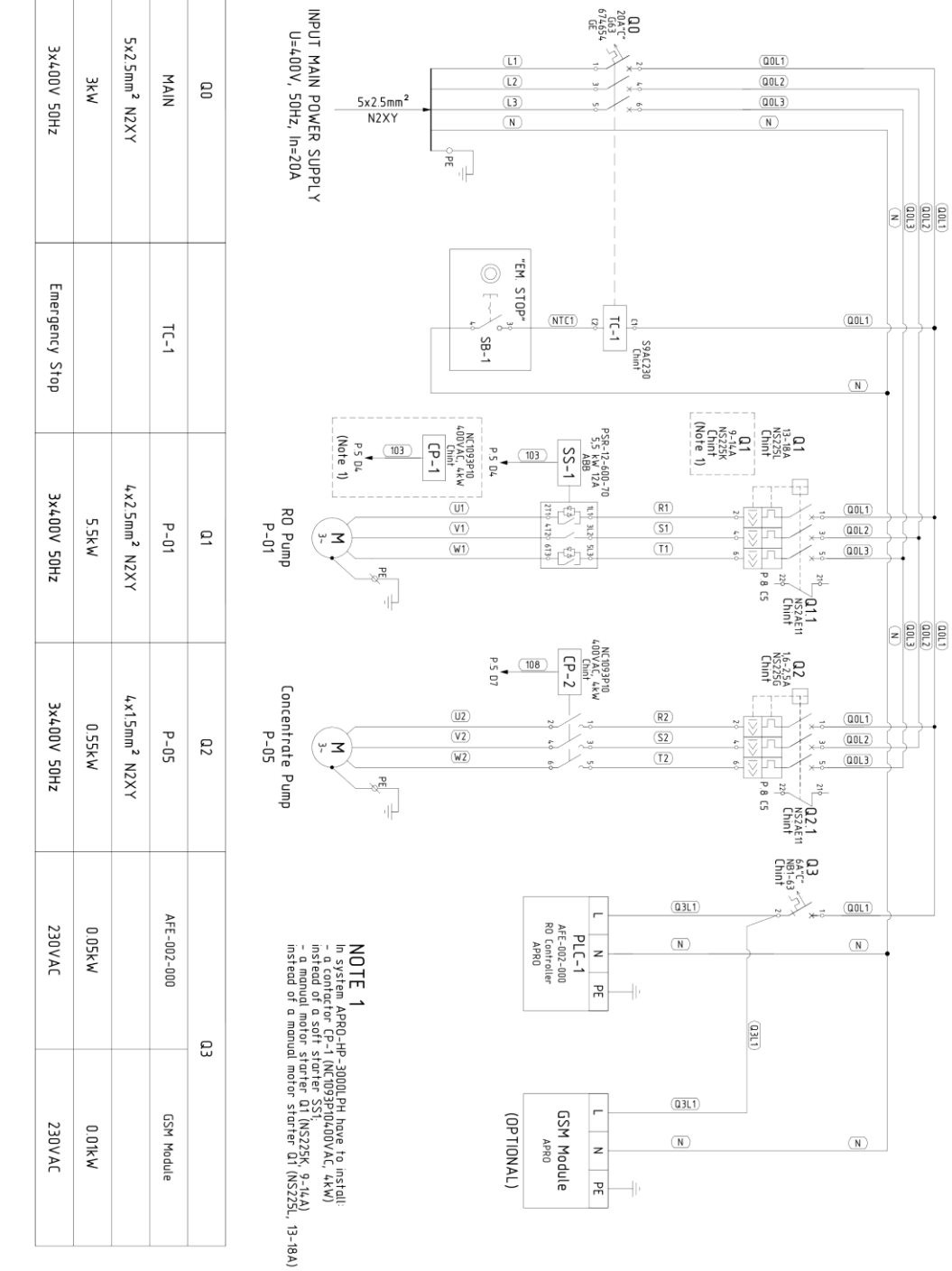
CODE	Model	Designation
PLC	CPU AFE-002-000	AQUAPHOR
	Power board AFE-006-100	10 Reley Outputs (active)
	Switching board AFE006-500	2 Conductivity electrodes 1 Analog Input 16 Digital Inputs 4 High-speed Counter Inputs 5 Transistor outputs (pnp) 2 Chanels RS485 (modbus)
Expansion Board	AFE-007-000	4 Analog Input
PLC		230 VAC Power Supply

Note 1:
In system APRO-HP-3000LPH have to install:
- a contactor CP-1 (NC1093P10400VAC, 4kW) instead of a soft starter SS1;
- a manual motor starter Q1 (NS225K, 9-14A) instead of a manual motor starter Q1 (NS225L, 13-18A)

Note 2:
Make all incoming field connections with cable glands PG type IP68



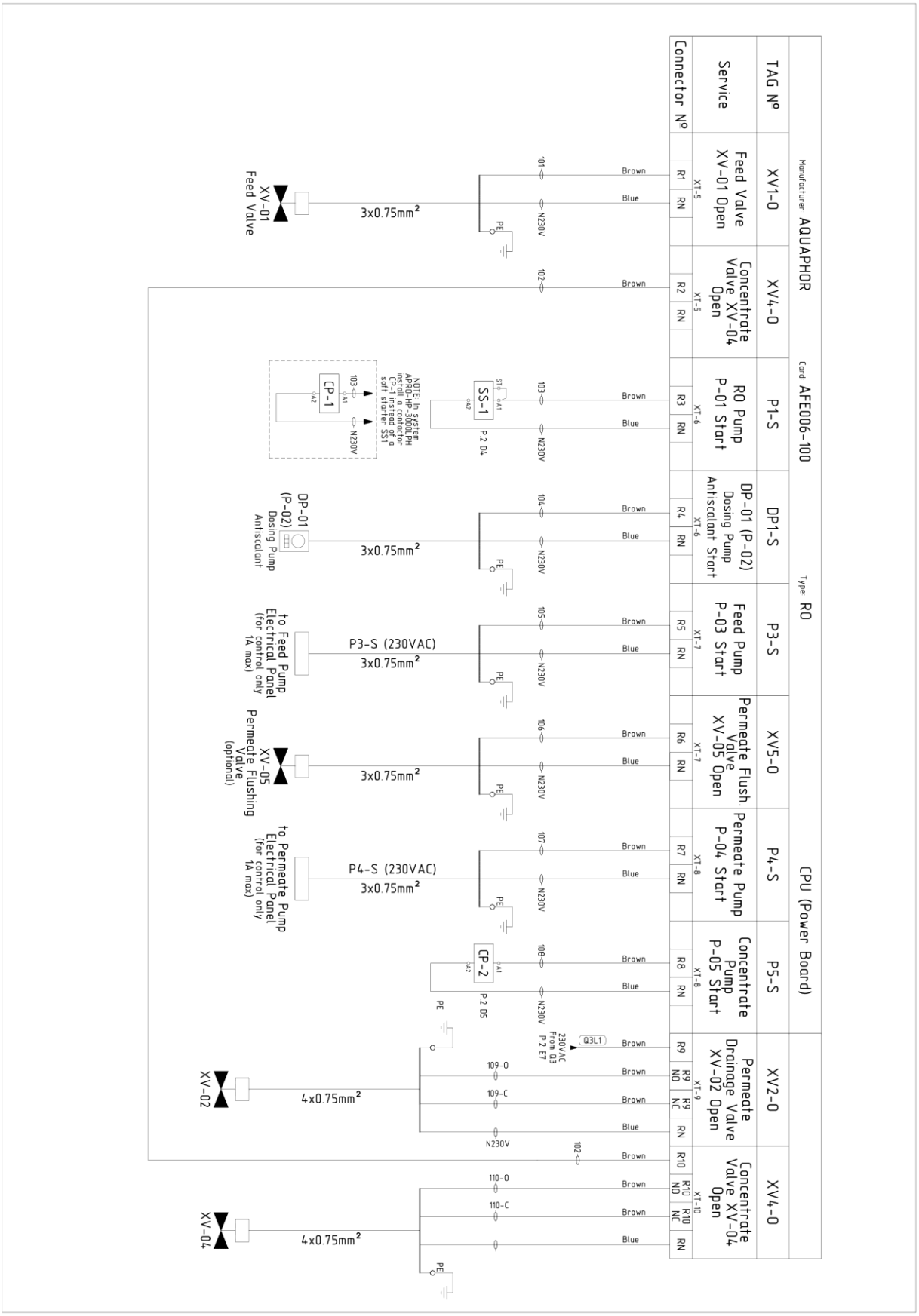
Note 1:
In system APRO-HP-3000LPH have to install:
- a contactor CP-1 (NC1093P10400VAC, 4kW)
instead of a soft starter SS1,
- a manual motor starter Q1 (NS225K, 9-14A)
instead of a manual motor starter Q1 (NS225L, 13-18A)

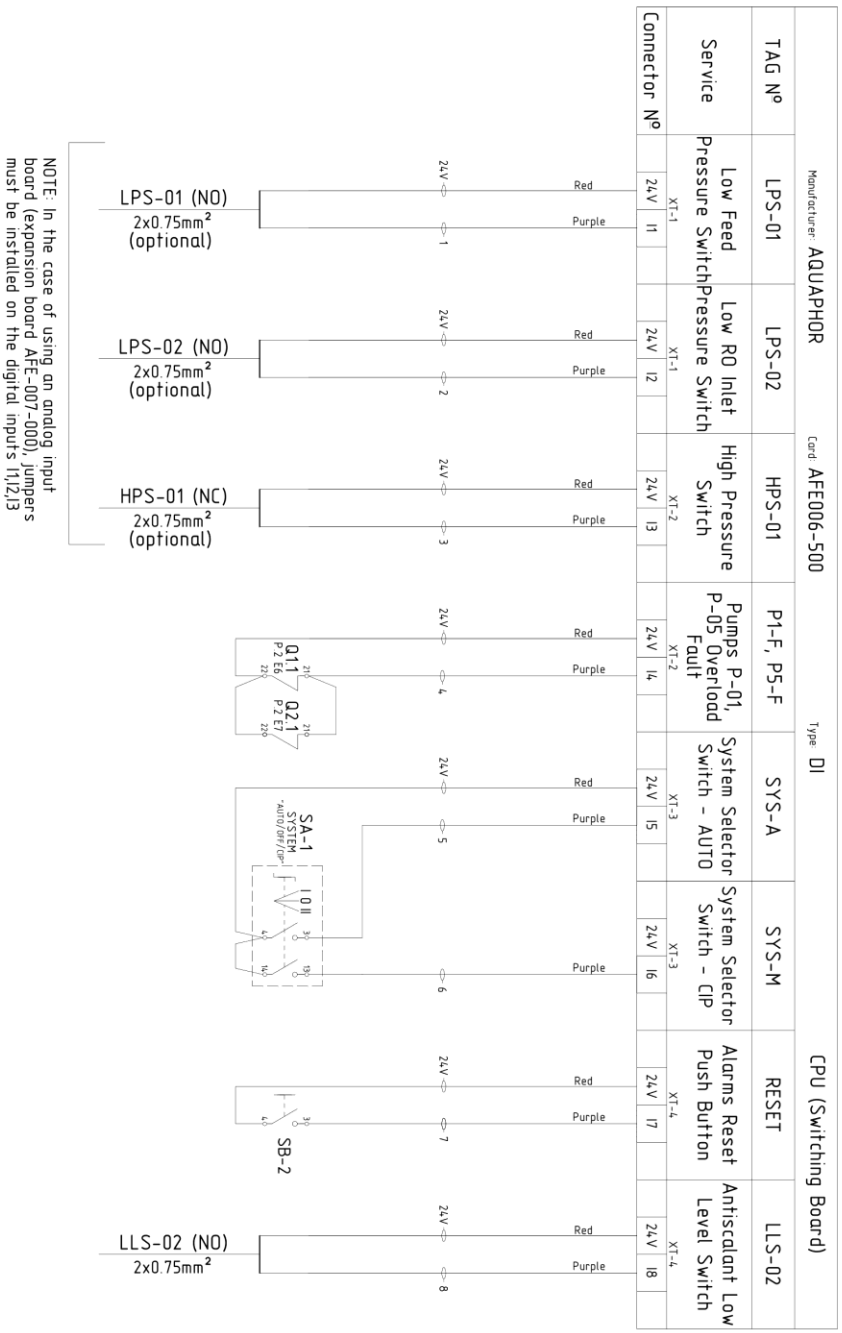


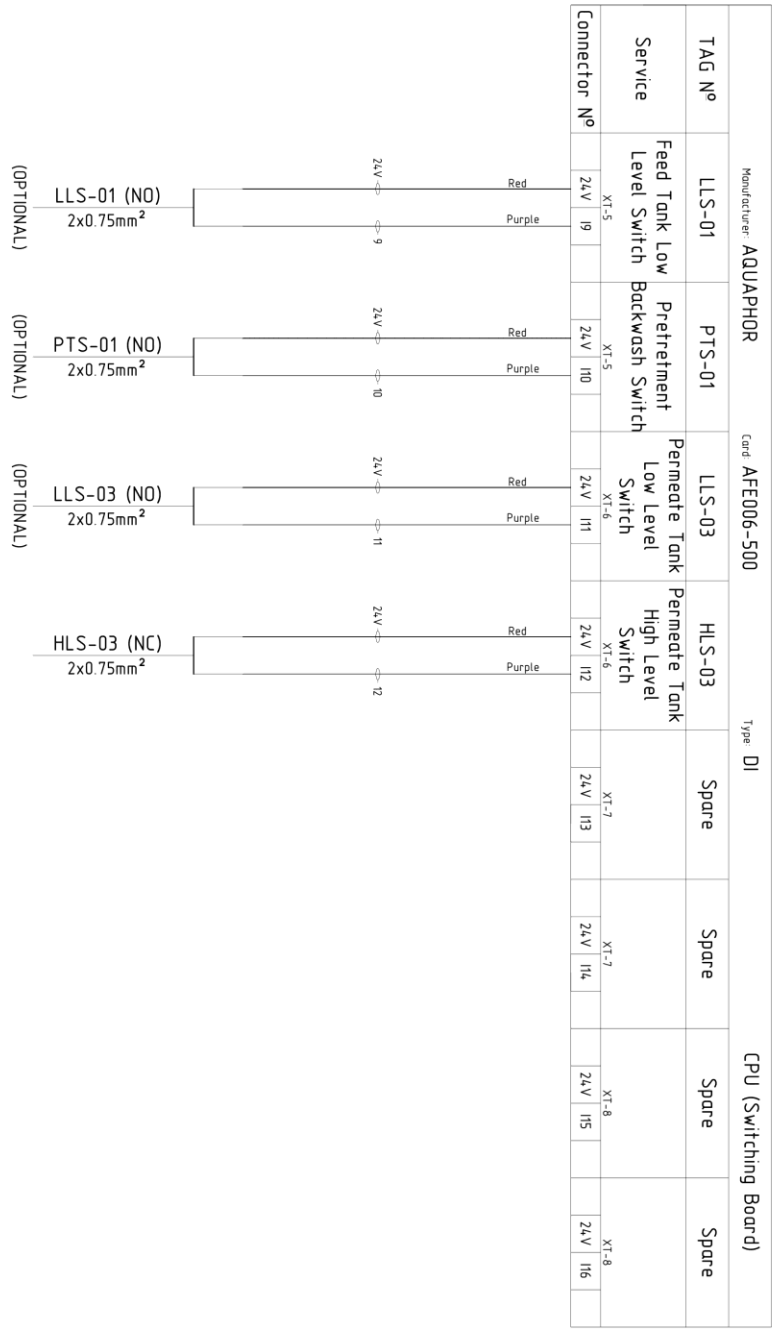
NOTE 1

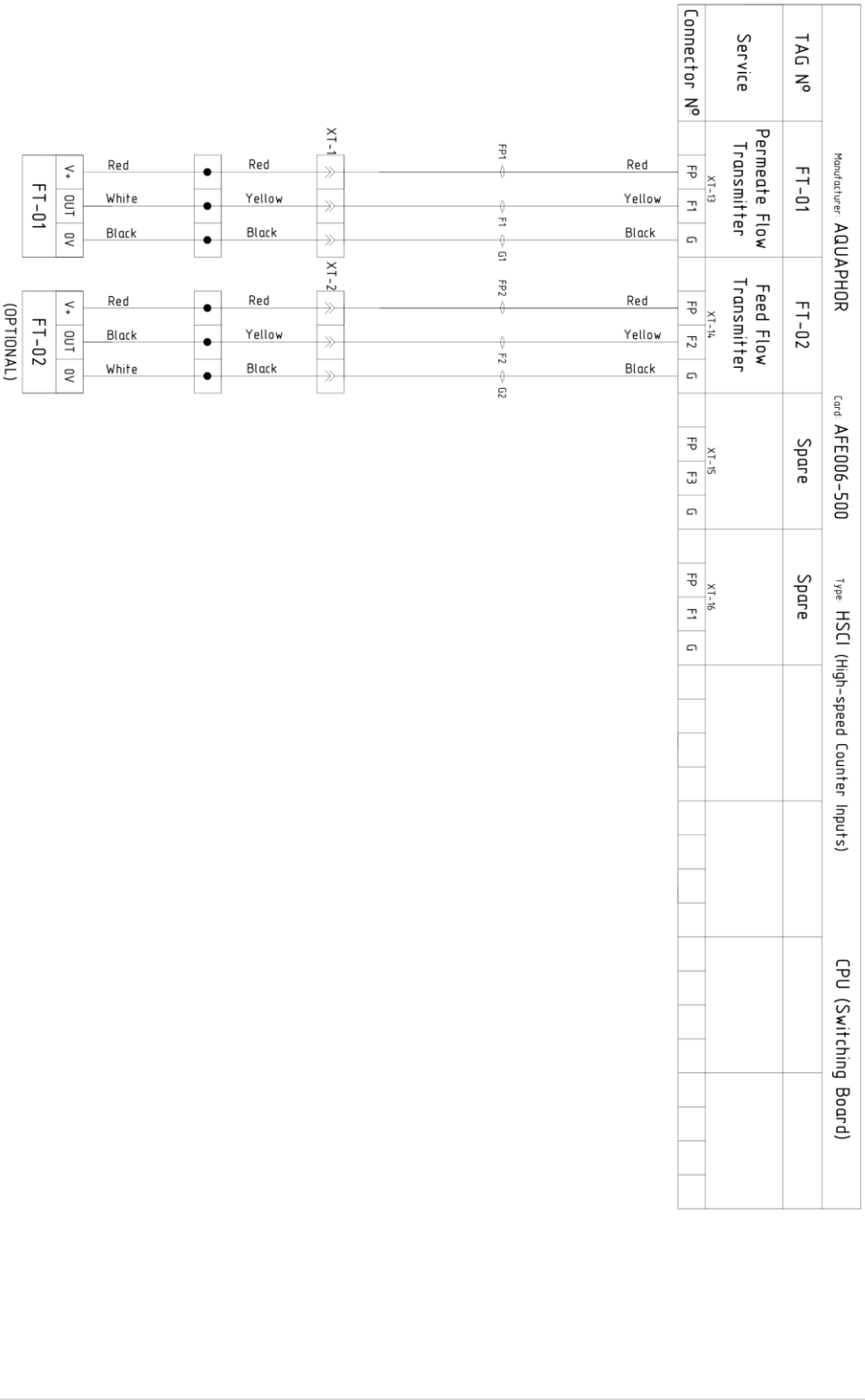
In system APRO-HP-3000LPH have to install:
- a contactor CP-1 (NC1093P10/400VAC, 4kW) instead of a soft starter SS1,
- a manual motor starter Q1 (NS225K, 9-14A) instead of a manual motor starter Q1 (NS225L, 13-18A)

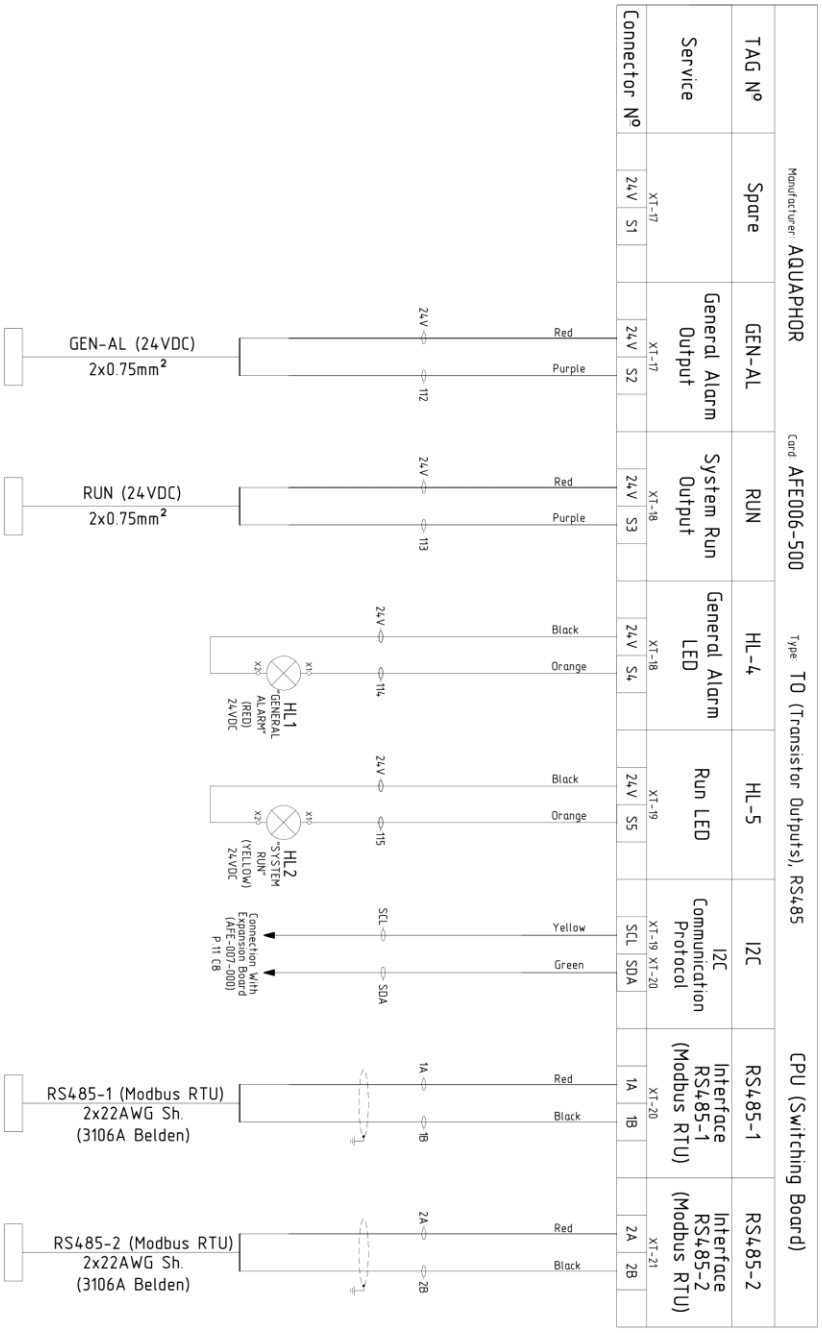
CIRC No	Q0		Q1	Q2	Q3	
TAG/CABLE No	MAIN	TC-1	P-01	P-05	AFE-002-000	GSM Module
CABLE SIZE	5x2.5mm² N2XY		4x2.5mm² N2XY	4x1.5mm² N2XY		
POWER (kW)	3kW		5.5kW	0.55kW	0.05kW	0.01kW
DUTY	3x400V 50Hz	Emergency Stop	3x400V 50Hz	3x400V 50Hz	230VAC	230VAC

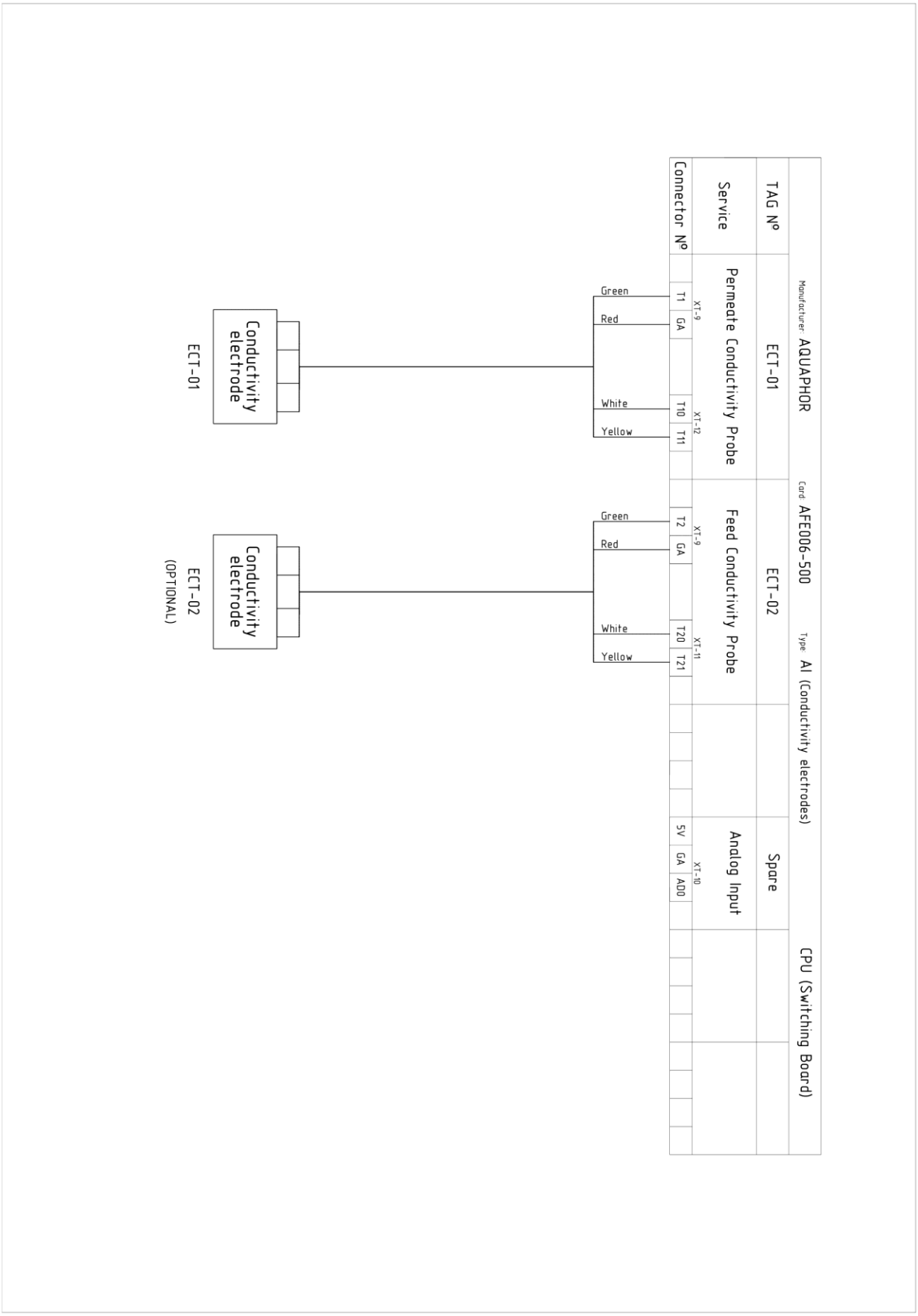

Manufacturer AQUAPHOR
Card AFE006-100
Type RO
CPU (Power Board)
Connector Nº
Service
TAG Nº
XT-5 R1 RN
Feed Valve XV-01 Open
XV1-O
XT-5 R2 RN
Concentrate Valve XV-04 Open
XV4-O
XT-6 R3 RN
RO Pump P-01 Start
P1-S
XT-6 R4 RN
DP-01 (P-02) Dosing Pump Antiscalant Start
DP1-S
XT-7 R5 RN
Feed Pump P-03 Start
P3-S
XT-7 R6 RN
Permeate Flush. Valve XV-05 Open
XV5-O
XT-8 R7 RN
Permeate Pump P-04 Start
P4-S
XT-8 R8 RN
Concentrate Pump P-05 Start
P5-S
XT-9 R9 NO R9 NC RN
Permeate Drainage Valve XV-02 Open
XV2-O
XT-10 R10 NO R10 NC RN
Concentrate Valve XV-04 Open
XV4-O
Brown
Blue
101
102
103
104
105
106
107
108
109-O
109-C
110-O
110-C
N230V
PE
3x0.75mm²
4x0.75mm²
XV-01 Feed Valve
XV-02
XV-04
CP-1
SS-1
CP-2
P 2 D4
P 2 D5
NOTE: In system APRO-HP-3000LPH install a contactor CP-1 instead of a soft starter SS1
DP-01 (P-02) Dosing Pump Antiscalant
to Feed Pump Electrical Panel (for control only 1A max)
P3-S (230VAC)
XV-05 Permeate Flushing Valve (optional)
to Permeate Pump Electrical Panel (for control only 1A max)
P4-S (230VAC)
Q3L1
230V AC from Q3 P 2 E7

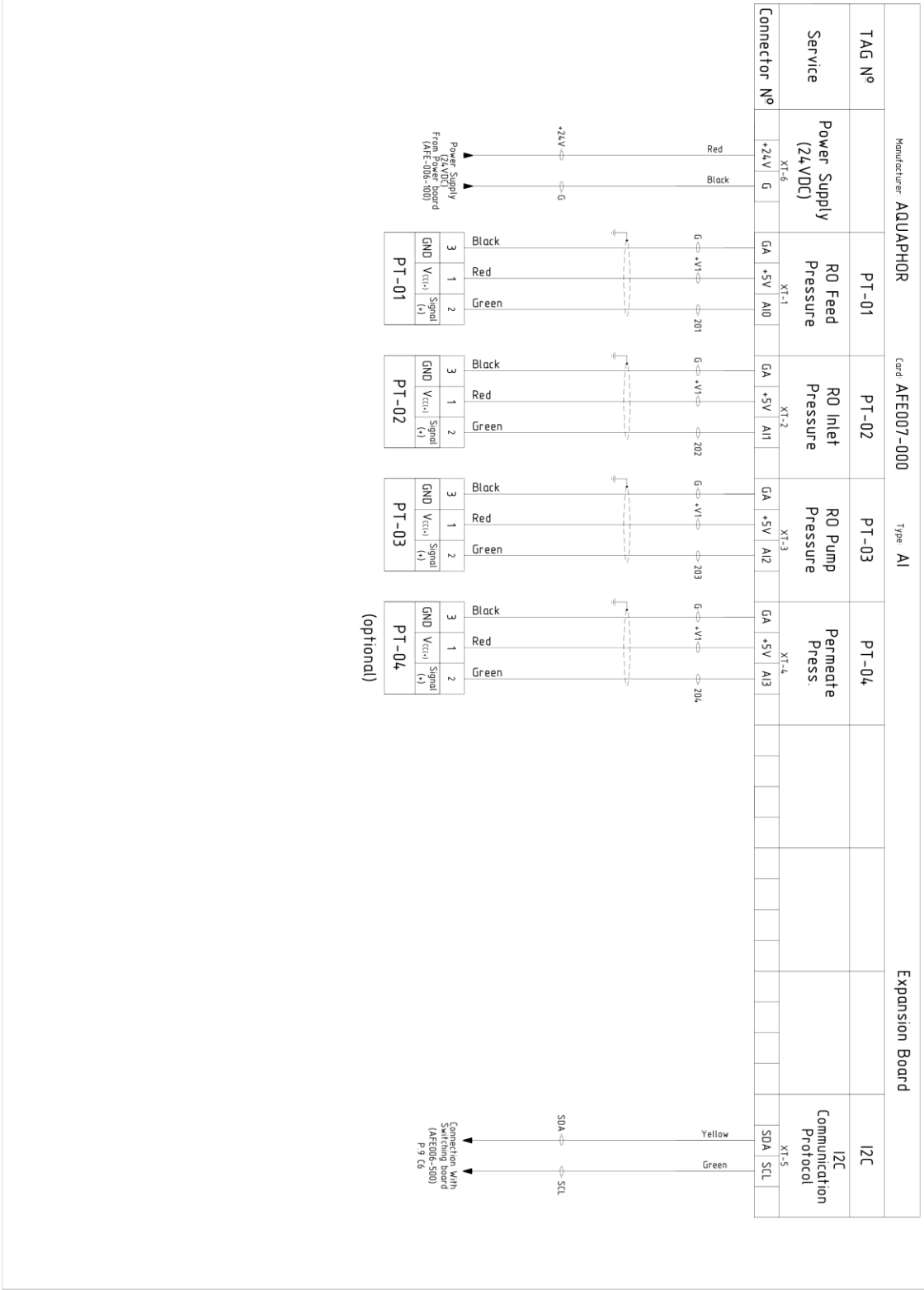

Manufacturer: AQUAPHOR
Card AFE006-500
Type DI
CPU (Switching Board)
Connector Nº
TAG Nº
Service
LPS-01
Low Feed Pressure Switch
LPS-02
Low RO Inlet Pressure Switch
HPS-01
High Pressure Switch
P1-F, P5-F
Pumps P-01, P-05 Overload Fault
SYS-A
System Selector Switch - AUTO
SYS-M
System Selector Switch - CIP
RESET
Alarms Reset Push Button
LLS-02
Antiscalant Low Level Switch
XT-1
XT-2
XT-3
XT-4
24V
I1
I2
I3
I4
I5
I6
I7
I8
LPS-01 (NO)
2x0.75mm²
(optional)
LPS-02 (NO)
2x0.75mm²
(optional)
HPS-01 (NC)
2x0.75mm²
(optional)
LLS-02 (NO)
2x0.75mm²
Red
Purple
NOTE: In the case of using an analog input board (expansion board AFE-007-000), jumpers must be installed on the digital inputs I1,I2,I3
Q11
P2 E6
Q21
P2 E7
SA-1
SYSTEM
AUTO/OFF/CIP
SB-2


Manufacturer AQUAPHOR
Card AFE006-500
Type DI
CPU (Switching Board)
TAG Nº
Service
Connector Nº
LLS-01
Feed Tank Low Level Switch
PTS-01
Pretreatment Backwash Switch
LLS-03
Permeate Tank Low Level Switch
HLS-03
Permeate Tank High Level Switch
Spare
Spare
Spare
Spare
XT-5
XT-6
XT-7
XT-8
24V
I9
I10
I11
I12
I13
I14
I15
I16
LLS-01 (NO)
2x0.75mm²
PTS-01 (NO)
2x0.75mm²
LLS-03 (NO)
2x0.75mm²
HLS-03 (NC)
2x0.75mm²
(OPTIONAL)
Red
Purple
9
10
11
12


Manufacturer AQUAPHOR
Card AFE006-500
Type HSCI (High-speed Counter Inputs)
CPU (Switching Board)
TAG Nº
FT-01
FT-02
Spare
Spare
Service
Permeate Flow Transmitter
Feed Flow Transmitter
Connector Nº
XT-13
XT-14
XT-15
XT-16
FP
F1
F2
F3
G
FP1
F1
G1
FP2
F2
G2
XT-1
XT-2
Red
White
Black
Yellow
FT-01
FT-02
(OPTIONAL)
V+
OUT
0V


Manufacturer AQUAPHOR
Card AFE006-500
Type TO (Transistor Outputs), RS485
CPU (Switching Board)
Connector Nº
TAG Nº
Service
Spare
GEN-AL
RUN
HL-4
HL-5
I2C
RS485-1
RS485-2
General Alarm Output
System Run Output
General Alarm LED
Run LED
I2C Communication Protocol
Interface RS485-1 (Modbus RTU)
Interface RS485-2 (Modbus RTU)
XT-17
XT-18
XT-19
XT-20
XT-21
24V
S1
S2
S3
S4
S5
SCL
SDA
1A
1B
2A
2B
GEN-AL (24VDC)
2x0.75mm²
RUN (24VDC)
2x0.75mm²
RS485-1 (Modbus RTU)
2x22AWG Sh.
(3106A Belden)
RS485-2 (Modbus RTU)
2x22AWG Sh.
(3106A Belden)
Red
Purple
Black
Orange
Yellow
Green
112
113
114
115
HL1
"GENERAL ALARM"
(RED)
24VDC
HL2
"SYSTEM RUN"
(YELLOW)
24VDC
Connection With Expansion Board (AFE-007-000) P 11 C8


Manufacturer AQUAPHOR
Card AFE006-500
Type AI (Conductivity electrodes)
CPU (Switching Board)
TAG Nº
ECT-01
ECT-02
Spare
Service
Permeate Conductivity Probe
Feed Conductivity Probe
Analog Input
Connector Nº
XT-9
XT-12
XT-9
XT-11
XT-10
T1
GA
T10
T11
T2
GA
T20
T21
5V
GA
AD0
Green
Red
White
Yellow
Green
Red
White
Yellow
Conductivity electrode
ECT-01
Conductivity electrode
ECT-02
(OPTIONAL)

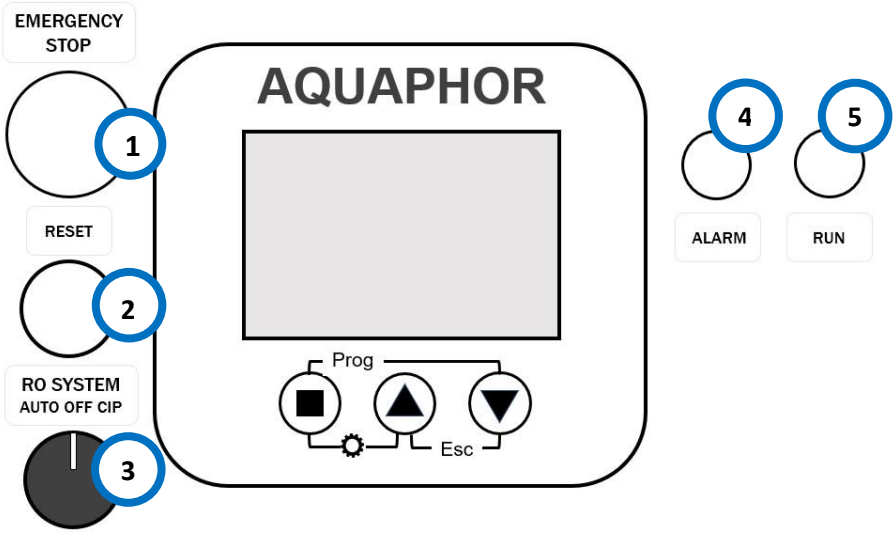

Manufacturer AQUAPHOR
Card AFE007-000
Type AI
Expansion Board
TAG Nº
Service
Connector Nº
Power Supply (24VDC)
RO Feed Pressure
RO Inlet Pressure
RO Pump Pressure
Permeate Press.
I2C Communication Protocol
PT-01
PT-02
PT-03
PT-04
XT-6
XT-1
XT-2
XT-3
XT-4
XT-5
+24V
G
GA
+5V
AI0
AI1
AI2
AI3
SDA
SCL
Red
Black
Green
Yellow
Power Supply From Power board (AFE-006-100)
Connection With Switching board (AFE006-500) P9 C6
201
202
203
204
(optional)

3. Control Panel

3.1. General Information

- The controller is protected by an osmosis control panel with IP-55 standard class and higher.
- The system nodes are controlled through the power board.
- The commutation of the controller and the power board is realized through quick-detachable connections.

3.2. Elements on the control panel



№	ELEMENT	FUNCTION
1	«**Emergency stop**» button	Emergency shutdown of the system. When pressed, it is fixed in a closed state and with its contacts blocks the power part of the installation, thereby completely de-energizing the controller.
2	«**Reset**» button	Resetting the current program (return to the start window SYSTEM OFF).
3	«**RO system**» mode switcher	**OFF** - Standby mode **AUTO** - Automatic mode **CIP** - Service Mode
4	«**Alarm**» lamp indicator	Emergency situation
5	«**Run**» lamp indicator	The unit operates normally

4. Technical Data Description and Requirements

4.1. Water Quality Requirements

Designation	Unit	Value
Water supply for the reverse osmosis system		
Temperature	°C	5 - 30
Turbidity factor	NTU	<1
Blocking factor (sludge / index of sedimentation density)	SDI	<3
Feed pressure	bar	2.5 - 6
Salinity	ppm	<4000
Total hardness	°dH	0 - 15
pH under constant operation	-	6.5 - 9
Short term for the rinse	-	1 - 12
Odour	-	odourless
Oil	mg/l	0
Free chlorine	mg/l	0
Iron	mg/l	<0.1
Manganese	mg/l	<0.1
Sewage		according to local regulations

4.2. Installation Room Requirements

Designation	Unit	Value
Temperature	°C	5 to 40
Lighting	lx	at least 150
Source of fresh air	-	aerate and deaerate sufficiently

4.3. Reverse Osmosis technical data

Designation	Unit	Value
Permeate production		
APRO 3000 LPH HP		
With 20 °C	l/h	3000
With 10 °C	l/h	2100
APRO 4000 LPH HP		
With 20 °C	l/h	4000
With 10 °C	l/h	2800
APRO 6000 LPH HP		
With 20 °C	l/h	6000
With 10 °C	l/h	4200
Operating pressure max.	bar	12 - 16
Power	kW	0.7
Control	W	10
Connections		
Feed water	NW	2’’
Concentrate	NW	1’’
Permeate	NW	1’’
Pressure fluctuations max.	bar	± 1
RO salt retention rate max.	%	Up to 95
Operating temperature	°C	30 - 40
Surrounding temperature	°C	4 - 40
Electric connection		EU plug
Connection	-	1/N/PE
Voltage	V	400
Frequency	Hz	50
Power	kW	2.5 (3000), 3.7 (4000), 3.7 (6000)
Nominal current	A	10 (3000), 16 (4000), 16 (4000)

5. Installation

5.1. Installation preparations

1. System Location

The RO system should be located away from direct sunlight, wind, and rain. You should also account for freezing temperatures and remember that lower temperatures reduce production. It would also be wise to leave plenty of room around the unit for future service.

2. Plumbing

The high-pressure pumps that feed the RO unit require a constant flow of water at a sufficient flow rate.

3. Feed water

Piping for the feed water should be either copper or plastic as iron or carbon steel pipe could increase the iron content of the feed water. Temperature of the feed water should not exceed 35° C. This unit comes equipped with pressure differential safety shut-off on the pre-filter so as not to starve the pump of water. This will also let you know when to change the pre-filter.

4. Product Water (Permeate) Line Connection & Primary membrane flushing

All our equipment comes with a built-in check valve on the permeate line.

Note: Install a hose temporarily between the outlet for permeate of the reverse osmosis unit and the sewer junction.

Note: When starting up a new unit, it should run to drain for 30-60 minutes to flush the new membranes. Be sure this product line is not shoved into a drain. If possible, run the product line from above with a substantial air-gap spraying into the drain from above. The normal plumbing code is at least twice the diameter of the drainpipe. A larger gap is preferable to avoid splashing of water from the drain. This may allow bacteria growth that may be able to migrate back into the unit thus causing a potential problem.

5. Concentrate or Waste Line Connection

Connect the concentrate or waste line to the outlet side of the concentrate flow meter. Run this line to an open drain with no restriction and leave an airgap at the drain end. Please, follow all local plumbing codes.

Note: Install a hose between the concentrate outlet of the reverse osmosis unit and the sewer junction and let it hang 10 to 15 cm over the drain, to prevent the contamination of the unit.

6. Electrical

Properly sized electrical service is required for proper operation of system.

7. Level Controls

Level controls are a float type in an atmospheric storage tank or a O-float level valve. Both are optional with our equipment and can be installed by us. Either one are wired directly into the controller and are controlled by the controller.

8. Pumps

All our units come with heavy-duty pumps, and they are not self-priming. Never let a pump run dry. This may damage the pump and void the warranty.

9. Pre-Filtration

Our units are equipped with a sediment pre-filter which will remove particles down to 5 microns in size. As this prefilter plugs up it will restrict the flow of water. At this point the controller will shut down the unit until the filter is changed. This option is standard on our equipment. Depending on the feed water, more pretreatment may be necessary. A water analysis is required to determine the need.

10. Installation.

Prior to start-up, carefully inspect the system for loose connections that may have loosened during shipping.

11. Membrane installation

Should the membranes need to be installed or replaced, be sure to notice how they were removed. The flow of water will always be from the end of the membrane with the brine seal to the end without the brine seal.

5.2. Installation

1. Unpack the system and place it to the permanent place of work.
2. Make sure the membranes and filter cartridges are installed.
3. Connect the inlet connection to the feed water supply.
4. Connect the electricity plug to ~220 V.
5. Connect the dosing suction pipe to the antiscalant tank.
6. Before starting work, move RO switcher to the AUTO position, make sure to perform degassing

   (Check 9.1 Dosing pump degassing)
7. Connect permeate connector to the permeate supply line.
8. The system is ready.

If an additional atmospheric permeate tank is used, connect the permeate line via a float switch. If a permeate supply pump (P-04) is used, connect the low-level switch (LLS-03) to the control panel.

6. Configuration

APRO 3000/4000/6000 LPH HP system can be configured in two ways:

- By using the three-button keyboard of the controller.
- By using the APRO Monitor application on the screen of a mobile device.

6.1. Starting Window

When power is applied to the switchboard, the program starts in the System OFF mode, opening the start window with the following parameters:

1. The current time and date
2. The name of the program
3. The name of the production
4. The possibility of starting the system infiltration mode
5. The position of the three-position switch
6. Errors that prevent the installation from starting in- filtration mode
7. The serial number of the board
8. The program version
9. The availability of Wi-Fi
10. The availability of mkS card

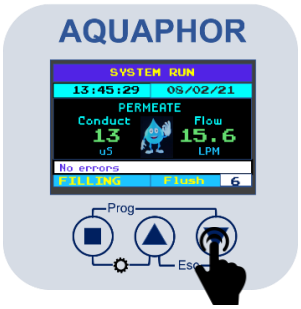
In the start window, you can perform the following operations:

- Switching using a three-position hereinafter switch to the "AUTO" position. The system will enter the filtering mode through the "Start-Up" mode.
- Switching the switch to the "CIP" position. The system will enter the state of chemical flushing system elements.
- Pressing the "OK" ■ button on the three-position switch for 2 seconds will turn on the system statistics window for 4 seconds (the function is convenient for defining service intervals).
- Pressing the "Up" ▲ button on the three-position switch for 5 seconds will start the calibration routine of the TDS (Total Dissolved Solids) sensors.
- Pressing the "OK" ■ and "Down" ▼ buttons on the three-position switch simultaneously will start the subroutine for configuring system devices.

If the starting parameters meet the system's requirements, then an indication of the system operation will be displayed on the controller screen:

6.2. System Run

System run panel has a few types of display, representing the current parameters of the system. Pressing “Up” and "Down"▼ buttons will switch the display to another one.



General display

- Permeate conductivity (µS)
- Permeate flow (LPM)
- Current errors
- Current flush

Flows display

- Permeate flow (LPM)
- Concentrate flow (LPM)
- Feed flow (LPM)
- Recovery, %

Conductivities display

- Permeate conductivity (µS)
- Permeate temperature, °C
- Supply conductivity (µS)
- Feed temperature, °C

Pressure display

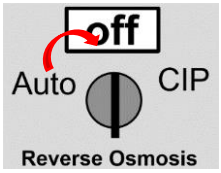
- Feed pressure
- Inlet pressure
- RO pressure

Cartridge display

- Resource, m^3 – a countdown of a remaining resource. Resource should be set up initially (**7.7, Setup-23**)
- Pressure drop, bar

6.3. Equipment Setup

1. Move the switch to the **OFF** position to start setting up the system.



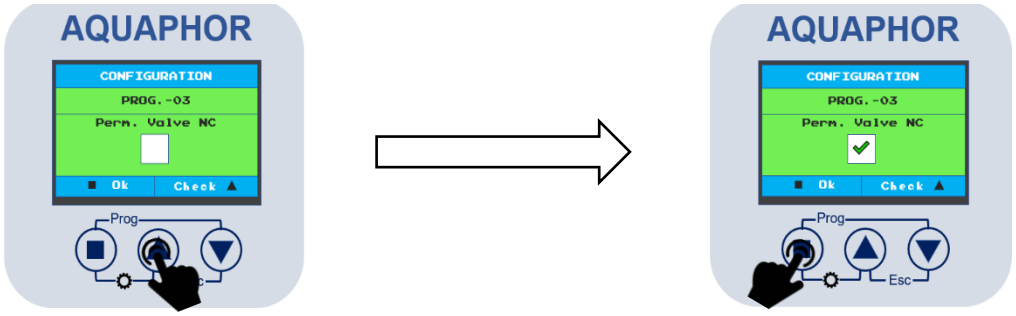
2. Perform dosing pump degassing (**Maintenance, 11.1**).
3. Make sure there is no leakage.
4. Check all the setups and programs
5. Whenever the low level sensor is off, it is recommended to perform P-04 deaeration (**Maintenance, 11.1**).

6.4. Example of software setup

1. To enter the settings menu, use the controller's three-button keyboard located under the monitor screen.

2. To open **Configuration** menu, press the “Ok” ■ and “Down” ▼ buttons.

3. If you want to add or exclude an element from the system, press the “Up” ▲ button. By pressing the “Ok” ■ button, we confirm the selection and proceed to the next element of the system.



7. Programs

If the program is on (✓), the valve is normally closed and operating in a described way. If the program is off, the valve closes when the maximum allowed value of LLS is exceed.

01	Feed Pump (P-03)*
-	If the input water does not meet the requirements of this manual for the minimum pressure and required volume, the system can be connected to the existing water supply through the raw water supply system. For this program, a pump for raw water should be added. By default, a storage tank with feed water is also added. The feed water pump works under the following conditions: ▪ The program is activated ▪ The three-position switch is in the "AUTO" position ▪ There is enough water in the storage tank. ▪ There is a signal from the RO system to start work
02	Pretreatment (PTS-01)
-	This program turns on the water pretreatment process. The pretreatment system (PTS-01) will carry out the regeneration according to a given program, and the results will be displayed on the controller screen. During this period, the RO system is in waiting mode. The time of the pretreatment regeneration does not depend on the controller settings. When the pretreatment regeneration mode is activated, all RO system units turn OFF, and the feed water feed pump turns on. After finishing the regeneration process, the system continues to work automatically.
03	Permeate Valve NC (XV-02)
✓	Presence of a primary permeate drainage valve (XV-02). The valve turns on when the set value of the product electrical conductivity is exceeded. During the system operation, the drainage valve opening symbol will be displayed on the controller during the frequency reset (**the green arrow indicator should be in the right upper corner**)
04	Supply Pump (P-04)
-	If there is a need to quickly supply a large volume of purified water quickly, a non-pressurized RO water supply system can be connected. The reverse osmosis system will fill the additional tank with RO water to the specified level.
05	Permeate Flow transmitter (FT-01)
✓	Enables/disables permeate flow sensor (FT-01).
06	Feed flow transmitter (FT-02)
✓	Enables/disables feed flow sensor (FT-02).
07	High pressure switch (HPS-01) *** APRO 6000 LPH HP ONLY**
✓*	Enables/disables high pressure switch (HPS-01).
08	Permeate Flush (XV-05)
-	Whenever the system is in stand-by mode, enables membrane flush with permeate. Permeate is supplied by XV-05 valve.
09	Pulse Dosing
-	Enables pulse dosing control. Current system is lacking pulse dosing. Program is not required.

10	Dosing Level SW. (LLS-02) - optional
✓	Enables/disables low antiscalant level switch.
12	Dosing Pump RO (DP-01)
✓	Enables dosing pump (DP-01).
13	Permeate Conductivity transmitter
✓	Enables RO permeate conductivity sensor (ECT-01).
14	Feed Conductivity transmitter (optional)
-	Enables feed water conductivity sensor (ECT-02**).**
15	Feed low pressure transmitter
✓	Enables feed low pressure sensor (LPT-01). If program is disabled, the system is protected by LPS-01.
16	Feed pressure transmitter 4-20 mA – *optional*
-	If the program enabled, the feed pressure sensor range is 4 – 20 mA. If the program disabled, there is an analogue sensor, and its range is 0 – 5 mV. The pressure range of the sensor is 0 – 10 bar.
17	Inlet low pressure transmitter
✓	Enables feed low pressure sensor (LPT-02).
18	Inlet pressure transmitter 4-20 mA – *optional*
-	If the program enabled, the inlet pressure sensor range is 4 – 20 mA. If the program disabled, it is an analogue sensor, and its range is 0 – 5 mV. The pressure range of the sensor is 0 – 10/40 bar (**Prog.20**).
19	RO high pressure transmitter
✓	RO high pressure sensor (HPT-01). If the program is disabled, the system is protected by HPS-01.
20	RO high pressure transmitter range 0-40 Bar
✓	If the program enabled, the RO high pressure sensor range is 0 – 40 bar. If the program disabled, the RO high pressure sensor range is 0 – 10 bar.
21	RO high pressure transmitter 4-20 mA – *optional*
-	If the program enabled, the inlet pressure sensor range is 4 – 20 mA. If the program disabled, it is an analogue sensor, and its range is 0 – 5 mV. The pressure range of the sensor is 0 – 10/40 bar (**Prog.20**).
22	Permeate pressure transmitter*
-	Enables/disables permeate pressure sensor (PT-01).
24	Conductivity Sm/PPM – *optional*
-	If the program enabled, the permeate pressure sensor range is 4 – 20 mA. If the program disabled, it is an analogue sensor, and its range is 0 – 5 mV. The pressure range of the sensor is 0 – 10/40 bar (**Prog.20**).
25	L/GAL, BAR/PSI, C/F – *optional*
-	Enable the program to switch to imperial units and Farenheits.

8. Setups

Setup 01	Start-up flush
15 sec	Setting the start-up flush time. The recommended value is 15 sec.
Setup 02	Shut-down flush
15 sec	Setting the shut-down flush time. The recommended value is 15 sec.
Setup 03	Stand-by-flush
12 h	Setting the stand-by flush period (period in hours). The recommended value is 12 hours.
Setup 04	High permeate conductivity alarm
100 mS	Setting the point for the product conductivity limit (max value). The recommended value is 100 mS.
Setup 05	High feed water conductivity alarm (optional)
900 mS	Setting the maximum value for the feed conductivity limit. The recommended value is 900 mS.
Setup 06	Low press. Delay
10/10/15 Sec	Setting the delay to stop the system after a signal of low input pressure is received. The recommended value is: APRO 3000 LPH HP – 10 sec APRO 4000 LPH HP – 10 sec APRO 6000 LPH HP – 15 sec
Setup 08	Permeate flow, K
38K	Setting the number of pulses per liter. The recommended value is 38K. Note: the parameter is set by flowmeter manufacturer.
Setup 09	Feed flow, K
8K	Setting the number of pulses per liter. The recommended value is 8K. Note: the parameter is set by flowmeter manufacturer.
Setup 10	Automatic concentrate valve open time
95 Sec.	Setting the automatic concentrate valve open time: The recommended value is 95 sec.
Setup 11	Automatic concentrate valve flush opening
80%	Setting the automatic concentrate valve flush opening %. The recommended value is 80%.

Setup 12	Automatic concentrate valve run opening

21/24/26%

Setting the automatic concentrate valve run opening %.

RECOVERY SETUP (SETUP-12)			
Setting concentrate valve opening percentage while running			
Desired Recovery (%)	**APRO-3000-LPH-CIP**	**APRO-4000-LPH-CIP**	**APRO-HP-6000-D-SST**
60%	(Set-12) 21%	(Set-12) 24%	(Set-12) 26%
65%	(Set-12) 20%	(Set-12) 22%	(Set-12) 25%
70%	(Set-12) 18%	(Set-12) 20%	(Set-12) 21%
75%	(Set-12) 17%	(Set-12) 18%	(Set-12) 19%
80%	(Set-12) 16%	(Set-12) 16%	(Set-12) 18%
85%	(Set-12) 14%	(Set-12) 14%	(Set-12) 17%
90%	(Set-12) 13%	(Set-12) 13%	(Set-12) 15%

The recommended value is:
APRO 3000 LPH HP – 21%
APRO 4000 LPH HP – 24%
APRO 6000 LPH HP – 26%

Setup 13	Full tank delay
5 sec	Setting the delay to stop the system after the full tank signal is received (HPS-02). The recommended value is 5 sec.
Setup 14	Permeate Low Flow alarm
10 LPM	Setting the minimum permeate flow signaling to stop the system (Check 9, Alarm-09). The recommended value is 10 LPM. Note: this is not the absolute minimum.
Setup 15	Concentrate Low Flow alarm
5 LPM	Setting the minimum concentrate flow. The recommended value is 5 LPM.
Setup 16	Low feed pressure alarm
1 Bar	Setting the minimum feed water pressure. The recommended value is 1 Bar.
Setup 17	Inlet low pressure alarm
0.8 Bar	Setting the minimum inlet pressure. The recommended value is 0.8 Bar.
Setup 18	High RO pump pressure alarm
20 Bar	Setting the highest acceptable RO pump pressure value. The recommended value is 20 Bar.
Setup 21	Cartridge filter pressure drop alarm
1.5 Bar	Setting the minimum value of the cartridge filter pressure. The recommended value is 1.5 Bar.

Setup 22	Cartridge filter resource
3000 m^2	Setting the volume of cartridge filter resource. The value is 3000 m^2.
Setup 23	System ID number
1	Setting the system ID number (1-255). The value is 1.
Setup 24	Year
2023	Setting the year (18-50). The value is 2023.
Setup 25	Date/Month
	Setting the date (DD:MM).
Setup 26	Time
	Setting the time (hh:mm).

9. Alarms

Alarm №	Symptoms	Possible causes	Corrective Action
Alarm-01	Low level in the feed water tank	Low level in the fee water tank T-01	Check the presence of feed water; otherwise, check RO water supply and LLS-01 functionality.
Alarm-02	Pretreatment system error	The pre-filtration system is in the PT-01 regeneration mode for > 3 hours	Check the functionality of pretreatment equipment, RO system controller cable, and pretreatment system controller.
Alarm-03	Antiscalant tank low level	No signal from the LLS-02 in the antiscalant T-02 tank for 10 seconds.	Check the presence of antiscalant or/and sensor functionality
Alarm-04	Feed water low pressure	No signal from the PT-01 in the supply line for a specified time (Setup.-06)	Check RO water supply and PT-01 functionality.
Alarm-05	Low inlet pressure	No signal from the PT-02 in the water supply line to the RO system for a specified time (Setup-06).	Check the functionality of RO water supply, PT-02, XV-01.
Alarm-06	High inlet pressure	No signal from the HPS-02 at the membrane inlet for 10 seconds.	Perform CIP or change the membrane, check HPS-02 functionality.
Alarm-07	RO pump overload	A signal is received from the thermal protection of the pump motor of the RO system P-01.	Check RO pump P-01 overload functionality.
Alarm-08	High electrical conductivity of permeate	The conductivity value of the RO system product is bigger than the set value (Setup-04) for 5 minutes	Perform PCP-01 calibration, perform CIP, or change the membrane.
Alarm-09	Minimum value of permeate flow	The osmosis system permeate flow value is less than the set value (Setup-14) for 5 minutes.	Check the functionality of FT-01. Perform CIP, or change the membrane.
Alarm-10	Minimum concentrate flow	The osmosis system permeate flow value is less than the set value (Setup-14) for 5 minutes.	Check the functionality of the concentrate sensor and automatic concentrate valve XV-04.
Alarm-11	Low permeate Level	There is no signal from the LLS-03 low water level sensor in the T-03 permeate tank for 20 minutes.	Check permeate presence in the tank.
Alarm-12	High feed conductivity	The conductivity of the feed water of the RO system is greater than the set value for 5 minutes	Check the feed water supply, functionality of ECT-02, and pretreatment system.
Alarm-14	Feed pressure sensor	The feed pressure value is lower than the set value (Setup-17) for 5 minutes	Check the sensor and cable connection. If there is an error after checking, then replace the sensor.

Alarm-15	Inlet pressure sensor	The inlet pressure value is lower than the set value (Setup-17) for 5 minutes	Check the sensor and cable connection. If there is an error after checking, then replace the sensor.
Alarm-16	RO pressure sensor	The RO pressure value is higher than the set value (Setup-18) for 5 minutes	Check the sensor and cable connection. If there is an error after checking, then replace the sensor.

10. APRO Android App

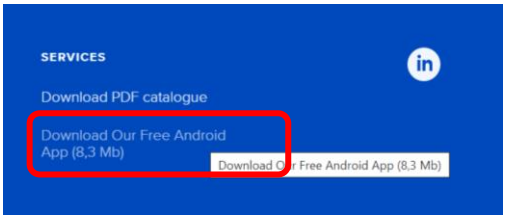
APRO Monitor app functionality:

- Data transfer in the local network
- Setting up the equipment programs and its setups
- Monitoring parameters in a running system, viewing a log, statistics.
- Alarms display

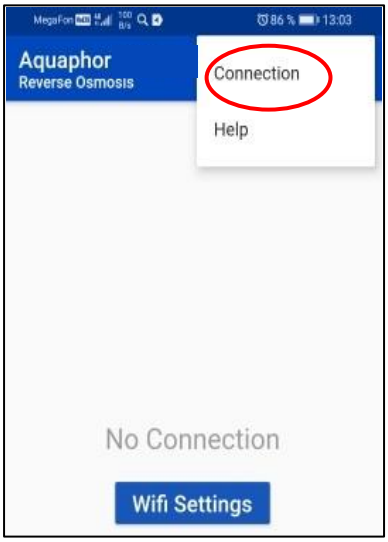
APRO Monitor app is available for Android OS only

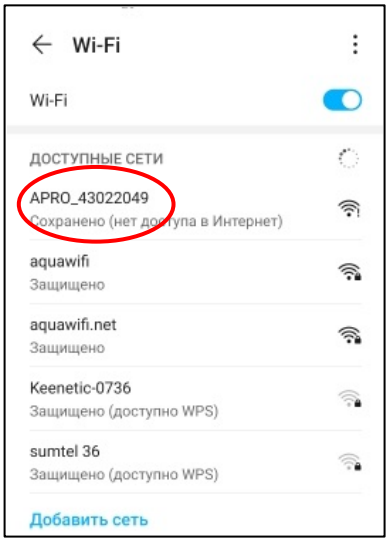
10.1. Setting Up

1. Download and install the APRO Monitor app from the official website of the system manufacturer (aquaphor-pro.com) to your mobile device. The link can be found in the footer:



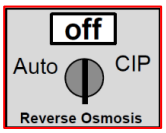
2. Open the app.
3. Configure the connection.
   a) Open the context menu and choose “Connection”.
   b) Press OK.
   c) Choose “APRO_*XXXXX*” network.
   d) Select “Connect” in the pop-up window.





4. Back in the context menu, choose “System’s Settings”.
5. Select the equipment and click “Save”.

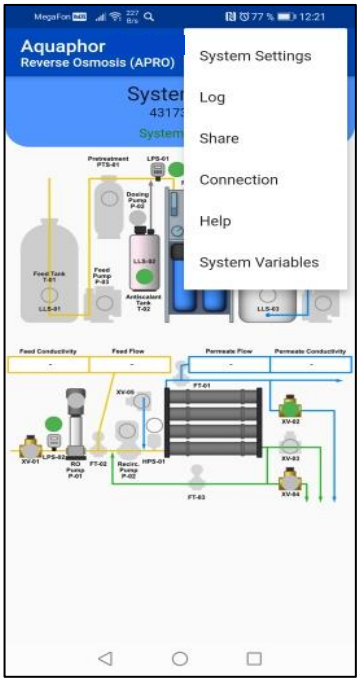
10.2. System Configuration



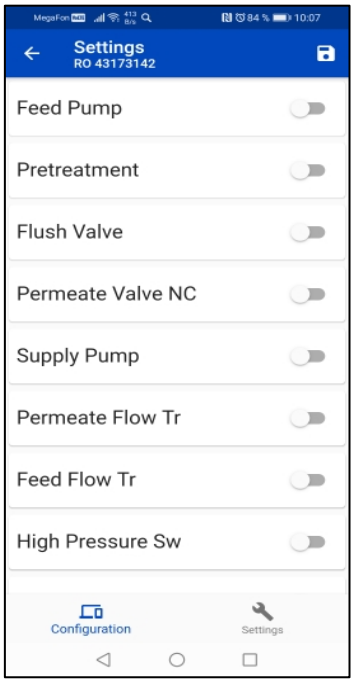
It is possible to make changes to the system configuration and parameters only in OFF mode.

The starting screen displays the system configuration and available reverse osmosis (RO) system's option **(1)**. System Settings window **(2)** has two subparts: "Configuration" enables or disables programs 01. "Settings" window **(3)** changes the setups of the active programs.

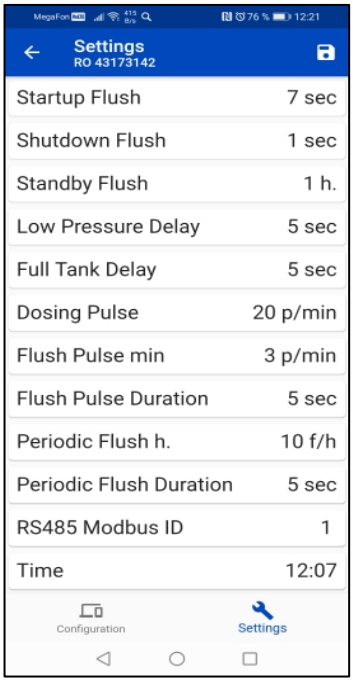
1)



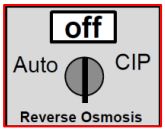
2)



3)



10.3. Operating Mode Functionality

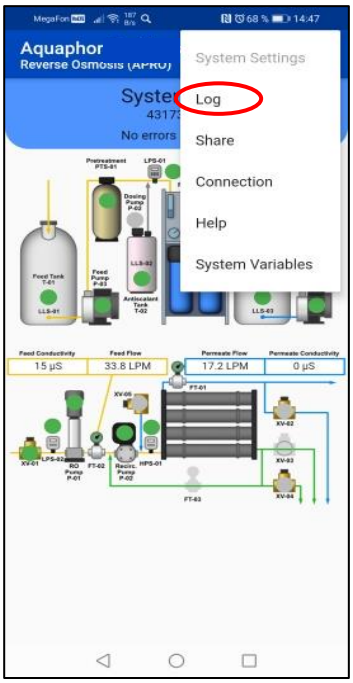


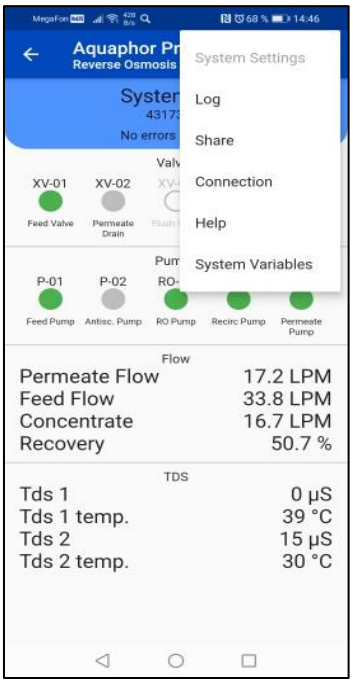
! Operating mode can be started only using a three-position switch on the RO control station.

When the system is operating, the following data is available:

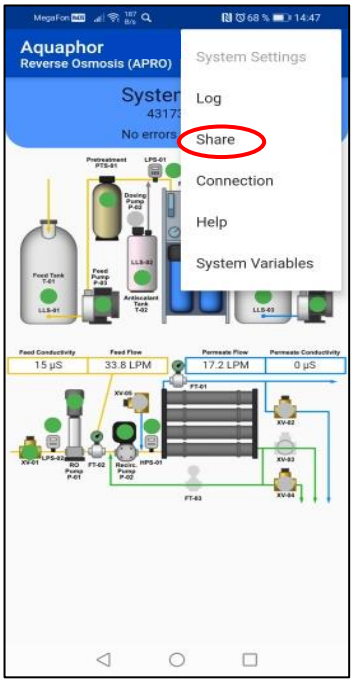
- Total operating hours
- Amount of permeate produced
- The amount of water used
- Overall system performance
- Date and time of starts/stops
- Change of modes
- Operating time of each mode

The “Log” button of the context menu shows statistics and log of the system.

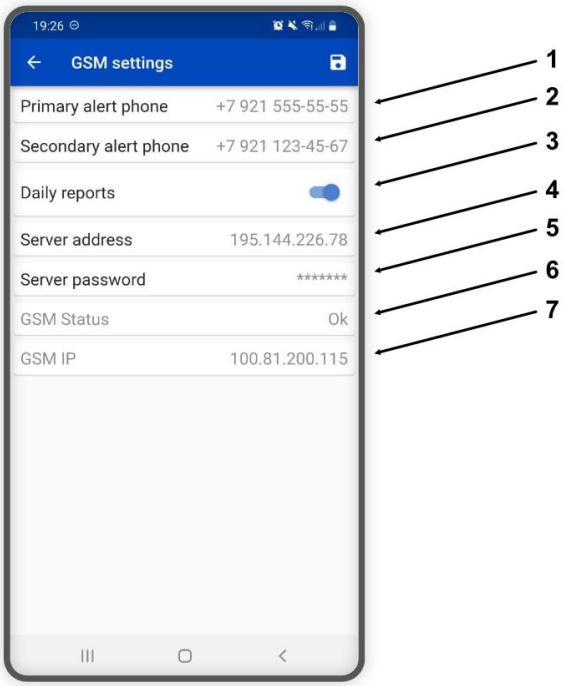




It is possible to share the statistics with other users and devices. The “Share” button of the context menu suggests several options (browser and messenger).



10.4. GSM Module Settings Window



1, 2 - Numbers for system notifications: numbers to which all the information from the system will be sent - reports, notifications about problems.

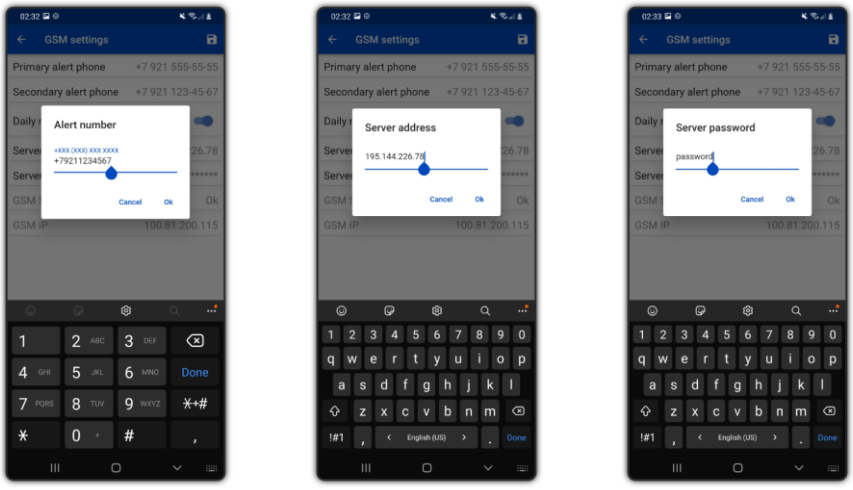
3 - Daily reports switcher: if this option is enabled, reports will be sent to notification numbers every day. (Report time 10:00 AM according to the system clock)

4, 5 - Data collection server address/password: setting the server to send the information about the system via the Internet.

6 - GSM module status is read-only. For details, see "GSM module statuses".

7 - IP address of the GSM module is read-only, if the module is not connected to the Internet, then 0.0.0.0 will be displayed.

By clicking on one of the menu items, the interface for editing will open:



1 2 3

1 - Editing the number for notifications. It is preferable to write in the format +XXX (XXX) XXX XXXXXX.

2 - Setting the server address. You can enter both IP and web addresses.

3 - Setting the server password.

10.5. GSM Module Status

Status	Explanation
Ok	No errors
Disconnected	GSM module is not detected by the system. Check if the module is turned off or if there is no wired connection between the GSM module and the system.
No SIM	There is no SIM card, or the SIM card is installed incorrectly.
No GSM	There is no connection with the GSM network, the SIM card may be damaged, or the SIM card / provider is not compatible with the GSM module.
No GPRS	There is no internet connection, perhaps the current tariff does not provide internet connection, or the SIM card has a negative balance or damaged.
No server connection	No data collection server was found. The server may not be configured correctly.
Server auth failed	Server found, authorization error. Please check if the password was set correctly.

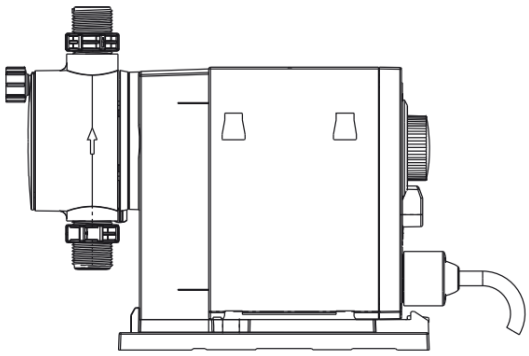
10.6. Additional information

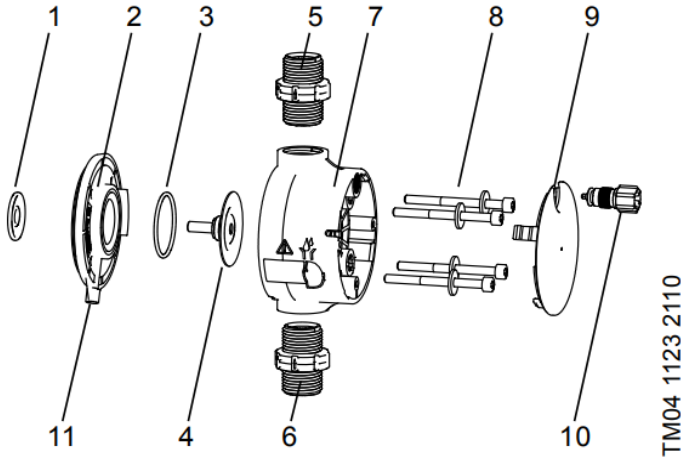
The context menu also contains the “Help” option. A detailed description of APRO application capabilities can be found there.

11. Maintenance

11.1 Dosing Pump Degasing

After antiscalant replacement, it is required to perform dosing pump degassing.





Dosing head detailed view:

1. Safety diaphragm
2. Flange
3. O-ring
4. Diaphragm
5. Valve on discharge side
6. Valve on suction side
7. Dosing head
8. Screws with discs
9. Cover
10. Deaeration valve
11. Drain opening

Start and deaerate the pump.

1. Connect mains supply. Make sure the system is turned on.

2. Open the deaeration valve by approximately half a turn.

3. DDE-B control variant: Turn the capacity adjustment knob to 100 % and wait until liquid flows out of the deaeration hose continuously and without any bubbles. Then set the capacity adjustment knob back to 0,1-1 % (depending on the water quality and antiscalant type).

4. Close the deaeration valve.

The pump is deaerated.

11.2. Replacing the membrane module

1. Prepare the pressure vessels:
    a. Remove the permeate pipe manifold to open the pressure vessels. Open Victaulic couplings connecting permeate port to the PVC manifold.
    b. Release PVC Union connections and disassemble the permeate manifold to allow free access to the pressure vessels.
    c. Remove the retaining ring from both pressure vessel ends.
    d. Use the extractor to pull out the end caps on both sides of the pressure vessel flush.
    e. Flush the vessel with water hose and clean any remaining debris with a clean rag.
    f. Apply a thin layer of lubricant to the inner walls of the pressure vessels at the brine side and the head seal. Make sure the head seal is clean.
    g. *If the thrust cone and sealing plate are separated, install the thrust cone on the end cap of the brine side. Ver-ify that the wide side is facing the lead membrane element and the narrow side is facing the sealing plate.
    h. Install the permeate thru adapter on the inner side of the permeate port.
    i. Install the end cap on the concentrate side.
    j. Put back support rings (if they exist) and secure with the retaining ring.
2. Load the membrane elements:
    a. Membrane elements are loaded from the feed side. Element direction is such that the V-ring brine seal is on the tail of the element. There is an arrow embedded on the element indicating the correct loading direction. Place the leading end of the first element into the feed water end of the pressure vessel and slide it in approximately three-quarters of the element's length. Apply a thin layer of lubricant (such as glycerin) to the V-ring brine seal and to both O-ring seals on the interconnector. Install the interconnector into the permeate tube of the element (push it in halfway through until it stops).
    b. Apply a thin layer of lubricant to the V-ring brine seal and to both O-ring seals on the interconnector. Install the interconnector into the permeate tube of the element (push it halfway through until it stops).
    c. Lift the next element into position and install the trailing end on the interconnector.
    d. **NOTE:** Align the next element to the previous one, so the weight is not supported by the interconnector and there is no stress on it.
    e. Push the element into the pressure vessel until one quarter of the element extends outside vessel. Keep on per-forming the same process for the other membranes. Lubricate the interconnectors O-ring seals and the V-ring brine seal after each element loading. Apply a thin layer of lubricant to the blind adapter O-ring and install into the permeate tube of the tail element.
    f. The last element is secured by a feed spacer which holds the blind adapter in place. The feed spacer is installed on the tail element permeant tube. Install the spacer pipe on the blind adapter and push the element into the pressure vessel almost the end to apply a thin layer of lubricant to the inner walls of the pressure vessel at the feed side.
    g. Install the feed side end cap on the pipe spacer using supplied coupler. Block the end cap with an additional permeate blind adapter, if necessary. Push the spacer into the pressure vessel until the feed end cap is in place.
    h. Put back support rings (if they exist) and secure the end cap with the retaining ring.
    i. The membrane module is replaced.

11.3. Replacing the filter cartridge (Viking – B520-13)

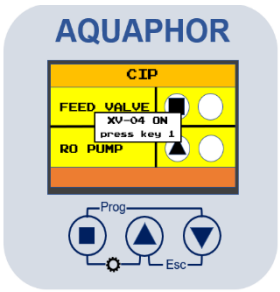
1. Turn OFF water supply and relieve pressure.
2. Unscrew the coupling nuts and disconnect the quick junction.
3. Unscrew the handle (1) and take away the water filter clamp (2).
4. Take away the upper semi-housing (3) and disconnect the filter cartridge off the connecting pipe.
5. Wash out the semi-housing, rubber gaskets, and plastic ring from dirt.
6. Place a new B520-13 filter cartridge.
7. Assemble the quick junction, screw the coupling nuts against stop.
8. Turn on water supply and make sure that there is no leakage.
9. When water pressure is raised, push the button on top (4) to release the air.

Replace the filter cartridge in proper time!

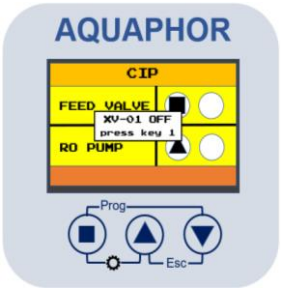
11.4. Equipment Testing

Equipment testing mode allows to check the condition of each system's element.

1. Turn the switch to the CIP position.
2. Press ▼ for 3 seconds. The following screen will appear:



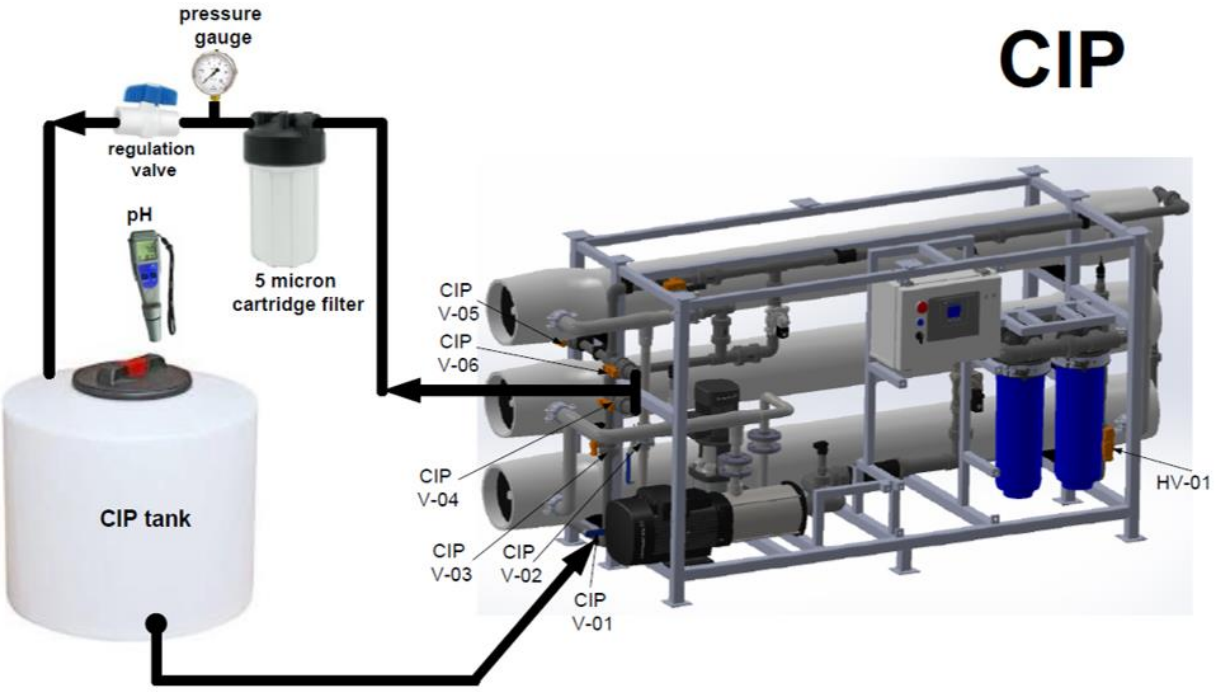
3. Press ■ to enable/disable the system's element and switch to the next one.



4. To close equipment testing mode, put the switch to the OFF position.

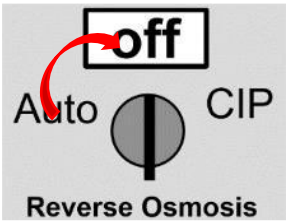
11.5. Membrane Cleaning (CIP)

Membranes can become contaminated after being used over time. There are such pollutants as colloids, biofilms, and biological matter. These contaminants can be absorbed by membrane, and the membrane system's pipes, consequentially, the system's performance will decrease.



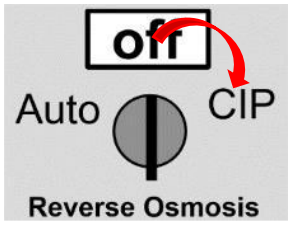
- If the membrane gets stuffed with organics (e.g., biofilm formation), the organic cleaning solution with a pH from 10 to 11 should be used. After the cleaning procedure is complete, check the amount and TDS of the permeate to evaluate the cleaning process's effectiveness.
- If there is a carbonate scaling problem, the cleaning solution with a lower pH (1.5 – 2) should be used together with antiscalant dosage adjustment.

1. Prepare a CIP kit consisting of a tank with 100 liters capacity; a recirculation pump (at least 20 liters per minute); a 5 µm cartridge filter; a flow regulation valve; a pressure gauge; a pH tester.
2. Fill the tank with RO permeate. If there is no RO permeate it is possible to use feed water (**not recommended**).
3. Switch the system to the OFF position.

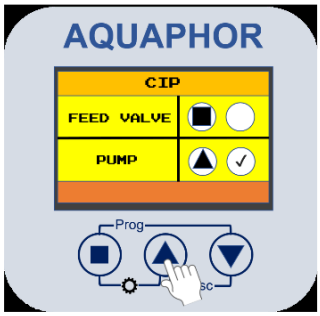


4. Connect the CIP kit to the system according to the picture.
5. Close valves HV-01, CIP V-02, CIP V-03, CIP V-05.
6. Open valves CIP V-01, CIP V-06, CIP V-04.

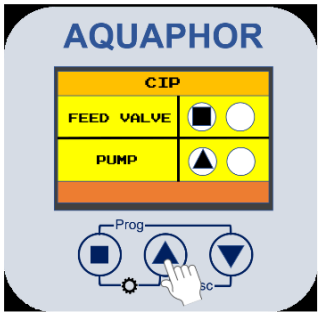
7. Switch the system to the CIP position.



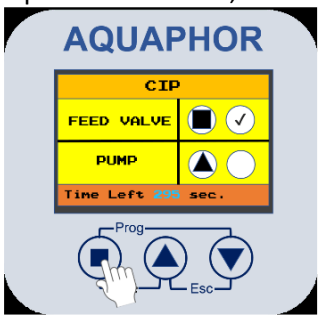
8. Press ▲ button to turn ON the recirculation pump.



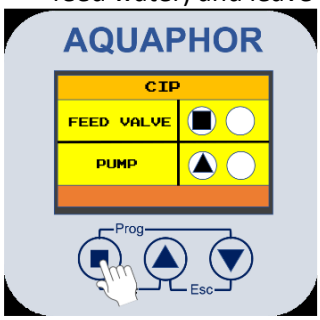
9. Check the permeate flow so the solution returns to the CIP tank. Add the cleaning solution (with a pH from 1.5 to 2) for the carbonate scaling or the organic cleaning solution (with a pH from 10 to 11).
10. After obtaining the desired pH: leave the system in its current state for 30 minutes; Stop the pump OFF for 30 minutes and then turn the system ON; Check the pH and add the reagent up to the necessary value. It is recommended to perform 3-5 CIP cycles.
11. Press ▲ button to turn OFF the recirculation pump.



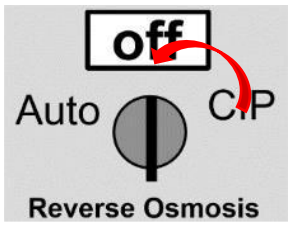
12. Empty the container, disconnect all pipes from the CIP kit.
13. Empty the CIP tank and disconnect the pipes.
14. Close valves CIP V-01, CIP V-03.
15. Open valves HV-01, CIP V-04. Connect the pipes of CIP V-06 to drainage.



a) Press “Ok” ■ button to open the Feed Valve (the solution starts flushing the system with feed water) and leave for 10 minutes.



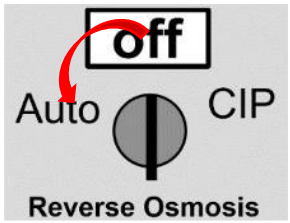
b) Press “Ok” ■ button to close the Feed Valve.



c) Move the switch to the OFF position.

d) Open CIP V-02.

e) Move the switch to the AUTO position and leave for 15 minutes.



f) Make sure the system is running, and the conductivity and pH of the permeate meet the requirements

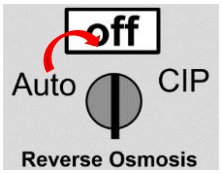
g) Close V06. Open V05.

16. The system is ready.

11.6. Callibration

The conductivity requires periodic calibration. Calibration is usually required after cleaning the sensor. APRO controller requires multipoint calibration: calibration solutions of 1413 mkS, 84 mkS, and air for 0 mkS calibration.

1. Switch the system to OFF position.



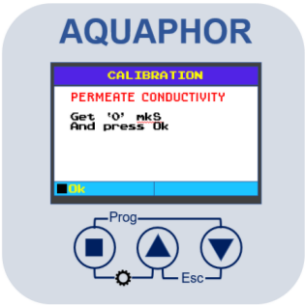
2. Take off the conductivity sensor. Wipe it with the distilled water and dry it.

3. Prepare the calibration solutions of 1413 mkS and 84 mkS. Make sure they are not expired. It is recommended to perform the calibration under 20-25 °C (the room temperature).

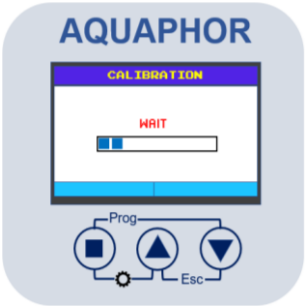
4. Hold ▲ button for 10 seconds. The main calibration menu will appear:

Make sure both of the conductivity sensors show 0 mkS and represent the actual temperature. If the sensor's value is not close to 0, or the temperature sensor represents the wrong value, the corresponding sensor should be replaced.

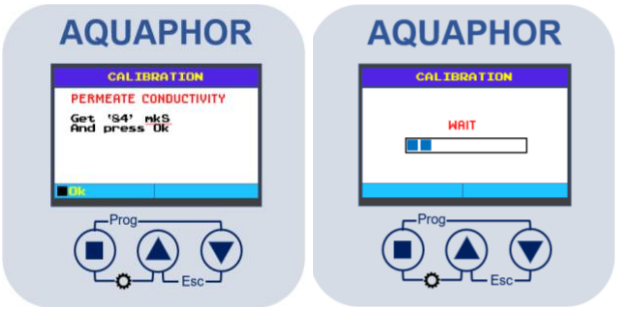
5. Press ■ button. Permeate conductivity '0 mkS' calibration screen will appear:



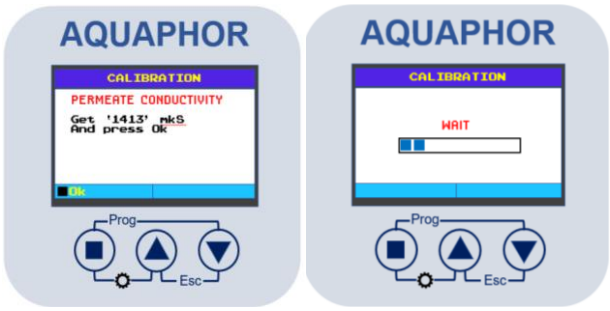
Make sure the conductivity sensor is in the air and press OK ■ button. Hold the sensor into the air while the screen shows WAIT mode.



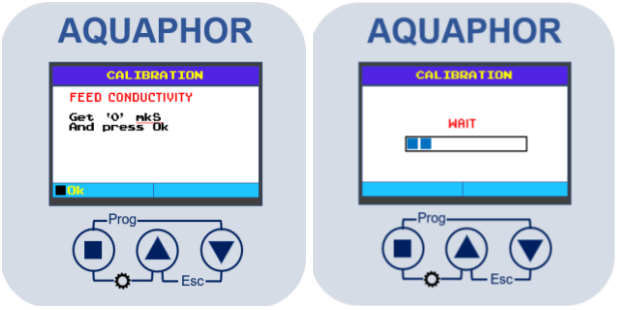
6. The screen switches to permeate conductivity ‘84 mkS’ calibration screen. Place the sensor in the calibration solution 84 mkS. Make sure the sensor do not touch the bottom of the jar. Press OK ■ button. Hold the sensor into the solution while the screen shows WAIT mode.



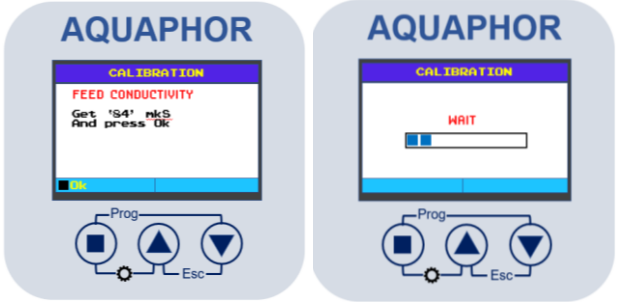
7. The screen switches to permeate conductivity ‘1413 mkS’ calibration screen. Rinse the conductivity sensor with distilled water, wipe it and dry it. Place the sensor in the calibration solution 1413 mkS. Make sure the sensor do not touch the bottom of the jar. Press OK ■ button. Hold the sensor into the solution while the screen shows WAIT mode.



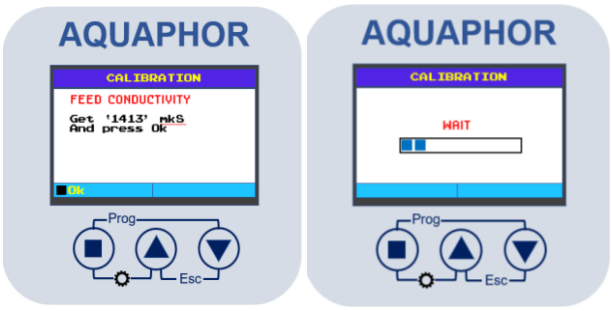
8. The screen switches to feed conductivity ‘0 mkS’ calibration screen. Rinse the conductivity sensor with distilled water, wipe it and dry it. Place the sensor in the air. Hold the sensor into the air while the screen shows WAIT mode.



9. The screen switches to feed conductivity ‘84 mkS’ calibration screen. Place the sensor in the calibration solution 84 mkS. Make sure the sensor do not touch the bottom of the jar. Press OK ■ button. Hold the sensor into the solution while the screen shows WAIT mode.



10.The screen switches to feed conductivity ‘1413 mkS’ calibration screen. Rinse the conductivity sensor with distilled water, wipe it and dry it. Place the sensor in the calibration solution 1413 mkS. Make sure the sensor do not touch the bottom of the jar. Press OK ■ button. Hold the sensor into the solution while the screen shows WAIT mode.



11.After finishing the calibration, the calibration menu will appear:

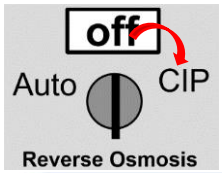
Place permeate sensor in 84 mkS solution and feed sensor in 1413 mkS solution. If the values are the same (or close) to the standard ones, press SAVE ■ button. If not, repeat the calibration (steps 4-11).

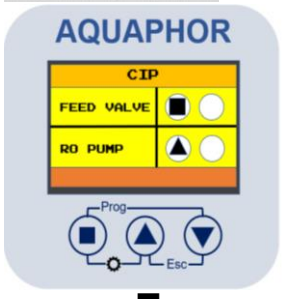
12.Place the sensors back in the system. Switch the system to the AUTO position.

11.7. Preservation of RO and NF systems

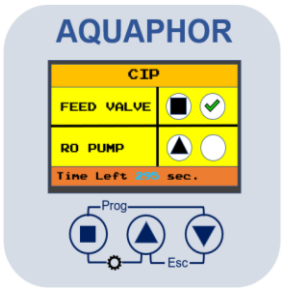
The elements of RO system must be preserved any time the plant is shut down for more than a maximum of 48 h to prevent biological growth. Depending on the previous operational history of the plant, it will be necessary in almost all cases to clean the membranes prior to shut-down and preservation. This applies to cases when the membranes are known or assumed to be fouled. After cleaning, the preservation should follow within the next 10 h as follows:

1. Totally immerse the elements in the pressure vessels in a solution of 1 – 1.5% SMBS, venting the air outside of the pressure vessels. Use the overflow technique: circulate the SMBS solution in such a way that the remaining air in the system is minimized after the recirculation is completed. After the pressure vessel is filled, the SMBS solution should be allowed to overflow through an opening located higher than the upper end of the highest-pressure vessel being filled.
2. Remove the Viking module and fill the gap with SMBS.
3. Move the switch at the top to the CIP position to enter the CIP mode.

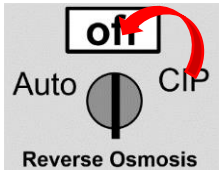




4. Press “Ok” ■ button to open the feed valve (the solution starts flushing the system with feed water) and leave for 10 minutes.



5. Press “Ok” ■ to turn of the feed valve and exit the CIP mode.



6. Separate the preservation solution from the air outside by closing all valves. Any contact with oxygen will oxidize the SMBS.
7. Check the pH once a week. When the pH becomes 3 or lower, change the preservation solution.
8. Change the preservation solution at least once a month. During the shut-down period, the plant must be kept frost-free, and the temperature must not exceed 113°F (45°C). A low temperature is desirable.

12. System Information Collection via Modbus

12.1 Modbus communication port setpoints

Modbus communication port are integrated in control panel. This provides communication from the control panel to a field Modbus bus network. When powered, the water system will be able to communicate via the secondary terminals labeled XT20-1A, XT20-1B, and XT20-G as a slave device. Recommended Modbus cable has twisted-pair wires having an aluminum/mylar foil shield with drain wire.

12.2 Viewing/Setting Modbus setpoints

Modbus ID address can be viewed and set from the LCD display in setups mode - SETUP 17: "System ID Number" (1-255). Control panel are shipped with set default address of 001. Modbus Settings: 9600 bits/second baud rate, even parity, and 1 stop bit.

12.3 Network Communication Protocol

Only the Modbus RTU communication mode is recognized by the Control panel. The Control Panel can support 65 registers (130 data bytes) only in a single Modbus transaction. The Control panel responds to a limited number of Modbus function codes. These are function codes 03 (Read Holding Registers) and 06 (Write Holding Registers).

Reading is carried out by one sending of all registers from address 0000 to address 0064. Writing is carried in register with address 0000, which is used to write Control Word.

12.4 RO Settings (Read Only)

Parameter	Address	Unit	Type
Device Type	0000	-	16-bit unsigned int
Config State * (Status word #1)	0001	-	32-bit unsigned int
Startup Flush	0003	sec.	16-bit unsigned int
Shutdown Flush	0004	sec.	16-bit unsigned int
Standby Flush	0005	h.	16-bit unsigned int
Valve Open Time (CL)	0006	sec.	16-bit unsigned int
Low Pressure Delay	0007	sec.	16-bit unsigned int
Full Tank Delay	0008	sec.	16-bit unsigned int
Dosing Pulse	0009	p/min	16-bit unsigned int
Flush Pulse min (HF)	0010	p/min	16-bit unsigned int
Flush Pulse Duration (HF)	0011	sec.	16-bit unsigned int
Periodic Flush h. (HF)	0012	f/h	16-bit unsigned int
Periodic Flush Duration (HF)	0013	sec.	16-bit unsigned int
Valve Flush Opening (CL)	0014	%	16-bit unsigned int
Valve Run Opening (CL)	0015	%	16-bit unsigned int
High Conductivity Alarm	0016	LPM	16-bit unsigned int
Feed High Conductivity Alarm	0017	LPM	16-bit unsigned int
Perm Flow K	0018	K	16-bit unsigned int
Feed Flow K	0019	K	16-bit unsigned int
Permeate Low Flow	0020	LPM (x10)	16-bit unsigned int
Concentrate Low Flow	0021	LPM (x10)	16-bit unsigned int

Parameter	Address	Unit	Type
System Time	0022	unix time	32-bit unsigned int
System Status* (Status word #2)	0024	-	16-bit unsigned int
Start up permit* (Status word #4)	0025	-	16-bit unsigned int
Output Values* (Status word #3)	0026	-	32-bit unsigned int
Errors* (Status word #5)	0028	-	32-bit unsigned int
Detected Errors* (Status word #5)	0030	-	32-bit unsigned int
Startup Errors* (Status word #6)	0032	-	32-bit unsigned int
Permeate Flow	0034	LPM | GPM (x10)	16-bit unsigned int
Feed Flow	0035	LPM | GPM (x10)	16-bit unsigned int
Recovery	0036	% (x10)	16-bit unsigned int
Tds 1	0037	uSm | ppm	16-bit unsigned int
Tds 1 temp.	0038	°C | °F	16-bit unsigned int
Tds 2	0039	uSm | ppm	16-bit unsigned int
Tds 2 temp.	0040	°C | °F	16-bit unsigned int
Total Permeate	0041	l (x10)	16-bit unsigned int
Total Feed	0042	l (x10)	16-bit unsigned int
Average Recovery	0043	% (x10)	16-bit unsigned int
Operating Time	0044	sec.	32-bit unsigned int
STM Serial Number	0046	-	32-bit unsigned int
Low feed pressure	0048	bar (x10)	16-bit unsigned int
Low inlet pressure	0049	bar (x10)	16-bit unsigned int
High RO pump pressure alarm	0050	bar (x10)	16-bit unsigned int
System stop perm. tank pressure	0051	bar (x10)	16-bit unsigned int
System start perm tank pressure	0052	bar (x10)	16-bit unsigned int
Cartridge filter press. drop alarm	0053	bar (x10)	16-bit unsigned int
Cartridge filter resource	0054	m^3 (x10)	16-bit unsigned int
Resource counter	0055	-	32-bit unsigned int
Feed pressure	0057	bar (x10)	16-bit unsigned int
Inlet pressure	0058	bar (x10)	16-bit unsigned int
RO pump pressure	0059	bar (x10)	16-bit unsigned int
Permeate pressure	0060	bar (x10)	16-bit unsigned int
Pressure difference	0061	bar (x10)	16-bit unsigned int
GSM module status	0062	-	16-bit unsigned int
GSM IP	0063	-	32-bit unsigned int

*For version CI/HF

12.5 Control Word

- Address 0000, 16 bit unsigned “Write only”.
- This register starts the RO system.

#	Meaning	Register Value
1	System Start	0
2	System Stop	1

12.6. Modbus Registers. Status Words

1. "**Config State**" – address 0001-0002, 32 bit unsigned. "Read only".

MSB 0001 LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

MSB 0002 LSB

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Bit	Name
0	Feed Pump Config
1	Pretreatment Config
2	Flush Valve Config
3	Reserved
4	Permeate Valve NC
5	Supply Pump
6	Permeate Flow Tr
7	Feed Flow Tr
8	High Pressure Sw
9	Permeate Flush Config
10	Pulse Dosing Operation
11	Dosing Level Sw
12	Control Valve
13	High Frequency RO
14	HQ Valve NO
15	Double Pump RO

Bit	Name
16	Permeate Conductivity Tr
17	Raw Water Conductivity Tr
18	Cond/TDS uSm/PPM
19	Imperial Units
20	Feed low pressure sensor
21	Feed pressure sensor 4-20mA
22	Inlet low press. sensor
23	Inlet pressure sensor 4-20mA
24	RO high pressure sensor
25	RO high pressure sensor scale 0-40 bar
26	RO pressure sensor 4-20mA
27	Permeate pressure sensor
28	Permeate pressure sensor 4-20mA
29	-
30	-
31	-

2. "**System Status**" – address 0024, 16 bit unsigned. "Read only".

MSB 0024 LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

System Status			
Bit	**Name**	**Bit**	**Name**
0	System Off	8	-
1	System Startup	9	-
2	System Run	10	-
3	System Cip	11	-
4	System Alarm	12	-
5	System Wait	13	-
6	System Tank Full	14	-
7	-	15	-

3. "**Output Values**" – address 0026-0027, 32 bit unsigned. "Read only"

MSB 0026 LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

MSB 0027 LSB

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Bit	Name
0	Feed Valve
1	Permeate Drain
2	Flush Valve
3	HF Valve
4	Permeate Flush
5	Valve Close
6	Valve Power
7	Feed Pump
8	RO Pump
9	Recirc Pump
10	Permeate Pump
11	Antisc. Pump
12	UV
13	Run Led
14	Alarm Led
15	LPS1

Bit	Name
16	LPS2
17	HPS1
18	LLSwT1
19	LLSwT2
20	LLSwT3
21	HLSwT3
22	Pretreatment
23	-
24	-
25	-
26	-
27	-
28	-
29	-
30	-
31	-

4. Start Up Permit
   - Address 0021, 16 bit unsigned "Read only".
   - This register is permission to control the system via Modbus.

#	Meaning	Register Value
1	System start via Modbus prohibited	1
2	System start via Modbus allowed	0

5. "**Errors**" / "**Detected Errors**" – address 0028-0029/0030-0031, 32 bit unsigned. "**Read only**".

MSB 0028 /0030 LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

MSB 0029 /0031 LSB

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Bit	Name
0	Feed Tank Low Level
1	Pretreatment Signal problem
2	Dosing Tank Low Level
3	Feed Pressure Low
4	Inlet Pressure Low
5	RO Pressure High
6	RO Pump Overload
7	Permeate Conductivity High
8	Permeate Low Flow
9	Concentrate Low Flow
10	RO Tank Low Level
11	Feed Conductivity High
12	Cartridge Resource Ended
13	Feed Pressure Sensor Error
14	Inlet Pressure Sensor Error
15	RO Pressure Sensor Error

Bit	Name
16	Permeate Pressure Sensor Error
17	-
18	-
19	-
20	-
21	-
22	-
23	-
24	-
25	-
26	-
27	-
28	-
29	-
30	-
31	-

6. “**Startup Errors**” – address 0032-0033, 32 bit unsigned. “**Read only**”.

MSB 0032 LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

MSB 0033 LSB

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Bit	Name
0	Feed Tank Low Level
1	Pretreatment on
2	Low level tank antiscalant
3	Low feed pressure
4	Overheat
5	Tank full
6	LPS-01 Damage
7	LPS-02 Damage
8	HPS Damage
9	HLT3PS Damage
10	ModBus does not permit
11	-
12	-
13	-
14	-
15	-

Bit	Name
16	-
17	-
18	-
19	-
20	-
21	-
22	-
23	-
24	-
25	-
26	-
27	-
28	-
29	-
30	-
31	-

13. Rules Of Storage and Transportation

- The RO system should be stored in plastic packaging, in a closed carton, in closed spaces with natural ventilation, with a relative humidity no higher than 80%, at a temperature not lower than +3 °C and not higher than 50 °C.
- Transportation and storage of the RO system are always in a vertical position. It is forbidden to turn over the system and other mechanical changes.
- The RO system must be transported within temperature limits of +3 °C up to + 50 °C. Before the beginning of usage, the shelf life of the RO system is not more than 5 years from the date of manufacture if all storage conditions are kept.

13.1. Shipping

Make sure that:

- The package does not leak.
- The elements are properly identified.
- The preservation solution is correctly labelled.

We recommend using the original packaging with the original polystyrene foam cushions to protect the element from mechanical damage. Elements with non flush-cut product water tubes should be protected against damage to the product water tube ends. The membrane elements will not be damaged by freezing temperatures during shipping provided the elements are thawed before loading and use.

14. Service and Warranty

Aquaphor Water Filters products are backed by some of the most comprehensive warranties in the industry. Aquaphor warrants that the Aquaphor water filtration system shall be free from defects in material and workman ship under normal use and service.

The reverse osmosis system APRO 3000/4000/6000 LPH HP – Two Year Warranty from the date of purchase. This does not apply, however, to consumable filters.

EXCLUSIONS AND LIMITATIONS

1. Aquaphor warrants its products to be free from manufacturing defects under normal use and service. This warranty is extended only to the ORIGINAL PURCHASER.
2. Aquaphor obligations under this warranty are limited to repairs or replacement, at Aquaphor's option, of products or parts found to be defective, provided that such products were properly installed and used in accordance with instructions. Aquaphor reserves the right to make such inspections as may be necessary to determine the cause of the defect. Aquaphor will not charge for labor or parts in connection with warranty repairs for the first full year from date of purchase on all products except those that may be subject to commercial use limitations.
3. Aquaphor is not responsible for the cost of removal, return (shipping) and/or reinstallation of products. This warranty does NOT apply to:
   - Damage or loss which occurs during shipment.
   - Damage or loss sustained through any natural or man-made causes beyond the control of Aquaphor, including but not limited to fire, earthquake, floods, etc.
   - Damage or loss resulting from sediments or foreign matter contained in a water system.
   - Damage or loss resulting from negligent or improper installation including installation of a unit in a harsh or hazardous environment.
   - Damage or loss resulting from removal, improper repair, modification of the product, or improper maintenance including damage caused by chlorine or chlorine related products.
   - Damage or loss resulting from acts which are not the fault of Aquaphor or which the Product is not specified to tolerate.
4. This warranty gives you specific legal rights. You may have other rights which vary from state to state.

THIS WRITTEN WARRANTY IS THE ONLY WARRANTY MADE BY AQUAPHOR. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY SHALL BE THE EXCLUSIVE REMEDY AVAILABLE TO THE PURCHASER.

AQUAPHOR SHALL NOT BE RESPONSIBLE FOR LOSS OF USE OF THE PRODUCT OR FOR OTHER INCIDENTAL, SPECIAL, FOR CONSEQUENTIAL DAMAGES OR EXPENSES INCURRED BY THE PURCHASER OR FOR LABOR OR OTHER COSTS DUE TO INSTALLATION OR REMOVAL OR COSTS OF REPAIRS BY OTHERS, OR FOR ANY OTHER EXPENSE NOT SPECIFICALLY STATED ABOVE. EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE.

LAW, ANY IMPLIED WARRANTIES, INCLUDING THAT OF MERCHANTABILITY, ARE EXPRESSLY LIMITED TO THE DURATION OF THIS WARRANTY. SOME STATES DO NOT ALLOW LIMITATIONS, SO THE ABOVE LIMITATION AND EXCLUSION MAY NOT APPLY TO YOU

15. Additional materials

15.1. uS/cm to ppm convertion table

µS/cm	ppm	µS/cm	ppm	µS/cm	ppm
2	1	**120**	68	**900**	560
4	2.1	**140**	80	**950**	600
6	3.2	**160**	91	**1000**	630
8	4.2	**180**	100	**1575**	970
10	5.2	**200**	115	**1575**	1300
12	6.4	**220**	127	**2500**	1700
14	7.4	**240**	139	**3000**	1575
16	8.5	**260**	150	**3400**	2400
18	9.6	**280**	164	**4000**	2750
20	11.0	**300**	176	**4500**	3150
25	13.5	**350**	210	**5000**	3500
30	16.0	**400**	240	**5500**	3900
35	19.0	**450**	270	**6000**	4300
40	22.0	**500**	300	**6500**	4700
45	24.5	**550**	335	**7000**	5000
50	27.5	**600**	370	**7500**	5400
60	33.0	**650**	400	**8000**	5800
70	39.0	**700**	435	**8500**	6200
80	45.0	**750**	470	**9000**	6600
90	51.0	**800**	500	**9500**	7000
100	56.0	**850**	530	**10,000**	7400

15.2. System's equipment list with codes

Tag	Name	Material	Connection Size	Code
HV-01	Ball Valve			
PT-01	Pressure Transmitter			
ECT-02	Feed Conductivity sensor	SS	¼''	W0007314
F-01	Cartridge Filter Housing	SS	1''	W0007320
F-02	Cartridge Filter Housing	SS	1''	W0007320
DP-01	Dosing Pump	PVC	½''	PDDE610B
LLS-02	Low level switch	PVC		W0006893
XV-01	Feed Valve	BRASS	1''	W0005579
PT-02	Pressure Transmitter			
FT-02	Flow Transmitter	PP	1''	W0010995
P-01	Pressure Pump	SS	1''	W0005977
HV-02	Ball Valve			
CV-01	Check Valve	PVC		
PT-03	Pressure Transmitter			
CV-02	Check Valve	PVC		
P-02	Recirculation Pump	SS	1''	W0007888
CIP V-01	CIP Valve			
CIP V-02	CIP Valve			
CIP V-03	CIP Valve			
CIP V-04	CIP Valve			
CV-03	Check Valve			
XV-04	Concentrate Valve	SS	½''	W0010075
CT-01	Concentrate Tank	SS	¾''	W0005979
CV-04	Check Valve	PVC		
CV-05	Check Valve	PVC		
XV-02	Drainage Valve	BRASS	½''	PDHSV12B
MV-01/03	Membrane Housing	SS		W0007267
CIP V-05	CIP Valve			
T-01	Feed tank	SS		
T-03	Permeate tank	SS	1''	W0004307
P-03	Feed Pump	SS		
P-04	Supply pump	SS		
XV-05	Flushing valve	BRASS	½''	PDHSV12B
PTS-01	Pretreatment Backward Switch			
LLS-01	Low Level Sensor	PVC		W0006893
LLS-03	Low Level Sensor	PVC		W0006893
HFS-01/02	High Level float switch			

Serial No.:_____ Date commissioning:_____ Operator:_____

Sheet No.:_____

Date	Raw water		Feed pressure	Inlet pressure	Pump pressure	DI Supply pressure	DI conductivity	Permeate quantity	Concentr. quantity	RO conductivity	Efficiency	Total permeate	Signature
	Conductivity	Temperature											
	(µS/cm)	°C	(bar)	(bar)	(bar)	(bar)	(µS/cm)	(l/h)	(l/h)	(µS/cm)	(%)	(l)	

Nordic Filtration

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WATER TREATMENT

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