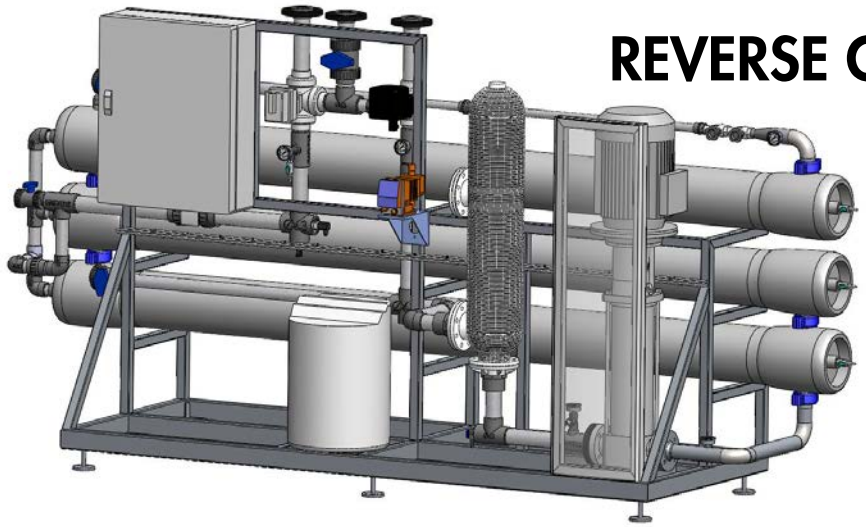
UK

ASSEMBLY AND MAINTENANCE INSTRUCTION FOR HOH RO 2700 SERIES REVERSE OSMOSIS PLANT



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BEST WATER TECHNOLOGY

BWT GROUP

LIST OF CONTENTS

1. GENERAL

This manual applies to HOH RO 2700 reverse osmosis plants.
This manual contains **important** information about the correct installation and service of the RO plant; consequently the following is very **important.**

1. **Enclosed "Start-up check sheet" shall be completed during start-up and filed together with the operating journal.**
2. **Operating journal shall be updated as described under various enclosures.**
3. **Floor drain must be present in the immediate vicinity of the plant.**
4. **The RO plant removes 95-99 % of all salts. Therefore you should be aware that it is possible to install post treatment, e.g. mixed bed or similar, if a better water quality is requested.**
5. **The instruction manual must be read carefully before assembling or starting up the plant. Correct installation and operation will form the basis for our 12-month warranty.**

The instruction should be read carefully before you assemble and commission the plant.
Correct installation and operation is required for a valid factory warranty.
Your RO-2700 plant is designed for minimum service and long and unproblematic operation.
However, this is on condition that the plant is installed and maintained correctly.
Always read this manual before taking the plant into use.

2. EXPLANATION OF WORDS

Permeate: Is the treated, totally desalinated water which the RO plant produces and supplies to the reservoir tank.

Concentrate: Is the water which is led to drain. This water contains the salts and minerals which have been retained from the water.

Raw water: Is the water which is led to the RO plant and which is to be desalinated in the RO plant.

TDS: Is the amount of totally dissolved salts; measured in the unit mg/l.

Conductivity: Is the designation for the salt concentration of the water and is measured in the unit µS/cm. The lower the figure is, the better the water quality.

Membranes: Are the filters of the plant which, by high pressure and flow, are capable of desalinating the raw water.

RO: Is the English abbreviation for Reverse Osmosis.

Reservoir pump: Is the pump that transports the treated water from the reservoir tank to the consumer.

Softening plant: Is the pre-filter which softens the water, i.e. removes hardness from the water.

3. PLACING OF PLANT

The plant must be placed in a non-freezing environment and with a maximum ambient temperature of 40°C.
The foundation must be level and plane.
The foundation has to be able to stand a weight load of 1,300 kg in total which is the approximate weight of the RO plant in operation. However, the weight of the softening plant and the reservoir must be taken into account.
The outside measures of the RO plant are WxDxH: 4800 x 1015 x 1860 mm, but when placing remember that a softening plant (option), CIP unit (option) and reservoir (option) may also have to be installed.
There must be a minimum space at the end of the membranes of 1500mm, so that the membranes can be accessed when they need to be replaced. There should also be free space at either side of the plant for water installations; you especially need to consider

the outlet access from the plant. **There must never be a block in this!**
There must be room in front of the plant for reading the manometer and operate the control panel.
In case of an error on the plant, situations may arise where either the plant or the level in the reservoir (option) overflows or some other sort of leak. **Consequently there must always be a drain in the immediate vicinity of the plant, placed so as to prevent this water from causing any damage**.

4. WATER QUALITY

The raw water which is to be treated in the RO-2700 plant, must be drinking water quality and with an evaporation residue (TDS) of maximum 500 mg/l. Furthermore it may not contain residual chlorine, and if there is free chlorine in the raw water > 0.1 mg/l, a carbon filter shall be installed ahead of the plant.
The plant capacity is based on a salt content (TDS) in the feed water of 500mg/l and a temperature of 10 °C. In case of a differen twater quality, contact the supplier.

The raw water may maximum contain:
*** Fe: 0.05 mg/l**
*** Mn: 0.05 mg/l**
*** Free chlorine: 0.1 mg/l**
*** TOC 3 mg/l**
*** BOD 5 mg/l**
*** COD 8 mg/l**
*** Turbidity max: 1.0 NTU**
*** Hardness 0.5 °dH (does not apply when using antiscalant)**
***Temperature max. 25 °C**
*** Siltindex: <3.0**
*** TDS 500 mg/l (= evaporation amount)**
*** KMnO4 max: 10 mg/l**
*** Silicic acid, SiO_2**
The plant is adjusted at 10 °C in our factory. If there is any doubt about the raw-water composition, a water analysis must be made. The plant shall be connected to a raw-water pressure of minimum 3 bar and maximum 6 bar. **The conductivity of the treated water will be less than 20 µS/cm with a feed-water quality of 10 °C and 500 mg/l**.

5. WATER CONNECTIONS

Note! All water connections must be in compliance with local regulations.
The best operating result is obtained by connecting to minimum 2" pipes. If the connection is too small, there is a risk of outages on the plant at the feed-water connection by lacking water pressure/amount, i.e. during rinsing of membranes, when the plant is started up, and in case of poor function of the softening plant. Especially when using pre-filtration, e.g. softening, you need to ensure that the operating pressure to the RO plant is minimum 3 bar.
Note! The outlet pipe shall stop minimum 50 mm above the floor. It must not go into the water of the floor drain, as the outlet water may then be sucked back into the plant during stand still.
There must never be any counter pressure in the permeate outlet of the plant as it would damage the plant membrane(s).
Totally desalinated water can accelerate corrosion. Therefore, always use corrosion-proof piping for the treated water, e.g. stainless steel or PVC pipe.

5.1 Connection of Soft Water to the RO Plant:

Regarding connection of feed water to the softening unit (Option), see the enclosed guide.
Connect soft water to the left side of the plant (feed water RO). The best operating result is obtained by connecting minimum 2" pipes. In this way you usually obtain the needed pressure and flow to the plant.
In case of a too small raw-water connection there is a risk of outages on the plant due to lacking water pressure/amount, e.g. during rinsing of membranes when the plant is started up and a poor function of the softening plant.

5.2 Connection of permeate outlet

The outlet of the RO plant shall be connected to the reservoir tank (option) or to another sort of collection reservoir, unless the plant is demand-controlled.
The best operating result is obtained by connecting to minimum 2" pipes.

6. ELECTRICAL CONNECTIONS

Note! The electrical connections must comply with local regulations.
Wiring: see electrical diagram.

2700 series		2710	2720	2730	2740	2750	2760	2780
Voltage	(V)	3 x 400 V+0+PE						
Net		TN-S						
Frequency	(Hz)	50						
Control panel	(VA)	110						
RO plant – wattage	(kW)	11			15			
RO plant – power consumption	(A)	21.4			26.5			
CIP plant – wattage	(kW)	16.6						
CIP plant – power consumption	(A)	24.5						
Reservoir – wattage	(kW)	*						
Reservoir – power consumption	(A)	*						
Maximum wattage	(kW)	11			15			
Maximum power consumption	(A)	21.4			26.5			
Maximum starting current	(A)							
Minimum fuse excl. reservoir (class gL/gI)	(A)	50			63			
Minimum fuse incl. reservoir (class gL/gI)	(A)	50			80			
Recommended fuse (class gL/gI)	(A)	80			80			
Maximum fuse (class gL/gI)	(A)	80			80			
Short-circuit level	(kA)	10						
* Consumption depends on selection of reservoir RO and CIP units cannot be active simultaneously								

7. START-UP OF PLANT

Check before start-up that all water and electrical connections are made as described in previous sections and comply with local regulations.
Check that all valve positions are correct before opening the water from the feed-water supply. The plant shall be started in valve position "flushing".
Check the quality of the admitted water on valve V7. IF a softening unit is installed as pre-treatment, the hardness may not exceed 0.5 °dH. A sample kit is enclosed when purchasing a new softening plant (see instruction in the box). As an alternative to the softening plant you may dose with antiscalant (option) as pre-treatment.
The softening plant (option) shall be adjusted at current hardnesses of the raw-water supply, salt reservoir shall be checked for possible refilling of salt and the softening plant shall be started up (follow the manual on the softening unit).
If pre-treatment comprises antiscalant, the mixing shall be checked for correct mixture and the setting of the dosing pump and its deaeration shall be checked. See the section dealing with antiscalant.
Read the entire paragraph "Start-up of Plant" thoroughly before starting up the RO plant.

7.1 Flushing

The valves shall be set as in "Commissioning of Plant" – see paragraph dealing with valve setting.
Check that the high-pressure pump P1 is filled with water. If not, loosen the filling screw and fill in water until the suction line and the pump are completely full.
Turn on the power supply. The pump cannot stand dry running under any circumstances.

Check:

- **that there is free outlet for permeate**
- **that there is free outlet for sewer,**
- **that the motor protection of the high-pressure pump P1 is engaged.**

Before starting the plant, the setpoint of the conductivity must be adjusted on the control panel. The plant is preset in our factory at 20 µS/cm, but it can be set differently as requested if there are special requirements to the treated water. When commissioning the plant membranes must first be rinsed free of chemical residue. On the touch screen of the PLC the flush switch can be engaged. Now the plant shall flush for minimum 30 minutes. When the flushing is finished, the plant stops. **Now the plant is in operation.**
Check that the motor is running in the right direction.
If the plant drops out and there is alarm for low raw-water pressure, then the raw-water supply may be inadequate (see paragraph "Water Connection"), or the pre-filter may be clogged.

7.2 Adjustment of Plant

Important! Read the entire paragraph "Start-up of Plant" before initiating the adjustment. Permeate, recirculation and concentrate flow must be adjusted, and which setting suits the individual plant depends on the feed-water quality.

7.3 Permeate Capacity

Generally the feed-water temperature vary and that affects the permeate capacity. An increase in permeate capacity may cause the membranes to be overloaded, which must never happen. The membranes will be clogged very quickly with a risk of being permanently damaged. Then the membranes cannot be CIP-cleaned. Generally the capacity increases approx. 3 % per 1 °C temperature increase.

7.4 Outlet Amount and Recovery

The outlet amount decides the plant water recovery. Too high water recovery damages the membranes. On condition that the feed water complies with the water quality requirements, the plant, with either softening or antiscalant, can operate at a water capacity of minimum 75 % which means that 75 % water turns into permeate and 25 % is led to sewer. You say that the plant recovery is 75 %. Dependent on whether it is surface or ground water, the plant can operate with a water recovery of 75-80 %. It is a condition that the requirements on feed water quality are complied with.

7.5 Recirculation Amount (does not apply to RO2760/2780)

When adjusting the plant you must maintain a minimum flow across the membranes. The minimum flow may not be less than 5 m^3/h after the last membrane in a pressure pipe.

7.6 Adjustment

When the operating conditions of the RO plant have been determined, the plant can be adjusted.
Open the recirculation valves V1 and V9, so that the permeate capacity is not exceeded, when you regulate the outlet amount. Start by scaling down the outlet amount.

1. The outlet amount shall be throttled on valves V1 and V2 until it has been downscaled as requested. The outlet amount can be read at FT2 on the PLC's touch screen.
2. The recirculation amount can be throttled on V9 until maximum permeate capacity (can be read on FT1) has been reached, and simultaneously the recirculation amount, which can be read on FT3, never be scaled down lower than minimum (FT2+FT3 > 3.5 m^3/h).

When the recirculation is throttled, the outlet amount increases again and vice versa. The outlet amount and the recirculation amount shall be adjusted in the mentioned order until the correct permeate and outlet amounts have been reached. Stop the plant (press stop on the panel at the front of the plant) and restart the plant (press start on the panel). After flushing, the plant sets itself at the previously adjusted values. Test the conductivity. If it is below set point e.g. 20 µS/cm, the plant is ready for operation. If the conductivity is higher than expected – see troubleshooting. The set point for the conductivity is now reset to normal setting: 20 µS/cm (or another desired value) – see paragraph: "Plant Functions".

7.7 Adjustment of concentrate capacity (option)

The concentrate from the RO membranes is divided into two flow directions, One for recirculation and one for 2nd step.

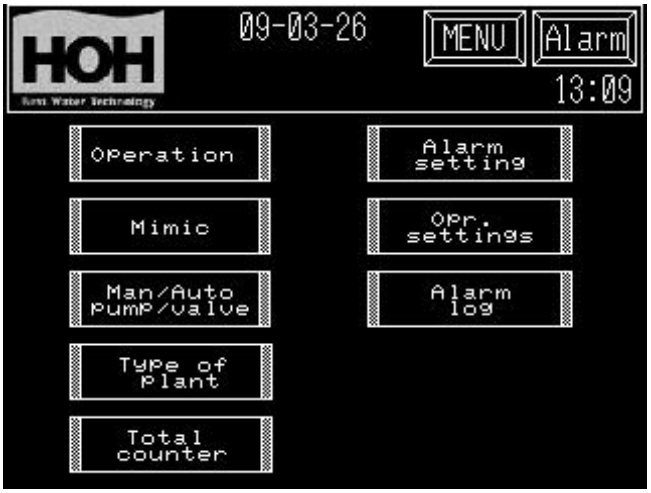
The recirculation amount will be led to high-pressure pump P1 via valves V1 and V9.

As the water recovery is 75 %, the remaining 25 % will be led on to 2nd step. In 2nd step the valves V2 and V13 are set for recycling approx. 50 %; this can be read on FT4, which will be led back to the suction side of P1, and the remaining 50 %, can be read on FT2, will be led to drain.

8. OPERATING MANUAL FOR OPERATOR PANEL RO-2700 SERIES

Contents:

1 Menu



1.1 Information found in the menu :
All screen displays are designed with a page header where date, time and plant type can be monitored.
In case of an alarm, the alarm text in the control button in the right corner will start to flash with a slow frequency.
Push the Alarm button
On the alarm screen all active alarms will be shown,
Push on the MENU button and you will return to this survey.
Push yy/mm/dd to adjust date and time.

1.2 Functions in menu:

Press Operation RO : On the operating screen it is possible to start and stop operation, flush and CIP cleaning if installed.

Press Operational settings: In operational setting you select settings for Start-up of the RO plant.
(This screen display is protected by a Password (see paragraph 14.0)

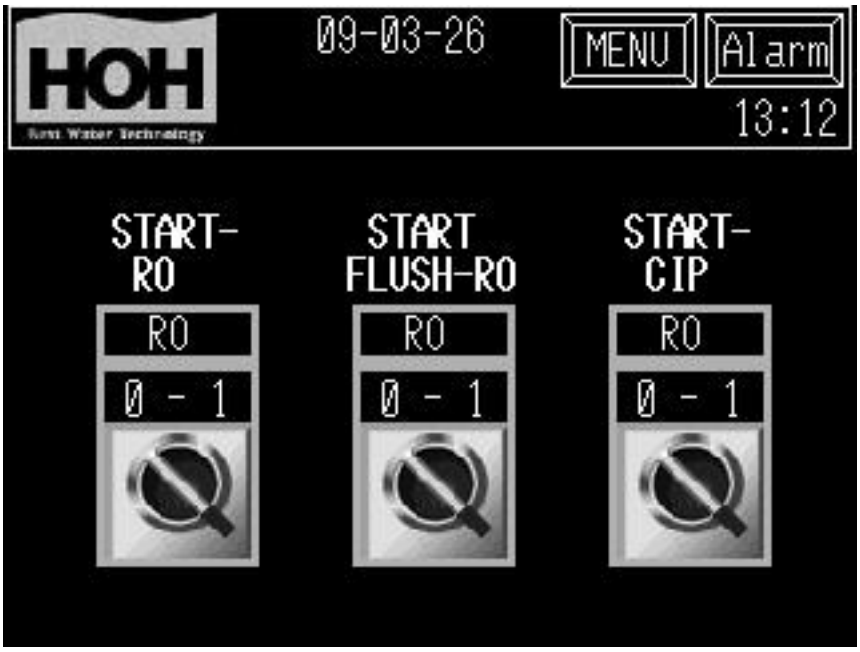
Press Mimic: On the mimic screen you can check operating status and measurements.

Press Total counter: On the counter screen the total water amount from the water meters are shown.

Press Alarm setting: In alarm setting you choose settings for setpoint and delays of alarms .
(This screen display is protected by a Password (see paragraph 14.0)

Press Type of plant: On the Type of Plant screen you can select type of plant, language and options.
(This display is protected by a password (see paragraph 14.0)

2 Operation



2.1 Information in Operation:

Buttons for start/stop of plant and start/stop manual flush. If the CIP-option is installed, it is operated from this point
When the button is activated it changes position from 0 - 1.

2.2 Functions in Operation:

Press 0 - 1 Start-RO	For start/stop of the plant.
Press 0 - 1 Start flush-RO	For start/stop flush of the plant.
Press 0 - 1 Start-CIP-RO	For start/stop CIP-cleaning of the plant.

3 Operation. Setting 1

3.1 Information in Operation Setting 1:

Times for delay of start-up, valves and pump operations.

3.2 Functions in Operation Setting 1:

Here you can change times of delay of start and stop of plant on the level switches.
You may insert delays for start of pump and opening/closing of valves.

Data change:
In order to change a setting, press one of the fields. A pop-up keyboard will appear on the screen and the new value can be entered and stored by pressing ENT.

(This screen display is protected by a Password level 1 (see paragraph 14.0)

4 Operation. Setting 2

4.1 Information in Operation Setting 2:

Setting of calibration of water meters and current water flow.

4.2 Functions in Ooperation Setting 2:

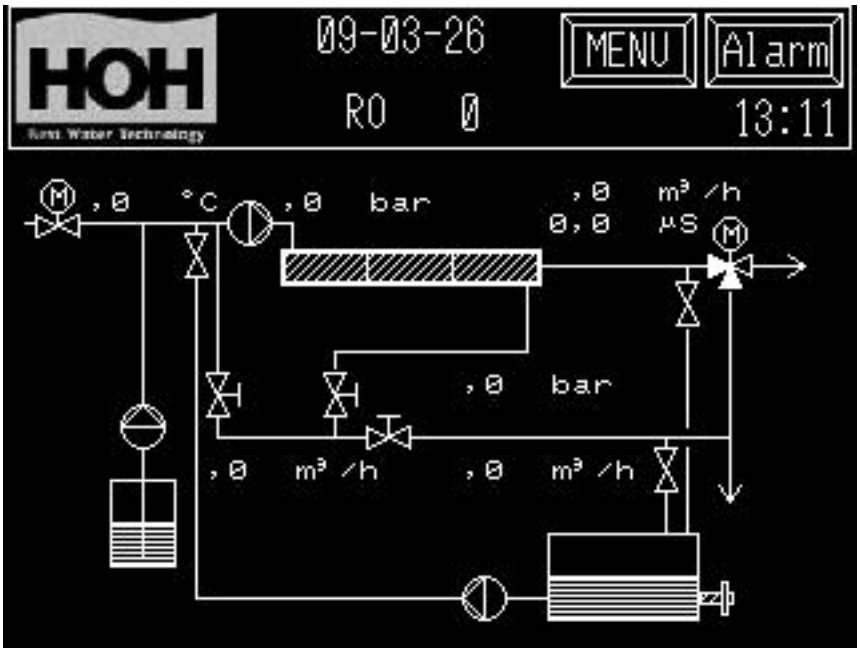
Here you can change the settings of calibration of water meters.

Change of Data:

In order to change a setting, press one of the fields. A pop-up keyboard will appear on the screen, and the new value can be entered and stored by pressing ENT.

(This screen is protected by a level 2 (see paragraph 14.0)

5. Mimic.

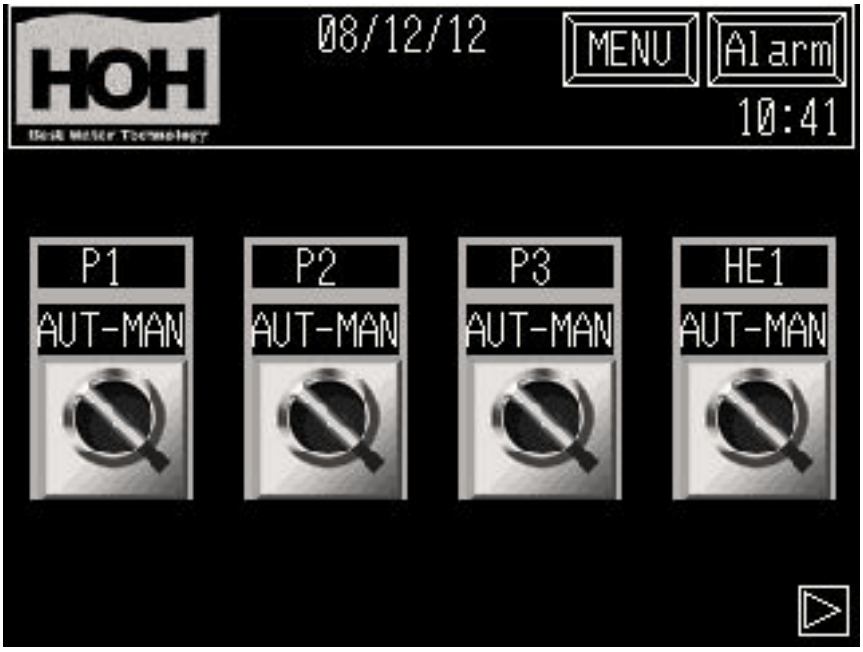


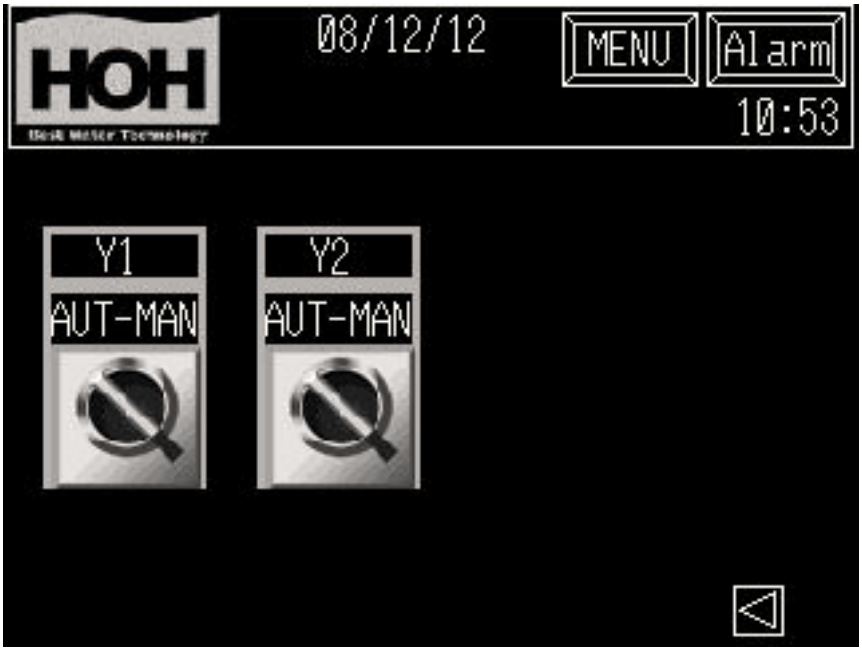
5.1 Information in Mimic:

Measurement of conductivity, flow, temperature and pressure (*if installed)*.
Operating status of plant.
Operating status of valves and pumps.
Pumps change colour. (black = stopped, white = operating).
Valves change colour. (black = closed, white = open).

5.2 Functions in "Mimic": none.

6. Manual/Auto pumps and valves





6.1 Information in Man/Auto pumps , valves:

Status for setting of pumps and valves.

6.2 Funktions in " Man/Auto pumps, valves":

Manual or auto operation/control of pumps and valves. You shift between auto/manual by pressing the change-over switch.

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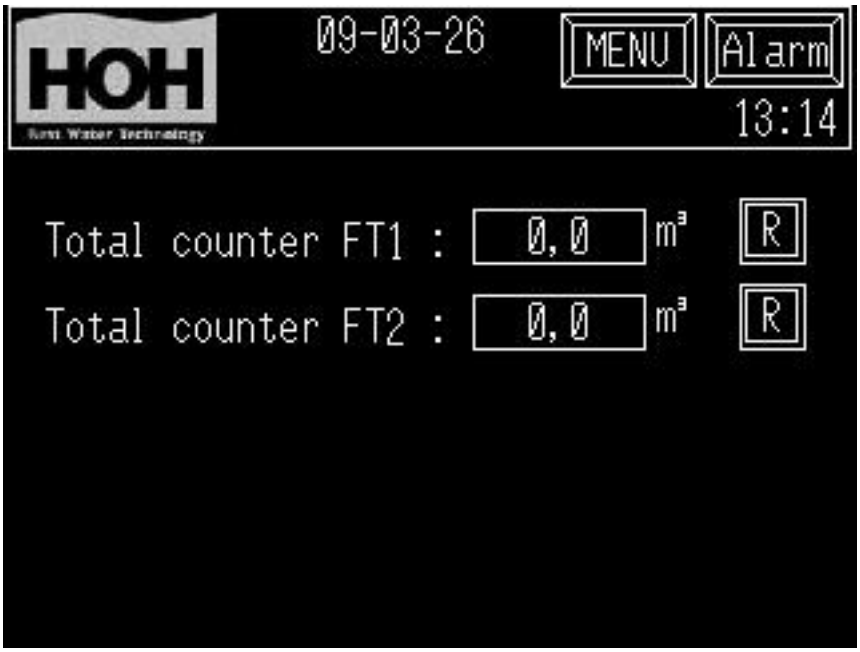
7 Total Counter



7.1 Information in Total counter:

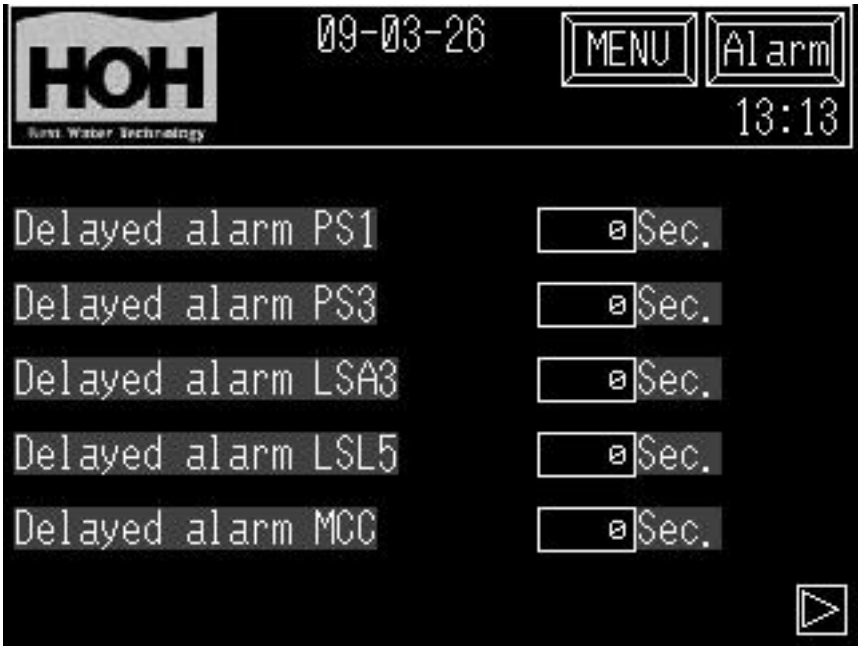
Total summed up water amount to and from the plant

7.2 Functions in "Total counter":

Press the R button to reset the total count of the water amount.

(This function is protected by a Password level 1 (see paragraph 14.0)

8 Alarm Settings



8.1 Information in Alarm.Setting:

Delays of alarms and setpoint for conductivity and pressure (if installed).

8.2 Functions in Alarm Setting:

Setting of times for delay of alarms and setpoints for conductivity and pressure in operation.

Change of Data:

In order to change a setting, press a field. A pop-up keyboard will appear on the screen and the new value can be entered and stored b y pressing ENT.

(These screens are protected with a Password level 1 (see paragraph 14.0).

9. Type of Plant

9.1 Information in Type of Plant:
RO type and selection of option.

9.2 Functions in "Type of Plant":

Press the button for Type of Plant and enter the type digits. Press on the field beside option in order to select options.

Press" Language " in order to change the language in the panel.

10. Alarm.

10.1 Information in Alarm.

This screen display with alarm will appear when pressing the Alarm button in the top right corner. If an alarm occurs on the plant, the alarm button will start to flash. The alarm will be presented with data and time of the alarm. When the alarm is reset on the alarm button, the alarm text will disappear and the alarm button will return to fixed text.

10.2 Functions in Alarm.

At the button of the screen display there is a button for shifting between screens in case of many alarms; the two buttons up/down are used for scrolling up or down the screen with the alarms. All active alarms are reset by pressing the alarm button in the top right corner.

11. Alarm Log:

11.1 Information in Alarm History:

In this screen you see the latest 128 alarms with date and time of the alarm occurrence and the time of resetting of the alarm. If more than 128 alarms occur, the alarms that occurred first will be deleted. At the bottom of the screen there is a button for shifting between the alarm screens in case of many alarms; the two buttons up/down are used for scrolling up and down in the alarm screen.

11.2 Functions in Alarm Log:

None.

13. Date/Time :

13.1 Information in Date/Time:

Date and time in the operator panel.

13.2 Functions in Date/Time:

Date and time are adjusted by pressing the individual buttons and then entering the new value. You store the new value by pressing ENT..

14 Password:

14.1 Information in Password:

The Password screen will appear automatically if a password-protected display is selected.
By entering the correct password you gain access to the requested screen display.
By pressing "cancel" you return to the original screen.

14.2 Functions in Password:

Entering of Data:

Enter the correct password and press ENT.

14.3 Password:

Password can be given by contacting :

HOH Watertechnology A/S
Tel.: +45 43600500
Process Department.

9. CONTROLS

9.1 Valve Position

The plant has two basis valve positions for the RO plant and additional 3 settings, if the plant is equipped with a CIP unit (option).
The two basis settings of the plant are flushing, which is a start-up and flush setting and the position the plant shall be in during operation.
The CIP valve settings are: CIP tank refilling, circulation of CIP-liquid and displacement of CIP liquid.

Below valve diagram contains valve positions as well as pump settings. it is important that both are correctly set for performing the individual procedures.

	Controls & Alarm for the 2700 series																	
Part	Name	Local reading	Panel reading	Warning	Registration	Shutdown	Standby	Start sequence	Operation	Stop	CIP	Binary	Analogue 4-20 mA	Calculated in PLC	Set point	Range	Delay (seconds)	Remark/-action
	Instruments																	
FT1	Flow permeate		x		X			X	X				X			0-25 m^3/h		Shows current permeate flow
FT2	Flow concentrate		X		X			X	X				X			0-18 m^3/h		Shows current outlet flow
FT3	Flow concentrate recirculation		X		X			X	X				X			0-18 m^3/h		Shows current recirculation flow (only on 2710, 2720, 2730, 2740 and 2750)
PI1	Raw water pressure	X			X			X	X							0-6 bar		Shows raw-water inlet pressure
PS1	Alarm low raw-water pressure			X	X	X		X	X				X		0.5 bar	0-5 bar	5	Raw water inlet pressure too low. Plant stopped
PT1	Pressure on inlet membranes		X	X	X			X	X				X			0-40 bar		Shows membrane inlet pressure (option)
PT1-PT2	Differential pressure membranes		X	X	X	X		X	X					X	4 bar	0-40 bar	60	Calculates the differential pressure across the membranes
PI5	Permeate pressure	X			X			X	X				X			0-35 bar		Shows permeate pressure
PS3	Alarm high permeate pressure			X	X	X		X	X				X		0.5 bar	0-5 bar	5	Alarm for high permeate pressure. Investigate.
PS2	Alarm pressure concentrate			X	X	X		X	X				X		5 bar	0-5 bar		Only on 2710, 2720, 2730, 2740, 2750
QIS1	Conductivity permeate		X		X			X	X				X			0-200 µS/cm		Shows the current conductivity of the permeate

	Controls & Alarm for the 2700 series																	
Part	Name	Local reading	Panel reading	Warning	Registration	Shutdown	Standby	Start sequence	Operation	Stop	CIP	Binary	Analogue 4-20 mA	Calculated in PLC	Set point	Range	Delay (seconds)	Remark/-action
QIS1	High conductivity permeate		X	X	X			X	X				X		20 µS/cm	0-200 µS/cm	5	If the conductivity rises above the set point, valve V02 shuts off the permeate and leads the water to sewer
QIS1	Alarm high conductivity permeate		X	X	X	X		X	X				X		20 µS/cm	0-200 µS/cm	5 min.	If the conductivity rises above the set point for longer than 10 minutes, the plant stops and the cause must be investigated.
	Alarm high-pressure pump		X		X	X		X	X			X					3	Alarm from motor protection switch
PT2	Pressure on outlet membranes		X		X	X		X	X				X			0-40 bar		Shows membrane outlet pressure (option)
	Valves and pumps																	
Y01	Inlet valve						C	O	O	C	C							
Y02	Permeate outlet valve						C	C	O	C	C							
Y02	Permeate drain valve						O	O	C	O	C							
P1	High pressure pump						S	S/R	R	S	S							In the starting sequence the high pressure pump starts after 1 minute
P3	Antiscalant pump						S	R	R	R	S							
P2	CIP pump						S	S	S	S	R							
V1	Concentrate discharge						T	T	T	T	O							

	Controls & Alarm for the 2700 series																	
Part	Name	Local reading	Panel reading	Warning	Registra-tion	Shutdown	Standby	Start se-quence	Operation	Stop	CIP	Binary	Analogue 4-20 mA	Calculat-ed in PLC	Set point	Range	Delay (se-conds)	Remark/-action
V2	Concentrate discharge						T	T	T	T	O							
V9	Recirculation						T	C	T	T	C							Only 2710, 2720, 2730, 2740, 2750
V3	CIP concentrate discharge						C	C	C	C	O							
V4	CIP Concentrate drainage						C	C	C	C	O							
V6	CIP permeate outlet						C	C	C	C/O	O							
V8	CIP water inlet						C	C	C	C	O							

C = Closed
O = Open
S = Standby
R = Running
T = Throttled

10. MAINTENANCE AND TROUBLE-SHOOTING

10.1 Maintenance

The RO plant is produced and designed for a minimum of service and maintenance. However, there are some functions which must be checked regularly. The interval is described in paragraph: Service intervals).

Following must be checked regularly:

If the operating conditions and/or capacity are changed compared to the settings on the day of start-up, the plant must be checked with regard to possible cleaning of membranes and/or adjustment of the plant capacity – see paragraph "Start-up of plant".

- **If the capacity has dropped by more than 10 %.**
- **If the presusre after the high-pressure pump has increased.**
- **The conductivity has increased.**
- **The operating pressure across the membranes is increasing**.

If there is a drop in capacity, the membranes must either be cleaned – see paragraph: Membrane Cleaning, or there is another reason for the error; see paragraph: Trouble-shooting.

Daily:

1. Take a daily water sample (only if a softening plant is installed ahead of the RO plant). The hardness after the softening unit must be less than 1° dH.
2. Check also the brine tub, refill if necessary. (Only applies if a softening unit is installed).
3. Read:
   - Capacity permeate FT1
   - Capacity concentrate FT2
   - Capacity recirculation FT3
   - Conductivity QIS 1
   - Inlet pressure feed Water PI1

   Pressure after high-pressure pump PI3/PT1
   - Outlet pressure permeate PI5
   - Outlet pressure concentrate PI4/PT2
   - Pressure after pre-filter PI2

Every week:

Flushing of the membranes must be carried out at least once a week. Open valve V1 and V2 for half an hour with the plant in operation. Then adjust valves V1, V2 so that the concentrate flow is again 20-25 %, see paragraph "Start-up of Plant".

Biannually:

1. Check-up of pumps. Follow the instructions provided by the manufacturer.
2. Check pipelines and connections for leaks.
3. Chekc all pressure switches, i.e. their function and settings.
4. Make an alarm release test.
5. Clean the control panel.
6. Replace defective/buzzing switches and relays.
7. Routine maintenance with CIP.

Note! If the plant needs to be shut down for a longer period, or there is a risk it will be exposed to frost, the membrane elements must be preserved.

For how long the plant needs to be out of operation until the membranes must be preserved, depends on how great the organic growth is. When using surface water, the membranes must be preserved by a shut down lasting 2-3 days or longer, when using ground water the membranes must be preserved by a shutdown of 2-7 days or longer.

When preserving, fill the membranes with a solution of:

MIXING RATIO	PRESERVATION (%)	FROST PROTECTION (%)
Mono-propylene glycol	-	20
Sodium bisulphite	1	1

When frost-protecting, you must take care that the pH value never drops below a value of pH 3. In that case there is a risk that the bisulphite oxidizes into sulphuric acid.

10.2 Trouble-shooting

This paragraph deals with the problems that may arise on your plant.

10.2 1 Plant Capacity has Dropped

This can be read on flow meter (FT1) when the RO plant is in operation.

Check:

Plant operating pressure can be read while the plant is operating on manometer PI3/PT1. If the operating pressure is low,

check that the raw-water pressure is the same as by start-up. If it is below 3 bar, look for the trouble in the water supply, possibly a clogged bag filter.

Check:

the raw-water temperature. If the raw-water temperature has dropped compared to the day of start-up (winter/summer), the capacity will drop as well, just like it will increase at a higher temperature.

For every ° C± the plant capacity will either drop or increase by approx. 3 %

That means that if the temperature has dropped by 4 °C compared to the day of start-up, the capacity may drop by approx. 12 %. This is quite normal and does not require service.

Check:

if the softening unit functions properly. If there is a defect on the plant so that hard water is supplied to the membrane, it will cause damage to the membrane and consequently a capacity loss.

Check:

if there is a resistance in the outlet pipe. If the plant capacity cannot be improved by these solutions, the membranes are probably clogged and must be cleaned, see paragraphs "CIP-cleaning – replacement of membranes" and "Replacement of membranes".

10.2.2 The quality of the treated water is higher than 20 µS/cm

Check:

If there is resistance in the outlet connection.

Check:

If the plant has been out of operation for a long period, i.e. 2 weeks or more.

Correct this error by letting the plant flush for 1-2 hours and then letting it operate minimum every 3rd day. After flushing, the outlet amount must be adjusted again, see paragraph "Start-up of Plant".

Check:

if raw water comes in connection with the treated water in the reservoir by leaks on the raw water side.

Correct this error by stopping possible leaks, empty the reservoir tank and let the plant refill with new, clean and treated water <20 µS/cm.

If none of these errors are present, the membrane(s) are defective and must be cleaned/replaced, see paragraph "CIP-cleaning of membranes" and "replacement of membrane".

10.2.3 The plant stops and the alarm lamp shines

The plant stops and the alarm lamp shines on the control panel, indicating low inlet pressure.

Check:

if the raw-water pressure is available.

Look for the error in the raw-water supply. When the raw-water pressure has been re-established, acknowledge on the button "reset" on the control panel, and the plant is ready for operation and commissioning by pressing "operation" on the control panel. If none of the above errors are present, it might be the pressure switch, which is located at the intake of the RO plant, which his defective or the PCB in the panel may be defective.

10.2.4 The plant does not run

Check:

if the main current is connected.

Check:

The reservoir level sensor; if it "hangs" or is defective.

Check:

if the plant needs to operate; filled reservoir or no "request" for water.

If none of above-mentioned errors are present, it may be the high-pressure pump or PCB that is defective; please check.

10.2.5 The reservoir pump does not run (option)

Check:

if there is a request for water from the reservoir pump. Create a water consumption on the outlet from the reservoir pump. If the pump is running, look for the error somewhere else. Plant and pump control are OK.

Check:

if alarm lamp for motor error is shining on the control panel. If so, check the motor protection relay in the panel.

Check:

If the reservoir has run dry. Let the reservoir fill up completely and then the reservoir pump will start again automatically.

Note! (HOH reservoir); if the reservoir has been completely drained, the reservoir pump will only start again, when the reservoir has been completely refilled. This is controlled by the level rod in the reservoir.

Check:

if the pressure switch on the reservoir pump is defective (option).

Short-circuit the pressure switch by making a connection be-

tween the two plugs. If the pump only works when this connection is made and there is a request for water, then the pressure switch is defective and must be replaced.

Check:
if the on/off switch on the reservoir pump or the motor protection switch is at "off". If this is not the problem, then the PCB or the reservoir pump is defective and must be replaced.

10.2.6 Plant reservoir (option) overflows

Check:
if the inlet valve of the RO plant is closed and tight. If the permeate hose is dripping constantly, when the plant is not operating, then the solenoid valve is defective (leaky) and must be replaced.

Check:
If the level stick in the reservoir is prevented from switching off the plant (hanging). Remove possible obstacle from the level stick.

10.2.7 The reservoir pump (option) stops and starts

The reservoir pump (option) stops and starts at 10-15 sec. interval without consuming treated water.

Check:
if there is a leak on the pipeline from the outlet of the plant to consumption of the treated water, or a defect at the consumer, e.g. a defective/leaky valve may create a small water consumption which makes the reservoir pump start and stop constantly.

Check:
if the non-return valve in the reservoir pump suction stick located at the bottom of the reservoir tank is leaky/defective.
If so, replace it.

Check:
if the reservoir pump hydrophore lacks air; the hydrophore must be pre-pressurised at 2.9 bar (without water pressure).

10.2.8 Hard water is measured at the test valve

Check:
if there is salt in the salt reservoir.
Fill in salt tablets and start a regeneration.

Check:
if the softening unit is adjusted at the actual hardness of the raw water (see paragraph "Start-up of Plant")
If none of the above-mentioned errors are causing the problem, then you must have your plant serviced.

10.2.9 CIP-pump P2 and Heating element HE1 (option) are not working

Check:
if the protective relay of the motor has been connected in the electric panel.

11. TECHNICAL DATA

11.1 Plant data

RO-2700 series	Unit	2710	2720	2730	2740	2750	2760	2780
Capacity*	M^3/h	6	8	10	12	14	16	20
Max. recovery*	%	75						
Salt retention**	%	95-98						
Inlet feed water, flange	DN	50						
Outlet concentrate, flange	DN	50						
Outlet permeate, flange	DN	50						
Height	mm	1860						
Length	mm	3800	4800	3800	3800	4800	3800	4800
Depth	mm	1015						
Max. water temperature	°C	25						
Max. water pressure	bar	6						
Min. water pressure	bar	3						
Weight (full)	kg	795	835	865	895	955	990	
No. of membranes	units	3	4	5	6	8	9	12

* Drinking water quality, 10°C, 3 bar, 500 mg/l total salt content ± 15% output
** Calculated at a drinking water quality of 500 mg/l

12. FUNCTIONAL DESCRIPTION

12.1 Plant Description

The RO plant is designed as a compact unit on basis of modules.
The raw water passes a softening plant (option) which treats the hardnesses of the raw water to 0.5 °dH.
A Grundfos high-pressure pump brings the water up to the necessary operating pressure dependent on the osmotic pressure of the water.
The pressure forces the water through the RO membranes and in this way the salts are filtered off so that only pure permeate passes the membrane.
The high-pressure pump is dimensioned to let a fixed part of the pump capacity re-circulate as flush water. The flush water is for preventing the filtered off, insoluble salts from blocking the membrane filter area.
Circulation and water inlet are placed in the piping system at the suction side of the high-pressure pump.
Via flow meter and needle valve the filtered-off salts leave the circulation system and are led to drain as concentrate.
After having passed the RO membranes, the recovered permeate will be under low pressure and will be led directly to consumption. The RO plants retain approx. 95-98 % of the salts in the water at a temperature of 10° C and a water recovery of up to 80 %.
The remaining 20-25 % is concentrate which will be led directly to sewer.
To monitor the quality of the permeate, a conductivity meter with a sensor has been installed in the permeate line.
The conductivity can be read on the operating panel of the plant.
All control functions and motor protection switches are placed in the electric panel. The principle shows how the RO plants have been designed.
Regarding operation of the operator panel, see chapter "Plant functions".
As an option you can select a 4" array which will desalt the concentrate and thus enable a coefficient of utilisation of approx. 85-90 %.

12.2 Pre-treatment/Prevention

It may be necessary to install a pre-treatment ahead of the RO plant in order to bring the feed water at the required quality – see paragraph "Water Quality". The better the water quality is – the longer is the lifetime of the membranes.

Content	Symptom	Preventive measure
TOC, BOC and COD	Can cause slimy as well as firm hard film	Can in some cases be micro-filtrated or removed by means of a carbon filter
Iron, Manganese	Precipitation of iron gives a reddish-brown film and precipitation of manganese gives a black deposit	Sand filter – oxidation, softening, greensand
Calcium, magnesium	The membrane scales	Softening, antiscalant
Silica	The membrane scales	Antiscalant
SDI (silt)	The membranes gets clogged	Microfiltration (absolute), ultra-filtration, flocculation
Oil	The membrane is greasy from oil	Carbon filter
Particles	The membrane gets clogged due to hard deposits	Microfiltration
Free chlorine	Membrane deformed. Permeate capacity and quality changed and cannot be CIP-cleaned back to the original capacity. The deformation is not visible	Free chlorine shall be removed by active carbon filter and chemical cleaning, either with Thiosulphate or sulphite.
Bacteria	Membrane is clogged by slime	Chlorination + de-chlorination, UV, micro-filtration 0.2 µS/cm and ultra-filtration.

12.3 RO Plant

In the RO plant the feed water is first led past an antiscalant dosing unit (option). The antiscalant dosing prevents scaling of salts and impurities – see paragraph "Antiscalant Dosing". Alternatively the feed water may be pre-filtrated in a softening unit.

After possible dosing, the water is led through pre-filtration in a bag filter which prevents larger particles from clogging the membranes. Further pre-filtration may be necessary if the water does not have the necessary feed-water quality (see above). A pressure switch PS1 stops the plant at low operating pressure on the feed water.

A high-pressure pump brings the water to the necessary operating pressure ahead of the membranes. In the pressure pipe only the pure water is pressed through the membranes for consumption. This extracted water is designated "permeate" and is unpressurised. A pressure switch PS3 on the outlet protects against damage of the membranes due to unwanted counter pressure. The permeate capacity can be read on FI1.

However, during start-up the permeate is led to drain via Y02 until the quality of the water has a conductivity QIS1 below the adjusted value (normal setting 20 µS/cm).
The concentrate will be led to drain and partially to recirculation. The recirculation amount depends on the plant construction and shall ensure that the membranes get adequate flush water during operation. The concentrate and recirculation flow can be read on FT2 and FT3 respectively.

12.4 Post-treatment

Post-treatment can be offered if necessary. An ion exchanger (mixed bed) may then be installed in order to improve the water quality and/or a UV lamp for sterilisation (option). Under normal operating conditions, the RO membranes have a long lifetime. But even with a good raw-water quality, there will, to a certain extent, be deposits of impurities and thus a slow reduction of the permeate capacity. When the capacity has been reduced by 10 %, the membranes must be cleaned. If regular cleaning is performed at the right intervals, then the original capacity can easily be restored.

13. ANTISCALANT DOSING

13.1 What is antiscalant?

Antiscalant is a product, which is added to the raw water, so that no precipitation of lime occurs on the membranes. This precipitation would otherwise clog the membranes.
A water analysis must always be available before the plant is put into operation, so that the antiscalant dosing can be set correctly.
Antiscalant shall be mixed in the measuring tank in a 10 % solution. Only fill in antiscalant for one week's consumption, as it will otherwise become stale which means that it cannot be reused.
Antiscalant shall be dosed in proportion to the raw-water's content of salts, lime etc. and adjusted at start-up of the plant. 2-4 ml concentrated antiscalant shall be dosed per m^3 raw water, i.e. when you have a 10 % solution, the pump must dose 40 ml/m^3.

13.2 Antiscalant Dosing

The antiscalant dosing unit shall be connected to the RO plant with a dosing hose from the dosing pump to the dosing nipple on the inlet ahead of the bag filter.
At the outlet from the dosing pump, a flow control is installed, which indicates if there is a flow. If the flow fails, the flow control registers this and stops the plant. The alarm is then triggered. If you wish to adjust this dosing pump, do as follows:

1. Push the flow control all the way down
2. Let the dosing pump operate for approx. 15 minutes, until it is warm and all air has been forced out of the pump
3. Lift the dosing control until the control signal disappears and then lower again, only so much that the signal returns.
4. It should be checked that the dosing nipple (dosing location) is tight, and then the plant is ready for operation.

See also diagram of standard settings of the dosing pump.
Important! The stroke length of the dosing pump may **not** be set below 50 %.

- **Every week the tank must be emptied and rinsed, and then new an-**

tiscalant shall be filled in
- **Every third month the tank must be rinsed and cleaned before filling in new antiscalant.**

Above-mentioned dosage is calculated on basis of our standard dimensioning conditions.
If you have doubts, HOH Water Technology A/S would be pleased to assist you in calculating the correct amount for your plant.

14. CIP-CLEANING OF MEMBRANES (OPTION)

14.1 Introduction

CIP unit is not included on the plant as standard. This is available as optional equipment; however, the plant is mechanically prepared for installation of such a unit.
During normal service, dependent on inlet pressure, water quality, temperature, operating conditions etc. the RO membranes will eventually lose capacity due to the varying content of mineral salts, biological matter, colloid particles and other insoluble, organic particles in the water.
These deposits will accumulate during operation and cause an increased pressure drop across the membrane and consequently a drop in capacity.
Membranes must be CIP-cleaned when:
- **the permeate flow has dropped by 10-15 % compared to original capacity**
- **the permeate quality has dropped by 10-15 % compared to original quality**
- **prior to a long-term shutdown**
- **Routine maintenance minimum biannually.**

In this connection it should be noted that the capacity drops by lower water temperatures (approx. 3 % per °C). In this case the plant need not be CIP-cleaned; see paragraph "Start-up of plant".

14.2 Diagnosing

Various factors may clog up the membranes, e.g. if the feed water quality is bad, lacking pre-filtration, added liquids and the operating conditions of the plant. If too much strain is placed on the plant, even frequent membrane cleanings cannot keep the membranes clean. This may be due to:
- **matters in the feed water which have not been pre-treated and thus damages the membrane**
- **use of incorrect dosing**
- **CIP fluid is not adapted to the feed water**
- **Incorrect CIP-order.**

Generally you see both decreasing retention rate, dropping permeate capacity and increasing pressure drop across the membranes, or one of these, when the plant membranes clog up.
It cannot be avoided that the membranes clog up over time; how often depends on the load rate. If the membranes cannot be cleaned by means of a CIP cleaning, it is because the membranes have been overloaded. This may be prevented/avoided by frequent CIP-cleaning, pre-filtration and by dosing of either antiscalant or biocides. Pre-filtration; see paragraph "Maintenance and Trouble-shooting". You can dose against:
- **Scaling and fouling**
- **Biofouling**

Scaling is inorganically bound salts that precipitate on the membranes. Fouling is organically bound salts that precipitate on membranes. Antiscalant keeps the salts dispersing – and partially the organically bound salts too. Antiscalant; see paragraph "Antiscalant Dosing". The water should be pre-filtrated first if there is a lot of fouling.
Biofouling will appear as precipitated slime and can easily be established by measuring if there are bacteria in the concentrate. Biofouling can be avoided by dosing biocides.

14.3 Conditions

CIP cleaning will have to be done with chlorine-free water of a good quality. We recommend to use permeate on this plant, however pre-treated water may also be used.
During circulation of cleaning agent in the membranes, the temperature may never exceed 35 °C and the pH-value must be kept between 2 and 11.5 for the standard membrane equipping. Please note that there may be various permissible pH values for the individual types and makes of membranes.

HOH CIP4 is an acid cleaning agent used for dissolving in organic deposits including iron, whereas the alkaline cleaning agent **HOH CIP 10** is used for dissolving organic deposits including oil. To avoid precipitation, you must CIP clean with alkaline agent (pH 10) first.

- **The flow direction during the CIP10-cleaning must be the same as during operation.**
- **Never use sulphuric acid H_2SO_4 for CIP-cleaning, as there is then a risk of precipitation of gypsum (calcium sulphate).**

The amount of acid or alkaline depends on the pH value in the water, the total water amount in pipes and tank, the coating of the membranes and the temperature of the CIP water. The requested pH value for acid shall be pH 4 and must not be lower, whereas for alkaline solutions it shall be pH 10 and must not be higher.

HOH CIP 4 is sold by HOH, item 701957020, tel. +45 43 600 500
HOH CIP 10 is sold by HOH, item 701957010, tel. +45 43 600 500.

When using another cleaning agent, it shall be mixed in accordance with the CIP diagram

CIP-diagram	CIP cleaning agent							
Foulant	0.1 % (w) Na-EDTA pH 12, 30°C	0.1% (w) NaOH 0,05 % (w) Na-DDSA	1.0 % (w) STP, 1.0 % (w) TSP 1.0 % (w)	0.2 % (W) HCl	0.5 % (W) H_3PO_4	2.0 % (W) citric acid	0.2 % (w) NH_2SO_3H	1.0 % (W) $Na_2S_2O_4$
Sulphate scaling	OK							
Carbonate scaling				Best	OK	Ok	OK	
Metal oxidation (e.g. iron)					Good		OK	Good
Inorganic colloid (silt)		Good						
Silica	OK							
Biofilm	Best	Good	Good					
Organic	Ok	Good	Good					

14.3.1 Division of CIP-cleaning

The CIP-cleaning can be divided into 3 phases:

1. Filling of CIP tank
2. Mixing/circulation of CIP agent
3. Displacement of CIP agent
4. Membrane flush – see start-up of plant
5. Adjustment – see start-up of plant

The CIP cleaning is usually done in a double cleaning where items 1-3 are carried out.

A double cleaning consists of:

1. First an alkaline CIP cleaning where 1 % HOH CIP-10 is mixed
2. Then an acid CIP cleaning where 1 % HOH CIP-4 is mixed.

If the CIP agent is very turbid after a CIP cleaning, you must make a completely new CIP cleaning after the displacement. After CIP cleaning the plant membranes must be flushed.

If the membranes cannot be flushed clean after the cleaning, they may be damaged. It may however be a good idea to repeat the CIP cleaning after the membrane rinsing, if the permeate capacity is still too low and the retention rate is satisfactory.

14.3.2 Filling

The CIP cleaning starts with refilling of the CIP tank. There are two options:

1. In case the plant is to be CIP-cleaned during a routine maintenance, the CIP tank shall be filled with permeate while the plant is operating.
2. In other cases the CIP tank is filled while the high-pressure pump is switched off.

If you have doubts, fill the tank with the high-pressure pump **out of operation**.

14.3.3 Filling with the high-pressure pump in operation

Only applies during routine maintenance where the plant is usually operating.

1. Open valve V6 and fill the CIP tank until it is ¾ full
2. Stop the RO plant on the panel front
3. Close valve V6

Note! If antiscalant is used as pre-treatment, it must be put into operation.
Now the CIP agent can be mixed.

14.3.4 Mixture/circulation of CIP agent

This is based on the plant being switched off and the CIP tank being full. Otherwise see the paragraph dealing with "Filling".

1. High-pressure pump P1 shall be switched off on the safety cut-out if this has not been done during filling. The high-pressure pump P1 may **never** be in operation during CIP cleaning.
2. Close valves V4 and V9.
3. Open valves V3, V6, and V8. Check that the valve position is in agreement with the CIP mixture/circulation in the valve diagram.
4. Start the CIP cleaning by pressing CIP on the panel front. Pump and heating element start. Check that there is CIP agent in the CIP tank, so that the circulation pump P2 does not run dry. The CIP tank must be ¾ full. Let permeate circulate until a temperature of 35 °C is reached.
5. Stop the CIP cleaning on the panel front. The CIP agent can now be dosed in the CIP tank. (Mixture of CIP agent; see conditions).
   Note! The CIP agent shall be dosed a little at a time due to the risk of overdosing. By each dosing, following must be done:
6. Add CIP agent
7. Stir the CIP agent in the CIP tank
8. Check pH value
9. Start the CIP cleaning and circulate the CIP agent for 3 minutes.
10. Check the pH value
11. Stop the CIP cleaning. When the correct pH value during circulation has been reached, continue the CIP cleaning for 15 minutes in total. If the pH value still varies by more than 0.5 pH units, you must add more until the correct pH value has been obtained, and above-mentioned partial dosage (items. 6-11) shall be carried out again. NB: the pH value is very sensitive towards temperature fluctuations. Otherwise the CIP procedure (item 14) is continued.
12. Start CIP cleaning and circulate the CIP agent for 15 minutes as described above.
13. Stop the CIP cleaning by pressing on the button on the panel front. Let the membranes absorb (soaking) for approx. 1 hour. If the membranes are very clogged, allow up to 15 hours "soaking".
14. After every CIP cleaning, the agent must be neutralised until the CIP agent's pH value is between 6.5-7.5. Repeat items 6-11 but this time with neutralisation. Acid CIP agent can be neutralised by alkaline agent and vice versa.

14.4 Displacement of CIP agent

It is assumed that the plant is switched off and a CIP cleaning has been performed.
CIP cleaning can be finished with displacement, and you cannot continue until all chemicals have been displaced.

1. Open valve V11 so that the CIP tank gets emptied.
2. Close valve V11 again when the CIP tank is empty.
3. Start the RO plant on the panel front and fill

the CIP tank until it is ¾ full.

4. Stop the RO plant on the panel front.
5. Start the CIP pump P2 on the panel front and let the liquid circulate for approx. 2-3 minutes.
6. Stop the CIP pump P2 on the panel front.
7. Open valve V11 so the CIP tank is drained.
8. Close valve V11 again when the CIP tank is empty.

It is assumed that the plant is now CIP-cleaned and the CIP agent displaced. When the CIP cleaning is finished, the membranes must be rinsed very carefully for chemicals, and the CIP tank must be cleaned before the valves can again be set back in operating position. Go to paragraph "Start-up of Plant".

14.5 Cleaning of NF membranes

9. While the plant is operating, fill the CIP tank with permeate.
10. Open valve V6
11. When the CIP tank has been filled with permeate, close valve V6.

    Set the valves as follows:

12. Close valves V8, V17, V15
13. Open valves V18, V16, V2 to CIP.
14. Start the CIP cleaning by pressing on the button on the panel front. Pump and heating element start. Check that there is CIP liquid in the CIP tank so that the circulation pump P2 does not run dry. The CIP tank must be ¾ full. Let the permeate circulate until a temperature of 35 °C has been reached.
15. Stop the CIP cleaning on the panel front. The CIP liquid can now be dosed in the CIP tank (mixture of CIP liquid; see conditions).

15. VARIOUS ENCLOSURES

15.1 Arrangement diagram

15.2 P & I Diagram

15.3 Operating journal

15.4 Spare parts list RO

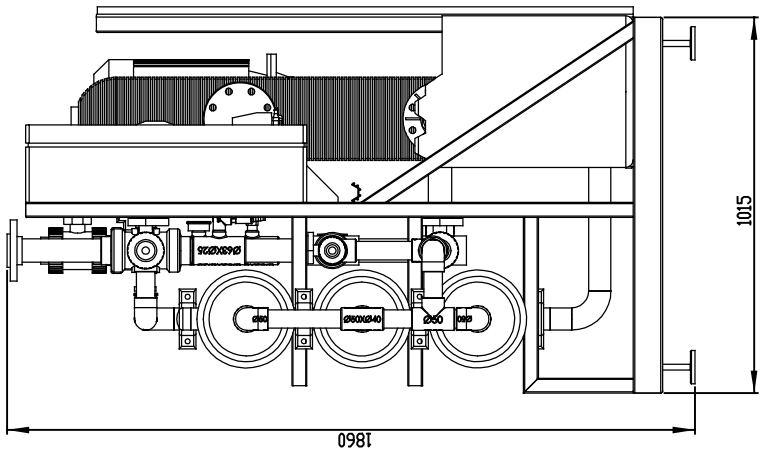
15.5 Spare parts list CIP

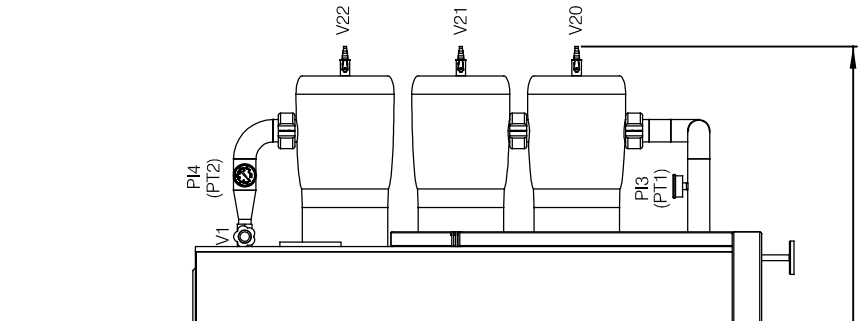
15.6 Spare parts list Antiscalant

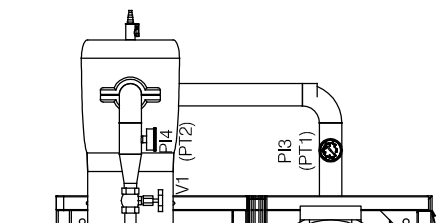
15.7 Declaration of Conformity

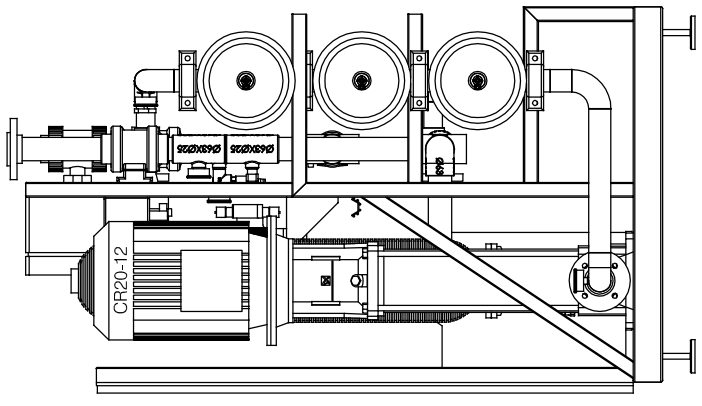
15.8 Circuit diagram

15.1 Arrangement diagram









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Scale	Designed by	Date	Quot. no.	Order no.	Drawing size	Material	Weight [kg]
1:10	KMP	19-11-2006			A1		

REVERSE OSMOSIS, RO2760
Arrangements drawing

Last Revision Date	Drawn	Text

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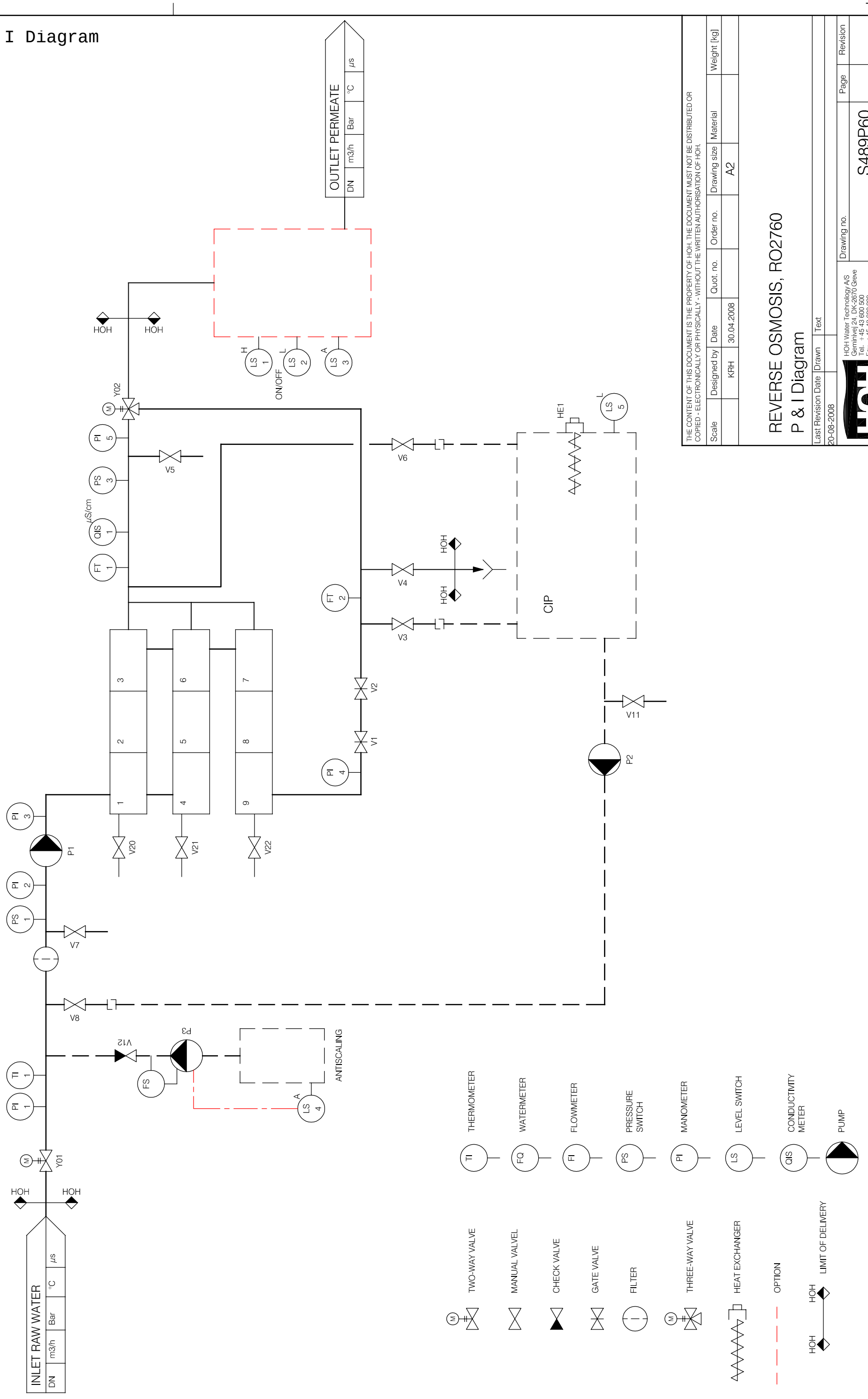
Drawing no.	Page	Revision
S489M60_1	1/2	

CAD file: S489M60_1

15.2 P & I Diagram



Scale	Designed by	Date	Quot. no.	Order no.	Drawing size	Material	Weight [kg]
	KRH	30.04.2008			A2		

REVERSE OSMOSIS, RO2760

P & I Diagram

Last Revision Date	Drawn
20-08-2008	Text

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Drawing no.	Page	Revision
S489P60		

CAD file: S489P60

15.3 Operating Journal

Date	Daily											Every week	Biannually		Remarks
	Flow meter permeate FT1	Flow meter concentrate FT2	Flow transmitter recirculation FT3	Pressure PI1	Pressure PI2	Pressure PI3 PT 1	Pressure PI4 PT2	Pressure PI5	Pressure PI6	Temp. TI1	Conductivity QIS 1	Flushing approx. ½ hour	Check for leaks	Control pressure switch PS 1 PS 2 PS 3	Filling of salt Water temperature etc.

15.4 Spare parts list RO-2700

Item No.	Subcomponents RO plant	Recommended Spare Parts	Part No.
V1, V2, V9	1" gate valve		200570100
FT1	Flow transmitter		453017063
FT2	Flow transmitter		453017032
FT3	Flow transmitter		453017032
Sensor	For FT1, FT2 and FT3		453017010
PT1, PT2	Pressure transmitter		452340040
TT1	Temperature transmitter		452321100
TI1	Temperature Indicator		452241000
PI1, PI2	Manometer 0-6 bar	1	452263000
PI5	Manometer 0-2,5 bar	1	452268000
PI3	Manometer 0-40 bar	1	452265000
PS1, PS3	Pressure switch 0.5 bar	1	452550005
P1	High-pressure pump (RO 2710/30)		454102624
P1	High-pressure pump (RO 2740/60)		454102719
P1	High-pressure pump (RO2780)		454102821
Y01	DN50 ball plug valve		200713063
Y02	DN 50 three-way ball plug valve		200718063
Actuator	For Y01 and Y02		200718100
V10	DN 25 non-return valve		200315032
V4	DN 40 ball valve PVC		200712050
V7	¼" check valve, PVC		200721010
V5	¼" check valve, PVC, permeate		200721020
	Filter cartridge 5µ	1	321448910
	8" membrane	2-3	451808048
	Relay Module		750001326
	Soft starter 11 kW (RO 2710/30)		750001723
	Soft starter 15 kW (RO 2740/80)		750001724
	Voltage/Power supply 230/230/24		750000930
	Proface-Panel PLC/HMI 6"		750001291
	Proface 4xAI Module		750001293
	On/Off switch 20,00..25,00A (RO 27/30)		750001530
	On/Off switch 22,00..32,00A (RO 2740/80		750001540

15.5 Spare parts list CIP

Item Nr.	Subcomponents CIP unit (option)	Recommended spare parts	Part No.
	300-liter reservoir	-	401526042
	600-liter reservoir	-	401526051
P2	CIP pump (RO 2710/40)	-	454100757
P2	CIP pump (RO 2750/80)	-	454104500
HE1	Heating element, 15.0 kW	-	451404615
LSL5	Level sensor	-	110851050
V11	Ø32 ball valve PVC	-	200712032

15.6 Spare parts Antiscalant

Item Nr.	Antiscalant unit (option)	Recommended spare parts	Part No.
FS	Dosage control	-	110844420
P3	Dosing pump, ProMinent	-	100513000
LS4	Suction lance 6 mm PVC	-	110848004
V12	½" dosing nipple	-	101110024

15.8 Declaration of Conformity

EC Declaration of Conformity
for Machinery
Directive 2006/42/EC, Annex II, A
Low Voltage Directive
EMC Directive

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herewith declares that:

- **RO2710, RO2720, RO2730, RO2740, RO2750, RO2760, RO2780**

- is in conformity with the provisions of the Machinery Directive (directive 2006/42/EC)
- is in conformity with the provisions of the following other EC directives
- Low Voltage Directive (2006/95/EEC)
- EMC Directive (2004/108/EEC)

- Place: Greve

- Date: 01-01-2010

Signature

Name: Lars Jensen

15.8 Circuit diagram

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Customer: HOH Water Technology A/S					Next page: Cont
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. F
Page title: Frontpage	Rev	02-10-2009	PK		
File name: S489E01_C	Drw	01-07-2009	JRI	Draw. no. S489E01B	
		Date	Ass. Appr		

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Project title: RO 2700 Serie Standard Plant

Page title: table of contens

File name: S489E01_C

Appr			
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	Date	Ass.	Appr

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Page no. Cont

Draw. no. S489E01B

IEC/EN 60757

HOH		UK	DK
1	BK	Black	Sort
	BN	Brown	Brun
6	RD	Red	Rød
12	OG	Orange	Orange
	YE	Yellow	Gul
	GN	Green	Grøn
5	BU	Blue/Dark blue	Blå
2	BU	Light blue	Lyseblå
8	VT	Violet	Violet
4	GY	Gray	Grå
7	WH	White	Hvid
9	PK	Pink	Pink
	GD	Gold	Guld
	TQ	Turquoise	Turkis
	SR	Silver	Sølv
3	GNYE	Green/Yellow	Grøn/Gul

Wire no.	Colour	Main power min. 1,5mm²/500VAC	
	500VAC		
1	BK-Black	PVT 90	L1/U
1	BK-Black	PVT 90	L2/V
1	BK-Black	PVT 90	L3/W
2	BU-Ligth blue	PVT 90	N
3	GNYE-Green/Yellow	PVT 90	PE

Wire no.	Colour	Control current wire 0,75mm²/500V-0,5mm²/300V	
	230VAC		
6	RD-Red	PVT	L Phase
2	BU-Ligth blue	PVT	N

Wire no.	Colour	Wires in measuring circuit, foreign Voltage ect.	
12	OG-Orange	PVT	External supplied wires

Wire no.	Colour	Control current wire 0,75m²/500V-0,5mm²/300V		
	24VDC	0,75mm²	0,5mm²	
4	GY-Gray	PVT	LIVY	L+ / VDC+
5	BU-Dark blue	PVT	LIVY	L- / VDC-
9	PK-Pink	PVT	LIVY	Connection wire
21	WHYE-White/Yellow	-	LIVY	Connection wire
22	WHRD-White/Red	-	LIVY	Connection wire
23	WHGY-White/Gray	-	LIVY	Connection wire
24	WHBU-White/Blue	-	LIVY	Connection wire
25	WHBN-White/Brown	-	LIVY	Connection wire
26	WHGN-White/Green	-	LIVY	Connection wire
27	WHBK-White/Black	-	LIVY	Connection wire
28	WHVT-White/Violet	-	LIVY	Connection wire
29	WHOG-White/Orange	-	LIVY	Connection wire
30	YERD-Yellow/Red	-	LIVY	Connection wire
31	YEGY-Yellow/Gray	-	LIVY	Connection wire
32	YEBU-Yellow/Blue	-	LIVY	Connection wire
33	YEBN-Yellow/Brown	-	LIVY	Connection wire
34	YEBK-Yellow/Black	-	LIVY	Connection wire
35	RDBU-Red/Blue	-	LIVY	Connection wire
36	RDGN-Red/Green	-	LIVY	Connection wire
37	RDBK-Red/Black	-	LIVY	Connection wire
38	GYRD-Gray/Red	-	LIVY	Connection wire
39	GYBU-Gray/Blue	-	LIVY	Connection wire
40	GYBN-Gray/Blue	-	LIVY	Connection wire
41	GYGN-Gray/Green	-	LIVY	Connection wire
42	GYBK-Gray/Black	-	LIVY	Connection wire
43	BUGN-Blue/Green	-	LIVY	Connection wire
44	BUBK-Blue/Black	-	LIVY	Connection wire
45	BNRD-Brown/Red	-	LIVY	Connection wire
46	BNBU-Brown/Blue	-	LIVY	Connection wire
47	BNGN-Brown/Green	-	LIVY	Connection wire
48	BNBK-Brown/Black	-	LIVY	Connection wire
49	GNBK-Green/Black	-	LIVY	Connection wire

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Project title: RO 2700 Serie Standard Plant
Page title: IEC/EN 60757 - Wire colours and no. in HOH panels
File name: S489E01_C

Appr				
Rev	02-10-2009		PK	
Drw	01-07-2009		JRI	
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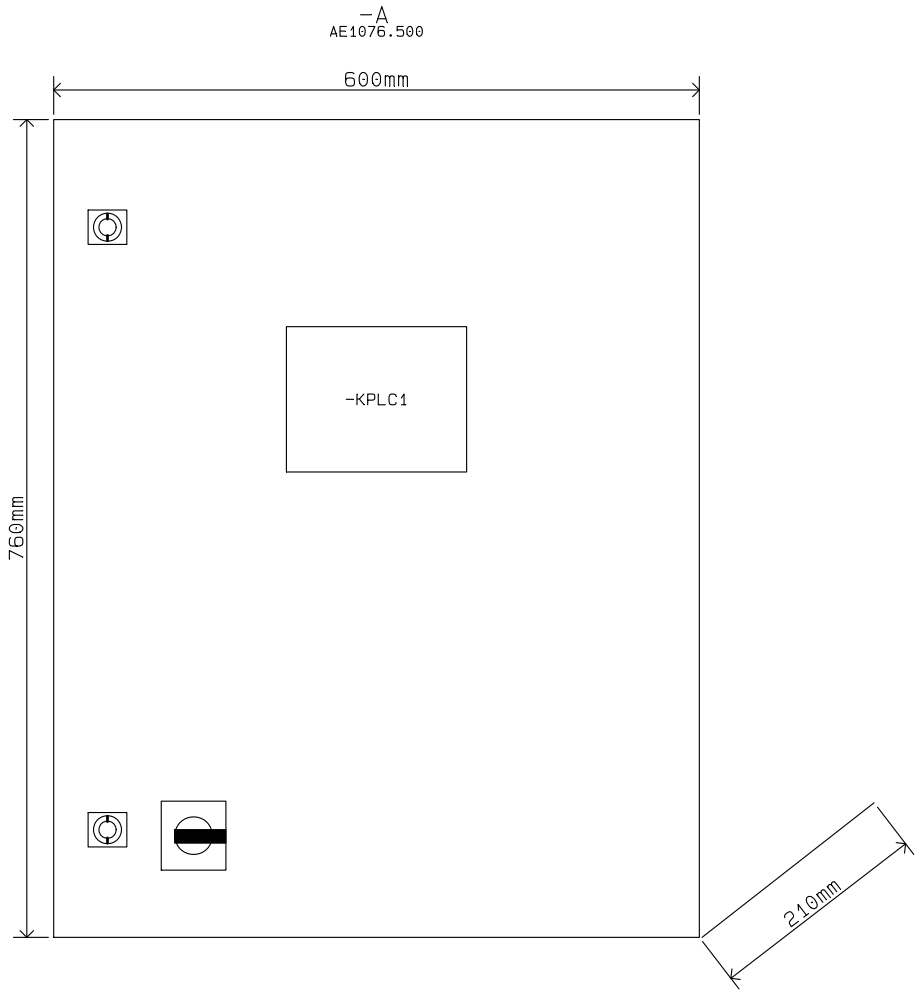
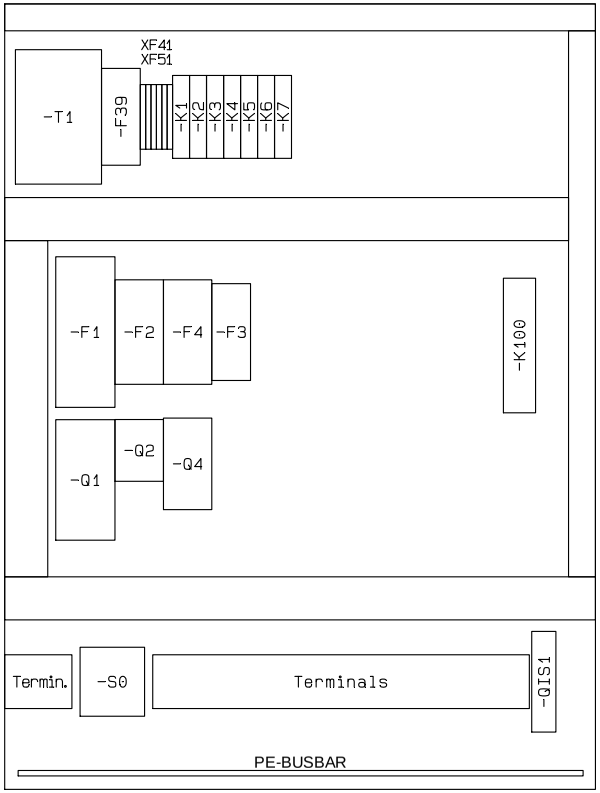
Draw. no. S489E01A



Door



Mounting plate
549x730mm

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Customer: HOH Water Technology A/S				Previous page: Info	Next page: 1
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. Layout
Page title: Layout	Rev	21-01-2010	PK		
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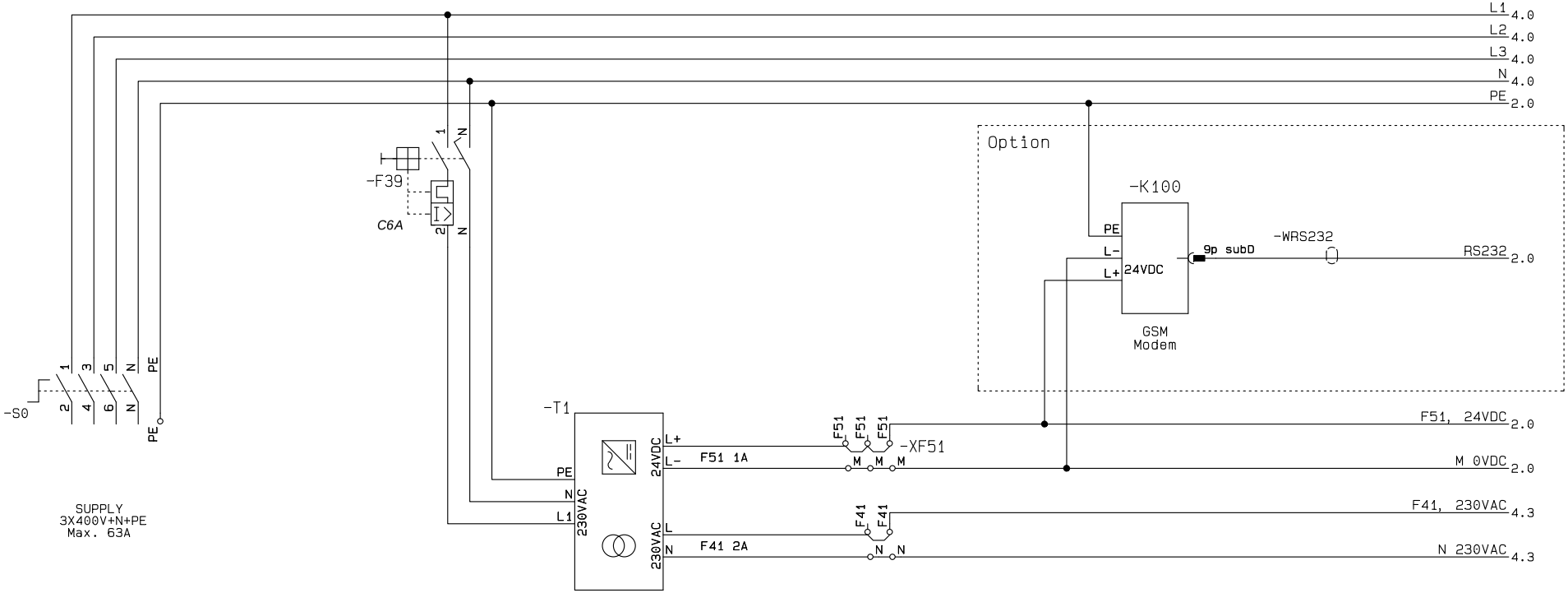

Power supply, Combi
230VAC/
230VAC 0,48A/
24VDC 1,25A

0 1 2 3 4 5 6 7 8 9

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Customer: HOH Water Technology A/S				Previous page: Layout	Next page: 2
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 1
Page title: P1 High pressure pump	Rev	05-05-2010	PK		
File name: S489E01_C	Drw	01-07-2009	JRI	Draw. no. S489E01B	
		Date	Ass. Appr		

-KPLC1

PLC/HMI Logic-touch series, 5,7" monochrome HMI, 16 DI/16 DO

IX.1.00.00 *14/1*	IN00 FT01 Flow pemeate outlet	B1	QX.1.01.00 *10/1*	OUT00 Available	B12
IX.1.00.01 *5/7*	IN01 Run Signal P2 CIP Pump	A1	QX.1.01.01 *10/2*	OUT01 Available	A12
IX.1.00.02 *14/3*	IN02 FT02 Flow Concentrate outlet	B2	QX.1.01.02 *10/3*	OUT02 Available	B13
IX.1.00.03 *8/1*	IN03 PS02 High pressure circulation only for Ro2710 RO2720 RO2730 RO2740 RO2750	A2	QX.1.01.03 *10/4*	OUT03 Available	A13
IX.1.00.04 *14/5*	IN04 FT03 Flow recirculation only for Ro2710 RO2720 RO2730 RO2740 RO2750	B3	QX.1.01.04 *4/5*	OUT04 Start order P1 High pressure pump	B14
IX.1.00.05 *4/7*	IN05 Run Signal P1 High pressure pump	A3	QX.1.01.05 *5/5*	OUT05 Start order P2 CIP Pump	A14
IX.1.00.06 *14/7*	IN06 Run Signal P2 CIP Pump	B4	QX.1.01.06 *6/5*	OUT06 Start order P3 Dosing pump	B15
IX.1.00.07 *6/7*	IN07 Alarm signal P3 Dosing pump	A4	QX.1.01.07 *7/5*	OUT07 Start order HE1 E1 heater CIP	A15
IX.1.00.08 *7/7*	IN08 Run Signal HE1 E1 heater CIP	B5	QX.1.01.08 *9/1*	OUT08 Y01 Raw water inlet valve	B16
IX.1.00.09 *8/2*	IN09 PS01 Low inlet pressure	A5	QX.1.01.09 *9/3*	OUT09 Y02 Permeate valve	A16
IX.1.00.10 *8/3*	IN10 PS03 High outlet permeate	B6	QX.1.01.10 *10/5*	OUT10 Available	B17
IX.1.00.11 *8/4*	IN11 LSH01 High level permeate	A6	QX.1.01.11 *10/6*	OUT11 Available	A17
IX.1.00.12 *8/5*	IN12 LSL02 Low level permeate	B7	QX.1.01.12 *10/7*	OUT12 Available	B18
IX.1.00.13 *8/6*	IN13 LSA03 Low alarm level permeate	A7	QX.1.01.13 *10/8*	OUT13 Available	A18
IX.1.00.14 *8/7*	IN14 TS01 thermostat CIP cleaning	B8	QX.1.01.14 *11/1*	OUT14 Available	B19
IX.1.00.15 *8/8*	IN15 LSL05 Low level CIP	A8	QX.1.01.15 *11/7*	OUT15 Ext. signal Common alarm	A19

LT3301-L1-D24-C

Option
1.9 RS232

NC A9 | COM B9 | +24V A10 | +24V B10 | 0V A11 | 0V B11

1.9 F51, 24VDC — F51, 24VDC 3.0
1.9 M 0VDC — M 0VDC 3.0
1.9 PE — PE 3.0

0 1 2 3 4 5 6 7 8 9

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Customer: HOH Water Technology A/S				Previous page: 1	Next page: 3
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 2
Page title: PLC Reference, 16 Digital input + 16 Digital output	Rev	05-05-2010	PK		
File name: S489E01_C	Drw	01-07-2009	JRI	Draw. no. S489E01A	
		Date	Ass. Appr		

-KPLC2

4xAI 0-10V/4-20mA / 2xAO 0-10V/4-20mA

		VO	
AI0	QIS1 Conductivity meter	I0	
		COM 0+1	
		V1	
			13/1
AI1	TT01 Temperature	I1	
		V2	
			13/3
AI2	PT01 Pressure inlet membranes	I2	
		COM 2+3	
		V3	
			13/5
AI3	PT02 Pressure Permeate	I3	
AO0	Available	VI0	
		COM0	
		S0	
AO1	Available	VI1	
		COM1	
		S1	

EXM-AMM6HT

\+ 24V DC - PE

2.9 F51, 24VDC → F51, 24VDC 4.3

2.9 M 0VDC → M 0VDC 4.3

2.9 PE → PE 4.0

0 1 2 3 4 5 6 7 8 9

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Customer: HOH Water Technology A/S				Previous page: 2	Next page: 4
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 3
Page title: PLC Reference, 4 Analog input + 2 Analoge output	Rev	06-05-2010	PK		
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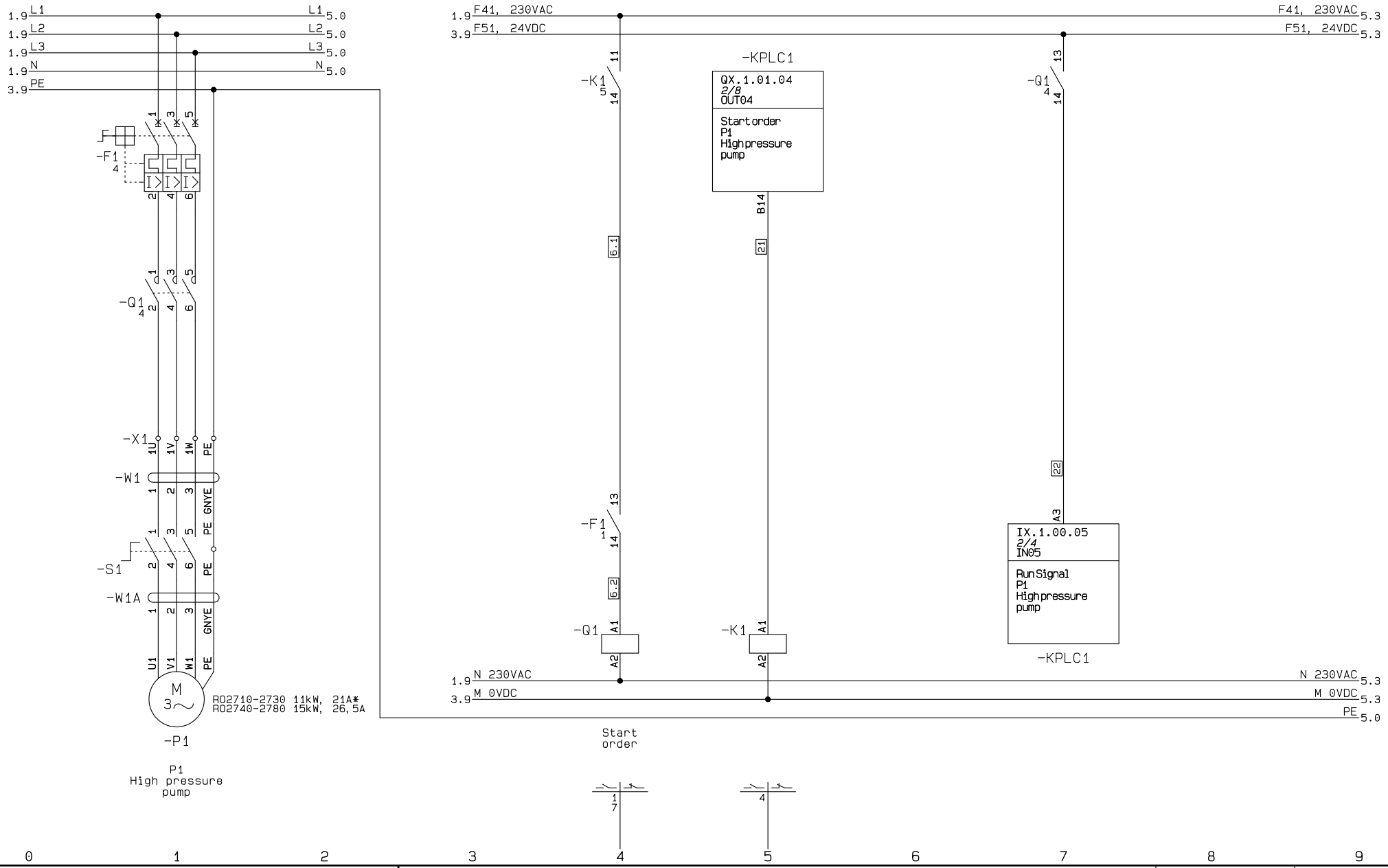
		Date	Ass. Appr		



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Customer: HOH Water Technology A/S				Previous page: 3	Next page: 5
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 4
Page title: P1 High pressure pump	Rev	06-05-2010	PK		
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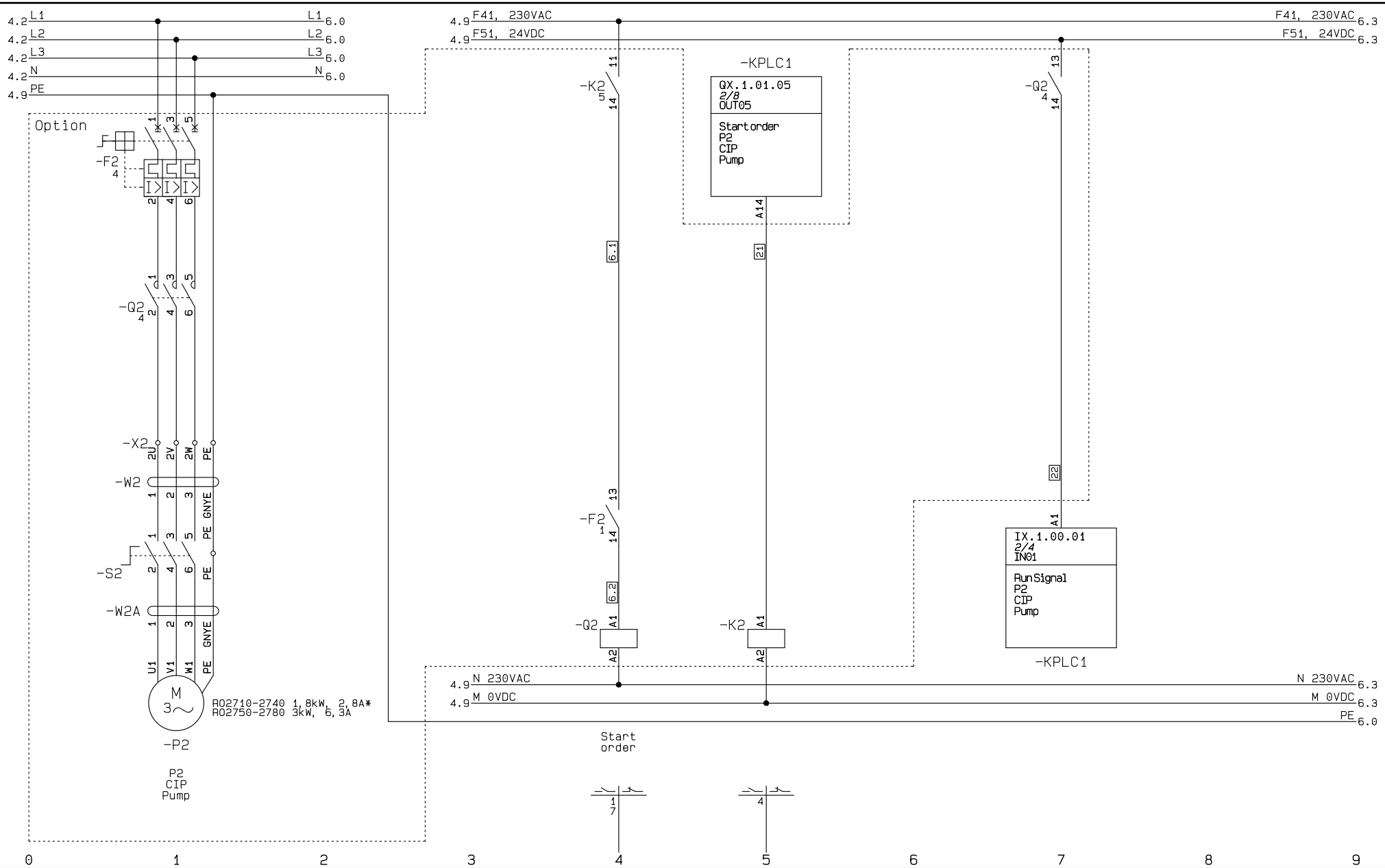

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Customer: HOH Water Technology A/S				Previous page: 4	Next page: 6
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 5
Page title: P2 CIP Pump	Rev	06-05-2010	PK		
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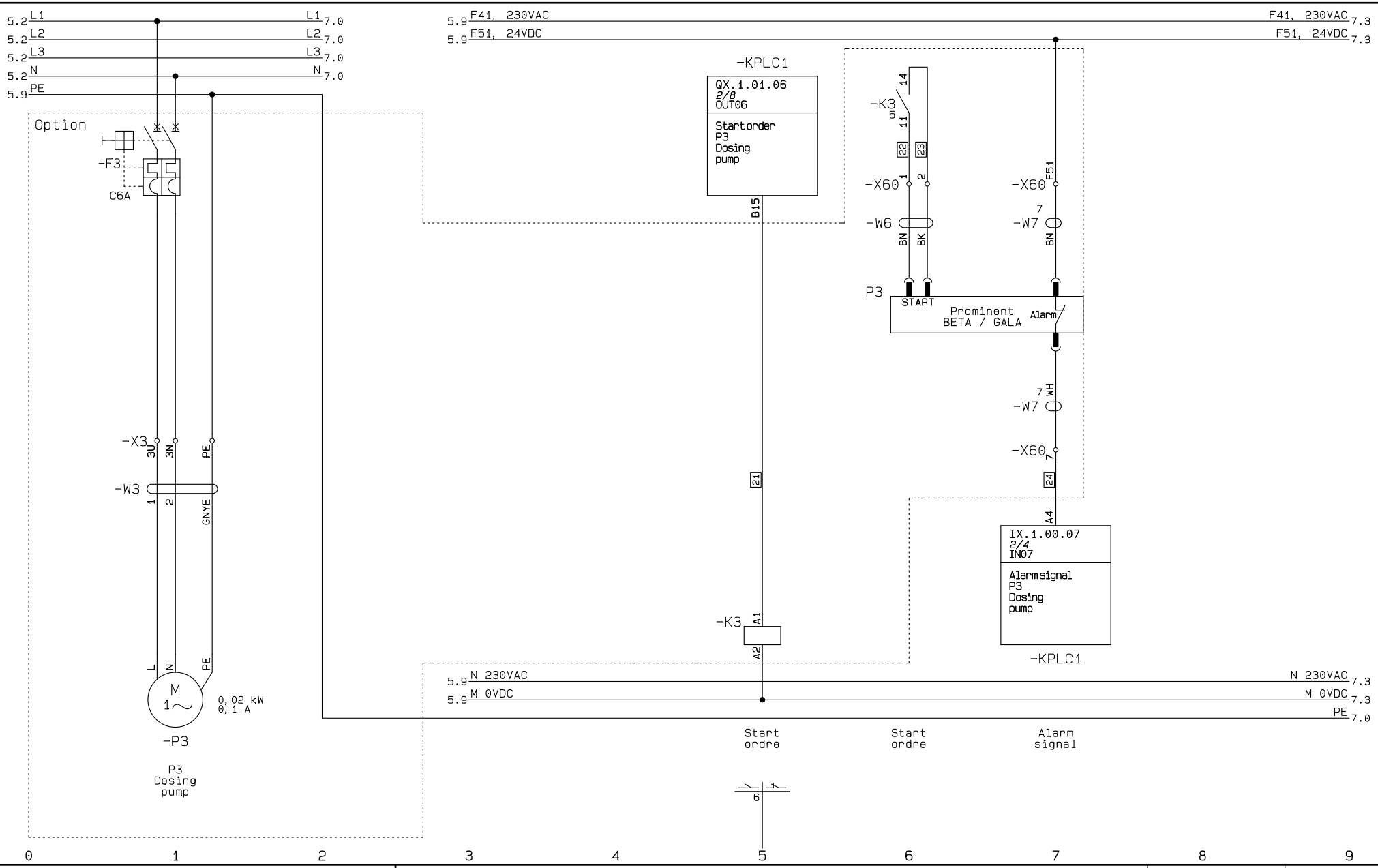

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Customer: HOH Water Technology A/S				Previous page: 5	Next page: 7
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 6
Page title: P3 Dosing pump	Rev	06-05-2010	PK		
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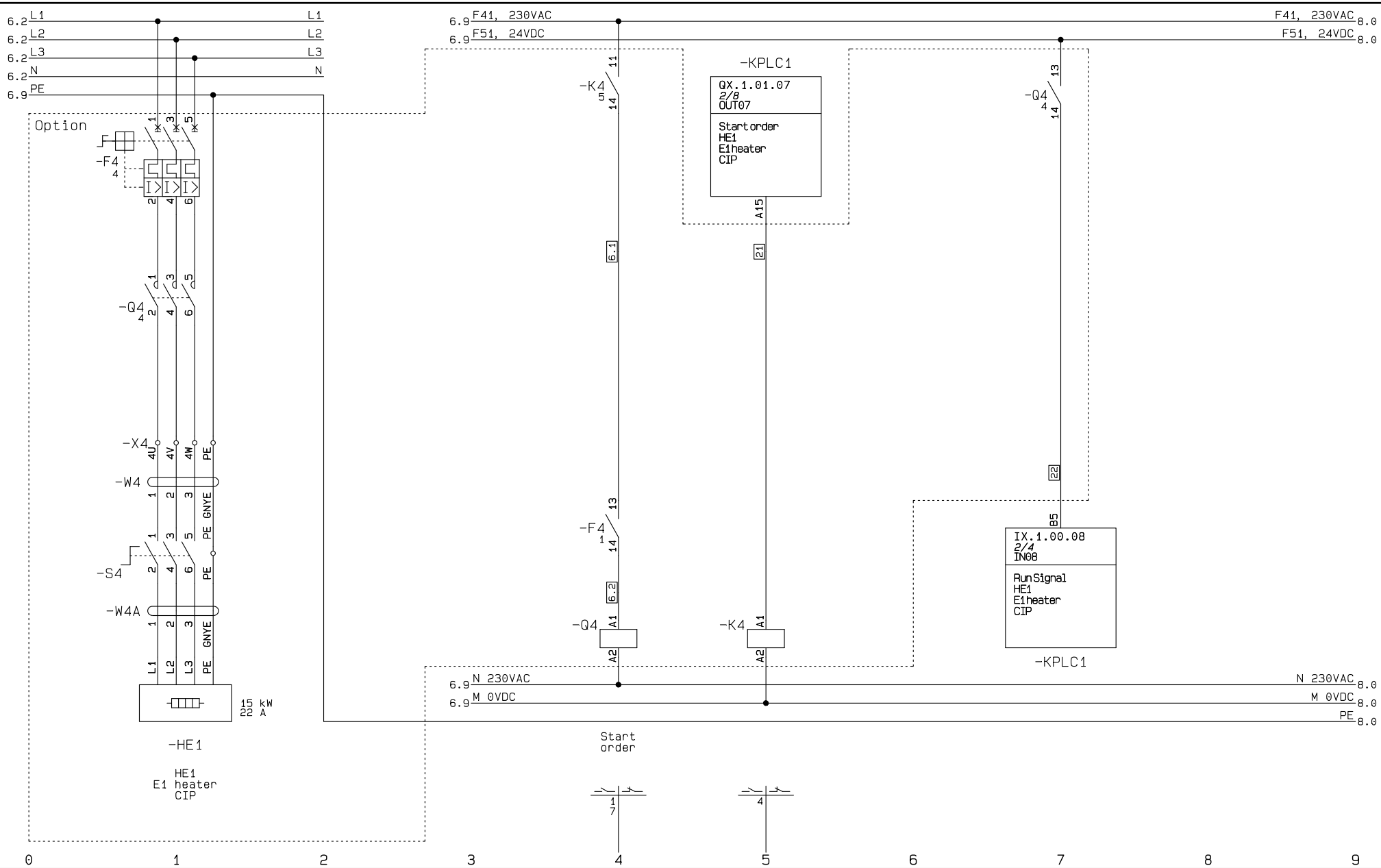
		Date	Ass. Appr		



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Customer: HOH Water Technology A/S				Previous page: 6	Next page: 8
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 7
Page title: HE1 E1 heater CIP	Rev	06-05-2010	PK		
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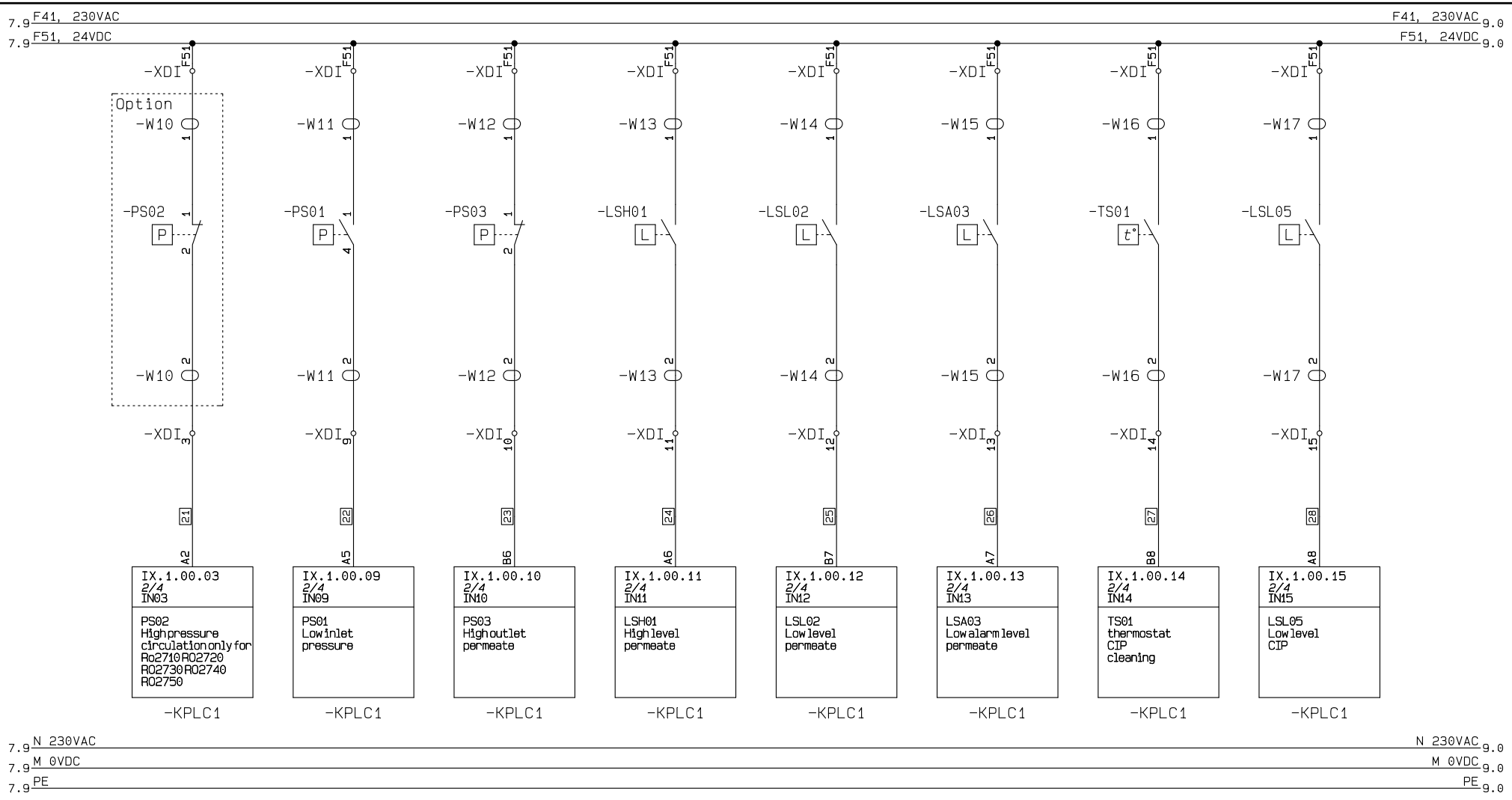
		Date	Ass. Appr		



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Customer: HOH Water Technology A/S				Previous page: 7	Next page: 9
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 8
Page title: XDi, Digital input	Rev	06-05-2010	PK		
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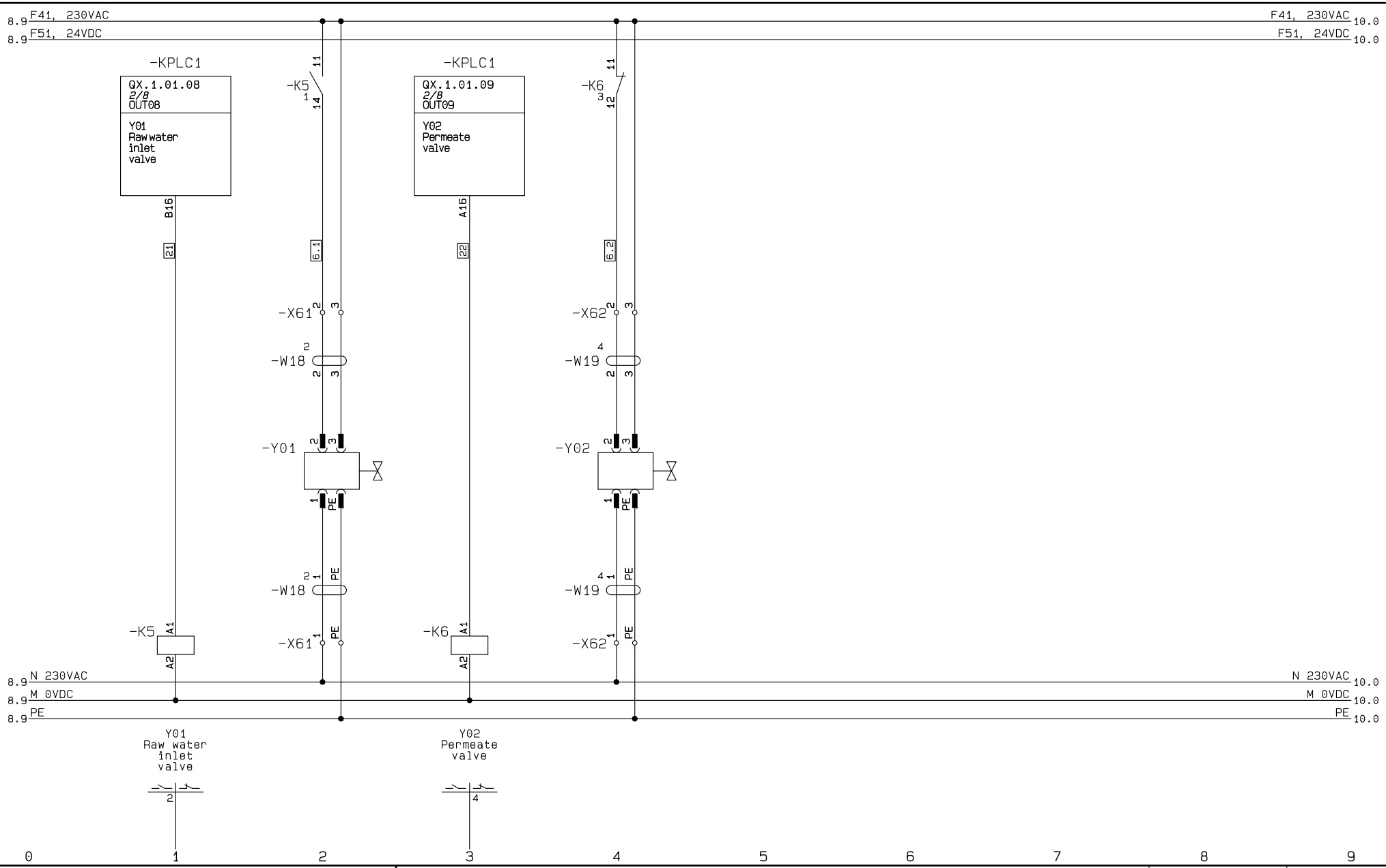
		Date	Ass. Appr		



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Customer: HOH Water Technology A/S				Previous page: 8	Next page: 10
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 9
Page title: XDo, Digital output - Valves	Rev	23-08-2010	PK		
File name: S489E01_C	Drw	01-07-2009	JRI	Draw. no. S489E01A	
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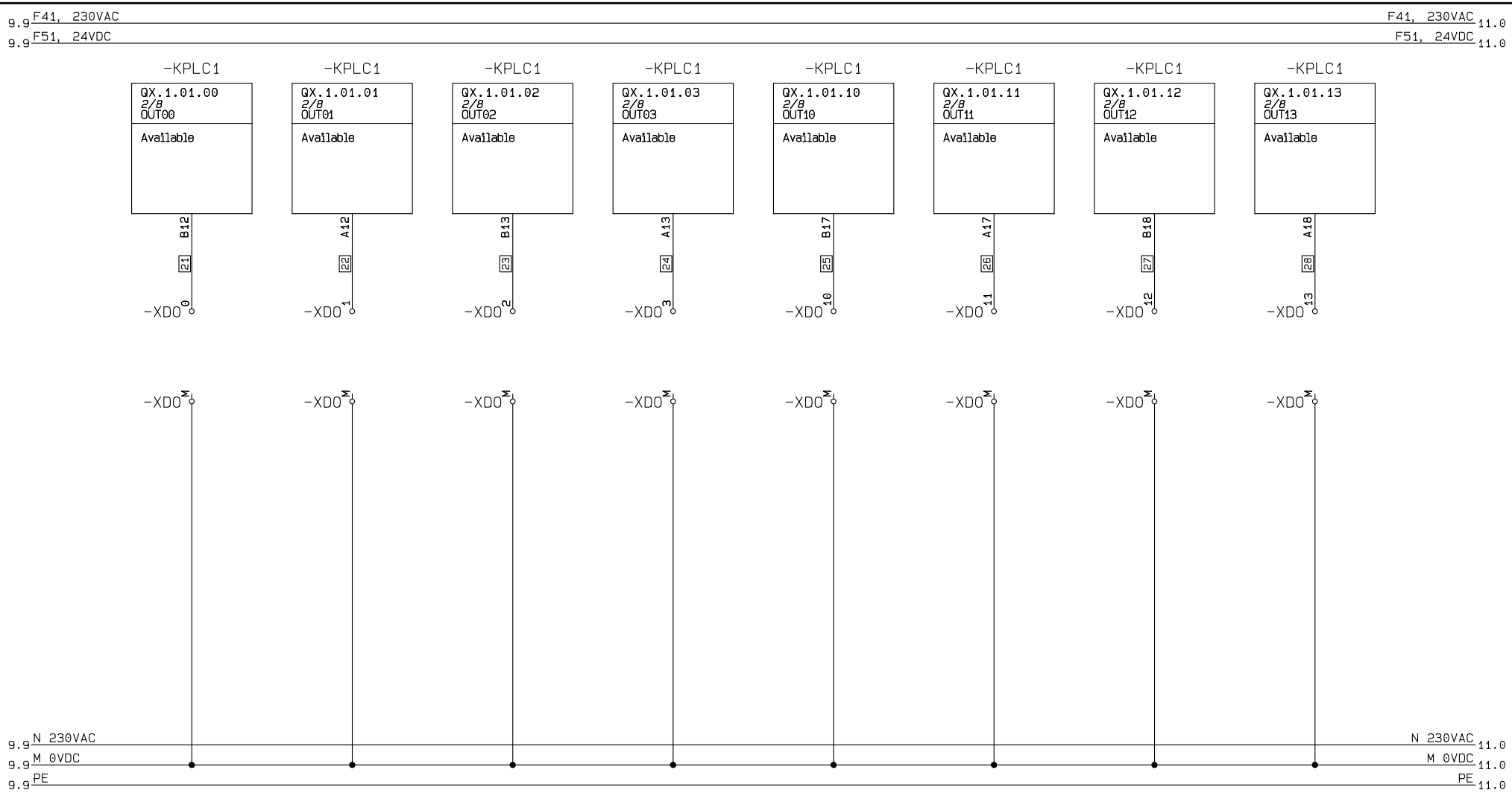

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Customer: HOH Water Technology A/S				Previous page: 9	Next page: 11
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 10
Page title: XDo, Digital output - Availables	Rev	23-08-2010	PK		
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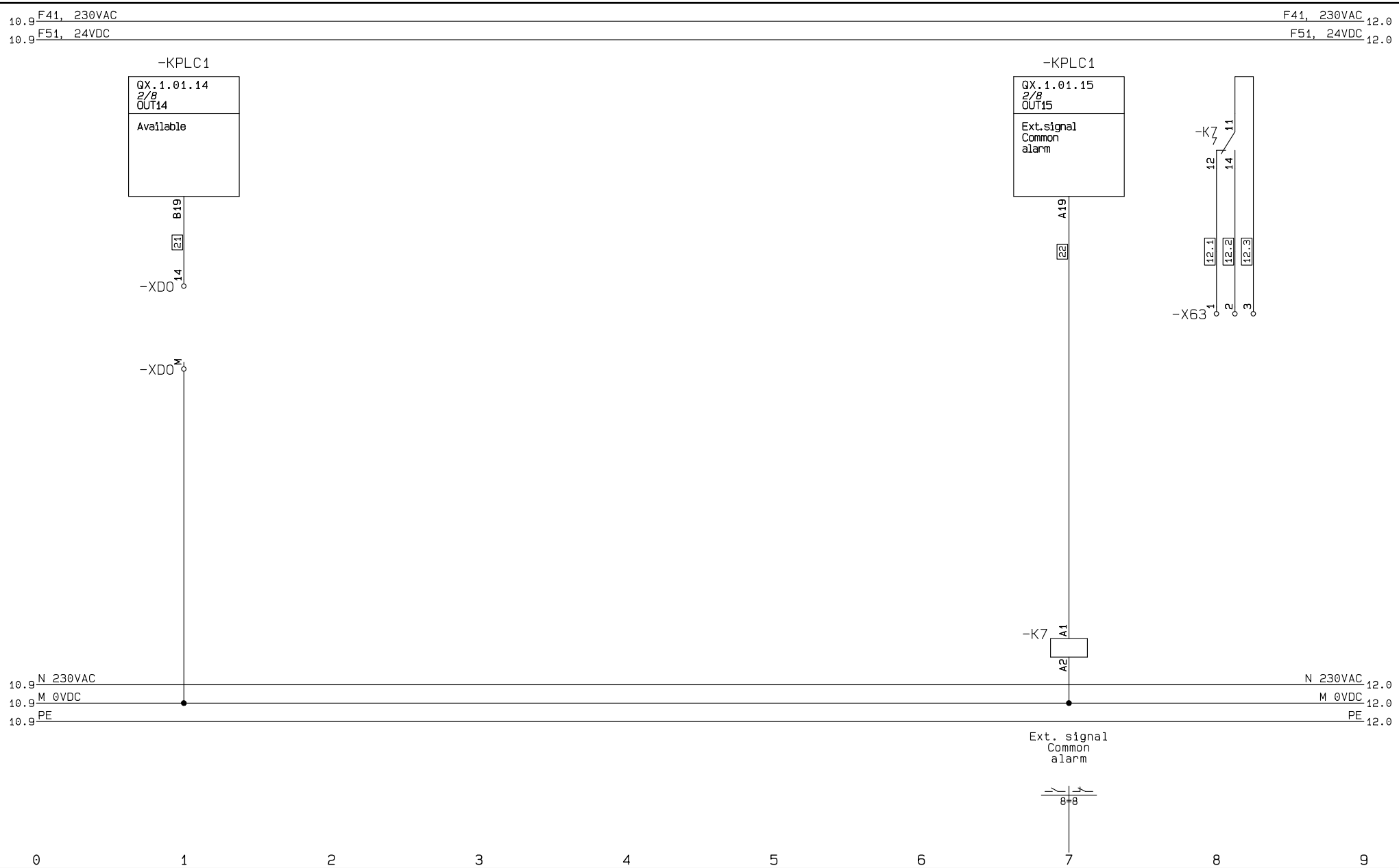
		Date	Ass. Appr		



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Customer: HOH Water Technology A/S				Previous page: 10	Next page: 12
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 11
Page title: XDo, Digital output - Valves	Rev	23-08-2010	PK		
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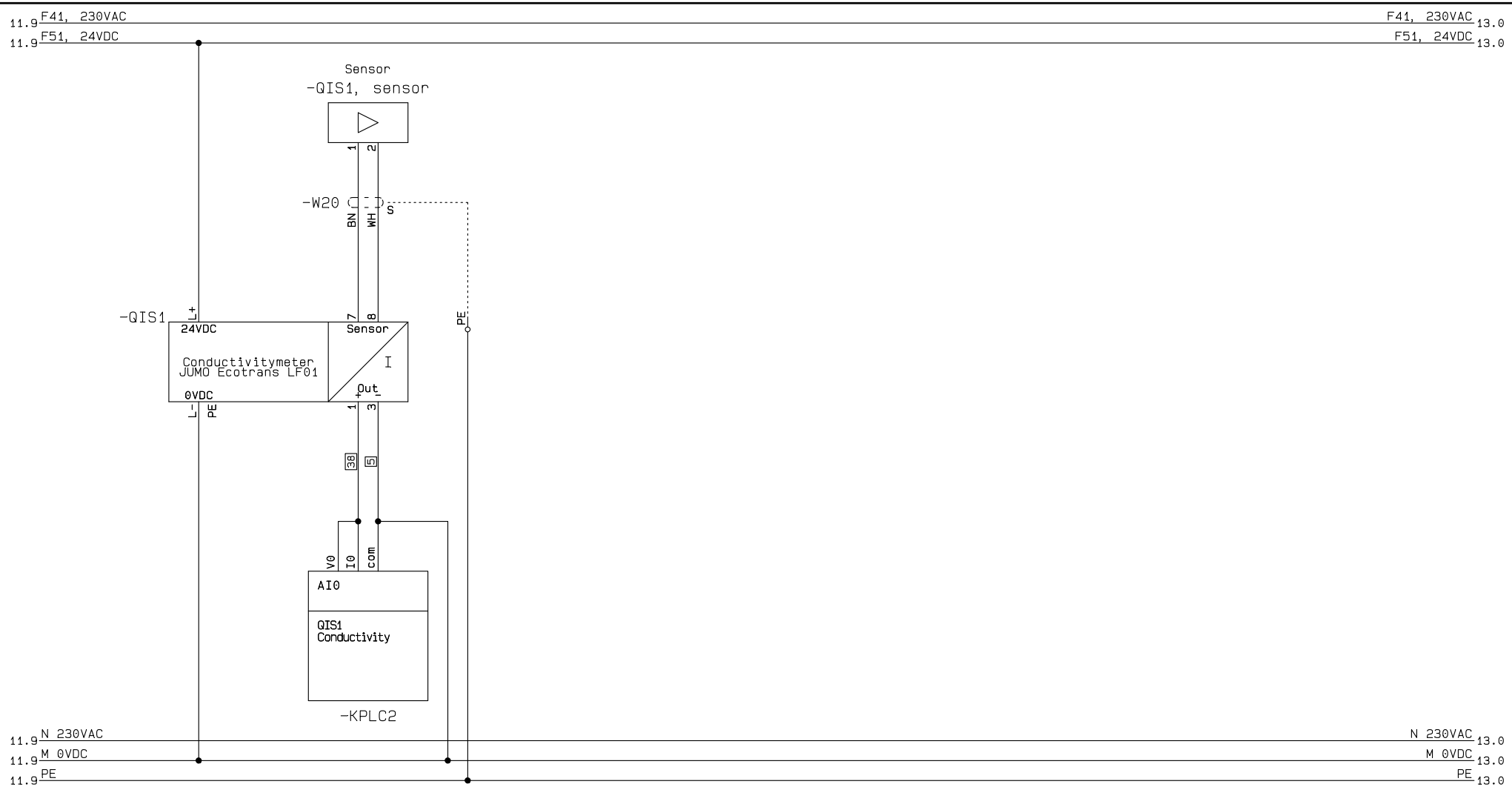
		Date	Ass. Appr		



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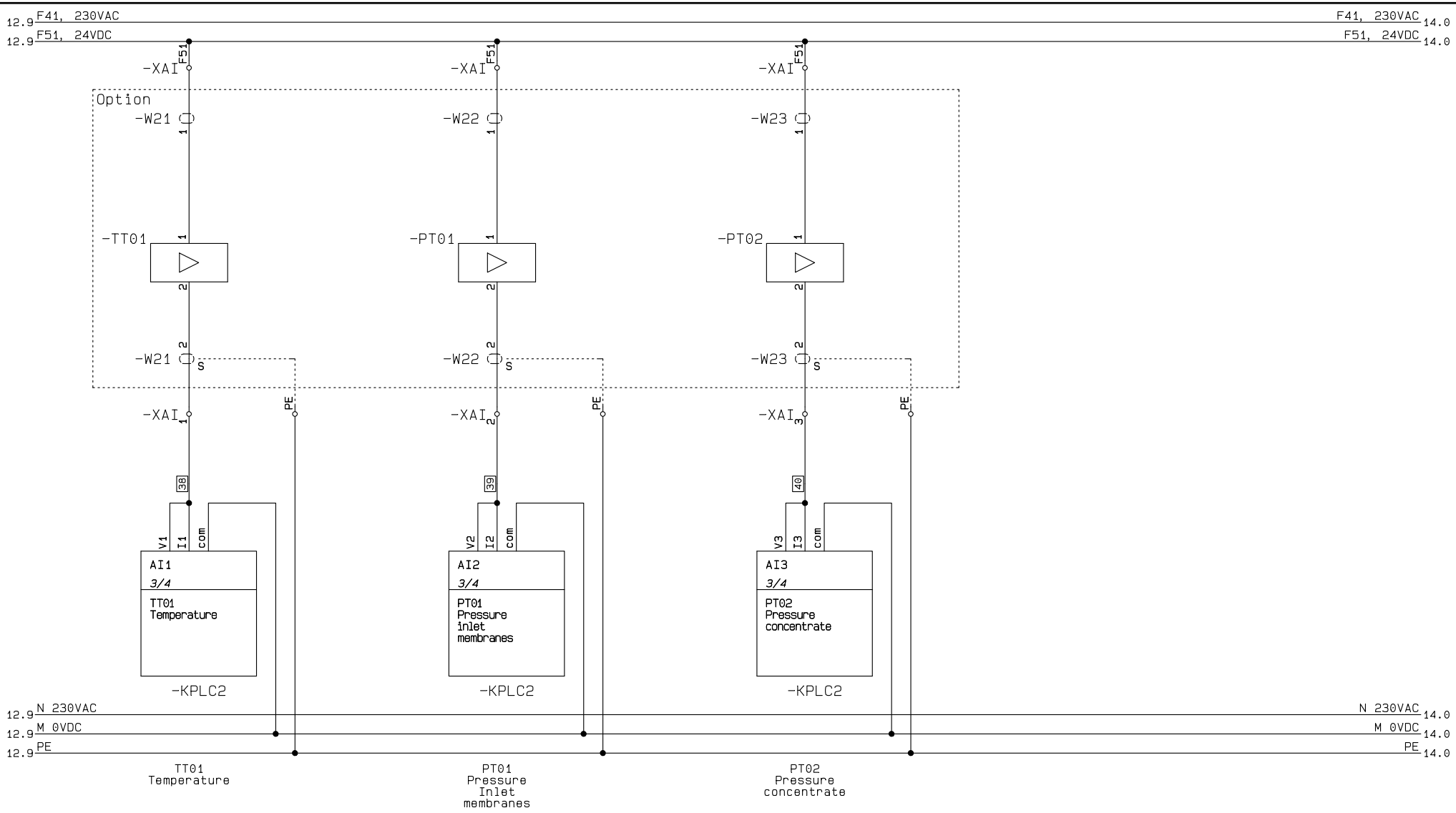
Customer: HOH Water Technology A/S				Previous page: 11	Next page: 13
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 12
Page title: Analog input - Conductivitymeter	Rev	23-08-2010	PK		
File name: S489E01_C	Drw	01-07-2009	JRI	Draw. no. S489E01B	
		Date	Ass. Appr		



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Customer: HOH Water Technology A/S				Previous page: 12	Next page: 14
Project title: RO 2700 Serie Standard Plant	Appr			Main no. S489	Page no. 13
Page title: Analog input - Temperature + Pressure	Rev	23-08-2010	PK		
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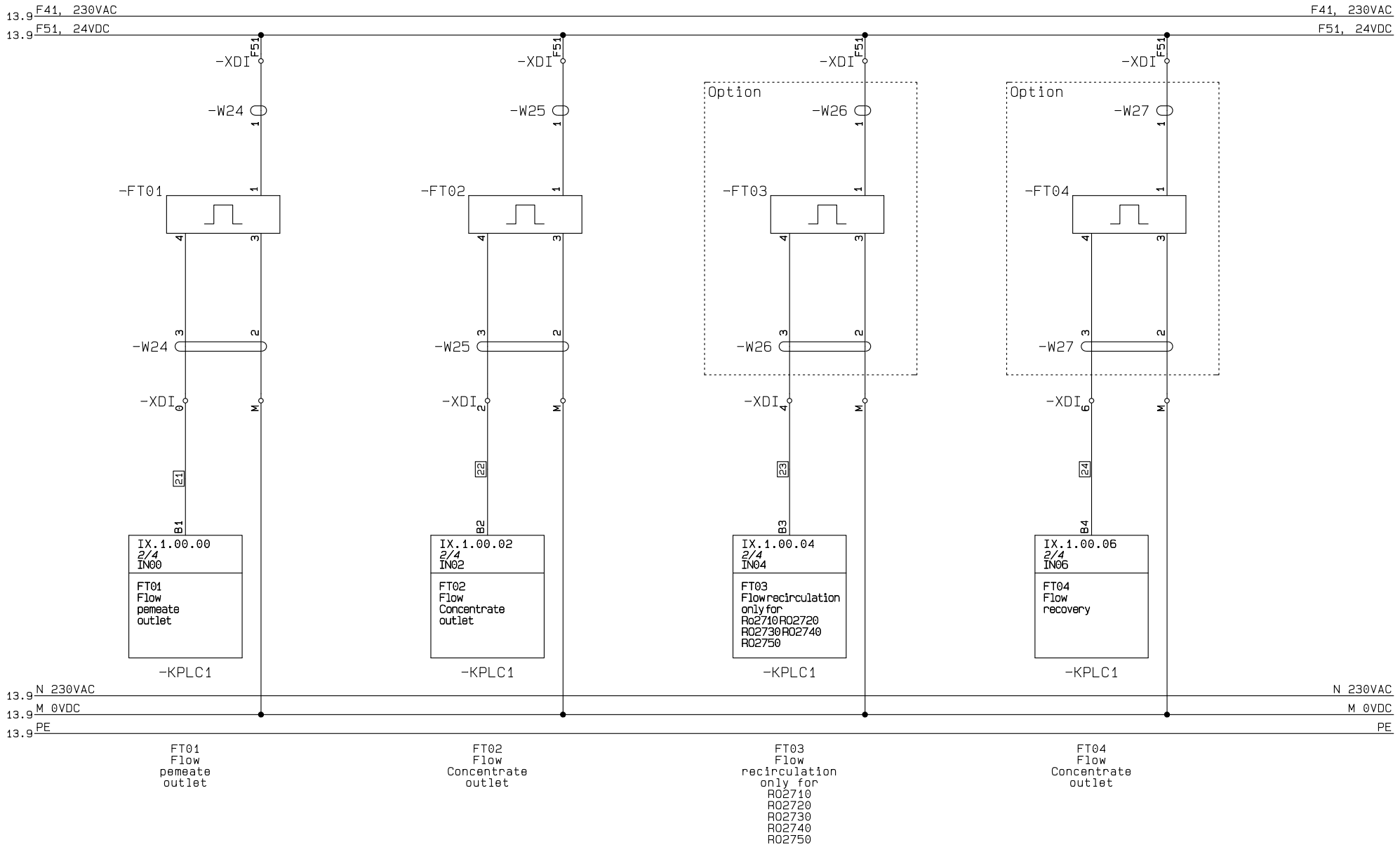
		Date	Ass. Appr		



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Page title: XDi, Digital input Flow	Rev	23-08-2010	PK		
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		Date	Ass. Appr		

Pos.	Name	I/O		Wire	Description	Signal path	Connected to	Position
1	-KPLC1:B1	IX.1.00.00	IN00	21	FT01 Flow pemeate outlet	-XDI:0,-W24:3	-FT01:4	14/1
2	-KPLC1:A1	IX.1.00.01	IN01	22	Run Signal P2 CIP Pump		-Q2:14	5/7
3	-KPLC1:B2	IX.1.00.02	IN02	22	FT02 Flow Concentrate outlet	-XDI:2,-W25:3	-FT02:4	14/3
4	-KPLC1:A2	IX.1.00.03	IN03	21	PS02 High pressure circulation only for Ro2710 RO2720 RO2730 RO2740 RO2750	-XDI:3,-W10:2	-PS02:2	8/1
5	-KPLC1:B3	IX.1.00.04	IN04	23	FT03 Flow recirculation only for Ro2710 RO2720 RO2730 RO2740 RO2750	-XDI:4,-W26:3	-FT03:4	14/5
6	-KPLC1:A3	IX.1.00.05	IN05	22	Run Signal P1 High pressure pump		-Q1:14	4/7
7	-KPLC1:B4	IX.1.00.06	IN06	24	FT04 Flow recovery	-XDI:6,-W27:3	-FT04:4	14/7
8	-KPLC1:A4	IX.1.00.07	IN07	24	Alarm signal P3 Dosing pump	-X60:7,-W7:WH	P3:4	6/7
9	-KPLC1:B5	IX.1.00.08	IN08	22	Run Signal HE1 E1 heater CIP		-Q4:14	7/7
10	-KPLC1:A5	IX.1.00.09	IN09	22	PS01 Low inlet pressure	-XDI:9,-W11:2	-PS01:4	8/2
11	-KPLC1:B6	IX.1.00.10	IN10	23	PS03 High outlet permeate	-XDI:10,-W12:2	-PS03:2	8/3
12	-KPLC1:A6	IX.1.00.11	IN11	24	LSH01 High level permeate	-XDI:11,-W13:2	-LSH01:2	8/4
13	-KPLC1:B7	IX.1.00.12	IN12	25	LSL02 Low level permeate	-XDI:12,-W14:2	-LSL02:2	8/5
14	-KPLC1:A7	IX.1.00.13	IN13	26	LSA03 Low alarm level permeate	-XDI:13,-W15:2	-LSA03:2	8/6
15	-KPLC1:B8	IX.1.00.14	IN14	27	TS01 thermostat CIP cleaning	-XDI:14,-W16:2	-TS01:2	8/7
16	-KPLC1:A8	IX.1.00.15	IN15	28	LSL05 Low level CIP	-XDI:15,-W17:2	-LSL05:2	8/8
17	-KPLC1:B12	QX.1.01.00	OUT00	21	Available	-XDO:0	-XDO:0	10/1
18	-KPLC1:A12	QX.1.01.01	OUT01	22	Available	-XDO:1	-XDO:1	10/2
19	-KPLC1:B13	QX.1.01.02	OUT02	23	Available	-XDO:2	-XDO:2	10/3
20	-KPLC1:A13	QX.1.01.03	OUT03	24	Available	-XDO:3	-XDO:3	10/4
21	-KPLC1:B14	QX.1.01.04	OUT04	21	Start order P1 High pressure pump		-K1:A1	4/5
22	-KPLC1:A14	QX.1.01.05	OUT05	21	Start order P2 CIP Pump		-K2:A1	5/5
23	-KPLC1:B15	QX.1.01.06	OUT06	21	Start order P3 Dosing pump		-K3:A1	6/5
24	-KPLC1:A15	QX.1.01.07	OUT07	21	Start order HE1 E1 heater CIP		-K4:A1	7/5
25	-KPLC1:B16	QX.1.01.08	OUT08	21	Y01 Raw water inlet valve		-K5:A1	9/1
26	-KPLC1:A16	QX.1.01.09	OUT09	22	Y02 Permeate valve		-K6:A1	9/3
27	-KPLC1:B17	QX.1.01.10	OUT10	25	Available	-XDO:10	-XDO:10	10/5
28	-KPLC1:A17	QX.1.01.11	OUT11	26	Available	-XDO:11	-XDO:11	10/6
29	-KPLC1:B18	QX.1.01.12	OUT12	27	Available	-XDO:12	-XDO:12	10/7
30	-KPLC1:A18	QX.1.01.13	OUT13	28	Available	-XDO:13	-XDO:13	10/8
31	-KPLC1:B19	QX.1.01.14	OUT14	21	Available	-XDO:14	-XDO:14	11/1
32	-KPLC1:A19	QX.1.01.15	OUT15	22	Ext. signal Common alarm		-K7:A1	11/7
33								
34	-KPLC2:VI0		AO0		Available			3/4
35	-KPLC2:VI1		AO1		Available			3/4
36	-KPLC2:V1			38		-XAI:1,-W21:2	-TT01:2	13/1
37	-KPLC2:V3			40		-XAI:3,-W23:2	-PT02:2	13/5
38	-KPLC2:V2			39		-XAI:2,-W22:2	-PT01:2	13/3
39	-KPLC2:I3		AI3		PT02 Pressure Permeate			3/4
40	-KPLC2:VO							3/4
41	-KPLC2:V0			38			-QIS1:1	12/2
42	-KPLC2:I0		AI0		QIS1 Conductivity meter			3/4
43	-KPLC2:I2		AI2		PT01 Pressure inlet membranes			3/4
44	-KPLC2:I1		AI1		TT01 Temperature			3/4
45	-KPLC2:COM0	.0						3/4

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Project title: RO 2700 Serie Standard Plant

Page title: IO List

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Pos.	Name	I/O	Wire	Description	Signal path	Connected to	Position
46	-KPLC2:S0	.0					3/4
47	-KPLC2:S1	.1					3/4
48	-KPLC2:COM1	.1					3/4
49	-KPLC2:I0	AI0	38	QIS1 Conductivity		-QIS1:1	12/2
50	-KPLC2:I1	AI1	38	TT01 Temperature	-XAI:1,-W21:2	-TT01:2	13/1
51	-KPLC2:I2	AI2	39	PT01 Pressure inlet membranes	-XAI:2,-W22:2	-PT01:2	13/3
52	-KPLC2:I3	AI3	40	PT02 Pressure concentrate	-XAI:3,-W23:2	-PT02:2	13/5
53							
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1	-X1:1U	4/1	-W1	-S1	4/1		4G4 mm² H07RN-F	4/1
2	-X1:1V	4/1	-W1	-S1	4/1		4G4 mm² H07RN-F	4/1
3	-X1:1W	4/1	-W1	-S1	4/1		4G4 mm² H07RN-F	4/1
4	-XPE:PE	4/1	-W1	-S1	4/1		4G4 mm² H07RN-F	4/1
5								
6	-S1:2	4/1	-W1A	-P1	4/1		4G4 mm² H07RN-F	4/1
7	-S1:4	4/1	-W1A	-P1	4/1		4G4 mm² H07RN-F	4/1
8	-S1:6	4/1	-W1A	-P1	4/1		4G4 mm² H07RN-F	4/1
9	-S1:PE	4/1	-W1A	-P1	4/1		4G4 mm² H07RN-F	4/1
10								
11	-X2:2U	5/1	-W2	-S2	5/1		4G1,5 mm² H07RN-F	5/1
12	-X2:2V	5/1	-W2	-S2	5/1		4G1,5 mm² H07RN-F	5/1
13	-X2:2W	5/1	-W2	-S2	5/1		4G1,5 mm² H07RN-F	5/1
14	-XPE:PE	5/1	-W2	-S2	5/1		4G1,5 mm² H07RN-F	5/1
15								
16	-S2:2	5/1	-W2A	-P2	5/1		4G1,5 mm² H07RN-F	5/1
17	-S2:4	5/1	-W2A	-P2	5/1		4G1,5 mm² H07RN-F	5/1
18	-S2:6	5/1	-W2A	-P2	5/1		4G1,5 mm² H07RN-F	5/1
19	-S2:PE	5/1	-W2A	-P2	5/1		4G1,5 mm² H07RN-F	5/1
20								
21	-X3:3U	6/1	-W3	-P3	6/1		3G0,75 mm² H05VV-F	6/1
22	-X3:3N	6/1	-W3	-P3	6/1		3G0,75 mm² H05VV-F	6/1
23	-XPE:PE	6/1	-W3	-P3	6/1		3G0,75 mm² H05VV-F	6/1
24								
25	-X4:4U	7/1	-W4	-S4	7/1		4G4 mm² H07RN-F	7/1
26	-X4:4V	7/1	-W4	-S4	7/1		4G4 mm² H07RN-F	7/1
27	-X4:4W	7/1	-W4	-S4	7/1		4G4 mm² H07RN-F	7/1
28	-XPE:PE	7/1	-W4	-S4	7/1		4G4 mm² H07RN-F	7/1
29								
30	-S4:2	7/1	-W4A	-HE1	7/1		4G4 mm² H07RN-F	7/1
31	-S4:4	7/1	-W4A	-HE1	7/1		4G4 mm² H07RN-F	7/1
32	-S4:6	7/1	-W4A	-HE1	7/1		4G4 mm² H07RN-F	7/1
33	-S4:PE	7/1	-W4A	-HE1	7/1		4G4 mm² H07RN-F	7/1
34								
35	-X60:2	6/6	-W6	P3	6/6		5 x 0,34 LIYY	6/6
36	-X60:1	6/6	-W6	P3	6/6		5 x 0,34 LIYY	6/6
37								
38	-X60:F51	6/7	-W7	P3	6/7		3 x 0,75 mm² LIYY	6/7
39	-X60:7	6/7	-W7	P3	6/7		3 x 0,75 mm² LIYY	6/7
40								
41	-XDI:F51	8/1	-W10	-PS02	8/1		2 x 0,75 mm² Multiflex	8/1
42	-XDI:3	8/1	-W10	-PS02	8/1		2 x 0,75 mm² Multiflex	8/1
43								
44	-XDI:F51	8/2	-W11	-PS01	8/2		2 x 0,75 mm² Multiflex	8/2
45	-XDI:9	8/2	-W11	-PS01	8/2		2 x 0,75 mm² Multiflex	8/2

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Pos.	From:Pin		Cable name	To		Part no.	Type	Position
46	-XDI:F51	8/3	-W12	-PS03	8/3		2 x 0,75 mm² Multiflex	8/3
47	-XDI:10	8/3	-W12	-PS03	8/3		2 x 0,75 mm² Multiflex	8/3
48								
49	-XDI:F51	8/4	-W13	-LSH01	8/4		2 x 0,75 mm² Multiflex	8/4
50	-XDI:11	8/4	-W13	-LSH01	8/4		2 x 0,75 mm² Multiflex	8/4
51								
52	-XDI:F51	8/5	-W14	-LSL02	8/5		2 x 0,75 mm² Multiflex	8/5
53	-XDI:12	8/5	-W14	-LSL02	8/5		2 x 0,75 mm² Multiflex	8/5
54								
55	-XDI:F51	8/6	-W15	-LSA03	8/6		2 x 0,75 mm² Multiflex	8/6
56	-XDI:13	8/6	-W15	-LSA03	8/6		2 x 0,75 mm² Multiflex	8/6
57								
58	-XDI:F51	8/7	-W16	-TS01	8/7		2 x 0,75 mm² Multiflex	8/7
59	-XDI:14	8/7	-W16	-TS01	8/7		2 x 0,75 mm² Multiflex	8/7
60								
61	-XDI:F51	8/8	-W17	-LSL05	8/8		2 x 0,75 mm² Multiflex	8/8
62	-XDI:15	8/8	-W17	-LSL05	8/8		2 x 0,75 mm² Multiflex	8/8
63								
64	-X61:1	9/2	-W18	-Y01	9/2		4G0,75 mm² Multiflex	9/2
65	-XPE:PE	9/2	-W18	-Y01	9/2		4G0,75 mm² Multiflex	9/2
66	-X61:2	9/2	-W18	-Y01	9/2		4G0,75 mm² Multiflex	9/2
67	-X61:3	9/2	-W18	-Y01	9/2		4G0,75 mm² Multiflex	9/2
68								
69	-X62:1	9/4	-W19	-Y02	9/4		4G0,75 mm² Multiflex	9/4
70	-XPE:PE	9/4	-W19	-Y02	9/4		4G0,75 mm² Multiflex	9/4
71	-X62:2	9/4	-W19	-Y02	9/4		4G0,75 mm² Multiflex	9/4
72	-X62:3	9/4	-W19	-Y02	9/4		4G0,75 mm² Multiflex	9/4
73								
74	-QIS1:7	11/2	-W20	-QIS1, sensor	11/2		2 x 0,34 LIYY + S	11/2
75	-QIS1:8	11/2	-W20	-QIS1, sensor	11/2		2 x 0,34 LIYY + S	11/2
76	-XPE:PE	11/3	-W20				2 x 0,34 LIYY + S	11/2
77								
78	-XAI:F51	12/1	-W21	-TT01	12/1		2 x 0,75 + S mm² Multiflex	12/1
79	-XAI:1	12/1	-W21	-TT01	12/1		2 x 0,75 + S mm² Multiflex	12/1
80	-XPE:PE	12/2	-W21				2 x 0,75 + S mm² Multiflex	12/1
81								
82	-XAI:F51	12/3	-W22	-PT01	12/3		2 x 0,75 + S mm² Multiflex	12/3
83	-XAI:2	12/3	-W22	-PT01	12/3		2 x 0,75 + S mm² Multiflex	12/3
84	-XPE:PE	12/4	-W22				2 x 0,75 + S mm² Multiflex	12/3
85								
86	-XAI:F51	12/5	-W23	-PT02	12/5		2 x 0,75 + S mm² Multiflex	12/5
87	-XAI:3	12/5	-W23	-PT02	12/5		2 x 0,75 + S mm² Multiflex	12/5
88	-XPE:PE	12/6	-W23				2 x 0,75 + S mm² Multiflex	12/5
89								
90								

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Page title: Cable list

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Pos.	From:Pin		Cable name	To		Part no.	Type	Position
91	-XDI:F51	13/2	-W24	-FT01	13/2		3 x 0,75 mm² Multiflex	13/2
92	-XDI:M	13/2	-W24	-FT01	13/2		3 x 0,75 mm² Multiflex	13/2
93	-XDI:0	13/1	-W24	-FT01	13/1		3 x 0,75 mm² Multiflex	13/1
94								
95	-XDI:F51	13/4	-W25	-FT02	13/4		3 x 0,75 mm² Multiflex	13/4
96	-XDI:M	13/4	-W25	-FT02	13/4		3 x 0,75 mm² Multiflex	13/4
97	-XDI:2	13/3	-W25	-FT02	13/3		3 x 0,75 mm² Multiflex	13/3
98								
99	-XDI:F51	13/6	-W26	-FT03	13/6		3 x 0,75 mm² Multiflex	13/6
100	-XDI:M	13/6	-W26	-FT03	13/6		3 x 0,75 mm² Multiflex	13/6
101	-XDI:4	13/5	-W26	-FT03	13/5		3 x 0,75 mm² Multiflex	13/5
102								
103	-XDI:F51	13/8	-W27	-FT04	13/8		3 x 0,75 mm² Multiflex	13/8
104	-XDI:M	13/8	-W27	-FT04	13/8		3 x 0,75 mm² Multiflex	13/8
105	-XDI:6	13/7	-W27	-FT04	13/7		3 x 0,75 mm² Multiflex	13/7
106								
107	-K100:0	1/7	-WRS232	-KPLC1	2/0	RS232	RS232	1/8
108								
109								
110								
111								
112								
113								
114								
115								
116								
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Pos.	Component names	Description	Part no.	Type	Manufacturer	Position
1	-A	Compact enclosure, 600x760x210mm IP55	AE1076.500	AE1076.500	Rittal	Layout/2
2	-F1	CIRCUIT-BREAKER 22...32 A, N-RELEASE 416 A, SIZE S	4011209287037	3RV1031-4EA10	Siemens	4/1
3	-F1	AUXIL. SWITCH, TRANSVERSE 1NO + 1NC, F. CIRCUIT-BR	4011209305977	3RV1901-1E	Siemens	4/4
4	-F1*	CIRCUIT-BREAKER, 20...25 A, N-RELEASE 325 A, SIZE	4011209281233	3RV1021-4DA10	Siemens	4/1
5	-F2	CIRCUIT-BREAKER, 5.5...8 A, N-RELEASE 104 A, SIZE	4011209281172	3RV1021-1HA10	Siemens	5/1
6	-F2	AUXIL. SWITCH, TRANSVERSE 1NO + 1NC, F. CIRCUIT-BR	4011209305977	3RV1901-1E	Siemens	5/4
7	-F2*	CIRCUIT-BREAKER, 2.8...4 A, N-RELEASE 52 A, SIZE S	4011209281141	3RV1021-1EA10	Siemens	5/1
8	-F3	Miniature Circuit-Breaker 1P+N C6A	5SY6 506-7	5SY6 506-7	Siemens	6/1
9	-F4	CIRCUIT-BREAKER, 20...25 A, N-RELEASE 325 A, SIZE	4011209281233	3RV1021-4DA10	Siemens	7/1
10	-F4	AUXIL. SWITCH, TRANSVERSE 1NO + 1NC, F. CIRCUIT-BR	4011209305977	3RV1901-1E	Siemens	7/4
11	-F39	Miniature Circuit-Breaker 1P+N C6A	5SY6 506-7	5SY6 506-7	Siemens	1/3
12	-K1	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack	4/5
13	-K2	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack	5/5
14	-K3	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack	6/5
15	-K4	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack	7/5
16	-K5	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack	9/1
17	-K6	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack	9/3
18	-K7	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack	10/1
19	-K100	GSM Modem	G2150I	G2150I	Moxa OneCell	1/7
20	-KPLC1	PLC/HMI Logic-touch series, 5,7" monocrome HMI, 16 DI/16 DO	LT3301-L1-D24-C	LT3301-L1-D24-C	Pro-face	2/5
21	-KPLC2	Analog input module 4 x AI + 2 x AO, 0-10V/4-20mA	750001293	EXM-AMM6HT	Pro-face	3/2
22	-Q1	AUXILIARY SWITCH BLOCK, 1 NO, DIN EN50005, SCREW C	4011209281332	3RH1921-1CA10	Siemens	4/7
23	-Q1	CONTACTOR, AC-3 15 KW/400 V, AC 230 V, 50 HZ, 3-PO	4011209294233	3RT1034-1AP00	Siemens	4/4
24	-Q1*	CONTACTOR, AC-3 11 KW/400 V, AC 230 V, 50 HZ, 3-PO	4011209291126	3RT1026-1AP00	Siemens	4/4
25	-Q2	CONTACTOR, AC-3 3 KW/400 V, 1 NO, AC 230 V, 50/60	4011209272521	3RT1015-1AP01	Siemens	5/4
26	-Q4	AUXILIARY SWITCH BLOCK, 1 NO, DIN EN50005, SCREW C	4011209281332	3RH1921-1CA10	Siemens	7/7
27	-Q4	CONTACTOR, AC-3 11 KW/400 V, AC 230 V, 50 HZ, 3-PO	4011209291126	3RT1026-1AP00	Siemens	7/4
28	-QIS1	Conductivity transmitter,24VDC, 4-20mA	750000391	JUMO Ecotrans LF01	JUMO	11/1
29	-QIS1, sensor	Conductivity cell, CrNi 1.4571, k=0,1, G1/2", 5m cable	750000392	441375 Jumo Blackline Lf	JUMO	11/2
30	-S0	MAIN CONTROL SWITCH 3-POLE IU=63, P/AC-23A AT 400V	4011209403413	3LD2545-0TK51	Siemens	1/1
31	-S0	N-CONDUCTOR LEADING FOR BASE MOUNTING FOR 63A (ACC	4011209403994	3LD9250-0C	Siemens	1/1
32	-S1	Isolator switch 3P 32A IP65	3LD2264-0TB51	3LD2264-0TB51	Siemens	4/1
33	-S2	Isolator switch, 3p 16A IP65	3LD2064-OTB51	3LD2064-OTB51	Siemens	5/1
34	-S4	Isolator switch 3P 32A IP65	3LD2264-0TB51	3LD2264-0TB51	Siemens	7/1
35	-T1	Power supply, Combi - 230VAC/230VAC/24VDC	24RC-OT66107	24RC-OT66107	Noratel	1/4
36	-W1			4G4 mm² H07RN-F		4/1
37	-W1A			4G4 mm² H07RN-F		4/1
38	-W2			4G1,5 mm² H07RN-F		5/1
39	-W2A			4G1,5 mm² H07RN-F		5/1
40	-W3			3G0,75 mm² H05VV-F		6/1
41	-W4			4G4 mm² H07RN-F		7/1
42	-W4A			4G4 mm² H07RN-F		7/1
43	-W6			5 x 0,34 LIYY		6/6
44	-W7			3 x 0,75 mm² LIYY		6/7
45	-W10			2 x 0,75 mm² Multiflex		8/1

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Pos.	Component names	Description	Part no.	Type	Manufacturer	Position
46	-W11			2 x 0,75 mm² Multiflex		8/2
47	-W12			2 x 0,75 mm² Multiflex		8/3
48	-W13			2 x 0,75 mm² Multiflex		8/4
49	-W14			2 x 0,75 mm² Multiflex		8/5
50	-W15			2 x 0,75 mm² Multiflex		8/6
51	-W16			2 x 0,75 mm² Multiflex		8/7
52	-W17			2 x 0,75 mm² Multiflex		8/8
53	-W18			4G0,75 mm² Multiflex		9/2
54	-W19			4G0,75 mm² Multiflex		9/4
55	-W20			2 x 0,34 LIYY + S		11/2
56	-W21			2 x 0,75 + S mm² Multiflex		12/1
57	-W22			2 x 0,75 + S mm² Multiflex		12/3
58	-W23			2 x 0,75 + S mm² Multiflex		12/5
59	-W24			3 x 0,75 mm² Multiflex		13/1
60	-W25			3 x 0,75 mm² Multiflex		13/3
61	-W26			3 x 0,75 mm² Multiflex		13/5
62	-W27			3 x 0,75 mm² Multiflex		13/7
63	-WRS232		RS232	RS232		1/8
64	-X1	Feed through terminal screw/screw 6mm²	102020	WDU 6	Weidmüller	4/1
65	-X2	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	5/1
66	-X3	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	6/1
67	-X4	Feed through terminal screw/screw 4mm²	102010	WDU 4	Weidmüller	7/1
68	-X60	Double feed through terminal screw/screw 2,5mm²	104110	WDK 2,5 ZQV	Weidmüller	6/7
69	-X61	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	9/2
70	-X62	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	9/4
71	-X63	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	10/2
72	-XAI	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	12/1
73	-XDI	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	13/1
74	-XDI	Double feed through terminal screw/screw 2,5mm²	104110	WDK 2,5 ZQV	Weidmüller	8/1
75	-XF41	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	1/5
76	-XF41	Disconnect terminal	4008190083441	WTR 2,5/STB	Weidmüller	Layout/6
77	-XF41	Disconnect terminal	4008190083441	WTR 2,5/STB	Weidmüller	1/6
78	-XF51	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller	1/5
79	-XF51	Disconnect terminal	4008190083441	WTR 2,5/STB	Weidmüller	1/6
80	-XPE	PE-Busbar	PE-Busbar	PE-Busbar	Weidmüller	1/1
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Pos.	Quantity	Component names	Description	Part no.	Type	Manufacturer
1	1	-S2	Isolator switch, 3p 16A IP65	3LD2064-OTB51	3LD2064-OTB51	Siemens
2	2	-S1,-S4	Isolator switch 3P 32A IP65	3LD2264-0TB51	3LD2264-0TB51	Siemens
3	2	-F3,-F39	Miniature Circuit-Breaker 1P+N C6A	5SY6 506-7	5SY6 506-7	Siemens
4	1	-T1	Power supply, Combi - 230VAC/230VAC/24VDC	24RC-OT66107	24RC-OT66107	Noratel
5	37	-X2,-X3,-X61..-X63,-XAI,-XDI,-XF41,-XF51	Feed through terminal screw/screw 2,5mm²	102000	WDU 2,5	Weidmüller
6	3	-X4	Feed through terminal screw/screw 4mm²	102010	WDU 4	Weidmüller
7	3	-X1	Feed through terminal screw/screw 6mm²	102020	WDU 6	Weidmüller
8	12	-X60,-XDI	Double feed through terminal screw/screw 2,5mm²	104110	WDK 2,5 ZQV	Weidmüller
9	1	-QIS1	Conductivity transmitter,24VDC, 4-20mA	750000391	JUMO Ecotrans LF01	JUMO
10	1	-QIS1, sensor	Conductivity cell, CrNi 1.4571, k=0,1, G1/2", 5m cable	750000392	441375 Jumo Blackline Lf	JUMO
11	1	-KPLC2	Analog input module 4 x AI + 2 x AO, 0-10V/4-20mA	750001293	EXM-AMM6HT	Pro-face
12	6	-XF41,-XF51	Disconnect terminal	4008190083441	WTR 2,5/STB	Weidmüller
13	1	-Q2	CONTACTOR, AC-3 3 KW/400 V, 1 NO, AC 230 V, 50/60	4011209272521	3RT1015-1AP01	Siemens
14	1	-F2*	CIRCUIT-BREAKER, 2.8...4 A, N-RELEASE 52 A, SIZE S	4011209281141	3RV1021-1EA10	Siemens
15	1	-F2	CIRCUIT-BREAKER, 5.5...8 A, N-RELEASE 104 A, SIZE	4011209281172	3RV1021-1HA10	Siemens
16	2	-F1*,-F4	CIRCUIT-BREAKER, 20...25 A, N-RELEASE 325 A, SIZE	4011209281233	3RV1021-4DA10	Siemens
17	2	-Q1,-Q4	AUXILIARY SWITCH BLOCK, 1 NO, DIN EN50005, SCREW C	4011209281332	3RH1921-1CA10	Siemens
18	1	-F1	CIRCUIT-BREAKER 22...32 A, N-RELEASE 416 A, SIZE S	4011209287037	3RV1031-4EA10	Siemens
19	2	-Q1*,-Q4	CONTACTOR, AC-3 11 KW/400 V, AC 230 V, 50 HZ, 3-PO	4011209291126	3RT1026-1AP00	Siemens
20	1	-Q1	CONTACTOR, AC-3 15 KW/400 V, AC 230 V, 50 HZ, 3-PO	4011209294233	3RT1034-1AP00	Siemens
21	3	-F1,-F2,-F4	AUXIL. SWITCH, TRANSVERSE 1NO + 1NC, F. CIRCUIT-BR	4011209305977	3RV1901-1E	Siemens
22	1	-S0	MAIN CONTROL SWITCH 3-POLE IU=63, P/AC-23A AT 400V	4011209403413	3LD2545-0TK51	Siemens
23	1	-S0	N-CONDUCTOR LEADING FOR BASE MOUNTING FOR 63A (ACC	4011209403994	3LD9250-0C	Siemens
24	1	-A	Compact enclosure, 600x760x210mm IP55	AE1076.500	AE1076.500	Rittal
25	1	-K100	GSM Modem	G2150I	G2150I	Moxa OneCell
26	1	-KPLC1	PLC/HMI Logic-touch series, 5,7" monocrome HMI, 16 DI/16 DO	LT3301-L1-D24-C	LT3301-L1-D24-C	Pro-face
27	7	-XPE	PE-Busbar	PE-Busbar	PE-Busbar	Weidmüller
28	1	-WRS232		RS232	RS232	
29	7	-K1..-K7	Auxiliary relay, 2P 8A 24VDC LED	XT484LC4	XT484LC4	Schrack
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1	-K100	0		G2150I	G2150I	GSM Modem	1/7	-WRS232	-KPLC1	:0
2										
3	-KPLC1	0		LT3301-L1-D24-C	LT3301-L1-D24-C	PLC/HMI Logic-touch series, 5,7" monocrome HMI, 16 DI/16 DO	2/0	-WRS232	-K100	:0
4										
5	-X1	1U		102020	WDU 6		4/1	-W1	-S1	:1
6	-X1	1V		102020	WDU 6		4/1	-W1	-S1	:3
7	-X1	1W		102020	WDU 6		4/1	-W1	-S1	:5
8										
9	-X2	2U		102000	WDU 2,5		5/1	-W2	-S2	:1
10	-X2	2V		102000	WDU 2,5		5/1	-W2	-S2	:3
11	-X2	2W		102000	WDU 2,5		5/1	-W2	-S2	:5
12										
13	-X3	3N		102000	WDU 2,5		6/1	-W3	-P3	:N
14	-X3	3U		102000	WDU 2,5		6/1	-W3	-P3	:L
15										
16	-X4	4U		102010	WDU 4		7/1	-W4	-S4	:1
17	-X4	4V		102010	WDU 4		7/1	-W4	-S4	:3
18	-X4	4W		102010	WDU 4		7/1	-W4	-S4	:5
19										
20	-X60	1		104110	WDK 2,5 ZQV		6/6	-W6	P3	:1
21	-X60	2		104110	WDK 2,5 ZQV		6/6	-W6	P3	:2
22	-X60	F51		104110	WDK 2,5 ZQV	Alarm signal	6/7	-W7	P3	:3
23	-X60	7		104110	WDK 2,5 ZQV		6/7	-W7	P3	:4
24										
25	-X61	3		102000	WDU 2,5		9/2	-W18	-Y01	:3
26	-X61	2		102000	WDU 2,5		9/2	-W18	-Y01	:2
27	-X61	1		102000	WDU 2,5		9/2	-W18	-Y01	:1
28										
29	-X62	3		102000	WDU 2,5		9/4	-W19	-Y02	:3
30	-X62	2		102000	WDU 2,5		9/4	-W19	-Y02	:2
31	-X62	1		102000	WDU 2,5		9/4	-W19	-Y02	:1
32										
33	-X63	1		102000	WDU 2,5		11/8			
34	-X63	2		102000	WDU 2,5		11/8			
35	-X63	3		102000	WDU 2,5		11/8			
36										
37	-XAI	F51		102000	WDU 2,5		13/1	-W21	-TT01	:1
38	-XAI	1		102000	WDU 2,5		13/1	-W21	-TT01	:2
39	-XAI	F51		102000	WDU 2,5		13/3	-W22	-PT01	:1
40	-XAI	2		102000	WDU 2,5		13/3	-W22	-PT01	:2
41	-XAI	F51		102000	WDU 2,5		13/5	-W23	-PT02	:1
42	-XAI	3		102000	WDU 2,5		13/5	-W23	-PT02	:2
43										
44										
45										

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46	-XDI	F51		102000	WDU 2,5	14/2	-W24	-FT01	:1
47	-XDI	M		102000	WDU 2,5	14/2	-W24	-FT01	:3
48	-XDI	0		102000	WDU 2,5	14/1	-W24	-FT01	:4
49	-XDI	F51		102000	WDU 2,5	14/4	-W25	-FT02	:1
50	-XDI	M		102000	WDU 2,5	14/4	-W25	-FT02	:3
51	-XDI	2		102000	WDU 2,5	14/3	-W25	-FT02	:4
52	-XDI	F51		104110	WDK 2,5 ZQV	8/1	-W10	-PS02	:1
53	-XDI	3		104110	WDK 2,5 ZQV	8/1	-W10	-PS02	:2
54	-XDI	F51		102000	WDU 2,5	14/6	-W26	-FT03	:1
55	-XDI	M		102000	WDU 2,5	14/6	-W26	-FT03	:3
56	-XDI	4		102000	WDU 2,5	14/5	-W26	-FT03	:4
57	-XDI	F51		104110	WDK 2,5 ZQV	8/2	-W11	-PS01	:1
58	-XDI	9		104110	WDK 2,5 ZQV	8/2	-W11	-PS01	:4
59	-XDI	F51		104110	WDK 2,5 ZQV	8/3	-W12	-PS03	:1
60	-XDI	10		104110	WDK 2,5 ZQV	8/3	-W12	-PS03	:2
61	-XDI	F51		104110	WDK 2,5 ZQV	8/4	-W13	-LSH01	:1
62	-XDI	11		104110	WDK 2,5 ZQV	8/4	-W13	-LSH01	:2
63	-XDI	F51		104110	WDK 2,5 ZQV	8/5	-W14	-LSL02	:1
64	-XDI	12		104110	WDK 2,5 ZQV	8/5	-W14	-LSL02	:2
65	-XDI	F51		104110	WDK 2,5 ZQV	8/6	-W15	-LSA03	:1
66	-XDI	13		104110	WDK 2,5 ZQV	8/6	-W15	-LSA03	:2
67	-XDI	F51		104110	WDK 2,5 ZQV	8/7	-W16	-TS01	:1
68	-XDI	14		104110	WDK 2,5 ZQV	8/7	-W16	-TS01	:2
69	-XDI	F51		104110	WDK 2,5 ZQV	8/8	-W17	-LSL05	:1
70	-XDI	15		104110	WDK 2,5 ZQV	8/8	-W17	-LSL05	:2
71	-XDI	F51		102000	WDU 2,5	14/8	-W27	-FT04	:1
72	-XDI	M		102000	WDU 2,5	14/8	-W27	-FT04	:3
73	-XDI	6		102000	WDU 2,5	14/7	-W27	-FT04	:4
74									
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91	-XDO	0		102000	WDU 2,5	10/1			
92	-XDO	1		102000	WDU 2,5	10/2			
93	-XDO	2		102000	WDU 2,5	10/3			
94	-XDO	3		102000	WDU 2,5	10/4			
95	-XDO	10		102000	WDU 2,5	10/5			
96	-XDO	11		102000	WDU 2,5	10/6			
97	-XDO	12		102000	WDU 2,5	10/7			
98	-XDO	13		102000	WDU 2,5	10/8			
99	-XDO	M		102000	WDU 2,5	10/1		-XDO	:M
100	-XDO	M		102000	WDU 2,5	10/2		-XDO	:M
101	-XDO	M		102000	WDU 2,5	10/3		-XDO	:M
102	-XDO	M		102000	WDU 2,5	10/4		-XDO	:M
103	-XDO	M		102000	WDU 2,5	10/5		-XDO	:M
104	-XDO	M		102000	WDU 2,5	10/6		-XDO	:M
105	-XDO	M		102000	WDU 2,5	10/7		-XDO	:M
106	-XDO	M		102000	WDU 2,5	10/8		-XDO	:M
107	-XDO	14		102000	WDU 2,5	11/1			
108	-XDO	M		102000	WDU 2,5	11/1		-K7	:A2
109									
110	-XF41	F41		4008190083441	WTR 2,5/STB	1/6			
111	-XF41	F41		4008190083441	WTR 2,5/STB	1/5		-T1	:L
112	-XF41	N		102000	WDU 2,5	1/5		-T1	:N
113	-XF41	N		102000	WDU 2,5	1/6		-XF41	:N
114									
115	-XF51	F51		4008190083441	WTR 2,5/STB	1/6		-XF51	:F51
116	-XF51	F51		4008190083441	WTR 2,5/STB	1/5		-T1	:L+
117	-XF51	F51		4008190083441	WTR 2,5/STB	1/5		-XF51	:F51
118	-XF51	F51		4008190083441	WTR 2,5/STB	1/5		-XF51	:F51
119	-XF51	F51		4008190083441	WTR 2,5/STB	1/5		-XF51	:F51
120	-XF51	M		102000	WDU 2,5	1/5		-T1	:L-
121	-XF51	M		102000	WDU 2,5	1/5		-XF51	:M
122	-XF51	M		102000	WDU 2,5	1/6		-XF51	:M
123									
124									
125									
126									
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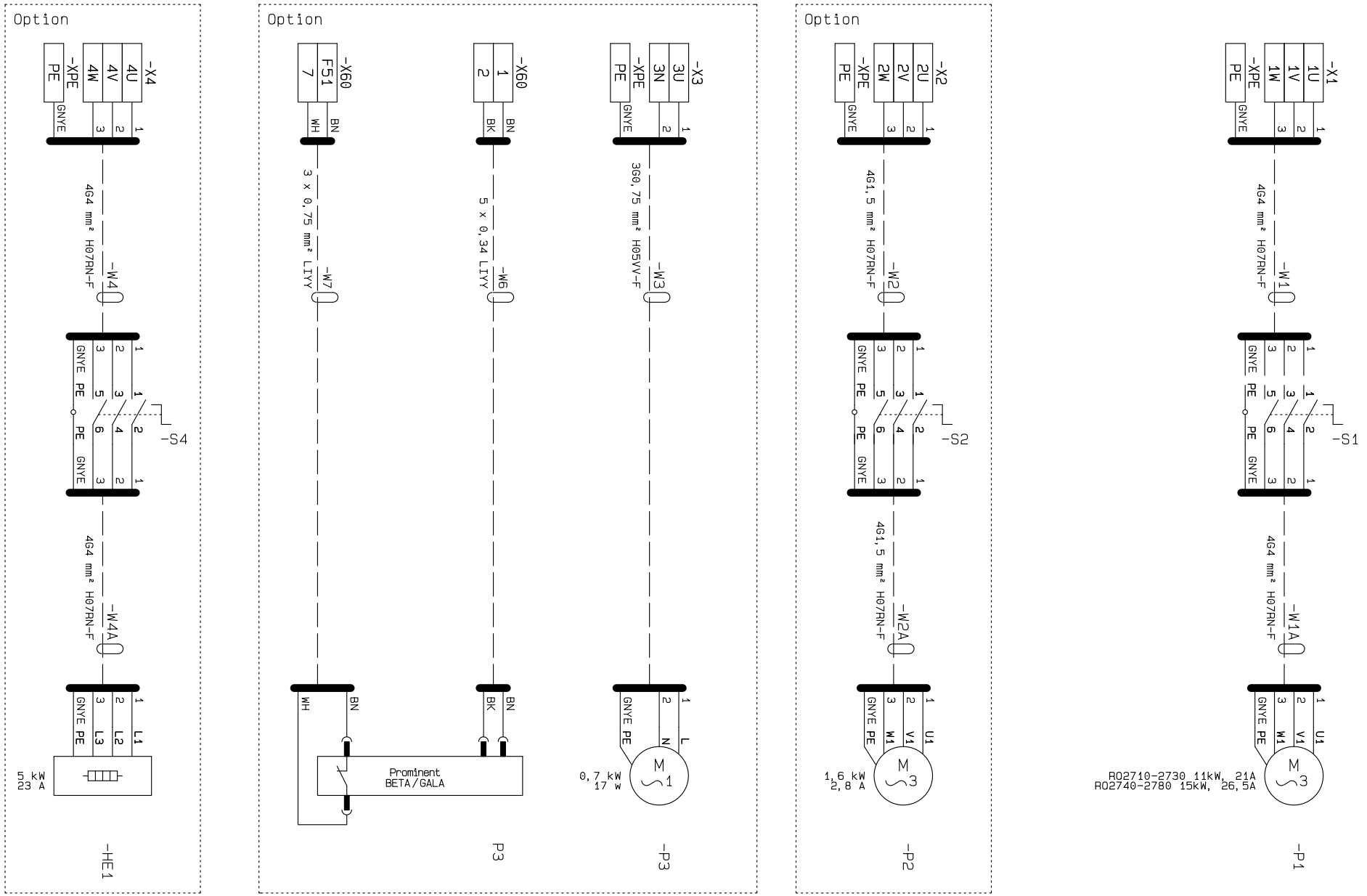

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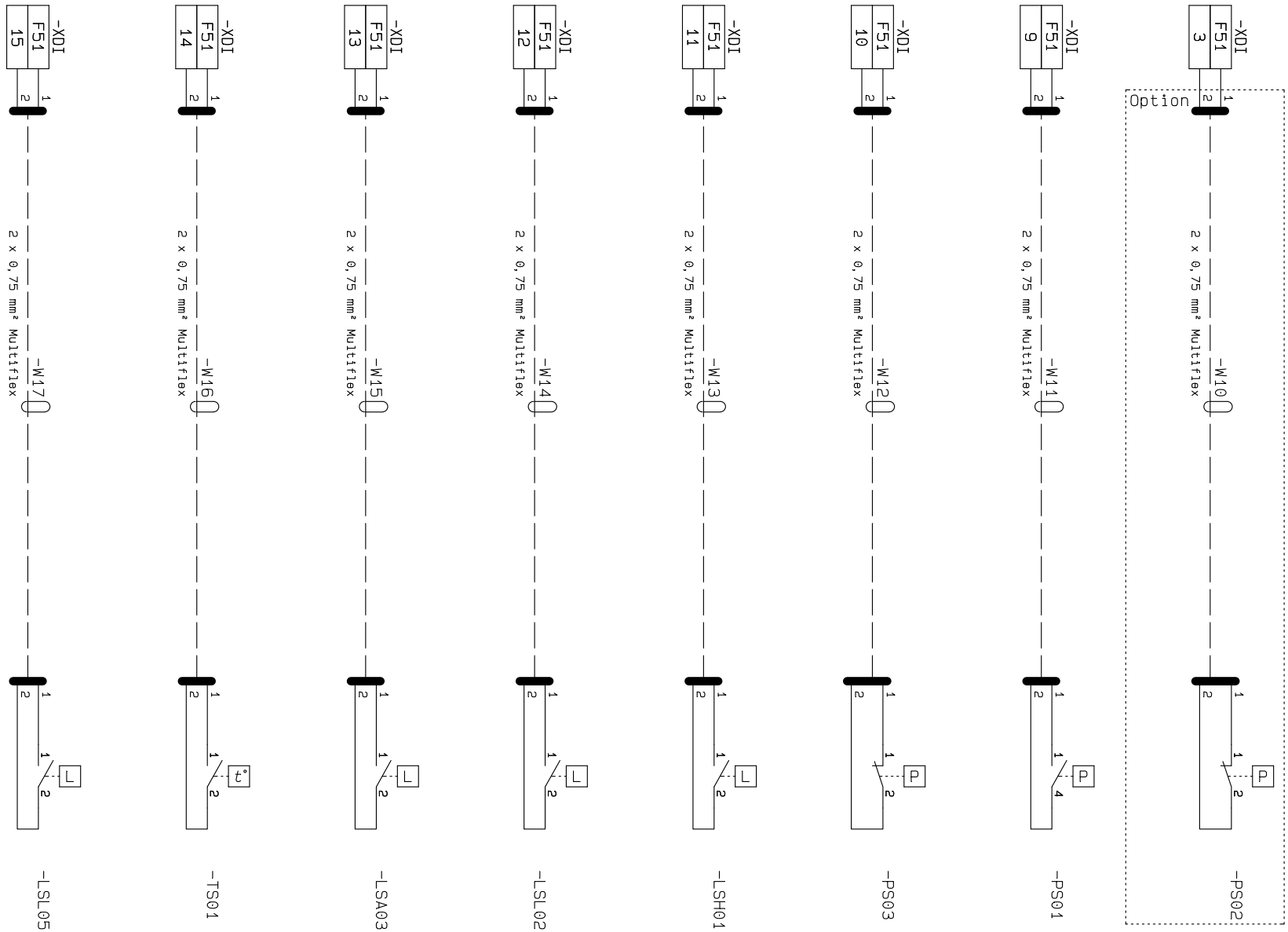

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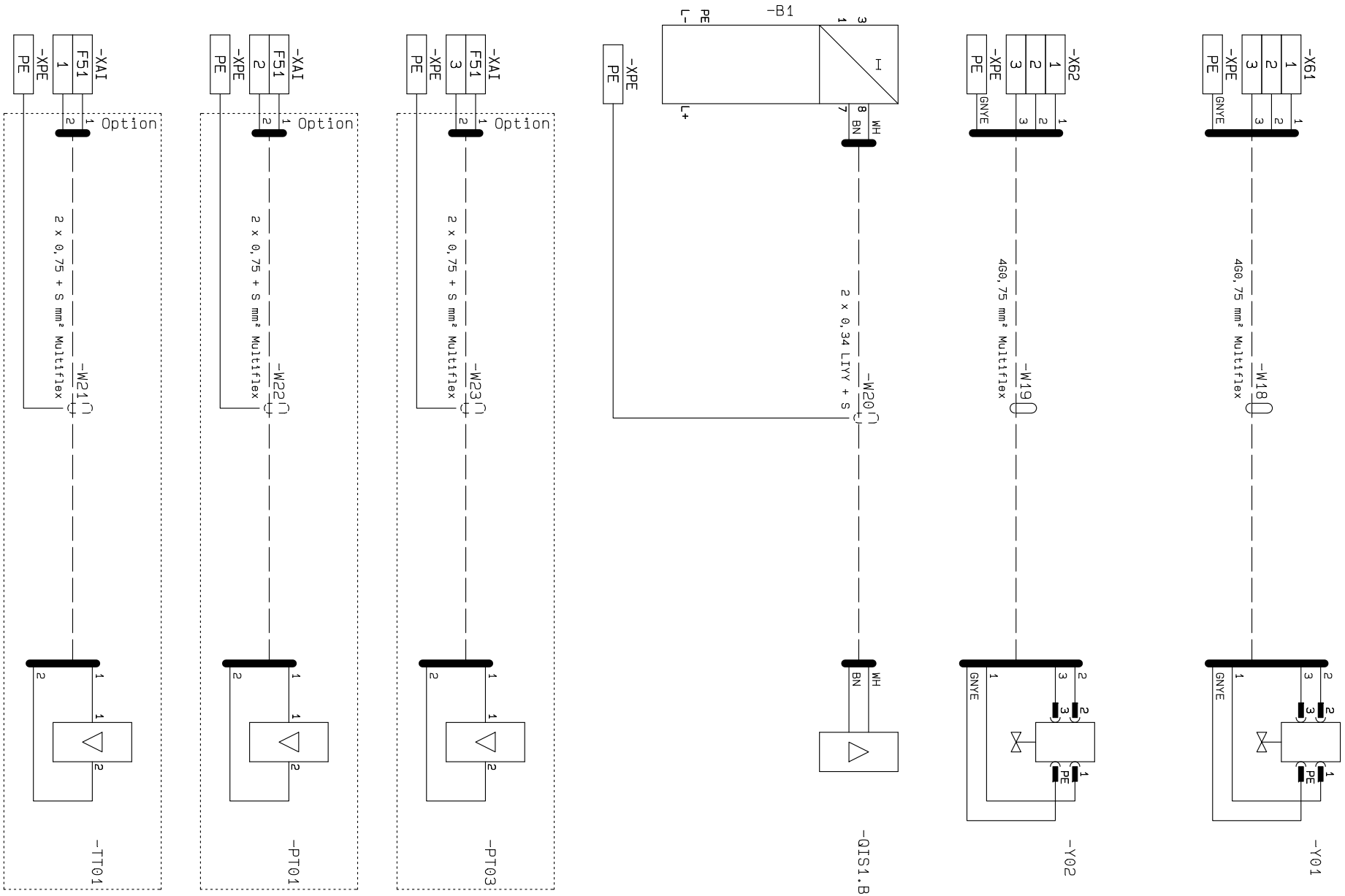
		Date	Ass. Appr		



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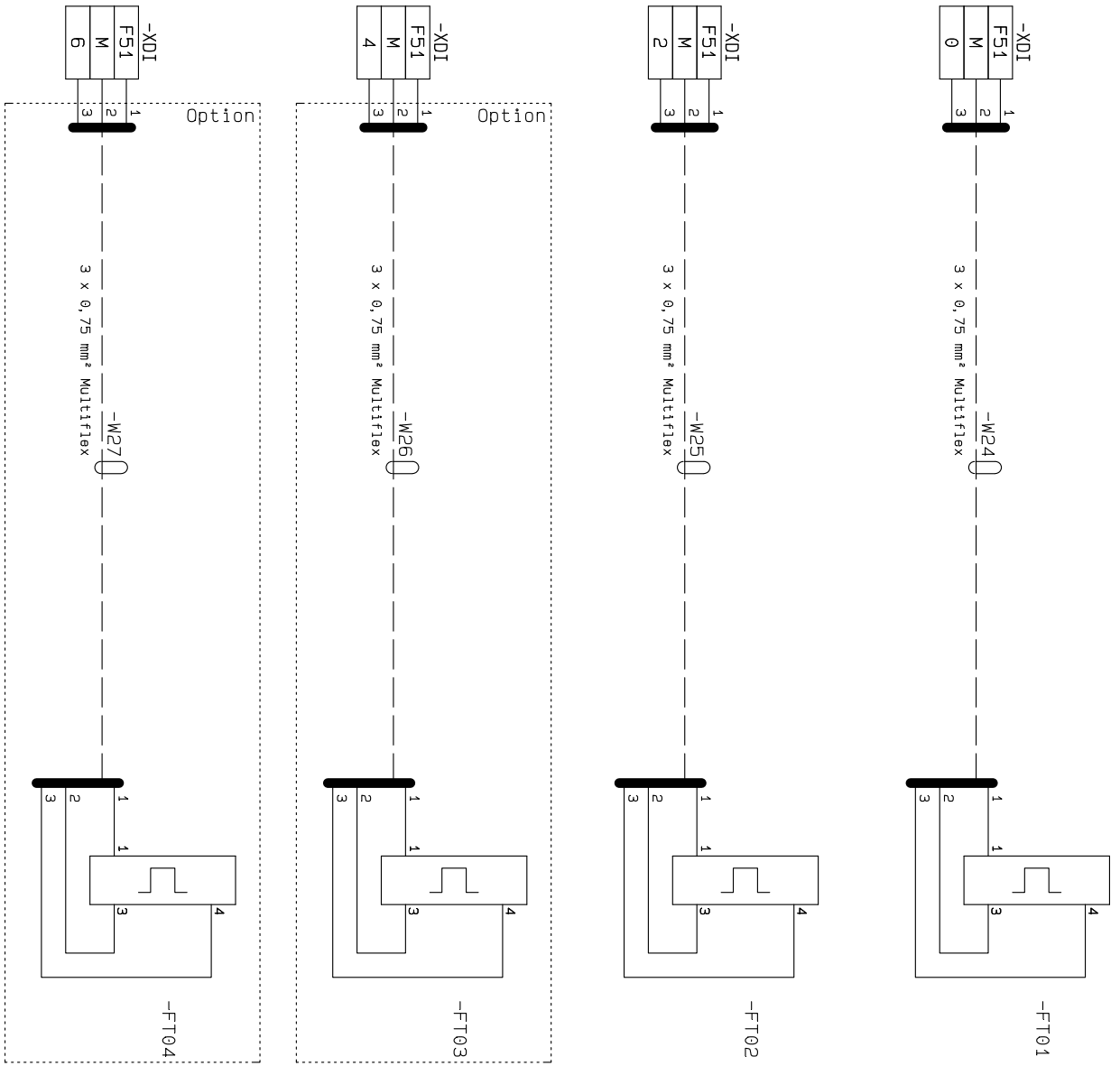
		Date	Ass. Appr		



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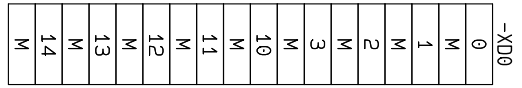

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