



BWT PERMAQ®
PRO 2110-2140
Reverse Osmosis Plant

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1. GENERAL

This assembly and operating instruction applies to BWT PERMAQ® PRO 2100 total demineralisation plants.

This assembly and operating instruction contains **important** information about the correct installation and operation of the RO plant, consequently the following is very **important**:

1. The attached "commissioning control" must be filled in during start-up and filed along with the operating log-book.
2. The log-book shall be updated as described in enclosures.
3. A floor drain must be available in the immediate proximity of the plant.
4. The RO plant removes 95-98 % of all salts, consequently you must consider possible post treatment with mixed bed or similar, if a better water quality is requested.
5. This instruction manual must be read carefully prior to assembly and start-up of the plant. Correct installation and operation is the basis of our 12-month warranty.

Your BWT PERMAQ® PRO 2100 plant is constructed in a compact design with storage reservoir (option) and softening plant (option) installed externally in order for the plant to take up as little space as possible and to ensure the most appropriate installation.

With its compact and complete design your BWT PERMAQ® PRO 2100 plant is easy to install since all internal installations are pre-assembled and

tested in our factory and subsequently disassembled for transport. All you have to do is refit these parts.

Your BWT PERMAQ® PRO 2100 plant is designed for minimum maintenance and long unproblematic operation.

However, this depends on correct installation and maintenance.

Therefore you must read this instruction before commissioning the plant.

2. EXPLANATION OF WORDS

Permeate: The treated, totally desalinated water, which is produced by the RO plant and is then supplied to the storage basin

Concentrate: The water that is led to outlet. This water contains the salts and minerals which have been removed from the raw water.

Raw water: The water that is led to the RO plant and which will be desalinated in the RO plant

TDS: Totally dissolved salts.

Conductivity: A designation for the conductivity of the

treated water; the lower figure, the better water quality

Membranes: The filters of the plant which at high pressure and flow are capable of desalinating the raw water.

RO: The abbreviation for Reverse Osmosis.

Reservoir pump: The pump which conveys the treated water from the plant storage basin to consumer.

Level sensor: The device controlling whether the RO plant should start/stop and which stops the reservoir pump in case of drainage of the storage basin.

Softening plant: A pre-treatment plant softening the raw water (removing hardness from the raw water).

3. PLACING OF PLANT

The plant has to be placed in a non-freezing location on a plane surface, so that the water in the storage reservoir (option) does not overflow when the tank is full.

The foundation must be able to withstand a weight load of

235 kg in total, which is the approximate weight of the RO plant in operation. However, remember to consider the weight of the softening plant and the storage reservoir!

The outside measures of the RO plant are W x D x H: 970 x 600 x 1675 mm, but on placing the plant, consider that a softening plant (option) and possibly a storage reservoir (option) have to be installed as well.

An additional height of 1000 mm must be anticipated to be able to take out the membranes of the plant.

Furthermore, you have to make room at both sides of the plant for water installations especially the drainage outlet has to be considered. **No resistance must ever occur in these!**

On placing the plant you have to ensure that the air intake at the top of the pump is not covered up.

Furthermore, some readings have to be performed at the front side of the plant, e.g. flow meter, manometer, conductivity meter and alarms.

Consequently, the front side is not to be covered up but must always be visible.

In case of a possible error on the plant, situations may arise where the level of the storage reservoir (option) overflows or there may be some other sort of leak. Therefore, there must always be a floor drain close by the plant, located in such a way that the water does not cause any damage.

4. WATER QUALITY

The raw water, which is to be treated in the BWT PERMAQ® PRO 2100 plant, must be of a softened drinking water quality and maximum 500 mg/l TDS.

The raw water should contain no more than:

- **Hardness: 0,5°dH (can be obtained by means of a softening plant (option))**
- **Fe: 0,05 mg/l**
- **Mn: 0,05 mg/l**
- **Free chloride: 0,1 mg/l (if higher a carbon filter must be fitted (option))**
- **Turbidity max. 1.0 NTU**
- **Silt index: 3.0**
- **KMnO₄ max.: 10 mg/l**

Maximum temperature: 25°C.
Note! The plant is adjusted for operation at 10°C by the factory.

If there are doubts about the raw water composition, a water analysis must be prepared.

The plant must be connected to a raw-water pressure of minimum 3 bar and maximum 6 bar.

The quality of the treated water must be less than 20 µS/cm at 10°C.

5. WATER CONNECTIONS

Note! All water connections of the plant must be made in compliance with local regulations.

For connection of raw water to the softening plant (option) see guideline encl. the softening plant.

Connection of soft water to the RO plant:

Connect soft water to the outlet on the left side of the plant (see figure 1). We prefer connection to minimum 3/4" flexible pressure hoses. HOH Water Technology keeps complete mounting kit for the BWT PERMAQ® PRO 2100 in stock.

The best operating result is obtained by connecting to minimum 3/4" raw-water pipes. In this way the required pressure and flow into the plant are obtained.

In case of too small raw-water connection, there will be a risk of drop-outs on the plant due to lacking water pressure/-amount, e.g. by flush of membranes when the plant is started and by bad functioning of the softening unit.

Connection of permeate discharge

The discharge of the RO plant (D) must be connected to the storage reservoir (option) (see plan view enclosure) or to another form of catch tank.

Item No.	Con-nection	Height	Dimen- sion
A	Inlet soft water micron filter (option)	720 mm	3/4" nipple
B	Dis-charge concen- trate outlet	1320 mm	3/4" socket
C	Dis-charge per- meate outlet	1420 mm	3/4" socket
D	Outlet per- meate for con- sump- tion	1520 mm	3/4" socket

Connection of discharge

The plant concentrate discharge is ideally to be fitted with a 20 mm PVC pipe. The concentrate discharge shall be led to floor drain.

Important! The drainpipe should not be inserted into the discharge water on the floor drain, as it may then risk being sucked back into the plant during standstills.

Important! Make sure that an obstruction **never** occurs on the discharge tubing, since this would damage the membrane(s) of the plant.

Connection of outlet water (from reservoir pump (option))

Connect the outlet water (water for consumption) to the water connection on the reservoir pump (option) The reservoir pump can with advantage be connected to 3/4" flexible pressure hoses (see plan view enclosure).

Note! Totally desalinated water might accelerate corrosion. Therefore you should always use corrosion-proof tubing for the treated water, e.g. stainless steel or PVC pipes.

6. ELECTRICAL CONNECTIONS

Note! The electrical connections must be made in compliance with local regulations.

The electrical connection to the BWT PERMAQ® PRO 2100 plant must be as follows:

2100 Series	2110	2120	2130	2140
Voltage	3 x 400 V + N + PE			
Power supply system	TN-S			
Frequency	50 Hz			
Consumption, control panel	110 VA			
Consumption RO plant	3.0 kW 6.25 A	4.0 kW 8.0 A		

Consumption CIP plant	6.62 kW, 10.9 A	
Consumption, Reser- voir	0.62–1.08 kW, 1.1 – 1.8 A	
Maximum consumption	6.62 kW, 10.9 A	
Maximum total consumption	6.62 kW, 10.9 A	
Maximum start current	50 A	72 A
Minimum fuse excl. of Reser- voir	13 A	
Minimum fuse incl. reservoir	16 A	
Recommended fuse	16A	
Maximum fuse (class gL/gl)	35 A	
Short-circuit level	10 kA	

* = Consumption is dependent on the type of reservoir chosen.

** = RO and CIP plant cannot run simultaneously.

Please also rf. to enclosed electrical diagram.

7. COMMISSIONING OF THE PLANT

Check before commissioning that all water and electric connections have been made as described in the previous paragraphs and in compliance with local regulations.

Before commissioning the softening plant (option) must be adjusted to current hardness in the raw-water supply and started up. This is done by following the instructions of the softening plant.

Provided that the softening plant is now commissioned; check if the plant supplies soft water to the soft-water control cock (V3). A sampling kit is enclosed when purchasing a new soft-water plant (see directions in the box).

Open the discharge valve V2 completely (figure 2).

Close the recirculation valve V1 completely.

Now switch on the power supply of the plant.

The plant is now operating.

Check that the motor runs in the right direction.

If the plant fails and the alarm LED for low inlet pressure is turned on, then the raw water supply is insufficient (see chap-

ter dealing with water connection).

The plant must operate and flush to drain for 20-30 minutes to rinse out chemical residue, and then the outlet/-recirculation valve must be re-adjusted.

After the flushing the outlet/-recirculation valves must be adjusted.

7.1 Adjustment of outlet amount V2

Important! read the whole chapter "Commissioning of Plant" before starting the adjustment.

The outlet amount has to be adjusted and whichever outlet amount is most suitable for your plant depends on the raw-water quality. Too high water recovery will damage the membranes. On condition that the raw water complies with the water quality requirements, the plant may operate at a water recovery of 40 %. When using softened raw water (recommended) a recovery of 70-80 % can be obtained dependent on whether it is surface or ground water.

Plant type	Permeate capacity l/h	Outlet amount l/h 75 %
PRO 2110	600	200
PRO 2120	1200	400
PRO 2130	1700	567
PRO 2140	2300	767

An easy method for checking the plant outlet amount is:

$$\text{Outletamount(l/h)} = \frac{100 \times \text{permeatecapacity}}{\text{recovery(\%)}} - \text{permeatecapacity(l/h)}$$

ex.: RO 2120 with 75 % recovery

$$\text{Outletamount l/h} = \frac{100 \times 1200}{75} - 1200 = 400 \text{ l/h}$$

When the requested amount of outlet water has been obtained, tighten the counter nuts on the outlet valve so that it is locked. It is important that the outlet amount is checked after the counter nuts have been tightened in order to make sure that the valve has not moved. Both counter nuts must be locked/tightened.

Important! The needle valve must be locked on the prescribed outlet amounts. If the needle valve is closed so that the outlet amount is reduced, the membrane(s) will be damaged.

7.2 Adjustment of recirculation amount V1

Adjust the recirculation amount by loosening the counter nuts on the recirculation valve V1. Adjust at permeate amounts of maximum 600, 1200, 1700 and 2300 l/h for PRO 2110, 2120, 2130 and 2140 respectively at a temperature between 10-25 °C.

If the temperature is below 10 °C, the capacity must be approx. 3 % below normal capacity for each degree below 10°C.

E.g. if the raw water temperature is 8 °C, on an BWT PERMAQ® PRO 2110 unit it means that the permeate capacity is 6 % below the normal 600 l/h, i.e. 564 l/h.

When the requested pressure and permeate capacity has been obtained, check again if

the outlet amount is adjusted correctly.

We recommend that both counter nuts are loosened while the valves get fine-adjusted.

When both valves have been adjusted, lock both valves V1/V2 with the counter nuts. Take care not to move the valve while tightening the counter nuts.

Important! Both counter nuts must be locked/tightened on the valves.

NB! After the valves have been locked, start and stop the plant 4-5 times and check the flow again. Re-adjust the valves if necessary.

Check on the high-pressure manometer PI2, that the correct operating pressure is indicated.

Note that the operating pressure may vary at different temperatures and capacities.

Now check the quality of the treated water at the permeate outlet. Conductivity must be below set point (normally 20 $\mu\text{S}/\text{cm}$). This can be checked on the conductivity meter.

The reservoir tank (option) will now get filled up with treated water < 20 $\mu\text{S}/\text{cm}$.

Make a note of the operating data in the enclosed operating logbook (see encl. operating logbook).

1. Operating pressure –can be read on the high-pressure manometer PI2

2. Permeate capacity – can be read on the flow meter FI1

3. Concentrate capacity – can be read on the flow meter FI2

4. Conductivity – can be read on the conductivity meter QIS1

5. Also make a note in the logbook of the raw-water pressure PI1 and the raw-water temperature.

8. OPERATING MANUAL FOR OPERATOR MENU



8.1 Information in menu:

All screen displays are designed with a header where date, time and type of plant can be monitored.

In case of alarm, the alarm text in the operating button at the right corner starts to flash at a slow frequency.

Press **ALARM**
On the alarm screen all active alarms are displayed.

Press **MENU**
And you return to the directory.

Press **yy/mm/dd**
For adjustment of date and clock.

8.2 Functions in menu:

Press **Operation**: on the operating screen you can start and stop operation, flush and possible CIP-cleaning.

Press **Operation setting**: In operation setting you can choose settings for start-up of RO plant and automatic flush of plant.

(This screen display is protected with a password (see chapter 14.0))

Press **Mimic**: on the mimic screen status of operation and valves/pumps is displayed.

(Option)
Press **Counters**: on the Counter screen is displayed the total flow of permeate and concentrate of the RO plant.

Press **Alarm setting**: in alarm setting you can select settings for set point and delays of alarms.

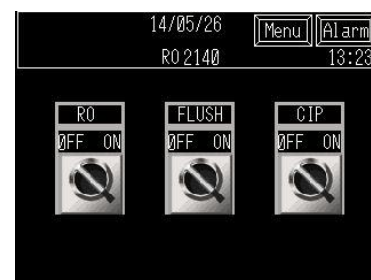
(This screen display is protected by a password (see chapter 14.0))

Press **Language**: in Language setting you can choose between different languages on the screens.

Press **RO model**: On the model screen you can select RO model and options.

(This screen display is protected by password (see chapter 14.0))

8.3 Operation



8.4 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 between off/on.

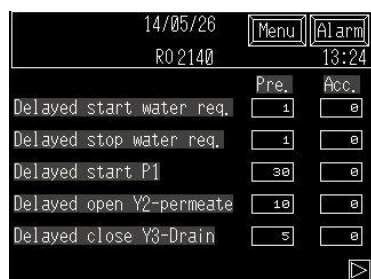
8.5 Functions in Operation:

Press **OFF-ON** RO:
For start/stop of plant.

Press **OFF-ON** Start flush:
For start/stop flush of plant.

Press **OFF-ON** Start CIP:
For start/stop CIP-cleaning of the plant.

8.6 Operation. Setting 1



8.7 Information in Operation setting 1:

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

8.8 Functions in Operation setting 1:

Here you can change times of delays of start and stop of the plant by means of the level switches.

You can insert delays for start of pump and opening/closing of valves.

Data change:

To change a setting, press one of the fields. A pop-up keyboard appears on the screen, and the new value can be entered and confirmed on ENT.

8.9 Operation Setting 2



8.10 Information in Operation setting 2:

Time for duration of automatic flush of RO plant.

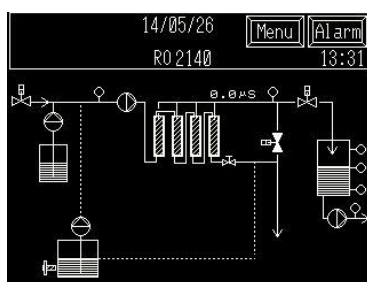
8.11 Functions in Operation setting 2:

Here you can change times for flush of the RO.

Data change:

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

8.12 Mimic



8.13 Information in Mimic:

Operating status of the plant

Operating status of valves and pumps.

Permeate and concentration flow

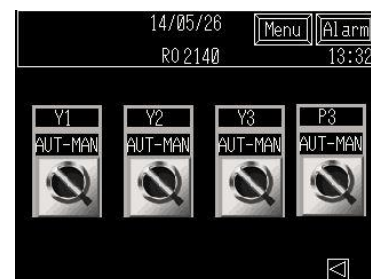
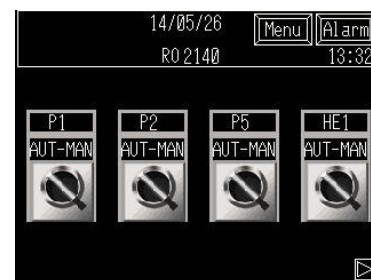
Pumps change colour (black = stopped, white = operation)

Valves change colour (black = closed, white = open.)

8.14 Functions in Mimic:

By pressing on valve or pump, the option for manual operation of components is given.

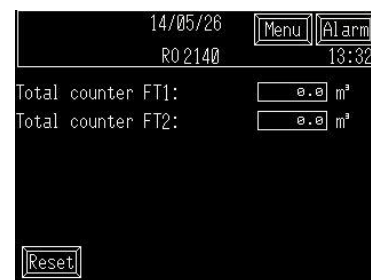
This option is protected by a password.



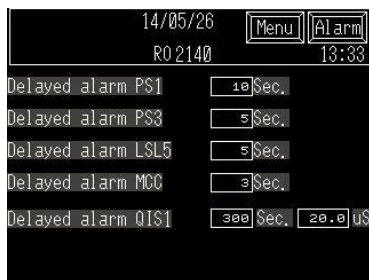
You must change to manual to make operation active. The plant must be in stop mode to operate the buttons.

When shifting back to Operating mode all components change back to Auto mode. The plant must be in stop mode to perform manual operation.

8.15 Total counters



8.16 Alarm setting



8.17 Information in Alarm Setting:

Delays of alarms and set point for conductivity.

8.18 Functions in Alarm Setting:

Setting of times by delay of alarms and set point for conductivity in operation.

Data change:

in order to change a setting, press on a field. A pop-up keyboard appears on the screen and the new value is entered and confirmed by pressing ENT.

8.19 Type of Plant



8.20 Information in Type of Plant:

RO type and selection of option.

8.21 Functions i type of Plant:

Press the button of the desired plant. The selected RO plant is shown in the field on the left.

8.22 Alarm log:



8.23 Information in Alarm log:

This screen display with alarm log will appear when pressing the Alarm button in the top right corner. if an alarm occurs n the plant, the alarm button will start a flashing frequency. The alarm will be presented with date and time for the occurrence of the alarm. When the alarm is reset on the alarm button, the alarm text disappears and the alarm button returns to fixed text.

8.24 Functions in Alarm log:

At the left side of the screen there are two buttons which are used for scrolling the alarm display.

In the centre of the screen display there is a button which shifts to the display containing explanations of the individual alarms.

At the right side of the screen display there is a button for shifting to alarm history.

8.25 Alarm History



8.26 Information in Alarm History:

In this screen display you can see the latest 128 alarms with date and time of the alarm's occurrence. When more than 128 alarms have occurred, the oldest occurrences will be deleted.

8.27 Functions in Alarm log:

At the left side of the screen display there are two buttons used for scrolling up and down in the alarm display.

8.28 Date/time



8.29 Information in Date/Time:

Date and hour in operator panel.

8.30 Functions in Date/Time:

Date and hour have to be set by pressing on the individual buttons and entering the new values. Confirm by pressing ENT.

8.31 Password





8.32 Information in Password:

The password screen automatically appears when you select a password-protected screen.

If correct password is entered, the desired screen will appear.

If the correct password has not been entered within 10 seconds, the screen will automatically change back to Menu.

8.33 Functions i Password:

Data entering:

Enter the correct password and press ENT.

8.34 Password:

Password can be informed by contacting

BWT A/S
Tlf.: +45 43600500
Service Department.

9. MAINTENANCE AND TROUBLE-SHOOTING

9.1 Maintenance:

The RO plant is produced and designed for minimum maintenance and service. However, there are some functions which should be checked regularly. (The interval is described below).

Following shall be checked regularly:

If the plant operating conditions or/and capacity change compared to the setting on the start-up day, the plant must be checked in preparation of a possible cleaning of the membranes or/and adjustment of the plant capacity.

- **If the capacity has dropped by more than 10 %**
- **If the pressure after teh high-pressure pump has increased**
- **The conductivity has increased (option)**

See chapter dealing with trouble-shooting.

Daily:

Take water samples daily. If a softening plant is installed ahead of the RO plant, the hardness must not exceed 1°dH.

Also check salt bin, fill up if necessary. (Applies only if a softening unit is installed).

-and read:

Capacity permeate: FI1

Capacity Concentrate: FI2

Conductivity: QIS1

Inlet pressure raw water: PI1

Pressure after high-pressure pump PI2

Outlet pressure permeate: PI3

Every week:

Operational flush of membranes shall be done at least once a week. Open valve V2 complete for half an hour while the plant is operating. Afterwards adjust valve V2, so that the concentrate flow is again

20-25%, see chapter concerning Start-up of Plant.

Every 6 months:

Inspection of pumps. Follow the manufacturer's instructions.

Check pipelines and connectors for leaks.

Check all pressure switches, i.e. function and settings.

Performa release test of the alarm.

Clean the automatics cabinet.

Change defective/buzzing switches and relays.

Note! If the plant must be out of operation for a long duration, or there is a risk it will be exposed to frost, each membrane element must be preserved.

For how long the plant can be out of operation without preserving the membranes, depends how great the organic growth is. When using surface water the membranes must be preserved in case of stops lasting 3 days or longer, and when using ground water the membranes must be preserved in case of stops lasting 7 days or longer.

When preserving, fill the membranes with a solution of:

Mix proportion	Preservation [%]	Frost protection [%]
MonoPropylene glycol	-	20
Sodium bisulphite	1	1

For longer preservation times you should be aware of organic growth. When frost protecting, you should further be aware that the pH value should

never drop to values under pH 3. In that case there is a risk that the bisulphite oxidizes into sulphuric acid.

9.2 Trouble-shooting:

This chapter deals with the problems that may arise on the plant.

9.2.1 Plant capacity has dropped

This can be read on the RO plant's flow meter (F11) or (option) on the PLC-panel while the RO-plant is in operation.

Check:

The Plant operating pressure on the manometer while the plant is in operation. If the operating pressure is low, check that the raw-water pressure is the same as on start-up. If it is below 3 bar, look for the error in the water supply; possibly a blocked pre-filter.

Check:

The raw-water temperature, if the raw-water temperature has dropped compared to the start-up day (winter/summer), the capacity will likewise drop, and it will rise again in case of higher temperature.

For each °C \pm the plant capacity will either fall or rise by approx. 3%.

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

Check

If the softening plant functions optimally. If there is a defect in the plant causing it to supply hard water to the membrane,

this will damage the membrane and will lead to a drop in the capacity.

Check:

if there is an obstacle in the outlet pipe.

If the plant capacity cannot be improved through these solutions, the membranes are blocked and must be cleaned, see chapters "Cleaning/- Replacement of membranes".

9.2.2 The quality of the treated water is higher than 20 μ S/cm.

Check:

If there is an obstacle in the plant outlet connection.

Check:

If the plant has been out of service for long time; i.e. 2 weeks or more.

Correct the error by letting the plant operate for 1-2 hours with the outlet valve open and then keep it operating minimum every 3rd day. After flushing the outlet amount must be adjusted again, see ch. Start-up of plant.

Check:

If, in case of leaks on the raw – water side, raw water gets in connection with the treated water in the reservoir tank.

Correct the error by tightening possible leaks, empty the reservoir tank of water and let the plant fill in new, clean and treated water < 20 μ S/cm.

If none of these errors are present, the plant membrane(s) are defective and must be cleaned/replaced, see ch.

Cleaning/Replacement of Membrane.

9.2.3 Plant switches off

This can be seen on the RO-plant's control panel for low inlet pressure.

Check:

If the required raw-water pressure is present.

Locate the error in the raw-water supply. When the raw-water pressure has been re-established, confirm on the button "reset" on the control panel and the plant is ready for operation again and can be started by pressing "operation" on the control panel.

If none of above-mentioned errors are present, the pressure switch located on the RO-plant inlet may be defective, or PCB in the control panel may be defective.

9.2.4 Plant does not run

Check

if the main power is connected.

Check

level sensor of the tank; if it is stuck or defective.

Check

if the plant needs to run? – Full storage tank or no "request" for water!

If none of above errors are present, the high-pressure pump or the control PCB may be defective - check.

9.2.5 Reservoir pump (option) will not operate.

Check

if there is a "request" for water from the reservoir pump.

Create water consumption at the outlet of the reservoir pump, if the pump runs, the error must be located elsewhere, plant and pump control are OK.

Check

if the alarm lamp indicating motor errors shines on the control panel. If so, check the motor protection relay in the electric panel.

Check

if the storage tank has run dry.

Let the tank fill up completely, then the reservoir pump starts again automatically.

Note! (on HOH storage tank) If the storage tank has been completely drained, the reservoir pump will not start until the storage tank is completely full. This is controlled by the tank level sensor.

Check

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

Short the pressure switch by making a connection between the two plugs. If the pump only

runs when this connection is active and there is a "request" for water, the pressure switch is defective – replace it.

Check

if the on/off switch of the reservoir pump or the motor protective switch is "off". If none of these errors are present, the control PCB or the reservoir pump are defective and must be replaced.

9.2.6 The Plant Storage Tank (option) flows over.

Check

if the inlet solenoid valve of the RO plant is closed and tight. If the permeate hose is constantly dripping when the plant is not operating; the solenoid valve is defective (leaky) – replace it.

Check

if the level sensor in the tank is prevented from interrupting the plant (stuck).

Remove obstacles, if any, from the level sensor.

9.2.7 Plant reservoir pump (option) stops and starts

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

Check

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

Check

if the non-pressure valve in the reservoir pump suction rod at the bottom of the storage tank is leaky/defective.

If it is leaky/defective, it must be replaced.

Check

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

9.2.8 CIP pump P2 and heating element HE1 are not working (Option)

Check

if the motor protective relays are connected in the electrical panel.

10. TECHNICAL DATA/SPECIFICATIONS

10.1 Technical data:

PRO-2100 SERIES	PRO-2110	PRO-2120	PRO-2130	PRO-2140
Capacity l/h*	600	1200	1700	2300
Max water recovery, %	80	80	80	80
Salt retention, %*	<99	<99	<99	<99
Conductivity, $\mu\text{S}/\text{cm}^*$	<20	<20	<20	<20
Elect. connection, V	400	400	400	400
Power consumption, kW/m^3	3,4	1,8	1,6	1,3
Electr. frequency, Hz	50	50	50	50
Pipe inlet, Diameter, "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "
Concentrate outlet, Diameter, "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "
Permeate outlet, Diameter, "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "
Permeate discharge consumption, Diameter, "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "
Height mm	1650	1650	1650	1650
Length, mm	970	970	970	970
Depth, mm	600	600	600	600
Max. water temperature	25°C	25°C	25°C	25°C
Max. water pressure	7 bar	7 bar	7 bar	7 bar
Min. water pressure	3 bar	3 bar	3 bar	3 bar
Weight (full)	160 kg	180 kg	215 kg	235 kg
Number of membranes	1	2	3	4
High-pressure pump P1 J1/1(A)	4,75	4,75	8,0	8,0
* At drinking water quality 10°C, 3 bar, max. 500 mg/l total salt content \pm 15% capacity				

10.2 Technical specifications

Sign	Plant type	Designation	Type/data
P1	2110 and 2120	High-pressure pump	3x400V, 50 Hz, 2.2 kW
P1	2130	High-pressure pump	3x400V, 50 Hz, 4,0 kW
P1	2140	High-pressure pump	3x400V, 50 Hz, 4,0 kW
FI 1	Joint	Flow meter	Ø32 PVC
FI 2	Joint	Flow meter	Ø32 PVC
PI 1	Joint	Manometer	0-6 bar, ¼"
PI 2	Joint	Manometer	0-40 bar, ¼"
PI 3	Joint	Manometer	0-2.5 bar, ¼"
V1	Joint	Needle valve	½", brass
V2	Joint	Needle valve	¾", brass
V4	Joint	3-way ball valve	Ø32 PVC
V5	Joint	Ball valve	Ø25 PVC
V6	Joint	Ball valve	¾" RF
V8	Joint	Ball valve	¾" RF
V9	Joint	Test valve	¼" PVC
Y1	Joint	Solenoid valve NC	¾" brass
Y2	Joint	Solenoid valve NC	¾" brass
Y3	Joint	Solenoid valve NO	¾" brass
PS 1	Joint	Pressure switch NO	¼"
PS 3	Joint	Pressure switch NC	¼"
QIS 1	Joint	Conductivity meter	½"

11. FUNCTIONAL DESCRIPTION

The water is pressed through the RO membrane by means of a high-pressure pump. The desalinated water/permeate is led to consumption, may possibly be collected in a storage reservoir. The water containing the concentrated salts/concentrate is led to drain. The ratio between permeate and concentrate shall be adjusted manually on the needle valve.

Under normal operating conditions, the RO membranes have a long life. However, even with a good raw-water quality, there will, to a certain extent, be built a layer of contaminants and thus a slow reduction of the permeate capacity.

12. REPLACEMENT OF MEMBRANES

Read this chapter carefully before dismantling/replacing plant membranes.

Disconnect the power and water to the plant.

Dismount the U-lock placed at the top of the membrane pipe. (The U-lock keeps the membrane end plate in place).

Remove the pin from the U-lock and pull the U-lock out of the pipe.

Now the end plate is pulled out of the membrane pipe by wriggling it from side to side and pulling simultaneously.

Now the membrane can be pulled out of the membrane pipe.

Note! at which end the big black O-ring is placed on the

outside of the membrane. When the new membrane is fitted, this O-ring shall be placed at the same end of the membrane as the old one.

When all connections have been re-fitted and the end plates securely fastened with the U-lock, the plant must be re-started. See ch. "Start-up of plant"

Write in the operating log-book:

Date of replacement of membranes.

New output of the plant (flow meter F11 and F12)

Water quality ($\mu\text{S}/\text{cm}$)

Plant operating pressure (manometer)

Raw-water temperature

Raw-water pressure.

13. CIP-CLEANING OF MEMBRANES (OPTION)

Introduction

The plant is not equipped with CIP plant as standard. This can be obtained as an option; however the plant is prepared mechanically for this feature.

During normal operation, depending on inlet, water quality, temperature, operating conditions etc, the RO membranes will lose their capacity successively due to the water's varying content of mineral salts, biological matter, colloid particles and other insoluble, organic particles.

These deposits are accumulated during operation and cause an increased pressure drop across the membrane and in that way a drop in capacity,

leading to a poorer water quality.

Membranes must be CIP-cleaned minimum once a year or immediately when the capacity has dropped 10 % compared to original capacity.

In this connection it should be noted that the capacity drops at lower water temperatures (approx. 3 % per °C), and a CIP cleaning is not necessary if this is the case.

Preconditions

It is necessary to perform the CIP cleaning with chlorine-free water of a good quality and a temperature of approx. 20 °C. We recommend the use of permeate on this plant, however pre-treated softened water may also be used.

During circulation of cleaning agent in the membranes, the temperature must never exceed 35°C and the pH value must be kept between 2 and 11.5.

The flow direction during CIP cleaning must be the same as during operation.

BWT CIP 4 is an acid cleaning agent used for dissolving inorganic coatings including iron, whereas the alkaline cleaning agent **BWT CIP 10** is used for dissolving organic coatings including oil.

Always clean with **BWT CIP 10** first and then with **BWT CIP 4**. Always follow the supplier's safety directions concerning handling of hazardous chemicals.

BWT CIP 4 is sold by BWT

Item No. : 70 19 57 020

BWT CIP 10 is sold by BWT

Item No. : 70 19 57 010

Never use sulphuric acid H_2SO_4 for CIP cleaning as there is a risk of precipitation of gypsum (calcium sulphate).

CIP Cleaning

While the plant is operating, fill the CIP tank with permeate.

Open valve V5.

When the CIP tank has been filled up with permeate, stop the RO plant.

High-pressure pump P1 must **never** be in operation during CIP cleaning.

Adjust the valves as follows:

Close valve: V1, V4, V8 (See figure 3 and figure 4).

Open valve: V2, V4, V5, V6 (See figure 3 and figure 4).

Mix the cleaning agent.

It is recommended to keep the temperature at approx. 35 °C during the CIP cleaning.

Start the CIP cleaning on the panel front.

P2 and HE1 start and the CIP fluid now circulates across the membranes.

Check that there is enough CIP fluid in the tank, so that P2 does not run dry.

When the CIP fluid has circulated for approx. 15 minutes, stop the CIP pump P2 by pressing on "stop" on the panel front.

Let the membranes soak for approx. 1 hour. If the membranes are very clogged, allow up to 15 hours of "soaking".

Start CIP-pump P2 again and let the CIP fluid circulate for approx. 5-10 minutes. If the CIP fluid is very turbid, a new CIP cleaning must be performed.

Check the pH value regularly. If the pH value varies by more than 0.5 pH units, more must be added so that the pH value becomes minimum 2 or maximum 11-5.

After final cleaning, stop the CIP pump. Neutralise the CIP fluid at pH 7.

Displace the chemicals in the RO plant.

Fill up the CIP tank with soft or desalinated water. Start the CIP pump P2 and displace the RO plant's content of liquid.

Check on the pH-meter.

Stop CIP pump P2.

Empty and flush the CIP tank.

Close valve: V4, V5, V6 (See figure 3, and figure 4).

Open valve: V 4, V8 (See figure 3 and figure 4).

Start the RO plant "in operation".

Let the RO plant operate for min. 15 minutes or until the conductivity is below the limit value, normally 20 $\mu S/cm$.

Then adjust V1 and V2 according to the chapter "Start-up of Plant".

Periodic sterilisation can be made with same equipment as is used for CIP cleaning. As sterilisation agent you may use 1 % (weight) sodium bisulphite (1 kg ~ 100 l water)

14. VARIOUS ENCLOSURES

14.1 Lay-out drawing

14.2 Principle diagram

14.3 Service- and maintenance diagram

14.4 Operational log-book

14.5 Spare parts drawing

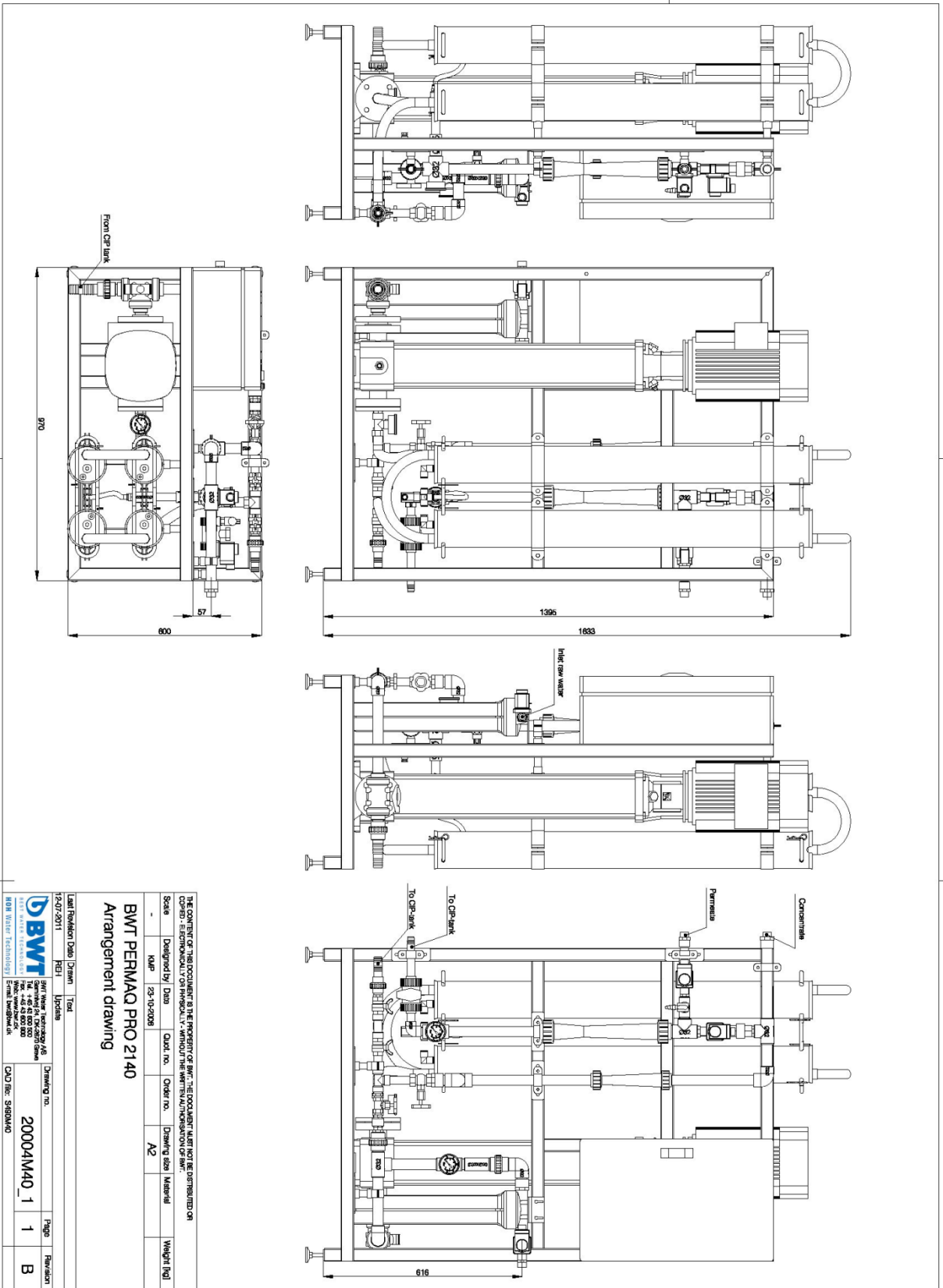
14.6 Spare parts list RO

14.7 Spare parts list CIP

14.8 Circuit diagram

14.9 Declaration of Conformity

14.1 Layout drawing



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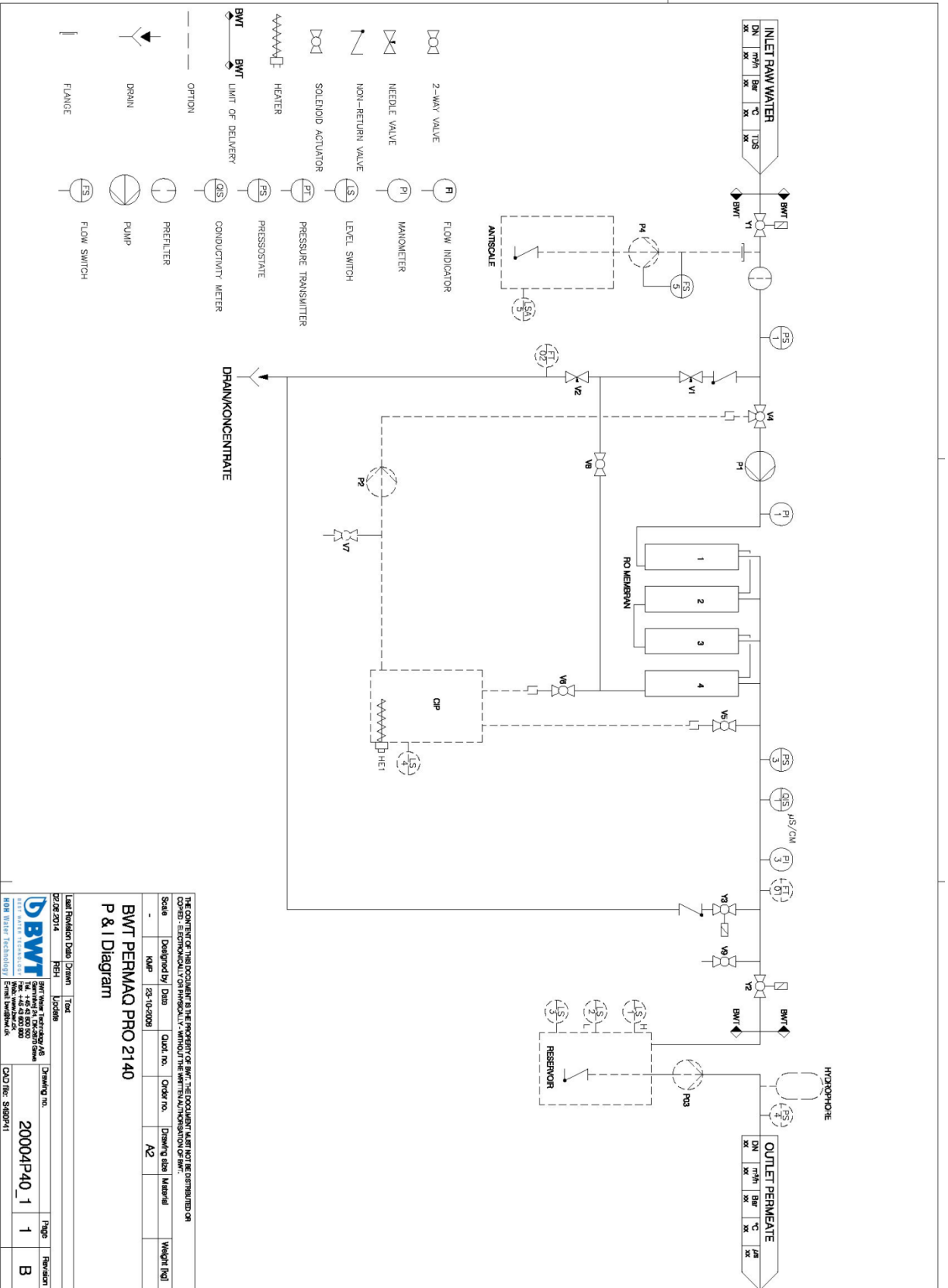
BWT PERMAQ PRO 2140
Arrangement drawing

Issue	Version	Created	By	Checked
12-07-2011	1.0	1.0	1.0	1.0

Drawing no.	Page	Revision
20004M40_1	1	B

 BWT WATER TECHNOLOGY AG Tel. +49 42 800 200 Fax +49 42 800 200 www.bwt.com StraÙe 10, 42699 Solingen, Germany	CAD file: 5983M40
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14.2 Diagram of Principles



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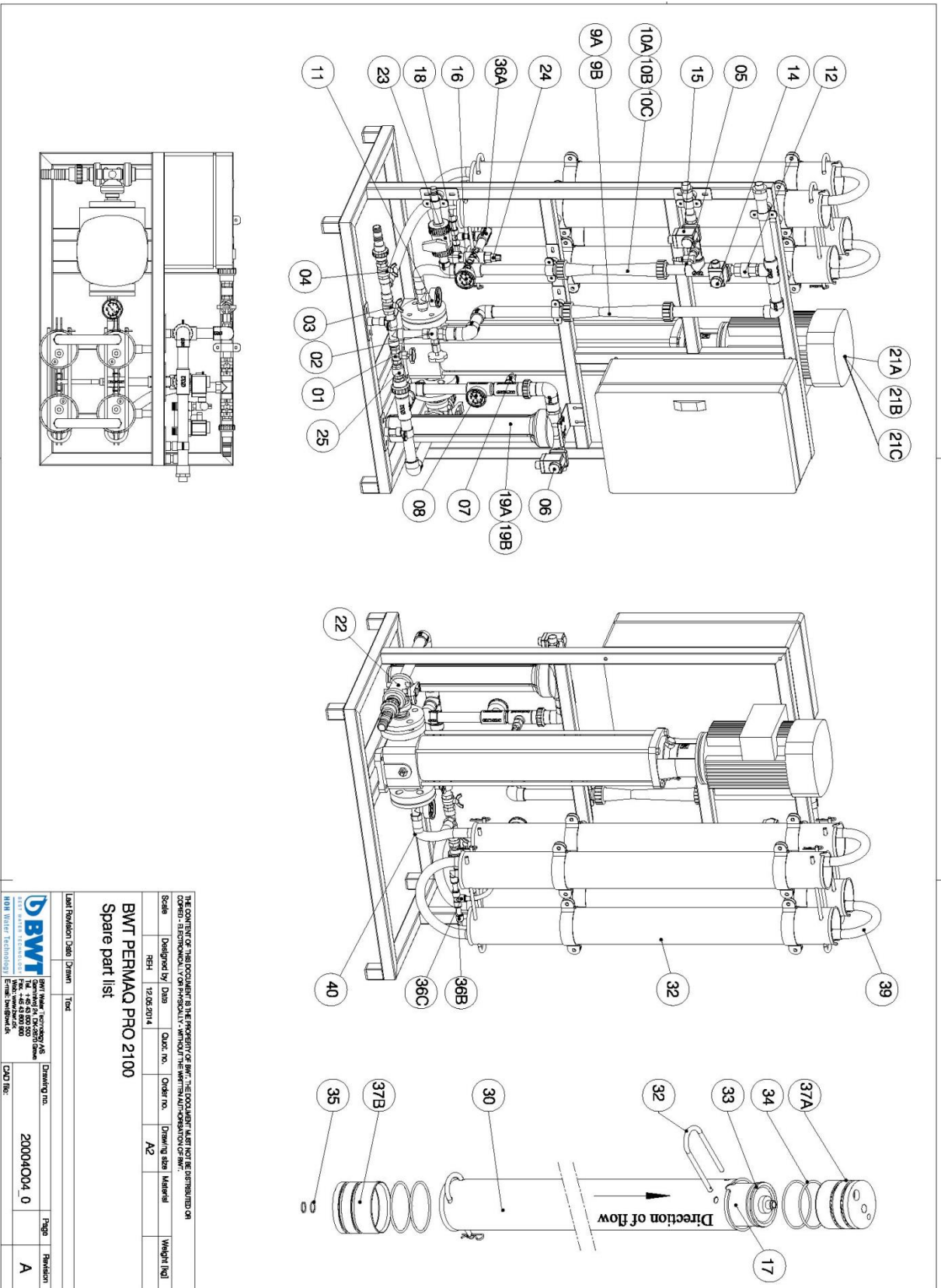
BWT PERMAQ PRO 2140
P & I Diagram

Issue	Drawn	Test	London
02.08.2014	REH		
		BWT Water Technology AG Schwanenweg 10, D-82008 Gröden Tel. +49 89 800 000 Fax +49 89 800 001 Email: sales@bwt.com www.bwt.com	
BWT Water Technology Schwanenweg 10		Drawing no.	Page
		200004P40_1	1
		CAD file: S482P41	Revision
			B

14.4 Operating logbook

	Every day	Every week	Every 5th to 8th week	Every 25th week	Every 52nd week
Service and maintenance of RO 2100 plant					
Check of supply of soft water (soft water < 0,5°dH) and salt tank.					
Water quality, permeate and concentrate capacity are checked on the conductivity meter and flow meter FI1 and FI2 while the plant is operating.					
Check-up on plant operating pressure . This can be read on the high-pressure manometer while the RO plant is operating.					
Check-up and cleaning of reservoir tank (growth, if any, shall be cleaned out of the tank (option)					
Cleaning of membrane(s) or earlier by 10 % capacity decrease.					

14.5 Spare part drawing



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Scale	Designed by	Date	Clad. no.	Order no.	Drawing size	Material	Weight [kg]
	BEH	17.06.2014			A2		

BWT PERMAQ PRO 2100
Spare part list

LAST REVISION	DATE	BY	TO								
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	20004004_0		A								
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14.6 Spare part list RO


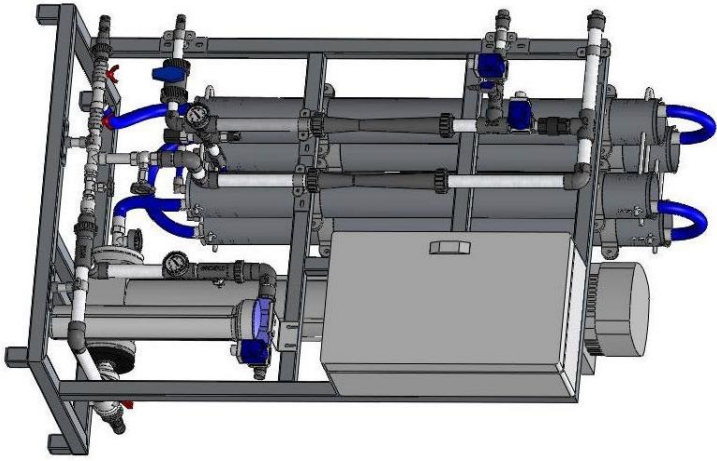
Position	RO plant	Recommended spare parts	Item No.
01	½" needle valve w. counter nuts	1	200731004
02	¾" needle valve w. counter nuts	1	200731006
03	¾" ball valve		200742006
04	¾" ball valve		200742006
05	¼" test valve PVC		200721020
06	¾" solenoid valve NC		200752006
07	Pressure switch 0.5 bar (inlet)	1	452550005
08	Manometer 0-6 bar	1	452263000
09 A	Flow meter concentrate 600 l/h. (2110/2120)		453010306
09 B	Flow meter concentrate 1000 l/h. (2130/2140)		453010310
10 A	Flow meter permeate 1000 l/h. (2110)		453010310
10 B	Flow meter permeate 1500 l/h. (/2120)		453012016
10 C	Flow meter permeate 2500 l/h. (2130/2140)		453010325
09/10 option	Flow transmitter sensor part (2110/2120/2130/2140)		453017010
09/10 option	Flow transmitter PVC part (2110/2120/2130/2140)		453017032
11	Manometer 0-40 bar	1	452266000
12	¾" non-return valve PVC	1	200727006
14	¾" solenoid valve NO	1	200752008
15	¾" solenoid valve NC	1	200752006
16	Manometer 0-2.5 bar	1	452268000
18	Sensor cell conductivity meter		750000392
19 A	20" Filter housing		321402000
19 B	20" filter cartridge 5µ	3	321420005
21 A	High-pressure pump (2110/2120)		454101225
21 B	High-pressure pump 2130)		454102226
21 C	High-pressure pump (2140)		454102222

Position	RO plant	Recommended spare parts	Item No.
22	Ø32, 3-way ball valve PVC		200718032
23	Ø32, ball valve PVC		200712032
24	Pressure switch 0.8 bar (permeate)	1	452550008
25	½" non-return valve brass	1	200726004
30	4" pressure pipe		451404079
31	4" Membrane	1-4	451404960
32	4" clasp		451404090
33	O-ring for 4" membrane	1-4	451404208
34	O-ring outside	4-16	451404211
35	O-ring inside	4-16	451404215
36	Spring-type coupling ½" x 14 union	1	454060014
36 A	Spring-type coupling 14 mm collector	1	454097014
36 B	Spring-type coupling 14 mm elbow	1	454090014
36 C	Spring-type coupling 14 mm tee	1	454095014
37 A	4" End plate	2	451404113
37 B	4" End plate	2	451404112
39 A	¾"x400 pressure hose	1-3	451404177
39 B	¾"x200 pressure hose	1-2	451404170

14.7 Spare parts list CIP 2100-series

Position.	CIP plant	Recommended spare parts	Item No.
	CIP pump, 3x400V, 50 Hz		454100940
	Electric heating element 6.0 kW		451404605
	Ø25 union PVC		061340025
	Level switch		110851050
	Weight for level switch		110860000

14.8 Circuit diagram

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<p>Customer: BWT HOH AS</p> <p>Project title: BWT PERMAD Pro21102120</p> <p>Page title: Frontpage</p> <p>File name: 20004E01_0.2.2kW</p>		
	<p>Appr. <input type="checkbox"/></p> <p>Rev. <input type="checkbox"/></p> <p>Dwg. <input checked="" type="checkbox"/></p>	<p>Date: 25-08-2014</p>
	<p>Ass. <input type="checkbox"/></p> <p>Appr. <input type="checkbox"/></p>	<p>Main no. 20004</p> <p>Page no. F</p>
	<p>Draw. no. 20004E01A</p>	<p>Next page: Cont</p>

Pos.	Titel	Revision	Page no.
1	IECEN 80757 - Wire colours and no. in HOH panels	A	Info
2	Mekanisk Layout	A	Layout
3	Control circuit	A	1
4	PLC Reference: 16 Digital input +16 Digital output	A	2
5	PLC Reference: 4 Analog input +2 Analog output	A	3
6	P1 High pressure pump	B	4
7	P2 CIP Pump	A	5
8	P3 Transport Pump	A	6
9	P4 Dosing pump	A	7
10	HEI EI heater CIP	A	8
11	High speed counter	A	9
12	XDI, Digital input	A	10
13	XDO, Digital output - Valves	A	11
14	XDO, Digital output - Valves	A	12
15	XDO, Digital output - Valves	A	13
16	Analog input	A	14
17	Component list	B	15
18	Terminal list	A	17
19	Cableplan	A	20
20	Cableplan	A	21
21	Cableplan	A	22
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IEC/EN 60757
BMT UK

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

Wire no. Colour

Wire no.	Colour	Main power min. 1,5mm ² /500VAC
1	BK-Black	PVT 90
1	BK-Black	PVT 90
1	BK-Black	PVT 90
2	BU-Light blue	PVT 90
3	GNYE-Green/Yellow	PVT 90

Wire no. Colour

Wire no.	Colour	Control current wire 0,75mm ² /500V-0,5mm ² /300V
6	RD-Red	PVT
2	BU-Light blue	PVT

Wire no. Colour

Wire no.	Colour	Wires in measuring circuit - foreign voltage act.
12	OG-Orange	PVT

External supplied wires

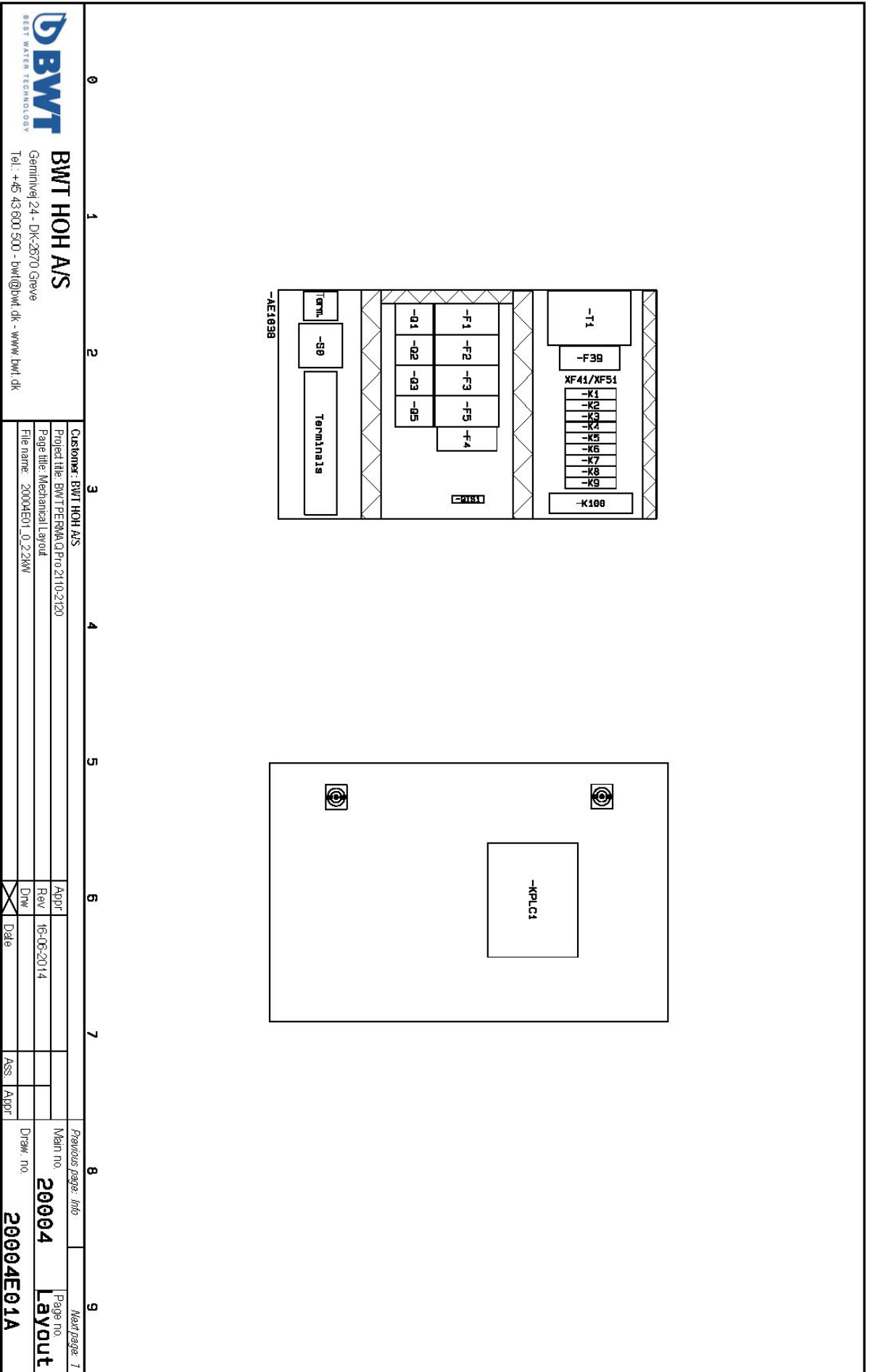
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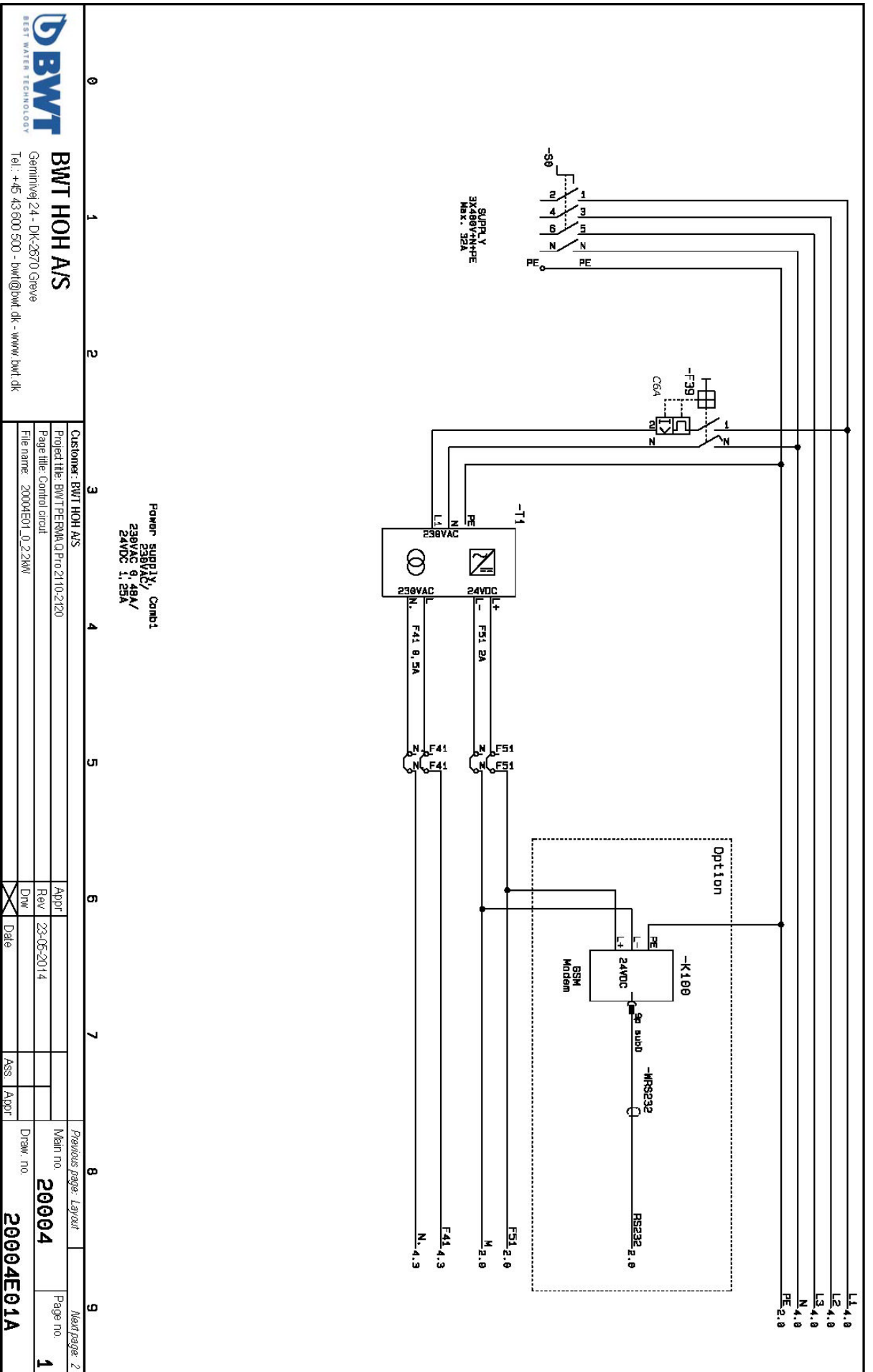
Wire no.	Colour	Control current wire 0,75mm ² 0,5mm ²	L+ / VDC+
4	GY-Gray	PVT	L+ / VDC+
5	BU-Dark blue	PVT	L- / VDC-
9	PK-Pink	PVT	Connection wire

21	WHY-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	ROBU-Red/Blue	LIVY	Connection wire
36	ROGN-Red/Green	LIVY	Connection wire
37	ROBK-Red/Black	LIVY	Connection wire
38	GYRD-Gray/Red	LIVY	Connection wire
39	GYBU-Gray/Blue	LIVY	Connection wire
40	GYBN-Gray/Brown	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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Customer: BWT HOH AS		Previous page: Cont		Next page: Layout	
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Page title: IEC/EN 60757 - Wire colours and no. in BWT panels	Rev	23-05-2014			
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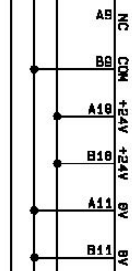
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-KPLC1

PLC/HMI Logic—touch version, 5,7' monochrome HMI, 16 DI/16 DO					
IX.1.00.00 9/1	IND0 High speed counter FT01	B1	OX.1.01.00 4/5	OUT00 Start order P1 High pressure pump	B12
IX.1.00.01 9/4	IND1 Thermostat CIP	A1	OX.1.01.01 5/5	OUT01 Start order P2 CIP Pump	A12
IX.1.00.02 6/2	IND2 High speed counter FT02	B2	OX.1.01.02 6/5	OUT02 Start order P3 Transport pump	B13
IX.1.00.03 4/7	IND3 Run Signal P1 High pressure pump	A2	OX.1.01.03 7/5	OUT03 Start order P4 Dosing pump	A13
IX.1.00.04 5/7	IND4 Run Signal P2 CIP Pump	B3	OX.1.01.04 8/5	OUT04 Start order HEI EI heater CIP	B14
IX.1.00.05 6/7	IND5 Run signal P3 Transport Pump	A3	OX.1.01.05 11/1	OUT05 Y01 Raw water inlet valve	A14
IX.1.00.06 7/7	IND6 Error Signal P4 Dosing pump	B4	OX.1.01.06 11/3	OUT06 Y02 Permeate valve	B15
IX.1.00.07 8/7	IND7 Run Signal HEI CIP Heater	A4	OX.1.01.07 11/5	OUT07 Y03 drain valve	A15
IX.1.00.08 10/1	IND8 LSI01 High level reservoir	B5	OX.1.01.08 12/1	OUT08 Available O08	B16
IX.1.00.09 10/2	IND9 LSI02 Low level reservoir	A5	OX.1.01.09 12/2	OUT09 Available O09	A16
IX.1.00.10 10/3	IND10 LSI.A03 Low alarm level reservoir	B6	OX.1.01.10 12/3	OUT10 Available O10	B17
IX.1.00.11 10/4	IND11 LSI.D4 Low level CIP	A6	OX.1.01.11 12/4	OUT11 Available O11	A17
IX.1.00.12 10/5	IND12 PSD1 Low pressure raw water inlet	B7	OX.1.01.12 12/5	OUT12 Available O12	B18
IX.1.00.13 10/6	IND13 PSD3 High pressure permeate outlet	A7	OX.1.01.13 12/6	OUT13 Available O13	A18
IX.1.00.14 10/7	IND14 PSD4 Low pressure reservoir pump	B8	OX.1.01.14 12/7	OUT14 Available O14	B19
IX.1.00.15 10/8	IND15 INI5 Ext. Start/Stop	A8	OX.1.01.15 13/1	OUT15 Ext. signal Common alarm	A19

1.9 FS1
1.9 M
1.9 PE



FS1-3,9
M-3,9
PE-3,9

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Main no. **200094**

Page no. **2**

Customer: BWT HOH A/S

Project title: BWT PERMAG Pro 2110-2120

Page title: PLC Reference, 16 Digital input + 16 Digital output

File name: 20004E01_0_22kW

Appr: Date:

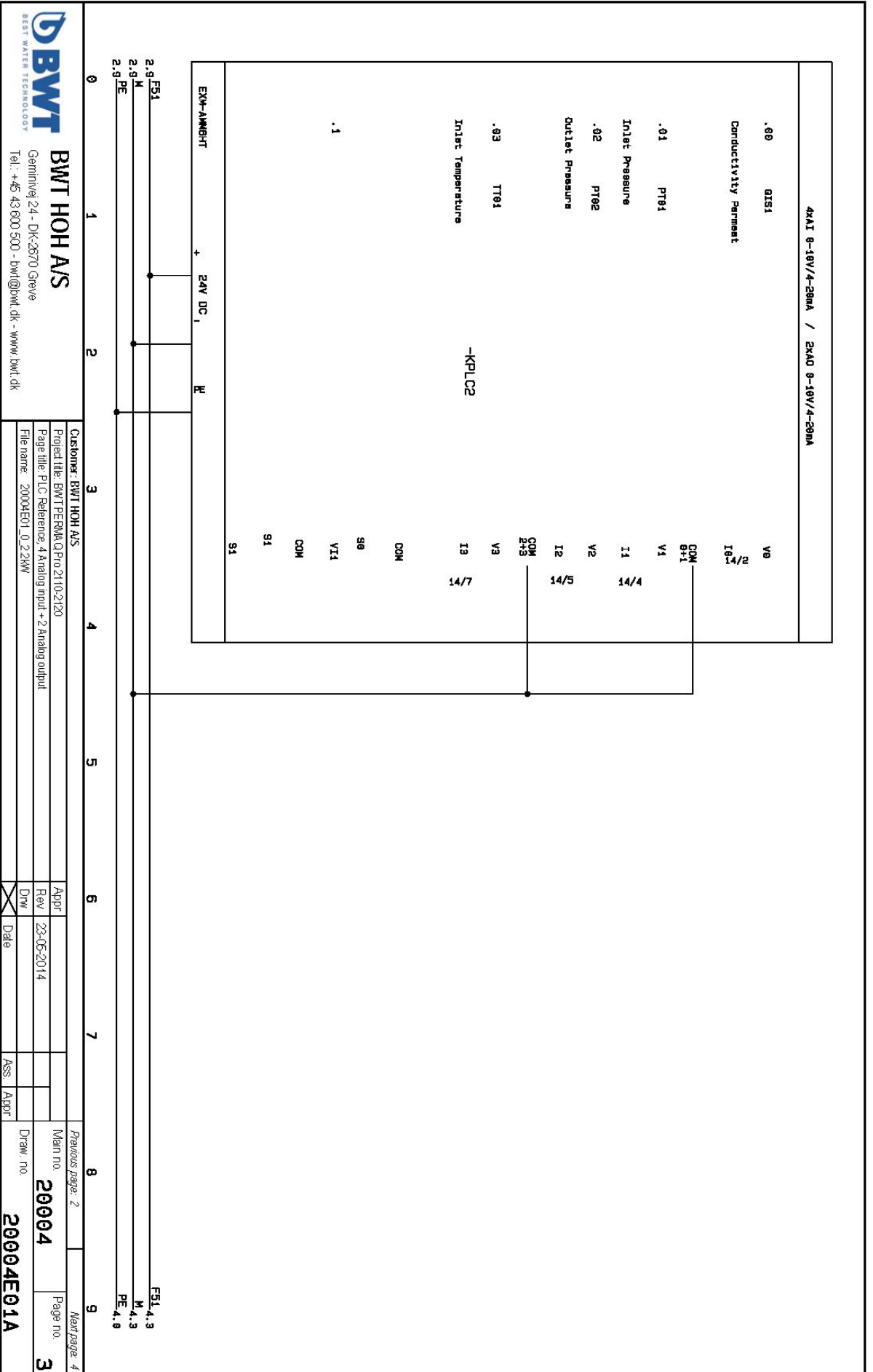
Rev: 23-05-2014

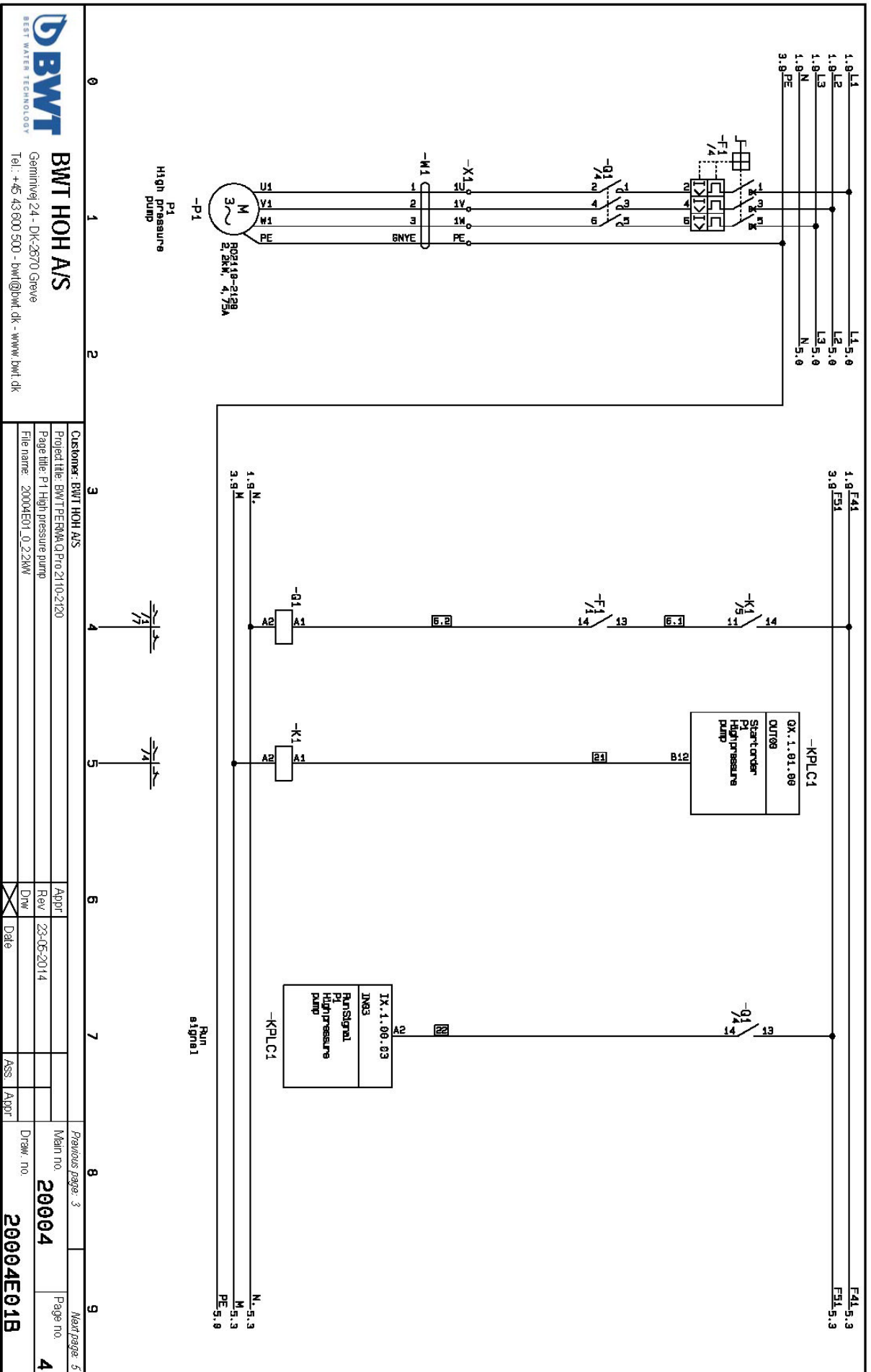
Dwg: Date:

Ass: Appr:

Draw. no. **20004E01A**

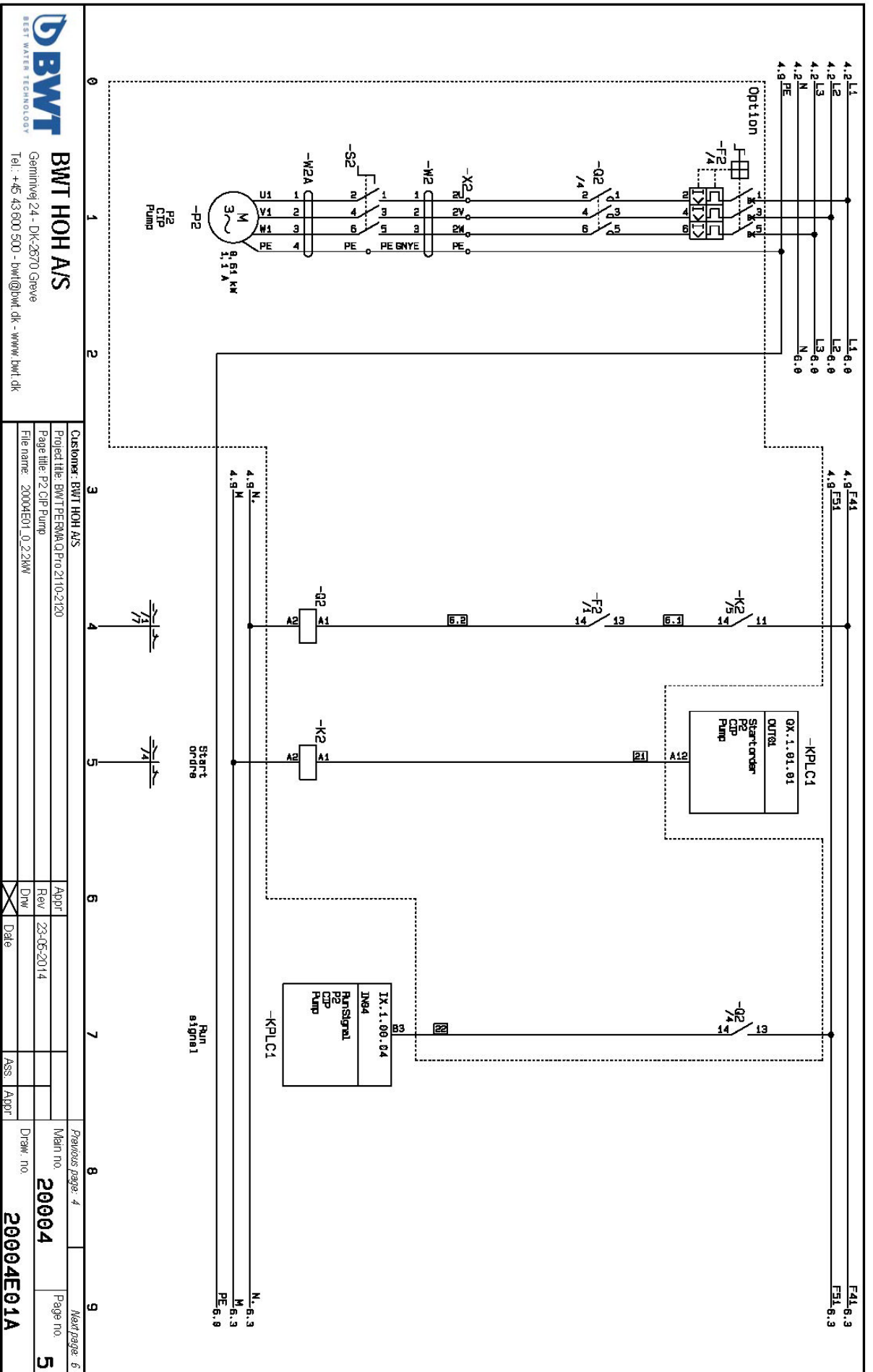
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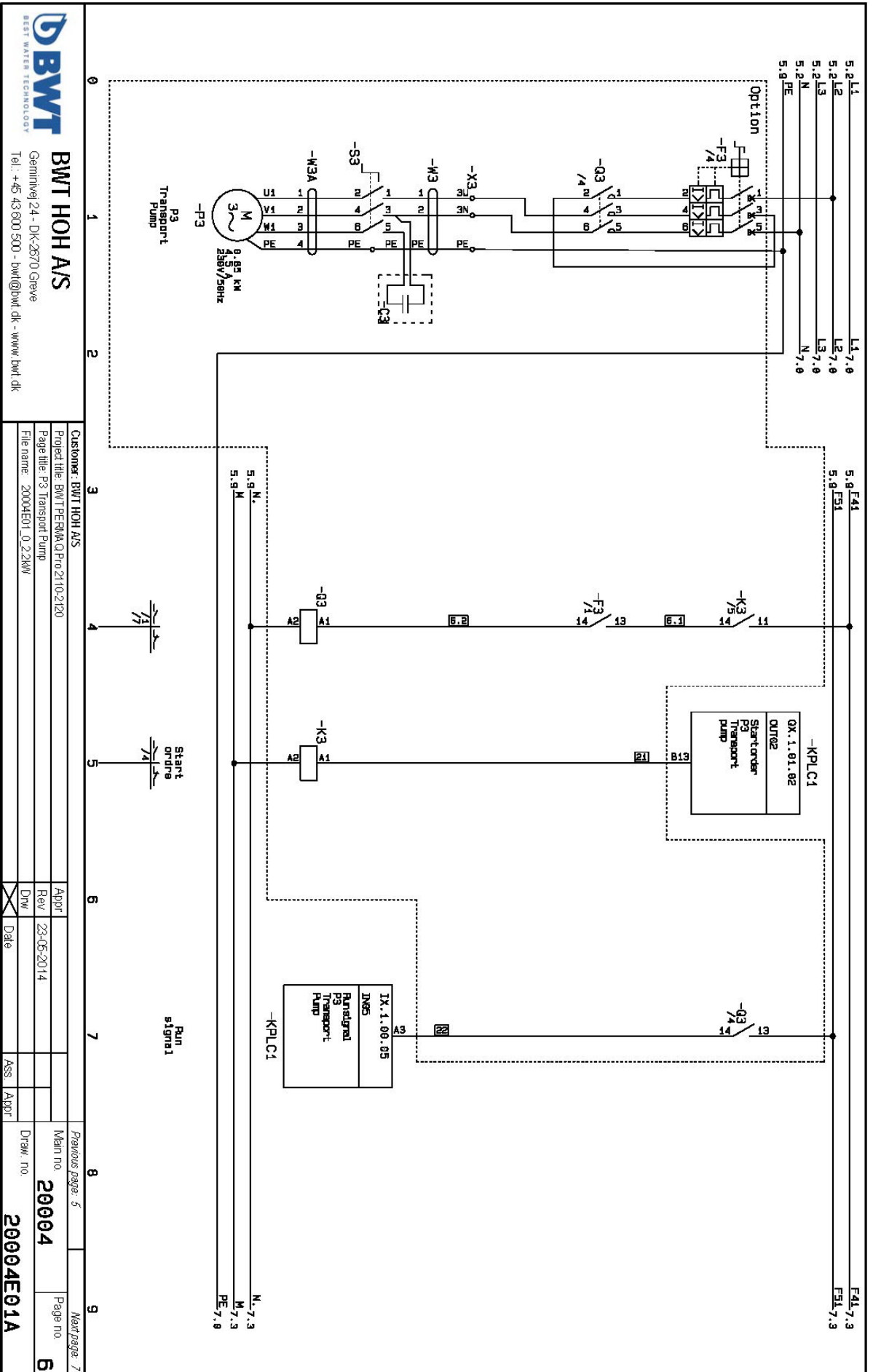
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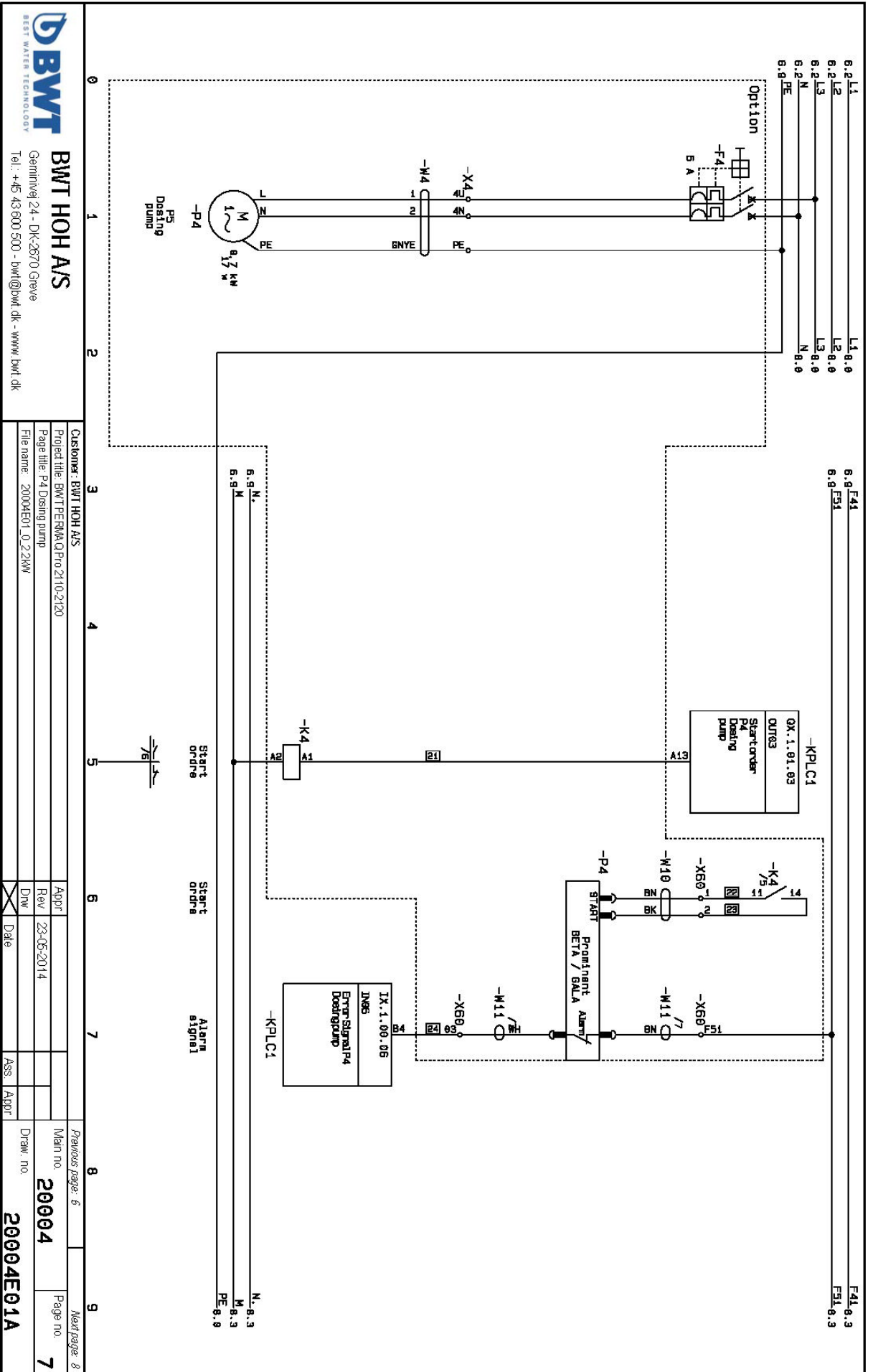
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RunSignal High pressure pump	Start order P1 High pressure pump	RunSignal High pressure pump	Start order P1 High pressure pump
IX. 1.00.83	IX. 1.01.09	IX. 1.00.83	IX. 1.01.09
RunSignal High pressure pump	Start order P1 High pressure pump	RunSignal High pressure pump	Start order P1 High pressure pump



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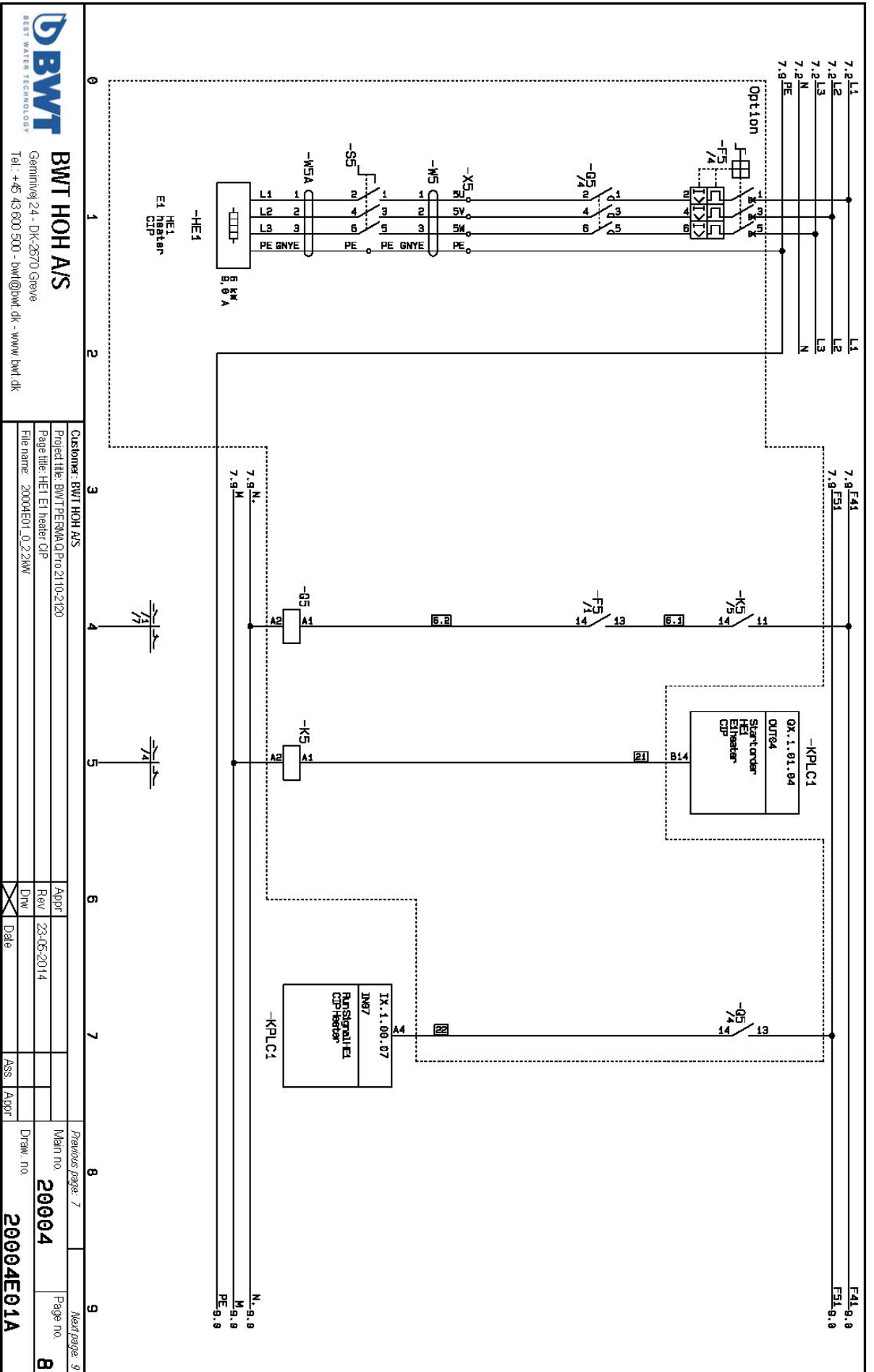
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Project title: BWT PERMA Q Pio 2110-2120	Rev	Main no. 20004	Page no.
Page title: P2 CIP Pump	Drw	23-05-2014	5
File name: 20004E01_0_22kW	Date		
	Ass: Appr		





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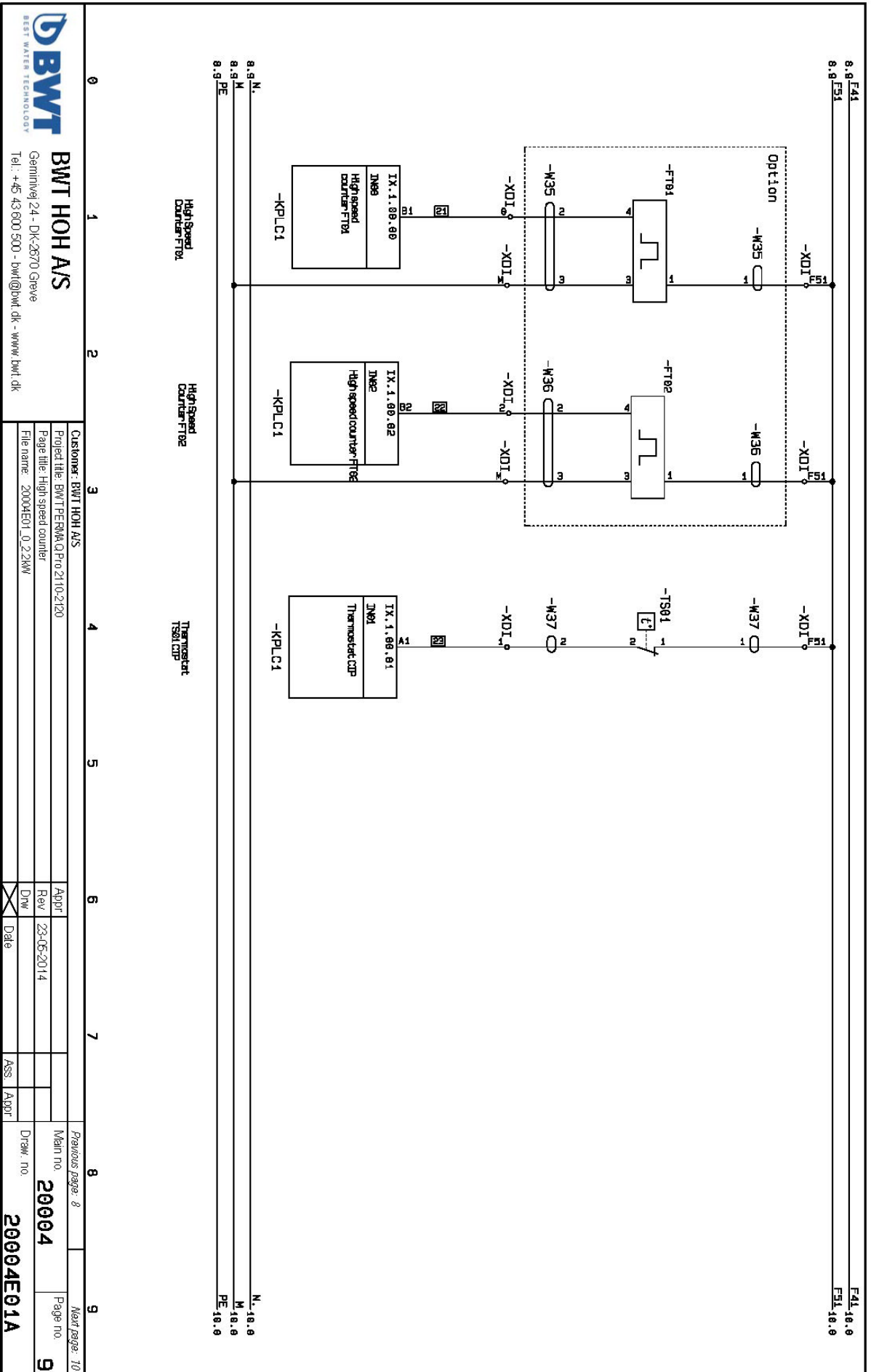
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Page title: P4 Dosing pump		Draw no: 20004E01A
File name: 20004E01_0.2.2kW		Next page: 8
		Page no: 7



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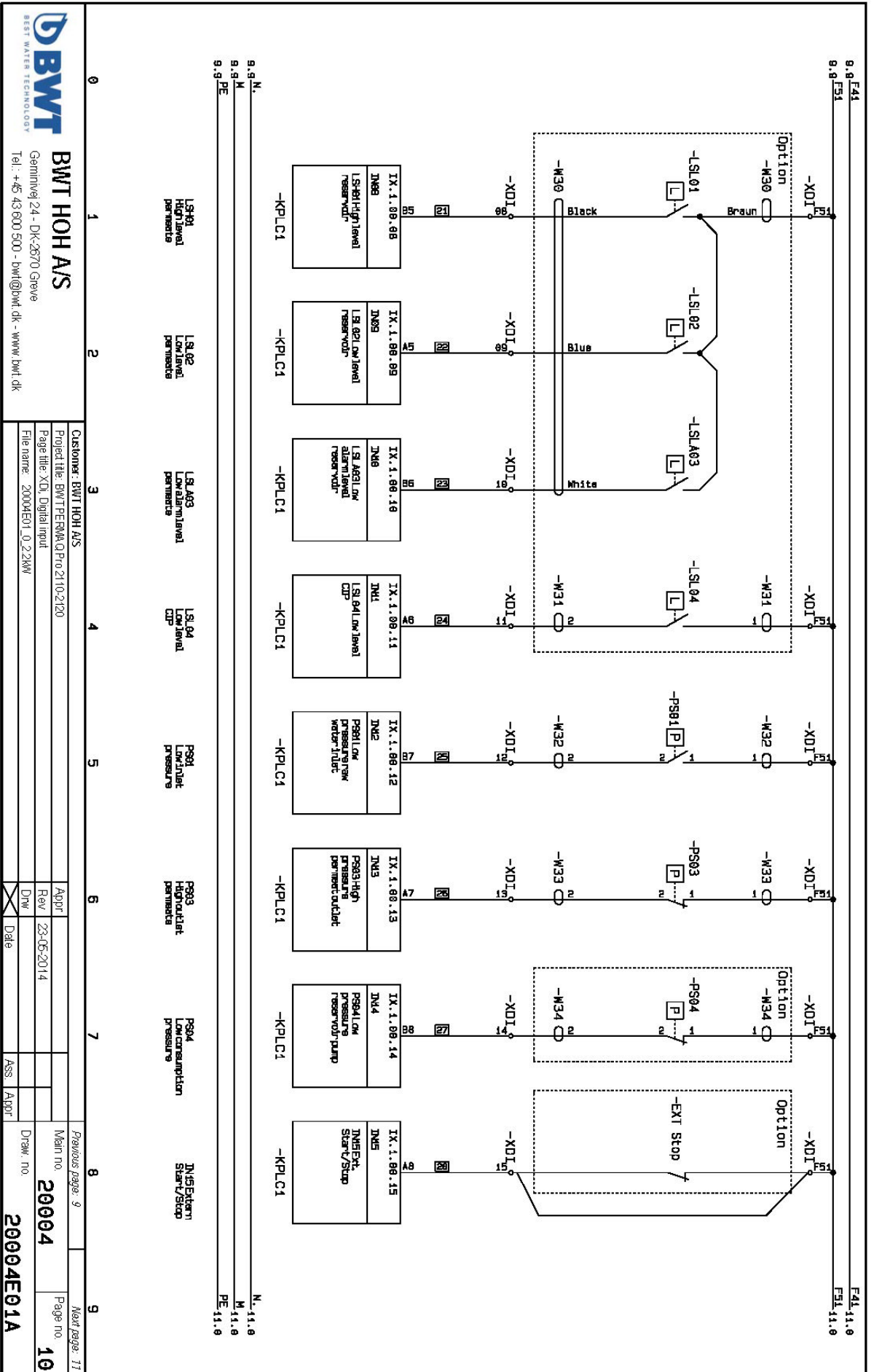
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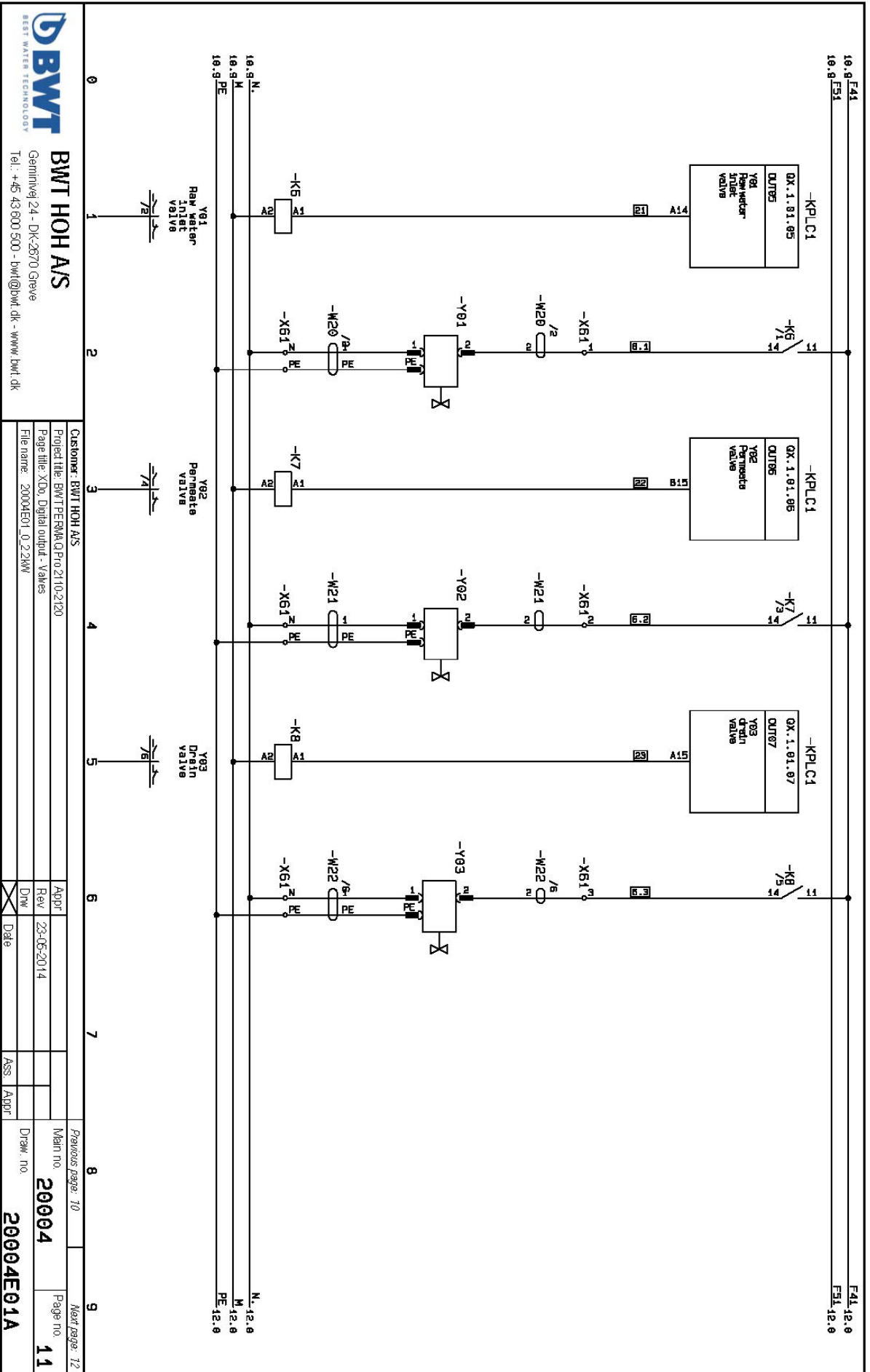
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				Date		Ass. Appr			



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Customer: BWT HOH A/S	Project file: BWT PERMAQ Pro 2110-2120	Page title: High speed counter	File name: 20004E01_0_2_2KW
Appr	Rev: 23-05-2014	Dwg	Date
Ass.	Appr.	Ass.	Appr.
Previous page: 8	Main no: 20004	Draw. no: 20004E01A	Next page: 10
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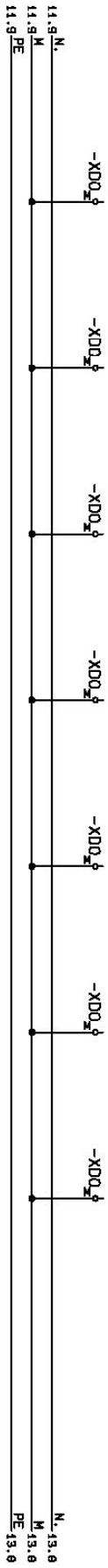
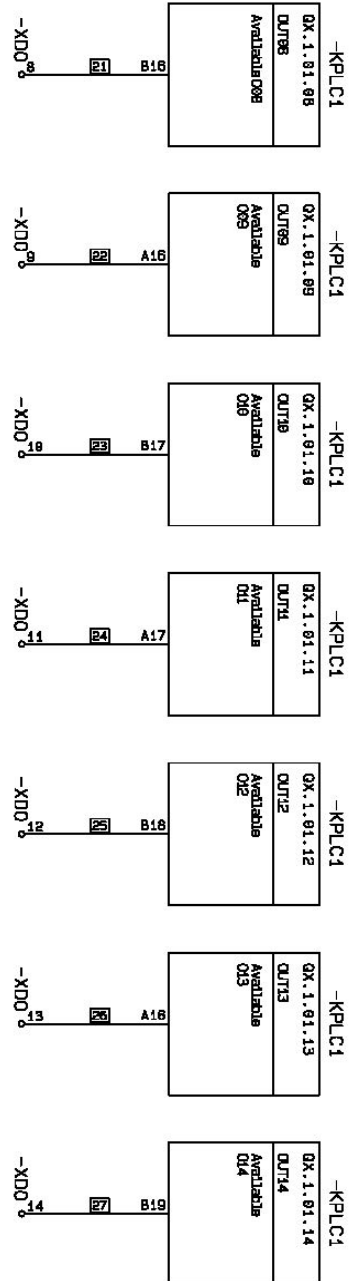
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Customer: BWT HOH A/S	Appr: 23-05-2014	Rev: DW	Date: <input type="checkbox"/>
Project title: BWT PERMVA Q16 2110-2120			
Page title: X09 Digital output - Values			
File name: 20004E01_0_22NW			

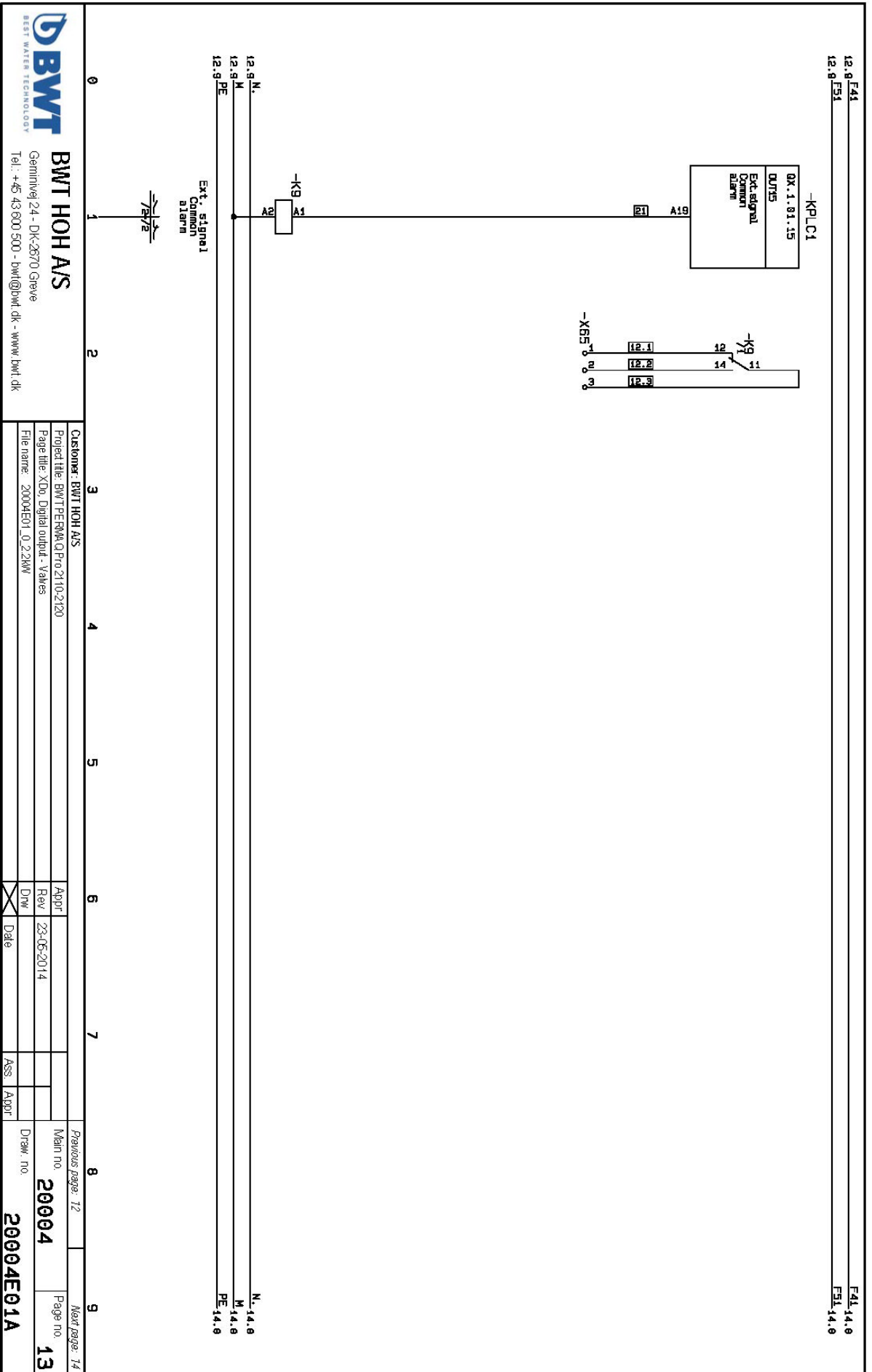
Previous page: 10	Main no: 20004	Draw no: 20004E01A
Next page: 12	Page no: 11	

11.9 F41
11.9 F51

F41 13.9
F51 13.9

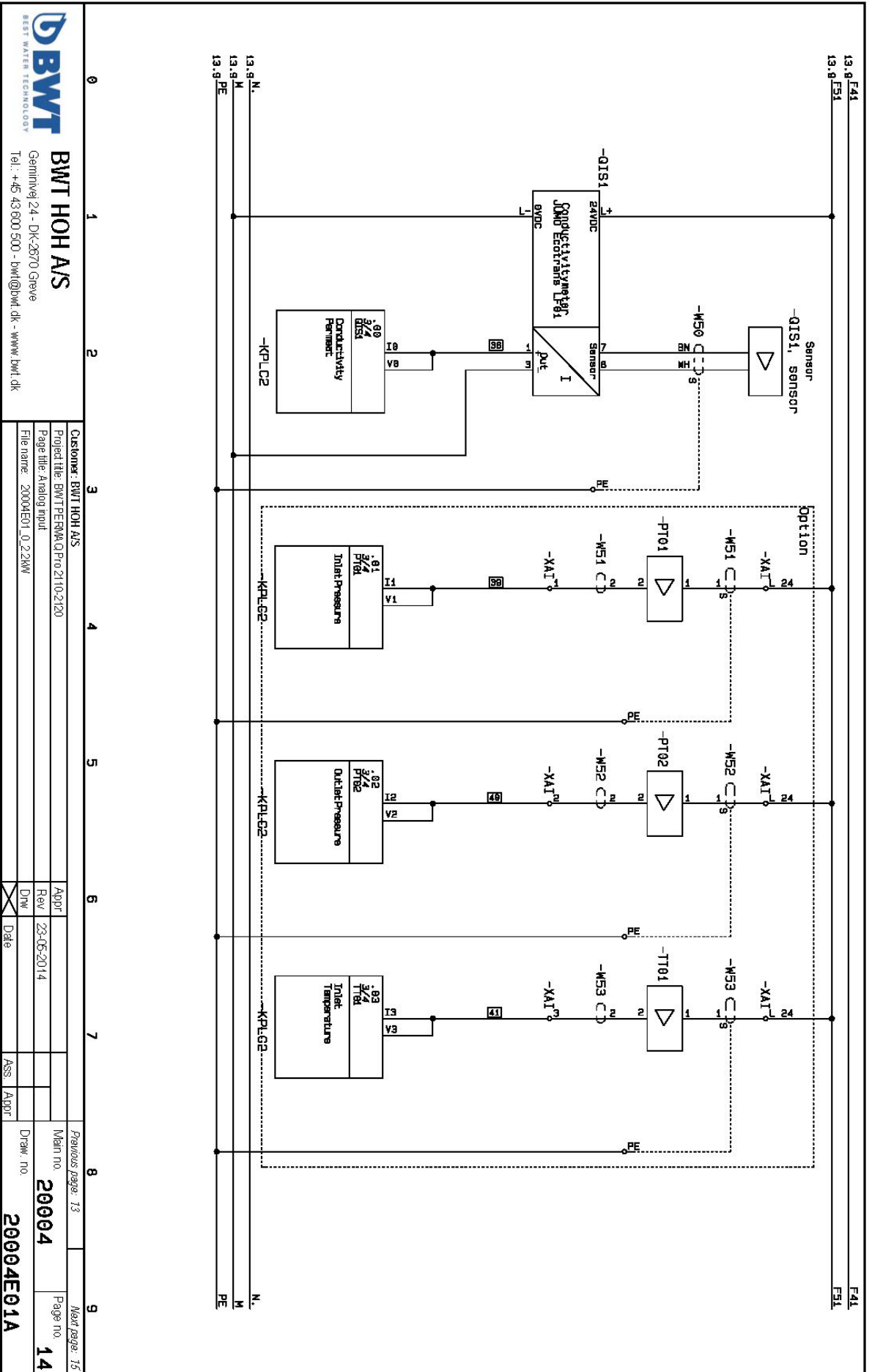


<p>BWT HOHAS Geminivej 24 - DK-2670 Greve Tel.: +45 43 600 500 - bwt@bwt.dk - www.bwt.dk</p>		Customer: BWT HOHAS		Previous page: 11		Next page: 13				
		Project title: BWT PERMA Q Pro 2110-2120		Appr	Rev	23-05-2014	Main no.	20004	Page no.	12
Page title: XDO, Digital output		File name: 20004E01_0_22kW		DMV	Date	Ass.	Appr.	Draw. no.		20004E01A



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Customer: BWT HOH A/S	Project title: BWT PERMUTPRO 2110-2120	Page title: Analog Input	File name: 20004E01_0.2.2KW
Appr	Rev	Appr	Rev
	23-05-2014		
DW	Date	Ass	Date
Previous page: 13	Main no: 20004	Draw no: 20004E01A	Next page: 15
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Pos.	Component names	Description	Part no.	Type	Manufacturer	Position
1	-F1	Circuit breaker 800, cl 10, A-uidl 35-5A, N-uidl 63A screw	4011209712461	3RV2011-1FA10	SIEMENS	4/1
2	-F1	Transverse aux. switch 11NO+1NC screw	4011209790964	3RV2301-1E	SIEMENS	4/4
3	-F2	Circuit breaker 800, cl 10, A-uidl 1+1-6A, N-uidl 21A screw	4011209712416	3RV2011-1AA10	SIEMENS	5/1
4	-F2	Transverse aux. switch 11NO+1NC screw	4011209790964	3RV2301-1E	SIEMENS	5/4
5	-F3	Circuit breaker 800, cl 10, A-uidl 35-5A, N-uidl 63A screw	4011209712461	3RV2011-1FA10	SIEMENS	6/1
6	-F3	Transverse aux. switch 11NO+1NC screw	4011209790964	3RV2301-1E	SIEMENS	6/4
7	-F4	Miniature Circuit Breaker 1P+N CSA	750001326	5SY6606-7	SIEMENS	7/1
8	-F5	Circuit breaker 800, cl 10, A-uidl 7-10A, N-uidl 130A screw	4011209712482	3RV2011-1AA10	SIEMENS	8/1
9	-F5	Transverse aux. switch 11NO+1NC screw	4011209790964	3RV2301-1E	SIEMENS	8/4
10	-F39	Miniature Circuit Breaker 1P+N CSA	5SY6606-7	5SY6606-7	SIEMENS	1/3
11	-K1	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	4/5
12	-K2	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	5/5
13	-K3	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	6/5
14	-K4	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	7/5
15	-K5	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	8/5
16	-K6	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	11/1
17	-K7	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	11/3
18	-K8	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	11/5
19	-K9	Auxiliary relay, 2P 8A 24VDC LED	750001326	RCIKT24 VDC 2CO LD/PP	Weidmüller	13/1
20	-K100	GSM Modem	G21601	G21601	Moxa OneCell	11/7
21	-K-PLC1	PLC/HMI Logic-touch series, 5.7" monochrome HMI, 16 DI/8 DO	LT3301-L1-D24-C	LT3301-L1-D24-C	Pro-face	2/0
22	-K-PLC2	PLC/HMI Logic-touch series, 5.7" monochrome HMI, 16 DI/8 DO	LT3301-L1-D24-C	LT3301-L1-D24-C	Pro-face	4/7
23	-K-PLC2	Analog input module 4 x AI + 2 x AO, 0-10V/4-20mA	EXM-AMMBHT	EXM-AMMBHT	Pro-face	3/2
24	-Q1	Contactor, AC-3, 3KV/400V, 1NO, AC 230V, 50/60 Hz, 3-pole S00 screw	4011209780767	3RT2015-1AP01	SIEMENS	4/4
25	-Q2	Contactor, AC-3, 3KV/400V, 1NO, AC 230V, 50/60 Hz, 3-pole S00 screw	4011209780767	3RT2015-1AP01	SIEMENS	5/4
26	-Q3	Contactor, AC-3, 3KV/400V, 1NO, AC 230V, 50/60 Hz, 3-pole S00 screw	4011209780767	3RT2015-1AP01	SIEMENS	6/4
27	-Q5	Contactor, AC-3, 4KV/400V, 1NO, AC 230V, 50/60 Hz, 3-pole S00 screw	4011209783304	3RT2016-1AP01	SIEMENS	8/4
28	-QIS1	Conductivity transmitter, 24VDC, 4-20mA	JUMO Ecodrans LFO1	JUMO Ecodrans LFO1	JUMO	14/1
29	-QIS1	Sensor	Sensor JUMO Conductivity	Sensor JUMO Conductivity	JUMO	14/2
30	-S0	MAIN CONTROL SWITCH 3-POLE IUL=32, PAC-23A AT 400V	4011209403277	3LD2244-0TK61	Siemens	1/1
31	-S0N	N-CONDUCTOR LEADING FOR BASE MOUNTING UP TO 32A (A)	4011209403970	3LD2220-0C	Siemens	1/1
32	-S2	Isolator switch, 3p 16A, IP65	3LD2064-0TB51	3LD2064-0TB51	Siemens	5/1
33	-S3	Isolator switch, 3p 16A, IP65	3LD2064-0TB51	3LD2064-0TB51	Siemens	6/1
34	-S5	Isolator switch, 3p 16A, IP65	3LD2064-0TB51	3LD2064-0TB51	Siemens	8/1
35	-T1	Power supply, Combi, 230VAC/230VAC/24VDC	24RC-0186-107	24RC-0186-107	Nordel	1/4
36	-W1		4G1.5 mm² H07RNLF	4G1.5 mm² H07RNLF		4/1
37	-W2		4G1.5 mm² H07RNLF	4G1.5 mm² H07RNLF		5/1
38	-W2A		4G1.5 mm² H07RNLF	4G1.5 mm² H07RNLF		5/1
39	-W3		4G1.5 mm² H07RNLF	4G1.5 mm² H07RNLF		6/1
40	-W3A		4G1.5 mm² H07RNLF	4G1.5 mm² H07RNLF		6/1
41	-W4		3G0.75 mm² H05VV-F	3G0.75 mm² H05VV-F		7/1
42	-W5		4G2.5 mm² H07RNLF	4G2.5 mm² H07RNLF		8/1
43	-W5A		4G2.5 mm² H07RNLF	4G2.5 mm² H07RNLF		8/1
44	-W10		5 x 0.34 LVV	5 x 0.34 LVV		7/5
45	-W11		3 x 0.75 mm² LVV	3 x 0.75 mm² LVV		7/7

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Customer: BWT HOH A/S		Project title: BWT PERMIO Pro 2110-2120		Draw: no. 200004E01B	
Page title: Component list	Rev: 23-05-2014	Appr:	Ass:	Main no. 20004	Page no. 15
File name: 20004E01_0_2.2kW	Dwg:	Date:	Ass:	Draw: no. 200004E01B	Page no. 15

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Pos.	Component names	Description	Part no.	Type	Manufacturer	Position
46	-JW20			300,75 mm Multiflex		112
47	-JW21			2 x 0,75 mm Multiflex		114
48	-JW22			300,75 mm Multiflex		118
49	-JW30			4 x 0,75 mm Multiflex		101
50	-JW31			2 x 0,75 mm Multiflex		104
51	-JW32			2 x 0,75 mm Multiflex		106
52	-JW33			2 x 0,75 mm Multiflex		108
53	-JW34			2 x 0,75 mm Multiflex		107
54	-JW35			3 x 0,75 mm Multiflex		91
55	-JW36			3 x 0,75 mm Multiflex		93
56	-JW37			2 x 0,75 mm Multiflex		94
57	-JW50			2 x 0,34 LfVY +S		142
58	-JW51			2 x 0,34 LfVY +S		144
59	-JW52			2 x 0,34 LfVY +S		146
60	-JW53			2 x 0,34 LfVY +S		147
61	-JWRS22		RS232	RS232		18
62	-X1	Feed through terminal screwscrew 2,5mm²	4008190096933	WDU 2,5	Weidmüller	41
63	-X2		102000	WDU 2,5		51
64	-X3		102000	WDU 2,5		61
65	-X4		102000	WDU 2,5		71
66	-X5		102000	WDU 2,5		81
67	-X60		104110	WDK 2,5 ZGV		77
68	-X61		102000	WDU 2,5		112
69	-X63		102000	WDU 2,5		132
70	-X65		4008190465149	WDU 2,5		144
71	-X41		104110	WDK 2,5 ZGV		91
72	-X01		104110	WDK 2,5 ZGV		121
73	-X00			WDK 2,5 ZGV		121
74	-XF41	Double feed through terminal screwscrew	4008190169827	WDK 2,5	Weidmüller	15
75	-XF41N	Double feed through terminal screwscrew	4008190169827	WDK 2,5	Weidmüller	15
76	-XF51	Double feed through terminal screwscrew	4008190169827	WDK 2,5	Weidmüller	15
77	-XF51M	Double feed through terminal screwscrew	4008190169827	WDK 2,5	Weidmüller	15
78	-XPE	PE-Busbar	PE-Busbar	PE-Busbar	Weidmüller	111
79	-XPE3	PE-Busbar	PE-Busbar	PE-Busbar	Weidmüller	148
80	-XPE4	PE-Busbar	PE-Busbar	PE-Busbar	Weidmüller	148
81						
82						
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Customer: BWT HOH A/S		Project title: BWT PERMANO Pro 2110.2120		Appr.		Previous page: 15		Next page: 17	
Page title: Component list		Rev		23-05-2014		Wbin.no.		20004	
File name: 20004E01_0_2.2kW		Dwg				Page no.		16	
		Date				Ass.		Appr.	
						Draw. no.		20004E01B	

Pos.	Terminal no.	:pin	Function	Partno.	Type	GSM/Modem	Position	Cable name	To	:pin
1	-K100	0		G21501	G21501		1/7			
2	-X1	1U		4008190098633	WDU25		4/1	-W1	-P1	:U1
3	-X1	1V		4008190098633	WDU25		4/1	-W1	-P1	:V1
4	-X1	1W		4008190098633	WDU25		4/1	-W1	-P1	:W1
5	-X1	1W		4008190098633	WDU25		4/1	-W1	-P1	:W1
6	-X2	2U		102000	WDU25		5/1	-W2	-S2	:1
7	-X2	2V		102000	WDU25		5/1	-W2	-S2	:3
8	-X2	2W		102000	WDU25		5/1	-W2	-S2	:5
9	-X2	2W		102000	WDU25		5/1	-W2	-S2	:5
10	-X3	3N		102000	WDU25		6/1	-W3	-S3	:3
11	-X3	3U		102000	WDU25		6/1	-W3	-S3	:1
12	-X3	3U		102000	WDU25		6/1	-W3	-S3	:1
13	-X4	4N		102000	WDU25		7/1	-W4	-P4	:N
14	-X4	4U		102000	WDU25		7/1	-W4	-P4	:L
15	-X4	4U		102000	WDU25		7/1	-W4	-P4	:L
16	-X5	5W		102000	WDU25		8/1	-W5	-S5	:5
17	-X5	5W		102000	WDU25		8/1	-W5	-S5	:5
18	-X5	5U		102000	WDU25		8/1	-W5	-S5	:1
19	-X5	5V		102000	WDU25		8/1	-W5	-S5	:3
20	-X5	5W		102000	WDU25		8/1	-W5	-S5	:5
21	-X60	1		104110	WDC25 ZCW		7/6	-W10	-P4	:1
22	-X60	2		104110	WDC25 ZCW		7/6	-W10	-P4	:2
24	-X60	F51		104110	WDC25 ZCW	Alarm signal	7/7	-W11	-P4	:3
25	-X60	03		104110	WDC25 ZCW		7/7	-W11	-P4	:4
26	-X61	1		102000	WDU25		11/2	-W20	-Y01	:2
27	-X61	2		102000	WDU25		11/4	-W21	-Y02	:2
28	-X61	3		102000	WDU25		11/6	-W22	-Y03	:2
30	-X61	N		102000	WDU25		11/2	-W22	-Y03	:1
31	-X61	N		102000	WDU25		11/2	-W21	-Y02	:1
32	-X61	N		102000	WDU25		11/2	-W20	-Y01	:1
33	-X63	2		102000	WDU25		13/2			
35	-X63	3		102000	WDU25		13/2			
36	-X66	1		102000	WDU25		13/2			
37	-X66	1		102000	WDU25		13/2			
38	-XAI	1		400819045149	WDU25		14/4	-W61	-KPLC2	:11
39	-XAI	2		400819045149	WDU25		14/5	-W62	-KPLC2	:12
40	-XAI	3		400819045149	WDU25		14/7	-W63	-KPLC2	:18
41	-XAI	L24		400819045149	WDU25		14/4	-W61	-PT01	:1
42	-XAI	L24		400819045149	WDU25		14/5	-W62	-PT02	:1
43	-XAI	L24		400819045149	WDU25		14/7	-W63	-TT01	:1
44	-XAI	L24		400819045149	WDU25		14/7	-W63	-TT01	:1
45	-XAI	L24		400819045149	WDU25		14/7	-W63	-TT01	:1

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Customer: **BWT HOH AIS**

Project title: **BWT PERWAQ Pro 2110.2120**

Page title: **Terminal list**

File name: **20004E01_0.2.2kW**

Appr: Rev: Dw: Date:

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Draw no: **20004E01A**

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Pos.	Terminal no.	Pin	Function	Part no.	Type	Position	Cable name	To	Pin
46	X101	M		104110	WDK 2,5 ZGV	9/2	-W35	-FT02	3
47	X101	M		104110	WDK 2,5 ZGV	9/2	-W35	-FT01	3
48	X101	F51		104110	WDK 2,5 ZGV	10/1	-W30	-LS101	1
49	X101	08		104110	WDK 2,5 ZGV	10/1	-W30	-LS101	2
50	X101	09		104110	WDK 2,5 ZGV	10/2	-W30	-LS102	2
51	X101	10		104110	WDK 2,5 ZGV	10/3	-W30	-LS1A08	2
52	X101	F51		104110	WDK 2,5 ZGV	10/4	-W31	-LS104	1
53	X101	11		104110	WDK 2,5 ZGV	10/4	-W31	-LS104	2
54	X101	F51		104110	WDK 2,5 ZGV	10/5	-W32	-P901	1
55	X101	12		104110	WDK 2,5 ZGV	10/5	-W32	-P901	2
56	X101	F51		104110	WDK 2,5 ZGV	10/6	-W33	-P903	1
57	X101	13		104110	WDK 2,5 ZGV	10/6	-W33	-P903	2
58	X101	F51		104110	WDK 2,5 ZGV	10/7	-W34	-P904	1
59	X101	14		104110	WDK 2,5 ZGV	10/7	-W34	-P904	2
60	X101	F51		104110	WDK 2,5 ZGV	10/8	-EXT Stop	-EXT Stop	1
61	X101	15		104110	WDK 2,5 ZGV	10/8	-EXT Stop	-EXT Stop	2
62	X101	F51		104110	WDK 2,5 ZGV	9/2	-W36	-FT02	1
63	X101	F51		104110	WDK 2,5 ZGV	9/2	-W35	-FT01	1
64	X101	0		104110	WDK 2,5 ZGV	9/1	-W35	-FT01	4
66	X101	2		104110	WDK 2,5 ZGV	9/2	-W36	-FT02	4
68	X101	1		104110	WDK 2,5 ZGV	9/4	-W37	-R801	2
67	X101	F51		104110	WDK 2,5 ZGV	9/4	-W37	-R801	1
68	X100	M		104110	WDK 2,5 ZGV	12/1			
70	X100	8		104110	WDK 2,5 ZGV	12/1			
71	X100	M		104110	WDK 2,5 ZGV	12/2			
72	X100	9		104110	WDK 2,5 ZGV	12/2			
73	X100	M		104110	WDK 2,5 ZGV	12/3			
74	X100	10		104110	WDK 2,5 ZGV	12/3			
75	X100	M		104110	WDK 2,5 ZGV	12/4			
76	X100	11		104110	WDK 2,5 ZGV	12/4			
77	X100	M		104110	WDK 2,5 ZGV	12/5			
78	X100	12		104110	WDK 2,5 ZGV	12/5			
79	X100	13		104110	WDK 2,5 ZGV	12/6			
80	X100	M		104110	WDK 2,5 ZGV	12/7			
81	X100	14		104110	WDK 2,5 ZGV	12/7			
82	X141	F41		4008190169627	WDK 2,5	1/5			
84	X141	F41		4008190169627	WDK 2,5	1/5			
85	X141N	N		4008190169627	WDK 2,5	1/5			
87	X141N	N		4008190169627	WDK 2,5	1/5		-T1	NL
88									
89									
90									

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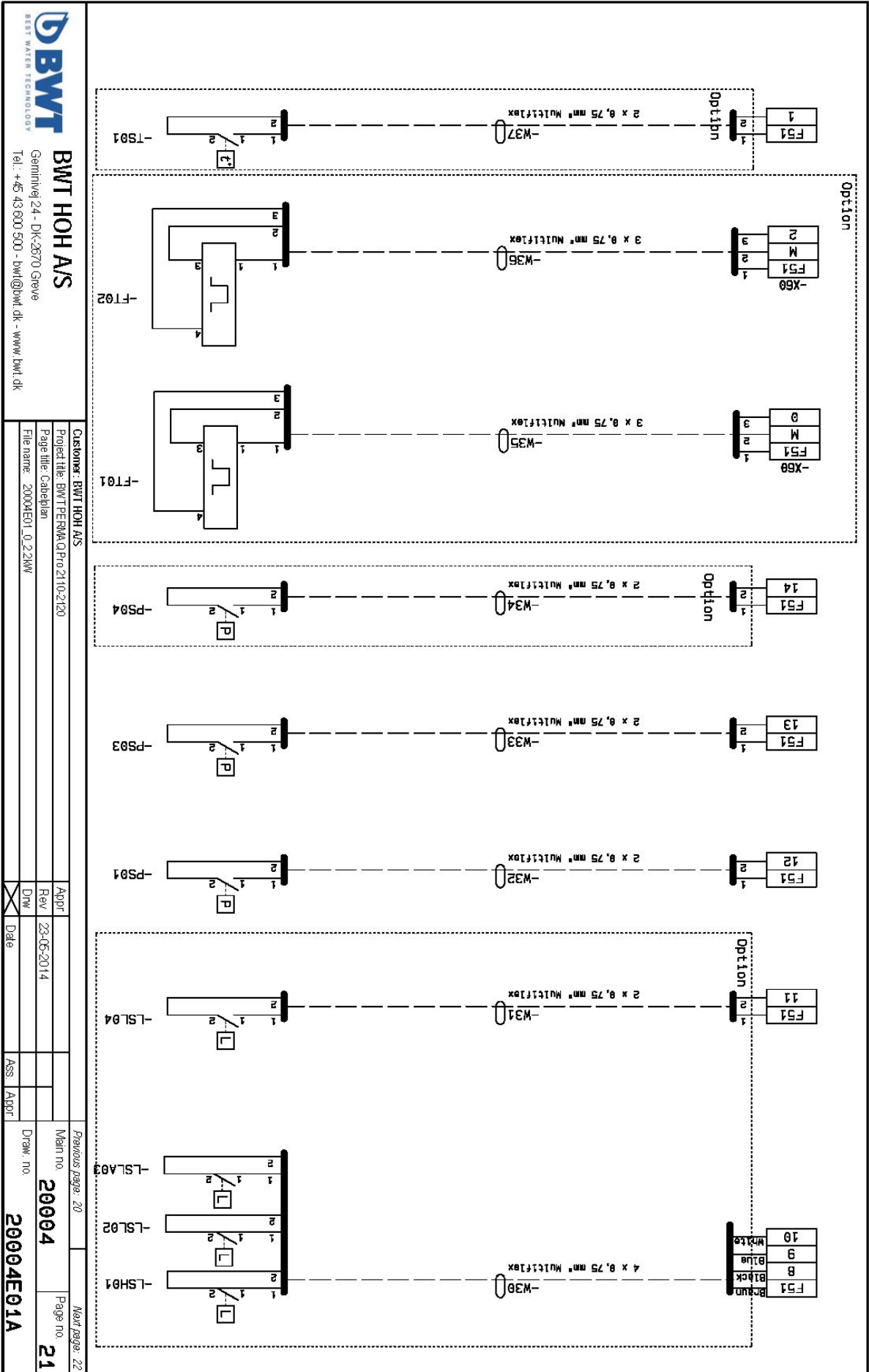
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Page title: Terminal list	Appr	22-05-2014	
File name: 20004E01_0_22kW	Rev		
	Dwg		
	Date		
	Ass.		
	Appr		
Previous page: 17	Main no: 20004	Next page: 19	Page no: 18
	Drawing no: 20004E01A		

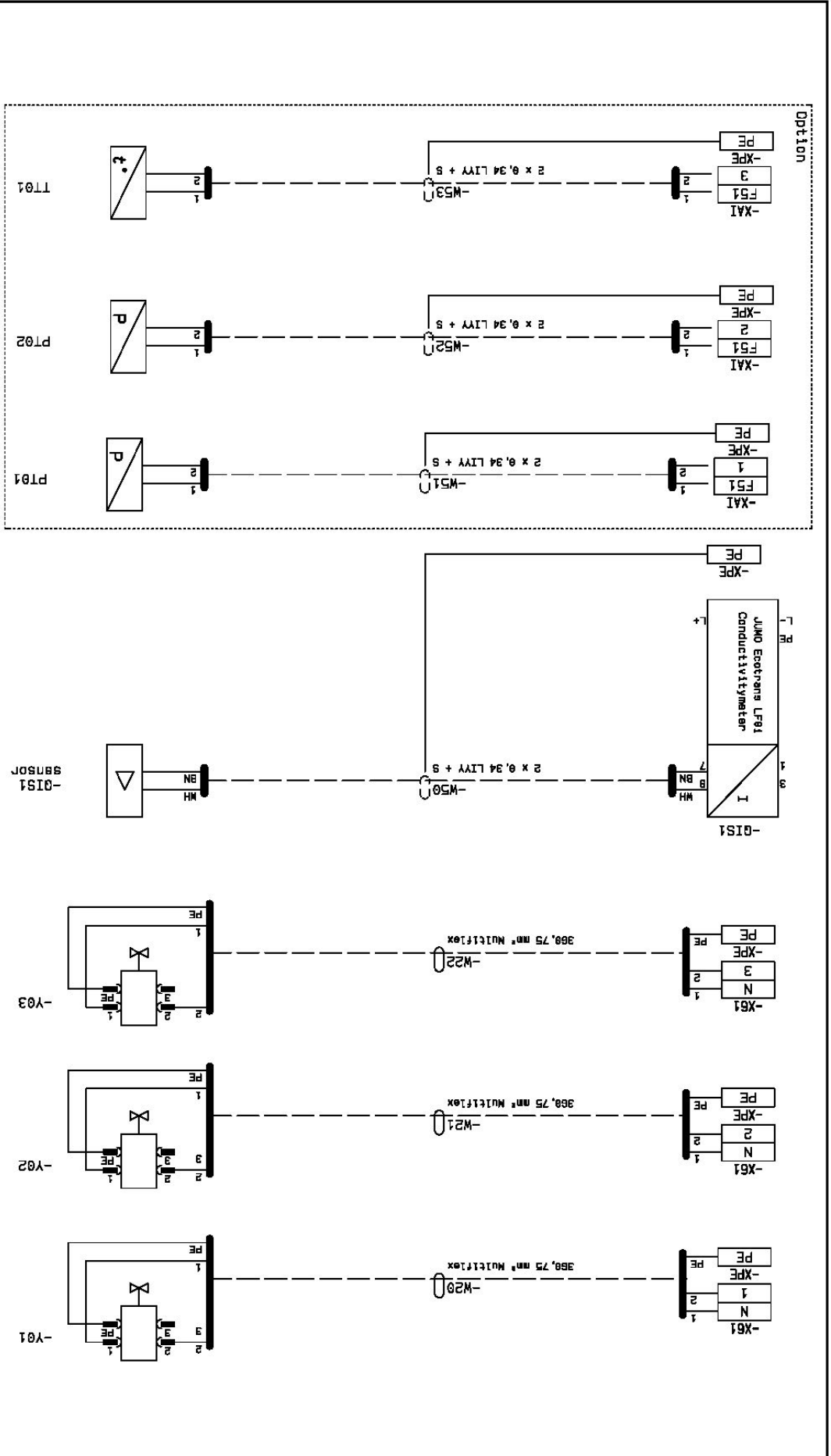
Pos.	Terminal no.	Pin	Function	Part no.	Type	Position	Cable name	To	Pin
91	-XF51	F51		40081901696Z7	WDK 2.5	1/5		-XF51	.F51
92	-XF51	F51		40081901696Z7	WDK 2.5	1/5		-XF51	.F51
93	-XF51	F51		40081901696Z7	WDK 2.5	1/5		.T1	.L+
94									
96	-XF51M	M		40081901696Z7	WDK 2.5	1/5			
98	-XF51M	M		40081901696Z7	WDK 2.5	1/5		.T1	.L-
97									
98	-XPB3	PE		PE-Busbar	PE-Busbar	148			
99									
100	-XPB4	PE		PE-Busbar	PE-Busbar	148			
101									
102									
103									
104									
106									
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Customer: BWT HOH AS		Project title: BWT PERMAQ Pro 2110-2120		Appr	Date	Previous page: 18	Next page: 20
Page title: Terminal list		File name: 2004E01_0.2.2kW		Rev	23-05-2014	Main no. 20004	Page no. 19
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<p>BWT BEST WATER TECHNOLOGY</p>		<p>BWT HOH A/S Gemlinvej 24 - DK-2870 Greve Tel.: +45 43 800 500 - bwt@bwt.dk - www.bwt.dk</p>	
<p>Customer: BWT HOH A/S</p>		<p>Project title: BWT PERMA-Q Pro 2110-2120</p>	
<p>Page title: Cabelplan</p>		<p>Rev: 23-05-2014</p>	
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<p>Date</p>		<p>Date</p>	
<p>Ass: Appr</p>		<p>Ass: Appr</p>	
<p>Previous page: 21</p>		<p>Main no: 20004</p>	
<p>Draw. no: 20004E01A</p>		<p>Page no: 22</p>	

14.9 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:

BWT PERMAQ[®] PRO 2110, 2120, 2130, 2140

- 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/EC)
- EMC Directive (2004/108/EC)

- Place: Greve, Denmark

- Date: 19-09-2014

Signature

Lars Jensen
Head of Product Management



For further information, please contact:

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