PA 605 Purifier System

Installation System Reference

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Contents

1 Technical Data

1.1 Demand Specifications Water

Alfa Laval ref. 574487 rev. 0

Poor quality of the operating water may with time cause erosion, corrosion and/or operating problems. The water shall be treated to meet certain demands.

The following requirements are of fundamental importance:

1 Turbidity-free water, solids content <0,001% by volume.
Max. particle size 50 µm.
Deposits shall not be allowed to form in certain areas in the system.

2 Total hardness less than 180 mg $CaCO_3$ per litre, which corresponds to 10 °dH or 12,5 °E. Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency. These effects become more severe the harder the water is.

3 Chloride content max. 100 ppm NaCl (equivalent to 60 mg Cl/l). Chloride ions contribute to corrosion on surfaces in contact with the operating water.Corrosion is a process that is accelerated by increased separating temperature, low pH, and high chloride ion concentration.

4 6,5 < pH < 9
Bicarbonate content (HCO3) min. 70mg HCO_3 per litre, which corresponds to 3,2 °dKH.

NOTE

Alfa Laval accepts no liability for consequences arising from unsatisfactorily purified operating water supplied by the customer.

1.2 Demand Specifications Air

Specific requirements regarding the quality of air

1 Pressure 500 – 700 kPa.

2 Free from oil, and solid particles larger than 0.01 mm.

3 Dry, with dew point min. 10 °C below ambient temperature.

NOTE

Electrical interconnections must be made by qualified electricians.
Mechanical interconnections must be made by qualified mechanical technicians.

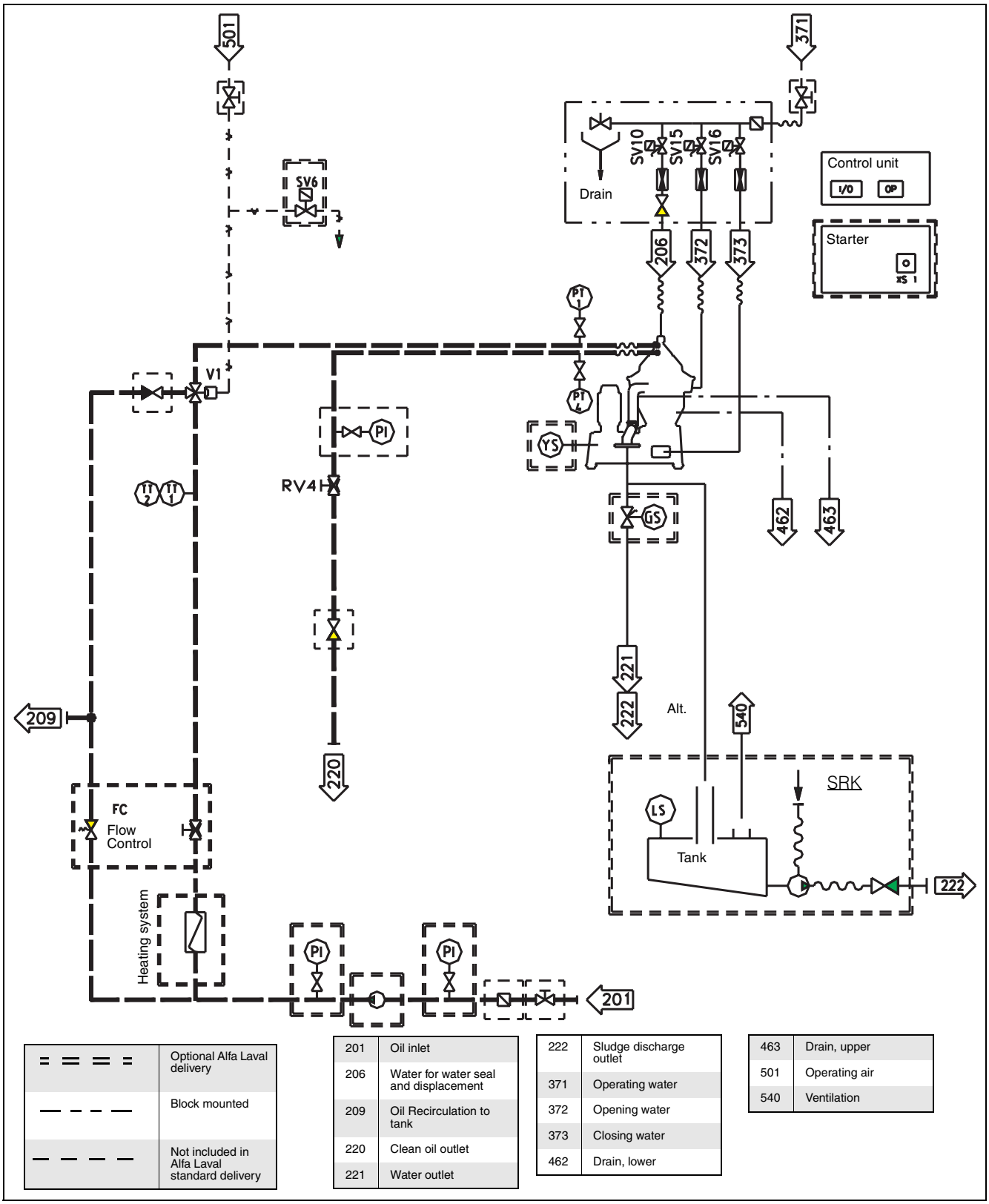
1.3 System Data

Media	Fuel oil and lube oils for diesel engines
Feed density, max.	991 kg/m³ at 15 °C
Viscosity, max.	50 cSt at 100 °C (600 cSt at 50 °C)
Pressure:	
Oil inlet	Max. 4 bar
Oil outlet	Max. delivery height 2.5 bar
Sludge outlet from separator	open outlet
Water outlet	open outlet
Feed temperature, max.	100 °C
Ambient temperature	Min. +5 °C, max. +55 °C
Operating water pressure	Min 2 bar, max. 6 bar
Operating water temp.	Min. +5 °C, max. +55 °C (unheated water)
Operating water density	Max. 1000 kg/m³
Operating water flow	to SV10: 8.0 l/m to SV 15: 18 l/m to SV 16: 0.9 l/m
Air quality	Instrument air
Air pressure	Min. 5 bar, max. 7 bar
Discharge volume	1.1 litre
Separator drain connection size	3/4”
Mains supply voltage	3x400/440/480 V ± 10%
Power consumption, control voltage; EPC supply voltage	230 V /110V/115 V/100V ± 10%, 10 A
Control voltage, operating	24 V AC
Frequency	50 or 60 Hz ± max. 5%
Ambient temperature	Max. 55 °C
Control cabinet max. distance from unit	50 m
Storage time before use (with bowl removed)	6 months
Storage temp.	Min. +0 °C, max. +70 °C
Storage humidity	Relative humidity (RH) 10% – 95 % Non Condensing
Enclosure class	Min. IP 54
Service intervals:	Note! Regularly check connections. Tighten if necessary.
Separator	Inspection every 2000 hours or 3 months operation Overhaul every 8000 hours or 12 months operation

Separation System Planned Maintenance Kits			
Hours	**Period**	**Separator**	**Ancillary Equipment**
1000			
2000			
4000	**6 months**	Inspection	
12000	**18 months**	Overhaul	
24000	**3 years**	Overhaul	
As necessary			Repair (components)
With delivery		Inspection Tools	

2 Drawings

2.1 Flow Chart



= = = =	Optional Alfa Laval delivery
— — — —	Block mounted
— — — —	Not included in Alfa Laval standard delivery

201	Oil inlet
206	Water for water seal and displacement
209	Oil Recirculation to tank
220	Clean oil outlet
221	Water outlet

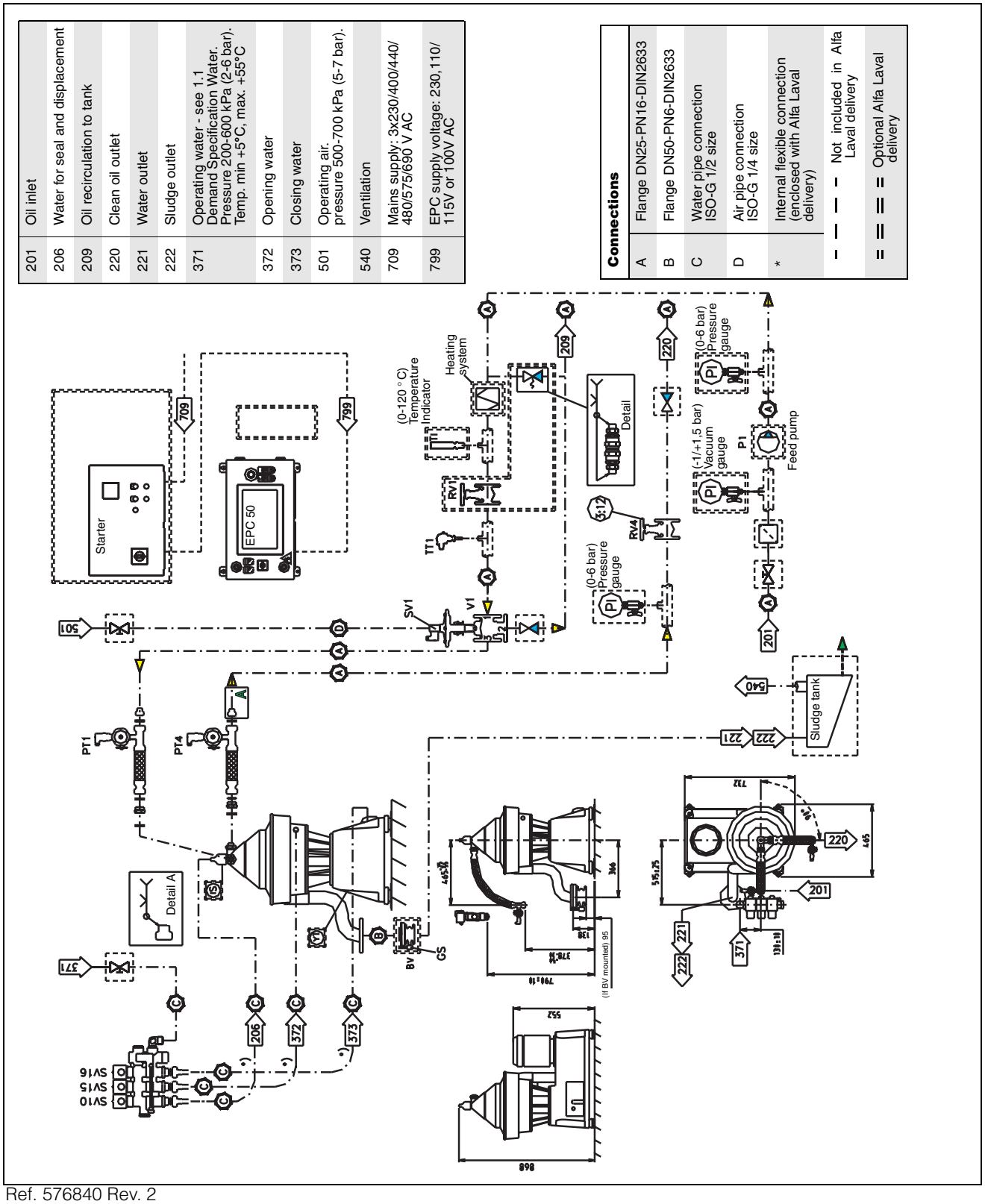
222	Sludge discharge outlet
371	Operating water
372	Opening water
373	Closing water
462	Drain, lower

463	Drain, upper
501	Operating air
540	Ventilation

Ref. 576791 Rev. 1

2.2 Drawings

2.2.1 P 605 Separator Mounting Drawing, DIN

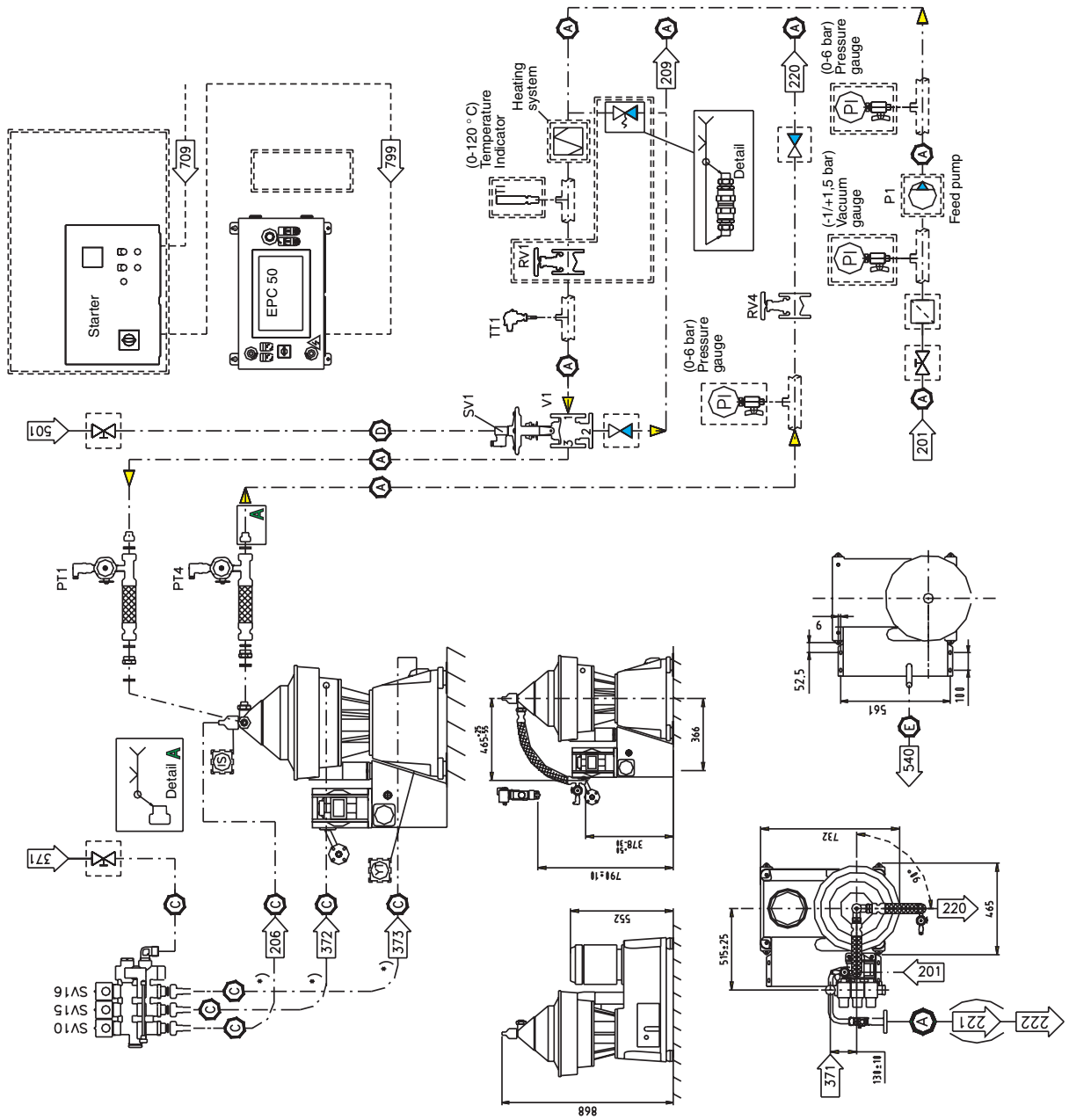


Ref. 576840 Rev. 2

2.2.2 P 605 Separator with Sludge Removal Kit Mounting Drawing, DIN

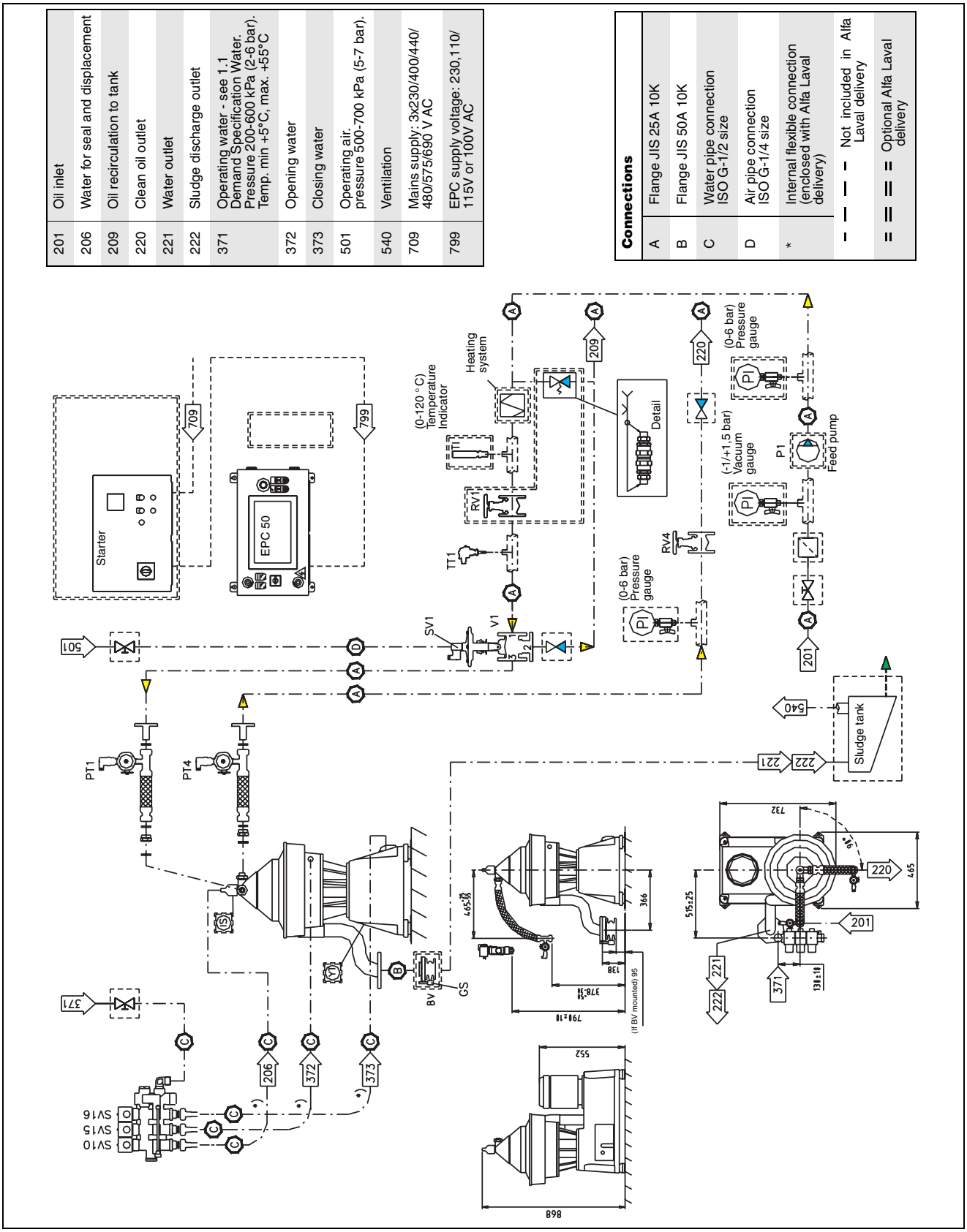
201	Oil inlet
206	Water for seal and displacement
209	Oil recirculation to tank
220	Clean oil outlet
221	Water outlet
222	Sludge outlet
371	Operating water - see 1.1 Demand Specification Water. Pressure 200-600 kPa (2-6 bar). Temp. min +5°C, max. +55°C
372	Opening water
373	Closing water
501	Operating air. pressure 500-700 kPa (5-7 bar).
540	Ventilation
709	Mains supply: 3x230/400/440/ 480/575/690 V AC
799	EPC supply voltage: 230,110/ 115V or 100V AC

Connections	
A	Flange DN25-PN16-DIN2633
C	Water pipe connection ISO-G 1/2 size
D	Air pipe connection ISO-G 1/4 size
E	Ventilation pipe 2" size
*	Internal flexible connection (enclosed with Alfa Laval delivery)
	Not included in Alfa Laval delivery
	Optional Alfa Laval delivery



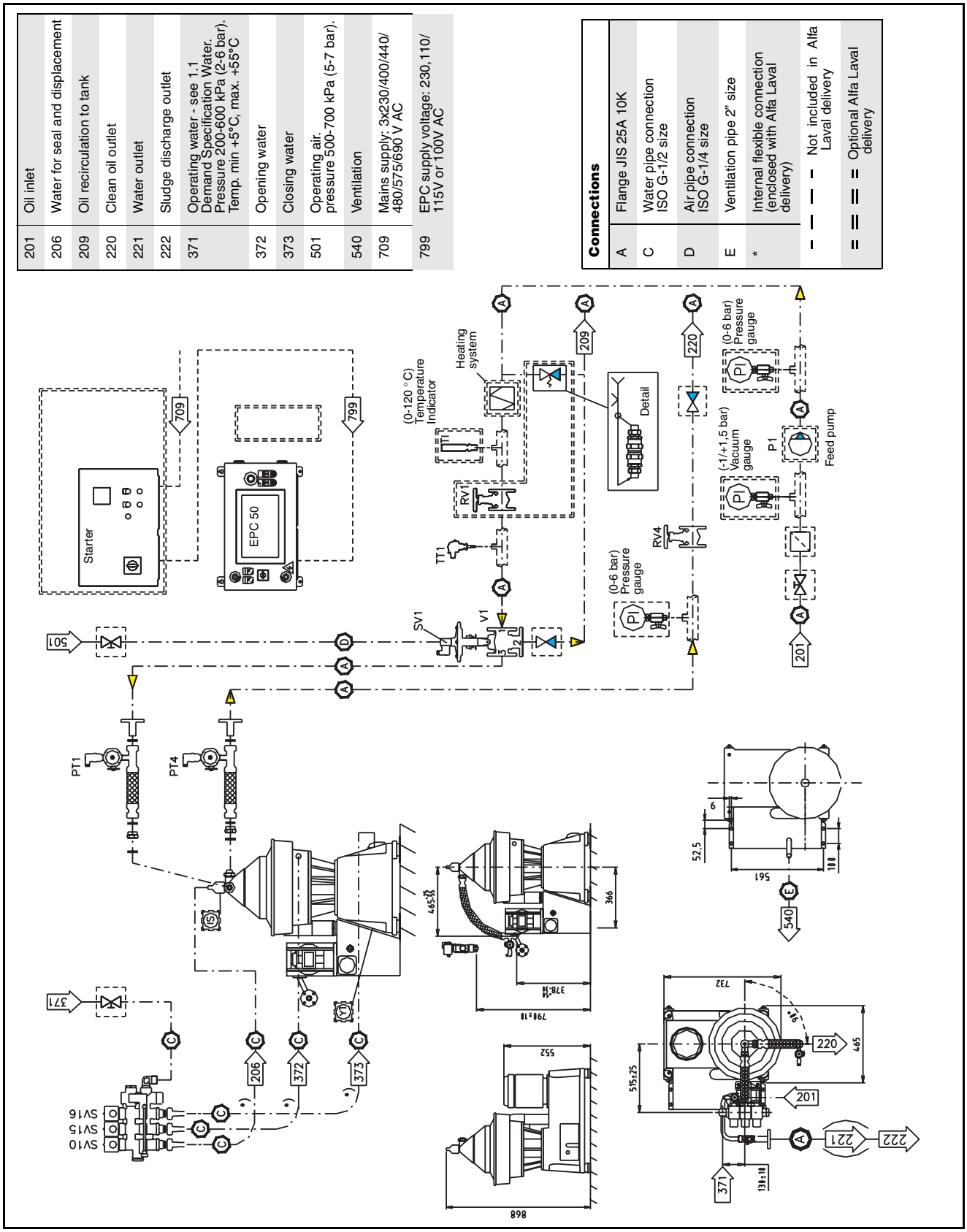
Ref. 578194 Rev. 0

2.2.3 P 605 Separator Mounting Drawing, JIS



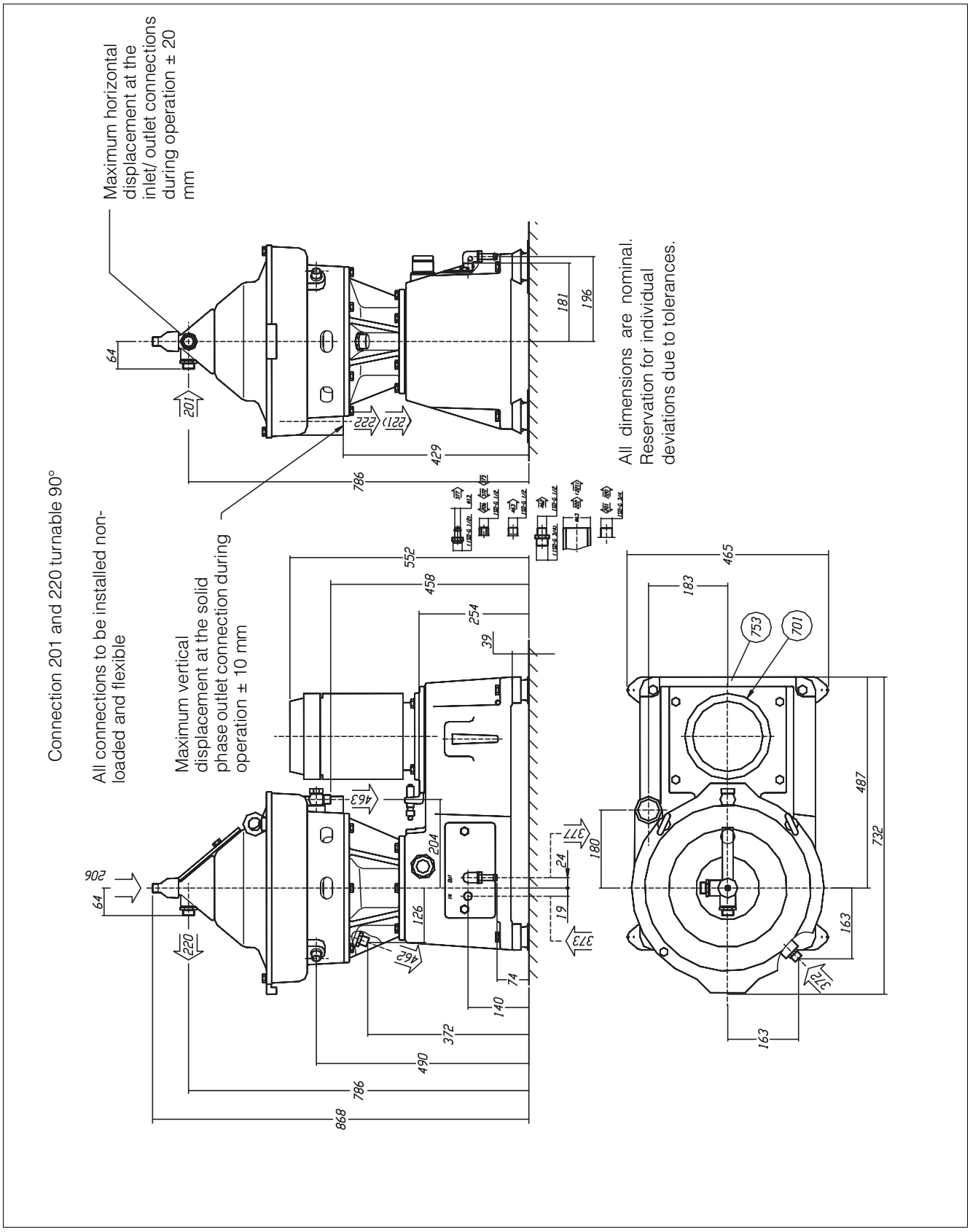
Ref. 576841 Rev. 2

2.2.4 P 605 Separator with Sludge Removal Kit Mounting Drawing, JIS



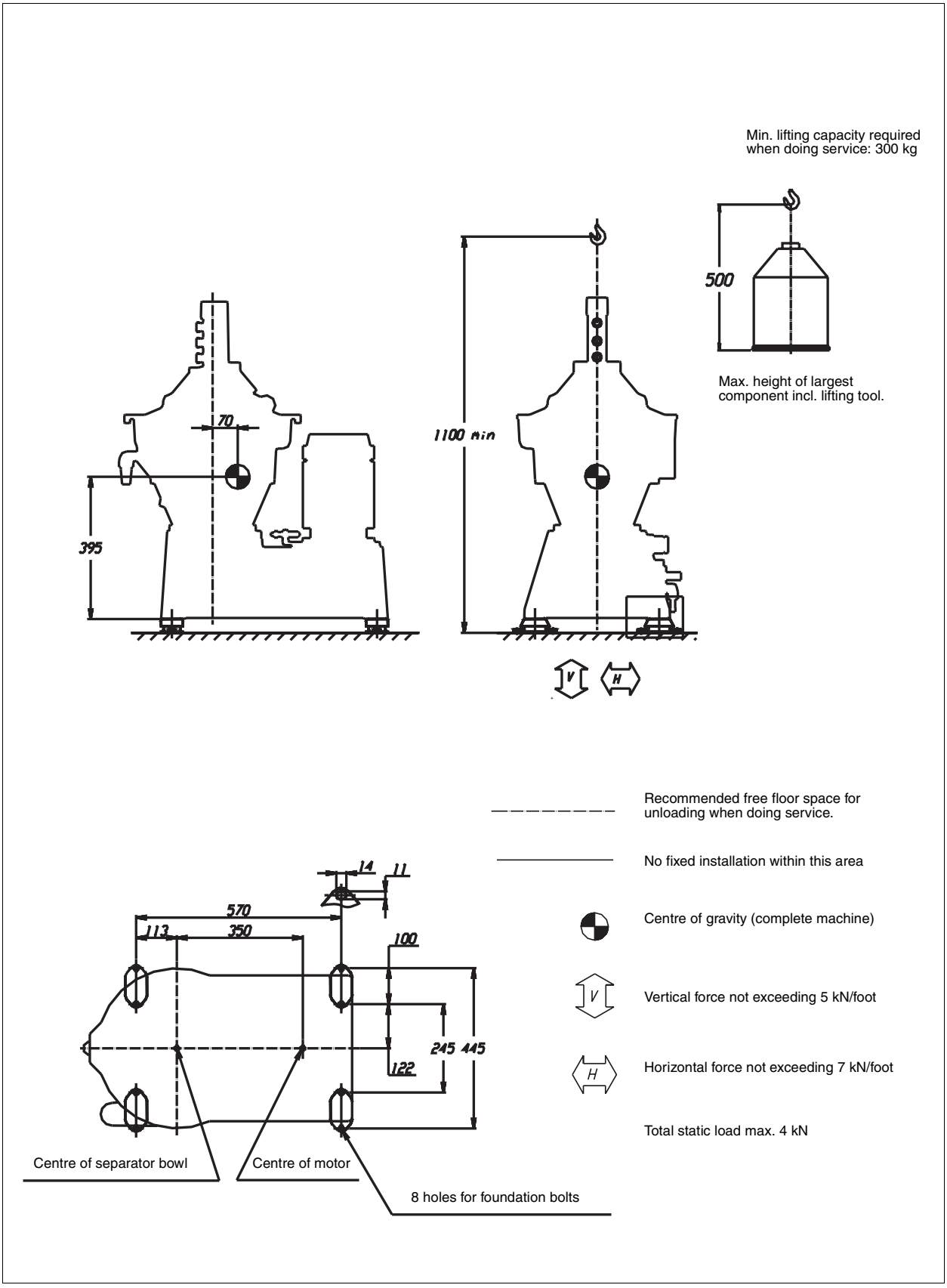
Ref. 578193 Rev. 0

2.2.5 P 605 Separator Basic Size Drawing



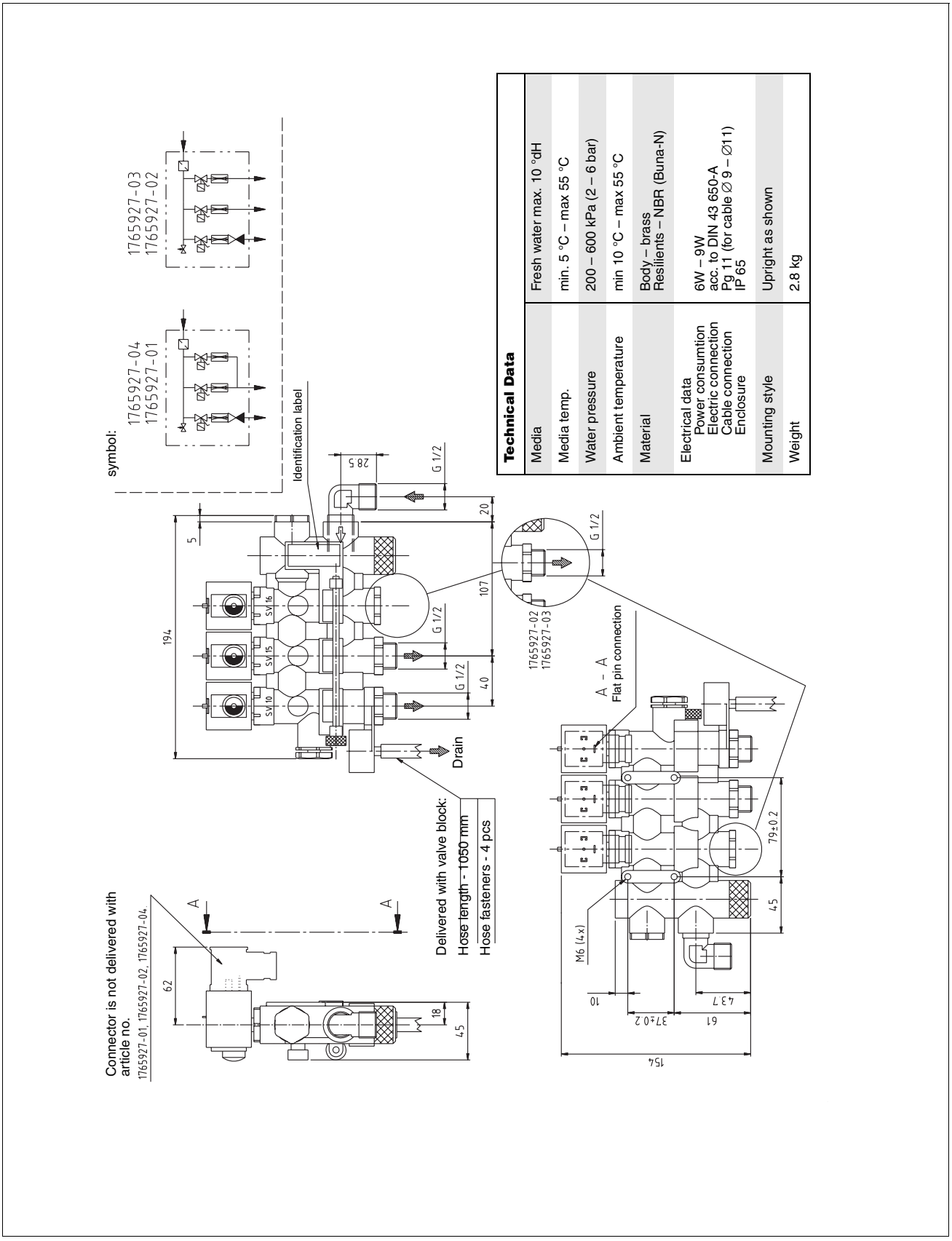
Ref. 565297 Rev. 2

2.2.6 P 605 Separator Foundation Drawing



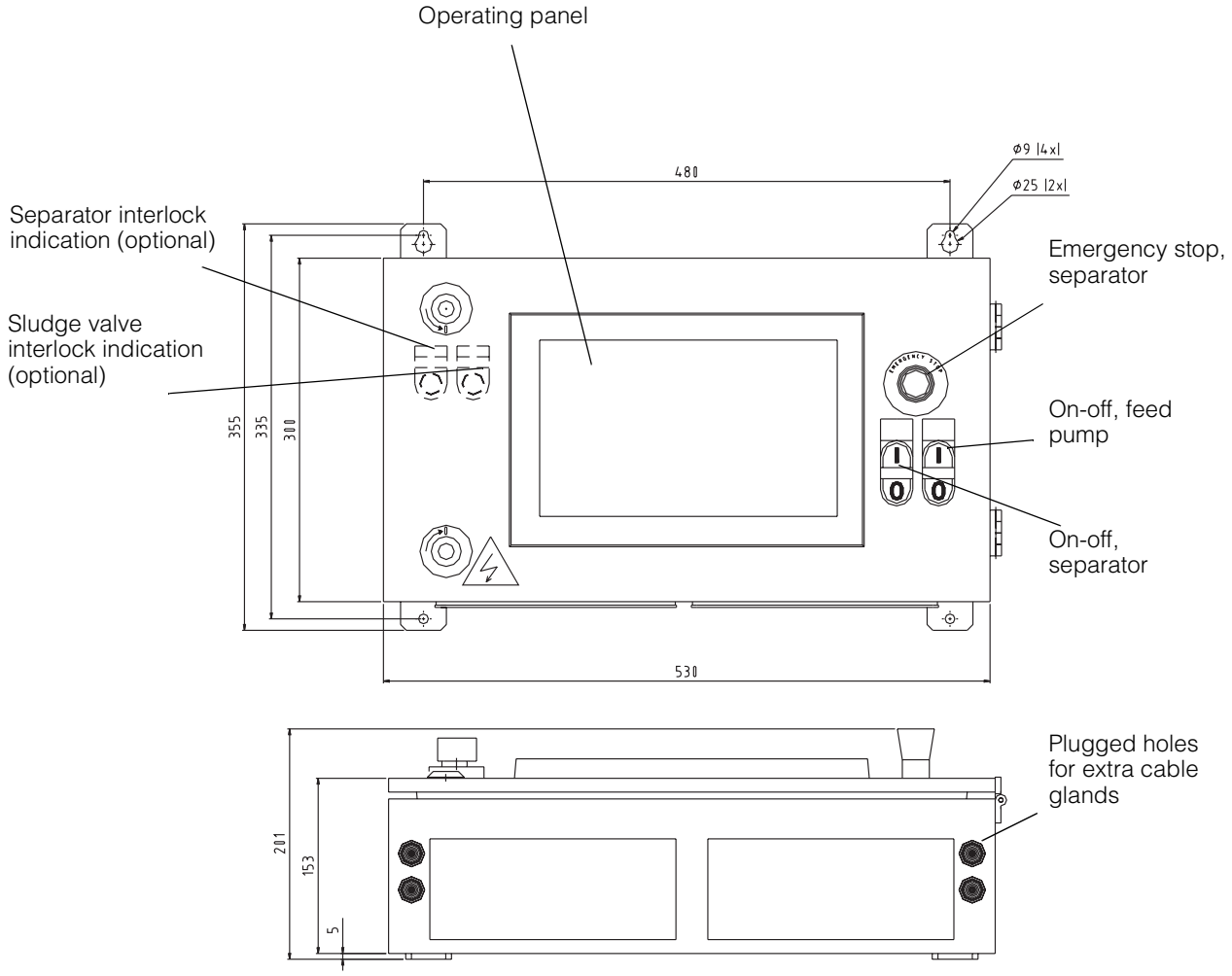
Ref. 548711 Rev. 2

2.2.7 Valve Block Water Dimension Drawing



Ref. 1765927 Rev. 9

2.2.8 Control Unit EPC 50 Dimension Drawing



Technical Data	
Ambient temperature	Max. 55 °C
Protection class	IP 65
Material in cabinet	Sheet steel
Power supply	100,115, or 230 V AC 50/60 Hz
Operating voltage	24 v AC 50/60 Hz
Power consumption	70 VA (+200 VA for I/O)
Weight	19 kg

– – – – Optional

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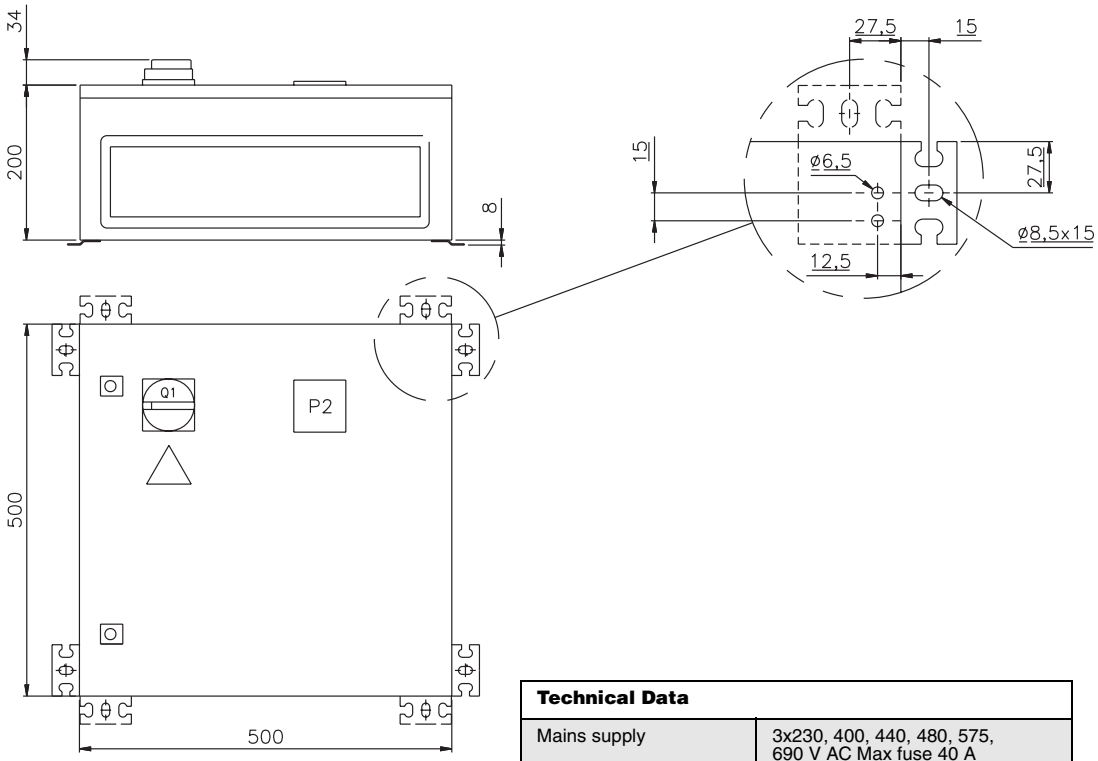
2.2.9 Starter Dimension Drawing



Technical Data	
Mains supply	3x230, 400, 440, 480, 575, 690 V AC Max fuse 40 A
Current ranges	Acc. to order (for separator 2.5 – 16 A and for pump 0.4 – 10 A)
Power supply to EPC	230 V, 300 VA
Weight	25 – 30 kg

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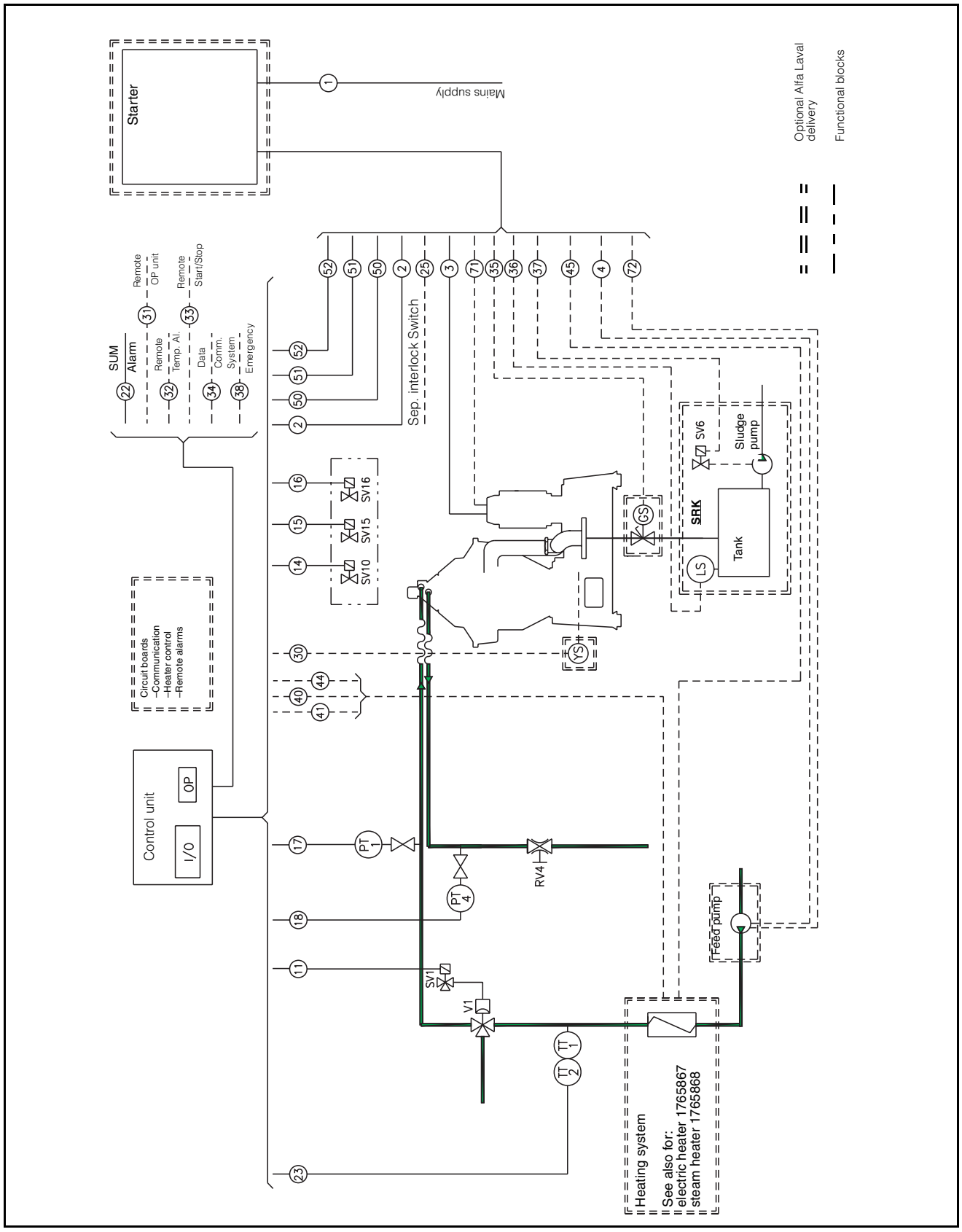
2.3 Electrical System Layout



Ref. 576789 Rev. 1

2.4 Electrical Diagrams

2.4.1 Cable List

No.	Type		Connection point A	Instruction	Connection point B	Remarks
Power cables (currents according to order)						
1	MPRXCX	3x4	Mains supply		Starter	Fuse 20 A
1	MPRXCX	3x10	Mains supply		Starter	Fuse 35 A
2	MPRXCX	2x1.5	Starter		EPC 50	
3	MPRXCX	3x1.5	Starter		Separator motor	2.5 – 6.3 A
3	MPRXCX	3x2.5	Starter		Separator motor	6.3 – 16 A
71	MPRXCX	2x1.5	Starter		Separator motor	
4	MPRXCX	3x1.5	Starter		Feed pump	0.4 – 6.3 A
4	MPRXCX	3x2.5	Starter		Feed pump	6.3 – 10 A
72	MPRXCX	2x1.5	Starter		Feed pump	

Ref. 571356 Rev. 1

No.	Type		Connection point A	Instruction	Connection point B	Remarks
Signal cables						
11	RFE-HF	1x2x0.75	EPC 50		SV1	
14	RFE-HF	1x2x0.75	EPC 50		SV10	
15	RFE-HF	1x2x0.75	EPC 50		SV15	
16	RFE-HF	1x2x0.75	EPC 50		SV16	
17	RFE-HF	1x2x0.75	EPC 50	SSC	PT1	
18	RFE-HF	1x2x0.75	EPC 50	SSC	PT4	
22	RFE-HF	1 x2x0.75	EPC 50		SUM Alarm	
23	RFE-HF	4x2x0.75	EPC 50	SSC	TT1/TT2	
50	RFE-HF	4x2x0.75	EPC 50		Starter	
51	RFE-HF	4x2x0.75	EPC 50		Starter	
52	RFE-HF	1 x4x0.75	EPC 50		Starter	
Options (as ordered)						
25		(PVC 5GO.75)	Starter		SS, Sep.Switch	Included in separator switch
30	RFE-HF	1 x4x0.75	EPC 50		YS, Vibr.Switch	
31	RFE-HF	1 x4x0.75	EPC 50	SSC+EMC	Rem. OP Unit	
32	RFE-HF	1 x4x0.75	EPC 50		Rem. Temp. al.	
33	MPRXCX	5x1.5	EPC 50		Rem. Start/stop	
34	RFE-HF	1 x4x0.75	EPC 50	SSC+EMC	Comm. Module	
35	RFE-HF	1 x4x0.75	Starter		GS, Valve Switch	
36	RFE-HF	1 x2x0.75	EPC 50		LS, Sludge Level	
37	RFE-HF	1 x2x0.75	EPC 50		SV6, Sol. Valve	For pneumatic sludge pump
38	MPRXCX	4x1.5	EPC 50		Syst.Emergency	[1]
40	RFE-HF	4x2x0.75	EPC 50		Power Unit	
45	RFE-HF	1 x2x0.75	Starter		Power Unit	
41	RFE-HF	1 x4x0.75	EPC 50		Steam Reg. Val	
44	RFE-HF	1 x2x0.75	EPC 50		Shut-off Valve	

[1] Cable cannot be longer than 25 meter to avoid voltage drop.

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Other equivalent and approved cables may be used.

Cable areas are calculated with correction factor 0.7.

Cables used are Shipboard Cables, designed according to IEC 92-3.

Flame retardant according to IEC 332-3/A.

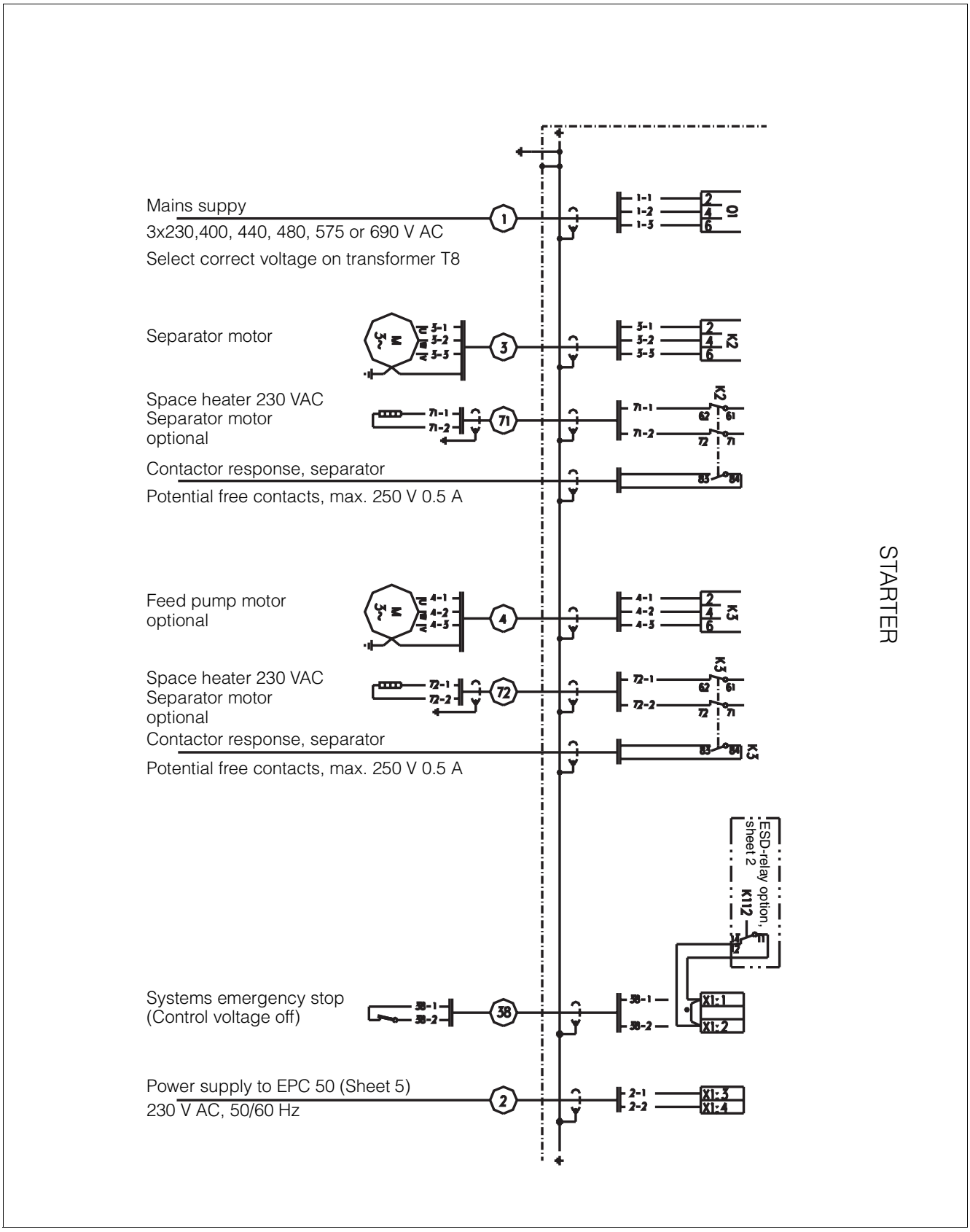
Halogen-free according to IEC 754-1

Code designations for cables obtainable through cable producers Helkama, Finland, and Acatel, France.

Where SSC is indicated it should be a Signal Shielded Cable with the shield properly connected to earth as shown in the electrical drawings.

For other connections, an armoured cable may be used provided the armour is connected to earth, as shown in the electrical drawings, and gives sufficient EMI protection. Copper wire armouring is normally used.

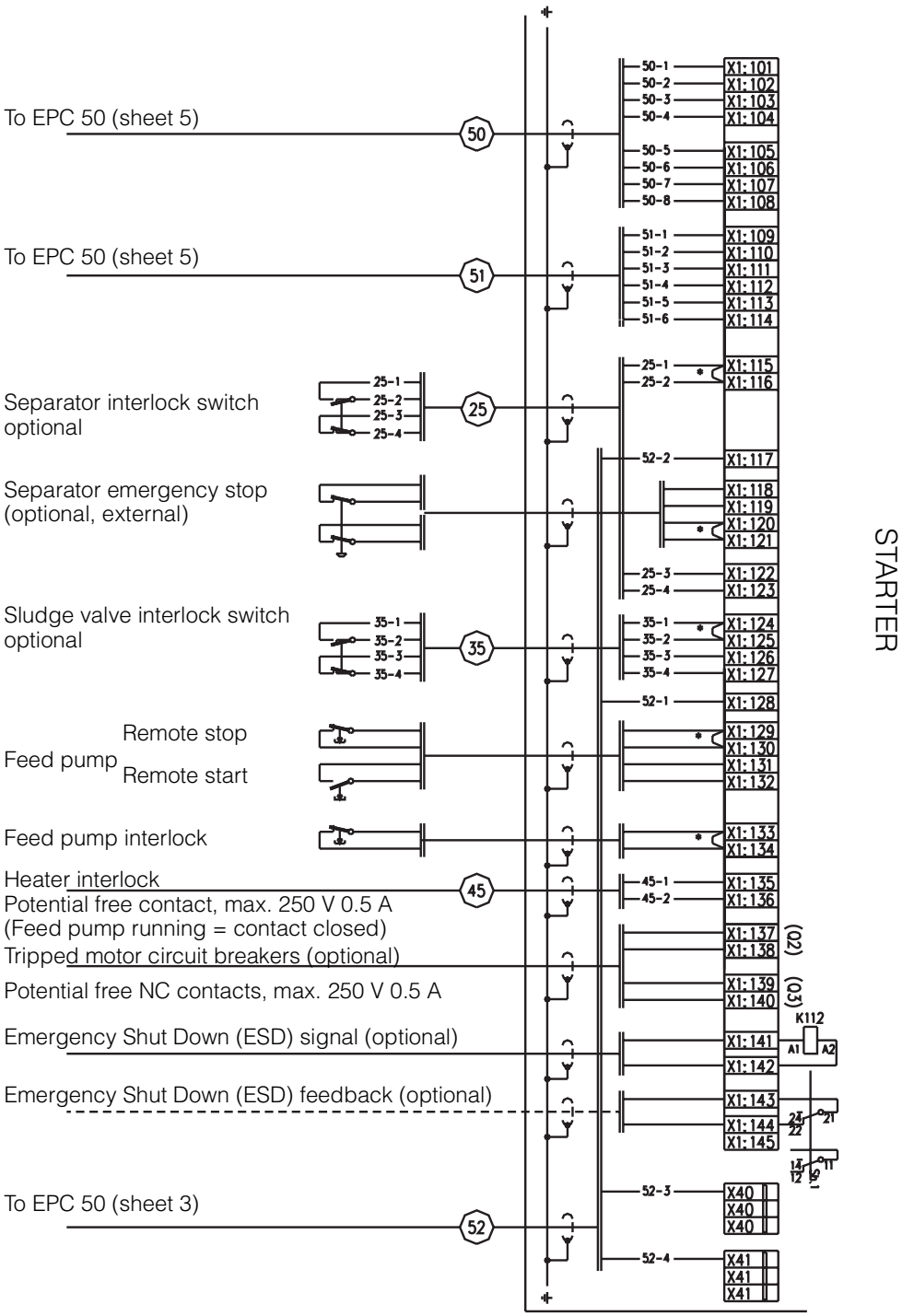
2.4.2 Interconnection Diagram, Starter



Ref. 571072 Rev. 1 Sheet 1

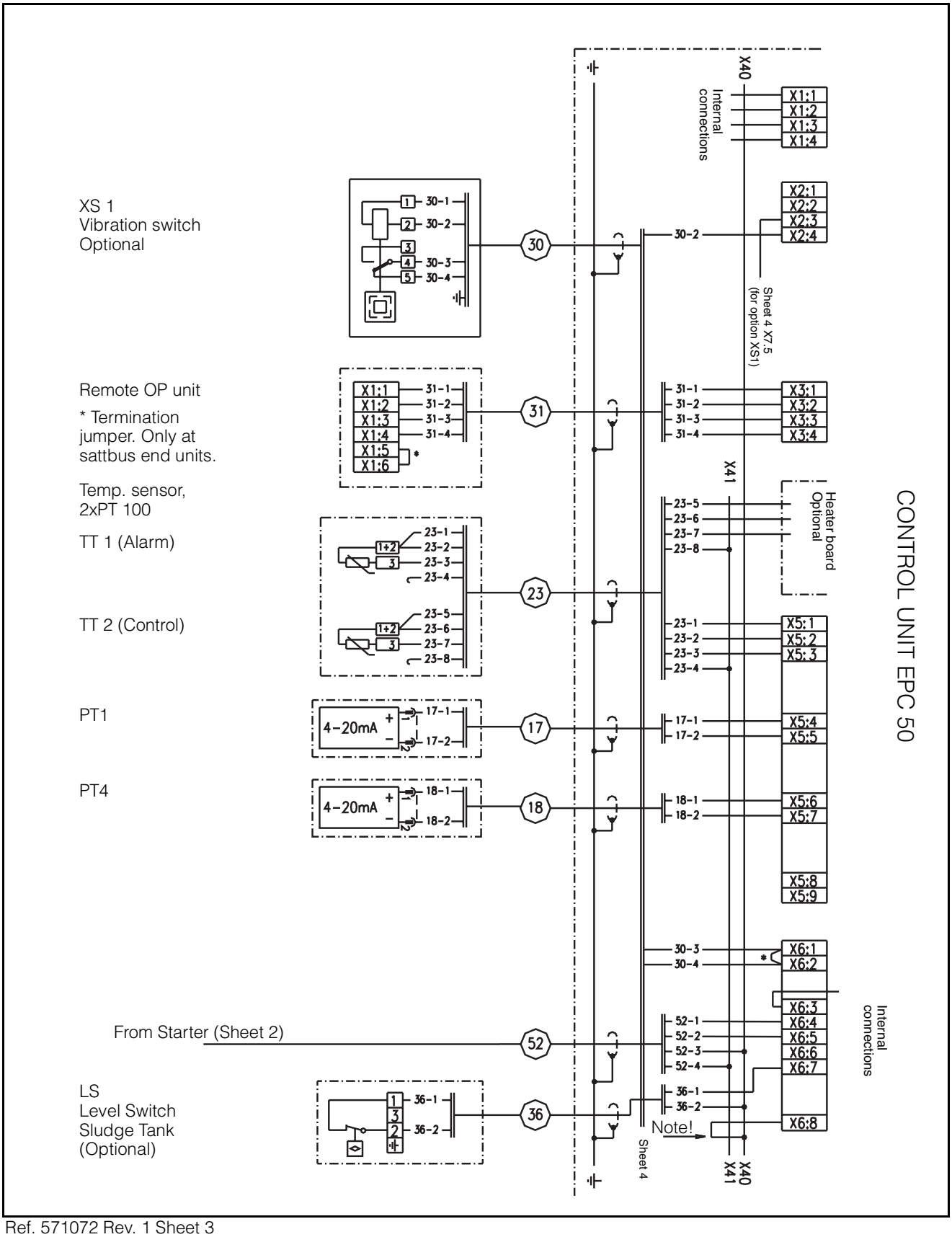
2.4.3 Interconnection Diagram, Starter, cont.

* = Replaces jumper in terminals
** = Internal connections



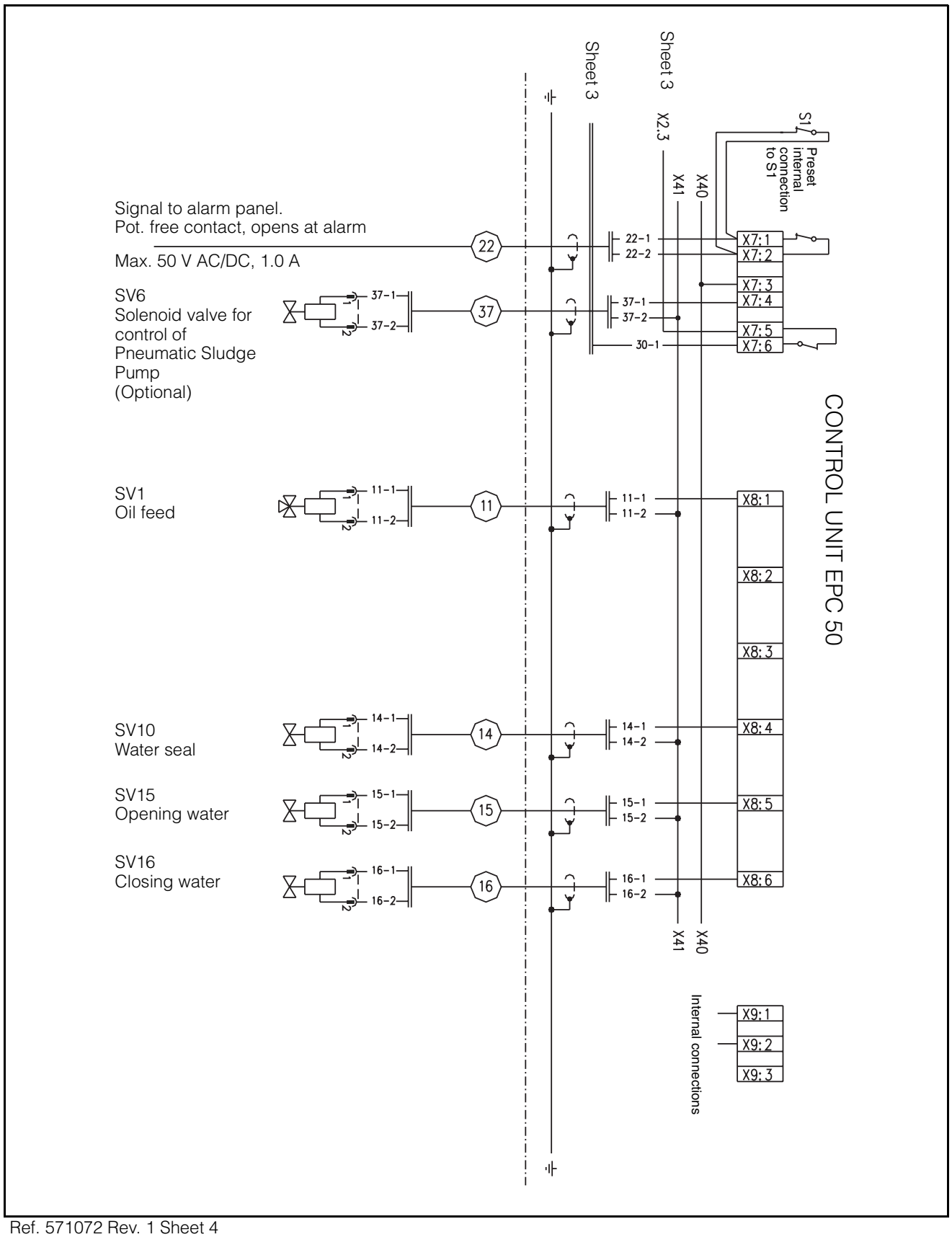
Ref. 571072 Rev. 1 Sheet 2

2.4.4 Interconnection Diagram, Transmitters



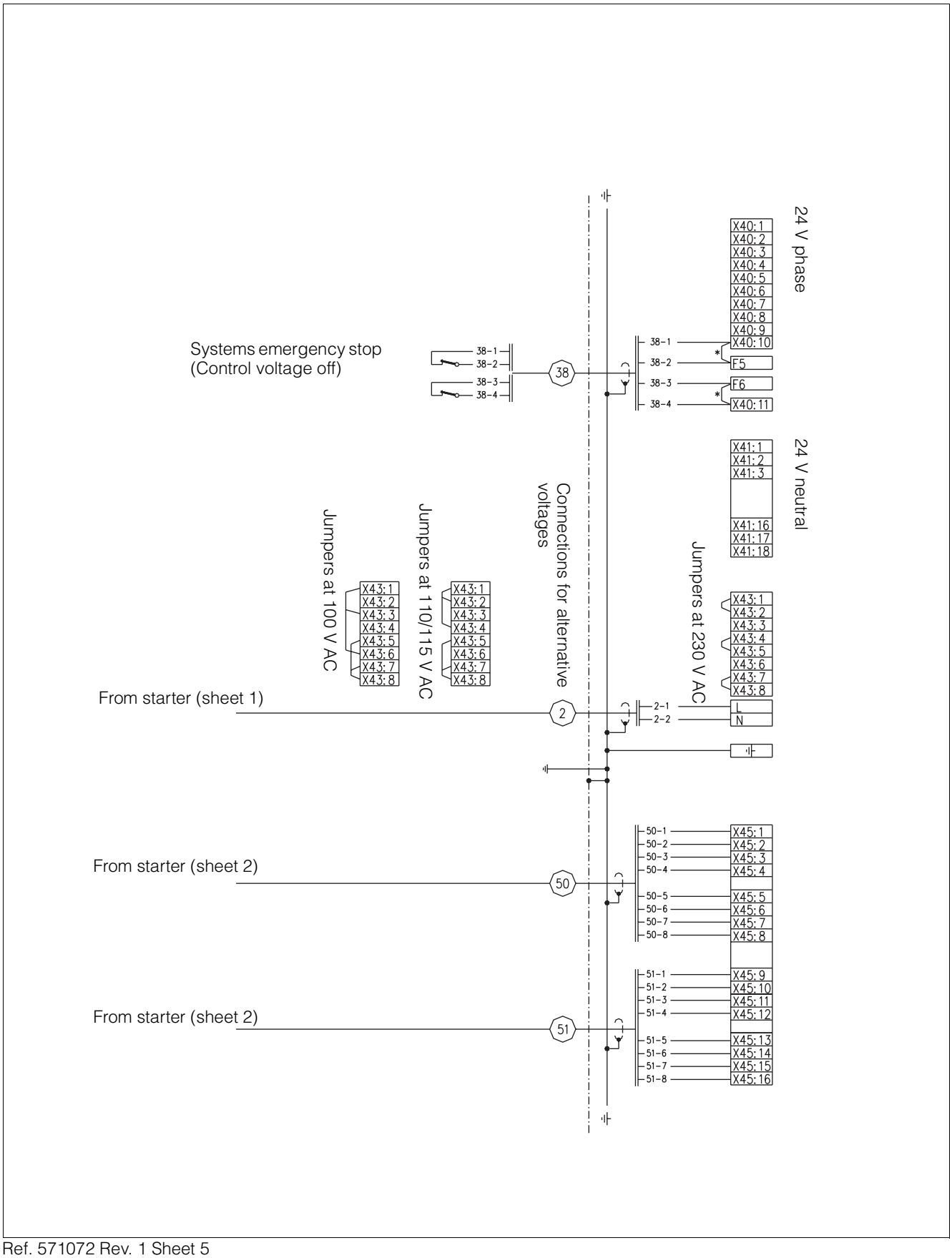
Ref. 571072 Rev. 1 Sheet 3

2.4.5 Interconnection Diagram, Solenoid Valves



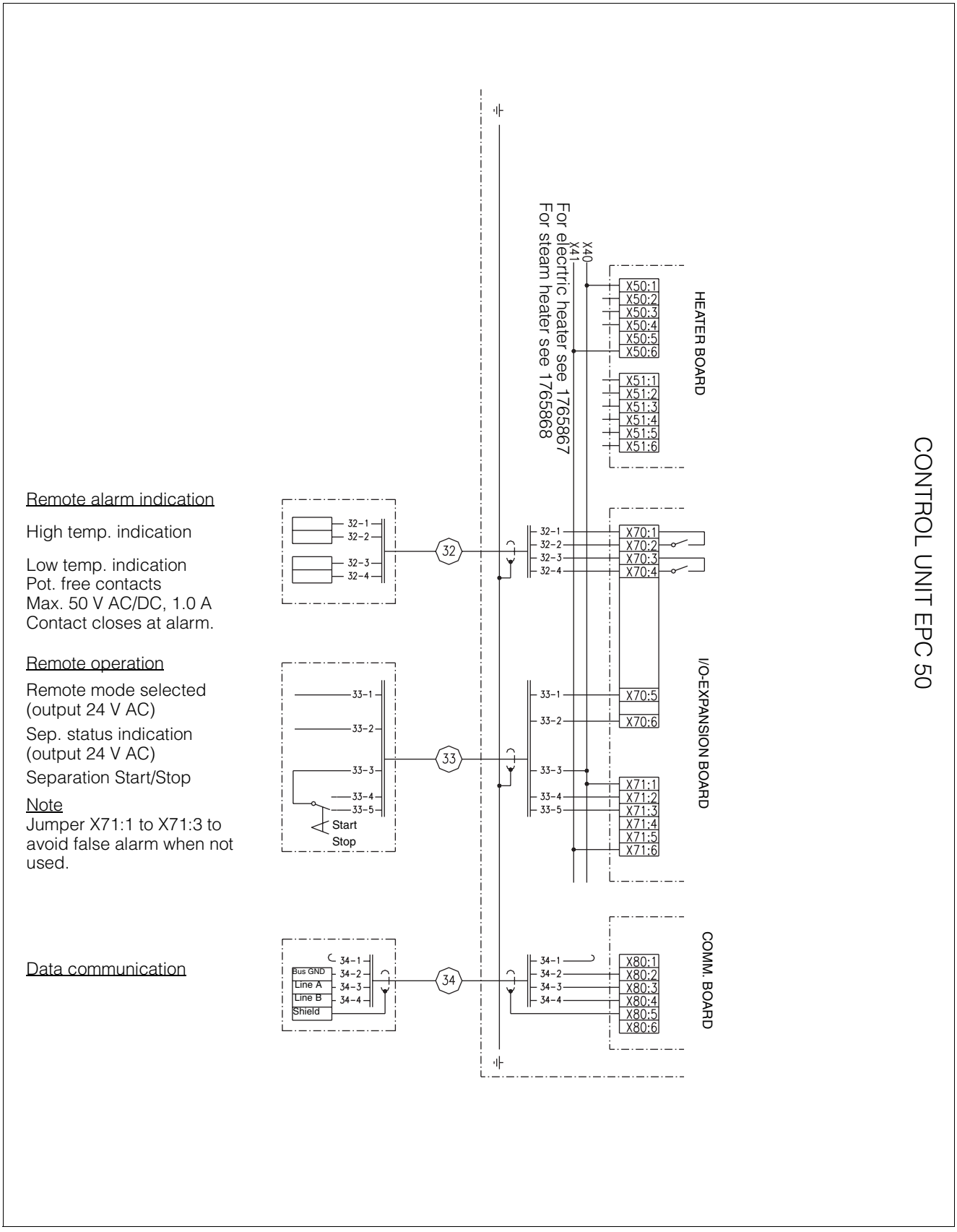
Ref. 571072 Rev. 1 Sheet 4

2.4.6 Interconnection Diagram, Solenoid Valves cont.



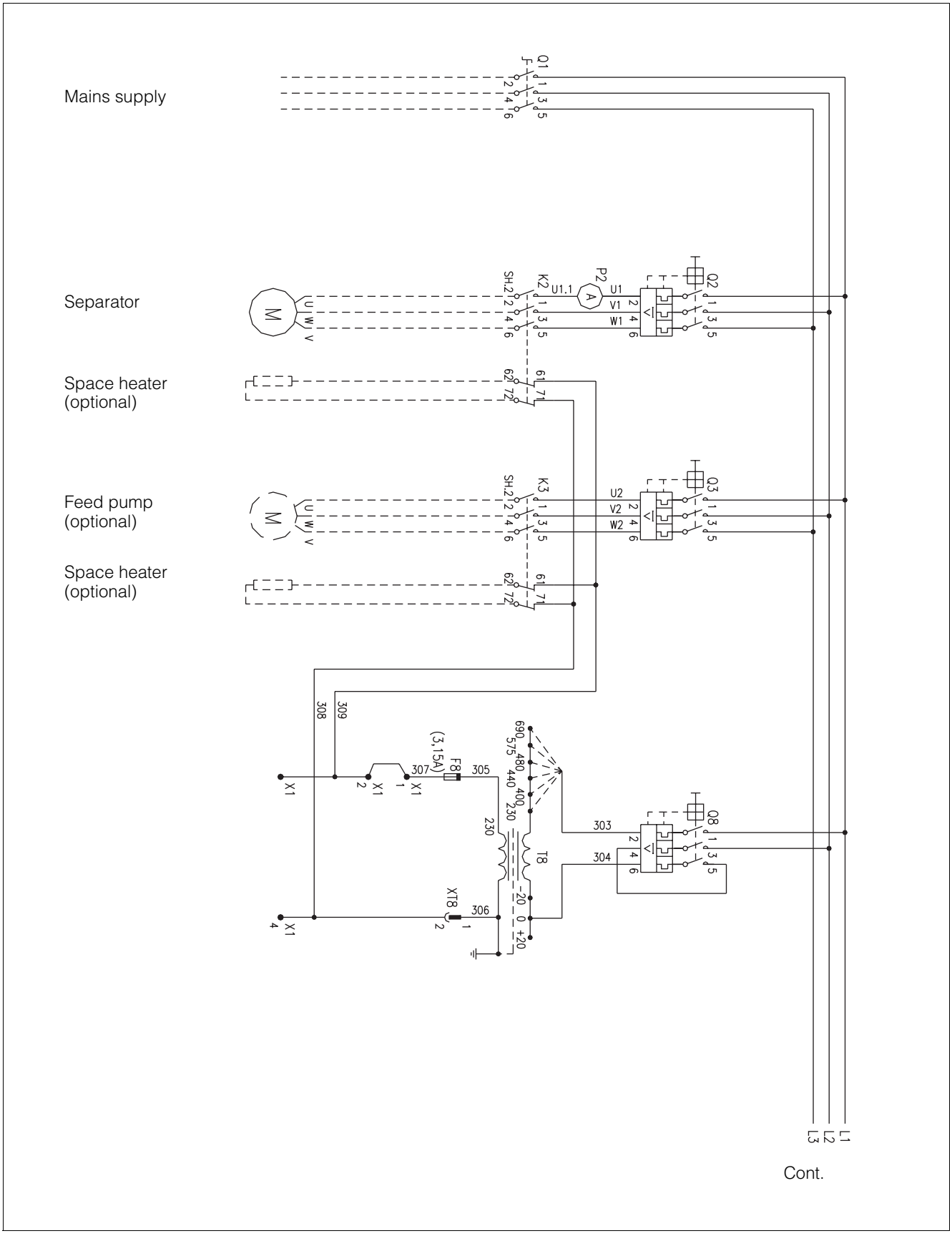
Ref. 571072 Rev. 1 Sheet 5

2.4.7 Interconnection Diagram, Optional Equipment



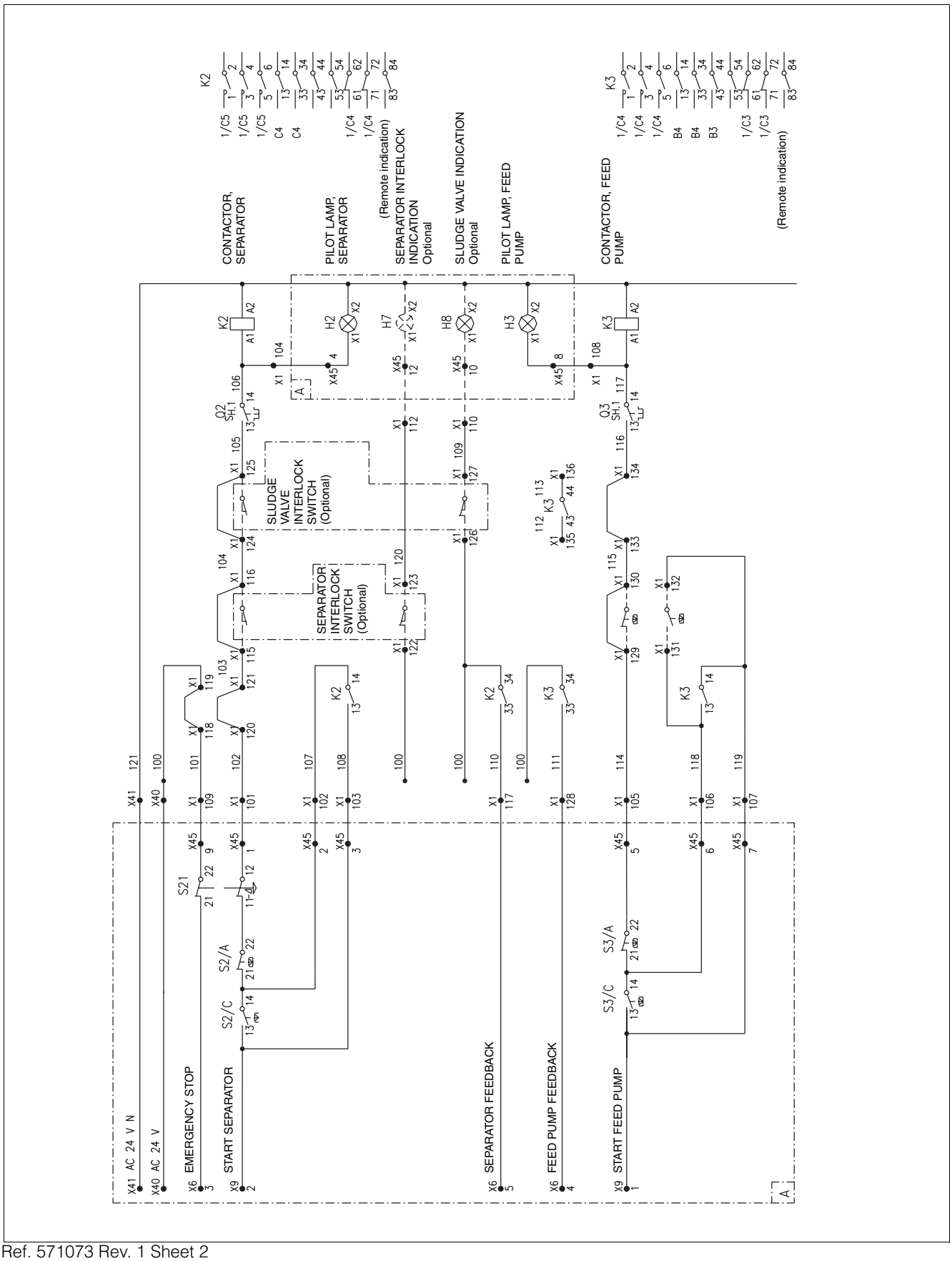
Ref. 571072 Rev. 1 Sheet 6

2.4.8 Circuit Diagram, Power Circuits



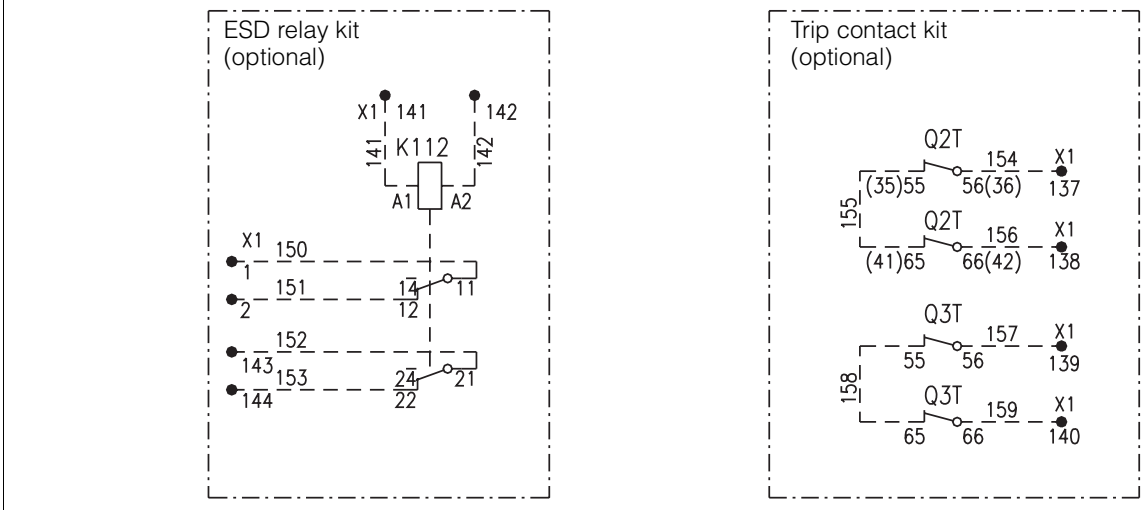
Ref. 571073 Rev. 1 Sheet 1

2.4.9 Circuit Diagram, Separator Starter and Feed Pump



Ref. 571073 Rev. 1 Sheet 2

2.4.10 Circuit Diagram, ESD-relay and Trip Contacts (optional)



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Ref. 571073 Rev. 1 Sheet 3

3 Remote Supervision

NOTE

It is possible to supervise the Purifier System from a remote position. It is, however, not possible to operate the Purifier System from a remote position.

Connection to steering system via PROFIBUS or MODBUS fieldbus systems.

PROFIBUS or MODBUS communication protocol can be used to connect an EPC 50 Control Unit to a central steering system. The EPC 50 Control Unit uses a PROFIBUS DP or MODBUS RTU. Every node, or EPC 50 Control Unit, on the bus has a unique address, and can use 200 bytes for data exchange. An interface board is needed to connect an EPC 50 Control Unit to the respective fieldbus system. This is mounted on the I/O card.

Remote fieldbus connection for EPC 50 Control Unit is for use in those cases where the user wants access to data and operation information from the control cabinet, and supervision and/ or remote control from his own steering system.

Alternative	PROFIBUS	MODBUS
User interface	To be arranged by customer.	To be arranged by customer.
Cable	Cable for PROFIBUS aquired and installed by customer.	Cable for MODBUS aquired and installed by customer.
Manual	Hardware and software instructions exist.	Hardware and software instructions exist.
Board	Part no. 31830-6559-1	Part no. 31830-6558-1

4 Specifications

4.1 Cables

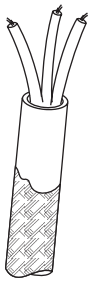
Cable Identification

All cables are marked to simplify identification and fault finding.

Specifications

The following specifications apply to cables connected to and from Alfa Laval equipment. Follow the instructions given in the cable list. Examples of cable types that can be used:

- Steel armoured cable.



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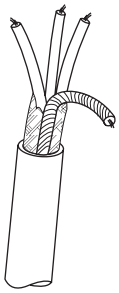
- Copper armoured cable with a separate earth core.



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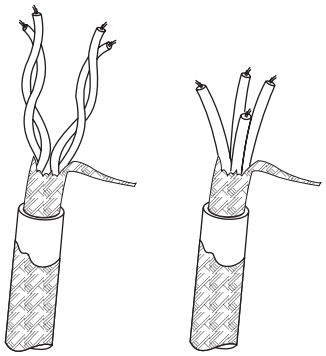
- Steel armoured and shielded signal cable; pair twisted or parallel.



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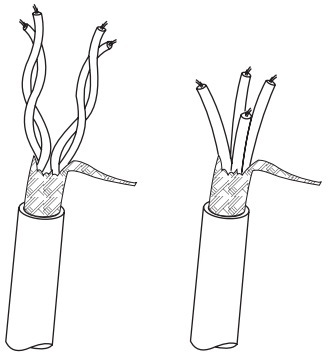
- Shielded signal cable; pair twisted or parallel.



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4.2 Cable Routing

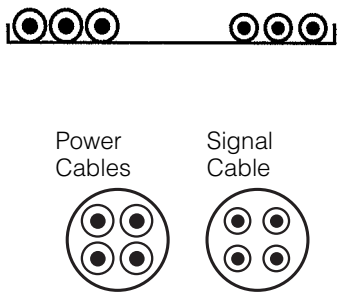
Recommendations

Power cables carry the power supply to motors, heaters, etc.
Any distance between signal and power cables reduces electrical noise transfer.

Examples of recommended routing of various cable types.

- Power cables and signal cables routed on a cable rack should be separated.
- Sattbus cables should be routed away from power cables.

If the space is limited, cables can be routed in tubes.



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4.3 Oil, Water, Steam, and Condensate Piping

For piping to and from Alfa Laval equipment, see the specifications below.

Specifications

- The correct pipe size must be used in the oil system.
- The number of bends in the oil pipes must be minimized.
- The suction height must be as low as possible.
- The oil feed pump must be a displacement type pump.
- The pump must be positioned close to the oil tank.
- The heater must be installed close to the purifier unit to maintain correct feed oil temperature.
- The recirculation line should be connected either directly to the settling tank (HFO) or to the oil outlet line from the separator (LO).
- The oil outlet line from the separator must be connected to the system tank for lube oil, or the service tank for fuel oil.

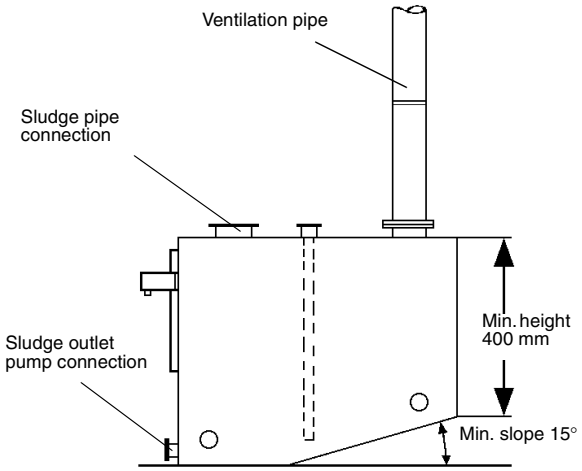
4.4 Ambient Temperature Limitation

Specification

Leading classification societies state in their regulations for engine room equipment that the maximum ambient temperature permissible is +55 °C. To meet this regulation, it is essential that electrical and electronic components have good ventilation, ant temperature control.

4.5 Sludge Tank

- Sludge tank volume per Purifier System should cover approximately up to 2 days storage at a discharge interval of 2 hours (for discharge volumes see technical data).
- A manhole should be installed for inspection and cleaning.
- The tank should be fitted with a sounding pipe.
- The tank floor, or most of it, should have a slope of minimum 15°.
- The sludge outlet pump connection should be positioned in the lowest part of the tank.
- A high level alarm switch, connected to the sludge pump, should be installed.
- A heating coil should be used to keep the sludge warm and fluid while being pumped out.
- Tank ventilation must follow the classification rules for evacuation of gases.
- There should be a ventilation pipe to fresh air.
- The ventilation pipe should be straight. If this is not possible, any bends must be gradual.
- The ventilation pipe must not extend below the tank top.
- A sludge tank with partition walls must have ventilation pipes in all compartments, or cutouts in the upper edge, to allow vapours to travel through the tank.



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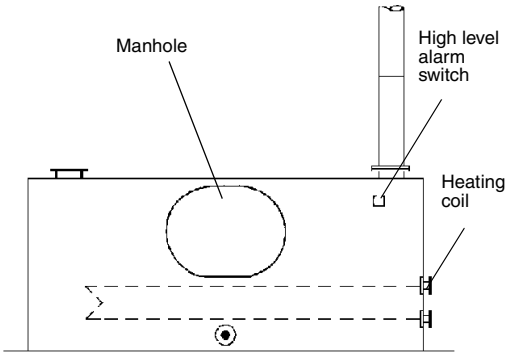

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The number of ventilation pipes, and their minimum dimension, depend on the size and number of separators connected to the same tank. See table below.

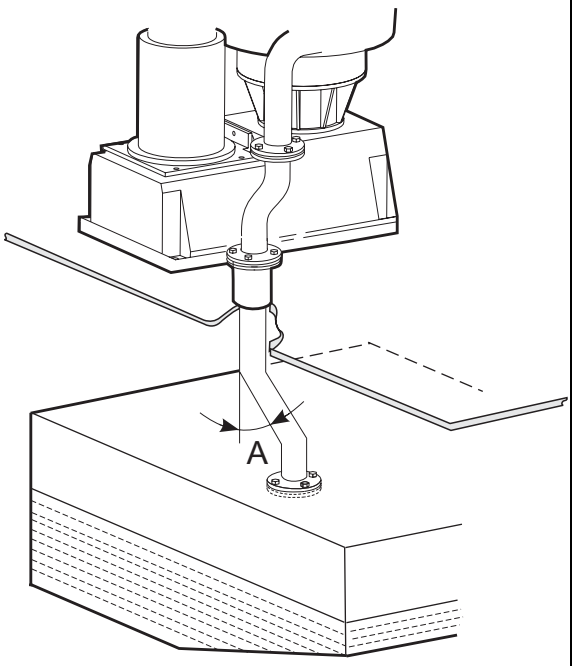
Type	1 system	2 systems
PA 605	1 x ∅70 mm	1 x ∅100 mm

4.6 Sludge Piping

Specification

- The sludge pipe from the separator to the sludge tank should be vertical.

If a vertical pipe is not possible, the deviation (A) from the vertical line must not exceed 30°.



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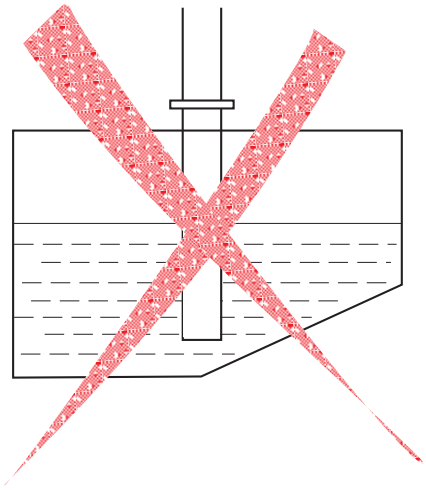
- The sludge pipe must not extend below the tank top.

NOTE

An extended sludge pipe will obstruct ventilation and create back pressure that could cause separator problems.



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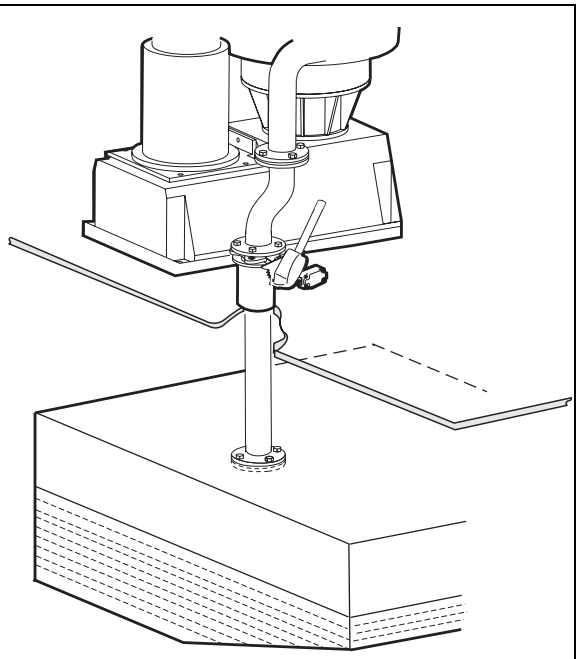
If more than one separator is connected to the same sludge tank, a butterfly valve should be installed in each sludge pipe.

NOTE

If a butterfly valve is not used, the bowl and the operating system may be affected.

- If a butterfly valve is used, it should be equipped with an interlocking switch (connected to the separator starter) to prevent the separator from being started when the valve is not fully open.



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5 Commissioning and Initial Start

5.1 Completion Check List

It is essential *before* starting up the separation system that all units are in good operating condition and that all pipelines and control equipment are properly connected to assure correct operation.

Use this check list as a guide for completing the system installation:

Breakdown hazard

Check that the power frequency is in agreement with the machine plate. If incorrect, resulting overspeed may cause breakdown.

1. Check that transport seals are removed from all pipes.
2. Use flushing filters to prevent pipe work debris from being pumped into the separation system.

The flushing filters must be removed after initial flushing.

3. Check that all separators are in proper working condition. Follow the manufacturer's instructions.
4. Make sure that separators are lubricated in accordance with instructions.

Make sure that the spindle bearings are prelubricated

5. Separators are delivered without oil in the oil sump. For information on oil filling and oil type, see the *Service Manual* booklet.

NOTE

Too much, or too little oil may result in damage to separator bearings.
Neglecting an oil change may result in damage to separator bearings.

6 Power on.

7 Check that the separator rotation direction corresponds with the arrow on the frame by doing a quick start/stop (1–2 seconds.) and looking at the motor fan rotation.

CAUTION

If power cables have been installed incorrectly, the separator will rotate in reverse, and vital rotating parts can unscrew.

8 Check the pump function and direction.

5.2 Initial Start-up

Use this check list for initial system start up:

1 Check that there is oil in the feed oil tank.

2 Check water and air supply. See *"System Data"* on page 6.

3 Check power supplies to the control unit and that the voltage is in accordance with data in *"System Data"* on page 6.

4 Check all parameter settings in the control unit. See *Installation Parameters* in the *Parameter List* booklet.

NOTE

The Control Unit is supplied with standard configuration parameters. You may have to make some changes to suit your installation.

5 Start the separation system as described in the *Operating Instructions* booklet.

6 Start up step by step, checking that the machine and units function properly.

7 Establish system pressures.

The delivery height pressure is the pressure in the oil pipe work down stream from the separation system, due to the pipe bends and the height (head) to the cleaned oil tank. If the cleaned oil tank is below the separation system the delivery height pressure may be very low. The oil paring disc pressure will have to be greater than the delivery height pressure for any oil to flow.
Proceed as follows:

- Ensure the valves in the oil system are in the correct positions.
- The oil should be at separation temperature.

Cont.

- Ensure that V5 is closed.
- Fully open the back pressure regulating valve RV4.
- The shut off valve V4 should be open.
- Open SV15 for 3 seconds to prime the operating slide.
- Open SV16 for 15 seconds to close the bowl.
- Open SV10 for 30 seconds to put water into the bowl.
- Feed oil to the separator at the normal flow rate by opening SV1.
- Note the pressure in the oil outlet PT4, both on the pressure gauge and in the EPC50 display. This pressure is P min.
- Gradually close the back pressure regulating valve RV4. The pressure on PT4 will increase. The water pressure (PT5) decreases slightly as the paring tube moves inwards. The water pressure will suddenly drop when oil passes from the oil paring chamber to the water paring chamber. Note the pressure of PT4 both on the pressure gauge and in the EPC50 display. This pressure is P max.
- Open RV4.
- Stop the oil feed to the separator and note the pressure in the oil outlet. This is the delivery height pressure P del.
- Stop the heater.
- Stop the separator.
- Stop the feed pump when the heater has cooled.

5.2.1 Calculating Operating Pressure

- Calculate the normal back pressure level during operation as follows:

$$\frac{P_{min} + P_{max}}{2} = P_{normal}$$

- Calculate the value for low pressure alarm setting (Pr 11) as follows:

$$\frac{P_{min} + P_{normal}}{2} = P_{low\ press.}$$

- Calculate the value for high pressure alarm setting (Pr 10) as follows:

$$\frac{P_{normal} + P_{max}}{2} = P_{high\ press.}$$

Adjust the back pressure to P_{normal}

Set Pr 11 to give alarm at pressure decreasing below the $P_{low\ press.}$ value.

Set Pr 10 to give alarm at pressure increasing above the $P_{high\ press.}$ value.

6 Shut-down and Storage

Storage before Installation

If the separation system is stored before installation, the following safeguards must be taken:

Storage period	< 6 months	> 6 months	See
Action			
Protect from dust, dirt, water, etc.	x	x	This chapter
Protect with anti-rust oil	x	x	This chapter
Inspection	x	x	*Service manual*
Overhaul		x	*Service manual*

6.1 Shut-down after Use

If the separation system is going to be shut down for a period of time, the following safeguards must be taken:

Shut-down period	< 3 months (stand-by)	3 – 12 months	> 12 months	See
Action				
Remove bowl	x	x	x	*Dismantling and Assembly* in the *Service Manual*
Protect from dust, dirt, water, etc.	x	x	x	This chapter
Protect with anti-rust oil	x	x	x	This chapter
Inspection		x	x	*Service manual*
Overhaul			x	*Service manual*

6.2 Protection and Storage

All system equipment, both the separator and the ancillary equipment, must be stored indoors at 5 – 55°C, if not delivered in water-resistant box for outdoor storage.

If there is a risk for condensation of water, the equipment must be protected by ventilation and heating above dew point.

The following protection products are recommended:

- Anti-rust oil with long lasting effective treatment for external surfaces. The oil should prevent corrosion attacks and give a waxy surface.
- Anti-rust oil (Dinitrol 40 or equivalent) thin and lubricating for inside protection. It gives a lubricating transparent oil film.
- Solvent, e.g. white spirit, to remove the anti-rust oil after the shut-down.
- If the storage time exceeds 12 months, the equipment must be inspected every 6 months and, if necessary, the protection be renewed.

Rubber Parts

- Gaskets, O-rings and other rubber parts should not be stored for more than two years. After this time, they should be replaced.

Separator

Dismantle the separator bowl and take out the O-rings. Clean the bowl with oil and reassemble without the O-rings. Place in a plastic bag with silica dessicant bags and seal the plastic bag.

Grease the spindle.

Valves, Pipes and Similar Equipment

- Components like valves need to be cleaned with solvent and treated with anti-rust oil (type 112).
- Water pipes should be drained and treated with anti-rust oil (type 112).
- Articles made of rubber or plastics (e.g. seals) must *not* be treated with anti-rust oil.

6.3 Reassembly and Start up

- Clean away the anti-rust oil with white spirit.
- Remove the silica gel bags from all units.
- Follow all relevant instructions in the *Service Manual* and *Operating Instructions*.