MADE IN SWEDEN

Electric Steam Boiler L-50-E

The Professional's Choice Since 1935

Installation & operation instructions

Note!

Maintenance of the boiler must be carried out according to this instruction.

All supervision of the boiler must be performed by trained personnel who are qualified specifically to work with boilers and its associated boiler equipment.

Before any activities carried out on the boiler, the maintenance manual and other related information shall be read through and understood.

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Congratulations to your new steam boiler!

You have just purchased an Osby Parca electric steam boiler which we hope you will be completely satisfied with. On the following pages, you can read about how to take care of your boiler.

Save this user manual with installation and care instructions. Your Osby Parca boiler will bring you joy for many years, and all the information and initial assistance you need can be found herein.

To ensure a long and fulfilling relationship with your electric steam boiler, you should sign a servicing contract with your installer.

This will enable the steam boiler to function in good condition for a long time. It will then produce the heat you need – at the lowest total cost – for many years to come.

Contact info sales department:

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SWEDEN

Note: Fill in the information below. This information is valuable if servicing is required.	
Product no 1:	Manufacturer no:
Product no 2:	Manufacturer no:
Installation company:	Tel. no:
Installation date:	Name (responsible):
Electrical contractor:	Tel. no:
Installation date:	Name (responsible):

! If these instructions are not followed during installation, operation and maintenance, Osby Parca's obligation pertaining to the applicable warranty terms and conditions is not binding.

Important to keep in mind!

- Care of the boiler must be done according to the instructions and any appendices.
- Any inspection of the boiler must be carried out by certified technicians who are trained to work with boilers, associated equipment and accessories.
- Prior to any inspection activities being carried out, this user manual and other associated manuals and documents applicable to the equipment must be read in full and understood.

It is of particular importance that the following points are adhered to upon delivery and installation:

- The boiler is equipped with lifting eyes for vertical lifts and jack mounts to be used during transport.
- Remove the packaging and, prior to installation, make sure the product has not been damaged during transport. Report any shipping damage to the transporter.
- Place the product on a stable surface, preferably concrete.
- Remember that a servicing access area of at least 1.2 metres in front of the product is required.
- The product must not be sunk below floor level.

Safety Instructions

The following safety instructions must be taken into account when handling, installing and using the product:

- Turn off the safety switch before performing any work on the product.
- Act carefully since there's always hot surfaces at a boiler in operation.
- When handling the product with lifting eyes or similar, make sure that the lifting devices, eye bolts and other parts are intact. Never stand or walk underneath a raised product.
- Never compromise safety by detaching or unscrewing covers, hoods or other parts.
- Never compromise safety by disconnecting safety equipment.
- Any work in the product's electrical system may only be carried out by a certified electrician.

This device is not designed to be used by persons (including children) with reduced physical, sensory or mental abilities, or persons with a lack of experience and knowledge who have not received guidance or instruction on the use of the device by a person responsible for their safety. Children must be supervised to ensure they do not play with the device.

Recycling

- The packaging must be deposited at a recycling station or with the installation engineer for correct waste management.
- At the end of the product’s life cycle, it must be recycled in a correct way and be transported to a waste station or reseller offering a service of that type. Disposing of the product as household waste is not permitted.
- It is of great importance that the product's electrical/electronic equipment and any other hazardous waste is properly disposed of.

1. General information and installation

1.1 Generell information

Osby Parca L-50-E is a fully automatic electric steam boiler. The heating is done with stainless steel, acid resistant immersion heaters. When using these materials one minimises servicing and maintenance needs. A pressure sensor keeps the boiler's operating pressure constant. The feed water supply is controlled by level electrodes that also switch off the electrodes should the water level be too low. If the water level drops too low, the boiler is turned off. An electrical cabinet is fitted on spacers on one of the long sides of the boiler. All electrical equipment is internally connected and taken to the electrical cabinet.

The model is also known as "Ång-Janne".

1.2 Technical Data

TECHNICAL DATA — LOW PRESSURE BOILER								
Item No.	Type	Voltage (V)	Power (kW)	Steam cap.* (kg/h)	Op. pressure (bar)	Power stage (Amount)	Rec. fuse (A)	Element length (mm)
1003-3	L-50-E**	3 x 400	36	50	0,9	2	63	570

* At a feed water temperature of 50 °C. ** Cabinet is equipped with circuit breaker

DIMENSION AND WEIGHT— LOW PRESSURE BOILER						Service space around the steam boiler		
Item No.	Type	L (mm)	W (mm)	H (mm)	Weight (kg)	in front of cabinet (mm)	along short sides (mm)	above (mm)
1003-3	L-50-E	1275	720	780	145	1200	1000	600

1.3 Location

Place the boiler on a horizontal and stable under layer. There must be free space in front of, at the side and above the boiler for service of electrical heaters, safety equipment etc. Info in table above.

The parts for lifting and transport have to be used when moving the boiler. Should the pressure vessel get damaged during transport or during installation there may occur unforeseen problems and damages.

There must be 1.2 m free space in front of the electric cabinet.

Ambient temperature should not exceed 25 °C. Higher ambient temperatures may lead to damage to electrical equipment.

1.4 Installation - general information

Vessel, electricity and safety equipment are to be installed according to valid standards.

Safety valves, bottom blow, steam pipes and feed water have to be supported well so that forces and momentum are minimized on the pressure vessel's connections. Flange connections are to be retightened in several rounds.

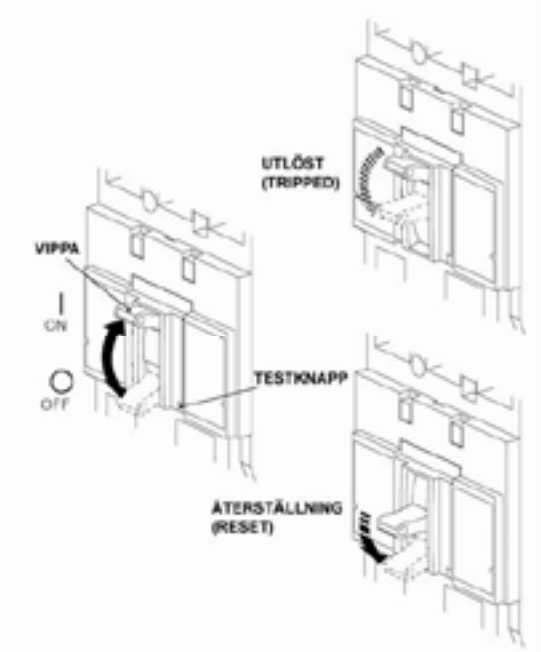
All pressurized pipes and fittings must have at least the same pressure class for which the boiler is intended to be approved.

The pressure vessel can't be filled with water when there is risk of freezing.

1.5 Electrical Installation

- The electrical Installation is to be handled by an authorised electrician and in accordance with valid regulations.
- Main switches are included in the steam boiler's automatic cabinet. The electrical connection is made directly on the upper side of the switch and according to the provided circuit diagrams.
- Before commissioning, inspection and re-tightening of the power cable connections must be carried out for the immersion heaters, current strips and their bolted joints, contactors, incoming phases - zero - earth, and other electrical connections.
- **After approximately 8 hours of operation, all power cables should be checked and secured.**

An authorised electrician should carry out all electrical work and the power has to be turned off when performing electricity work.



1.5.1 Circuit breaker

The boiler is equipped with a circuit breaker which breaks the power when any safety device is released.

The circuit breaker cannot be switched on until the trigge-red safeguard is reset.
Reset is done by pushing the switch (all the way) downwards, see image!

1.6 Pipe installation

1.6.1 Steam piping

- All pressurized pipes and fittings should have at least the same pressure class as the steam boiler. The opening pressure of the safety valves decides the lowest approved pressure material strength. Pressure vessel pipes should be used for steam pipes as a rule. In certain cases, thick wall copper pipes soldered using high temperature solder could be used.
- Please ask for details from the local authority in case of doubt.
- The pipe dimension should be selected in order to keep the steam pipe speed below 25 m/s. When long pipes are used, a larger dimension should be selected in order to keep the pressure loss at a minimum. The steam pipe is connected to the boiler's regulator valve with a drop of at least 0.5% in the steam flow direction.
- All low points and one point before the steam consuming equipment should be equipped with a drain pocket and connected to a condensate diverter.
- Steam connections to steam consuming equipment should be made on top of the steam pipe.
- At the final point of the steam pipe, a manual or automatic de-airing device should be fitted.
- It's vital for the operation safety that all gaskets are sealed. Leakages may lead to person or machine damage.

1.6.2 Exhaust piping

Exhaust pipes from a safety valve should be well braced and be able to divert outgoing steam in a safe way. It should be dimensioned in order to maintain the safety valve's blow down system.

The exhaust pipe should discharge outdoors and straight upwards without U-turn and making sure water collections don't appear. It should be placed in a frost-free place and the low point should be equipped with a drain facility.

1.6.3 Drain piping

From the safety valves, water levels and water pipes, the drainpipes should be drawn to the sewer line. It is recommended that the drain pipes discharge into a heat-protected funnel and from there in a joint pipe to the sewer line.

1.6.4 Feed water

Feed water connection is to be made directly to the steam boiler via a shutoff valve.

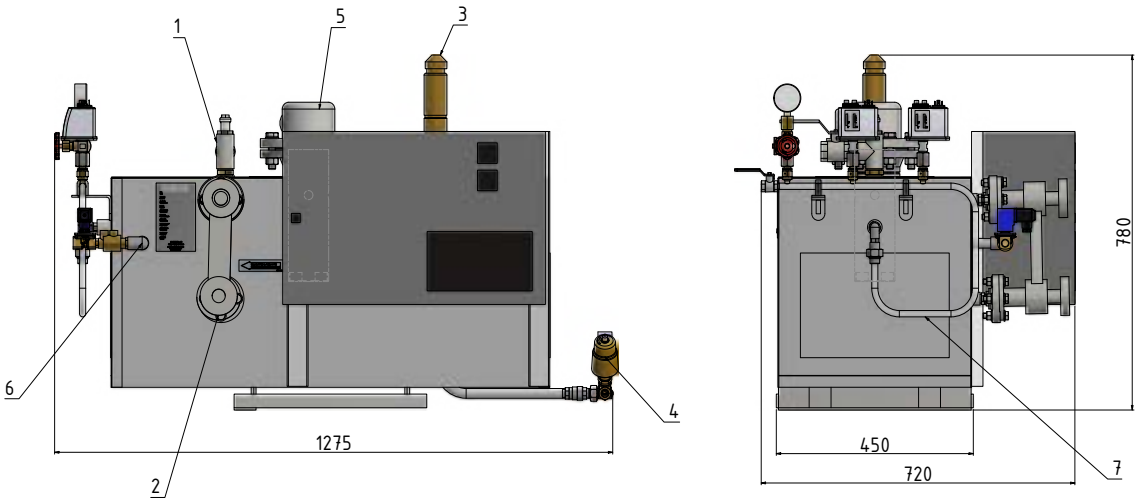
1.6.5 Blow down

When using automatic blowdown a flash tank has to be installed.
When using manual blow down the pipe can lead to a floor drain.

1.6.6 Insulation

Steam pipes normally have a high temperature. They should therefore be well insulated and the covering should be made using AL-sheets or similar. Avoid using plastic materials for insulation.
There are hot surfaces on the boiler, therefore carefulness is vital for avoiding burn wounds.

1.7 External layout L-50-E



1. Steam throttle
2. Level set w. drain valve
3. Safety valve
4. Drain/blowdown
5. Level stand
6. Water replenishment
7. Water pocket tube with pressure switch and pressure gauge

Connection dimensions are specified in the component list chapter 4.

1.8 Inspection

After installation and prior to commissioning, the entire plant should be inspected and tested.

Reinspection according to valid standards and laws is also recommended, to prevent accidents.

All inspections must be carried out by authorized staff.

1.9 Water quality / boiler water

The following requirements apply:

- Boiler water must not contain salt and lime concentrations at levels that may damage the boiler and increase the risk of limescale build-up.
- Water hardness must not exceed 0,1 dH.
- The pH value of the water must not be too low; should be between 8,8 - 10,5.
- The water must not contain sludge or any other contaminants.
- Requirements regarding water quality must always be met. Good water increases the service life of the boiler.

1.10 Steam boiler in storage

If the boiler is not to be used for a longer period, the water must be drained. This can be done, for example, with a wet vacuum cleaner or a drying fan. Since there is a risk of negative pressure in the vessel when draining, an opening should be made, for example, by the electrode stand so that air can enter the boiler.

As an alternative to emptying, you can fill the steam boiler with water all the way up to the top. However, this makes high demands on the water quality (see chapter ”Water Quality / boiler water”) otherwise there is a risk of corrosion on pressure vessels and its contents. Most important is that the ambient temperature is above +5°C. Please find more information at chapter ”Risk of freezing”.

1.11 Risks

1.11.1 Risk of property and personal injury

During operation and during the time that the boiler water is cooling of the pressure inside the boiler are higher than the atmosphere pressure, therefore the temperature is higher than the air temperature. During these circumstances neither the pressure vessel nor the connections can be opened, as this may lead to person or material damage. The boiler has to be turned off and the water must be cooled down before opening.

1.11.2 Risk of freezing

The system must be protected from freezing. Never let the temperature fall below +5°C.
If the boiler is not to be used for a longer period of time the water must be drained. The pressure vessel can’t be filled with water when there is risk of freezing.

2. Operation and maintenance

2.1 Function

The level controller monitors the water level, which also can be seen at the level stand. The solenoid valve fills water from the domestic water supply. A nonreturn valve makes sure that the water doesn't get pressed back from the steam boiler.

If the water level gets to low the low level controller stops the power supply.

The steam leaves the steam boiler through the steam drain to the consumer where the steam is condensated at constant temperature and emits its energy. All condensate is returned to the water feed tank via a steam trap. Non-returned steam is replaced by dilution water.

If a reducing valve is used between the steam boiler and the consumer a more stable temperature is reached and there's also a spare capacity for larger or urgent needs.

Pressure switches starts and stops the power supply to maintain the pressure of the boiler. If the pressure exceed maximum, the power supply is stopped. If the pressure continues to raise the safety valves will open.

By the blowdown the boiler is cleaned from sludge and impurities. The blowdown should be performed daily.

2.2 Safety equipment

Only a summary description of each component is found here. For detail information and desciption of trouble shooting, testing etc - **see appendices!**

2.2.1 Level switch ERK-S2

The level switch is a so called self-monitored low level protection with a redundant, electrical two-channnels solution. The low level protection alarms and stops the process at:

- Low water level around the level electrode.
- Any cable break.
- Isolation error, e.g. contamination on the level electrode.

2.2.2 Pressure switches

Monitors and regulates the pressure of the boiler. One is for the operating pressure and the other for controlling the maximum pressure.

2.2.3 Level controll ER-8

During operation, the equipment monitors low level, high level and pump* start - stop. Indicator lights illuminate for normal water level, pump indication and alarms for high and low level.

The solenoid valve closes/opens when high/low limit is reached. A separate alarm will go off when the high/low limit has been reached. When the level is too low a safety measure will trigger the device.

2.2.4 Safety valve

This safety device is designed to open and relieve excess pressure from vessels or equipment and to reclose and prevent the further release of fluid after normal conditions have been restored.

**In this case the solenoid valve*

2.3 Function of automatic blowdown ERB (optional)

The program controlled bottom blower control works with a programmable time system. The device unit has a relay output to be connected to a bottom blower valve. When the set time is reached, the bottom blower valve opens and closes a number of times over a certain period of time, depending on the set values. When the bottom blowdown is switched on, the green light lights up.

The automatic blow-down is to be configured according to following instruction:

Program period — The time that are to pass between the blow cycles.

Program time — The duration of each blow-down.

Valve closed — The time during which the blow-down valve is closed.

Valve open — The time during which the blow-down valve is open.

Example:

"*The steam boiler is to be bottom-blown each 5th hour.*"

During two minutes every 5th hour a bottom-blow program should occur in 30 second impulses. During each interval the valve should be open 5 seconds.

Configure according to the following specifications:

Program period:	5 hours.	**Program time:**	2 minutes.
Valve closed:	25 seconds.	**Valve open:**	5 seconds.

This configuration now will open the valve in total 4 times every 5th hour during 2 minutes: 25 seconds closed and 5 seconds open. In order to not keeping the operator waiting when testing a new program configuration the program is executed each time that the attendance button is put to the "on" position.

2.4 Commissioning

1. Check that the pipe installations and the electrical installations have been carried out according to instructions and applicable requirements. Check that the regulation and blow down valves are shut. Open the taps on the level stand and the feed water.
2. Turn on the main switch. Turn on the valve via the "operating mode switch" at the control cabinet.
3. Turn on the power via "the power selector". Indicator lights illuminate LW alarm och reg (pump) on the level controller ER-8 (and LW alarm for ERK-S2.) The solenoid valve will now open and fill the vessel. The water level of the sightglass should be 10-30 mm from the top.
4. When the tank is full the valve will close and the red light of the the level controller's LW alarm will turn off. Reset the alarm at ERK-S2 by pressing the reset button. Now the boiler is permitted to put on the heaters.
5. When the boiler pressure increases, check that the pressure gauge switches the power off before the safety valve opens. The pressure gauge is factory set at approximately 0.1 bar below the safety valve opening pressure, which is 1.0 bar.
6. The operating pressure is adjusted using the adjustment knob on top of the pressure gauge. The differential pressure (the difference in bar between activation and deactivation of the power) can also be adjusted. This is done by loosening the front of the pressure gauge and turning the differential pressure knob. Clockwise movement increases the difference, and anticlockwise movement decreases the difference between on and off modes.
7. Now the steam-regulating valve may be carefully opened.
8. Check the water level. Close the taps on the level stand.

2.5 Maintenance instructions

2.5.1 Daily

- Close the steam-regulating valve and shut pff the power when the work is done. Do not close the feed water supply.
- Open the taps on the level stand. Check the water level and then close them again.
- Make sure that there are no leaks.
- IF USING MANUAL BLOW-DOWN: Open the blow down valve for 5 seconds, wait 25. Repeat this cycle four times. (Total: 2 minutes). The blow-down cleaning need depends on the water quality.

2.5.2 Monthly

- Function tests (device tests) of the level controllers ER-8 and ERK-S2.

2.5.3 Quarterly

- Check the safety valves' function manually.
- Open the cleaning tap below the level stand for approx. 5 secs
- Open the cleaning tap on the water pipe for approx. 5 secs

2.5.4 Annually

- Check and secure all power cable connections.
- Check the water quality.
- Clean the level electrodes.
- Check the pressure vessel and the electric immersion heaters.
  - In case of scale deposits the boiler should be cleaned.
  - If there's caustic corrosion damage present, blow-down should be carried out more often, 2 - 4 times per operation pass.
- Check the pressure gauge function.
- Perfom test during operation of the level controllers ER-8 and ERK-S2.

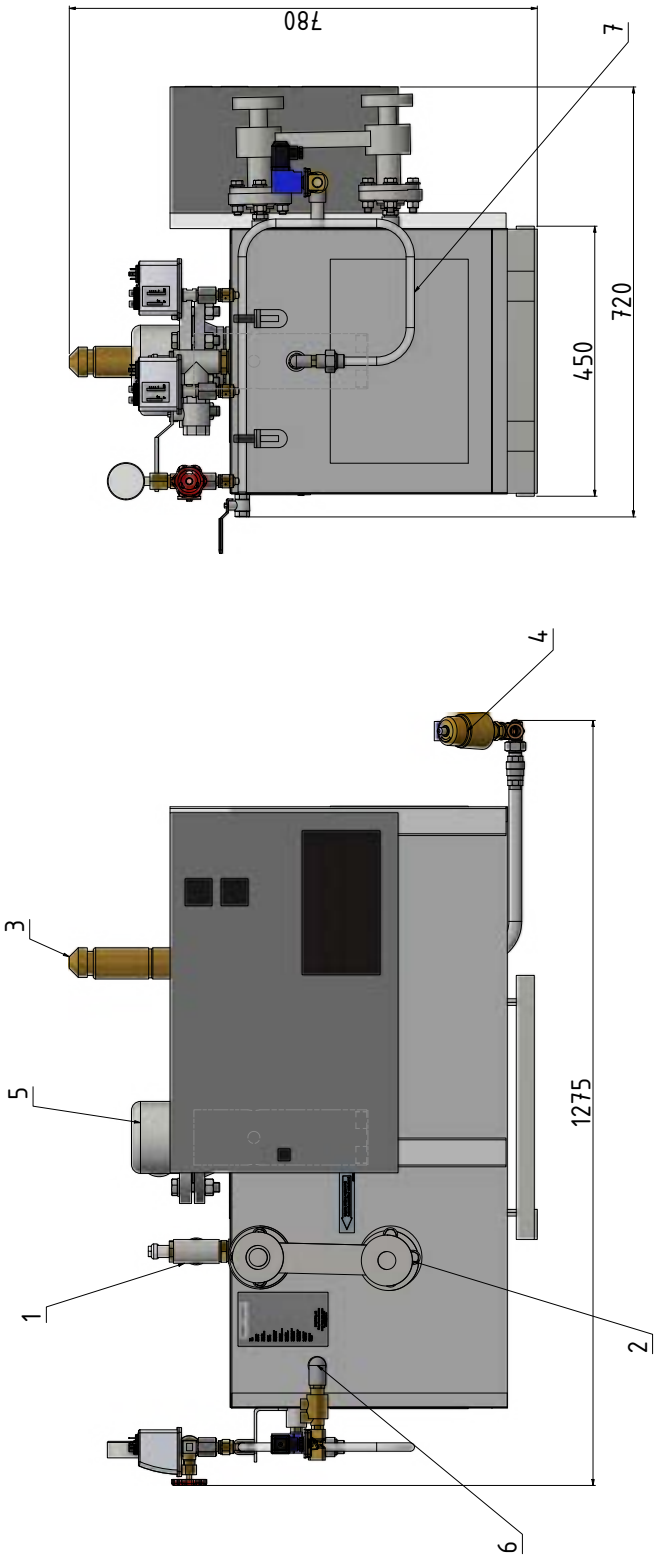
2.6 Troubleshooting (general)

Problem: Boiler overfilled.
Reason: Vacuum occurred when the boiler was started.
Solution: Control the vacuum valve and replace it if needed.

Problem: The level regulation of the pump doesn't work.
Solution: Check the electric connections on the electrode stand.
Solution: Check the regulation unit / level controller.
Solution: Control the electrode(s) and clean them if needed.

Problem: The safety valve opens even though the pressure gauge shows low pressure.
Reason: The water pocket tube is tamped.
Solution: Clean the water pocket tube.

3. Exterior drawing with positions



4. Component list

Pos.	Qnt.	Denomination	Item No.	Material	Dimension	Comment
1	1	**Steam throttle**	3123-0125		1"	
2	1	**Level stand w. drain valve**	3184-2206		DN 20	
		Right handed			c/c = 215 mm	
		2 | Gasket	3411-0111	Grafex	DN 20	
3	1	**Safety valve**				
		1 | Safety valve	3118-0100		1" - 1 1/2"	Set pressure 1.0 bar
4	1	**Blow-down**				
		1 | Ball valve	3123-0115		DN15 PN25	
		For automatic blow-down the following is also included:				Option
		1 | Blow-down valve	3167-0500		1/2"	
5	1	**Electrode stand**				
		1 | Electrode stand	R1000764		DN100 P10-16	(3366-2054 ENT 220 included.)
		1 | Gasket	3411-0118	Grafex	DN100 P10-16	
6	1	**Boiler feed water refill**				
		1 | Nonreturn valve	3121-2280		3/8"	
		1 | Solenoid valve	3352-2090		3/8"	
		1 | Coil	3352-0902			
		1 | Cable plug	3352-0904			
7	1	**Water pocket tube with equipment**				
		1 | Water pocket tube	4155-0163			
		1 | Operation pressure switch	3352-0336		0.1-1.1 bar	
		1 | Maximum pressure switch	3352-0332		0.1-1.1 bar	with reset function
		1 | Pressure gauge check valve	3164-0610		1/4"	
		1 | Manometer	3182-2239		1/4"	0-2 bar, red from 1 bar
		1 | Ball valve	3123-0108		1/4"	
8		**Immersion heaters, total 36 kW**				
		6 | Immersion heater	3311-8004		2"	6 kW, 400 V
		6 | Gasket	3411-7171		74x60x1.5	

5. Appendices

5.1 Electric circuit diagram

The electric circuit diagram comes as a separate appendix.

5.2 External equipment

Detailed manuals for the external equipment (emergency trip, level controls, pressure switches, water level stand and automatic blow-down) are included as separate appendices.

5.3 Certificate of conformity (LVD & EMC)

CE

EU Försäkran om Överenstämmelse (FoÖ)
EU-Declaration of Conformity (DoC)

Osby Parca AB
Box 93
SE-283 22 Osby
Sweden

Intygar att konstruktion och tillverkning av denna produkt överensstämmer med de europeiska direktiven för CE-märkning samt REACH-förordningen enligt nedan:

Declares that the design and manufacturing of this product complies with the European directives for CE-marking and the REACH-regulation as stated below:

- 2014/30/EU EMC
- 2014/35/EU LVD
- EG 1907/2006 REACH

Standarder / Standards

- SS-EN 60204-1 *Maskiners elutrustning / Safety of machinery*
- SS-EN ISO 12100:2010 *Riskbedömning och riskreduktion / Risk assessment and risk reduction*

Installation av komponenter har utförts enligt tillverkarens instruktioner
Installation of components is done according to manufacture instructions

Produkt/ Product	**Elångpanna / Electrical steamboiler**
Modell / Type	**L50-E - H52-E / L50-E - H52-E**
Ritning / Drawing	**R1003070/J**
Projekt / Order	**N/A**

Osby 2024-08-21

Stefan Bondesson,
Teknisk Chef / CTO

OSBYPARCA™ pannor för proffs

5.4 Steam flow velocity in pipe systems

Pres.	Veloc.	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Bar	m/s	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
	15	7	14	24	37	52	99	145	213	394	648	917	1606	2590	3678
0.4	25	10	25	40	62	92	162	265	384	675	972	1457	2806	4101	5936
	40	17	35	64	102	142	265	403	576	1037	1670	2303	4318	6909	9500
	15	7	16	25	40	59	109	166	250	431	680	1006	1708	2791	3852
0.7	25	12	25	45	72	100	182	287	430	716	1145	1575	2816	4629	6204
	40	18	37	68	106	167	298	428	630	1108	1712	2417	4532	7251	10323
	15	8	17	29	43	65	112	182	260	470	694	1020	1864	2814	4045
1	25	12	26	48	72	100	193	300	445	730	1160	1660	3099	4869	6751
	40	19	39	71	112	172	311	465	640	1150	1800	2500	4815	7333	10370
	15	12	25	45	70	100	182	280	410	715	1125	1580	2814	4545	6277
2	25	19	43	70	112	162	195	428	656	1215	1755	2520	4815	7425	10575
	40	30	64	115	178	275	475	745	1010	1895	2925	4175	7678	11997	16796
	15	16	37	60	93	127	245	385	535	925	1505	2040	3983	6217	8743
3	25	26	56	100	152	225	425	632	910	1580	2480	3440	6779	10269	14316
	40	41	87	157	250	357	595	1025	1460	2540	4050	5940	10476	16470	22950
	15	19	42	70	108	156	281	432	635	1166	1685	2460	4618	7121	10358
4	25	30	63	115	180	270	450	742	1080	1980	2925	4225	7866	12225	17304
	40	49	116	197	295	456	796	1247	1825	3120	4940	7050	12661	19663	27816
	15	22	49	87	128	187	352	526	770	1295	2105	2835	5548	8586	11947
5	25	26	59	105	153	225	425	632	925	1555	2525	3400	6654	10297	14328
	40	59	131	225	338	495	855	1350	1890	3510	5400	7870	13761	23205	32244
	15	26	59	105	153	225	425	632	925	1555	2525	3400	6654	10297	14328
6	25	43	97	162	253	370	658	1065	1520	2530	4250	6175	10629	17108	24042
	40	71	157	270	405	595	1025	1620	2270	4210	6475	9445	16515	27849	38697
	15	29	63	110	165	260	445	705	952	1815	2763	3990	7390	12015	16096
7	25	49	114	190	288	450	785	1205	1750	3025	4813	6900	12288	19377	27080
	40	76	177	303	455	690	1210	1865	2520	4585	7560	10880	19141	30978	43470
	15	32	70	126	190	285	475	800	1125	1990	3025	4540	8042	12625	17728
8	25	54	122	205	320	465	810	1260	1870	3240	5220	7120	13140	21600	33210
	40	84	192	327	510	730	1370	2065	3120	5135	8395	12470	21247	33669	46858
	15	41	95	155	250	372	626	1012	1465	2495	3995	5860	9994	16172	22713
9	25	66	145	257	405	562	990	1530	2205	3825	6295	8995	15966	25860	35890
	40	104	216	408	615	910	1635	2545	3600	6230	9880	14390	26621	41011	57560
	15	50	121	205	310	465	810	1270	1870	3220	5215	7390	12921	20538	29016
10	25	66	145	257	405	562	990	1530	2205	3825	6295	8995	15966	25860	35890
	40	104	216	408	615	910	1635	2545	3600	6230	9880	14390	26621	41011	57560
	15	50	121	205	310	465	810	1270	1870	3220	5215	7390	12921	20538	29016
14	25	85	195	331	520	740	1375	2080	3120	5200	8500	12560	21720	34139	47128
	40	126	305	555	825	1210	2195	3425	4735	8510	13050	18630	35548	54883	76534

The capacity is stated in kg/h.
Example:

Steam pressure 10 bar, 1530 kg/h. The estimated steam velocity is 25 m/s, i.e. DN65.
N.B! When long steam pipes are used, one also has to regard the pressure decay.

5.5 Saturation data for water and steam

Temp. °C	Pressure bar	Entalphy water kJ / kg	Entalphy steam kJ / kg	Spec. vol. water m3 / kg	Spec. vol. steam m3 / kg
1	0.0066	4.2	2503.4	1.00E-03	1.93E+02
2	0.0087	21	2510.7	1.00E-03	1.47E+02
10	0.0123	42	2519.9	1.00E-03	1.06E+02
15	0.017	62.9	2529.1	1.00E-03	7.80E+01
20	0.0234	83.9	2538.2	1.00E-03	5.78E+01
25	0.0317	104.8	2547.3	1.00E-03	4.34E+01
30	0.0424	125.7	2556.4	1.00E-03	3.29E+01
35	0.0562	146.6	2565.4	1.01E-03	2.52E+01
40	0.0738	167.5	2574.4	1.01E-03	1.96E+01
45	0.0958	188.4	2583.3	1.01E-03	1.53E+01
50	0.1234	209.3	2592.2	1.01E-03	1.21E+01
55	0.1574	230.2	2601	1.02E-03	9.58E+00
60	0.1992	251.1	2609.7	1.02E-03	7.68E+00
65	0.2501	272	2618.4	1.02E-03	6.20E+00
70	0.3115	293	2626.9	1.02E-03	5.05E+00
75	0.3855	313.9	2635.4	1.03E-03	4.13E+00
80	0.4736	334.9	2643.8	1.03E-03	3.41E+00
85	0.578	355.9	2652	1.03E-03	2.83E+00
90	0.7011	376.9	2660.1	1.04E-03	2.36E+00
95	0.8453	398	2668.2	1.04E-03	1.98E+00
100	1.0133	419.1	2676	1.04E-03	1.67E+00
105	1.208	440.2	2683.7	1.05E-03	1.42E+00
110	1.4327	461.3	2691.3	1.05E-03	1.21E+00
115	1.6906	482.5	2698.7	1.06E-03	1.04E+00
120	1.9854	503.7	2706	1.06E-03	8.92E-01
125	2.231	525	2713	1.07E-03	7.70E-01
130	2.7013	546.3	2719.9	1.07E-03	6.68E-01
135	3.1307	567.7	2762.6	1.08E-03	5.82E-01
140	3.6138	589.1	2733.1	1.08E-03	5.09E-01
145	4.1552	610.6	2739.3	1.09E-03	4.46E-01
150	4.76	632.2	2745.4	1.09E-03	3.92E-01
155	5.4333	653.8	2751.2	1.10E-03	3.46E-01
160	6.1806	675.5	2756.7	1.10E-03	3.07E-01
165	7.0077	697.3	2762	1.11E-03	2.72E-01
170	7.9202	719.1	2767.1	1.11E-03	2.43E-01
175	8.9244	741.1	2771.8	1.12E-03	2.17E-01
180	10.027	763.1	2776.3	1.13E-03	1.94E-01
185	11.233	785.3	2780.4	1.13E-03	1.74E-01
190	12.551	807.5	2784.3	1.14E-03	1.53E-01
195	13.987	829.9	2787.8	1.15E-03	1.41E-01
200	15.549	852.4	2794	1.16E-03	1.27E-01
205	17.243	875.0	2793.8	1.16E-03	1.150E-01

N.B! The saturation degree is stated as a function of the temperature.

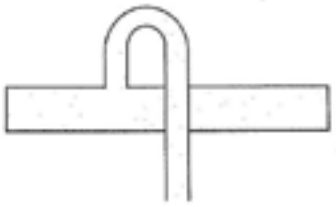
5.6 Steam table

Manometer press. Bar	Absolute press. Bar	Temperature °C	Liquid heat kJ / kg	Steam heat kJ / kg	Spec. vol. steam m3 / kg
0.1	1.113	102.66	430.2	2680.4	1.533
0.2	1.213	105.1	440.8	2684.2	1.414
0.3	1.313	107.39	450.4	2687.6	1.312
0.4	1.413	109.55	459.7	2691	1.255
0.5	1.513	111.61	468.3	2693.9	1.149
0.6	1.613	113.56	476.4	2696.8	1.083
0.7	1.713	115.4	484.1	2699.5	1.024
0.8	1.813	117.14	491.6	2702.1	0.971
0.9	1.913	118.8	498.9	2704.5	0.923
1	2.013	120.42	505.6	2706.7	0.881
1.1	2.113	121.96	512.2	2709.2	0.841
1.2	2.213	123.46	518.7	2711.5	0.806
1.3	2.313	124.9	524.6	2713.3	0.773
1.4	2.413	126.28	530.5	2715.3	0.743
1.5	2.513	127.62	536.1	2717.1	0.714
1.6	2.613	128.89	541.6	2718.9	0.689
1.7	2.713	130.13	547.1	2720.8	0.655
1.8	2.813	131.37	552.3	2722.4	0.643
1.9	2.913	132.54	557.3	2724	0.622
2	3.013	133.69	562.2	2725.5	0.603
2.5	3.513	139.02	585	2732.6	0.522
3	4.013	143.75	605.3	2738.7	0.461
4	5.013	151.96	640.7	2748.8	0.374
5	6.013	158.92	670.9	2756.9	0.315
6	7.013	165.04	697.5	2763.5	0.272
7	8.013	170.5	721.4	2796.1	0.24
8	9.013	175.43	743.1	2774	0.215
9	10.013	179.97	763	2778.1	0.194
10	11.013	184.13	781.6	2781.7	0.177
11	12.013	188.02	798.8	2784.8	0.163
12	13.013	191.68	815.1	2787.6	0.151
13	14.013	195.1	830.4	2790	0.141
14	15.013	198.35	845.1	2792.2	0.132
15	16.013	201.45	859	2794	0.124
16	17.013	204.38	872.3	2795.7	0.117
17	18.013	207.17	885	2797.1	0.11
18	19.013	209.9	897.2	2708.5	0.105
19	20.013	212.47	909	2799.5	0.1
20	21.013	214.96	920.3	2800.5	0.0949
21	22.013	217.35	931.3	2801.4	0.0906
22	23.013	219.65	941.9	2802	0.0868
23	24.013	221.85	952.2	2802.6	0.0832
24	25.013	224.02	962.2	2803.1	0.0797
25	26.013	226.12	972.1	2803.5	0.0768
26	27.013	228.15	981.6	2802.2*	0.074
27	28.013	230.14	990.7	2804.4	0.0714
28	29.013	232.05	999.7	2804.1	0.0689
29	30.013	233.93	1008.6	2804.1	0.0666
30	31.013	235.78	1017	2804.1	0.0645

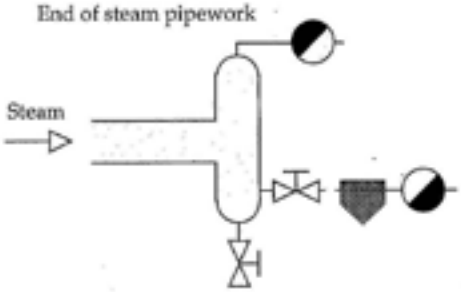
5.7 Steam installation examples

Steam pipe leans forward 3-5mm/M

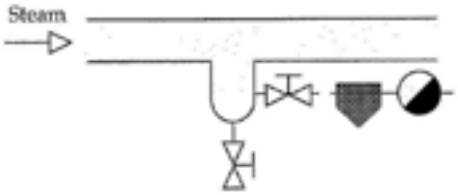
Steam diversion on top of the pipe



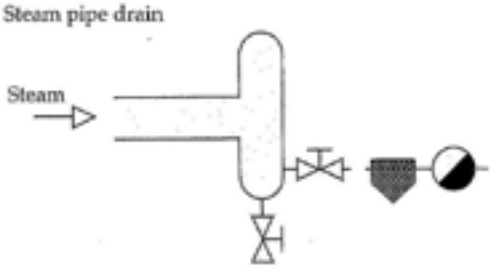
End of steam pipework



Steam pipe drain

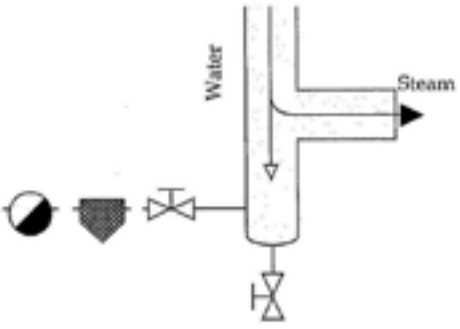


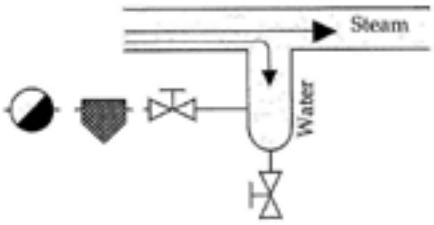
Steam pipe drain



Use eccentric cones

Steam pipe drain before machine or regulating valve





Shutoff tap

Dirt filter

Steam trap

Air vent