



www.packmanco.com
info@packmanco.com

ACKMAN

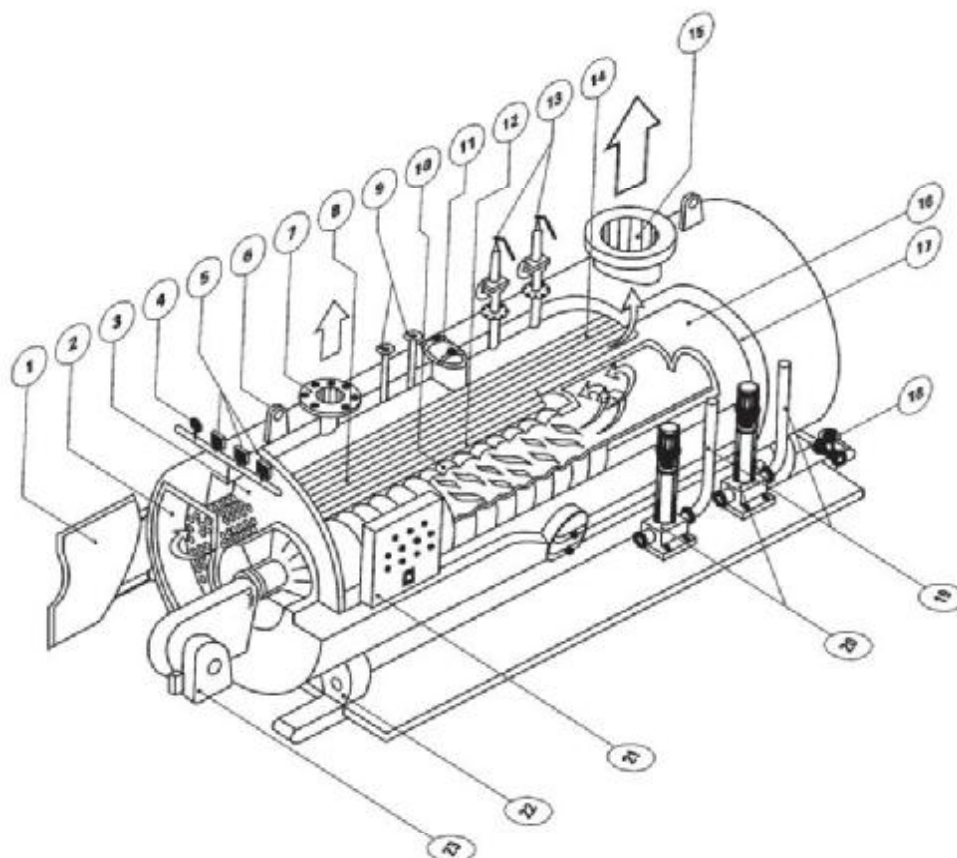
Manufacturer of Boilers, Thermal Oil Heaters
Heat Exchangers, Pressure Vessels, Storage Tanks &
Water Treatment Plants



Three Pass Boilers

Hot water boilers P.H.W.B series Steam boilers horizontal P.S.B.H series

Packman Three - Pass Steam Boilers



- 1-Hinged Front Door
- 2-Reversing Chamber
- 3-Boiler Body
- 4-Pressure Gauge
- 5-Pressure Switches
- 6-Lifting Lug
- 7-Main Steam Outlet
- 8-Tubes Water
- 9-Level Control Lines
- 10-Flat Resp. Corrugated Flame Tube
- 11-Handhole
- 12-Smoke Tubes 2nd Pass

- 13-Safety Valve
- 14-Smoke Tubes 3rd Pass
- 15-Chimney
- 16-Reversing Chamber
- 17-Insulation
- 18-Drain Valve
- 19-Feed Water Lines
- 20-Feed Water Pumps
- 21-Electric Control Panel
- 22-Boiler Frame
- 23-Burner

Description of the boiler

The PACKMAN three-pass boilers are produced in workshops equipped with the most modern machines. Materials and workmanship are submitted to a permanent quality control. Thus it is possible to produce reliable construction elements and groups. Reliable to make sure that you can rely on your PACKMAN boiler, even after a number of years. And these are the convincing advantages of the PACKMAN three-pass boiler:

- adaptation of the thermal layout to fuel, medium and operation;
- adjusting of the boiler to the plant with regard to heating circuit, environmental and constructional conditions;
- dimensioning and selection of material qualities according to thermal stress and charge;
- constructional design in consideration of the greatest possible elasticity for absorption of thermal stresses;
- extensive heat utilization by water cooling of the flue gas touched surfaces and reduction of the radiation losses to a minimum;
- over pressure operation at the flue gas side and dimensioning of the fire tube, adapted to the furnace, result in a complete burn-out and thus in highest possible furnace efficiency rates;
- low losses combined with low energy demand and optimum controllability enable the most economical operation which can be achieved with today's technique.

The three-pass boiler is robust and economical. The furnace is formed by the fire tube. The flue gases are directed through topped smoke tubes where they are cooled down. As it has proved to be especially economical to lead the flue gases through three passes most of the large water space boilers built today belong to this type - hence the name "three-pass boilers". Because of its constructional design the three-pass boiler is especially suitable for the combustion of liquid or gaseous fuels. It can, however, as well be used for solid fuels. Coal or wood can be burnt economically on the interior grate or in prefurnaces.

■ Fire tube:

In the three-pass boiler the fire tube forms the combustion chamber. The chosen diameter makes sure that an unobjectionable flame can develop and a complete burn-out is guaranteed. The decision whether plane or corrugated fire tubes are to be used depends on the diameter and the working pressure. The arrangement in the inferior part of the water space has an especially favourable effect on the heat exchange and the water circulation, and allows a clear arrangement of the remaining flue gas passes. The limited thermal load for fire tubes prescribed by the German law demands the installation of two fire tubes at boiler capacities exceeding 9.3 MW. In several foreign countries, however, higher capacities are allowed with one fire tube.

■ Boiler supports, skids:

The boiler body is based on supports. Most of the units are delivered on skids; by that special foundations for the installation are not required. In this case all accessories which are necessary for operation, such as oil or gas firing equipment, combustion air fan, oil preheater, control panel or switchboard and feeding device, can be mounted on the skid, too.

■ Boiler body, insulation:

The cylindrical boiler body forms the water and the steam space and contains the heating surfaces. Outside it is provided with a highly effective insulation as well as with a cladding of galvanized sheets (at both sides). All connection pieces with mountings, fittings, control instruments as well as service platform, flue gas reversing chambers and flue gas duct are mounted at the boiler body. Man-and hand-holes allow inspection at the water side and supervision of the heating surfaces.

■ Smoke tubes:

The second and third boiler pass are formed by thick-walled smoke tubes which are welded into the end plates. The tubes are easily accessible and can be cleaned without problems. The arrangement of the smoke tubes considers the recommendation of ascending flue passes in order to prevent the formation of residual-or lingering gases.

■ Rear reversing chamber:

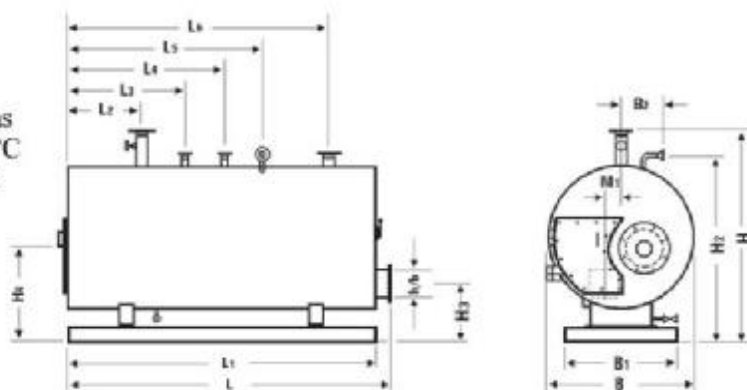
PACKMAN three pass boilers with a fire tube have an interior flue gas reversing chamber, situated in the water space. Here the direction of the flue gases, coming out of the fire tube is changed and they are distributed to the smoke tubes of the second pass. The all over cooling of the reversing chamber contributes to an optimum heat utilization. At PACKMAN double flue boilers the rear reversing chamber is arranged outside the boiler body. The exterior reversing chamber is formed of tightly welded tube walls; it is watercooled and absolutely gas-tight. At this type, too, an economical heat utilization has been drawn into consideration.

Access openings allow an flue gas side inspection of the interior and exterior reversing chamber.

■ Front reversing chamber:

Inside of a tightly welded and insulated chamber made of steel sheets the flue gases are led from the second to the third boiler pass. The reversing chamber is equipped with large doors, allowing free access to the smoke tubes and easy maintenance and cleaning. High quality tightening material guarantees that the doors are shut gas tight. Special literature on three-pass boilers with wood or coal firing as well as on special constructions can be sent upon request. In addition our engineers as well as our representatives abroad are always at your disposal for further information and assistance.

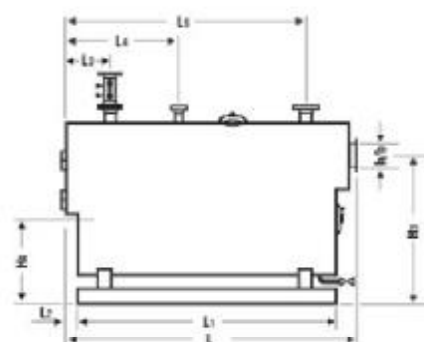
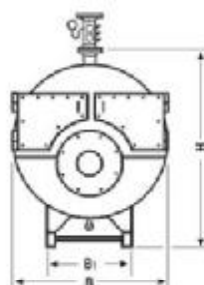
- for the combustion of fuel oil EL or gas generating hot water up to approx 200°C for plants acc. to DIN 4751 and 4752
- design pressure up to 20 bar
- thermal capacity 0.23 - 1.63 MW



1 MW = 1000 KW = 860,000 Kcal/hr; 1 Kcal/hr = 3.93 BTU/hr; 1 bar = 14.504 psi
1 atm = 1.013 bar; 1 kg/cm² = 14.223 lb/sq in(psi); 1 BHP = 33,480 BTU/hr = 9.803 KW
All Specifications are subject to change without notice.

Low pressure hot water boiler type PHWB2

- for the combustion of fuel oil EL or gas generating hot water up to 120 °C for plants acc. to DIN 4751
- design pressure up to 6.0 bar
- thermal capacity 1.15 - 9.30 MW
- Execution for multi - storey buildings
- exceeding 6 bar with special permission.

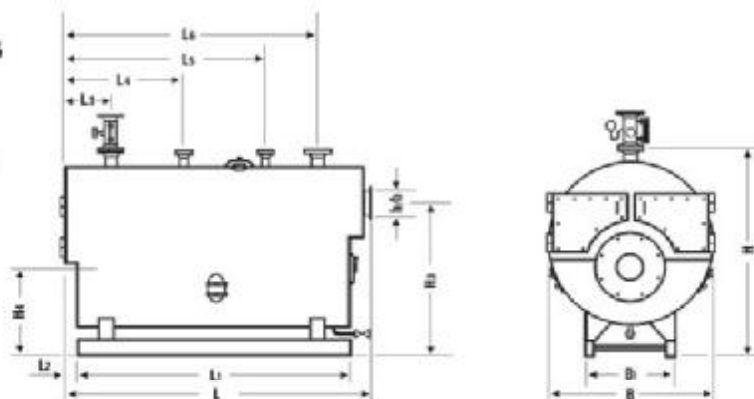


Boiler Type			PHWB2	115	145	185	230	290	370	460	580	700	820	930
Thermal capacity	MW			1.15	1.45	1.85	2.30	2.90	3.70	4.60	5.80	7.00	8.20	9.30
water contents full	m ³			2.09	2.47	2.98	3.20	4.55	5.97	7.50	9.75	11.70	13.90	17.70
transport weight	t			3.47	4.11	4.86	5.94	7.24	8.26	10.37	13.04	15.41	17.71	20.60
service weight	t			6.20	7.30	8.40	1.10	13.00	15.70	17.90	25.10	29.90	34.80	42.20
press. Loss comb. Chamber	mbar			9.5	9.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
gas contents up to boiler end	m ³			1.45	1.79	2.07	3.00	3.80	4.90	6.00	7.80	9.50	12.80	18.50
Boiler dimensions	length	L	mm	3750	3950	4050	4100	4700	4850	5050	5600	5750	6100	6450
	width	B	mm	1360	1480	1580	1710	1860	2010	2160	2310	2510	2660	2910
	height	H	mm	1650	1750	1850	2000	2150	2300	2450	2600	2800	2950	3200
boiler skid	length	L1	mm	3300	3500	3600	3650	4150	4300	4500	5000	5150	5500	5850
	width	B1	mm	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
	excess length	L2	mm	150	150	150	150	200	200	200	250	250	250	250
burner height	H4	mm		675	700	725	775	805	855	875	905	955	1000	1135
fire tube diameter		mm		600	650	700	800	850	950	1000	1050	1150	1250	1450
flue gas conn. height	H3	mm		1240	1290	1305	1485	1510	1675	1750	1805	1935	2100	2275
clear width	h	mm		315	315	355	400	400	500	560	630	710	800	800
	b	mm		315	400	400	500	500	630	630	710	800	900	1000
conn. piece distances														
outflow	L3	mm		650	650	650	650	750	750	800	900	900	900	900
safety outflow	L4	mm		1150	1200	1200	1250	1450	1550	1800	1700	1800	1900	1900
return	L5	mm		3000	3200	3300	3350	3900	4000	4200	4750	4850	5200	5200
nominal widths and pressures														
outflow& return at Δt														
20 °C	PN16	DN		125	150	150	200	200	200	250	250	300	300	300
30/40 °C	PN16	DN		100	100	125	150	150	150	200	200	200	250	250
safety outflow	PN16	DN		65	65	80	100	100	100	125	125	150	150	150
drainage	PN40	DN		25	25	32	32	32	40	40	40	50	50	50

1 MW = 1000 KW = 860,000 Kcal/hr ; 1 Kcal/hr = 3.93 BTU/hr ; 1 bar = 14.504 psi
1 atm = 1.013 bar ; 1 kg/cm² = 14.223 lb/sq in(psi) ; 1 BHP = 33,480 BTU/hr = 9.803 KW
All Specifications are subject to change without notice.

Hot water boiler type PHWB 3

- for the combustion of fuel oil or gas
generating hot water exceeding 120 °C
up to appr. 180°C for plants acc. to DIN
4752, group I and II
- design pressure up to 16 bar
- thermal capacity 1.15 - 9.30 MW



Boiler Type			PHWB3	115	145	185	230	290	370	460	580	700	820	930
Thermal capacity			MW	1.15	1.45	1.85	2.3	2.90	3.70	4.60	5.80	7.00	8.20	9.30
water contents full			m ³	4.7	5.3	6.3	6.6	8.0	9.9	12.6	15.4	17.5	19.5	21.8
transport weight at 8 bar			t	6.5	6.8	7.7	8.6	10.4	11.7	14.4	16.7	19.8	23.5	25.5
service weight at 8 bar			t	12.5	13.0	15.5	18.0	21.5	26.0	31.5	37.0	43.5	52.0	56.0
press. Loss comb. Chamber			mbar	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.5
gas contents up to boiler end			m ³	1.70	2.50	3.20	4.50	4.80	5.20	6.30	7.20	10.60	13.80	17.50
Boiler dimensions	length	L	mm	3900	3900	4600	4700	5150	5250	5950	6050	6200	6650	6750
	width	B	mm	1700	1800	1950	2000	2150	2300	2500	2600	2750	2900	3000
	height	H	mm	1950	2050	2200	2250	2400	2550	2750	2850	3000	3150	3250
boiler skid	length	L1	mm	3450	3450	4050	4150	4550	4650	5350	5450	5600	5950	6050
	width	B1	mm	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
	excess length	L2	mm	200	200	250	250	300	300	300	300	300	350	350
burner height			H4	mm	760	790	855	875	905	960	980	1010	1060	1160
fire tube diameter			mm	700	750	850	900	960	1050	1100	1150	1250	1300	1450
flue gas conn.	height	H3	mm	1380	1410	1590	1610	1780	1800	1890	1900	2020	2080	2180
	clear width	h	mm	315	315	355	400	400	500	560	630	710	800	800
		b	mm	315	400	400	500	500	630	630	710	800	900	1000
conn. piece distances														
outflow			L3	mm	900	900	900	900	900	900	900	900	900	900
safety outflow			L4	mm	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
feeding			L5	mm	2800	2800	3150	3300	3700	3750	4100	4300	4500	4800
return			L6	mm	3250	3250	3700	3900	4350	4450	5100	5100	5500	5500
nominal widths and pressures														
outflow and return at Δt														
20°C PN*)			DN	125	150	150	200	200	200	250	250	300	300	300
30/40°C PN*)			DN	100	100	125	150	150	150	200	200	200	250	250
50°C PN*)			DN	80	80	80	100	100	125	150	150	150	200	200
safety valve make leser														
at design pressure 6 bar PN25			DN	40	40	50	50	65	65	80	80	100	100	100
8 bar PN25			DN	32	40	40	50	50	65	65	80	80	100	100
10 bar PN25			DN	32	32	40	40	50	50	65	65	80	80	80
13 bar PN25			DN	25	32	40	40	40	50	65	65	65	80	80
16 bar PN25			DN	25	32	32	40	40	50	50	65	65	65	80
feeding PN40			DN	25	25	25	25	25	32	32	32	32	40	40
drainage PN40			DN	25	25	25	32	32	40	40	40	50	50	50
venting in outflow														
intermediary piece PN40			DN	20	20	20	20	20	25	25	25	25	25	25

*) up to DN 150 PN 40, from DN 200 on PN 25

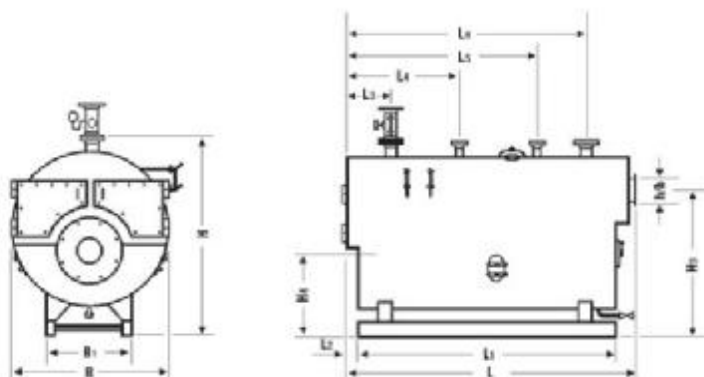
1 MW = 1000 KW = 860,000 Kcal/hr; 1 Kcal/hr = 3.93 BTU/hr; 1 bar = 14.504 psi

1 atm = 1.013 bar; 1 kg/cm² = 14.223 lb/sq in(psi); 1 BHP = 33,480 BTU/hr = 9.803 KW

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Hot water boiler type PHWB 4

- for the combustion of fuel oil or gas generating hot water up to appr. 200 °C for plants acc. to DIN 4752, group I and II
- design pressure up to 25 bar
- thermal capacity 1.60 - 9.00 MW



Boiler Type			PHWB4	160	200	260	320	400	450	500	600	700	800	900
Thermal capacity			MW	1.60	2.00	2.60	3.20	4.00	4.50	5.00	6.00	7.00	8.00	9.00
water contents full			m³	6.03	7.40	9.48	11.87	13.34	13.69	13.91	17.54	18.73	20.46	24.10
transport weight at 8 bar			t	6.5	7.6	9.0	11.0	12.5	14.0	15.1	17.6	19.6	22.2	25.9
service weight at 8 bar			t	13.2	15.8	19.5	24.0	27.2	29.2	30.8	37.0	40.5	45.0	52.0
press. Loss comb. Chamber			mbar	11.0	11.0	11.0	11.0	11.0	11.5	12.5	12.5	13.0	12.5	12.0
gas contents up to boiler end			m³	3.00	3.80	4.80	6.25	7.40	8.80	9.60	11.75	13.50	15.25	19.00
Boiler dimensions	length L	mm	4050	4650	5050	5450	5700	5900	6150	6500	6800	6800	7300	
	width B	mm	2100	2150	2300	2450	2550	2600	2600	2800	2850	3000	3150	
	height H	mm	2350	2400	2550	2700	2800	2850	2850	3050	3100	3250	3400	
	boiler skid	length L1	mm	3200	3800	4200	4600	4800	5000	5200	5500	5800	5800	6300
		width B1	mm	1400	1450	1550	1650	1750	1800	1800	1950	1950	2100	2200
excess	length L2	mm	400	400	400	400	400	400	450	500	500	500	500	
burner height	H4	mm	832	858	910	935	960	1000	1025	1050	1075	1125	1175	
fire tube diameter			mm	800	850	900	950	1000	1050	1100	1150	1200	1300	1400
flue gas conn .piece	height H3	mm	1600	1650	1800	1900	1950	2000	2200	2400	2450	2450	2650	
	ext. Diameter Da	mm	398	398	498	548	598	648	698	748	748	848	948	
conn. piece distances														
outflow	L3	mm	700	700	700	750	750	800	850	900	900	900	900	950
safety outflow	L4	mm	1300	1350	1400	1550	1600	1650	1700	1800	1800	1850	1900	
feeding	L5	mm	2850	3450	3800	4100	4300	4400	4600	4900	5100	5000	5400	
return	L6	mm	3300	3900	4300	4650	4900	5000	5250	5600	5900	5900	6350	
nominal widths and pressures														
outflow and return at Δt														
	20°C	PN*)	DN	150	200	200	250	250	300	300	300	350	350	400
	30°C	PN*)	DN	125	125	150	150	200	200	200	250	250	300	300
	40°C	PN*)	DN	100	125	125	150	150	200	200	200	200	250	250
	50°C	PN*)	DN	100	100	125	125	150	150	150	200	200	200	200
safety valve make leser														
at design pressure 6 bar	PN25	DN	50	50	65	65	80	80	80	100	100	100	100	125
8 bar	PN25	DN	40	50	50	65	65	65	80	80	80	80	100	100
10 bar	PN25	DN	40	40	50	50	65	65	65	80	80	80	80	80
13 bar	PN25	DN	32	40	40	50	50	50	65	65	65	80	80	80
16 bar	PN25	DN	32	32	40	40	50	50	50	65	65	65	65	65
20 bar	PN40	DN	25	32	32	40	40	50	50	50	65	65	65	65
25 bar	PN40	DN	25	32	32	32	40	40	40	50	50	50	50	65
feeding	PN40	DN	25	25	25	25	32	32	32	32	32	40	40	40
drainage	PN40	DN	25	25	32	32	32	40	40	40	50	50	50	50
venting in outflow intermediary piece			PN40	DN	20	20	20	20	20	20	20	20	20	20

*) up to DN 150 PN 40, from DN 200 on PN 25

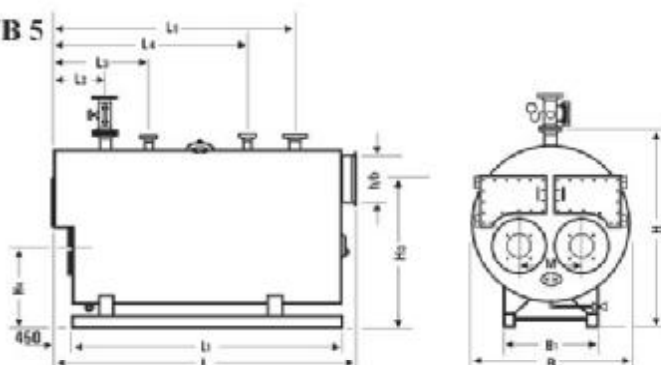
1 MW = 1000 KW = 860,000 Kcal/hr : 1 Kcal/hr = 3.93 BTU/hr : 1 bar = 14.504 psi

1 atm = 1.013 bar; 1 kg/cm² = 14.223 lb/sq in (psi); 1 BHP = 33,480 BTU/hr = 9.803 KW

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Hot water double-flue boiler type PHWB 5

- for the combustion of fuel oil or gas
generating hot water up to appr. 200 °C
for plants acc. to DIN 4751 and 4752
- design pressure up to 20 bar
- thermal capacity 10.5 - 18.5 MW



Boiler Type			PHWB5	1050	1200	1300	1450	1650	1850
Thermal capacity			MW	10.50	12.00	13.00	14.50	16.50	18.50
water contents full			m ³	25.50	27.90	29.05	33.80	37.15	40.36
transport weight at 8 bar			t	28.0	31.0	34.0	39.0	42.0	49.0
service weight at 8 bar			t	59.0	65.0	70.0	80.0	87.0	99.0
press. Loss comb. Chamber			mbar	12.0	12.0	12.0	13.0	10.5	10.0
gas contents up to boiler end			m ³	22.0	24.0	27.0	29.0	34.0	39.5
Boiler dimensions	length	L	mm	7400	7400	7400	7700	8200	8200
	width	B	mm	3400	3550	3650	3800	3900	4100
	height	H	mm	3850	4000	4100	4250	4350	4550
boiler skid	length	L1	mm	5750	5750	5750	6050	6550	6550
	width	B1	mm	1700	1800	1800	1900	1900	2000
burner height			H4	mm	1565	1605	1690	1710	1790
burner distance			M	mm	1400	1450	1550	1600	1700
fire tube diameter			mm	1100	1150	1200	1250	1300	1400
flue gas conn.	height	H3	mm	2800	3000	3025	3100	3200	3425
	clear width	h	mm	725	825	900	950	950	1000
		b	mm	1050	1050	1050	1100	1250	1350
conn. piece distances									
outflow			L2	mm	1200	1200	1200	1400	1400
safety valve			L3	mm	2000	2000	2000	2400	2400
feeding			L4	mm	4700	4700	4700	5000	5000
return			L5	mm	5500	5500	5500	6000	6000
Nominal widths and pressures									
outflow and return at Δt									
20°C			PN25	DN	300	350	350	400	400
30°C			PN25	DN	250	250	300	300	350
40°C			PN25	DN	200	250	250	300	300
50°C			PN25	DN	200	200	250	250	250
safety valve make leser			PN25	DN	125	150	150	200	200
at design pressure 6 bar			PN25	DN	100	125	150	150	150
8 bar			PN25	DN	100	100	100	125	150
10 bar			PN25	DN	80	80	100	100	100
13 bar			PN25	DN	80	80	80	100	100
16 bar			PN25	DN	80	80	80	80	100
20 bar			PN25	DN	65	65	80	80	100
feeding			PN40	DN	50	50	50	65	65
drainage			PN40	DN	50	50	65	65	65
venting			PN40	DN	20	20	20	20	20

1 MW = 1000 KW = 860,000 Kcal/hr; 1 Kcal/hr = 3.93 BTU/hr; 1 bar = 14.504 psi
 1 atm = 1.013 bar; 1 kg/cm² = 14.223 lb/sq in(psi); 1 BHP = 33,480 BTU/hr = 9.803 KW
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