WAMAK

Heat pump

SCROLL

EEV

HEAT COOL

WEB APP

TBW 98 EVI HD Modul

WAMAK TBW 98 EVI HD Modul

Product description

High-efficiency heat pump consisting of multiple modules of separate heat pumps. Each module contains one short closed refrigerant circuit with a pair of quiet Scroll compressors and robust stainless steel plate heat exchangers. Applications range from heating, cooling and domestic hot water heating of office or multi-functional buildings to cascading applications in industrial applications.

Use for demanding industrial applications. By combining the most suitable performance and application variants of heat pump modules, it is possible to tailor-make the complete system required. Each module is refrigeration, hydraulically and electrically isolated with a separate controller. The connection of the modules is cascaded, whereby each single controller can take over the function of the cascade master.

As a primary source, the thermal energy of the sun accumulated in the ground through a horizontal collector or geothermal energy through a deep borehole is used. In the collector or borehole, an antifreeze flows which takes the energy of the earth at a low temperature and the heat pump raises this temperature to a temperature usable for heating or hot water.

The EVI (Enhanced Vapour Injection) technology allows the heat pump to achieve higher header flow temperatures even at lower source temperatures. EVI also has a possitive impact on the compressor lifespan and overall system stability because the discharge gas temperature from the compressor is lower.

The twin compressors give the system robustness and the ability to distribute the heat output according to the actual load.

Product features

- Scroll compressor
- EVI technology
- Asymetric plate heat exchanger
- Multi-stage capacity control
- Phase and rotation control
- High pressure sensor - analogue
- Flow switch consumer - on/off - (with accessory)
- Flow switch source - on/off - (with accessory)
- DHW temperature sensor
- Cascade control
- Solid frame structure
- Sylomer pads under compressor unit
- Electronic expansion valve
- Two-stage capacity control
- Compressor soft starter
- High pressure switch
- Low pressure sensor - analogue
- Flow sensor consumer - analogue - (with accessory)
- Outdoor temperature sensor
- Buffer temperature sensor
- Modbus connection
- Two level frame

Basic performance data - WAMAK TBW 98 EVI HD Modul

Heating - EN 14511		
Heating capacity [kW]	B0 / W35 (max)	**96.1** (48.1 / 96.1)
	B0 / W35 (min)	**48.1** (48.1 / 96.1)
	B0 / W34	**96.0** (48.0 / 96.0)
Electrical power input [kW]	B0 / W35 (max)	**21.7** (10.7 / 21.7)
	B0 / W35 (min)	**10.7** (10.7 / 21.7)
	B0 / W34	**21.2** (10.5 / 21.2)
Heating efficiency faktor [COP]	B0 / W35 (max)	4.43
	B0 / W35 (min)	4.49
	B0 / W34	4.52
Seasonal space heating energy efficiency - SCOP EN 14825		
Average Climate / Low Temperature [35°C]	SCOP	5.01
	η [%]	200.3
	Label	A+++
	Qhe [kWh]	198542.6
	Pdesignh [kW]	96.1
	Tbivalent [°C]	-10
Cooling		
Cooling capacity - [kW]	A35 / W23-18	96.9
	A25 / W23-18	101.8
	A35 / W12-7	96.9
	A25 / W12-7	96.9
Seasonal space cooling energy efficiency - SEER EN 14825		
[W 23 / 18°C]	SEER	5.14
	Qce [kWh]	43680.0
	ηc [%]	205.7
Sound EN 12102		
Acoustic power - Lw	dB(A)	65
Acoustic pressure - Lp	**1 m** dB(A)	57
	5 m dB(A)	43
	10 m dB(A)	37
Mechanical and operational information		
Compressor type (3~ 400/50)	SCROLL / 2 /	On/Off
Refrigerant	R410A (GWP - 2088)	15.8 kg
Operating limit temperatures heating - (min / max) [°C]		25 / **65**
Operating limit temperatures source - (min / max) [°C]		**-10 (7)** / 30
Weight		530 kg

Main technical data - WAMAK TBW 98 EVI HD Modul

Enclosure type		HD2L1
Basic dimensions	Height [mm]	2000
	Width [mm]	820
	Length [mm]	1200
Weight [kg]		530
Colour		Gray
Enclousure IP Class		IP20
Refrigeration cycle		
Compressor	Type	Scroll
	Number of stages	2
	On/Off	
	Power factor Cosϕ	0.64
	Winding resistance	0.76 Ohm
Refrigerant		R410A
	Volme	15.8 kg
	GWP	2088
	Safety class	A1
Refrigeration oil type	POE RL32-3MAF	
	Oil volume	2 x 3.38 L
Maximal pressure - refrigerant [bar]		50
	PED class	2
EVI - vapour injection with economizer		
Electrical connection data		
Line voltage [#~ V/Hz]		3~ 400/50
Current	nominal [A]	46.70
	maximal [A]	74.80
	starting [A]	63.04
Softstart		2 x MCD 201
Main safety		C80
Control System		

Main controller	SIEMENS	RVS 61	
Extension module	AVS75.3xx	AVS75.3xx	AVS75.372
Bus Clip-In		LPB OCI346	Modbus OCI352
Online connection		Web server OZW672	ToSyMo
Superheat controller			SEC61

*** with accessory

Heat energy rejection side data		
Operating limit temperatures heating	MAX [°C]	65
	MIN [°C]	25
for more see operating limits diagram		
Condenser	Port size	VIC 2.1/2 "
	Type	BPHE
	Count	1
	Material	AISI 316
Maximal operating pressure - refrigerant [bar]		50
Maximal operating pressure - Water [bar]		3
Testing pressure [bar]		70
Heat transfer medium		Water
Volume flow - Water [m3/h]		8.32 ~ 16.63
Internal pressure drop - Water [kPa]		20
Temperature difference	@ 35°C (nom)	5 K
	@ 55°C	8 K
	@ 65°C	10 K
Renewable energy extraction side data		
Operating limit temperatures source	MIN [°C]	-10 (7)
	MAX [°C]	30
for more see operating limits diagram		
Evaporator	Port size	VIC 2.1/2 "
	Type	BPHE
	Count	1
	Material	AISI 316
Maximal operating pressure - refrigerant [bar]		29
Heat transfer medium		Ethylenglykol
Brine proportion [%]		29
Antifreeze to [°C]		-15
Maximal operating pressure - Ethylenglykol [bar]		3
Volume flow - Ethylenglykol [m3/h]		8.48 ~ 16.96
Internal pressure drop - Ethylenglykol [kPa]		20
Temperature difference - Ethylenglykol		4 K

WAMAK TBW 98 EVI HD Modul

ErP (EU) No 811/2013: Technical parameters for heat pump space heaters

Model	**TBW 98 EVI HD Modul**
Air-to-water heat pump	no
Brine-to-water heat pump	yes
Water-to-water heat pump	no
Low-temperature heat pump	no
Equipped with a supplementary heater	no
Heat pump combination heater	no
Temperature application	low (35°C - 30°C)
Climate conditions	average

Item	Symbol	Value	Unit
Rated heat output at Tdesignh	Prated	96.1	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	Pdh	96.0	kW
Tj = +2 °C	Pdh	95.5	kW
Tj = +7 °C	Pdh	47.5	kW
Tj = +12 °C	Pdh	47.3	kW
Tj = bivalent temperature	Pdh	96.1	kW
Tj = operation limit temperature	Pdh	---	kW
Bivalent temperature	Tbiv	-10	°C
Power consumption in modes other than active mode			
Off mode	Poff	0.010	kW
Thermostat-off mode	Pto	0.010	kW
Standby mode	Psb	0.010	kW
Crankcase heater mode	Pck	0.000	kW
Other items			
Capacity control		multi-stage	
Sound power level			
indoors	Lwa	65	dB
outdoors	Lwa	---	dB
Annual energy consumption	Q_{HE}	198542.6	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	ηs	200.3	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	COPd	4.52	-
Tj = +2 °C	COPd	4.9	-
Tj = +7 °C	COPd	5.3	-
Tj = +12 °C	COPd	5.7	-
Tj = bivalent temperature	COPd	4.4	-
Tj = operation limit temperature	COPd	---	-
Tj = operation limit temperature	TOL	---	°C
Heating water operating limit temperature	WTOL	65	°C
Supplementary heater			
Rated heat output	Psup	18.5	kW
Type of energy input		electricity	
For air-to-water heat pumps: Rated air flow rate, outdoors	-	---	m3/h
For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-	8.48 ~ 16.96	m3/h

Contact details: WAMAK, s.r.o., Orovnica 252, 96652, Orovnica, Slovensko, info@wamak.sk

WAMAK TBW 98 EVI HD Modul

ErP (EU) No 811/2013: Technical parameters for heat pump space heaters

Model	**TBW 98 EVI HD Modul**
Air-to-water heat pump	no
Brine-to-water heat pump	yes
Water-to-water heat pump	no
Low-temperature heat pump	no
Equipped with a supplementary heater	no
Heat pump combination heater	no
Temperature application	middle (55°C - 47°C)
Climate conditions	average

Item	Symbol	Value	Unit
Rated heat output at Tdesignh	Prated	98.3	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	Pdh	98.9	kW
Tj = +2 °C	Pdh	98.9	kW
Tj = +7 °C	Pdh	48.6	kW
Tj = +12 °C	Pdh	48.3	kW
Tj = bivalent temperature	Pdh	98.3	kW
Tj = operation limit temperature	Pdh	---	kW
Bivalent temperature	Tbiv	-10	°C
Power consumption in modes other than active mode			
Off mode	Poff	0.010	kW
Thermostat-off mode	Pto	0.010	kW
Standby mode	Psb	0.010	kW
Crankcase heater mode	Pck	0.000	kW
Other items			
Capacity control		multi-stage	
Sound power level			
indoors	Lwa	65	dB
outdoors	Lwa	---	dB
Annual energy consumption	Q_{HE}	203087.8	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	ηs	160.5	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	COPd	3.29	-
Tj = +2 °C	COPd	4.1	-
Tj = +7 °C	COPd	4.6	-
Tj = +12 °C	COPd	5.0	-
Tj = bivalent temperature	COPd	2.9	-
Tj = operation limit temperature	COPd	---	-
Tj = operation limit temperature	TOL	---	°C
Heating water operating limit temperature	WTOL	65	°C
Supplementary heater			
Rated heat output	Psup	18.5	kW
Type of energy input		electricity	
For air-to-water heat pumps: Rated air flow rate, outdoors	-	---	m3/h
For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-	8.48 ~ 16.96	m3/h

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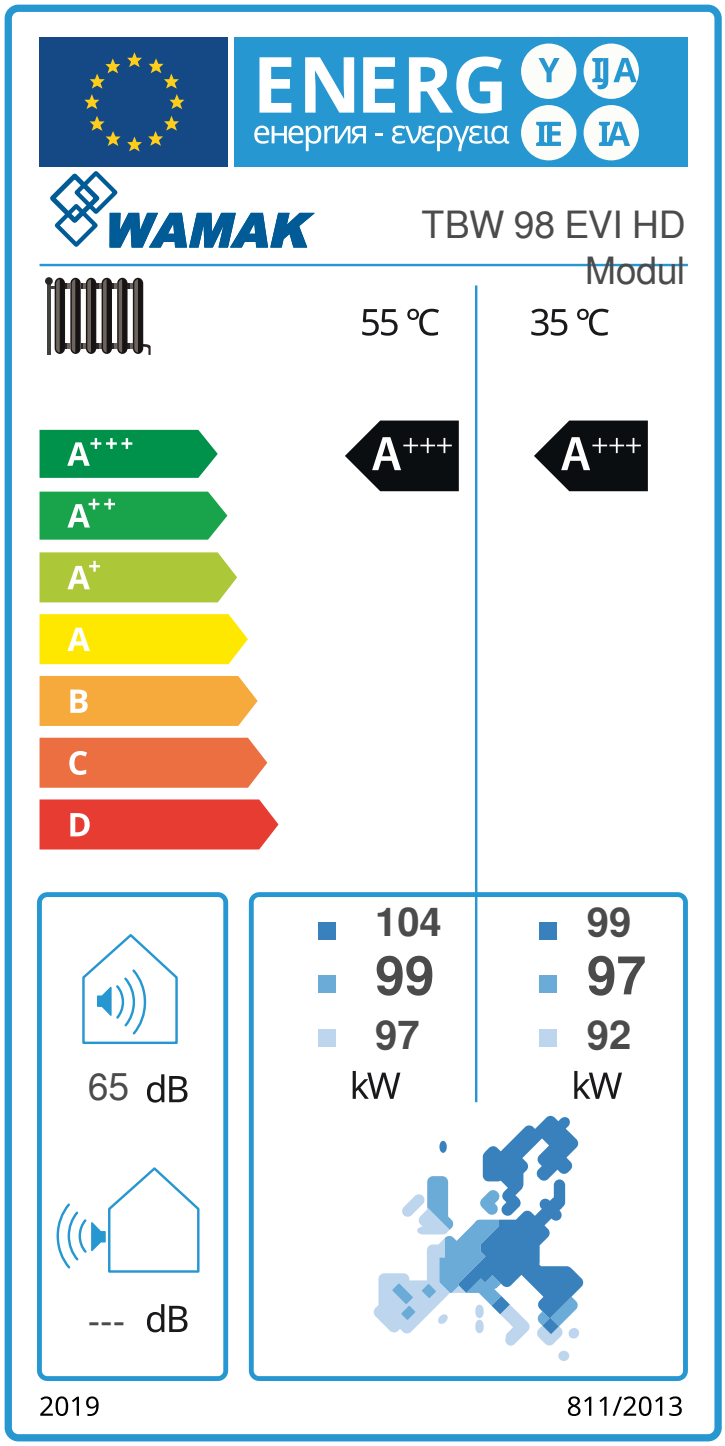


TBW 98 EVI HD Modul **ErP Data**

		55 °C	35 °C
Energy class		A+++	A+++
η	[%]	160.5	200.3
P_{rated}	[kW]	99	97
Q_{HE}	[kWh/y]	203088	198543
SCOP	[-]	4.01	5.01
$T_{bivalent}$	[°C]	-10	-10

CONTROLER

+ QAA55/75	class **VII**	3.5% ↓
- QAA55/75	class **III**	1.5% ↓

Heating performance data Version: v202223.006-BW-WW

Source - Brine [0°C] / Low Temperature [35°C] ZHI46K1P-TWD_R410A_2_BWW

	Operating conditions	Qh	P	COP
1	B0 / W30-35	96.1	21.7	4.43
2	B0 / W30-35 (MIN)	48.1	10.7	4.49
A	B0 / Wxx-34	96.0	21.2	4.52
B	B0 / Wxx-30	95.5	19.4	4.92
C	B0 / Wxx-27	47.5	8.9	5.32
D	B0 / Wxx-24	47.3	8.3	5.68
E	B0 / Wxx-35	96.1	21.7	4.43
F	B0 / Wxx-35	96.1	21.7	4.43

SCOP DATA EN 14825:2018	
Source - Brine [0°C] / Low Temperature [35°C]	
SCOPon	5.01
SCOPnet	5.01
SCOP	5.01
η [%]	200.25
Label	A+++
Qh [kWh]	198543
Pdesignh [kW]	96.1
Tbivalent [°C]	-10

Source - Brine [0°C] / Medium Temperature [55°C]

	Operating conditions	Qh	P	COP
1	B0 / W47-55	98.3	34.0	2.89
2	B0 / W47-55 (MIN)	49.1	16.5	2.93
A	B0 / Wxx-52	98.9	31.0	3.29
B	B0 / Wxx-42	98.9	24.2	4.13
C	B0 / Wxx-36	48.6	10.6	4.59
D	B0 / Wxx-30	48.3	9.6	5.05
E	B0 / Wxx-55	98.3	34.0	2.89
F	B0 / Wxx-54	99.0	31.8	3.12

SCOP DATA EN 14825:2018	
Source - Brine [0°C] / Medium Temperature [55°C]	
SCOPon	4.02
SCOPnet	4.02
SCOP	4.01
η [%]	160.49
Label	A+++
Qh [kWh]	203088
Pdesignh [kW]	98.3
Tbivalent [°C]	-10

Source - Water [10°C] / Low Temperature [35°C]

	Operating conditions	Qh	P	COP
1	W10 / W30-35	121.2	21.7	5.58
2	W10 / W30-35 (MIN)	60.6	10.7	5.66
A	W10 / Wxx-34	121.2	21.2	5.70
B	W10 / Wxx-30	121.3	19.5	6.21
C	W10 / Wxx-27	60.6	9.0	6.72
D	W10 / Wxx-24	60.6	8.5	7.16
E	W10 / Wxx-35	121.2	21.7	5.58
F	W10 / Wxx-35	121.2	21.7	5.58

SCOP DATA EN 14825:2018	
Source - Water [10°C] / Low Temperature [35°C]	
SCOPon	6.33
SCOPnet	6.33
SCOP	6.32
η [%]	252.96
Label	A+++
Qh [kWh]	250399
Pdesignh [kW]	121.2
Tbivalent [°C]	-10.00

Source - Water [10°C] / Medium Temperature [55°C]

	Operating conditions	Qh	P	COP
1	W10 / W47-55	120.9	34.0	3.55
2	W10 / W47-55 (MIN)	60.5	16.8	3.60
A	W10 / Wxx-52	122.1	31.0	3.94
B	W10 / Wxx-42	122.4	24.2	5.06
C	W10 / Wxx-36	61.3	10.6	5.79
D	W10 / Wxx-30	61.3	9.6	6.37
E	W10 / Wxx-55	120.9	34.0	3.55
F	W10 / Wxx-55	120.9	34.0	3.55

SCOP DATA EN 14825:2018	
Source - Water [10°C] / Medium Temperature [55°C]	
SCOPon	4.91
SCOPnet	4.91
SCOP	4.91
η [%]	196.37
Label	A+++
Qh [kWh]	249779
Pdesignh [kW]	120.9
Tbivalent [°C]	-10.00

Low temperature cooling W 12 / 7°C

	Operating conditions	Qc	P	EER
A	W30-35 / W12-7	74.8	23.2	3.22
B	W26-xx / W12-7	76.2	21.2	3.59
C	W22-xx / W12-7	77.3	19.4	3.98
D	W18-xx / W12-7	77.9	18.6	4.20

SEER DATA EN 14825:2018 [W 12 / 7°C]	
SEERon	3.86
SEER	3.86
Qc [kWh]	43680
η [%]	154.44

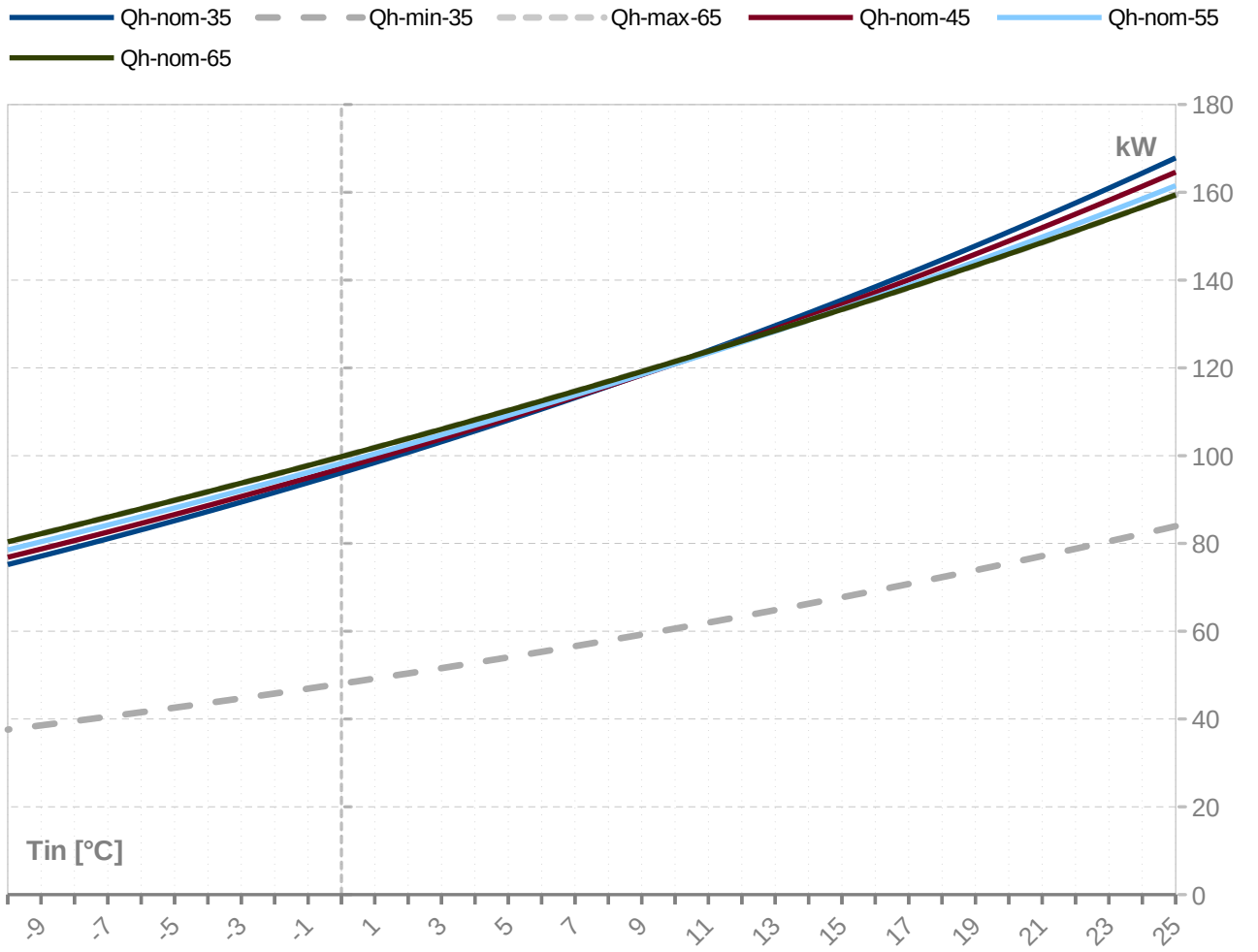
Radiant cooling W 23 / 18°C

	Operating conditions	Qc	P	EER
A	W50-xx / W23-18	86.9	36.5	2.38
B	W40-xx / W23-18	93.9	29.0	3.24
C	W30-35 / W23-18	99.5	23.2	4.29
D	W26-xx / W23-18	101.4	21.2	4.77

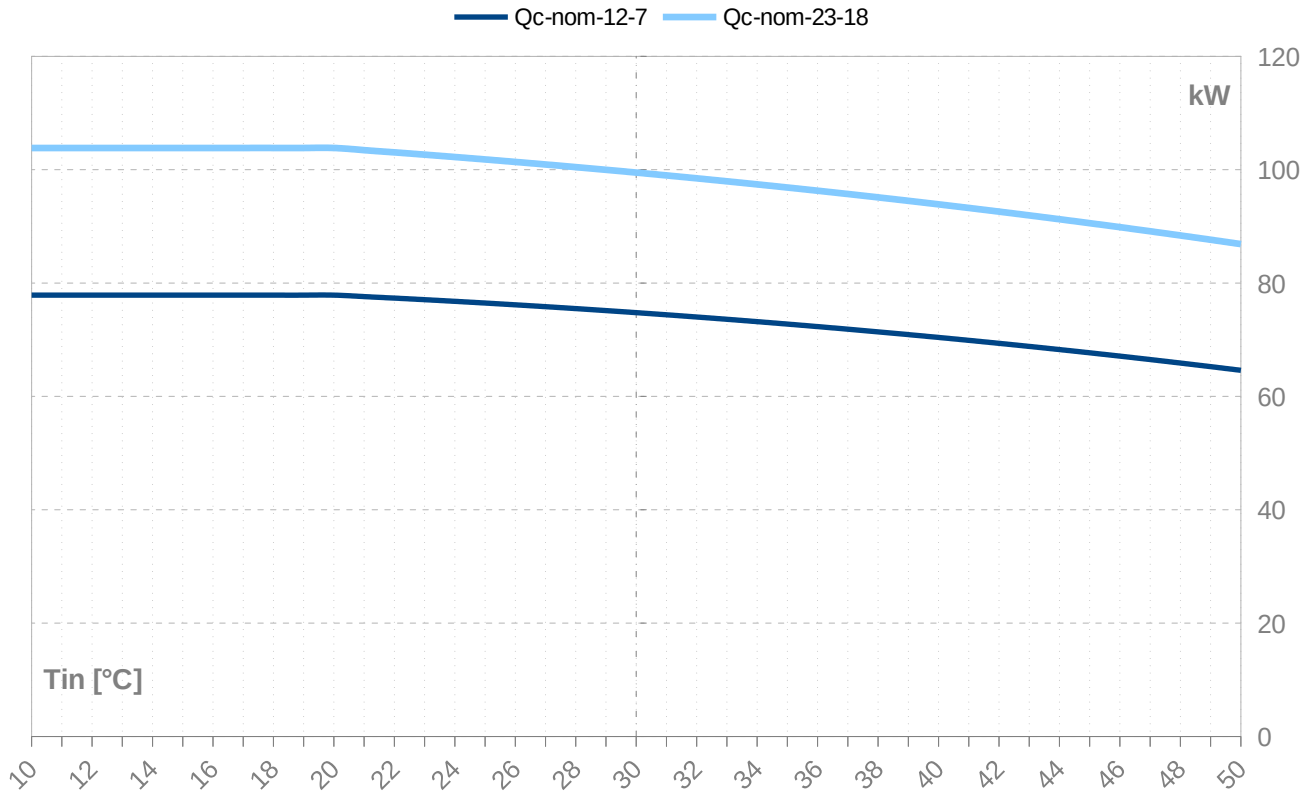
SEER DATA EN 14825:2018 [W 23 / 18°C]	
SEERon	5.15
SEER	5.14
Qc [kWh]	43680
η [%]	205.69

Performance lines - heating

ZHI46K1P-TWD_R410A_2_BWW



Performance lines - cooling



Th -OU	**[°C]**			**35**							
Ts -IN	**Qh nom**	**Qh min**	**Qh max**	**Pin nom**	**Pin min**	**Pin max**	**COP nom**	**Qc nom**	**Qc min**	**Qc max**	**I nom**
[°C]	**[kW]**	[kW]	[kW]	**[kW]**	[kW]	[kW]	**kW / kW**	[kW]	[kW]	[kW]	[A]
25	**167.8**	83.9	167.8	**22.1**	10.9	22.1	**7.59**	147.2	73.6	147.2	46.8
24	**164.4**	82.2	164.4	**22.1**	10.9	22.1	**7.45**	143.8	71.9	143.8	46.7
23	**160.9**	80.5	160.9	**22.0**	10.9	22.0	**7.31**	140.4	70.2	140.4	46.6
22	**157.6**	78.8	157.6	**22.0**	10.8	22.0	**7.18**	137.1	68.5	137.1	46.6
21	**154.3**	77.1	154.3	**21.9**	10.8	21.9	**7.04**	133.8	66.9	133.8	46.5
20	**151.0**	75.5	151.0	**21.9**	10.8	21.9	**6.90**	130.6	65.3	130.6	46.5
19	**147.8**	73.9	147.8	**21.8**	10.8	21.8	**6.76**	127.4	63.7	127.4	46.5
18	**144.6**	72.3	144.6	**21.8**	10.8	21.8	**6.63**	124.3	62.1	124.3	46.5
17	**141.5**	70.8	141.5	**21.8**	10.7	21.8	**6.49**	121.2	60.6	121.2	46.5
16	**138.5**	69.2	138.5	**21.8**	10.7	21.8	**6.36**	118.1	59.1	118.1	46.5
15	**135.5**	67.7	135.5	**21.8**	10.7	21.8	**6.23**	115.1	57.6	115.1	46.5
14	**132.5**	66.3	132.5	**21.7**	10.7	21.7	**6.10**	112.2	56.1	112.2	46.5
13	**129.6**	64.8	129.6	**21.7**	10.7	21.7	**5.96**	109.3	54.7	109.3	46.5
12	**126.8**	63.4	126.8	**21.7**	10.7	21.7	**5.84**	106.5	53.2	106.5	46.6
11	**123.9**	62.0	123.9	**21.7**	10.7	21.7	**5.71**	103.7	51.8	103.7	46.6
10	**121.2**	60.6	121.2	**21.7**	10.7	21.7	**5.58**	100.9	50.5	100.9	46.6
9	**118.5**	59.2	118.5	**21.7**	10.7	21.7	**5.46**	98.2	49.1	98.2	46.7
8	**115.8**	57.9	115.8	**21.7**	10.7	21.7	**5.34**	95.5	47.8	95.5	46.7
7	**113.2**	56.6	113.2	**21.7**	10.7	21.7	**5.22**	92.9	46.5	92.9	46.8
6	**110.6**	55.3	110.6	**21.7**	10.7	21.7	**5.10**	90.4	45.2	90.4	46.9
5	**108.1**	54.0	108.1	**21.7**	10.7	21.7	**4.98**	87.8	43.9	87.8	46.9
4	**105.6**	52.8	105.6	**21.7**	10.7	21.7	**4.87**	85.3	42.7	85.3	47.0
3	**103.2**	51.6	103.2	**21.7**	10.7	21.7	**4.75**	82.9	41.4	82.9	47.0
2	**100.8**	50.4	100.8	**21.7**	10.7	21.7	**4.64**	80.5	40.3	80.5	47.1
1	**98.4**	49.2	98.4	**21.7**	10.7	21.7	**4.53**	78.1	39.1	78.1	47.1
0	**96.1**	48.1	96.1	**21.7**	10.7	21.7	**4.43**	75.8	37.9	75.8	47.2
-1	**93.8**	46.9	93.8	**21.7**	10.7	21.7	**4.32**	73.6	36.8	73.6	47.3
-2	**91.6**	45.8	91.6	**21.7**	10.7	21.7	**4.22**	71.3	35.7	71.3	47.3
-3	**89.4**	44.7	89.4	**21.7**	10.7	21.7	**4.12**	69.2	34.6	69.2	47.3
-4	**87.3**	43.6	87.3	**21.7**	10.7	21.7	**4.02**	67.0	33.5	67.0	47.4
-5	**85.2**	42.6	85.2	**21.7**	10.7	21.7	**3.93**	64.9	32.5	64.9	47.4
-6	**83.1**	41.5	83.1	**21.7**	10.7	21.7	**3.83**	62.8	31.4	62.8	47.5
-7	**81.1**	40.5	81.1	**21.7**	10.7	21.7	**3.74**	60.8	30.4	60.8	47.5
-8	**79.1**	39.5	79.1	**21.7**	10.7	21.7	**3.65**	58.8	29.4	58.8	47.5
-9	**77.1**	38.6	77.1	**21.6**	10.7	21.6	**3.56**	56.9	28.4	56.9	47.5
-10	**75.2**	37.6	75.2	**21.6**	10.7	21.6	**3.48**	55.0	27.5	55.0	47.5
-11	**73.3**	36.6	73.3	**21.6**	10.6	21.6	**3.39**	53.1	26.6	53.1	47.5
-12	**71.4**	35.7	71.4	**21.6**	10.6	21.6	**3.31**	51.3	25.7	51.3	47.5
-13	**69.6**	34.8	69.6	**21.5**	10.6	21.5	**3.23**	49.5	24.8	49.5	47.4
-14	**67.8**	33.9	67.8	**21.5**	10.6	21.5	**3.16**	47.8	23.9	47.8	47.4
-15	**66.1**	33.0	66.1	**21.4**	10.6	21.4	**3.08**	46.1	23.0	46.1	47.3

-- attention: operating limits not reflected in performance table

Th -OU	**[°C]**			**45**							
Ts -IN	**Qh nom**	**Qh min**	**Qh max**	**Pin nom**	**Pin min**	**Pin max**	**COP nom**	**Qc nom**	**Qc min**	**Qc max**	**I nom**
[°C]	**[kW]**	[kW]	[kW]	**[kW]**	[kW]	[kW]	**kW / kW**	[kW]	[kW]	[kW]	[A]
25	**164.6**	82.3	164.6	**26.6**	13.1	26.6	**6.18**	139.7	69.9	139.7	52.9
24	**161.4**	80.7	161.4	**26.6**	13.1	26.6	**6.06**	136.5	68.2	136.5	52.8
23	**158.2**	79.1	158.2	**26.6**	13.1	26.6	**5.94**	133.3	66.7	133.3	52.8
22	**155.0**	77.5	155.0	**26.6**	13.1	26.6	**5.82**	130.2	65.1	130.2	52.7
21	**151.9**	76.0	151.9	**26.6**	13.1	26.6	**5.71**	127.1	63.5	127.1	52.7
20	**148.9**	74.4	148.9	**26.6**	13.1	26.6	**5.59**	124.0	62.0	124.0	52.7
19	**145.9**	73.0	145.9	**26.6**	13.1	26.6	**5.48**	121.0	60.5	121.0	52.7
18	**143.0**	71.5	143.0	**26.6**	13.1	26.6	**5.37**	118.1	59.0	118.1	52.7
17	**140.0**	70.0	140.0	**26.6**	13.1	26.6	**5.26**	115.2	57.6	115.2	52.7
16	**137.2**	68.6	137.2	**26.6**	13.1	26.6	**5.15**	112.3	56.2	112.3	52.7
15	**134.4**	67.2	134.4	**26.7**	13.1	26.7	**5.04**	109.5	54.7	109.5	52.7
14	**131.6**	65.8	131.6	**26.7**	13.2	26.7	**4.94**	106.7	53.4	106.7	52.7
13	**128.9**	64.4	128.9	**26.7**	13.2	26.7	**4.83**	104.0	52.0	104.0	52.7
12	**126.2**	63.1	126.2	**26.7**	13.2	26.7	**4.73**	101.3	50.6	101.3	52.8
11	**123.6**	61.8	123.6	**26.7**	13.2	26.7	**4.63**	98.6	49.3	98.6	52.8
10	**121.0**	60.5	121.0	**26.7**	13.2	26.7	**4.53**	96.0	48.0	96.0	52.8
9	**118.4**	59.2	118.4	**26.7**	13.2	26.7	**4.43**	93.4	46.7	93.4	52.8
8	**115.9**	57.9	115.9	**26.7**	13.2	26.7	**4.33**	90.9	45.4	90.9	52.8
7	**113.4**	56.7	113.4	**26.8**	13.2	26.8	**4.24**	88.4	44.2	88.4	52.9
6	**111.0**	55.5	111.0	**26.8**	13.2	26.8	**4.14**	86.0	43.0	86.0	52.9
5	**108.6**	54.3	108.6	**26.8**	13.2	26.8	**4.05**	83.5	41.8	83.5	52.9
4	**106.2**	53.1	106.2	**26.8**	13.2	26.8	**3.96**	81.2	40.6	81.2	52.9
3	**103.9**	51.9	103.9	**26.8**	13.2	26.8	**3.88**	78.8	39.4	78.8	52.9
2	**101.6**	50.8	101.6	**26.8**	13.2	26.8	**3.79**	76.6	38.3	76.6	53.0
1	**99.3**	49.7	99.3	**26.8**	13.2	26.8	**3.71**	74.3	37.2	74.3	53.0
0	**97.1**	48.6	97.1	**26.8**	13.2	26.8	**3.62**	72.1	36.0	72.1	53.0
-1	**94.9**	47.5	94.9	**26.8**	13.2	26.8	**3.54**	69.9	35.0	69.9	53.0
-2	**92.8**	46.4	92.8	**26.8**	13.2	26.8	**3.46**	67.8	33.9	67.8	52.9
-3	**90.7**	45.3	90.7	**26.8**	13.2	26.8	**3.39**	65.7	32.8	65.7	52.9
-4	**88.6**	44.3	88.6	**26.8**	13.2	26.8	**3.31**	63.6	31.8	63.6	52.9
-5	**86.6**	43.3	86.6	**26.8**	13.2	26.8	**3.24**	61.6	30.8	61.6	52.9
-6	**84.6**	42.3	84.6	**26.7**	13.2	26.7	**3.16**	59.6	29.8	59.6	52.8
-7	**82.6**	41.3	82.6	**26.7**	13.2	26.7	**3.09**	57.6	28.8	57.6	52.8
-8	**80.6**	40.3	80.6	**26.7**	13.2	26.7	**3.02**	55.7	27.9	55.7	52.7
-9	**78.7**	39.4	78.7	**26.6**	13.1	26.6	**2.96**	53.8	26.9	53.8	52.6
-10	**76.8**	38.4	76.8	**26.6**	13.1	26.6	**2.89**	52.0	26.0	52.0	52.5
-11	**75.0**	37.5	75.0	**26.5**	13.1	26.5	**2.82**	50.2	25.1	50.2	52.4
-12	**73.2**	36.6	73.2	**26.5**	13.1	26.5	**2.76**	48.4	24.2	48.4	52.3
-13	**71.4**	35.7	71.4	**26.4**	13.0	26.4	**2.70**	46.7	23.3	46.7	52.2
-14	**69.6**	34.8	69.6	**26.4**	13.0	26.4	**2.64**	45.0	22.5	45.0	52.0
-15	**67.9**	33.9	67.9	**26.3**	13.0	26.3	**2.58**	43.3	21.6	43.3	51.9

-- attention: operating limits not reflected in performance table

Th -OU	**[°C]**			**55**							
Ts -IN	**Qh nom**	**Qh min**	**Qh max**	**Pin nom**	**Pin min**	**Pin max**	**COP nom**	**Qc nom**	**Qc min**	**Qc max**	**I nom**
[°C]	**[kW]**	[kW]	[kW]	**[kW]**	[kW]	[kW]	**kW / kW**	[kW]	[kW]	[kW]	[A]
25	**161.5**	80.8	161.5	**33.7**	16.6	33.7	**4.79**	130.0	65.0	130.0	61.3
24	**158.5**	79.3	158.5	**33.7**	16.6	33.7	**4.70**	127.0	63.5	127.0	61.3
23	**155.6**	77.8	155.6	**33.7**	16.6	33.7	**4.61**	124.1	62.0	124.1	61.3
22	**152.7**	76.3	152.7	**33.8**	16.6	33.8	**4.52**	121.2	60.6	121.2	61.3
21	**149.8**	74.9	149.8	**33.8**	16.7	33.8	**4.44**	118.3	59.1	118.3	61.3
20	**147.0**	73.5	147.0	**33.8**	16.7	33.8	**4.35**	115.4	57.7	115.4	61.3
19	**144.2**	72.1	144.2	**33.8**	16.7	33.8	**4.26**	112.6	56.3	112.6	61.3
18	**141.5**	70.7	141.5	**33.9**	16.7	33.9	**4.18**	109.9	54.9	109.9	61.3
17	**138.8**	69.4	138.8	**33.9**	16.7	33.9	**4.10**	107.1	53.6	107.1	61.4
16	**136.1**	68.1	136.1	**33.9**	16.7	33.9	**4.01**	104.4	52.2	104.4	61.4
15	**133.5**	66.7	133.5	**33.9**	16.7	33.9	**3.93**	101.8	50.9	101.8	61.4
14	**130.9**	65.4	130.9	**34.0**	16.7	34.0	**3.86**	99.2	49.6	99.2	61.4
13	**128.3**	64.2	128.3	**34.0**	16.8	34.0	**3.78**	96.6	48.3	96.6	61.5
12	**125.8**	62.9	125.8	**34.0**	16.8	34.0	**3.70**	94.1	47.0	94.1	61.5
11	**123.4**	61.7	123.4	**34.0**	16.8	34.0	**3.63**	91.6	45.8	91.6	61.5
10	**120.9**	60.5	120.9	**34.0**	16.8	34.0	**3.55**	89.1	44.6	89.1	61.5
9	**118.5**	59.3	118.5	**34.0**	16.8	34.0	**3.48**	86.7	43.4	86.7	61.5
8	**116.1**	58.1	116.1	**34.1**	16.8	34.1	**3.41**	84.3	42.2	84.3	61.5
7	**113.8**	56.9	113.8	**34.1**	16.8	34.1	**3.34**	82.0	41.0	82.0	61.5
6	**111.5**	55.7	111.5	**34.1**	16.8	34.1	**3.27**	79.7	39.8	79.7	61.5
5	**109.2**	54.6	109.2	**34.1**	16.8	34.1	**3.20**	77.4	38.7	77.4	61.5
4	**107.0**	53.5	107.0	**34.1**	16.8	34.1	**3.14**	75.1	37.6	75.1	61.5
3	**104.7**	52.4	104.7	**34.1**	16.8	34.1	**3.07**	72.9	36.5	72.9	61.5
2	**102.6**	51.3	102.6	**34.1**	16.8	34.1	**3.01**	70.8	35.4	70.8	61.5
1	**100.4**	50.2	100.4	**34.0**	16.8	34.0	**2.95**	68.6	34.3	68.6	61.4
0	**98.3**	49.1	98.3	**34.0**	16.8	34.0	**2.89**	66.5	33.3	66.5	61.4
-1	**96.2**	48.1	96.2	**34.0**	16.8	34.0	**2.83**	64.4	32.2	64.4	61.3
-2	**94.1**	47.1	94.1	**34.0**	16.8	34.0	**2.77**	62.4	31.2	62.4	61.3
-3	**92.1**	46.0	92.1	**33.9**	16.7	33.9	**2.71**	60.4	30.2	60.4	61.2
-4	**90.1**	45.0	90.1	**33.9**	16.7	33.9	**2.66**	58.4	29.2	58.4	61.1
-5	**88.1**	44.0	88.1	**33.9**	16.7	33.9	**2.60**	56.5	28.2	56.5	61.0
-6	**86.1**	43.1	86.1	**33.8**	16.7	33.8	**2.55**	54.6	27.3	54.6	60.9
-7	**84.2**	42.1	84.2	**33.7**	16.6	33.7	**2.50**	52.7	26.3	52.7	60.8
-8	**82.3**	41.1	82.3	**33.7**	16.6	33.7	**2.44**	50.8	25.4	50.8	60.6
-9	**80.4**	40.2	80.4	**33.6**	16.6	33.6	**2.39**	49.0	24.5	49.0	60.5
-10	**78.5**	39.3	78.5	**33.5**	16.5	33.5	**2.34**	47.2	23.6	47.2	60.3
-11	**76.7**	38.3	76.7	**33.4**	16.5	33.4	**2.29**	45.5	22.7	45.5	60.1
-12	**74.9**	37.4	74.9	**33.3**	16.4	33.3	**2.25**	43.7	21.9	43.7	59.9
-13	**73.1**	36.5	73.1	**33.2**	16.4	33.2	**2.20**	42.1	21.0	42.1	59.7
-14	**71.3**	35.7	71.3	**33.1**	16.3	33.1	**2.15**	40.4	20.2	40.4	59.4
-15	**69.6**	34.8	69.6	**33.0**	16.3	33.0	**2.11**	38.7	19.4	38.7	59.2

-- attention: operating limits not reflected in performance table

Th -OU	**[°C]**			**65 (T-max)**							
Ts -IN	**Qh nom**	**Qh min**	**Qh max**	**Pin nom**	**Pin min**	**Pin max**	**COP nom**	**Qc nom**	**Qc min**	**Qc max**	**I nom**
[°C]	**[kW]**	[kW]	[kW]	**[kW]**	[kW]	[kW]	**kW / kW**	[kW]	[kW]	[kW]	[A]
25	**159.4**	79.7	159.4	**42.9**	21.2	42.9	**3.71**	119.3	59.7	119.3	72.0
24	**156.6**	78.3	156.6	**43.0**	21.2	43.0	**3.65**	116.5	58.3	116.5	72.0
23	**153.9**	77.0	153.9	**43.0**	21.2	43.0	**3.58**	113.8	56.9	113.8	72.1
22	**151.2**	75.6	151.2	**43.0**	21.2	43.0	**3.51**	111.0	55.5	111.0	72.2
21	**148.6**	74.3	148.6	**43.1**	21.2	43.1	**3.45**	108.3	54.2	108.3	72.2
20	**145.9**	73.0	145.9	**43.1**	21.3	43.1	**3.39**	105.7	52.8	105.7	72.3
19	**143.3**	71.7	143.3	**43.1**	21.3	43.1	**3.32**	103.1	51.5	103.1	72.3
18	**140.8**	70.4	140.8	**43.2**	21.3	43.2	**3.26**	100.5	50.2	100.5	72.4
17	**138.3**	69.1	138.3	**43.2**	21.3	43.2	**3.20**	97.9	49.0	97.9	72.4
16	**135.8**	67.9	135.8	**43.2**	21.3	43.2	**3.14**	95.4	47.7	95.4	72.5
15	**133.3**	66.7	133.3	**43.2**	21.3	43.2	**3.08**	92.9	46.5	92.9	72.6
14	**130.9**	65.4	130.9	**43.2**	21.3	43.2	**3.03**	90.5	45.3	90.5	72.6
13	**128.5**	64.2	128.5	**43.3**	21.3	43.3	**2.97**	88.1	44.0	88.1	72.6
12	**126.1**	63.1	126.1	**43.3**	21.3	43.3	**2.92**	85.7	42.9	85.7	72.7
11	**123.8**	61.9	123.8	**43.3**	21.3	43.3	**2.86**	83.4	41.7	83.4	72.7
10	**121.5**	60.7	121.5	**43.3**	21.3	43.3	**2.81**	81.0	40.5	81.0	72.7
9	**119.2**	59.6	119.2	**43.3**	21.3	43.3	**2.75**	78.8	39.4	78.8	72.8
8	**116.9**	58.5	116.9	**43.3**	21.3	43.3	**2.70**	76.5	38.3	76.5	72.8
7	**114.7**	57.3	114.7	**43.2**	21.3	43.2	**2.65**	74.3	37.1	74.3	72.8
6	**112.5**	56.2	112.5	**43.2**	21.3	43.2	**2.60**	72.1	36.1	72.1	72.8
5	**110.3**	55.2	110.3	**43.2**	21.3	43.2	**2.55**	70.0	35.0	70.0	72.8
4	**108.1**	54.1	108.1	**43.2**	21.3	43.2	**2.50**	67.8	33.9	67.8	72.7
3	**106.0**	53.0	106.0	**43.1**	21.3	43.1	**2.46**	65.7	32.9	65.7	72.7
2	**103.9**	52.0	103.9	**43.1**	21.3	43.1	**2.41**	63.7	31.8	63.7	72.6
1	**101.8**	50.9	101.8	**43.1**	21.2	43.1	**2.37**	61.6	30.8	61.6	72.6
0	**99.8**	49.9	99.8	**43.0**	21.2	43.0	**2.32**	59.6	29.8	59.6	72.5
-1	**97.7**	48.9	97.7	**42.9**	21.2	42.9	**2.28**	57.6	28.8	57.6	72.4
-2	**95.7**	47.9	95.7	**42.9**	21.1	42.9	**2.23**	55.7	27.8	55.7	72.3
-3	**93.7**	46.9	93.7	**42.8**	21.1	42.8	**2.19**	53.8	26.9	53.8	72.2
-4	**91.8**	45.9	91.8	**42.7**	21.1	42.7	**2.15**	51.9	25.9	51.9	72.1
-5	**89.8**	44.9	89.8	**42.6**	21.0	42.6	**2.11**	50.0	25.0	50.0	71.9
-6	**87.9**	43.9	87.9	**42.5**	21.0	42.5	**2.07**	48.2	24.1	48.2	71.8
-7	**86.0**	43.0	86.0	**42.4**	20.9	42.4	**2.03**	46.4	23.2	46.4	71.6
-8	**84.1**	42.0	84.1	**42.3**	20.9	42.3	**1.99**	44.6	22.3	44.6	71.4
-9	**82.2**	41.1	82.2	**42.2**	20.8	42.2	**1.95**	42.8	21.4	42.8	71.2
-10	**80.4**	40.2	80.4	**42.0**	20.7	42.0	**1.91**	41.1	20.5	41.1	70.9
-11	**78.5**	39.3	78.5	**41.9**	20.7	41.9	**1.87**	39.4	19.7	39.4	70.6
-12	**76.7**	38.3	76.7	**41.7**	20.6	41.7	**1.84**	37.7	18.9	37.7	70.4
-13	**74.9**	37.4	74.9	**41.6**	20.5	41.6	**1.80**	36.1	18.0	36.1	70.1
-14	**73.1**	36.5	73.1	**41.4**	20.4	41.4	**1.77**	34.4	17.2	34.4	69.7
-15	**71.3**	35.6	71.3	**41.2**	20.3	41.2	**1.73**	32.8	16.4	32.8	69.4

-- attention: operating limits not reflected in performance table

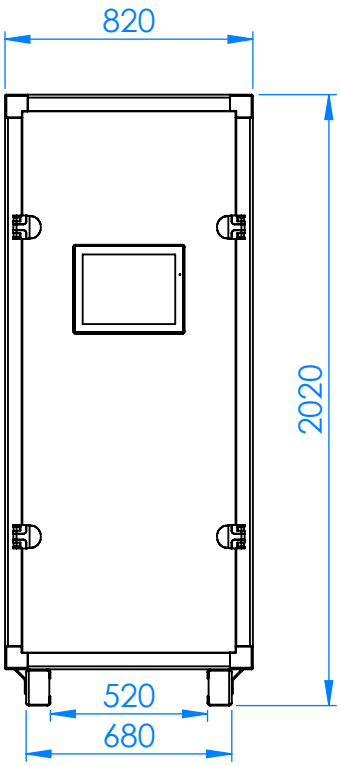
Tc -OU	**[°C]**			**W 12 / 7 °C**							
Ts -IN	**Qc nom**	**Qc min**	**Qc max**	**Pin nom**	**Pin min**	**Pin max**	**EER**	**Qh nom**	**Qh min**	**Qh max**	**I nom**
[°C]	**[kW]**	[kW]	[kW]	**[kW]**	[kW]	[kW]	**kW / kW**	[kW]	[kW]	[kW]	[A]
40	**70.4**	35.2	70.4	**29.0**	14.3	29.0	**2.43**	97.5	48.7	97.5	55.5
39	**70.9**	35.5	70.9	**28.4**	14.0	28.4	**2.50**	97.4	48.7	97.4	54.7
38	**71.4**	35.7	71.4	**27.7**	13.7	27.7	**2.58**	97.3	48.6	97.3	54.0
37	**71.9**	35.9	71.9	**27.1**	13.4	27.1	**2.65**	97.2	48.6	97.2	53.3
36	**72.3**	36.2	72.3	**26.5**	13.1	26.5	**2.73**	97.1	48.5	97.1	52.6
35	**72.8**	36.4	72.8	**25.9**	12.8	25.9	**2.81**	97.0	48.5	97.0	52.0
34	**73.2**	36.6	73.2	**25.4**	12.5	25.4	**2.89**	96.9	48.4	96.9	51.3
33	**73.6**	36.8	73.6	**24.8**	12.2	24.8	**2.97**	96.8	48.4	96.8	50.7
32	**74.0**	37.0	74.0	**24.3**	12.0	24.3	**3.05**	96.7	48.3	96.7	50.1
31	**74.4**	37.2	74.4	**23.7**	11.7	23.7	**3.14**	96.6	48.3	96.6	49.5
30	**74.8**	37.4	74.8	**23.2**	11.4	23.2	**3.22**	96.4	48.2	96.4	48.9
29	**75.1**	37.6	75.1	**22.7**	11.2	22.7	**3.31**	96.3	48.2	96.3	48.3
28	**75.5**	37.7	75.5	**22.2**	10.9	22.2	**3.40**	96.2	48.1	96.2	47.7
27	**75.8**	37.9	75.8	**21.7**	10.7	21.7	**3.49**	96.1	48.1	96.1	47.2
26	**76.2**	38.1	76.2	**21.2**	10.5	21.2	**3.59**	96.0	48.0	96.0	46.7
25	**76.5**	38.2	76.5	**20.8**	10.2	20.8	**3.68**	95.9	47.9	95.9	46.1
24	**76.8**	38.4	76.8	**20.3**	10.0	20.3	**3.78**	95.7	47.9	95.7	45.6
23	**77.1**	38.5	77.1	**19.9**	9.8	19.9	**3.88**	95.6	47.8	95.6	45.1
22	**77.3**	38.7	77.3	**19.4**	9.6	19.4	**3.98**	95.5	47.7	95.5	44.6
21	**77.6**	38.8	77.6	**19.0**	9.4	19.0	**4.09**	95.3	47.7	95.3	44.1
20	**77.9**	38.9	77.9	**18.6**	9.1	18.6	**4.20**	95.2	47.6	95.2	43.6

Tc [°C]				**W 23 / 18 °C**							
0	**Qc nom**	**Qc min**	**Qc max**	**Pin nom**	**Pin min**	**Pin max**	**EER**	**Qh nom**	**Qh min**	**Qh max**	**I nom**
[°C]	**[kW]**	[kW]	[kW]	**[kW]**	[kW]	[kW]	**kW / kW**	[kW]	[kW]	[kW]	[A]
40	**93.9**	46.9	93.9	**29.0**	14.3	29.0	**3.24**	120.9	60.4	121.0	55.4
39	**94.5**	47.3	94.5	**28.4**	14.0	28.4	**3.33**	120.9	60.5	121.0	54.7
38	**95.1**	47.6	95.1	**27.7**	13.7	27.7	**3.43**	120.9	60.5	120.9	53.9
37	**95.7**	47.9	95.7	**27.1**	13.4	27.1	**3.53**	120.9	60.5	120.9	53.2
36	**96.3**	48.1	96.3	**26.5**	13.1	26.5	**3.63**	121.0	60.5	120.9	52.4
35	**96.9**	48.4	96.9	**25.9**	12.8	25.9	**3.74**	121.0	60.5	120.9	51.7
34	**97.4**	48.7	97.4	**25.4**	12.5	25.4	**3.84**	121.0	60.5	120.9	51.1
33	**97.9**	49.0	97.9	**24.8**	12.2	24.8	**3.95**	121.0	60.5	120.9	50.4
32	**98.5**	49.2	98.5	**24.3**	12.0	24.3	**4.06**	121.1	60.5	120.9	49.7
31	**99.0**	49.5	99.0	**23.7**	11.7	23.7	**4.17**	121.1	60.5	120.9	49.1
30	**99.5**	49.7	99.5	**23.2**	11.4	23.2	**4.29**	121.1	60.6	120.9	48.5
29	**100.0**	50.0	100.0	**22.7**	11.2	22.7	**4.41**	121.1	60.6	120.9	47.9
28	**100.5**	50.2	100.5	**22.2**	10.9	22.2	**4.53**	121.2	60.6	120.9	47.2
27	**100.9**	50.5	100.9	**21.7**	10.7	21.7	**4.65**	121.2	60.6	120.9	46.6
26	**101.4**	50.7	101.4	**21.2**	10.5	21.2	**4.77**	121.2	60.6	121.0	46.1
25	**101.8**	50.9	101.8	**20.8**	10.2	20.8	**4.90**	121.2	60.6	121.0	45.5
24	**102.2**	51.1	102.2	**20.3**	10.0	20.3	**5.03**	121.3	60.6	121.0	44.9
23	**102.7**	51.3	102.7	**19.9**	9.8	19.9	**5.17**	121.3	60.6	121.0	44.3
22	**103.1**	51.5	103.1	**19.4**	9.6	19.4	**5.31**	121.3	60.6	121.1	43.8
21	**103.4**	51.7	103.4	**19.0**	9.4	19.0	**5.45**	121.3	60.6	121.1	43.2
20	**103.8**	51.9	103.8	**18.6**	9.1	18.6	**5.60**	121.3	60.6	121.1	42.6

-- attention: operating limits not reflected in performance table

LEGEND:

Ts-IN: Temperature renewable source - inlet [°C]
Th-OU: Temperature heating - outlet (flow) [°C]
Tc-OU: Temperature cooling - outlet (flow) [°C]
Qh nom: Heating capacity nominal
Qh min: Heating capacity minimal
Qh max: Heating capacity maximal
Pin nom: Power input at nominal heating capacity
Pin min: Power input at minimal heating capacity
Pin max: Power input at maximal heating capacity
COP nom: coefficient of performance at nominal heating capacity
Qc nom: cooling / heat extraction capacity at nominal heating capacity
Qc min: cooling / heat extraction at minimal heating capacity
Qc max: cooling / heat extraction at maximal heating capacity
I nom: Current at nominal heating capacity
EER: energy efficiency ratio at nominal cooling capacity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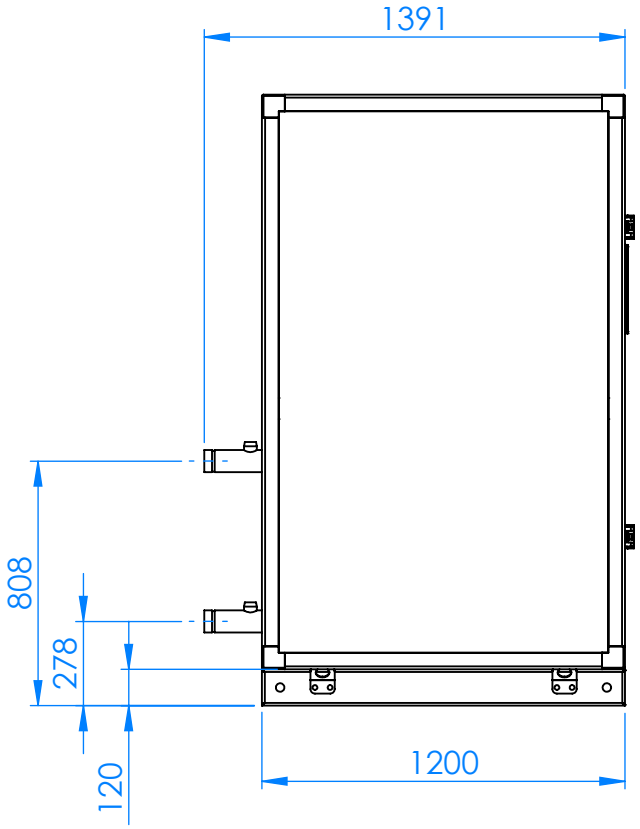
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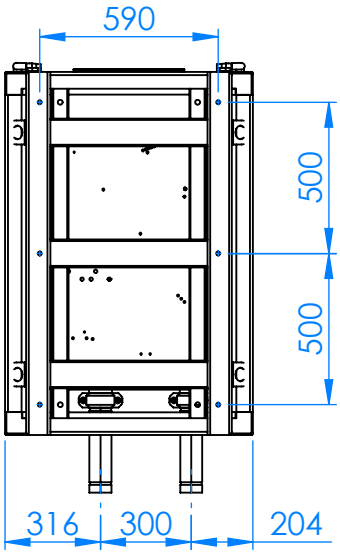
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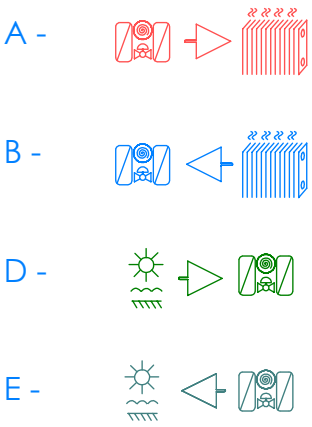
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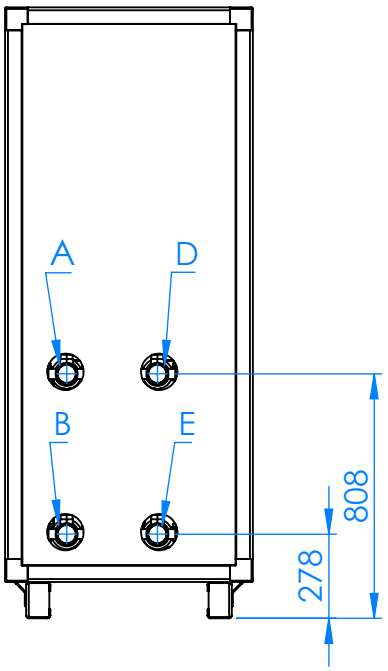
B -
D -
E -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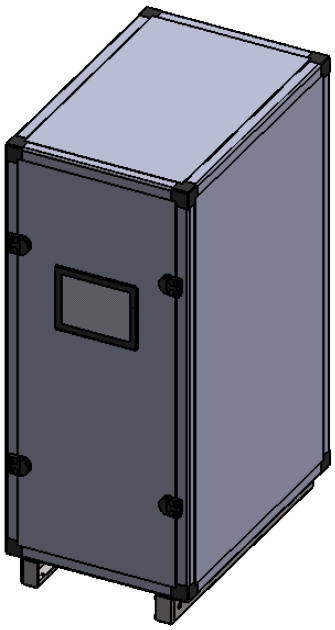
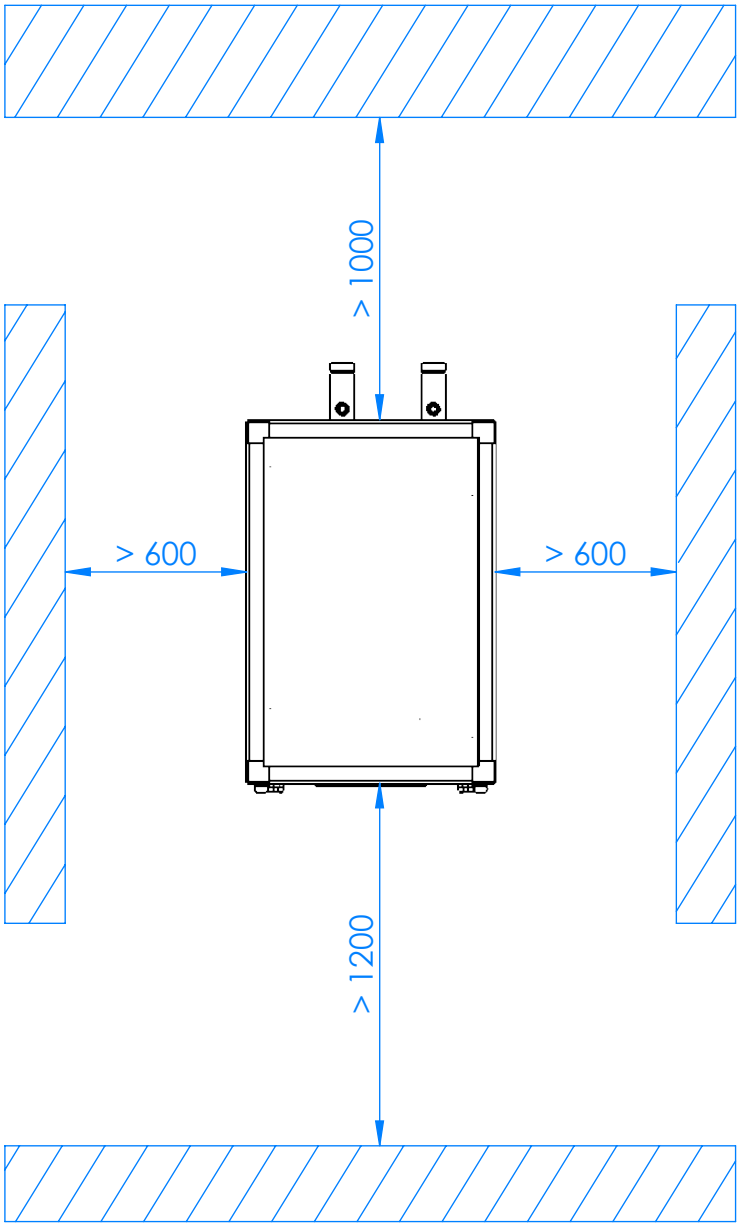
D
B
E
808
278

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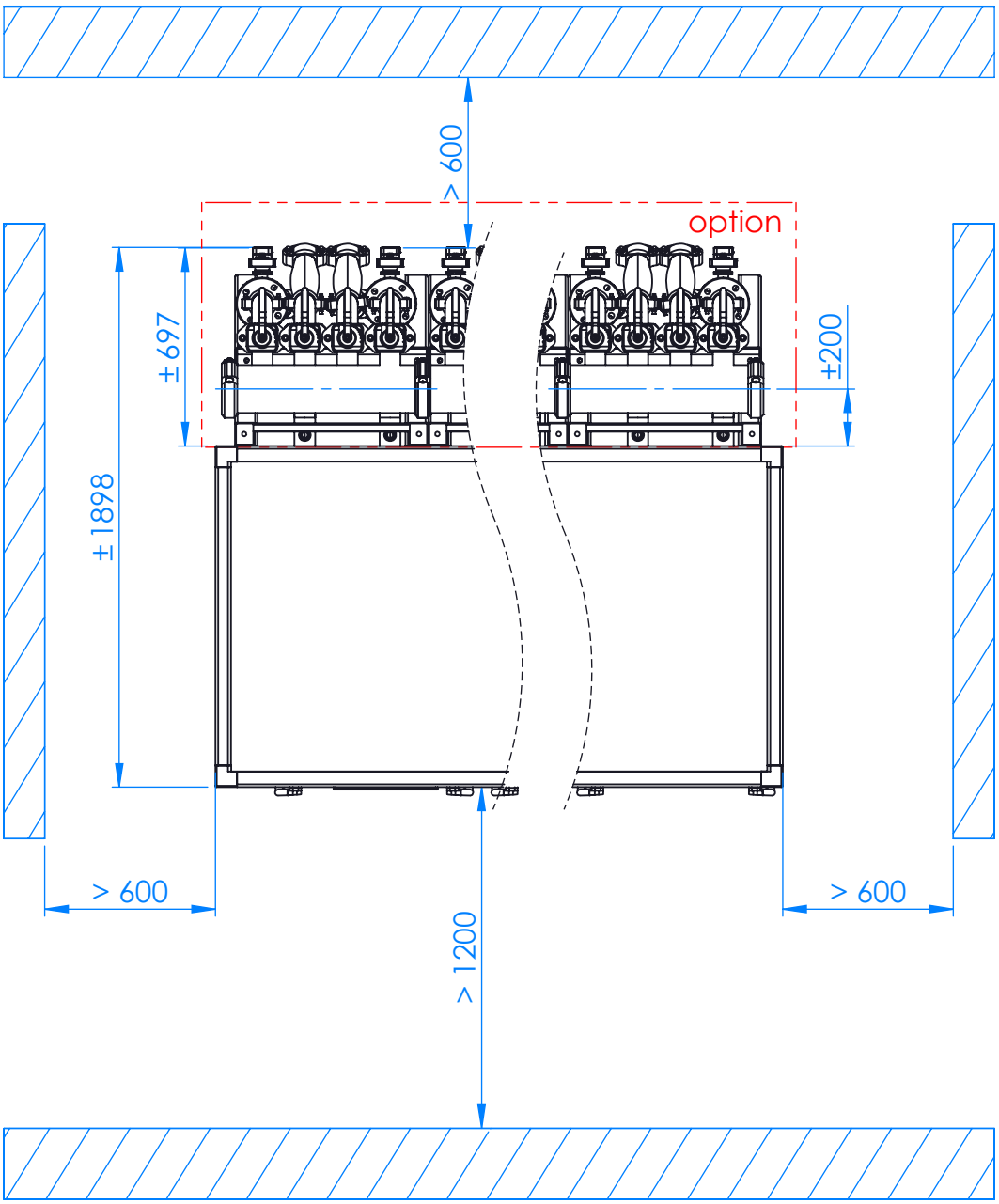
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