Climaveneta **Technical Bulletin**
FOCS2_W_CA_E_1301_4802_201001_GB

FOCS2-W/CA-E

HFC R-134a

1301 - 4802
321 - 1299 kW

High efficiency water-cooled chillers

(The photo of the unit is indicative and may change depending on the model)

- High efficiency
- Adaptability
- Silent operation
- Heat pump function

CLIMAVENETA

SUMMARY

FOCS2-W/CA-E
1301 - 4802

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EUROVENT CERTIFIED PERFORMANCE

This company participates in the Eurovent Certification Programme. The products are listed in the Directory of certified products.

Eurovent certification applied to units with cooling capacity up to 1500 kW for air cooled water chillers and water cooled liquid chillers.

CE

TÜV MANAGEMENT SERVICE ISO 9001

Company quality system certified to UNI EN ISO 9001

Liability disclaimer

This bulletin is not exhaustive about: installation, use, safety precautions, handling and transport. Refer to the "General Manual of Installation" for further information.
This bulletin refers to standard executions, particularly as regards dimensions, weight, electric, hydraulic, aeraulic and refrigerant connections (where applicable). Contact Climaveneta Commercial Office for further drawings and schemes.
Climaveneta declines any liability deriving from use of the bulletin.

The data contained herein are subject to change without notice.

1. PRODUCT PRESENTATION

High efficiency

1.1 Energetic indices IPLV and ESEER

The electrical power consumed by units is now being subjected to greater and greater attention. Indexes have been adopted that now take into consideration even use under partial load conditions, with external air flow lower than design project value and under partial load conditions in the chiller compressors installed.
The valuation index adopted in the United States is called IPLV (Integrated Part Load Value) and is defined in the regulations issued by ARI (American Refrigeration Institute):

ARI Standard

(1) $IPLV_{ARI} = (1*EER_{100\%} + 42*EER_{75\%} + 45*EER_{50\%} + 12*EER_{25\%}) /100$

where EER100%, EER75%, EER50%, EER25% are the efficiencies of the chiller in the various load conditions (100% - 75% - 50% and 25% respectively), calculated in the operating conditions shown below.

T of evaporator outlet water	6.7 °C constant			
Evaporator fouling factor	0.018 m² °C/kW			
Delta T at full load	5°C			
Load	100%	75%	50%	25%
Cond. water inlet temp	29.4°C	23.9°C	18.3°C	18,3°C
Condenser fouling factor	0.044 m² °C/kW			

The multipliers 1, 42, 45 and 12 are the statistical coefficients allocated to the cooling efficiencies calculated at the various load conditions analytically calculated by ARI for different typologies of buildings and operating conditions in 29 different American cities.

In Europe, the ESEER index proposed by EECCAC (Energy Efficiency and Certification of Central Air Conditioners) is used in order to more closely interpret European air conditioning usage. ESEER (European Seasonal Energy Efficiency Ratio) is defined as:

Proposal EECCAC

(3) $ESEER = (3*EER_{100\%} + 33*EER_{75\%} + 41*EER_{50\%} + 23*EER_{25\%}) /100$

where

T of evaporator outlet water	7 °C constant			
Delta T at full load	5 °C			
Load	100%	75%	50%	25%
Cond. water inlet temp.	30°C	26°C	22°C	18°C

These indices can be used to estimate the total energy requirement of the plant during the summer season. Calculations using the ESEER index will therefore be more accurate than those using just the EER.

FOCS2-W/CA-E	ESEER	EER values			
		100% 30°C	75% 26°C	50% 22°C	25% 18°C
1301	6.49	5.60	6.27	6.65	6.64
1401	6.50	5.60	6.27	6.65	6.66
1601	6.30	5.59	6.06	6.46	6.47
1801	6.40	5.61	6.11	6.64	6.47
2101	6.37	5.59	6.07	6.59	6.52
2401	6.40	5.59	6.08	6.62	6.58
2802	6.65	5.60	6.26	6.85	7.00
3202	6.57	5.59	6.07	6.78	7.02
3602	6.73	5.61	6.12	7.00	7.25
4202	6.65	5.59	6.07	688	7.19
4802	6.66	5.59	6.08	6.89	7.20

1.2 High efficiency

The version ´CA-E´ is characterized by efficiency beyond the ´Class A´ for Eurovent. The technological choices adopted assure the minimization of operating costs and therefore a quick payback time.

1.3 Adaptability

Adaptability at the building's cooling request thanks to the continuous capacity regulation, assured by sophisticated control's logic.

1.4 Silent operation

Silent operation thanks to the accurate unit's design. Optional integral acoustic enclosure, further reduces the sound level beyond the best on market.

1.5 Heat pump function

Heat pump function water circuit side reversal.

(1) IPLV (Integrated Part Load Value) ARI Standard indices

(2) EER (Energy Efficiency Ratio) Efficiency at full load (kW/kW)

(3) ESEER (European Seasonal Energy Efficiency Ratio) Indices for EECCAC proposal

2. UNIT DESCRIPTION

Unit for indoor installation for chilled water production. Semihermetic screw compressors optimized to operate with low compression ratio and R134a; shell and tubes condenser and direct expansion evaporator; electronic expansion valve. Frame in polyester-painted galvanized steel. High efficiency unit: the innovative optimized compressors and the high performing heat exchangers enhance EER values up to 5,6 at Eurovent standars conditions.

Water cooled chillers
The unit is supplied fully refrigerant charged and factory tested. On site installation only requires power and hydraulic connection.

2.1 Standard unit composition

Structure
Frame in polyester-painted galvanized steel. The self-supporting frame is built to guarantee maximum accessibility for servicing and maintenance operations.

Refrigerant circuit
Unit with independent cooling circuits for each compressor assuring continuous operation, limited pollution and ease of maintenance. Each cooling circuit is fitted standard with:
- electronic adjustment valve
- safety valves
- high and low pressure transducers
- compressor discharge check valve
- on-off valve on the liquid and compressor delivery lines
- liquid line solenoid valve
- dryer filter with replaceable cartridge
- refrigerant line sight glass with humidity indicator
- high pressure switches.

Compressors
Semi-hermetic screw compressors specifically designed for low temperature application.
The compressor has 2 five and six-lobe rotors: the five-lobe rotor is splined directly onto the motor without any interposed overgears. The use of two rotors permits elevated volumetric output, uniform gas flow without jerks, reduced vibrations and dimensions. The bearings provided along the rotor axis, in a separate chamber isolated from the compression chamber, are in high-strenght carbon steel.
Oil flow managed by pressure's differences, without any dedicated oil pump, specifically designed so that the smallest differences between high pressure and suction pressure ensure sufficient oil supply to the bearings, both at full and partial load. The built-in oil separator has 3 stages of separation with a 10 mm stainless steel mesh filter ensuring the constant presence of oil inside, with an oil carry over rate lower than 0,5%.
Compressor's continuous modulation thanks to a slide valve which, depending on the position assumed, permits the compression's chamber stepless reduction. Each compressor partializes down to 25% of its maximum capacity.
In addition to standard no-load switch-on procedure, the motor is fitted with electric devices limiting the absorbed current during start-up. Each compressor is fitted with manual reset motor thermal protection, controls for the delivery gas temperature and the oil level flow and an electric resistance to heat the carter while the compressor is stopped.
A check valve on the refrigerant outlet assures the compressor from the risk of reverse rotation after stopping. A compressor discharge valve is used to force the refrigerant into the heat exchangers during the compressors' maintenance operation.

Heat exchanger on plant side
Direct expansion evaporator; refrigerant flows inside the tubes and water on the shell side. Baffles in the shell increase turbolence and therefore enhance the heat exchange's efficiency. Steel shell insulated with a foamed closed-cell elastomer 10 mm thickness and 0.033 W/mK at 0°C thermal conductivity. Internal copper tubes are mechanically fitted onto the plates and grooved internally to enhance the heat exchange between refrigerant and water. A differential pressure switch is present as standard to control the waterflow while the unit is working preventing the ice formation. The heat exchanger complishes with PED and ASME regulation, respectively concerning the operating pressures and stresses. Flexible joint water connection.

Heat exchanger on heat source side
2-steps shell and tube condenser, flooded type, with water flowing inside and refrigerant flowing outside the pipes. Only for the units in function /H (heat pump reversible on hydraulic side), the steel shell is insulated with a foamed polyethylene closed-cell mat of 10 mm thickness and a thermal conductivity of 0.033 W/mK at 0°C to avoid condensation on its surface. The copper tubes are internally and externally grooved to improve heat exchange. Heads can be removed to inspect the tubes. Under request it's possible to have a 4-steps heat exchanger (water side) for application with low-medium temperature sources (for example underground water). The heat exchanger complies with PED standards, concerning to operating pressure. Flexible joint water connection.

Electrical and control panel
Electrical and control panel built to EN60204-1 and EC204-1 standards, complete with:
- electronic controller
- control circuit transformer
- general door lock isolator
- power circuit with bar distribution system
- fuses for compressors
- compressors protection with internal thermal overload
- terminals for cumulative alarm block
- remote on/off terminals
- spring-type control circuit terminal board
- phases sequence and minimum/maximum voltage control.

2.2 Certifications

EUROVENT - certification programme
CE – Product quality certificate for the European Union
GOST – Product quality certificate for Russian Federation
SAFETY QUALITY LICENCE – Product quality certificate for Popular Republic of China
M&I – Quality Certification for Australia and New Zealand
Machine Directive 2006/42/CE
Pressure Equipment Directive PED 97/23/EC
Low voltage Directive 2006/95/EC
Electromagnetic compatibility Directive 2004/108/EC
ISO 9001 - Company Quality Management System Certification
ISO 14001 - Company Environmental Management System Certification

2.3 Unit's test
Tests carried out along the all productive process as imposed by ISO9001. Possibility to have performance and acoustical witness tests, with the support of qualified technical operators. Performance tests give the possibility to measure electric data, waterflows, operating temperature, absorbed and given power, both at full load and partial load condition. It's even possible to have a simulation of the most common alarm states and the pressure drops (water side) measurements. The acoustical tests allow to verify level of sound emissions of the unit according to ISO3744.

2.4 Electronic control W3000SE Large
The controller W3000 large offers the latest control and functions specially developed for these units.
The keypad is generously sized with full operating status display. The controls and detailed LCD make access to machine settings easy and safe. These resources permit to diirectly act on the unit settings through a multilevel menu, available in several languages.
The diagnostics includes full management of alarms with black-box functions and alarm record for better analysis of unit performance. For multi-units plants a special device to coordinate and manage all the resources is available as an option; energy metering device is even possible as an option. Supervision is easy through Climaveneta devices or with various options for interfacing to ModBus, Bacnet, Echelon LonTalk protocols. Compatibility with remote keyboard (management up to 10 units). Clock available with programming of operation (standard 4 days and 10 time bands).
Temperature regulation features the continuous capacity modulation, based on a neutral zone and the return water temperature control. It´s even possible the steps regulation, based on the return water temperature, with proportional or proportional+integral logic.
As option is possible to choose the VPF system control integrated on-board to the units.

2.5 Versions
CA-E, very high efficiency version, Class A enhanced
Super high efficiency unit for the minimum investment payback time. EER of 5.6 at standard condition. Electronic expansion valve, high performing heat exchangers and generous heat exchange's surfaces. 2-steps condensers water side.

2.6 Functions
< >, standard unit
Standard unit for production of chilled water

/D, with Desuperheater
Unit for production of chilled water, complete of an auxiliary heat exchanger on the discharge section of the compressor to the superheat reclaim. The reclaim heat is approximately the 20% of the total cooling capacity. This function is used for application with domestic hot water production or other secondary uses, as support of the existing boiler.

/R, with total heat Reclaim
Unit for the production of chilled water, with a dedicated heat exchanger refrigerant/water for the condensation heat reclaim. The heat reclaim is managed to reach the set-point. This function is used for air treatment in applications with AHU or for domestic hot water production together with an auxiliary boiler.

/H, Hydraulic side reversible heat pump
Heat pump reversible on hydraulic side. The unit has, as standard, an additional temperature probe on condenser and an extra insulating material on it. The controller is set to manage the unit on a double set-point, depending on the commutation: summer or winter mode.

2.7 Accessories

- Kit HWT
  Kit for extending the operating limits of the unit: maximum condenser outlet temperature 65°C. To control the temperature of the hot water produced, this accessory must be applied to the unit in function/H. The accessory is required for applications at elevated condensation temperatures (heat pump, heat recovery at high temperatures or critical installations with dry-coolers).

- Integral acoustical enclosure basic
  Enclosure realized with peraluman panels lined with an acoustic insulation made by polyester fiber of thickness 30 mm. The sound power level reduction achieved with this accessory is 12 dB(A).

- Integral acoustical enclosure plus
  Enclosure realized with peraluman panels lined with a special acoustic insulation composed by 5 alternating layers of polyurethane and gaiter of total thickness 50 mm. The sound power level reduction achieved with this accessory is 16 dB(A).

- Partial heat reclaim management
  0-10 V signal to control the auxiliary pumps on the desuperheat circuit. This option minimizes pumps' consumption: they are called to work only when gas saturated discharge temperature is higher than the tank one. (Thermostat and pumps at client responsibility)

- Compressors' on/off signal
  Auxiliary contactors to give a voltage free signal.

- Automatic circuit breakers
  Over-current switch on the major electrical loads.

- Demand limit
  Digital input (voltage free).

- Modbus connectivity
  Two-directional communications board.

- Bacnet connectivity
  Two-directional communications board.

- Echelon connectivity
  Two-directional communications board.

- Auxiliary signal 4-20 mA
  Analog input 4-20 mA.

- 0-10 V signal for the condensation's control
  0-10 V signal on terminal board for the condensation control. For dry-cooler or cooling tower applications, it permits to modulate the fans' speed in order to maintain the condensing pressure in a pre-defined range. Max transmission length 30 m. Shielded cable is recommended.

- Relay for pump(s) management
  Relay for the pump(s) on/off.

- CuNi condensers
  Shell and tube heat exchanger recommended for applications with water with a high corrosion potential. Headers, shell, baffles and refrigerant connection in carbon steel. Available tubes in CuNi 90/10 all, or CuNi 70/30; the last option is recommended for marine water applications. [Consider a penalization on the condensation temperature of 2°C for 90/10 alloy, and of 3°C for 70/30]

- VPF system (see dedicate section)
  Predisposition for the variable flow pumps' control on the primary circuit. The system comprises: extensions on the controller to read the system's pressure transducer signals (4-20 mA) and the consequent management of pumps and bypass valve (0-10 V signal), additional pressure transducer as extra safety device. (Pressure transducer, pumps and bypass valve at client responsibility)

- Pressostatic valve for the condensation control (see dedicate section)
  Pressostatic valve with grey cast iron body. It's used for regulating the flow of water as a function of the condensing pressure, maintaining it constant during operation. When the refrigeration plant is stopped, the cooling water flow is shut off automatically. The valve is selected and tested by Climaveneta during the unit's test. Recommended for applications with low temperature water, for example groundwater, where it's request the condensation pressure's control and it's possible to work with variable flow on the rejection circuit (Separately supplied, not mounted)

- Soft start
  Electronic device adopted to manage the inrush current. This reduces the current peak when the motor starts. Starting takes place therefore without jerks and consequently reduces wear of the motor and allow the electrical system to be more favourably sized.

Other accessories
- Flanged evaporator connectors
- Flanged condenser connection
- Evaporator flowswitch (water side)
- Compressor intake valve
- Power factor correction
- Rubber anti vibration device
- Numbered wiring
- Multi-units control devices (sequencer, Manager3000, FWS3000). Separately supplied
- Remote Keyboard predisposition
- Remote signal for double set-point
- Container packing.

3.1 GENERAL TECHNICAL DATA

FOCS2-W CA-E

SIZE		1301	1401	1601	1801	2101	2401	2802
FOCS2-W/CA-E								
COOLING	(1)							
Cooling capacity	**kW**	**321**	**365**	**442**	**506**	**574**	**649**	**729**
Total power input (unit)	kW	57,3	65,1	79,1	90,3	103	116	130
EER		5,60	5,60	5,59	5,61	5,59	5,59	5,60
ESEER		6,49	6,5	6,3	6,4	6,37	6,4	6,66
Heat exchanger water flow	m³/h	55,2	62,8	76,1	87,2	98,8	112	126
Heat exchanger pressure drop	kPa	45,7	47,7	53,5	53,4	52,8	60,2	51,9
FOCS2-W/H/CA-E								
HEATING	(2)							
Heating capacity	**kW**	**357**	**407**	**488**	**559**	**638**	**722**	**813**
Total power input (unit)	kW	73,1	83,1	99,5	114	129	146	166
COP		4,89	4,89	4,91	4,92	4,94	4,94	4,89
Heat exchanger water flow	m³/h	62,1	70,6	84,8	97,1	111	125	141
Heat exchanger pressure drop	kPa	44,4	42,8	46,4	47,4	49,5	51,3	42,7
FOCS2-W/D/CA-E								
COOLING WITH PARTIAL RECOVERY	(3)							
Cooling capacity	kW	333	378	458	525	595	674	757
Total power input (unit)	kW	55,3	62,8	76,3	87,1	99,0	112	126
Heat exchanger water flow	m³/h	55,2	62,8	76,1	87,2	98,8	112	126
Heat exchanger pressure drop	kPa	45,7	47,7	53,5	53,4	52,8	60,2	51,9
Heat recovery thermal capacity	**kW**	**24,8**	**28,1**	**34,2**	**39,0**	**44,3**	**50,2**	**56,3**
Heat exchanger recovery water flow	m³/h	4,30	4,89	5,93	6,78	7,70	8,72	9,78
Plant side heat exchanger recovery pressure drop	kPa	25,3	32,7	32,1	27,6	35,6	45,6	32,8
FOCS2-W/R/CA-E								
COOLING WITH TOTAL RECOVERY	(4)							
Cooling capacity	kW	289	328	395	452	-	-	657
Total power input (unit)	kW	73,1	83,1	99,5	114	-	-	166
Heat exchanger water flow	m³/h	55,2	62,8	76,1	87,2	-	-	126
Heat exchanger pressure drop	kPa	45,7	47,7	53,5	53,4	-	-	51,9
Heat recovery thermal capacity	**kW**	**357**	**407**	**488**	**559**	**-**	**-**	**813**
Heat exchanger recovery water flow	m³/h	62,1	70,6	84,8	97,1	-	-	141
Plant side heat exchanger recovery pressure drop	kPa	44,4	42,8	46,4	47,4	-	-	42,7
COMPRESSORS								
Number	N°.	1	1	1	1	1	1	2
Number of capacity	N°.	-	-	-	-	-	-	-
Number of circuits	N°.	1	1	1	1	1	1	2
Type of regulation		STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Minimum capacity steps	%	25	25	25	25	25	25	25
Type of refrigerant		R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge	kg.	50	49	75	73	85	94	110
Oil charge	kg.	19	19	35	35	35	35	38
NOISE LEVELS	(5)							
Total sound power	dB(A)	97	97	97	97	97	97	99
Total sound pressure	dB(A)	65	65	65	65	65	65	67
DIMENSIONS AND WEIGHTS	(6)							
Length	mm.	4300	4300	4000	4000	4000	4300	4600
Width	mm.	900	900	900	900	900	900	1150
Height	mm.	1950	1950	2000	2000	2000	2100	2195
Weight	kg.	2460	2750	3560	3720	3760	4180	5360

1 Plant (side) cooling exchanger water (in/out) 12/7 °C
Source (side) heat exchanger water (in/out) 30/35 °C
2 Source (side) heat exchanger water (in/out) 12/7 °C
Plant (side) heating exchanger water (in/out) 40/45 °C
3 Plant (side) cooling exchanger water (in/out) 12/7 °C
Source (side) heat exchanger water (in/out) 30/35 °C
Plant (side) heat exchanger recovery water (in/out) 40/45 °C
4 Plant (side) cooling exchanger water (in/out) 12/7 °C
Plant (side) heat exchanger recovery water (in/out) 40/45 °C
5 Sound power on the basis of measurements made in compliance with ISO 9614 and Eurovent 8/1 for Eurovent certified units; in compliance with ISO 3744 for non-certified units
Average sound pressure level, at 10 (m.) distance, unit in a free field on a reflective surface; non-binding value obtained from the sound power level
6 Standard configuration
- Not available

GENERAL TECHNICAL DATA

FOCS2-W CA-E

SIZE		3202	3602	4202	4802			
FOCS2-W/CA-E								
COOLING	(1)							
Cooling capacity	**kW**	**884**	**1012**	**1147**	**1299**			
Total power input (unit)	kW	158	180	205	232			
EER		5,59	5,61	5,59	5,59			
ESEER		6,57	6,73	6,64	6,66			
Heat exchanger water flow	m³/h	152	174	197	224			
Heat exchanger pressure drop	kPa	58,6	41,3	55,0	65,0			
FOCS2-W/H/CA-E								
HEATING	(2)							
Heating capacity	**kW**	**977**	**1118**	**1275**	**1443**			
Total power input (unit)	kW	199	227	258	292			
COP		4,91	4,92	4,94	4,94			
Heat exchanger water flow	m³/h	170	194	221	251			
Heat exchanger pressure drop	kPa	46,4	47,5	49,5	51,6			
FOCS2-W/D/CA-E								
COOLING WITH PARTIAL RECOVERY	(3)							
Cooling capacity	kW	917	1050	1190	1347			
Total power input (unit)	kW	153	174	198	224			
Heat exchanger water flow	m³/h	152	174	197	224			
Heat exchanger pressure drop	kPa	58,6	41,3	55,0	65,0			
Heat recovery thermal capacity	**kW**	**68,3**	**77,9**	**88,6**	**100**			
Heat exchanger recovery water flow	m³/h	11,9	13,5	15,4	17,4			
Plant side heat exchanger recovery pressure drop	kPa	32,1	27,5	35,6	45,6			
FOCS2-W/R/CA-E								
COOLING WITH TOTAL RECOVERY	(4)							
Cooling capacity	kW	790	904	-	-			
Total power input (unit)	kW	199	227	-	-			
Heat exchanger water flow	m³/h	152	174	-	-			
Heat exchanger pressure drop	kPa	58,6	41,3	-	-			
Heat recovery thermal capacity	**kW**	**977**	**1118**	**-**	**-**			
Heat exchanger recovery water flow	m³/h	170	194	-	-			
Plant side heat exchanger recovery pressure drop	kPa	46,4	47,5	-	-			
COMPRESSORS								
Number	N°.	2	2	2	2			
Number of capacity	N°.	-	-	-	-			
Number of circuits	N°.	2	2	2	2			
Type of regulation		STEPLESS	STEPLESS	STEPLESS	STEPLESS			
Minimum capacity steps	%	25	25	25	25			
Type of refrigerant		R134a	R134a	R134a	R134a			
Refrigerant charge	kg.	131	144	213	207			
Oil charge	kg.	70	70	70	70			
NOISE LEVELS	(5)							
Total sound power	dB(A)	99	99	99	99			
Total sound pressure	dB(A)	67	67	67	67			
DIMENSIONS AND WEIGHTS	(6)							
Length	mm.	4950	5220	4920	4920			
Width	mm.	1150	1150	1150	1285			
Height	mm.	2195	2195	2350	2430			
Weight	kg.	6410	6870	7850	8470			

1 Plant (side) cooling exchanger water (in/out) 12/7 °C
Source (side) heat exchanger water (in/out) 30/35 °C
2 Source (side) heat exchanger water (in/out) 12/7 °C
Plant (side) heating exchanger water (in/out) 40/45 °C
3 Plant (side) cooling exchanger water (in/out) 12/7 °C
Source (side) heat exchanger water (in/out) 30/35 °C
Plant (side) heat exchanger recovery water (in/out) 40/45 °C
4 Plant (side) cooling exchanger water (in/out) 12/7 °C
Plant (side) heat exchanger recovery water (in/out) 40/45 °C
5 Sound power on the basis of measurements made in compliance with ISO 9614 and Eurovent 8/1 for Eurovent certified units; in compliance with ISO 3744 for non-certified units
Average sound pressure level, at 10 (m.) distance, unit in a free field on a reflective surface; non-binding value obtained from the sound power level
6 Standard configuration
- Not available

3.2 COOLING CAPACITY PERFORMANCE

1301

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**338**	**324**	**318**	**309**	**293**	**287**	**351**	**336**	**330**	**321**	**305**	**298**	**363**	**348**	**342**	**333**	**317**	**310**
Pat	44,7	50,5	53,1	57,1	64,6	67,8	44,8	50,6	53,2	57,3	64,8	68,0	44,9	50,8	53,3	57,4	65,0	68,2
Qev	58,2	55,7	54,7	53,1	50,5	49,4	60,4	57,8	56,8	55,2	52,5	51,4	62,6	60,0	58,9	57,3	54,5	53,4
Dpev	50,8	46,5	44,9	42,4	38,3	36,7	54,7	50,2	48,4	45,7	41,3	39,6	58,8	54,0	52,1	49,2	44,6	42,7
Pt	383	374	371	366	358	355	395	387	383	378	370	367	408	399	395	390	381	378
Qcd	65,6	64,2	63,6	62,8	61,4	60,9	67,8	66,3	65,7	64,9	63,5	62,9	70,1	68,5	67,9	67,0	65,5	64,9
Dpcd	49,5	47,4	46,5	45,3	43,4	42,7	52,9	50,6	49,7	48,4	46,3	45,5	56,4	53,9	53,0	51,6	49,3	48,5
Tev				**9**						**10**						**11**		
Pf	**376**	**361**	**354**	**345**	**328**	**321**	**389**	**373**	**367**	**357**	**340**	**333**	**403**	**386**	**380**	**369**	**352**	**345**
Pat	45,0	50,9	53,5	57,6	65,1	68,4	45,1	51,0	53,6	57,7	65,3	68,6	45,1	51,0	53,7	57,8	65,4	68,7
Qev	64,8	62,1	61,1	59,4	56,5	55,4	67,1	64,3	63,2	61,5	58,6	57,4	69,4	66,6	65,4	63,7	60,7	59,4
Dpev	63,0	57,9	55,9	52,9	47,9	46,0	67,5	62,1	59,9	56,7	51,5	49,4	72,2	66,5	64,2	60,8	55,2	53,0
Pt	421	412	408	402	393	390	434	424	421	415	405	402	448	437	433	427	417	414
Qcd	72,3	70,7	70,0	69,1	67,6	67,0	74,6	72,9	72,2	71,2	69,6	69,0	76,8	75,1	74,4	73,4	71,7	71,1
Dpcd	60,1	57,4	56,4	54,9	52,5	51,6	63,9	61,1	60,0	58,4	55,8	54,8	67,9	64,9	63,7	62,0	59,2	58,1

1401

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**384**	**368**	**361**	**351**	**334**	**327**	**399**	**382**	**375**	**365**	**347**	**340**	**413**	**396**	**389**	**378**	**360**	**353**
Pat	50,9	57,4	60,3	64,9	73,4	77,1	51,0	57,6	60,5	65,1	73,6	77,3	51,1	57,7	60,6	65,3	73,8	77,5
Qev	66,2	63,4	62,2	60,5	57,5	56,2	68,7	65,8	64,6	62,8	59,7	58,5	71,2	68,2	67,0	65,2	62,0	60,7
Dpev	53,0	48,6	46,8	44,2	39,9	38,3	57,1	52,4	50,5	47,7	43,1	41,3	61,3	56,3	54,3	51,4	46,5	44,6
Pt	435	426	422	416	407	404	450	440	436	430	420	417	464	454	450	444	434	430
Qcd	74,7	73,0	72,4	71,4	69,9	69,3	77,2	75,4	74,8	73,8	72,2	71,6	79,7	77,9	77,2	76,2	74,5	73,8
Dpcd	47,8	45,7	44,9	43,7	41,8	41,1	51,0	48,8	47,9	46,6	44,6	43,9	54,4	52,0	51,1	49,7	47,6	46,7
Tev				**9**						**10**						**11**		
Pf	**428**	**410**	**403**	**392**	**373**	**366**	**443**	**425**	**417**	**406**	**387**	**379**	**458**	**439**	**432**	**420**	**400**	**392**
Pat	51,2	57,8	60,8	65,4	74,0	77,7	51,2	57,9	60,9	65,6	74,2	77,9	51,3	58,0	61,0	65,7	74,4	78,1
Qev	73,7	70,7	69,4	67,5	64,3	63,0	76,3	73,2	71,9	70,0	66,6	65,3	78,9	75,7	74,4	72,4	69,0	67,6
Dpev	65,8	60,5	58,3	55,2	50,0	48,0	70,4	64,8	62,6	59,2	53,7	51,6	75,3	69,3	67,0	63,4	57,6	55,3
Pt	479	468	464	458	447	443	494	483	478	472	461	457	509	497	493	486	475	470
Qcd	82,2	80,4	79,7	78,6	76,8	76,2	84,8	82,9	82,1	81,0	79,2	78,5	87,4	85,4	84,6	83,5	81,6	80,9
Dpcd	58,0	55,4	54,4	52,9	50,6	49,7	61,6	58,9	57,8	56,3	53,8	52,8	65,5	62,5	61,4	59,7	57,1	56,0

1601

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**465**	**446**	**438**	**425**	**403**	**394**	**483**	**463**	**455**	**442**	**419**	**409**	**500**	**480**	**472**	**459**	**435**	**425**
Pat	62,3	70,1	73,4	78,8	88,4	92,6	62,6	70,3	73,7	79,1	88,8	92,9	62,8	70,6	74,0	79,3	89,1	93,3
Qev	80,1	76,8	75,4	73,2	69,4	67,8	83,1	79,7	78,3	76,1	72,1	70,5	86,1	82,7	81,2	79,0	74,9	73,2
Dpev	59,3	54,5	52,6	49,6	44,5	42,5	63,9	58,8	56,7	53,5	48,1	46,0	68,6	63,3	61,0	57,7	51,9	49,6
Pt	528	516	511	504	492	486	545	533	528	521	508	502	563	551	546	538	524	519
Qcd	90,5	88,5	87,7	86,5	84,4	83,5	93,5	91,5	90,7	89,4	87,2	86,2	96,6	94,5	93,7	92,3	90,0	89,1
Dpcd	52,8	50,6	49,7	48,3	45,9	44,9	56,4	54,0	53,0	51,6	49,0	48,0	60,2	57,6	56,6	55,0	52,3	51,2
Tev				**9**						**10**						**11**		
Pf	**518**	**498**	**489**	**475**	**451**	**441**	**536**	**515**	**506**	**492**	**468**	**458**	**554**	**533**	**524**	**510**	**485**	**474**
Pat	62,9	70,8	74,2	79,6	89,4	93,6	63,1	71,0	74,4	79,9	89,7	94,0	63,2	71,1	74,6	80,1	90,0	94,3
Qev	89,2	85,7	84,2	81,9	77,8	76,0	92,3	88,7	87,2	84,8	80,6	78,8	95,5	91,8	90,2	87,8	83,5	81,7
Dpev	73,6	67,9	65,6	62,0	55,9	53,5	78,9	72,8	70,3	66,6	60,1	57,5	84,3	78,0	75,3	71,3	64,5	61,7
Pt	581	568	563	555	541	535	599	586	581	572	558	552	617	604	598	590	575	568
Qcd	99,7	97,6	96,7	95,3	92,9	91,9	103	101	99,7	98,3	95,8	94,8	106	104	103	101	98,7	97,7
Dpcd	64,1	61,4	60,3	58,6	55,7	54,5	68,2	65,3	64,1	62,3	59,2	57,9	72,4	69,4	68,1	66,2	62,9	61,5

Tcd [°C] - Source (side) heat exchanger output water temperature
Tev [°C] - Plant (side) cooling exchanger output water temperature
Pf [kW] - Cooling capacity
Pat [kW] - Total power input
Qev [m³/h] - Plant (side) heat exchanger water flow
Dpev [kPa] - Plant (side) cooling exchanger pressure drop
Pt [kW] - Heating capacity
Qcd [m³/h] - Source (side) heating exchanger water flow
Dpcd [kPa] - Source (side) heat exchanger pressure drop
'-' Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

COOLING CAPACITY PERFORMANCE

1801

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**533**	**511**	**502**	**487**	**462**	**451**	**553**	**531**	**521**	**506**	**480**	**469**	**573**	**550**	**541**	**525**	**499**	**487**
Pat	71,2	80,0	83,8	89,9	101	106	71,5	80,3	84,2	90,3	101	106	71,7	80,6	84,5	90,6	102	107
Qev	91,8	88,0	86,4	83,9	79,5	77,7	95,2	91,4	89,7	87,2	82,7	80,8	98,7	94,8	93,1	90,5	85,9	83,9
Dpev	59,2	54,4	52,5	49,5	44,4	42,4	63,7	58,7	56,6	53,4	48,0	45,9	68,5	63,1	60,9	57,5	51,8	49,5
Pt	604	591	586	577	563	557	625	611	605	597	582	575	645	631	625	616	600	594
Qcd	104	101	100	99,1	96,6	95,6	107	105	104	102	99,8	98,8	111	108	107	106	103	102
Dpcd	53,9	51,6	50,7	49,3	46,9	45,9	57,6	55,2	54,2	52,6	50,0	49,0	61,5	58,8	57,8	56,2	53,4	52,2
Tev				**9**						**10**						**11**		
Pf	**594**	**570**	**560**	**545**	**517**	**506**	**614**	**590**	**580**	**564**	**536**	**524**	**635**	**611**	**600**	**584**	**555**	**543**
Pat	71,9	80,8	84,7	90,9	102	107	72,0	81,1	85,0	91,2	103	107	72,2	81,3	85,2	91,5	103	108
Qev	102	98,2	96,5	93,8	89,1	87,1	106	102	99,9	97,2	92,4	90,4	109	105	103	101	95,7	93,6
Dpev	73,5	67,8	65,5	61,9	55,8	53,4	78,7	72,7	70,2	66,4	60,0	57,4	84,2	77,8	75,2	71,2	64,4	61,6
Pt	666	651	645	636	620	613	686	671	665	656	639	632	707	692	685	676	658	651
Qcd	114	112	111	109	106	105	118	115	114	113	110	109	121	119	118	116	113	112
Dpcd	65,5	62,7	61,6	59,8	56,8	55,6	69,6	66,7	65,5	63,6	60,5	59,2	74,0	70,9	69,6	67,6	64,2	62,9

2101

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**605**	**579**	**568**	**552**	**525**	**514**	**627**	**601**	**590**	**574**	**545**	**534**	**650**	**623**	**612**	**595**	**566**	**554**
Pat	80,7	90,8	95,1	102	115	120	81,0	91,2	95,6	103	115	121	81,3	91,6	96,0	103	116	121
Qev	104	99,6	97,8	95,1	90,3	88,4	108	103	102	98,8	93,9	91,9	112	107	105	103	97,5	95,5
Dpev	58,6	53,7	51,8	48,9	44,2	42,3	63,1	57,9	55,9	52,8	47,7	45,7	67,8	62,3	60,1	56,8	51,4	49,3
Pt	685	670	664	654	640	634	708	692	686	676	661	654	732	715	708	698	682	676
Qcd	118	115	114	112	110	109	121	119	118	116	113	112	126	123	122	120	117	116
Dpcd	55,6	53,2	52,2	50,8	48,5	47,7	59,5	56,8	55,8	54,3	51,8	50,9	63,5	60,7	59,5	57,9	55,3	54,2
Tev				**9**						**10**						**11**		
Pf	**673**	**646**	**634**	**617**	**587**	**575**	**697**	**669**	**657**	**639**	**609**	**596**	**721**	**692**	**680**	**661**	**630**	**617**
Pat	81,6	91,9	96,4	103	116	122	81,8	92,3	96,8	104	117	122	82,0	92,6	97,1	104	117	123
Qev	116	111	109	106	101	99,0	120	115	113	110	105	103	124	119	117	114	109	106
Dpev	72,8	66,9	64,6	61,1	55,4	53,1	78,0	71,8	69,3	65,6	59,5	57,0	83,4	76,8	74,2	70,3	63,8	61,2
Pt	755	738	731	721	704	697	779	761	754	743	725	718	803	784	777	766	747	740
Qcd	130	127	125	124	121	120	134	131	129	128	125	123	138	135	133	132	128	127
Dpcd	67,6	64,6	63,4	61,7	58,8	57,7	72,0	68,8	67,5	65,6	62,6	61,4	76,5	73,1	71,7	69,7	66,5	65,2

2401

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**684**	**655**	**643**	**625**	**594**	**582**	**710**	**680**	**668**	**649**	**617**	**604**	**736**	**705**	**693**	**674**	**641**	**628**
Pat	91,3	103	108	116	130	136	91,7	103	108	116	130	137	92,1	104	109	117	131	137
Qev	118	113	111	108	102	100	122	117	115	112	106	104	127	121	119	116	110	108
Dpev	66,8	61,3	59,1	55,8	50,4	48,3	72,0	66,1	63,7	60,2	54,5	52,2	77,4	71,1	68,6	64,9	58,7	56,3
Pt	776	758	751	741	724	717	802	783	776	766	748	741	828	809	802	790	772	765
Qcd	133	130	129	127	124	123	137	134	133	131	128	127	142	139	138	136	133	131
Dpcd	57,7	55,1	54,1	52,7	50,3	49,4	61,6	58,9	57,8	56,3	53,7	52,7	65,8	62,8	61,7	60,0	57,3	56,2
Tev				**9**						**10**						**11**		
Pf	**762**	**731**	**718**	**698**	**665**	**651**	**789**	**756**	**743**	**723**	**689**	**675**	**815**	**782**	**769**	**748**	**713**	**699**
Pat	92,4	104	109	117	132	138	92,7	104	110	118	132	138	93,0	105	110	118	133	139
Qev	131	126	124	120	114	112	136	130	128	125	119	116	140	135	133	129	123	120
Dpev	83,0	76,4	73,7	69,7	63,2	60,6	88,9	81,9	79,0	74,8	67,9	65,1	95,1	87,6	84,6	80,2	72,8	69,8
Pt	854	835	827	816	796	789	881	861	853	841	821	813	908	887	879	866	846	837
Qcd	147	143	142	140	137	135	151	148	146	144	141	140	156	152	151	149	145	144
Dpcd	70,1	67,0	65,7	63,9	61,0	59,8	74,6	71,2	69,9	68,0	64,8	63,6	79,2	75,7	74,3	72,2	68,8	67,5

Tcd [°C] - Source (side) heat exchanger output water temperature
Tev [°C] - Plant (side) cooling exchanger output water temperature
Pf [kW] - Cooling capacity
Pat [kW] - Total power input
Qev [m³/h] - Plant (side) heat exchanger water flow
Dpev [kPa] - Plant (side) cooling exchanger pressure drop
Pt [kW] - Heating capacity
Qcd [m³/h] - Source (side) heating exchanger water flow
Dpcd [kPa] - Source (side) heat exchanger pressure drop
'-' Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

COOLING CAPACITY PERFORMANCE

2802

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**769**	**736**	**723**	**702**	**668**	**653**	**798**	**764**	**750**	**729**	**694**	**679**	**827**	**792**	**778**	**757**	**720**	**705**
Pat	102	115	121	130	147	154	102	115	121	130	147	155	102	116	121	131	148	155
Qev	132	127	124	121	115	112	137	132	129	126	119	117	142	136	134	130	124	121
Dpev	57,6	52,8	50,9	48,1	43,4	41,6	62,1	56,9	54,9	51,9	46,9	45,0	66,7	61,2	59,1	55,9	50,6	48,5
Pt	871	851	844	832	815	808	900	879	871	860	841	834	929	908	900	887	868	860
Qcd	149	146	145	143	140	139	154	151	150	148	144	143	159	156	154	152	149	148
Dpcd	47,7	45,6	44,8	43,7	41,8	41,1	51,0	48,7	47,9	46,6	44,6	43,8	54,4	52,0	51,0	49,7	47,5	46,7
Tev				**9**						**10**						**11**		
Pf	**856**	**821**	**806**	**784**	**747**	**731**	**886**	**850**	**835**	**812**	**774**	**758**	**916**	**879**	**863**	**840**	**801**	**785**
Pat	102	116	122	131	148	156	103	116	122	131	149	156	103	116	122	132	149	156
Qev	147	141	139	135	129	126	153	146	144	140	133	131	158	151	149	145	138	135
Dpev	71,5	65,8	63,5	60,0	54,4	52,2	76,6	70,5	68,0	64,4	58,4	56,1	81,9	75,4	72,8	69,0	62,6	60,1
Pt	959	937	928	915	895	887	988	966	957	944	922	914	1018	995	986	972	950	941
Qcd	164	161	159	157	154	152	170	166	164	162	158	157	175	171	169	167	163	162
Dpcd	57,9	55,3	54,3	52,9	50,6	49,7	61,6	58,8	57,8	56,2	53,7	52,8	65,4	62,5	61,3	59,7	57,0	56,0

3202

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**931**	**893**	**876**	**851**	**807**	**788**	**966**	**927**	**910**	**884**	**838**	**819**	**1001**	**961**	**944**	**917**	**871**	**851**
Pat	125	140	147	158	177	185	125	141	147	158	178	186	126	141	148	159	178	187
Qev	160	154	151	147	139	136	166	160	157	152	144	141	172	165	163	158	150	147
Dpev	65,0	59,7	57,6	54,3	48,8	46,5	69,9	64,4	62,1	58,6	52,7	50,3	75,2	69,3	66,8	63,1	56,9	54,3
Pt	1056	1033	1023	1009	983	973	1091	1067	1057	1042	1016	1005	1127	1102	1092	1076	1049	1038
Qcd	181	177	176	173	169	167	187	183	181	179	174	173	193	189	187	185	180	178
Dpcd	52,8	50,5	49,6	48,2	45,9	44,9	56,4	54,0	53,0	51,5	49,0	47,9	60,1	57,6	56,5	55,0	52,2	51,1
Tev				**9**						**10**						**11**		
Pf	**1037**	**996**	**978**	**951**	**903**	**883**	**1073**	**1031**	**1013**	**985**	**936**	**916**	**1109**	**1066**	**1048**	**1020**	**970**	**949**
Pat	126	142	148	159	179	187	126	142	149	160	179	188	126	142	149	160	180	189
Qev	179	171	168	164	156	152	185	178	175	170	161	158	191	184	181	176	167	163
Dpev	80,7	74,4	71,8	67,9	61,2	58,5	86,4	79,8	77,0	72,9	65,8	63,0	92,4	85,4	82,5	78,1	70,6	67,6
Pt	1162	1137	1127	1110	1082	1070	1199	1173	1162	1145	1116	1104	1235	1208	1197	1180	1150	1137
Qcd	199	195	193	191	186	184	206	201	199	197	192	190	212	208	206	203	198	195
Dpcd	64,1	61,3	60,2	58,5	55,6	54,4	68,1	65,3	64,1	62,3	59,2	57,9	72,4	69,3	68,1	66,1	62,8	61,5

3602

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**1066**	**1022**	**1003**	**975**	**924**	**902**	**1106**	**1061**	**1042**	**1012**	**960**	**938**	**1146**	**1100**	**1081**	**1050**	**997**	**974**
Pat	142	160	167	180	202	211	143	160	168	180	203	212	143	161	169	181	203	213
Qev	183	176	173	168	159	155	190	183	179	174	165	162	197	189	186	181	172	168
Dpev	45,8	42,1	40,6	38,3	34,4	32,8	49,3	45,4	43,8	41,3	37,2	35,5	53,0	48,8	47,1	44,5	40,1	38,3
Pt	1208	1182	1171	1154	1125	1113	1249	1221	1210	1193	1163	1150	1289	1261	1249	1232	1200	1187
Qcd	207	203	201	198	193	191	214	210	208	205	200	197	221	216	214	211	206	204
Dpcd	54,1	51,8	50,8	49,4	47,0	46,0	57,8	55,3	54,3	52,8	50,2	49,1	61,6	59,0	58,0	56,3	53,5	52,4
Tev				**9**						**10**						**11**		
Pf	**1187**	**1140**	**1120**	**1089**	**1034**	**1011**	**1228**	**1180**	**1160**	**1128**	**1072**	**1049**	**1270**	**1221**	**1200**	**1168**	**1110**	**1086**
Pat	144	162	169	182	204	214	144	162	170	182	205	215	144	162	170	183	206	215
Qev	204	196	193	188	178	174	212	203	200	194	185	181	219	210	207	201	191	187
Dpev	56,8	52,4	50,6	47,9	43,2	41,3	60,9	56,2	54,3	51,4	46,4	44,4	65,1	60,2	58,1	55,0	49,8	47,6
Pt	1330	1301	1289	1271	1238	1225	1372	1342	1330	1310	1277	1263	1414	1383	1370	1350	1316	1301
Qcd	228	223	221	218	213	210	235	230	228	225	219	217	243	238	235	232	226	224
Dpcd	65,7	62,9	61,7	60,0	57,0	55,8	69,9	66,9	65,7	63,8	60,6	59,3	74,2	71,1	69,8	67,8	64,4	63,0

Tcd [°C] - Source (side) heat exchanger output water temperature
Tev [°C] - Plant (side) cooling exchanger output water temperature
Pf [kW] - Cooling capacity
Pat [kW] - Total power input
Qev [m³/h] - Plant (side) heat exchanger water flow
Dpev [kPa] - Plant (side) cooling exchanger pressure drop
Pt [kW] - Heating capacity
Qcd [m³/h] - Source (side) heating exchanger water flow
Dpcd [kPa] - Source (side) heat exchanger pressure drop
'-' Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

COOLING CAPACITY PERFORMANCE

4202

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**1208**	**1157**	**1136**	**1104**	**1049**	**1027**	**1254**	**1201**	**1180**	**1147**	**1090**	**1067**	**1300**	**1246**	**1224**	**1190**	**1132**	**1108**
Pat	161	182	190	204	229	240	162	182	191	205	230	241	163	183	192	206	231	242
Qev	208	199	196	190	181	177	216	207	203	197	188	184	224	215	211	205	195	191
Dpev	61,0	56,0	53,9	50,9	46,0	44,0	65,7	60,3	58,2	55,0	49,7	47,6	70,6	64,9	62,6	59,2	53,6	51,3
Pt	1370	1339	1327	1308	1279	1267	1416	1384	1371	1352	1321	1308	1463	1429	1416	1396	1363	1351
Qcd	235	230	228	225	219	217	243	237	235	232	227	225	251	245	243	240	234	232
Dpcd	55,7	53,3	52,3	50,9	48,6	47,7	59,6	56,9	55,9	54,4	51,9	51,0	63,6	60,8	59,6	58,0	55,4	54,3
Tev				**9**						**10**						**11**		
Pf	**1346**	**1291**	**1268**	**1234**	**1174**	**1150**	**1393**	**1337**	**1313**	**1278**	**1217**	**1192**	**1441**	**1382**	**1359**	**1322**	**1260**	**1234**
Pat	163	184	193	207	232	243	164	185	194	208	233	244	164	185	194	209	234	245
Qev	232	222	218	212	202	198	240	230	226	220	210	205	248	238	234	228	217	213
Dpev	75,8	69,7	67,3	63,6	57,7	55,3	81,2	74,7	72,2	68,3	61,9	59,4	86,9	80,0	77,3	73,2	66,4	63,7
Pt	1510	1475	1461	1441	1407	1393	1557	1521	1507	1485	1450	1436	1605	1568	1553	1531	1494	1479
Qcd	259	253	251	247	242	239	267	261	259	255	249	247	275	269	267	263	257	254
Dpcd	67,8	64,7	63,5	61,8	58,9	57,8	72,1	68,9	67,6	65,7	62,7	61,5	76,6	73,2	71,8	69,8	66,6	65,3

4802

Tcd	25	30	32	35	40	42	25	30	32	35	40	42	25	30	32	35	40	42
Tev				**6**						**7**						**8**		
Pf	**1368**	**1310**	**1287**	**1250**	**1188**	**1163**	**1419**	**1360**	**1336**	**1299**	**1235**	**1209**	**1471**	**1410**	**1385**	**1347**	**1282**	**1255**
Pat	183	206	215	231	260	272	183	206	216	232	261	273	184	207	217	233	262	274
Qev	235	226	221	215	205	200	244	234	230	224	213	208	253	243	239	232	221	216
Dpev	72,1	66,1	63,8	60,2	54,4	52,1	77,6	71,3	68,7	65,0	58,7	56,3	83,4	76,7	74,0	70,0	63,3	60,7
Pt	1551	1516	1502	1482	1448	1435	1603	1567	1552	1531	1496	1482	1655	1618	1603	1581	1544	1529
Qcd	266	260	258	254	248	246	275	269	266	263	257	254	284	278	275	271	265	263
Dpcd	58,0	55,4	54,5	53,0	50,6	49,7	62,0	59,2	58,2	56,6	54,0	53,0	66,1	63,2	62,1	60,4	57,6	56,5
Tev				**9**						**10**						**11**		
Pf	**1524**	**1461**	**1436**	**1396**	**1329**	**1302**	**1577**	**1513**	**1486**	**1446**	**1377**	**1349**	**1630**	**1565**	**1538**	**1496**	**1426**	**1397**
Pat	185	208	218	234	263	276	185	209	219	235	264	277	186	210	220	236	265	278
Qev	262	252	247	241	229	224	272	261	256	249	237	232	281	270	265	258	246	241
Dpev	89,5	82,3	79,5	75,2	68,1	65,3	95,9	88,3	85,2	80,7	73,2	70,2	103	94,5	91,3	86,4	78,5	75,3
Pt	1709	1669	1654	1631	1592	1577	1762	1722	1705	1681	1641	1626	1816	1774	1757	1732	1691	1674
Qcd	293	287	284	280	273	271	302	296	293	289	282	279	312	305	302	298	291	288
Dpcd	70,5	67,3	66,1	64,3	61,3	60,2	75,0	71,6	70,3	68,4	65,2	64,0	79,7	76,1	74,7	72,6	69,2	67,9

3.3 HEAT PUMP CAPACITY PERFORMANCE

1301

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	30						35						40					
Pt	276	335	359	384	409	434	271	327	351	375	399	424	266	320	343	366	389	414
Qcd	47,8	57,9	62,1	66,3	70,7	75,1	46,9	56,7	60,7	64,9	69,1	73,4	46,1	55,5	59,5	63,5	67,6	71,7
Pcd	26,2	38,5	44,3	50,6	57,4	64,9	25,3	36,9	42,4	48,4	54,9	62,0	24,4	35,5	40,6	46,3	52,5	59,2
Pat	48,9	50,0	50,3	50,6	50,9	51,0	55,3	56,6	57,0	57,3	57,6	57,8	62,7	64,0	64,4	64,8	65,1	65,4
Pf	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321
Qev	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2
Dpev	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7
Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	43						45						50					
Pt	263	316	338	361	384	408	261	313	335	357	380	404	257	307	328	349	371	394
Qcd	45,6	54,9	58,7	62,7	66,7	70,8	45,3	54,4	58,2	62,1	66,1	70,1	44,7	53,4	57,1	60,8	64,7	68,6
Pcd	23,9	34,6	39,6	45,1	51,1	57,6	23,6	34,1	39,0	44,4	50,2	56,6	23,0	32,8	37,5	42,6	48,1	54,1
Pat	67,4	68,8	69,3	69,7	70,1	70,4	70,8	72,2	72,7	73,1	73,5	73,9	79,8	81,3	81,8	82,3	82,8	83,2
Pf	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321
Qev	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2	55,2
Dpev	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7

1401

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	30						35						40					
Pt	314	381	408	436	465	494	308	372	399	426	454	482	302	364	390	416	443	470
Qcd	54,3	65,8	70,6	75,4	80,4	85,4	53,3	64,4	69,1	73,8	78,6	83,5	52,4	63,1	67,6	72,2	76,8	81,6
Pcd	25,3	37,1	42,7	48,8	55,4	62,5	24,4	35,6	40,9	46,6	52,9	59,7	23,5	34,2	39,2	44,6	50,6	57,1
Pat	55,5	56,8	57,2	57,6	57,8	58,0	62,8	64,2	64,7	65,1	65,4	65,7	71,1	72,6	73,2	73,6	74,0	74,4
Pf	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
Qev	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8
Dpev	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7
Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	43						45						50					
Pt	299	359	385	410	437	463	297	356	381	407	432	459	292	349	373	397	422	448
Qcd	51,9	62,4	66,8	71,2	75,8	80,5	51,6	61,9	66,2	70,6	75,2	79,8	50,8	60,8	64,9	69,2	73,5	78,0
Pcd	23,1	33,4	38,2	43,5	49,3	55,5	22,8	32,9	37,6	42,8	48,4	54,5	22,1	31,6	36,1	41,0	46,3	52,1
Pat	76,6	78,2	78,7	79,2	79,6	80,0	80,4	82,0	82,6	83,1	83,6	84,0	90,7	92,4	93,0	93,5	94,0	94,5
Pf	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
Qev	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8	62,8
Dpev	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7	47,7

1601

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	30						35						40					
Pt	380	461	495	529	564	600	372	450	483	516	550	585	363	439	470	503	536	569
Qcd	65,8	79,8	85,6	91,5	97,6	104	64,3	78,0	83,6	89,4	95,3	101	62,9	76,1	81,6	87,2	92,9	98,7
Pcd	27,9	41,1	47,3	54,0	61,4	69,4	26,7	39,2	45,1	51,6	58,6	66,2	25,5	37,3	42,9	49,0	55,7	62,9
Pat	67,2	69,1	69,8	70,3	70,8	71,1	75,6	77,7	78,4	79,1	79,6	80,1	84,9	87,2	88,0	88,8	89,4	90,0
Pf	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442
Qev	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1
Dpev	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5
Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	43						45						50					
Pt	357	431	462	494	526	559	353	426	457	488	520	553	344	414	443	473	504	535
Qcd	62,0	74,9	80,3	85,8	91,4	97,1	61,4	74,1	79,4	84,8	90,4	96,0	59,9	72,0	77,1	82,4	87,7	93,2
Pcd	24,8	36,2	41,6	47,5	53,9	60,9	24,3	35,4	40,7	46,4	52,7	59,5	23,1	33,5	38,4	43,7	49,6	56,0
Pat	91,0	93,4	94,3	95,1	95,8	96,5	95,2	97,7	98,6	99,5	100	101	106	109	110	111	112	113
Pf	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442
Qev	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1	76,1
Dpev	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5	53,5

Tev [°C] - Source (side) heat exchanger output water temperature
Tcd (°C) - Plant (side) heating exchanger output water temperature
Pt (kW) - Heating capacity
Qcd (m³/h) - Plant (side) heating exchanger water flow
Dpcd (kPa) - Plant (side) heating exchanger pressure drop
Pat (kW) - Total power input
Pf (kW) - Cooling capacity
Qev (m³/h) - Source (side) heat exchanger water flow
Dpev (kPa) - Source (side) cooling exchanger pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

HEAT PUMP CAPACITY PERFORMANCE

1801

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd			**30**						**35**						**40**			
Pt	**435**	**528**	**567**	**606**	**646**	**687**	**425**	**516**	**553**	**591**	**630**	**670**	**415**	**502**	**538**	**576**	**613**	**652**
Qcd	75,3	91,4	98,0	105	112	119	73,7	89,3	95,8	102	109	116	72,0	87,1	93,4	99,8	106	113
Pcd	28,4	41,9	48,2	55,2	62,7	70,9	27,2	40,0	46,0	52,6	59,8	67,6	26,0	38,1	43,8	50,0	56,8	64,2
Pat	76,7	78,9	79,7	80,3	80,8	81,3	86,3	88,7	89,5	90,3	90,9	91,5	96,9	99,6	101	101	102	103
Pf	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506
Qev	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2
Dpev	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4
Tev	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**
Tcd			**43**						**45**						**50**			
Pt	**409**	**494**	**529**	**566**	**603**	**641**	**405**	**488**	**523**	**559**	**596**	**633**	**394**	**474**	**507**	**542**	**577**	**613**
Qcd	71,0	85,8	91,9	98,2	105	111	70,3	84,9	90,9	97,1	104	110	68,5	82,5	88,3	94,3	100	107
Pcd	25,3	36,9	42,4	48,5	55,0	62,2	24,8	36,1	41,5	47,4	53,8	60,8	23,6	34,2	39,2	44,7	50,7	57,2
Pat	104	107	108	109	109	110	109	112	113	114	115	115	122	125	126	127	128	129
Pf	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506	506
Qev	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2	87,2
Dpev	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4	53,4

2101

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd			**30**						**35**						**40**			
Pt	**492**	**598**	**642**	**687**	**732**	**779**	**482**	**584**	**627**	**670**	**714**	**759**	**472**	**571**	**612**	**654**	**697**	**740**
Qcd	85,1	103	111	119	127	135	83,5	101	109	116	124	132	81,8	99,0	106	113	121	128
Pcd	29,2	43,1	49,7	56,8	64,6	73,1	28,1	41,3	47,5	54,3	61,7	69,7	27,0	39,5	45,4	51,8	58,8	66,5
Pat	86,3	89,3	90,3	91,2	91,9	92,6	97,1	100	102	103	103	104	109	113	114	115	116	117
Pf	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574
Qev	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8
Dpev	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8
Tev	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**
Tcd			**43**						**45**						**50**			
Pt	**466**	**563**	**603**	**644**	**686**	**729**	**462**	**557**	**597**	**638**	**679**	**721**	**453**	**544**	**582**	**621**	**661**	**702**
Qcd	80,9	97,7	105	112	119	127	80,3	96,9	104	111	118	125	78,9	94,8	101	108	115	122
Pcd	26,4	38,5	44,2	50,4	57,2	64,5	26,0	37,8	43,4	49,5	56,1	63,3	25,1	36,2	41,4	47,2	53,4	60,2
Pat	117	121	122	123	124	126	122	126	128	129	130	131	137	141	143	144	145	147
Pf	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574	574
Qev	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8	98,8
Dpev	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8	52,8

2401

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd			**30**						**35**						**40**			
Pt	**558**	**677**	**727**	**777**	**829**	**881**	**546**	**662**	**710**	**759**	**808**	**859**	**535**	**646**	**693**	**740**	**788**	**838**
Qcd	96,5	117	126	134	143	152	94,5	115	123	131	140	149	92,7	112	120	128	137	145
Pcd	30,3	44,7	51,5	58,9	67,0	75,7	29,1	42,8	49,2	56,3	63,9	72,2	28,0	41,0	47,1	53,7	61,0	68,8
Pat	97,7	101	102	103	104	105	110	114	115	116	117	118	124	128	129	130	132	133
Pf	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649
Qev	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112
Dpev	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2
Tev	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**
Tcd			**43**						**45**						**50**			
Pt	**528**	**637**	**683**	**729**	**776**	**825**	**524**	**631**	**676**	**722**	**768**	**816**	**513**	**616**	**660**	**704**	**749**	**795**
Qcd	91,7	111	119	127	135	143	91,0	110	117	125	134	142	89,4	107	115	122	130	138
Pcd	27,4	39,9	45,8	52,3	59,3	66,9	27,0	39,2	45,0	51,3	58,1	65,6	26,0	37,6	43,0	48,9	55,4	62,4
Pat	132	137	138	140	141	142	139	143	145	146	147	149	155	160	161	163	165	166
Pf	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649	649
Qev	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112
Dpev	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2	60,2

Tev [°C] - Source (side) heat exchanger output water temperature
Tcd (°C) - Plant (side) heating exchanger output water temperature
Pt (kW) - Heating capacity
Qcd (m³/h) - Plant (side) heating exchanger water flow
Dpcd (kPa) - Plant (side) heating exchanger pressure drop
Pat (kW) - Total power input
Pf (kW) - Cooling capacity
Qev (m³/h) - Source (side) heat exchanger water flow
Dpev (kPa) - Source (side) cooling exchanger pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

HEAT PUMP CAPACITY PERFORMANCE

2802

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	30						35						40					
Pt	629	761	816	872	930	988	616	744	798	852	907	964	604	728	780	832	886	941
Qcd	109	132	141	151	161	171	107	129	138	148	157	167	105	126	135	144	154	163
Pcd	25,3	37,1	42,7	48,7	55,3	62,5	24,3	35,6	40,8	46,6	52,9	59,7	23,5	34,1	39,1	44,6	50,6	57,0
Pat	111	114	115	115	116	116	126	129	130	130	131	132	142	145	146	147	148	149
Pf	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729
Qev	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126
Dpev	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9
Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	43						45						50					
Pt	598	719	769	821	873	927	593	713	762	813	865	918	584	698	746	795	845	896
Qcd	104	125	134	143	152	161	103	124	132	141	150	160	102	122	130	138	147	156
Pcd	23,0	33,3	38,2	43,5	49,2	55,5	22,8	32,8	37,6	42,7	48,4	54,5	22,1	31,6	36,1	41,0	46,3	52,1
Pat	153	156	158	159	159	160	161	164	165	166	167	168	182	185	186	187	188	189
Pf	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729
Qev	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126
Dpev	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9	51,9

3202

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	30						35						40					
Pt	761	923	990	1059	1129	1200	743	901	966	1033	1101	1170	725	877	941	1005	1071	1139
Qcd	132	160	171	183	195	208	129	156	167	179	191	203	126	152	163	174	186	198
Pcd	27,9	41,0	47,2	54,0	61,3	69,3	26,7	39,2	45,1	51,5	58,5	66,1	25,5	37,3	42,9	49,0	55,6	62,8
Pat	134	138	140	141	142	142	151	155	157	158	159	160	170	174	176	178	179	180
Pf	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884
Qev	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
Dpev	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6
Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	43						45						50					
Pt	714	863	925	988	1053	1119	707	853	914	977	1040	1106	688	828	886	946	1008	1071
Qcd	124	150	161	172	183	194	123	148	159	170	181	192	120	144	154	165	175	186
Pcd	24,8	36,2	41,5	47,4	53,8	60,8	24,3	35,4	40,6	46,4	52,6	59,4	23,1	33,4	38,3	43,7	49,6	56,0
Pat	182	187	189	190	192	193	190	195	197	199	201	202	213	218	220	222	224	226
Pf	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884	884
Qev	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
Dpev	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6	58,6

3602

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	30						35						40					
Pt	870	1056	1133	1212	1292	1373	850	1031	1105	1182	1260	1339	830	1004	1076	1150	1226	1303
Qcd	150	183	196	210	223	238	147	178	191	205	218	232	144	174	187	200	213	226
Pcd	28,5	42,0	48,4	55,3	62,9	71,1	27,3	40,1	46,2	52,8	60,0	67,8	26,1	38,2	43,9	50,2	57,0	64,4
Pat	153	158	159	160	162	162	172	177	179	180	182	183	194	199	201	203	204	206
Pf	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012
Qev	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174
Dpev	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3
Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd	43						45						50					
Pt	817	987	1058	1131	1205	1281	809	976	1046	1118	1191	1266	787	947	1014	1083	1154	1226
Qcd	142	171	184	196	209	222	141	170	182	194	207	220	137	165	177	189	201	213
Pcd	25,4	37,0	42,6	48,6	55,2	62,3	24,9	36,3	41,6	47,5	53,9	60,9	23,7	34,3	39,3	44,8	50,8	57,4
Pat	208	213	215	217	219	220	217	223	225	227	229	231	243	249	252	254	256	258
Pf	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012
Qev	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174	174
Dpev	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3	41,3

Tev [°C] - Source (side) heat exchanger output water temperature
Tcd (°C) - Plant (side) heating exchanger output water temperature
Pt (kW) - Heating capacity
Qcd (m^3/h) - Plant (side) heating exchanger water flow
Dpcd (kPa) - Plant (side) heating exchanger pressure drop
Pat (kW) - Total power input
Pf (kW) - Cooling capacity
Qev (m^3/h) - Source (side) heat exchanger water flow
Dpev (kPa) - Source (side) cooling exchanger pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

HEAT PUMP CAPACITY PERFORMANCE

4202

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd				**30**						**35**						**40**		
Pt	**984**	**1196**	**1284**	**1373**	**1464**	**1556**	**963**	**1168**	**1253**	**1340**	**1428**	**1518**	**943**	**1141**	**1223**	**1307**	**1393**	**1480**
Qcd	170	207	222	237	253	269	167	202	217	232	247	263	164	198	212	227	242	257
Pcd	29,3	43,2	49,8	56,9	64,7	73,2	28,1	41,3	47,6	54,4	61,8	69,8	27,0	39,6	45,5	51,9	58,9	66,6
Pat	173	179	181	182	184	185	194	201	203	205	207	209	218	226	228	230	232	234
Pf	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147
Qev	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197
Dpev	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0
Tev	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**
Tcd				**43**						**45**						**50**		
Pt	**932**	**1125**	**1205**	**1287**	**1371**	**1457**	**924**	**1114**	**1194**	**1275**	**1357**	**1442**	**906**	**1089**	**1165**	**1242**	**1322**	**1403**
Qcd	162	195	209	224	238	253	161	194	207	221	236	251	158	189	203	216	230	244
Pcd	26,4	38,5	44,3	50,5	57,3	64,7	26,1	37,9	43,5	49,5	56,2	63,4	25,1	36,3	41,5	47,3	53,5	60,3
Pat	234	242	244	247	249	251	245	253	256	258	260	263	274	282	285	288	291	293
Pf	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147
Qev	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197
Dpev	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0	55,0

4802

Tev	-2	3	5	7	9	11	-2	3	5	7	9	11	-2	3	5	7	9	11
Tcd				**30**						**35**						**40**		
Pt	**1115**	**1354**	**1453**	**1554**	**1657**	**1762**	**1092**	**1323**	**1419**	**1517**	**1617**	**1718**	**1069**	**1292**	**1385**	**1480**	**1577**	**1675**
Qcd	193	234	251	269	287	305	189	229	246	263	280	298	185	224	240	257	273	291
Pcd	30,5	45,0	51,8	59,2	67,3	76,1	29,3	43,1	49,5	56,6	64,3	72,6	28,2	41,2	47,3	54,0	61,3	69,2
Pat	195	202	204	206	208	210	220	227	230	232	234	236	247	255	258	261	263	265
Pf	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299
Qev	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Dpev	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0
Tev	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**	**-2**	**3**	**5**	**7**	**9**	**11**
Tcd				**43**						**45**						**50**		
Pt	**1056**	**1274**	**1365**	**1458**	**1553**	**1649**	**1047**	**1262**	**1352**	**1443**	**1537**	**1632**	**1026**	**1233**	**1319**	**1407**	**1497**	**1589**
Qcd	183	221	237	253	270	286	182	219	235	251	267	284	179	215	230	245	261	277
Pcd	27,6	40,2	46,1	52,6	59,6	67,3	27,2	39,5	45,2	51,6	58,5	65,9	26,2	37,8	43,2	49,2	55,7	62,7
Pat	265	273	276	279	282	284	277	286	289	292	295	297	310	319	323	326	329	332
Pf	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299	1299
Qev	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Dpev	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0	65,0

Tev [°C] - Source (side) heat exchanger output water temperature
Tcd (°C) - Plant (side) heating exchanger output water temperature
Pt (kW) - Heating capacity
Qcd (m³/h) - Plant (side) heating exchanger water flow
Dpcd (kPa) - Plant (side) heating exchanger pressure drop
Pat (kW) - Total power input
Pf (kW) - Cooling capacity
Qev (m³/h) - Source (side) heat exchanger water flow
Dpev (kPa) - Source (side) cooling exchanger pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

3.4 DESUPERHEATER CAPACITY PERFOR.

1301																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	349	349	349	333	333	333	316	316	316	306	306	306	300	300	300	282	282	282
Pat	48,9	48,9	48,9	55,3	55,3	55,3	62,5	62,5	62,5	67,3	67,3	67,3	70,6	70,6	70,6	79,4	79,4	79,4
Ptde	**25,3**	**17,4**	**4,79**	**44,2**	**36,5**	**24,8**	**63,1**	**55,9**	**44,6**	**74,0**	**67,2**	**56,1**	**81,0**	**74,4**	**63,3**	**96,8**	**90,8**	**79,2**
Qde	4,39	3,02	0,832	7,65	6,34	4,30	10,9	9,69	7,76	12,8	11,6	9,75	14,0	12,9	11,0	16,8	15,7	13,8
Dpde	26,4	12,5	0,949	80,1	55,0	25,3	163	129	82,5	225	186	130	270	228	166	385	340	259

1401																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	396	396	396	378	378	378	360	360	360	348	348	348	341	341	341	321	321	321
Pat	55,5	55,5	55,5	62,8	62,8	62,8	71,0	71,0	71,0	76,4	76,4	76,4	80,2	80,2	80,2	90,3	90,3	90,3
Ptde	**28,8**	**19,8**	**5,44**	**50,2**	**41,5**	**28,1**	**71,6**	**63,5**	**50,7**	**84,1**	**76,3**	**63,7**	**92,1**	**84,5**	**71,9**	**110**	**103**	**90,0**
Qde	4,99	3,43	0,946	8,69	7,20	4,89	12,4	11,0	8,81	14,6	13,2	11,1	15,9	14,7	12,5	19,0	17,9	15,6
Dpde	34,1	16,1	1,23	103	71,0	32,7	211	166	106	291	240	168	348	294	214	497	438	335

1601																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	480	480	480	458	458	458	435	435	435	420	420	420	409	409	409	382	382	382
Pat	67,9	67,9	67,9	76,3	76,3	76,3	85,7	85,7	85,7	91,7	91,7	91,7	96,0	96,0	96,0	107	107	107
Ptde	**35,2**	**24,2**	**6,65**	**60,9**	**50,4**	**34,2**	**86,4**	**76,5**	**61,2**	**101**	**91,6**	**76,5**	**110**	**101**	**86,1**	**131**	**123**	**107**
Qde	6,10	4,19	1,16	10,6	8,74	5,93	15,0	13,3	10,6	17,5	15,9	13,3	19,1	17,5	15,0	22,6	21,3	18,6
Dpde	33,8	16,0	1,22	101	69,6	32,1	204	160	103	278	230	161	332	280	204	466	411	314

1801																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	551	551	551	525	525	525	498	498	498	481	481	481	469	469	469	438	438	438
Pat	77,5	77,5	77,5	87,1	87,1	87,1	97,8	97,8	97,8	105	105	105	110	110	110	123	123	123
Ptde	**40,2**	**27,6**	**7,59**	**69,6**	**57,6**	**39,0**	**98,7**	**87,4**	**69,9**	**115**	**105**	**87,4**	**126**	**116**	**98,4**	**149**	**140**	**122**
Qde	6,96	4,78	1,32	12,0	9,98	6,78	17,1	15,2	12,1	20,0	18,2	15,2	21,8	20,1	17,1	25,9	24,3	21,2
Dpde	29,1	13,7	1,04	87,1	59,8	27,6	175	138	88,4	240	198	138	285	241	175	401	354	271

2101																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	624	624	624	595	595	595	566	566	566	548	548	548	536	536	536	504	504	504
Pat	88,0	88,0	88,0	99,0	99,0	99,0	111	111	111	119	119	119	125	125	125	139	139	139
Ptde	**45,6**	**31,3**	**8,62**	**79,0**	**65,4**	**44,3**	**112**	**99,3**	**79,4**	**131**	**119**	**99,3**	**143**	**131**	**112**	**169**	**159**	**139**
Qde	7,91	5,43	1,50	13,7	11,3	7,70	19,4	17,2	13,8	22,7	20,6	17,2	24,8	22,8	19,4	29,3	27,6	24,1
Dpde	37,5	17,7	1,35	112	77,2	35,6	226	178	114	309	255	179	368	311	226	517	456	348

2401																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	706	706	706	674	674	674	641	641	641	620	620	620	606	606	606	571	571	571
Pat	99,6	99,6	99,6	112	112	112	126	126	126	135	135	135	141	141	141	157	157	157
Ptde	**51,7**	**35,5**	**9,76**	**89,5**	**74,0**	**50,2**	**127**	**112**	**89,9**	**148**	**135**	**112**	**162**	**149**	**126**	**192**	**180**	**157**
Qde	8,95	6,15	1,70	15,5	12,8	8,72	22,0	19,5	15,6	25,7	23,3	19,5	28,0	25,8	22,0	33,2	31,2	27,3
Dpde	48,1	22,7	1,73	144	99,0	45,6	290	228	146	396	327	229	471	398	290	661	584	446

Tde (°C) - Plant (side) heating exchanger recovery output water temperature
Tcd [°C] - Source (side) cooling exchanger output water temperature
Pf (kW) - Cooling capacity (Plant side cooling exchanger water in/out 12/7 °C)
Pat (kW) - Total power input
Ptde (kW) - Heat recovery thermal capacity
Qde (m3/h) - Plant (side) cooling exchanger recovery water flow
Dpde (kPa) - Plant side heating exchanger recovery pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

DESUPERHEATER CAPACITY PERFOR.

2802																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	793	793	793	757	757	757	720	720	720	697	697	697	681	681	681	642	642	642
Pat	111	111	111	126	126	126	142	142	142	153	153	153	161	161	161	181	181	181
Ptde	**57,7**	**39,6**	**10,9**	**100**	**83,1**	**56,3**	**143**	**127**	**102**	**168**	**153**	**128**	**184**	**169**	**144**	**220**	**206**	**180**
Qde	9,99	6,87	1,89	17,4	14,4	9,78	24,8	22,0	17,6	29,2	26,5	22,2	31,9	29,4	25,0	38,1	35,8	31,3
Dpde	34,2	16,2	1,23	104	71,3	32,8	212	167	107	292	241	169	350	295	215	499	440	336

3202																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	961	961	961	917	917	917	870	870	870	840	840	840	819	819	819	765	765	765
Pat	136	136	136	153	153	153	171	171	171	184	184	184	192	192	192	215	215	215
Ptde	**70,4**	**48,3**	**13,3**	**122**	**101**	**68,3**	**173**	**153**	**122**	**202**	**183**	**153**	**220**	**202**	**172**	**261**	**245**	**214**
Qde	12,2	8,38	2,31	21,1	17,5	11,9	29,9	26,6	21,3	35,0	31,8	26,6	38,2	35,1	29,9	45,3	42,5	37,2
Dpde	33,9	16,0	1,22	102	69,7	32,1	204	161	103	279	230	161	332	281	204	467	412	315

3602																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	1101	1101	1101	1050	1050	1050	996	996	996	962	962	962	938	938	938	876	876	876
Pat	155	155	155	174	174	174	195	195	195	209	209	209	219	219	219	245	245	245
Ptde	**80,3**	**55,1**	**15,2**	**139**	**115**	**77,9**	**197**	**175**	**140**	**230**	**209**	**175**	**252**	**231**	**197**	**298**	**280**	**244**
Qde	13,9	9,56	2,64	24,1	19,9	13,5	34,1	30,3	24,3	39,9	36,3	30,3	43,6	40,1	34,2	51,7	48,5	42,4
Dpde	29,0	13,7	1,04	86,9	59,7	27,5	175	138	88,2	239	197	138	285	241	175	401	354	270

4202																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	1246	1246	1246	1190	1190	1190	1131	1131	1131	1095	1095	1095	1071	1071	1071	1008	1008	1008
Pat	176	176	176	198	198	198	222	222	222	238	238	238	249	249	249	278	278	278
Ptde	**91,3**	**62,6**	**17,2**	**158**	**131**	**88,6**	**224**	**199**	**159**	**262**	**238**	**199**	**286**	**262**	**223**	**339**	**318**	**277**
Qde	15,8	10,9	3,00	27,4	22,7	15,4	38,8	34,5	27,6	45,4	41,2	34,5	49,5	45,5	38,8	58,7	55,1	48,2
Dpde	37,5	17,7	1,35	112	77,2	35,6	226	178	114	309	255	178	368	311	226	517	456	348

4802																	
Tde	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tcd		**30**			**35**			**40**			**43**			**45**			**50**	
Pf	1411	1411	1411	1347	1347	1347	1281	1281	1281	1240	1240	1240	1212	1212	1212	1142	1142	1142
Pat	199	199	199	224	224	224	252	252	252	269	269	269	282	282	282	315	315	315
Ptde	**103**	**70,9**	**19,5**	**179**	**148**	**100**	**254**	**225**	**180**	**297**	**269**	**225**	**324**	**297**	**253**	**383**	**360**	**314**
Qde	17,9	12,3	3,39	31,0	25,7	17,4	44,0	39,0	31,2	51,4	46,7	39,0	56,1	51,5	43,9	66,4	62,4	54,5
Dpde	48,1	22,7	1,73	144	99,0	45,6	290	228	146	396	327	229	471	398	290	661	584	446

Tde (°C) - Plant (side) heating exchanger recovery output water temperature
Tcd [°C] - Source (side) cooling exchanger output water temperature
Pf (kW) - Cooling capacity (Plant side cooling exchanger water in/out 12/7 °C)
Pat (kW) - Total power input
Ptde (kW) - Heat recovery thermal capacity
Qde (m3/h) - Plant (side) cooling exchanger recovery water flow
Dpde (kPa) - Plant side heating exchanger recovery pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

3.5 RECOVERY CAPACITY PERFORMANCE

1301

Tre	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45
Tev		**6**			**7**			**8**			**9**			**10**			**11**	
Pf	309	293	278	321	305	289	333	317	300	345	328	311	357	340	323	369	352	334
Qev	53,1	53,1	53,1	55,2	55,2	55,2	57,3	57,3	57,3	59,4	59,4	59,4	61,5	61,5	61,5	63,7	63,7	63,7
Dpev	42,4	42,4	42,4	45,7	45,7	45,7	49,2	49,2	49,2	52,9	52,9	52,9	56,7	56,7	56,7	60,8	60,8	60,8
Pat	57,1	64,6	72,9	57,3	64,8	73,1	57,4	65,0	73,3	57,6	65,1	73,5	57,7	65,3	73,7	57,8	65,4	73,9
Ptre	**362**	**354**	**346**	**375**	**366**	**357**	**387**	**378**	**369**	**399**	**389**	**380**	**411**	**401**	**392**	**424**	**414**	**404**
Qre	62,8	61,4	60,2	64,9	63,5	62,1	67,0	65,5	64,1	69,1	67,6	66,1	71,2	69,6	68,1	73,4	71,7	70,1
Dpre	45,3	43,4	41,6	48,4	46,3	44,4	51,6	49,3	47,2	54,9	52,5	50,2	58,4	55,8	53,3	62,0	59,2	56,6

1401

Tre	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45
Tev		**6**			**7**			**8**			**9**			**10**			**11**	
Pf	351	334	316	365	347	328	378	360	341	392	373	354	406	387	367	420	400	380
Qev	60,5	60,5	60,5	62,8	62,8	62,8	65,2	65,2	65,2	67,5	67,5	67,5	70,0	70,0	70,0	72,4	72,4	72,4
Dpev	44,2	44,2	44,2	47,7	47,7	47,7	51,4	51,4	51,4	55,2	55,2	55,2	59,2	59,2	59,2	63,4	63,4	63,4
Pat	64,9	73,4	82,8	65,1	73,6	83,1	65,3	73,8	83,3	65,4	74,0	83,6	65,6	74,2	83,8	65,7	74,4	84,0
Ptre	**412**	**403**	**394**	**426**	**416**	**407**	**440**	**429**	**419**	**454**	**443**	**432**	**468**	**457**	**446**	**482**	**470**	**459**
Qre	71,4	69,9	68,4	73,8	72,2	70,6	76,2	74,5	72,9	78,6	76,8	75,2	81,0	79,2	77,4	83,5	81,6	79,8
Dpre	43,7	41,8	40,1	46,6	44,6	42,8	49,7	47,6	45,5	52,9	50,6	48,4	56,3	53,8	51,4	59,7	57,1	54,5

1601

Tre	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45
Tev		**6**			**7**			**8**			**9**			**10**			**11**	
Pf	425	403	379	442	419	395	459	435	410	475	451	426	492	468	442	510	485	458
Qev	73,2	73,2	73,2	76,1	76,1	76,1	79,0	79,0	79,0	81,9	81,9	81,9	84,8	84,8	84,8	87,8	87,8	87,8
Dpev	49,6	49,6	49,6	53,5	53,5	53,5	57,7	57,7	57,7	62,0	62,0	62,0	66,6	66,6	66,6	71,3	71,3	71,3
Pat	78,8	88,4	99,1	79,1	88,8	99,5	79,3	89,1	99,9	79,6	89,4	100	79,9	89,7	101	80,1	90,0	101
Ptre	**499**	**486**	**472**	**516**	**503**	**488**	**533**	**519**	**504**	**550**	**536**	**520**	**567**	**552**	**536**	**585**	**569**	**553**
Qre	86,5	84,4	82,1	89,4	87,2	84,8	92,3	90,0	87,6	95,3	92,9	90,4	98,3	95,8	93,2	101	98,7	96,0
Dpre	48,3	45,9	43,5	51,6	49,0	46,4	55,0	52,3	49,5	58,6	55,7	52,7	62,3	59,2	56,0	66,2	62,9	59,5

1801

Tre	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45
Tev		**6**			**7**			**8**			**9**			**10**			**11**	
Pf	487	462	435	506	480	452	525	499	470	545	517	488	564	536	506	584	555	525
Qev	83,9	83,9	83,9	87,2	87,2	87,2	90,5	90,5	90,5	93,8	93,8	93,8	97,2	97,2	97,2	101	101	101
Dpev	49,5	49,5	49,5	53,4	53,4	53,4	57,5	57,5	57,5	61,9	61,9	61,9	66,4	66,4	66,4	71,2	71,2	71,2
Pat	89,9	101	113	90,3	101	114	90,6	102	114	90,9	102	115	91,2	103	115	91,5	103	115
Ptre	**572**	**557**	**541**	**591**	**576**	**559**	**611**	**594**	**577**	**630**	**613**	**596**	**650**	**633**	**614**	**670**	**652**	**633**
Qre	99,1	96,6	94,0	102	99,8	97,1	106	103	100	109	106	104	113	110	107	116	113	110
Dpre	49,3	46,9	44,4	52,6	50,0	47,4	56,2	53,4	50,5	59,8	56,8	53,8	63,6	60,5	57,2	67,6	64,2	60,8

2802

Tre	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45
Tev		**6**			**7**			**8**			**9**			**10**			**11**	
Pf	702	668	632	729	694	657	757	720	682	784	747	708	812	774	734	840	801	760
Qev	121	121	121	126	126	126	130	130	130	135	135	135	140	140	140	145	145	145
Dpev	48,1	48,1	48,1	51,9	51,9	51,9	55,9	55,9	55,9	60,0	60,0	60,0	64,4	64,4	64,4	69,0	69,0	69,0
Pat	130	147	166	130	147	166	131	148	167	131	148	167	131	149	168	132	149	168
Ptre	**825**	**806**	**788**	**852**	**832**	**813**	**880**	**859**	**839**	**907**	**886**	**865**	**936**	**913**	**891**	**964**	**941**	**918**
Qre	143	140	137	148	144	141	152	149	146	157	154	150	162	158	155	167	163	160
Dpre	43,7	41,8	40,1	46,6	44,6	42,7	49,7	47,5	45,5	52,9	50,6	48,4	56,2	53,7	51,4	59,7	57,0	54,5

3202

Tre	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45	35	40	45
Tev		**6**			**7**			**8**			**9**			**10**			**11**	
Pf	851	807	759	884	838	790	917	871	821	951	903	852	985	936	884	1020	970	916
Qev	147	147	147	152	152	152	158	158	158	164	164	164	170	170	170	176	176	176
Dpev	54,3	54,3	54,3	58,6	58,6	58,6	63,1	63,1	63,1	67,9	67,9	67,9	72,9	72,9	72,9	78,1	78,1	78,1
Pat	158	177	198	158	178	199	159	178	200	159	179	201	160	179	201	160	180	202
Ptre	**999**	**973**	**945**	**1033**	**1005**	**977**	**1067**	**1038**	**1008**	**1101**	**1071**	**1040**	**1135**	**1105**	**1073**	**1170**	**1139**	**1106**
Qre	173	169	164	179	174	170	185	180	175	191	186	181	197	192	186	203	198	192
Dpre	48,2	45,9	43,4	51,5	49,0	46,4	55,0	52,2	49,4	58,5	55,6	52,6	62,3	59,2	56,0	66,1	62,8	59,4

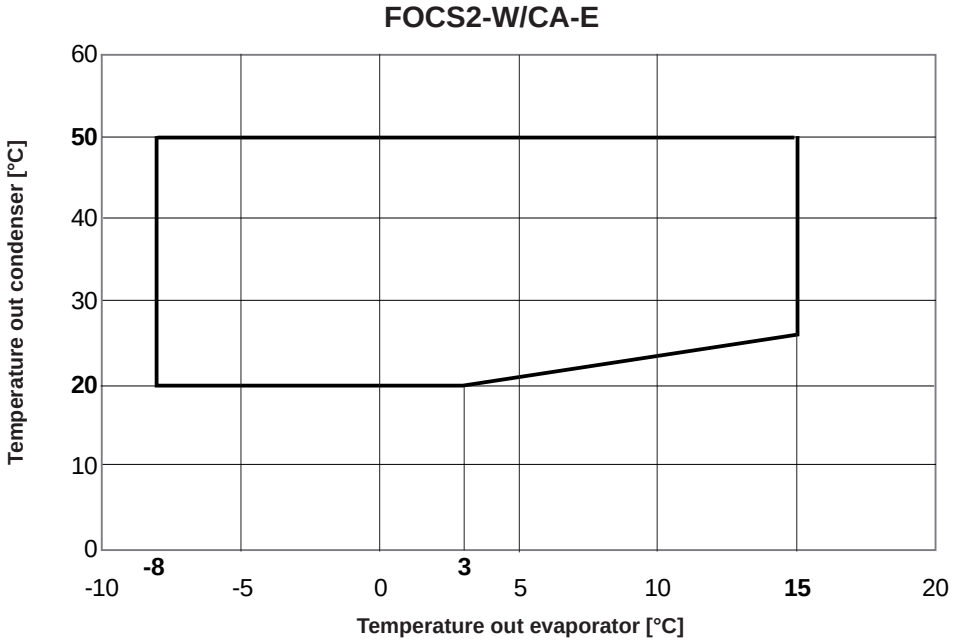
Tre (°C) - Plant (side) heat exchanger recovery output water temperature
Tev (°C) - Plant (side) cooling exchanger output water temperature
Pf (kW) - Cooling capacity
Qev (m3/h) - Plant (side) heat exchanger water flow
Dpev (kPa) - Plant (side) cooling exchanger pressure drop
Ptre (kW) - Heat recovery thermal capacity
Pat (kW) - Total power input
Qre (m3/h) - Plant side heat exchanger recovery water flow
Dpre (kPa) - Plant side heating exchanger recovery pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

RECOVERY CAPACITY PERFORMANCE

3602																		
Tre	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**	**35**	**40**	**45**
Tev		**6**			**7**			**8**			**9**			**10**			**11**	
Pf	975	924	869	1012	960	904	1050	997	940	1089	1034	976	1128	1072	1012	1168	1110	1049
Qev	168	168	168	174	174	174	181	181	181	188	188	188	194	194	194	201	201	201
Dpev	38,3	38,3	38,3	41,3	41,3	41,3	44,5	44,5	44,5	47,9	47,9	47,9	51,4	51,4	51,4	55,0	55,0	55,0
Pat	180	202	226	180	203	227	181	203	228	182	204	229	182	205	230	183	206	231
Ptre	**1143**	**1113**	**1082**	**1182**	**1150**	**1118**	**1221**	**1188**	**1154**	**1260**	**1226**	**1191**	**1299**	**1265**	**1228**	**1339**	**1303**	**1266**
Qre	198	193	188	205	200	194	211	206	201	218	213	207	225	219	213	232	226	220
Dpre	49,4	47,0	44,5	52,8	50,2	47,5	56,3	53,5	50,7	60,0	57,0	53,9	63,8	60,6	57,4	67,8	64,4	60,9

Tre (°C) - Plant (side) heat exchanger recovery output water temperature
Tev (°C) - Plant (side) cooling exchanger output water temperature
Pf (kW) - Cooling capacity
Qev (m3/h) - Plant (side) heat exchanger water flow
Dpev (kPa) - Plant (side) cooling exchanger pressure drop
Ptre (kW) - Heat recovery thermal capacity
Pat (kW) - Total power input
Qre (m3/h) - Plant side heat exchanger recovery water flow
Dpre (kPa) - Plant side heating exchanger recovery pressure drop
'-' - Conditions outside the operating range
Waterflow and pressure drop on heat exchangers calculated with 5°C of delta T

4. OPERATING RANGE



ETHYLENE GLYCOL MIXTURE

Ethylene glycol and water mixtures, used as a heat-conveying fluid, cause a variation in unit performance. For correct data, use the factors indicated in the following table.

	Freezing point (°C)							
	0	-5	-10	-15	-20	-25	-30	-35
	Ethylene glycol percentage by weight							
	0	12%	20%	30%	35%	40%	45%	50%
cPf	1	0,985	0,98	0,974	0,97	0,965	0,964	0,96
cQ	1	1,02	1,04	1,075	1,11	1,14	1,17	1,2
cdp	1	1,07	1,11	1,18	1,22	1,24	1,27	1,3

cPf: cooling capacity correction factor
cQ: flow correction factor
cdp: pressure drop correction factor

For data concerning other kind of anti-freeze solutions (e.g. propylene glycol) please contact our Sales Department.

FOULING FACTORS

Performances are based on clean condition of tubes (fouling factor =0). For different fouling values, performance should be adjusted using the correction factors shown in the following table.

Fouling factors	Plant side heat exchanger				Source / recovery side exchanger				Partial heat recovery exchanger
	f1	fk1	fx1	KE (°C)	f2	fk2	fx2	KC (°C)	r3
(m^2 °C/W) 0,18 x 10^{-4}	1	1	1	0	1	1	1	0	1
(m^2 °C/W) 0,44 x 10^{-4}	1	1	1	0	0,998	1,010	1,010	0,3	0,990
(m^2 °C/W) 0,88 x 10^{-4}	0,970	0,998	0,998	0,5	0,995	1,015	1,015	0,5	0,980
(m^2 °C/W) 1,32 x 10^{-4}	0,960	0,994	0,994	0,8	0,992	1,023	1,023	1	0,964
(m^2 °C/W) 1,72 x 10^{-4}	0,950	0,990	0,990	1	0,990	1,030	1,030	1,5	0,950

f1 - f2 : capacity correction factors
fk1 - fk2 : compressor power input correction factors
fx1 - fx2 : total power input correction factors

r3 : capacity correction factors
KE : minimum condenser outlet temperature increase
KC : maximum condenser outlet temperature decrease

5. HYDRAULIC DATA

5.1 Water flow and pressure drop

Water flow in the heat exchangers is given by:
Q=Px0,86/Dt

Q: water flow (m^3/h)
Dt: difference between inlet and outlet water temp. (°C)
P: heat exchanger capacity (kW)

Pressure drop is given by:
$Dp= K \times Q^2/1000$

Q: water flow (m^3/h)
Dp: pressure drop (kPa)
K: unit size coefficient

SIZE	Plant (side) heat exchanger				Source (side) heat exchanger			User side heat recovery exchanger		
	K	Q min m^3/h	Q max m^3/h	W.c. min m^3	K	Q min m^3/h	Q max m^3/h	K	Q min m^3/h	Q max m^3/h
FOCS2-W/CA-E 1301	15	34,5	97,5	1,6	11,5	20,1	92,4	-	-	-
FOCS2-W/CA-E 1401	12,1	39,2	112	1,82	8,57	22,9	106,8	-	-	-
FOCS2-W/CA-E 1601	9,25	47,5	110	2,21	6,45	27,8	123,2	-	-	-
FOCS2-W/CA-E 1801	7,03	54,4	128	2,53	5,02	31,8	139,6	-	-	-
FOCS2-W/CA-E 2101	5,41	61,7	149	2,87	4,03	36	152	-	-	-
FOCS2-W/CA-E 2401	4,82	69,8	163	3,25	3,26	40,8	168,4	-	-	-
FOCS2-W/CA-E 2802	3,29	78,4	210	2,56	2,14	45,8	213,6	-	-	-
FOCS2-W/CA-E 3202	2,53	95,1	230	3,09	1,61	55,5	246,5	-	-	-
FOCS2-W/CA-E 3602	1,36	108,8	287	3,54	1,26	63,5	279,3	-	-	-
FOCS2-W/CA-E 4202	1,41	123,3	288	4,01	1,01	72	304	-	-	-
FOCS2-W/CA-E 4802	1,3	139,6	288	4,55	0,82	81,5	336,9	-	-	-
FOCS2-W/D/CA-E 1301	15	34,5	97,5	1,6	11,5	20,1	92,4	1370	-	8,2
FOCS2-W/D/CA-E 1401	12,1	39,2	112	1,82	8,57	22,9	106,8	1370	-	8,2
FOCS2-W/D/CA-E 1601	9,25	47,5	110	2,21	6,45	27,8	123,2	910	-	10,3
FOCS2-W/D/CA-E 1801	7,03	54,4	128	2,53	5,02	31,8	139,6	600	-	12,3
FOCS2-W/D/CA-E 2101	5,41	61,7	149	2,87	4,03	36	152	600	-	12,3
FOCS2-W/D/CA-E 2401	4,82	69,8	163	3,25	3,26	40,8	168,4	600	-	12,3
FOCS2-W/D/CA-E 2802	3,29	78,4	210	2,56	2,14	45,8	213,6	343	-	16,4
FOCS2-W/D/CA-E 3202	2,53	95,1	230	3,09	1,61	55,5	246,5	228	-	20,5
FOCS2-W/D/CA-E 3602	1,36	108,8	287	3,54	1,26	63,5	279,3	150	-	24,6
FOCS2-W/D/CA-E 4202	1,41	123,3	288	4,01	1,01	72	304	150	-	24,6
FOCS2-W/D/CA-E 4802	1,3	139,6	288	4,55	0,82	81,5	336,9	150	-	24,6

Q min: minimum water flow admitted to the heat exchanger.
Q max: maximum water flow admitted to the heat exchanger.
C.a. min: minimum water content admitted in the plant.

SIZE	Plant (side) heat exchanger				Source (side) heat exchanger			User side heat recovery exchanger		
	K	Q min m^3/h	Q max m^3/h	W.c. min m^3	K	Q min m^3/h	Q max m^3/h	K	Q min m^3/h	Q max m^3/h
FOCS2-W/H/CA-E 1301	15	34,5	97,5	11,5	11,5	20,1	92,4	-	-	-
FOCS2-W/H/CA-E 1401	12,1	39,2	112	8,57	8,57	22,9	106,8	-	-	-
FOCS2-W/H/CA-E 1601	9,25	47,5	110	6,45	6,45	27,8	123,2	-	-	-
FOCS2-W/H/CA-E 1801	7,03	54,4	128	5,02	5,02	31,8	139,6	-	-	-
FOCS2-W/H/CA-E 2101	5,41	61,7	149	4,03	4,03	36	152	-	-	-
FOCS2-W/H/CA-E 2401	4,82	69,8	163	3,26	3,26	40,8	168,4	-	-	-
FOCS2-W/H/CA-E 2802	3,29	78,4	210	2,14	2,14	45,8	213,6	-	-	-
FOCS2-W/H/CA-E 3202	2,53	95,1	230	1,61	1,61	55,5	246,5	-	-	-
FOCS2-W/H/CA-E 3602	1,36	108,8	287	1,26	1,26	63,5	279,3	-	-	-
FOCS2-W/H/CA-E 4202	1,41	123,3	288	1,01	1,01	72	304	-	-	-
FOCS2-W/H/CA-E 4802	1,3	139,6	288	0,82	0,82	81,5	336,9	-	-	-
FOCS2-W-/R/CA-E 1301	15	34,5	97,5	11,5	11,5	20,1	92,4	11,5	40,2	92,4
FOCS2-W-/R/CA-E 1401	12,1	39,2	112	8,57	8,57	22,9	107	8,57	45,8	107
FOCS2-W-/R/CA-E 1601	9,25	47,5	110	6,45	6,45	27,8	123	6,45	55,6	123
FOCS2-W-/R/CA-E 1801	7,03	54,4	128	5,02	5,02	31,8	140	5,02	63,6	140
FOCS2-W-/R/CA-E 2802	3,29	78,4	210	2,14	2,14	45,8	214	2,14	91,6	214
FOCS2-W-/R/CA-E 3202	2,53	95,1	230	1,61	1,61	55,5	247	1,61	111	247
FOCS2-W-/R/CA-E 3602	1,36	109	287	1,26	1,26	63,5	279	1,26	127	279

Q min: minimum water flow admitted to the heat exchanger.
Q max: maximum water flow admitted to the heat exchanger.
C.a. min: minimum water content admitted in the plant.

6. ELECTRICAL DATA

Maximum values							
Size	n	Compressor			Total (1)		
		F.L.I. [kW]	F.L.A. [A]	L.R.A. [A]	F.L.I. [kW]	F.L.A. [A]	S.A. [A]
1301	1	1x89	1x146.8	1x300	89.0	146.8	300.0
1401	1	1x101.3	1x168	1x360	101.3	168.0	360.0
1601	1	1x121.6	1x197.2	1x404	121.6	197.2	404.0
1801	1	1x137.7	1x223	1x436	137.7	223.0	436.0
2101	1	1x154.9	1x247	1x465	154.9	247.0	465.0
2401	1	1x175.1	1x286	1x586	175.1	286.0	586.0
2802	2	2x101.3	2x168	2x360	202.6	336.0	456.0
3202	2	2x121.6	2x197.2	2x404	243.2	394.4	520.0
3602	2	2x137.7	2x223	2x436	275.4	446.0	560.0
4202	2	2x154.9	2x247	2x465	309.8	494.0	600.2
4802	2	2x175.1	2x286	2x586	350.2	572.0	747.8

F.L.I. Full load power input at max admissible condition
F.L.A. Full load current at max admissible condition
L.R.A. Locked rotor amperes for single compressor
S.A. Inrush current

(1) Safety values to be considered when cabling the unit for power supply and line-protections

Voltage tolerance: 10%
Maximum voltage unbalance: 3%

7.0 FULL LOAD SOUND LEVEL

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB(A)								
1301	81	78	89	93	96	84	73	67	**97**
1401	81	78	89	93	96	84	73	67	**97**
1601	81	78	89	93	96	84	73	67	**97**
1801	81	78	89	93	96	84	73	67	**97**
2101	81	78	89	93	96	84	73	67	**97**
2401	81	78	89	93	96	84	73	67	**97**
2802	83	80	90	95	98	86	75	69	**99**
3202	83	80	90	95	98	86	75	69	**99**
3602	83	80	90	95	98	86	75	69	**99**
4202	83	80	90	95	98	86	75	69	**99**
4802	83	80	90	95	98	86	75	69	**99**

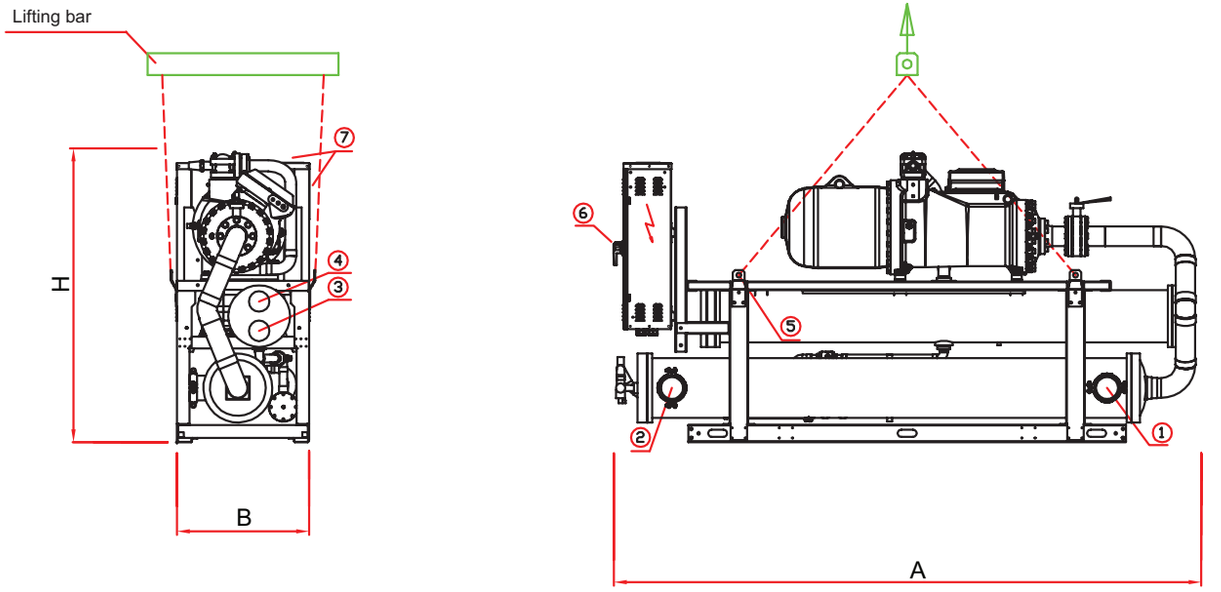
Working conditions
Plant (side) cooling exchanger water (in/out) 12/7 °C
Source (side) heat exchanger water (in/out) 30/35 °C
Sound power on the basis of measurements made in compliance with ISO 9614 and Eurovent 8/1 for Eurovent certified units;
in compliance with ISO 3744 for non-certified units
Such certification refers specifically to the sound Power Level in dB(A). This is therefore the only acoustic data to be considered as binding.

SOUND PRESSURE LEVEL									
SIZE	Octave band [Hz] at 10 m								Total sound level
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB(A)								
1301	49	46	57	61	64	52	41	35	**65**
1401	49	46	57	61	64	52	41	35	**65**
1601	49	46	57	61	64	52	41	35	**65**
1801	49	46	57	61	64	52	41	35	**65**
2101	49	46	57	61	64	52	41	35	**65**
2401	49	46	57	61	64	52	41	35	**65**
2802	51	48	58	63	66	54	43	37	**67**
3202	51	48	58	63	66	54	43	37	**67**
3602	51	48	58	63	66	54	43	37	**67**
4202	51	48	58	63	66	54	43	37	**67**
4802	51	48	58	63	66	54	43	37	**67**

Working conditions
Plant (side) cooling exchanger water (in/out) 12/7 °C
Source (side) heat exchanger water (in/out) 30/35 °C
Average sound pressure level, at 10 (m.) distance, unit in a free field on a reflective surface; non-binding value obtained from the sound power level.

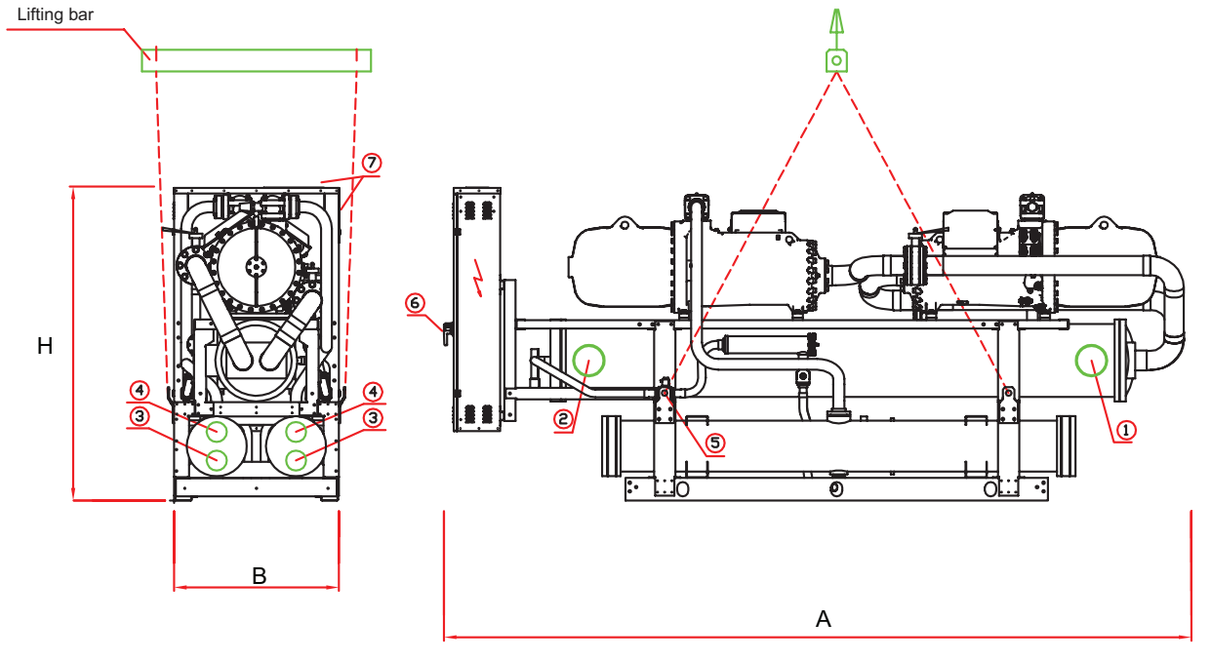
Additional soundproofing
The sound power and pressure levels are reduced of 12 dB(A) when present the accessory “integral acoustical enclosure basic”and of 16 dB(A) when present the accessory “integral acoustical enclosure plus”.

8. DIMENSIONAL DRAWINGS



NOTE:

For installation purposes, please refer to the documentation sent after the purchase contract. These technical data should be considered as indicative. CLIMAVENETA may modify them at any moment.



1. EVAPORATOR WATER INLET
2. EVAPORATOR WATER OUTLET
3. CONDENSER WATER INLET
4. CONDENSER WATER OUTLET
5. LIFTING POINTS
6. MAIN ISOLATOR
7. POWER INLET

NOTE:

For installation purposes, please refer to the documentation sent after the purchase contract. These technical data should be considered as indicative. CLIMAVENETA may modify them at any moment.

Size	DIMENSIONS AND WEIGHTS FOCS2-W/CA-E				CLEARANCES (see following page)			
	A [mm]	B [mm]	H [mm]	P [kg]	R1 [mm]	R2 [mm]	R3 [mm]	R4 [mm]
1301	4300	900	1950	2460	900	900	1500	3250
1401	4300	900	1950	2750	900	900	1500	3000
1601	4000	900	2000	3560	900	900	1500	3250
1801	4000	900	2000	3720	900	900	1500	3500
2101	4000	900	2000	3760	900	900	1500	3500
2401	4300	900	2100	4180	900	900	1500	3000
2802	4600	1150	2195	5360	900	900	1500	3000
3202	4950	1150	2195	6410	900	900	1500	2750
3602	5220	1150	2195	6870	900	900	1500	2750
4202	4920	1150	2350	7850	900	900	1500	2750
4802	4920	1285	2430	8470	900	900	1500	2750

Size	DIMENSIONS AND WEIGHTS FOCS2-W/D/CA-E				CLEARANCES (see following page)			
	A [mm]	B [mm]	H [mm]	P [kg]	R1 [mm]	R2 [mm]	R3 [mm]	R4 [mm]
1301	4300	900	1950	2650	900	900	1500	3000
1401	4300	900	1950	2770	900	900	1500	3000
1601	4000	900	2000	3590	900	900	1500	3250
1801	4000	900	2000	3750	900	900	1500	3500
2101	4000	900	2000	3790	900	900	1500	3500
2401	4300	900	2100	4210	900	900	1500	3000
2802	4600	1150	2195	5390	900	900	1500	3000
3202	4950	1150	2195	6470	900	900	1500	2750
3602	5220	1150	2195	6930	900	900	1500	2750
4202	4920	1285	2430	8500	900	900	1500	2750
4802	4920	1285	2430	8530	900	900	1500	2750

Size	DIMENSIONS AND WEIGHTS FOCS2-W/H/CA-E				CLEARANCES (see following page)			
	A [mm]	B [mm]	H [mm]	P [kg]	R1 [mm]	R2 [mm]	R3 [mm]	R4 [mm]
1301	4300	900	1950	2460	900	900	1500	3000
1401	4300	900	1950	2750	900	900	1500	3000
1601	4000	900	2000	3560	900	900	1500	3250
1801	4000	900	2000	3720	900	900	1500	3500
2101	4000	900	2000	3760	900	900	1500	3500
2401	4300	900	2100	4180	900	900	1500	3000
2802	4600	1150	2195	5360	900	900	1500	3000
3202	4950	1150	2195	6410	900	900	1500	2750
3602	5220	1150	2195	6870	900	900	1500	2750
4202	4920	1150	2350	7850	900	900	1500	2750
4802	4920	1285	2430	8470	900	900	1500	2750

Size	DIMENSIONS AND WEIGHTS FOCS2-W/R/CA-E				CLEARANCES (see following page)			
	A [mm]	B [mm]	H [mm]	P [kg]	R1 [mm]	R2 [mm]	R3 [mm]	R4 [mm]
1301	4000	900	2000	3170	900	900	1500	3250
1401	4000	900	2000	3240	900	900	1500	3250
1601	4000	900	2100	4070	900	900	1500	3250
1801	4000	900	2100	4240	900	900	1500	3500
2802	4600	1285	2300	6340	900	900	1500	3000
3202	4950	1285	2300	7450	900	900	1500	2750
3602	5200	1285	2430	7950	900	900	1500	2750

FOCS2-W/CA-E	EVAPORATOR		CONDENSER	
	WATER INLET	WATER OUTLET	WATER INLET	WATER OUTLET
	ø	ø	ø	ø
1301	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 4"	FLEXIBLE JOINT 4"
1401	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
1601	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
1801	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
2101	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
2401	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"
2802	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
3202	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
3602	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
4202	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
4802	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"

FOCS2-W/D/CA-E	EVAPORATOR		CONDENSER		RECUPERATOR	
	WATER INLET	WATER OUTLET	WATER INLET	WATER OUTLET	WATER INLET	WATER OUTLET
	ø	ø	ø	ø	ø	ø
1301	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 4"	FLEXIBLE JOINT 4"	GAS 1"1/4	GAS 1"1/4
1401	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
1601	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
1801	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
2101	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
2401	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	GAS 1"1/4	GAS 1"1/4
2802	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
3202	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
3602	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
4202	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	GAS 1"1/4	GAS 1"1/4
4802	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	GAS 1"1/4	GAS 1"1/4

FOCS2-W/H/CA-E	EVAPORATOR		CONDENSER	
	WATER INLET	WATER OUTLET	WATER INLET	WATER OUTLET
	ø	ø	ø	ø
1301	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 4"	FLEXIBLE JOINT 4"
1401	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
1601	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
1801	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
2101	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
2401	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"
2802	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
3202	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
3602	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
4202	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
4802	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 10"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"

FOCS2-W/R/CA-E	EVAPORATOR		CONDENSER		RECUPERATOR	
	WATER INLET	WATER OUTLET	WATER INLET	WATER OUTLET	WATER INLET	WATER OUTLET
	ø	ø	ø	ø	ø	ø
1301	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
1401	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
1601	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
1801	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 6"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
2802	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
3202	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"
3602	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 8"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"	FLEXIBLE JOINT 5"

9. LEGEND OF PIPE CONNECTIONS

UNI ISO 228/1

Pipe threads where pressure-tight joints are not made on the threads - Designation, dimensions and tolerances

Used terminology:

G: Pipe threads where pressure-tight joints are not made on the threads

A: Close tolerance class for external pipe threads where pressure-tight joints are not made on the threads

B: Wider tolerance class for external pipe threads where pressure-tight joints are not made on the threads

Internal threads: G letter followed by thread mark (only tolerance class)

External threads: G letter followed by thread A letter for A class external threads or by B letter for B class external threads.

UNI ISO 7/1

Pipe threads where pressure-tight joints are made on the threads - Designation, dimensions and tolerances

Used terminology:

Rp: Internal cylindrical threads where pressure-tight joints are made on the threads

Rc: Internal conical threads where pressure-tight joints are made on the threads

R: External conical threads where pressure-tight joints are made on the threads

Internal cylindrical threads: R letter followed by p letter
Internal conical threads: R letter followed by c letter
External conical threads: R letter

Designation	Description
UNI ISO 7/1 - Rp 1 1/2	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø : 1 ½”
UNI ISO 7/1 - Rp 2 1/2	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø : 2 ½”
UNI ISO 7/1 - Rp 3	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø : 3”
UNI ISO 7/1 - R 3	External conical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø : 3”
UNI ISO 228/1 - G 4 B	Pipe threads where pressure-tight joints are not made on the threads, defined by standard UNI ISO 228/1 Wide tolerance class for external pipe threads Conventional ø : 4”
DN 80 PN 16	Flange Nominal Diameter: 80 mm Nominal Pressure: 16 bar

Note:

Conventional diameter value [in inches] identifies short thread designation, based upon the relative standard.
All relative values are defined by standards.
As example, here below some values:

	UNI ISO 7/1	UNI ISO 228/1
conventional ø	1”	1”
Pitch	2.309 mm	2.309 mm
external ø	33.249 mm	33.249 mm
core ø	30.291 mm	30.291 mm
Thread height	1.479 mm	1.479 mm

10. CONDENSATION CONTROL DEVICES

PRESSOSTATIC VALVE

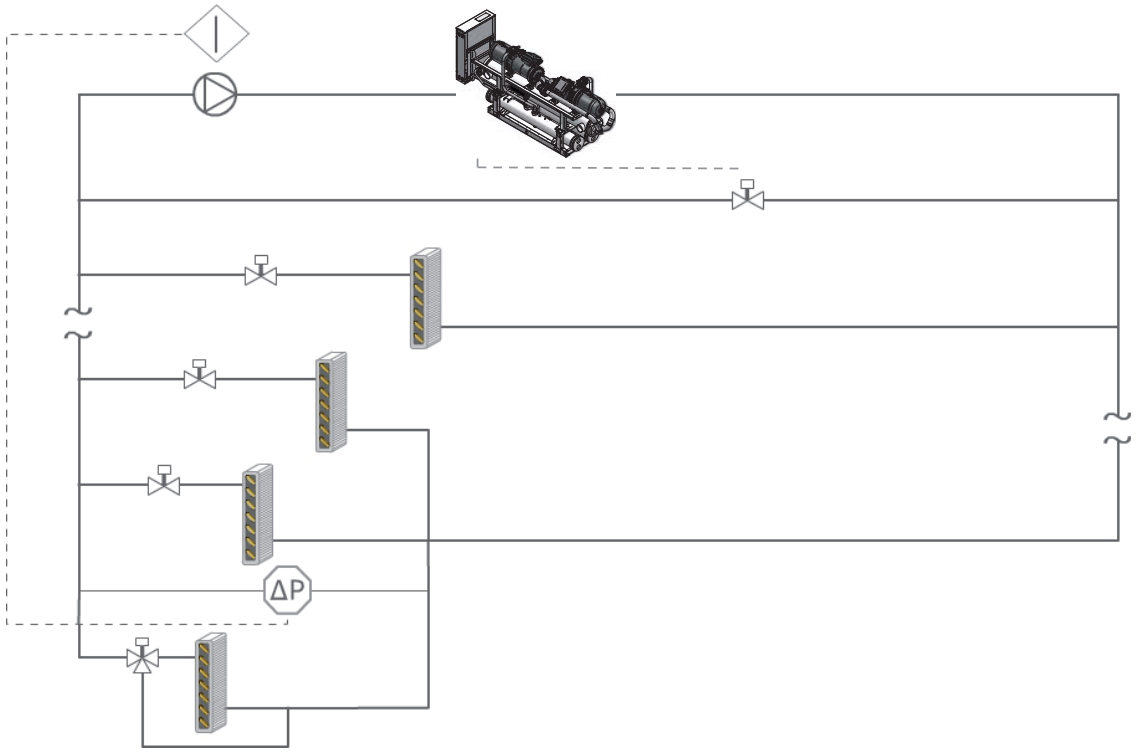
Pressostatic valve with grey cast iron body. It's used for regulating the flow of water as a function of the condensing pressure, maintaining it constant during operation. When the refrigeration plant is stopped, the cooling water flow is shut off automatically. The valve is selected for a thermic drop of 10°C and tested by Climaveneta during the unit's test. Recommended for applications with low temperature water, for example groundwater, where it's request the condensation pressure's control and it's possible to work with variable flow on the rejection circuit.

Size	DT 10K	
	Q cond [m3/h]	**Dp** [bar]
1301	35.7	0.63
1401	40.2	0.83
1601	46.9	1.18
1801	53.8	0.47
2101	60.5	0.61
2401	66.3	0.75
2802	80.4	0.83
3202	93.8	1.18
3602	107.6	0.47
4202	120.9	0.61
4802	132.7	0.76

11. VPF SYSTEM
VARIABLE FLOW (optional)

The energy consumption associated with fluid circulation weighs heavily on the total operating costs of a large installation, especially when the units work at part load, and even more, when they are in stand-by. Under these conditions, although the power absorbed by the compressors and fans is reduced, the power consumed for water circulation remains high.
The FOCS2-W/CA-E permits reduction in system power consumption using pumps with continuous flow control by inverter. Energy savings are considerable and immediately evident, to the extent that an Δx reduction of the flow of water to be delivered to the system amounts to a proportional reduction of $(\Delta x)^3$ in the power absorbed. High or low head accessory pumps controlled by inverter can be installed. In the most advanced systems (see the simplified model shown in the diagram below), these become the pumps for the entire hydraulic circuit, and this eliminates the need to detach the primary from the secondary circuit for the purpose of water circulation throughout the entire system.

Previously this was the only choice possible in traditional systems, and imposed primarily by the need for the chiller to work with constant water flows through the evaporator. Now, thanks to the FOCS units, designers need no longer worry about this limitation. The unit has been designed to work at maximum efficiency even with variable flows to the evaporator and independently adjust itself in order to keep the outlet water temperature constantly at the set-point entered by the user. This simplifies the design and realisation of variable flow systems and offers advantages in terms of both reductions in consumption and hydraulic circuit sizing. In short, in addition to energy saving and consequently lower running costs, this innovative solution enables simplification in design that ensures substantial savings in initial investment costs.

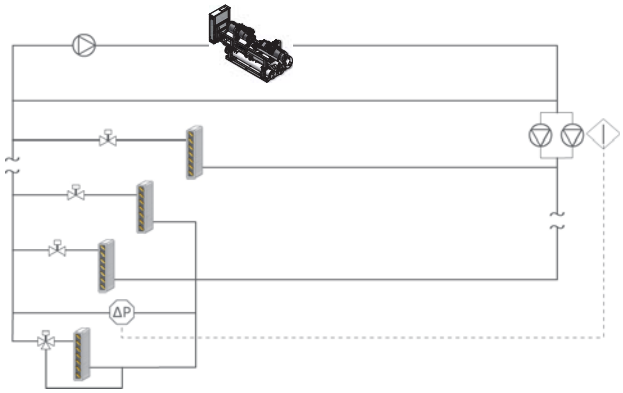


The “system VPF” option comprises:
- extensions on the controller to read the system’s pressure transducer signals (4-20 mA) and the consequent management of pumps and bypass valve (0-10 V signal)
- additional pressure transducer as extra safety device. The on-board controller modulates flow up to a minimum of 50%, always in observance of the minimum flow limit to the evaporator indicated in page 19

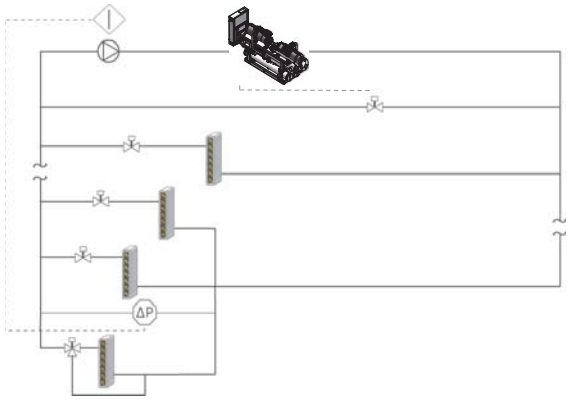
Pressure transducer, pumps and bypass valve at client responsibility.

Working logic of “smart” plant with an only one variable primary flow circuit

Traditional plant



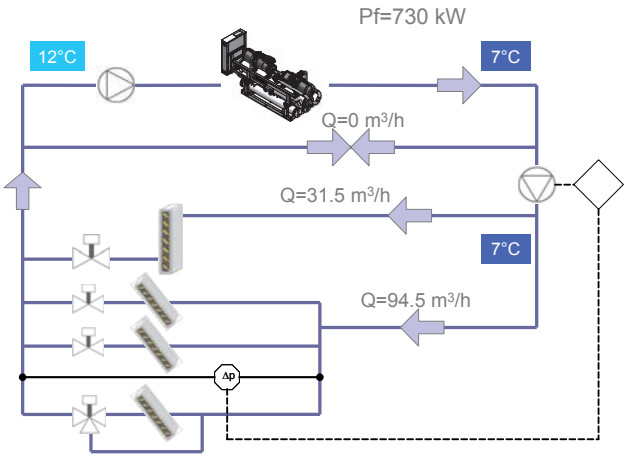
“Smart” plant

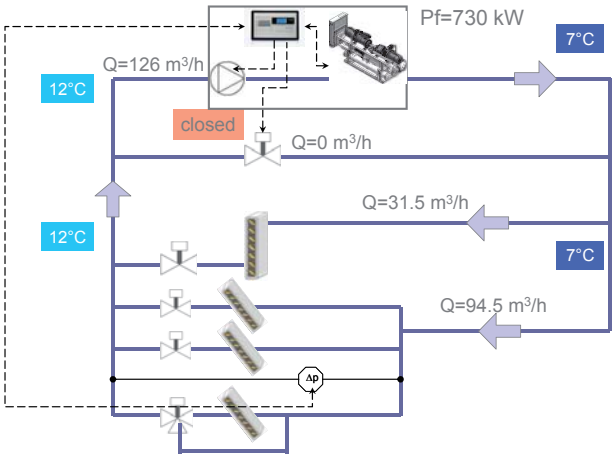


It is necessary to have a “decuple” system, which uses constant water flow through each chiller evaporator and variable water flow through each cooling coil to satisfy space loads. As each two-way valve adjusts the flow of chilled water through the coil to satisfy the existing load, the distribution pump responds by regulating the amount of chilled water delivered. Water flows through the bypass in either direction as needed to balance the system.

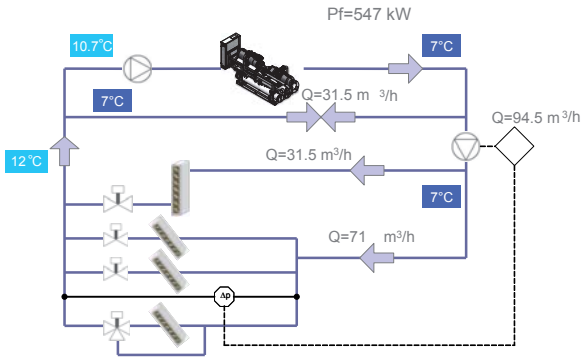
There is an only one variable primary flow circuit, which varies water flow throughout the entire system – that is, through the evaporator of the operating chiller as well as through the cooling coils. Two-way control valves and a bypass valve are required; the bypass valve ensures that the amount of the flow that returns to the operating chiller(s) never falls below the minimum limit.

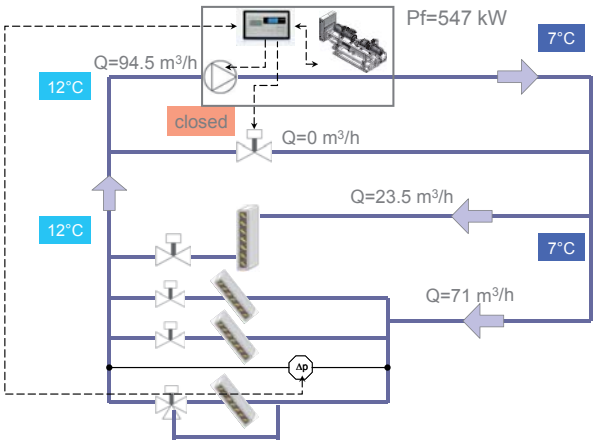
Situation 1. 100% cooling capacity



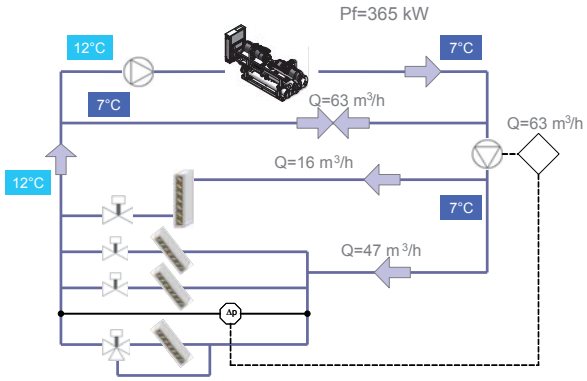


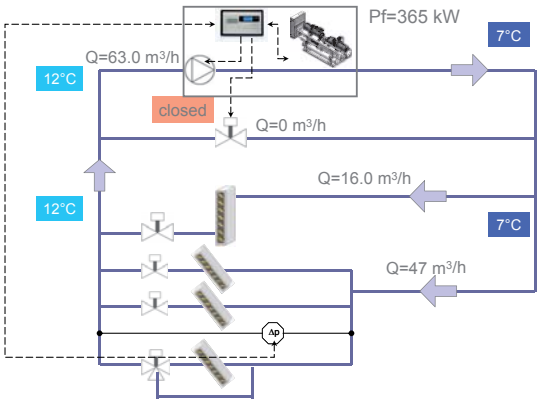
Situation 2. 75% cooling capacity



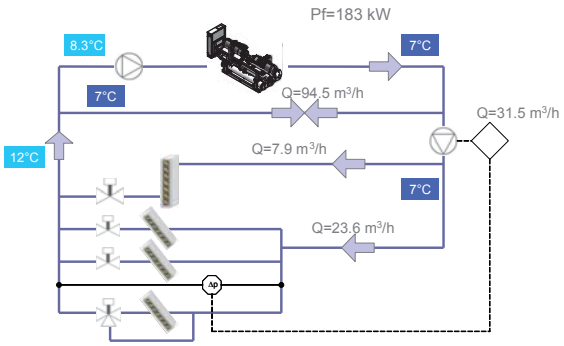


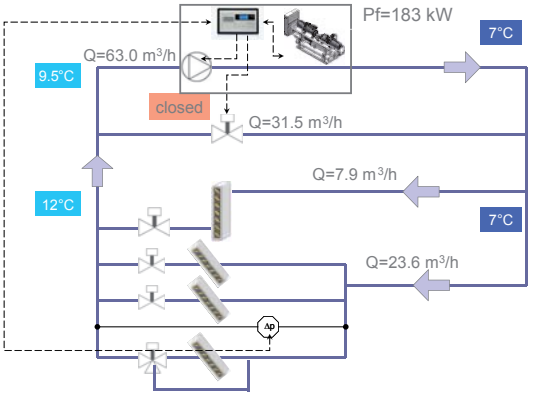
Situation 3. 50% cooling capacity





Situation 4. 25% cooling capacity





Climaveneta S.p.A.
Via Sarson 57/c
36061 Bassano del Grappa (VI)
Italy
Tel +39 0424 509 500
Fax +39 0424 509 509
info@climaveneta.com
www.climaveneta.com

Climaveneta Home System
Via Duca d'Aosta 121
31030 Mignagola (TV)
Italy
Tel +39 0422 4131
Fax +39 0422 413659
info.cvhs@climaveneta.com
www.climaveneta.com

Climaveneta France
3, Village d'Entreprises
ZA de la Couronne des Prés
Avenue de la Mauldre
78680 Epône
France
Tel +33 (0)1 30 95 19 19
Fax +33 (0)1 30 95 18 18
info@climaveneta.fr
www.climaveneta.fr

Climaveneta Deutschland
Rhenus Platz 2
59439 Holzwickede
Germany
Tel +49 2301 91222-0
Fax +49 2301 91222-99
info@climaveneta.de
www.climaveneta.de

Climaveneta
España - Top Clima
Londres 67, 1 4
08036 Barcelona
Spain
Tel +34 934 195 600
Fax +34 934 195 602
topclima@topclima.com
www.climaveneta.com

Climaveneta Chat Union
Refrig. Equipment Co Ltd
88 Bai Yun Rd, Pudong Xinghuo
New dev. zone 201419 Shanghai
China
Tel 008 621 575 055 66
Fax 008 621 575 057 97

Climaveneta Polska Sp. z o.o.
Ul. Sienkiewicza 13A,
05-120 Legionowo,
Poland
Tel +48 22 766 34 55-57
Fax +48 22 784 39 09
info@climaveneta.pl
www.climaveneta.pl