



QDVAC / QDHAC

TECHNICAL MANUAL

AIR COOLED WATER CHILLERS AND HEAT PUMPS WITH CENTRIFUGAL FANS





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EC DECLARATION OF CONFORMITY

Herewith TEV Ltd declare that the air conditioning equipment designated below is in accordance with the essential requirements of current EC Directives.

This declaration is based on the design and construction of the equipment in the form brought onto the market by TEV Ltd. If alterations are made to the machinery without prior consultation with TEV Ltd. this declaration becomes invalid.

Relevant EC Council Directives: Machinery Directive (98/37/EC)
 EMC Directive (89/336/EEC in the versions 93/68/EEC)
 Low Voltage Directive (73/23/EEC in the version 93/68/EEC)
 Directive PED (97/23/EC)

Applied harmonised standards: EN 292-1:1991, EN 292-2:1991, EN 294:1992, EN 349:1993, EN 55014-1:2000,
 EN 55014-2:1997, EN 60335-1:2002, EN 60335-2-40:2003, EN 61000-3:1995

Basis of self attestation: BS EN ISO 9001:2000 BSI registered firm certificate no. FM671

EG KONFORMITÄTSERKLÄRUNG

Hiermit erklärt TEV Ltd, daß die unten angegebenen Klimageräte in Übereinstimmung mit den Gesundheits - und Sicherheitsbestimmungen der gültigen EG-Direktiven stehen.

Diese Erklärung bezieht sich auf die Konzeption und die Konstruktion der Geräte, die von TEV Ltd. auf den Markt gebracht werden.


Wenn Veränderungen an den Geräten ohne vorherige Absprache mit TEV Ltd. gemacht werden, so wird diese Erklärung ungültig.

Relevante EG Richtlinien: Maschinen - Richtlinien (Version 98/37/EWG)
 EMV Direktive: (89/336/EWG/EEC in den Versionen 93/68/EWG)
 Niederspannungsrichtlinie: (73/23/EWG/EEC in der Version 93/68/EWG)
 Richtlinien PED (97/23/EC)

Angewandte Standard Normen: EN 292-1:1991, EN 292-2:1991, EN 294:1992, EN 349:1993, EN 55014-1:2000,
 EN 55014-2:1997, EN 60335-1:2002, EN 60335-2-40:2003, EN 61000-3:1995

Bestätigungsgrundlage: BS EN ISO 9001:2000 Zertifikat Nr. FM 671

Model Name: Nom du modèle: Nombre del Modelo:	Machinebeschrijving: Modellname:	
Serial Number: Numéro de série: Numéro de Serie:	Serienummer: Serienummer:	
Model Part Number: Référence du modèle: Artikelnummer:	Modellnummer: Número de la Parte del Modelo:	

Signature of TEV Ltd. designated "responsible person":	Handtekening van de gemachtigde persoon bij TEV Ltd.:	 (A C HAMMERSLEY)
Signature of TEV Ltd Le responsable:	Unterschrift von TEV Ltd. "verantwortliche Person":	
Firma de TEV Ltd. designado como "persona responsable":		

Position of Signatory:	MANUFACTURING DIRECTOR
Fonction du signataire:	DIRECTEUR DE FABRICATION
Cargo del firmante:	DIRECTOR FABRICACIÓN
Functie van gemachtigde	PRODUKTIE COÖRDINATOR
Position desUnterschreibenden:	PRODUKTIONS DIREKTOR



TECHNICAL FEATURES

Frame

All QDVAC/QDHAC unit enclosures are manufactured from hot-galvanised sheet steel, painted with polyurethane powder enamel and stoved at 180°C to provide a durable, corrosion resistant finish. The frame is self-supporting with removable panels. All screws and rivets are made from stainless steel. The paint colour is RAL 7035.

Refrigerant circuit

Refrigerant is R407C. The refrigerant circuit is assembled using quality brand components and in accordance with ISO 97/23 concerning welding procedures. Model sizes 140 and upwards have multiple refrigerant circuits. Each refrigerant circuit is totally independent of the other. Failure of one circuit does not influence the other circuit. The refrigerant circuit includes:

- Liquid line manual shut-off valve
- Sight glass
- Filter drier
- Thermal expansion valve with external equalizer
- Electric expansion valve with electronic control to optimise efficiency in part load conditions (option)
- Reversing valve (heat pump version only)
- No-return valve (for heat pump version only)
- Liquid receiver (for heat pump version only)
- Schrader valves for maintenance and control
- Pressure safety device (according to PED requirements)

Compressors

Scroll compressors are used, each fitted with a crankcase heater and provided with thermal overload protection via a klixon embedded in the motor winding. Compressors are mounted in a separate chamber in order to be separated from the air stream and to enable maintenance to be performed whilst the unit is operating. The crankcase heater is always powered when the compressors are in stand-by. All compressors are in tandem configuration. This creates higher efficiencies during part load conditions compared to units with independent refrigerant circuits per compressor.

Condensers

Condensers are made of copper tubes with aluminium fins. The diameter of the copper tubes is 3/8" and the thickness of the aluminium fins is 0.1 mm. Tubes are mechanically expanded into the aluminium fins to maximise heat transfer. The geometry of these condensers guarantees a low air side pressure drop and allows the use of slow running (and low noise) fans. The condensers can be protected by a metallic filter (option).

Fans

Fans are centrifugal, double inlet, with forward curved blades, made of galvanized steel. They are statically and dynamically balanced and supplied complete with safety fan guard meeting EN 294. They are mounted on the unit frame using rubber anti-vibration mounts. The electric motors are 4 pole (approx. 1500 rpm), three-phase power supply. The fans are belt and pulley driven. Motors are protected to IP 54. **Standard fans are capable of operation against 50Pa. For higher external static pressures, adjustment of the pulley drive is possible or alternative fans are available as an option. Please specify the external static required in the initial enquiry.**



Evaporators

The plate evaporators are made from 316 stainless steel, braze-welded. Unit sizes 045 to 130 have a single water side circuit. From unit size 140 upwards, the circuits are double "cross flow" type. The use of these types of evaporator allows a significant reduction of the refrigerant charge for the unit compared to traditional shell-in-tube evaporators and increases the efficiency of the refrigerant cycle during part load operation. The evaporators are factory insulated with flexible close-cell insulation and can be fitted with an antifreeze heater (optional). Each evaporator is provided with a temperature sensor as antifreeze protection.

Hydraulic circuit (K versions only)

The QDVAC/QDHAC chillers can be delivered as option, with a built in hydraulic kit that includes:

Water tank: various capacities (depending on the size of the unit), factory insulated with flexible close-cell material and ready for installation of an antifreeze kit (option). The water tank is installed on the supplied water side (7°C) in order to minimize fluctuations in the water temperature caused by cycling of the compressors. By installing on the supply side, the supply water temperature can be maintained for some time after the compressors turn off, a situation that cannot be achieved if the water tank is installed on the return water side (12°C).

Water pump: centrifugal type, is available in single (K1) or double configuration (K2). In the K2 version, one pump is running and one pump is in stand-by. The change over can be manual (by a manual switch installed in the electric box) or automatically controlled by the microprocessor (option). The expansion vessel, safety valve and manual valves with fittings are sited in the hydraulic circuit.

Electrics enclosure

Access to the electrics enclosure is achieved by switching the mains isolator to "OFF" and removing the front cover. The electrics conform to electromagnetic compatibility norms CEE 73/23 and 89/336. Moisture protection is IP55.

All QDVAC/QDHAC units have installed, as standard, a compressor sequence relay, which disables compressor operation if the power supply phase sequence is incorrect (scroll compressors can be damaged if they operate in reverse). The following components are also installed as standard:

Mains switch, Magnetic-thermal switches (MCB's) for protection of pumps and fans,
Compressor(s) fuses Control circuit automatic breakers
Compressor contactors, Fan contactors, pump contactors.

The terminal board is supplied with volt free contacts for remote ON-OFF, Heat\Cool change over (heat pumps only) and general alarms.

Microprocessors

QDVAC/QDHAC units are supplied with microprocessor controls as standard. The specific controller used depends upon the unit size, number of features and use of optional features e.g. electronic expansion valves.

The microprocessor controls the following basic functions:

regulation of the water temperature
antifreeze protection
compressor timing
compressor automatic starting sequence
alarm reset
volt free contact for remote common alarm
alarms and leds.

Any microprocessor can, on request, be connected to a BMS system for remote control and management. Typically, solutions can be found for MODBUS, LONWORKS, BACNET or TREND protocols.

Control and protection devices

All units are supplied with the following control and protection devices:

Return water temperature sensor, installed on the return water line from the plant (12°C)
Antifreeze protection sensor installed on the outlet water temperature (7°C)
High pressure switch with manual reset
Low pressure switch with automatic reset
High pressure safety valve
Compressor thermal overload protection
Fan thermal overload protection
Flow switch.



OTHER VERSIONS

Heat pump version (HP)

Heat pump versions are provided with a 4-way reversing valve and are can produce hot water up to a 45-50°C. They are always supplied with a liquid receiver and a second thermostatic valve to optimise the efficiency of the refrigerant cycle in heating and in cooling. The microprocessor is set for automatic defrost (for operation in severe ambient conditions) and for Heat\Cool change over.

Free cooling version (FC)

The Free Cooling option is a system designed to give important energy savings, when the cooling system is operating continuously, and when ambients are low. Free cooling units use low temperature ambient air to cool down the water in the system. In some situations, chilled water can be produced without any mechanical, refrigeration (compressors) with consequent large reduction of power consumption. The Free Cooling system comprises:

- | | |
|--------------------------------|---|
| Free cooling coil: | Heat exchanger made of copper tubes and aluminium fins, with bleed valves. |
| Microprocessor control: | The "heart" of the system; it allows correct control of all parameters, leading to high efficiencies over a range of ambient conditions. |
| 3 way valve: | An ON/OFF 3 way valve that opens/closes the free cooling circuit, depending on the signal coming from the microprocessor control. |
| Head pressure control: | Maintains the correct condensing pressure in the refrigerant circuit when ambient temperatures are low. In Free Cooling systems, this effect is achieved by partially closing refrigerant circuits in the condensing coil with solenoid valves: this reduces the heat transfer capacity and maintains a suitable condensing pressure. |



**WATER CHILLERS AND HEAT PUMPS
QDVAC/QDHAC / LS (Low noise version)
TECHNICAL DATA**

MOD.		040	045	050	060	070	080	090	110
Refrigerant		R407C	R407C	R407C	R407C	R407C	R407C	R407C	R407C
Cooling capacity	kW	37,7	46,0	54,0	60,0	67,0	79,0	91,0	107,0
Compressor input power	kW	13,2	15,7	17,5	20,4	22,2	27,8	32,0	34,6
Water flow rate	l/h	6490	7910	9290	10320	11520	13590	15650	18400
Water pressure drop	KPa	26,2	32,4	31,5	23,3	30,1	30,4	27,6	26,5
Heating capacity	kW	38,5	47,0	55,0	62,0	68,0	83,0	95,0	107,0
Compressor input power	kW	12,9	15,2	17,3	19,5	21,7	26,4	30,3	34,2
Water flow rate	l/h	6630	8085	9460	10665	11695	14275	16340	18400
Water pressure drop	kPa	28,5	33,8	32,6	24,8	31,0	33,5	30,0	26,5
Total input current (A version)	A	35,5	39,1	41,7	44,4	47,1	56,9	73,2	78,7
Total peak current	A	122,6	149,5	157,7	197,7	202,3	235,5	272,1	284,3
Maximum input current	A	38,7	44,5	51,7	56,3	60,9	65,3	86,1	98,3
Power supply	V/Ph/Hz	400/3/50							
Airflow	m³/h	12000	12000	19000	19000	18000	17300	30000	30000
Fans	n° x kW	2 x 1,1	2 x 1,1	2 x 1,5	2 x 1,5	2 x 1,5	2 x 1,5	3 x 2,2	3 x 2,2
Compressors	type	Scroll							
	n°	2	2	2	2	2	2	2	2
Refrigerant circuits	n°	1	1	1	1	1	1	1	1
Control steps	n°	2	2	2	2	2	2	2	2
Sound power level ⁽¹⁾	dB(A)	86	86	89	89	89	89	92	92
Sound pressure level ⁽²⁾	dB(A)	58	58	61	61	61	61	64	64
Water pump (option)	kW	1,1	1,1	1,1	1,1	1,1	1,5	1,5	2,2
Water pump input current	A	2,9	2,9	2,9	2,9	2,9	4,3	4,3	5,3
Pump available pressure (option)	kPa	165	160	141	125	110	150	130	150
Water tank capacity (option)	l	180	180	300	300	300	300	530	530
Expansion vessel (option)	l	18	18	18	18	18	18	18	18
Length	mm	1870	1870	2608	2608	2608	2608	3608	3608
Width	mm	850	850	1105	1105	1105	1105	1105	1105
Height	mm	1250	1250	1566	1566	1566	1566	1566	1566
Weight (Standard configuration)	kg	580	600	720	736	770	820	1110	1190
Weight (with hydraulic kit)	kg	740	760	890	906	940	1030	1320	1400

Performances are rated at:

Cooling: ambient air temperature 35 °C; evaporator water temperature in/out 12°C / 7 °C.

Heating: ambient air temperature 8.3 °C db, 6.1 °C wb ; condenser water temperature in/out 40°C / 45 °C.

(1): Sound power level according to ISO 3746.

(2): Sound pressure level measured at 10m from the unit in free field conditions: direction factor Q=2 (according to ISO 3746).



**WATER CHILLERS AND HEAT PUMPS
QDVAC/QDHAC / LS (Low noise version)
TECHNICAL DATA**

MOD.		120	130	140	160	190	210	240	260
Refrigerant		R407C	R407C	R407C	R407C	R407C	R407C	R407C	R407C
Cooling capacity	kW	120	129	143	158	186	211	241	263
Compressor input power	kW	39,7	45,1	50,9	55,7	61,8	73,3	79,4	90,2
Water flow rate	l/h	20640	22190	24600	27180	31990	36290	41450	45240
Water pressure drop	kPa	29,4	30,0	30,8	36,0	39,6	42,7	49,0	51,2
Heating capacity	kW	120	132	150	165	189	217	242	267
Compressor input power	kW	38,5	42,9	48,1	52,8	60,6	68,4	77,1	85,8
Water flow rate	l/h	20640	22700	25800	28380	32510	37320	41620	45920
Water pressure drop	kPa	29,4	31,3	33,8	39,2	40,9	45,1	49,4	52,7
Total input current (A version)	A	87,6	96,7	104,0	112,4	143,0	160,4	180,2	198,4
Total peak current	A	309,3	317,8	295,0	299,4	357,6	380,0	421,1	438,1
Maximum input current	A	106,8	115,3	124,8	129,2	171,6	194,0	218,6	235,6
Power supply	V/Ph/Hz	400/3/50							
Airflow	m³/h	29000	29000	36000	36000	60000	60000	60000	60000
Fans	n° x kW	3 x 2,2	3 x 2,2	2 x 4,0	2 x 4,0	4 x 4	4 x 4	4 x 5,5	4 x 5,5
Compressors	type	Scroll							
	n°	2	2	4	4	4	4	4	4
Refrigerant circuits	n°	1	1	2	2	2	2	2	2
Control steps	n°	2	2	4	4	4	4	4	4
Sound power level ⁽¹⁾	dB(A)	92	92	94	94	96	96	96	96
Sound pressure level ⁽²⁾	dB(A)	64	64	66	66	68	68	68	68
Water pump (option)	kW	2,2	2,2	2,2	3,0	3,0	3,0	4,0	4,0
Water pump input current	A	5,3	5,3	5,3	8,5	8,5	8,5	9,9	9,9
Pump available pressure (option)	kPa	120	130	105	180	140	110	170	155
Water tank capacity (option)	l	530	530	530	670	670	670	670	670
Expansion vessel (option)	l	18	18	18	18	18	18	18	18
Length	mm	3608	3608	4108	4108	4708	4708	4708	4708
Width	mm	1105	1105	1105	1105	1105	1105	1105	1105
Height	mm	1566	1566	1986	1986	1986	1986	1986	1986
Weight (Standard configuration)	kg	1240	1270	1750	1800	2070	2180	2290	2590
Weight (with hydraulic kit)	kg	1450	1480	1960	2100	2370	2480	2590	2900

Performances are rated at:

Cooling: ambient air temperature 35 °C; evaporator water temperature in/out 12°C / 7 °C.

Heating: ambient air temperature 8.3 °C db, 6.1 °C wb ; condenser water temperature in/out 40°C / 45 °C.

(1): Sound power level according to ISO 3746.

(2): Sound pressure level measured at 10m from the unit in free field conditions: direction factor Q=2 (according to ISO 3746).



**QDVAC/QDHAC / LS (LOW NOISE VERSION)
COOLING CAPACITIES AND COMPRESSOR INPUT POWER**

MOD.	TU (°C)	PF (kW)						PA (kW)					
		TA (°C)						TA (°C)					
		20	25	30	35	40	45	20	25	30	35	40	45
040	-5	26,64	24,98	23,36	21,79	---	---	9,39	10,50	11,71	13,02	---	---
	-3	29,27	27,48	25,74	24,04	---	---	9,36	10,50	11,76	13,13	---	---
	-1	32,07	30,15	28,28	26,44	---	---	9,32	10,48	11,77	13,21	---	---
	1	35,05	33,00	30,98	29,00	---	---	9,28	10,44	11,77	13,25	---	---
	3	38,23	36,02	33,85	31,73	29,65	---	9,24	10,41	11,75	13,27	14,94	---
	5	41,60	39,24	36,91	34,63	32,39	---	9,21	10,36	11,72	13,26	14,98	---
	7	45,18	42,66	40,17	37,71	35,31	32,95	9,19	10,33	11,68	13,24	15,00	16,93
	9	48,97	46,28	43,62	40,99	38,41	35,87	9,19	10,30	11,64	13,21	14,99	16,97
	11	52,99	50,12	47,28	44,48	41,71	38,98	9,21	10,28	11,60	13,17	14,97	16,98
	13	57,24	54,19	51,16	48,17	45,21	42,29	9,26	10,28	11,57	13,13	14,93	16,97
15	61,74	58,50	55,27	52,08	48,92	45,80	9,34	10,30	11,56	13,09	14,90	16,95	
045	-5	33,41	31,45	29,48	27,48	---	---	11,23	12,52	13,96	15,56	---	---
	-3	36,45	34,36	32,24	30,11	---	---	11,22	12,53	13,99	15,60	---	---
	-1	39,69	37,45	35,19	32,90	---	---	11,21	12,53	14,01	15,64	---	---
	1	43,13	40,75	38,33	35,89	---	---	11,19	12,53	14,02	15,67	---	---
	3	46,80	44,25	41,67	39,06	36,42	---	11,18	12,52	14,02	15,69	17,54	---
	5	50,69	47,98	45,23	42,44	39,63	---	11,16	12,51	14,03	15,71	17,58	---
	7	54,83	51,94	49,01	46,00	43,04	40,00	11,14	12,50	14,02	15,72	17,61	19,70
	9	59,21	56,14	53,02	49,86	46,66	43,43	11,12	12,48	14,02	15,73	17,63	19,74
	11	63,85	60,59	57,27	53,91	50,51	47,07	11,09	12,47	14,01	15,73	17,65	19,78
	13	68,77	65,30	61,78	58,21	54,60	50,95	11,07	12,45	14,00	15,73	17,66	19,80
15	73,96	70,28	66,55	62,77	58,94	55,06	11,05	12,43	13,98	15,73	17,67	19,83	
050	-5	39,58	37,29	34,94	32,53	---	---	12,52	13,96	15,50	17,15	---	---
	-3	43,08	40,64	38,14	35,57	---	---	12,50	13,98	15,58	17,30	---	---
	-1	46,80	44,21	41,54	38,82	---	---	12,47	13,98	15,63	17,41	---	---
	1	50,76	48,00	45,17	42,27	---	---	12,43	13,97	15,66	17,49	---	---
	3	54,98	52,04	49,03	45,95	42,79	---	12,38	13,94	15,66	17,54	19,58	---
	5	59,45	56,33	53,13	49,86	46,50	---	12,34	13,90	15,64	17,57	19,66	---
	7	64,19	60,88	57,49	54,00	50,46	46,82	12,29	13,85	15,62	17,57	19,71	22,03
	9	69,22	65,71	62,12	58,43	54,66	50,80	12,25	13,81	15,58	17,56	19,74	22,11
	11	74,55	70,83	67,02	63,11	59,12	55,04	12,22	13,77	15,54	17,53	19,74	22,17
	13	80,19	76,25	72,21	68,08	63,85	59,53	12,21	13,73	15,50	17,50	19,74	22,20
15	86,14	81,97	77,70	73,34	68,87	64,31	12,22	13,70	15,46	17,46	19,71	22,21	
060	-5	44,18	41,55	38,86	36,12	---	---	14,46	16,14	17,97	19,95	---	---
	-3	48,09	45,29	42,42	39,49	---	---	14,47	16,18	18,07	20,12	---	---
	-1	52,26	49,27	46,22	43,09	---	---	14,46	16,20	18,13	20,25	---	---
	1	56,69	53,51	50,26	46,93	---	---	14,45	16,21	18,18	20,35	---	---
	3	61,41	58,02	54,56	51,02	47,40	---	14,43	16,21	18,21	20,42	22,85	---
	5	66,42	62,82	59,14	55,37	51,52	---	14,42	16,20	18,22	20,47	22,95	---
	7	71,73	67,91	64,00	60,00	55,91	51,74	14,40	16,18	18,21	20,49	23,02	25,78
	9	77,37	73,31	69,16	64,91	60,58	56,15	14,40	16,17	18,21	20,51	23,07	25,88
	11	83,34	79,04	74,63	70,13	65,54	60,85	14,41	16,16	18,20	20,51	23,10	25,96
	13	89,66	85,10	80,43	75,67	70,80	65,84	14,44	16,17	18,19	20,50	23,11	26,01
15	96,34	91,51	86,57	81,53	76,39	71,14	14,50	16,19	18,19	20,50	23,12	26,04	

TU: Outlet water temperature (°C)
 TA: Ambient temperature (°C)
 PA: Compressors input power (kW)
 PF: Cooling capacity (kW)



**QDVAC/QDHAC / LS (LOW NOISE VERSION)
COOLING CAPACITIES AND COMPRESSOR INPUT POWER**

MOD.	TU (°C)	PF (kW)						PA (kW)					
		TA (°C)						TA (°C)					
		20	25	30	35	40	45	20	25	30	35	40	45
070	-5	49,33	46,44	43,48	40,47	---	---	15,63	17,47	19,51	21,77	---	---
	-3	53,68	50,59	47,43	44,21	---	---	15,65	17,51	19,60	21,92	---	---
	-1	58,31	55,01	51,64	48,21	---	---	15,66	17,54	19,66	22,03	---	---
	1	63,23	59,72	56,13	52,47	---	---	15,66	17,56	19,71	22,12	---	---
	3	68,47	64,73	60,91	57,00	53,02	---	15,67	17,57	19,74	22,18	24,90	---
	5	74,04	70,06	65,99	61,83	57,59	---	15,69	17,58	19,76	22,23	24,99	---
	7	79,95	75,72	71,39	67,00	62,46	57,87	15,72	17,59	19,77	22,26	25,05	28,15
	9	86,21	81,72	77,12	72,43	67,64	62,76	15,76	17,62	19,79	22,28	25,10	28,24
	11	92,85	88,08	83,20	78,22	73,14	67,97	15,83	17,65	19,81	22,30	25,14	28,31
	13	99,87	94,81	89,64	84,37	78,99	73,50	15,92	17,70	19,84	22,32	25,16	28,36
	15	107,3	101,9	96,46	90,88	85,18	79,38	16,05	17,78	19,88	22,35	25,19	28,40
080	-5	58,51	55,07	51,54	47,94	---	---	19,61	21,99	24,54	27,22	---	---
	-3	63,71	60,03	56,27	52,42	---	---	19,57	22,02	24,67	27,51	---	---
	-1	69,24	65,32	61,31	57,21	---	---	19,52	22,00	24,75	27,71	---	---
	1	75,12	70,95	66,68	62,30	---	---	19,46	21,96	24,76	27,83	---	---
	3	81,38	76,94	72,39	67,73	62,97	---	19,40	21,90	24,75	27,89	31,30	---
	5	88,03	83,30	78,46	73,50	68,44	---	19,37	21,84	24,70	27,90	31,42	---
	7	95,08	90,06	84,91	79,00	74,26	68,76	19,37	21,79	24,64	27,88	31,47	35,37
	9	102,5	97,22	91,75	86,16	80,45	74,61	19,41	21,76	24,58	27,83	31,47	35,47
	11	110,5	104,8	99,02	93,08	87,02	80,84	19,52	21,77	24,54	27,77	31,45	35,51
	13	118,8	112,8	106,7	100,4	94,00	87,45	19,70	21,83	24,52	27,72	31,40	35,51
	15	127,7	121,3	114,8	108,2	101,4	94,47	19,97	21,96	24,54	27,68	31,34	35,48
090	-5	67,32	63,10	58,71	54,16	---	---	22,38	25,09	28,16	31,62	---	---
	-3	73,37	68,89	64,23	59,41	---	---	22,41	25,14	28,23	31,73	---	---
	-1	79,80	75,05	70,12	65,01	---	---	22,44	25,18	28,30	31,83	---	---
	1	86,64	81,61	76,39	70,98	---	---	22,46	25,21	28,34	31,90	---	---
	3	93,92	88,59	83,06	77,33	71,41	---	22,50	25,24	28,39	31,97	36,01	---
	5	101,6	96,00	90,15	84,10	77,84	---	22,54	25,27	28,43	32,02	36,09	---
	7	109,8	103,8	97,69	91,00	84,68	77,87	22,59	25,31	28,46	32,07	36,15	40,75
	9	118,5	112,2	105,6	98,92	91,95	84,76	22,66	25,37	28,51	32,11	36,21	40,84
	11	127,6	121,0	114,1	107,0	99,67	92,10	22,75	25,43	28,56	32,16	36,27	40,91
	13	137,4	130,3	123,1	115,6	107,8	99,88	22,86	25,51	28,62	32,21	36,32	40,97
	15	147,6	140,2	132,6	124,7	116,5	108,1	23,00	25,61	28,70	32,28	36,38	41,04
110	-5	78,60	73,67	68,49	63,05	---	---	24,07	26,92	30,28	34,24	---	---
	-3	85,65	80,44	74,96	69,23	---	---	24,17	27,00	30,31	34,21	---	---
	-1	93,15	87,65	81,87	75,82	---	---	24,28	27,10	30,38	34,23	---	---
	1	101,1	95,32	89,22	82,84	---	---	24,39	27,21	30,47	34,28	---	---
	3	109,5	103,4	97,04	90,32	83,31	---	24,50	27,33	30,59	34,36	38,76	---
	5	118,5	112,1	105,3	98,27	90,89	---	24,61	27,46	30,71	34,47	38,83	---
	7	128,1	121,3	114,1	107,0	98,96	90,90	24,69	27,58	30,85	34,60	38,92	43,93
	9	138,1	131,0	123,5	115,6	107,5	99,06	24,76	27,70	30,99	34,74	39,05	44,01
	11	148,8	141,3	133,4	125,2	116,6	107,7	24,81	27,80	31,13	34,90	39,20	44,13
	13	160,1	152,2	143,9	135,2	126,2	116,9	24,82	27,88	31,26	35,05	39,36	44,28
	15	172,0	163,7	154,9	145,9	136,4	126,6	24,80	27,94	31,38	35,21	39,53	44,44

TU: Outlet water temperature (°C)
 TA: Ambient temperature (°C)
 PA: Compressors input power (kW)
 PF: Cooling capacity (kW)



**QDVAC/QDHAC / LS (LOW NOISE VERSION)
COOLING CAPACITIES AND COMPRESSOR INPUT POWER**

MOD.	TU (°C)	PF (kW)						PA (kW)					
		TA (°C)						TA (°C)					
		20	25	30	35	40	45	20	25	30	35	40	45
120	-5	88,37	82,32	76,09	69,68	---	---	27,64	31,00	34,96	39,62	---	---
	-3	96,55	90,15	83,54	76,75	---	---	27,75	31,07	34,98	39,56	---	---
	-1	105,2	98,48	91,49	84,29	---	---	27,87	31,15	35,02	39,54	---	---
	1	114,5	107,3	99,94	92,33	---	---	28,00	31,26	35,08	39,55	---	---
	3	124,3	116,7	108,9	100,8	92,62	---	28,14	31,38	35,17	39,58	44,72	---
	5	134,8	126,8	118,5	109,9	101,2	---	28,28	31,51	35,27	39,65	44,73	---
	7	145,9	137,4	128,6	120,0	110,4	100,9	28,43	31,66	35,39	39,73	44,76	50,57
	9	157,7	148,7	139,4	129,9	120,2	110,2	28,58	31,81	35,53	39,84	44,82	50,57
	11	170,1	160,6	150,9	140,8	130,5	120,0	28,72	31,96	35,67	39,96	44,91	50,60
	13	183,3	173,3	163,0	152,4	141,5	130,4	28,86	32,11	35,83	40,10	45,01	50,66
	15	197,2	186,6	175,8	164,6	153,2	141,5	29,00	32,26	35,98	40,25	45,14	50,75
130	-5	95,43	88,46	81,36	74,17	---	---	31,38	35,29	39,89	45,26	---	---
	-3	104,5	97,10	89,57	81,92	---	---	31,48	35,34	39,88	45,17	---	---
	-1	114,1	106,3	98,31	90,19	---	---	31,61	35,41	39,88	45,11	---	---
	1	124,4	116,1	107,6	99,00	---	---	31,74	35,50	39,92	45,08	---	---
	3	135,4	126,5	117,5	108,3	99,10	---	31,90	35,61	39,97	45,06	50,98	---
	5	147,0	137,6	128,0	118,3	108,5	---	32,08	35,73	40,04	45,07	50,91	---
	7	159,4	149,4	139,2	129,0	118,5	107,9	32,27	35,88	40,13	45,11	50,88	57,52
	9	172,5	161,9	151,1	140,2	129,2	118,0	32,48	36,05	40,25	45,16	50,87	57,44
	11	186,3	175,1	163,8	152,2	140,5	128,6	32,70	36,23	40,39	45,24	50,88	57,38
	13	201,0	189,2	177,1	164,9	152,5	140,0	32,95	36,44	40,55	45,35	50,92	57,34
	15	216,5	204,0	191,3	178,4	165,3	152,0	33,21	36,66	40,73	45,47	50,98	57,34
140	-5	105,5	99,32	92,90	86,35	---	---	35,77	40,04	44,70	49,71	---	---
	-3	114,9	108,2	101,4	94,42	---	---	35,76	40,13	44,94	50,16	---	---
	-1	124,9	117,7	110,4	103,0	---	---	35,71	40,15	45,09	50,50	---	---
	1	135,5	127,9	120,1	112,1	---	---	35,66	40,14	45,17	50,72	---	---
	3	146,8	138,7	130,4	121,9	113,2	---	35,62	40,09	45,19	50,86	57,07	---
	5	158,7	150,1	141,3	132,3	123,1	---	35,59	40,04	45,17	50,93	57,29	---
	7	171,5	162,3	152,9	143,0	133,5	123,6	35,62	40,01	45,13	50,94	57,42	64,51
	9	185,0	175,2	165,3	155,1	144,7	134,1	35,70	40,00	45,08	50,93	57,48	64,71
	11	199,2	188,9	178,3	167,5	156,5	145,3	35,86	40,03	45,06	50,89	57,50	64,84
	13	214,4	203,4	192,2	180,8	169,1	157,2	36,12	40,14	45,06	50,86	57,48	64,90
	15	230,3	218,7	206,9	194,8	182,4	169,8	36,49	40,32	45,12	50,84	57,46	64,92
160	-5	115,9	109,1	102,1	95,01	---	---	39,22	43,97	49,07	54,44	---	---
	-3	126,2	118,9	111,5	103,9	---	---	39,15	44,03	49,35	55,02	---	---
	-1	137,2	129,4	121,5	113,3	---	---	39,04	44,00	49,49	55,41	---	---
	1	148,9	140,6	132,1	123,4	---	---	38,91	43,92	49,53	55,66	---	---
	3	161,3	152,4	143,4	134,2	124,8	---	38,80	43,80	49,49	55,78	62,61	---
	5	174,4	165,1	155,5	145,6	135,6	---	38,73	43,68	49,40	55,81	62,83	---
	7	188,4	178,4	168,2	158,0	147,1	136,2	38,73	43,58	49,28	55,76	62,93	70,73
	9	203,2	192,6	181,8	170,7	159,4	147,8	38,83	43,53	49,16	55,66	62,95	70,93
	11	218,9	207,7	196,2	184,4	172,4	160,2	39,04	43,55	49,07	55,55	62,89	71,02
	13	235,5	223,6	211,4	199,0	186,3	173,3	39,40	43,66	49,04	55,44	62,79	71,02
	15	253,1	240,5	227,6	214,4	200,9	187,2	39,93	43,91	49,08	55,36	62,69	70,97

TU: Outlet water temperature (°C)
 TA: Ambient temperature (°C)
 PA: Compressors input power (kW)
 PF: Cooling capacity (kW)



**QDVAC/QDHAC / LS (LOW NOISE VERSION)
COOLING CAPACITIES AND COMPRESSOR INPUT POWER**

MOD.	TU (°C)	PF (kW)						PA (kW)					
		TA (°C)						TA (°C)					
		20	25	30	35	40	45	20	25	30	35	40	45
190	-5	137,1	128,7	120,0	111,0	---	---	43,27	48,48	54,40	61,08	---	---
	-3	149,3	140,5	131,2	121,7	---	---	43,32	48,56	54,53	61,28	---	---
	-1	162,3	152,9	143,2	133,1	---	---	43,37	48,63	54,63	61,44	---	---
	1	176,2	166,2	155,9	145,2	---	---	43,43	48,69	54,72	61,58	---	---
	3	190,9	180,4	169,4	158,1	146,4	---	43,49	48,75	54,80	61,69	69,49	---
	5	206,5	195,4	183,8	171,8	159,4	---	43,58	48,82	54,87	61,79	69,63	---
	7	223,1	211,3	199,1	186,0	173,3	159,8	43,70	48,91	54,95	61,87	69,75	78,64
	9	240,6	228,2	215,3	201,9	188,1	173,8	43,85	49,02	55,03	61,96	69,86	78,78
	11	259,2	246,1	232,4	218,3	203,8	188,7	44,04	49,16	55,14	62,06	69,96	78,92
	13	278,9	265,0	250,6	235,7	220,4	204,6	44,29	49,34	55,28	62,17	70,07	79,04
15	299,6	285,0	269,8	254,2	238,0	221,3	44,59	49,56	55,44	62,30	70,18	79,16	
210	-5	156,5	146,1	135,1	123,7	---	---	50,88	57,06	64,35	72,97	---	---
	-3	170,6	159,7	148,1	136,1	---	---	51,06	57,18	64,37	72,83	---	---
	-1	185,8	174,2	162,0	149,3	---	---	51,27	57,35	64,45	72,79	---	---
	1	201,8	189,6	176,8	163,4	---	---	51,51	57,56	64,60	72,83	---	---
	3	218,9	206,0	192,5	178,4	163,7	---	51,74	57,80	64,80	72,95	82,44	---
	5	237,0	223,5	209,2	194,3	178,9	---	51,98	58,06	65,05	73,13	82,52	---
	7	256,3	241,9	227,0	211,0	195,1	178,2	52,20	58,33	65,32	73,37	82,67	93,43
	9	276,6	261,6	245,8	229,3	212,2	194,5	52,39	58,59	65,61	73,64	82,89	93,55
	11	298,2	282,3	265,7	248,5	230,5	211,9	52,54	58,83	65,90	73,95	83,16	93,74
	13	320,9	304,3	286,8	268,7	249,9	230,4	52,64	59,05	66,20	74,27	83,47	93,99
15	344,9	327,4	309,2	290,1	270,4	249,9	52,68	59,23	66,47	74,60	83,81	94,30	
240	-5	178,3	166,1	153,5	140,6	---	---	55,28	62,00	69,93	79,23	---	---
	-3	194,8	181,9	168,5	154,8	---	---	55,49	62,13	69,95	79,12	---	---
	-1	212,4	198,7	184,6	170,0	---	---	55,73	62,31	70,03	79,08	---	---
	1	231,1	216,6	201,6	186,3	---	---	55,99	62,52	70,16	79,09	---	---
	3	251,0	235,6	219,8	203,5	186,8	---	56,27	62,76	70,33	79,17	89,44	---
	5	272,1	255,8	239,1	221,9	204,3	---	56,56	63,03	70,55	79,30	89,46	---
	7	294,5	277,3	259,6	241,0	222,8	203,7	56,86	63,31	70,79	79,47	89,53	101,1
	9	318,2	300,1	281,4	262,2	242,5	222,4	57,16	63,61	71,06	79,68	89,65	101,1
	11	343,3	324,2	304,5	284,2	263,4	242,2	57,45	63,92	71,35	79,92	89,82	101,2
	13	369,9	349,7	328,9	307,5	285,6	263,2	57,73	64,22	71,65	80,20	90,03	101,3
15	398,0	376,7	354,7	332,2	309,2	285,6	57,99	64,53	71,97	80,49	90,28	101,5	
260	-5	194,3	180,1	165,6	151,0	---	---	62,76	70,58	79,77	90,51	---	---
	-3	212,7	197,7	182,3	166,8	---	---	62,97	70,68	79,75	90,35	---	---
	-1	232,4	216,4	200,1	183,6	---	---	63,21	70,82	79,77	90,23	---	---
	1	253,4	236,4	219,1	201,5	---	---	63,49	70,99	79,83	90,16	---	---
	3	275,7	257,6	239,3	220,6	201,7	---	63,80	71,21	79,93	90,13	101,9	---
	5	299,4	280,2	260,7	241,0	220,9	---	64,15	71,47	80,08	90,15	101,8	---
	7	324,5	304,2	283,6	263,0	241,3	219,8	64,53	71,76	80,27	90,22	101,7	115,0
	9	351,2	329,7	307,8	285,6	263,0	240,2	64,95	72,09	80,50	90,33	101,7	114,8
	11	379,4	356,6	333,5	310,0	286,1	262,0	65,41	72,47	80,78	90,49	101,7	114,7
	13	409,3	385,2	360,7	335,8	310,6	285,1	65,90	72,88	81,09	90,69	101,8	114,6
15	440,9	415,4	389,5	363,3	336,6	309,6	66,42	73,33	81,45	90,95	101,9	114,6	

TU: Outlet water temperature (°C)
 TA: Ambient temperature (°C)
 PA: Compressors input power (kW)
 PF: Cooling capacity (kW)



**QDVAC/QDHAC / HP / LS (LOW NOISE VERSION)
HEATING CAPACITIES AND COMPRESSOR INPUT POWER**

MOD.	TA (°C)	PC (kW)						PA (kW)					
		TU (°C)						TU (°C)					
		30	35	40	45	50	55	30	35	40	45	50	55
040	-5	25,1	---	---	---	---	---	9,1	---	---	---	---	---
	0	30,3	29,8	---	---	---	---	9,2	10,2	---	---	---	---
	5	36,2	35,6	35,1	---	---	---	9,2	10,3	11,5	---	---	---
	8	40,2	39,4	38,8	38,5	---	---	9,1	10,2	11,5	12,9	---	---
	10	43,0	42,2	41,5	41,0	40,7	---	9,1	10,2	11,5	12,9	14,5	---
	15	51,1	49,8	48,8	48,0	47,5	---	9,0	10,1	11,4	12,9	14,6	---
	20	60,5	58,8	57,3	56,1	55,2	54,5	9,0	10,0	11,3	12,9	14,6	16,6
045	-5	32,1	---	---	---	---	---	11,0	---	---	---	---	---
	0	37,9	37,5	---	---	---	---	11,0	12,2	---	---	---	---
	5	44,8	44,1	43,5	---	---	---	11,0	12,3	13,7	---	---	---
	8	49,4	48,6	47,8	47,0	---	---	11,0	12,3	13,7	15,3	---	---
	10	52,8	51,8	50,9	50,2	49,6	---	11,0	12,3	13,7	15,3	17,1	---
	15	62,1	60,8	59,5	58,4	57,4	---	10,9	12,2	13,7	15,4	17,2	---
	20	73,0	71,2	69,5	67,9	66,5	65,2	10,9	12,2	13,7	15,4	17,2	19,3
050	-5	37,3	---	---	---	---	---	12,3	---	---	---	---	---
	0	44,2	43,6	---	---	---	---	12,5	14,0	---	---	---	---
	5	52,1	51,2	50,4	---	---	---	12,5	14,0	15,6	---	---	---
	8	57,4	56,4	55,4	55,0	---	---	12,5	14,0	15,6	17,4	---	---
	10	61,2	60,1	59,0	58,0	57,0	---	12,5	14,0	15,6	17,5	19,4	---
	15	71,8	70,2	68,8	67,4	66,2	---	12,3	13,9	15,6	17,6	19,7	---
	20	84,1	82,0	80,1	78,3	76,6	75,0	12,2	13,8	15,6	17,5	19,7	22,1
060	-5	42,3	---	---	---	---	---	13,7	---	---	---	---	---
	0	50,0	49,3	---	---	---	---	13,9	15,4	---	---	---	---
	5	59,0	58,0	57,1	---	---	---	14,0	15,6	17,4	---	---	---
	8	65,0	63,8	62,7	61,7	---	---	14,0	15,7	17,5	19,5	---	---
	10	69,3	68,0	66,7	65,6	64,6	---	14,0	15,7	17,6	19,6	21,9	---
	15	81,4	79,5	77,8	76,3	74,9	---	13,9	15,6	17,6	19,8	22,2	---
	20	95,5	93,0	90,7	88,6	86,7	84,9	13,9	15,6	17,6	19,8	22,3	25,0
070	-5	46,7	---	---	---	---	---	15,1	---	---	---	---	---
	0	55,2	54,5	---	---	---	---	15,4	17,1	---	---	---	---
	5	65,1	64,0	63,1	---	---	---	15,5	17,3	19,3	---	---	---
	8	71,8	70,4	69,2	68,2	---	---	15,5	17,3	19,4	21,7	---	---
	10	76,6	75,0	73,7	72,5	71,5	---	15,5	17,3	19,5	21,8	24,4	---
	15	90,0	87,8	85,9	84,2	82,7	---	15,5	17,4	19,5	22,0	24,7	---
	20	105,6	102,8	100,2	97,8	95,7	93,8	15,6	17,4	19,6	22,0	24,8	27,9
080	-5	56,3	---	---	---	---	---	18,4	---	---	---	---	---
	0	66,8	65,9	---	---	---	---	18,7	20,8	---	---	---	---
	5	78,6	77,5	76,5	---	---	---	18,7	21,0	23,5	---	---	---
	8	86,6	85,2	83,9	82,8	---	---	18,6	21,0	23,6	26,4	---	---
	10	92,3	90,7	89,2	88,0	86,8	---	18,6	20,9	23,6	26,5	29,7	---
	15	108,4	106,0	103,9	102,1	100,5	---	18,5	20,8	23,5	26,6	30,0	---
	20	127,3	124,0	121,0	118,3	116,0	113,9	18,7	20,8	23,4	26,5	30,0	33,8
090	-5	64,7	---	---	---	---	---	21,1	---	---	---	---	---
	0	76,5	75,5	---	---	---	---	21,3	23,8	---	---	---	---
	5	90,4	88,8	87,4	---	---	---	21,4	24,0	26,9	---	---	---
	8	99,8	97,8	96,0	94,5	---	---	21,4	24,0	27,0	30,3	---	---
	10	106,5	104,3	102,3	100,5	98,9	---	21,5	24,1	27,0	30,4	34,2	---
	15	125,4	122,4	119,6	117,1	114,8	---	21,5	24,1	27,1	30,5	34,4	---
	20	147,3	143,4	139,8	136,4	133,2	130,3	21,7	24,3	27,2	30,6	34,5	39,0
110	-5	73,4	---	---	---	---	---	23,9	---	---	---	---	---
	0	86,7	85,4	---	---	---	---	23,9	26,8	---	---	---	---
	5	102,7	100,6	98,8	---	---	---	24,1	26,9	30,3	---	---	---
	8	113,6	111,0	108,7	106,7	---	---	24,2	27,0	30,3	34,2	---	---
	10	121,4	118,6	115,9	113,5	111,5	---	24,3	27,2	30,4	34,2	38,7	---
	15	143,2	139,6	136,1	132,7	129,7	---	24,6	27,5	30,7	34,5	38,8	---
	20	168,2	163,9	159,5	155,2	151,1	147,4	24,8	27,8	31,1	34,8	39,1	44,1

TU: Outlet water temperature (°C)
 TA: Ambient temperature dry bulb (°C)
 PA: Compressors input power (kW)
 PH: Heating capacity (kW)



**QDVAC/QDHAC / HP / LS (LOW NOISE VERSION)
HEATING CAPACITIES AND COMPRESSOR INPUT POWER**

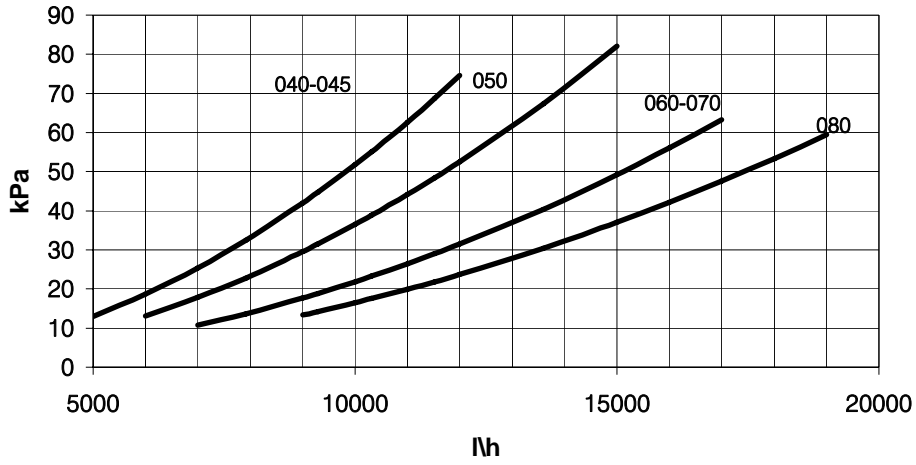
MOD.	TA (°C)	PC (kW)						PA (kW)					
		TU (°C)						TU (°C)					
		30	35	40	45	50	55	30	35	40	45	50	55
120	-5	82,2	---	---	---	---	---	26,8	---	---	---	---	---
	0	97,9	96,1	---	---	---	---	26,8	30,2	---	---	---	---
	5	116,6	113,8	111,5	---	---	---	27,0	30,3	34,1	---	---	---
	8	129,3	126,0	123,0	120,4	---	---	27,2	30,4	34,2	38,6	---	---
	10	138,5	134,8	131,3	128,3	125,8	---	27,3	30,5	34,2	38,6	43,7	---
	15	164,1	159,3	154,7	150,4	146,7	---	27,7	30,8	34,5	38,7	43,7	---
	20	193,7	187,7	181,8	176,3	171,1	166,5	28,1	31,2	34,8	39,0	43,8	49,4
130	-5	89,5	---	---	---	---	---	29,6	---	---	---	---	---
	0	107,3	105,1	---	---	---	---	29,8	33,5	---	---	---	---
	5	128,2	124,9	122,2	---	---	---	30,0	33,6	38,0	---	---	---
	8	142,5	138,5	135,0	132,1	---	---	30,2	33,8	38,0	42,9	---	---
	10	152,8	148,3	144,2	140,8	138,1	---	30,3	33,9	38,0	42,9	48,6	---
	15	181,5	175,6	170,2	165,2	160,9	---	30,8	34,2	38,2	43,0	48,5	---
	20	215,0	207,5	200,4	193,8	187,9	182,6	31,3	34,6	38,6	43,2	48,5	54,7
140	-5	102,1	---	---	---	---	---	33,5	---	---	---	---	---
	0	120,8	119,3	---	---	---	---	34,1	37,9	---	---	---	---
	5	142,2	140,1	138,3	---	---	---	34,2	38,3	42,8	---	---	---
	8	156,7	154,1	151,7	149,7	---	---	34,1	38,3	43,0	48,2	---	---
	10	167,1	164,0	161,3	159,0	157,0	---	34,1	38,3	43,1	48,4	54,1	---
	15	196,2	191,8	187,9	184,5	181,5	---	34,0	38,2	43,0	48,6	54,7	---
	20	230,3	224,3	218,8	214,0	209,6	205,8	34,3	38,2	42,9	48,5	54,8	61,8
160	-5	112,0	---	---	---	---	---	36,7	---	---	---	---	---
	0	132,6	131,0	---	---	---	---	37,4	41,6	---	---	---	---
	5	156,1	153,9	152,0	---	---	---	37,4	42,0	47,0	---	---	---
	8	171,9	169,2	166,8	164,6	---	---	37,3	42,0	47,2	52,9	---	---
	10	183,3	180,1	177,3	174,8	172,6	---	37,1	41,9	47,2	53,1	59,4	---
	15	215,1	210,5	206,4	202,8	199,6	---	37,0	41,6	47,0	53,2	60,0	---
	20	252,7	246,1	240,2	235,0	230,5	226,4	37,4	41,6	46,8	52,9	59,9	67,7
190	-5	129,4	---	---	---	---	---	42,3	---	---	---	---	---
	0	153,1	150,9	---	---	---	---	42,6	47,6	---	---	---	---
	5	180,7	177,6	174,7	---	---	---	42,8	47,9	53,8	---	---	---
	8	199,5	195,6	192,1	189,0	---	---	42,9	48,0	54,0	60,7	---	---
	10	213,0	208,6	204,6	200,9	197,8	---	42,9	48,1	54,0	60,8	68,4	---
	15	250,8	244,8	239,3	234,1	229,5	---	43,1	48,3	54,2	61,1	68,8	---
	20	294,6	286,9	279,6	272,7	266,4	260,6	43,5	48,5	54,4	61,3	69,1	77,9
210	-5	149,4	---	---	---	---	---	47,8	---	---	---	---	---
	0	176,9	174,0	---	---	---	---	47,8	53,7	---	---	---	---
	5	209,6	205,2	201,3	---	---	---	48,1	53,8	60,6	---	---	---
	8	232,0	226,6	221,7	217,3	---	---	48,5	54,1	60,7	68,4	---	---
	10	248,1	242,1	236,5	231,4	227,0	---	48,7	54,3	60,8	68,5	77,5	---
	15	292,8	285,3	277,9	270,8	264,4	---	49,2	54,9	61,4	68,9	77,7	---
	20	344,3	335,1	326,0	316,9	308,4	300,4	49,6	55,5	62,1	69,6	78,2	88,1
240	-5	165,3	---	---	---	---	---	53,5	---	---	---	---	---
	0	197,1	193,4	---	---	---	---	53,7	60,4	---	---	---	---
	5	234,8	229,2	224,3	---	---	---	54,1	60,6	68,2	---	---	---
	8	260,5	253,7	247,6	242,4	---	---	54,4	60,8	68,3	77,2	---	---
	10	279,0	271,4	264,4	258,3	253,2	---	54,7	61,0	68,5	77,2	87,3	---
	15	330,7	320,8	311,5	302,9	295,2	---	55,4	61,7	68,9	77,4	87,3	---
	20	390,4	378,2	366,3	355,0	344,6	335,1	56,1	62,4	69,6	78,0	87,6	98,8
260	-5	181,2	---	---	---	---	---	59,3	---	---	---	---	---
	0	217,3	212,7	---	---	---	---	59,5	67,1	---	---	---	---
	5	259,9	253,1	247,4	---	---	---	60,0	67,3	75,9	---	---	---
	8	289,0	280,7	273,5	267,4	---	---	60,4	67,5	76,0	85,9	---	---
	10	310,0	300,7	292,3	285,1	279,3	---	60,7	67,7	76,1	85,8	97,2	---
	15	368,5	356,4	345,1	334,9	326,0	---	61,6	68,4	76,5	85,9	97,0	---
	20	436,5	421,2	406,7	393,1	380,8	369,8	62,7	69,3	77,1	86,3	97,0	109,4

TU: Outlet water temperature (°C)
 TA: Ambient temperature dry bulb (°C)
 PA: Compressors input power (kW)
 PH: Heating capacity (kW)

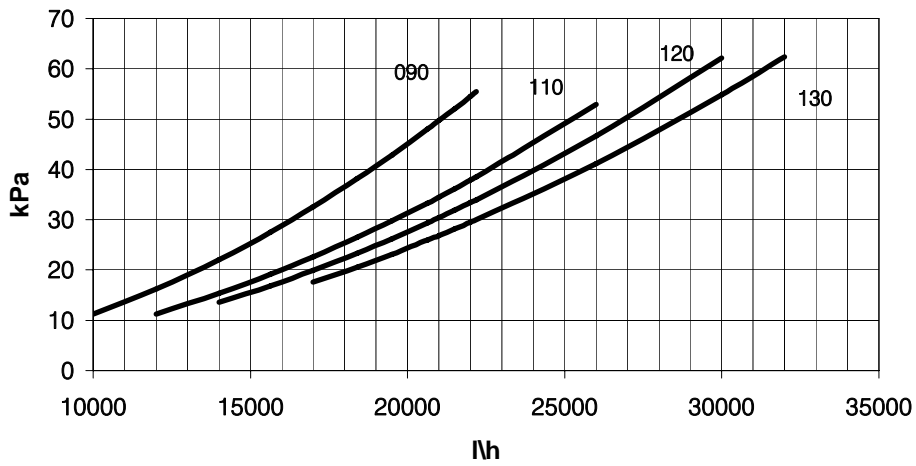


EVAPORATOR PRESSURE DROP

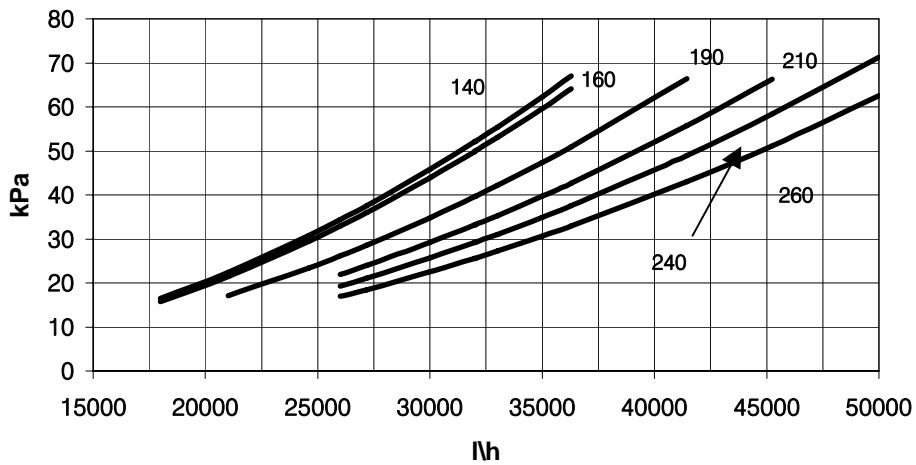
QDVAC/QDHAC (040-045)-050-(060-070)-080



QDVAC/QDHAC 090-110-120-130

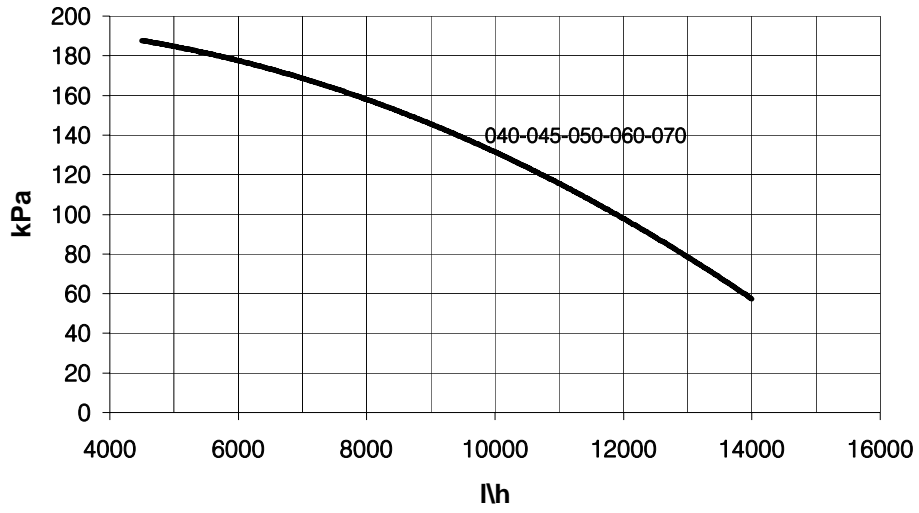


QDVAC/QDHAC 140-160-190-210-240-260

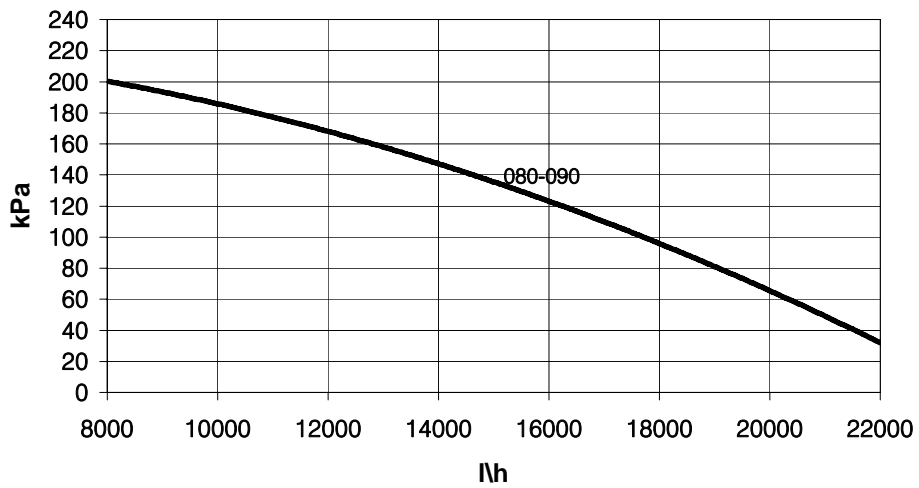




**WATER PUMP AVAILABLE STATIC PRESSURE
QDVAC/QDHAC / K1-K2 039-045-050-060-070**

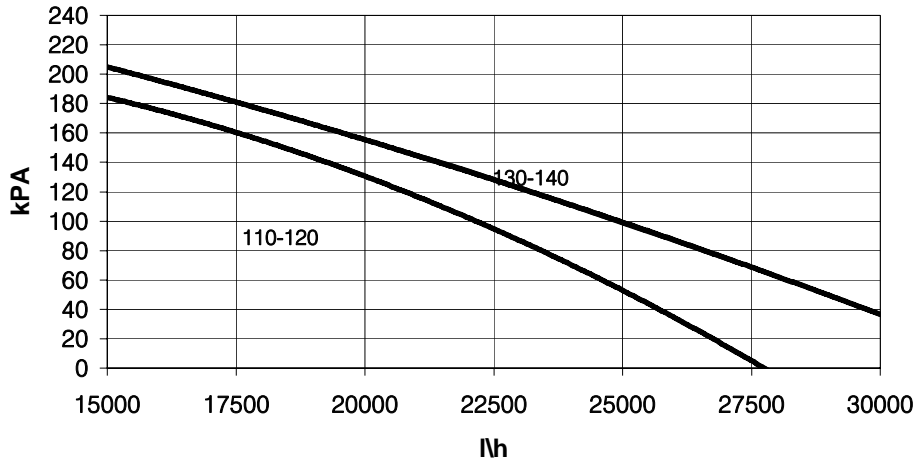


MODELS QDVAC/QDHAC / K1-K2 080-090

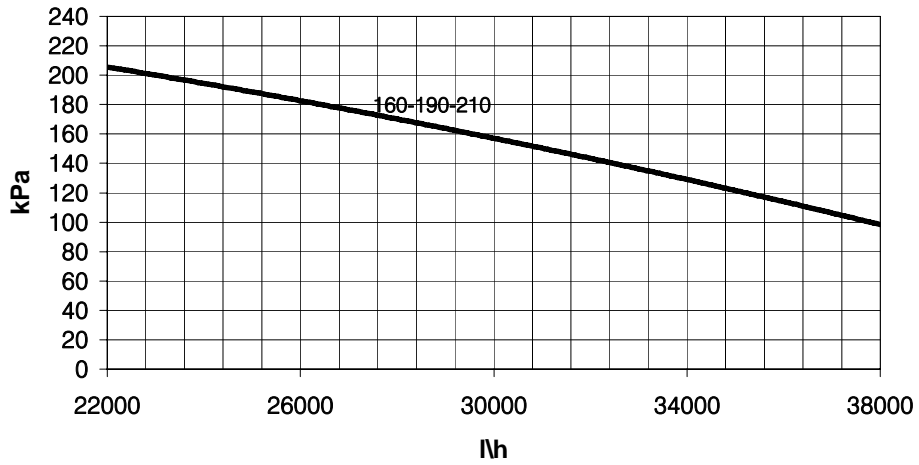




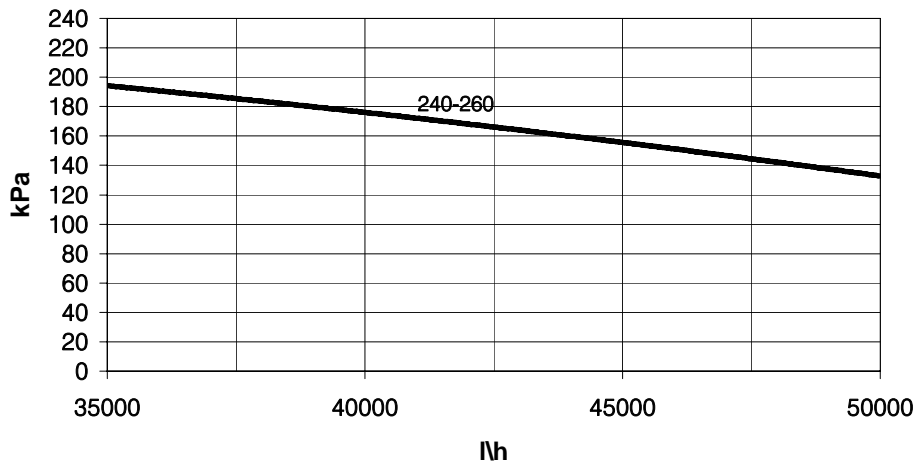
WATER PUMP AVAILABLE STATIC PRESSURE
QDVAC/QDHAC / K1-K2 110-120-130-140



QDVAC/QDHAC / K1-K2 160-190-210



QDVAC/QDHAC / K1-K2 240-260





CORRECTION TABLE Operation with glycol

Water temp.	Glycol	WFCF	PDCF
7	10%	1,012	1,125
	20%	1,048	1,32
	35%	1,109	1,62
3	10%	0,870	0,85
	20%	0,875	0,92
	35%	0,925	1,13
-2	10%	0,710	0,64
	20%	0,730	0,85
	35%	0,770	1,05
-5	10%	---	---
	20%	0,600	0,56
	35%	0,625	0,7

WFCF = Water flow correction factor PDCF = Pressure drop correction factor

The water flow rate and pressure drop correction factors are to be applied directly to the values given for operation without glycol. The water flow rate correction factor is calculated in order to maintain the same temperature difference as that which would be obtained without glycol. The pressure drop correction factor takes into account the different flow rate obtained from the application of the flow rate correction factor.

CORRECTION TABLES Different DT

Water temperature difference	3	5	8
CCCP	0,99	1	1,02
IPCF	0,99	1	1,01

CCCP = Cooling capacity correction factor IPCF = Input power correction factor

CORRECTION TABLES Different Fouling factors

Fouling factor	0,00005	0,0001	0,0002
CCCP	1	0,98	0,94
IPCF	1	0,98	0,95

CCCP = Cooling capacity correction factor IPCF = Input power correction factor

ELECTRICAL DATA

Model		040	045	050	060	070	080	090	110
Power line fuses	A	50	63	63	80	100	100	125	125
Power line cable section	mm ²	10	10	16	16	25	25	25	35
Model		120	130	140	160	190	210	240	260
Power line fuses	A	160	200	200	200	250	250	35	400
Power line cable section	mm ²	50	50	50	50	70	95	120	150

Power supply	V/~ / Hz	400 / 3 / 50		Control board	V/~ / Hz	24 / 1 / 50
Auxiliary circuit	V/~ / Hz	230 / 1 / 50		Fans power supply	V/~ / Hz	400 / 3 / 50

Electrical data varies depending on specification. Always refer to the wiring diagram supplied in the unit.



Installation Instructions – General

- When installing or servicing the unit, you must follow the instructions given in this manual and on labels attached to the unit.
- As the chiller is charged with refrigerant under pressure and unauthorised access to the electrical components provides a shock hazard, any work performed on the unit must be **by suitably trained personnel** only.
- Failure to observe the instructions provided in this manual, or any modification of the unit without explicit previous authorisation, will invalidate the warranty.

Attention: before servicing the unit ensure that the electric supply is disconnected.

Inspection

After receiving the unit, immediately check its integrity. The unit left the factory in perfect condition; any eventual damage must be reported to the carrier and be recorded on the Delivery Note before it is signed. Quartz Ltd must be informed, within 8 days, of the extent of the damage. The customer should prepare a written statement of any severe damage: digital photos of any damage is useful.

Lifting and site handling

When unloading the unit, care **must** be taken to prevent damage to the refrigerant circuit, condensing coils or unit casing.

When using a crane, pass bars through the base frame lifting holes (marked with yellow arrows) and attach the cable or chains to these bars. Ensure that they are clamped firmly. Protect the sides of the chiller with boarding or material of a similar nature.

Forklift forks must be inserted in the base pallet: care must be taken to prevent them hitting the base or panels. Keep the unit horizontal to avoid damage to the internal components.

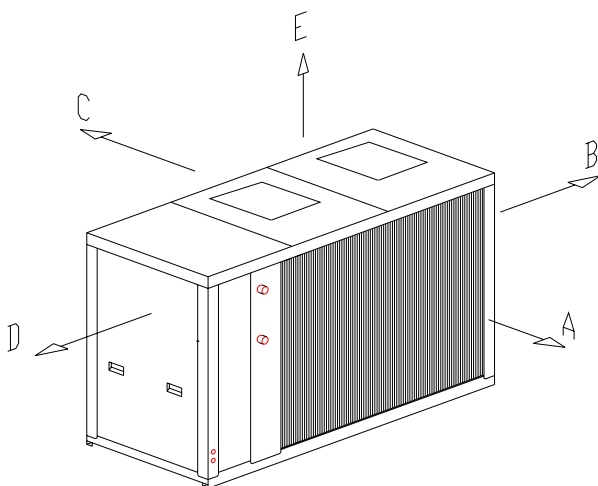
IMPORTANT: be sure that the method of lifting does not allow the unit to slip from chains or slings, turn over or slide from lifting devices.

Unpacking

When unpacking, be careful not to damage the unit. The packing is made up of different materials: wood, cardboard, polythene etc. We recommend that they are kept separately for delivery to a re-cycling centre in order to reduce their environmental impact.

LOCATION AND MINIMUM CLEARANCES

QDVAC/QDHAC units are designed for internal installation: it is advisable to create a firm base for the unit, with a size similar to unit foot-print. Normal unit vibration levels are very low: it is good practice, however, to fit a rigid rubber interface between base and unit frame. Where desirable, fit anti-vibration mounts (spring or rubber), to keep vibration to a minimum. For future maintenance, these clearances are recommended:-



Mod.	A	B	C	D	E*
040	1000	800	800	800	3000
045	1000	800	800	800	3000
050	1500	800	800	800	3000
060	1500	800	800	800	3000
070	1500	800	800	800	3000
080	1500	800	800	800	3000
090	1500	1000	1000	1000	3000
110	1500	1000	1000	1000	3000
120	1500	1000	1000	1000	3000
130	1500	1000	1000	1000	3000
140	1500	1000	1000	1000	4000
160	1500	1000	1000	1000	4000
190	2000	1000	1000	1000	4000
210	2000	1000	1000	1000	4000
240	2000	1000	1000	1000	4000
260	2000	1000	1000	1000	4000

* = If not ducted

DUCT CONNECTIONS

For QDVAC/QDHAC units, both return air and discharge air can be ducted. Care must be taken to ensure adequate air volume flow to the condenser. Re-circulation of discharge air must be avoided. If a return air duct is present, it must have the same cross-sectional area as the condensing coil. Ducts must be carefully designed, taking into account the cross-section and the total length. Units are designed to provide 50 Pa external static pressure. Where higher static pressures are required, please discuss with Quartz.

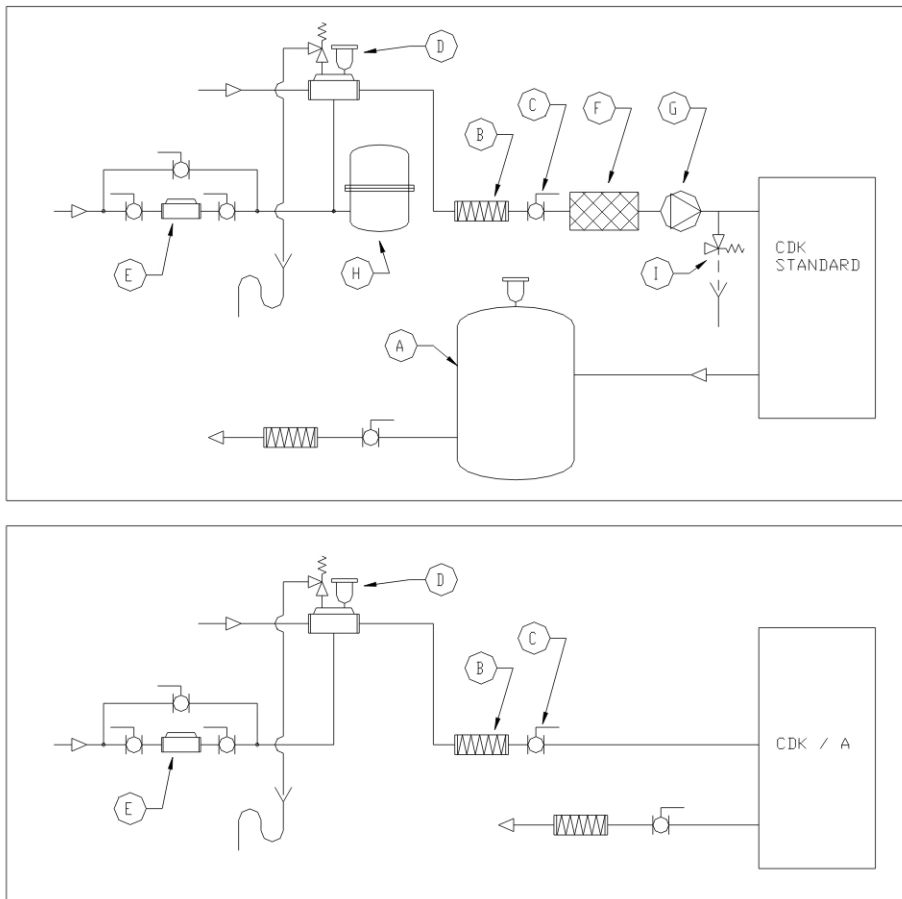
HYDRAULIC CONNECTIONS

Unit water pipe-work must be installed in accordance with national and local regulations. Pipes can be steel, galvanized steel or PVC. Pipes have to be designed depending on the nominal water flow and the hydraulic pressure drops of the system. All pipes must be insulated with closed-cell material of adequate thickness. The chiller must be connected to the pipework using flexible joints. Piping should include:

- Temperature and pressure gauges for maintenance or servicing operations.
- Manual shut-off valves to separate the unit from the hydraulic circuit.
- Metallic water filter (strainer) to be sited at the inlet pipe, with a mesh not larger than 1 mm.
- Vent valves, expansion tank with water filling, discharge valve.

The water inlet must correspond with the connection labelled "USER WATER INLET", otherwise the evaporator may freeze.

All units leave the factory with the flow switch installed on the evaporator water outlet connection (labelled USER WATER OUTLET). You must fit a metallic filter with a mesh not larger than 1 mm at the 'USER WATER INLET' connection. If the flow switch is altered or the water filter is not fitted, the warranty will be invalidated.



A	Water tank		F	Water strainer
B	Flexible connection		G	Water pump
C	Ball shut-off valve		H	Expansion vessel
D	Vent valve		I	Safety valve
E	System filling group			



QDVAC/QDHAC / FC FREE COOLING VERSION

The free cooling versions can operate in 3 different operating modes. The free-cooling coil is installed in series with the water chiller evaporator; the 3 way valve controls the water flow through the coil. When the ambient temperature is lower than the return water temperature, the microprocessor allows the water flow to pass through the free-cooling coil first, then through the evaporator.

Cooling mode (Summer operation) Ambient temperature is higher than the return water temperature. In this case, the ambient conditions are not suitable to allow Free Cooling operation; the 3 way valve is closed and the water flows to the evaporator, where it is cooled. The compressors, fans, and the water pump are activated; the unit operates like a normal liquid cooler.

Free cooling mode (Winter operation) Ambient temperature is much lower than the return water temperature. In this case, the ambient conditions are suitable to allow Free Cooling operation; the 3 way valve opens and the water flows into the free cooling coil, where the ambient conditions are sufficient to give the total required load. In this case the pump and the fans are in operation, while the compressors are stopped. In this case, the free cooling system works in substitution of the water chiller.

Cooling mode + Free cooling (Mid-season operation) Ambient temperature is lower than the return water temperature. In this case, the ambient conditions are suitable to allow Free Cooling operation; the 3 way valve opens and water flow pass into the free cooling coil although the ambient conditions are not sufficiently low to give the total required load. The microprocessor control activates the compressors (pump and fans are already in operation) and partialises the condensor coil in order to satisfy the required load. In this case the free cooling system works in conjunction with the water chiller. In these circumstances the head pressure control device is activated.

CONDENSING PRESSURE CONTROL (optional)

If unit operation below 20°C is expected, a condensing pressure control must be fitted in the unit. This device will allow unit operation under low ambient temperature, by reducing condenser air flow and obtaining acceptable operating parameters. This device features a modulating damper that changes the airflow onto the condensing coil in proportion to the condensing pressure measured by the pressure transducer. When the unit is OFF, the damper is closed. **This device is factory pre-set. The values must never be modified.**

OPERATIONAL LIMITS

Evaporator water flow rate

The nominal water flow rates are based on a delta T ($W_{in} - W_{out}$) of 5 °C. The maximum flow rate allowed is that achieved with a delta T of 3 °C: higher values may cause too high pressure drop. The minimum water flow rate allowed is that achieved with a delta T of 8 °C. Insufficient values cause too low evaporating temperatures, tripping safety devices which stop the unit.

Chilled water temperature (summer operation)

The minimum temperature allowed at the evaporator outlet is 5 °C. To work below this limit, the unit needs some structural modifications - please contact Quartz Ltd. The maximum temperature allowed at the evaporator inlet is 20 °C.

Hot water temperature (winter operation)

Once the system is at temperature, the water temperature at the condenser inlet should not be less than 23 °C: lower values could cause incorrect working operation of the compressor and compressor failure may occur. The maximum water temperature at the condenser outlet should not exceed 48 °C: higher values will cause safety devices to trip and stop operation.

Ambient air temperature

The units are designed and manufactured to operate, in cooling, with ambient air temperature between 20°C to 42 °C. If a fan speed control is installed then the minimum ambient air temperature is -10°C. In winter operation (heat pump cycle) operates from -5°C to 20°C.



ELECTRICAL CONNECTIONS

**Disconnect the electrical supply before undertaking any work on the unit.
All electrical work must be undertaken by suitably qualified personnel.**

The electrical supply must match the nominal electrical data (voltage, phase, frequency) shown on the label in the front panel of the unit. Power connections must be made in accordance to the wiring diagram enclosed with the unit and in accordance current local and national regulations. Power cable and line protection must be sized according to the specification stated on the wiring diagram enclosed with the unit.

The variation in line voltage must not be more than $\pm 5\%$ of the nominal value, whilst the voltage imbalance between phases must not exceed 2%. If those tolerances are likely to be exceeded, please contact Quartz Ltd., as further protection devices are required.

Electrical supply must be as described, otherwise warranty will be invalid.

START UP

Before start-up

- Check that all power cables are connected in the correct sequence and that all terminals are tight.
- The voltage measured at the R Y B phase clamps must be $400\text{ V} \pm 5\%$ (or the value given on the rating plate for special voltages). If the voltage is incorrect, **do not proceed**.
- Check for any refrigerant leaks using a leak detector. Should a leak be found **do not proceed**. All leaks must be rectified and the unit re-charged by trained personnel.
- Check that the crankcase heaters are energised.

Crankcase heaters must be energised at least 12 hours before start up by switching on the unit at the main switch.

- Verify that heaters are working correctly. After a short warm up period, the compressor crankcase must be warm to the touch and must have a temperature at least 10K higher than ambient temperature.
- Check that all hydraulic connections have been made correctly and that all information given on the unit's labels have been observed.
- The system must be filled with water and bled to eliminate any air.

Caution: before starting the unit up, check that all cover panels are correctly located and securely fastened.

Start up

Please refer to the microprocessor manual enclosed with the unit.

If the unit fails to start:

- Check that the control thermostat is set to the correct value.
- **Do not modify any internal wiring, otherwise warranty will be invalidated.**
- For heat pump versions, the summer/winter operation must be selected at the beginning of the related season. Frequent change over of the summer/winter mode must be avoided to prevent severe damage to compressors.

Controls during unit operation

- Check the rotation of the fans. If the rotation is incorrect, disconnect the main switch and change over any two phases of the incoming main supply to reverse motor rotation:
- Check that water temperature at evaporator inlet is near to the set point of the control thermostat.
- For "K" version units (units with pumps and storage tank), if the motor driven pump is noisy, slowly close the discharge shut-off valve until normal working conditions are restored.

This trouble may occur when system pressure drop is significantly different from pump available pressure.



Refrigerant charge checking

- A few minutes after start up, working on summer operating mode (cooling), check that condensing temperature, is approximately 15 °C higher than condenser inlet air temperature. Also check that the evaporation temperature is about 5 °C lower than the evaporator outlet temperature.
- When the operation has stabilised, check that the sight glass core shows green: if the core is yellow, moisture is present in the circuit. In this case it is necessary to dehydrate the circuit (qualified personnel only). Check at the sight glass that there are no continuous vapour bubbles present. If so, additional refrigerant charge may be required. (A few vapour bubbles are acceptable).
- Check that refrigerant superheat on the evaporator is about 5-7 °C
- Check if refrigerant sub-cooling on the condenser is about 5-7 °C.

Unit switch OFF

Please refer to the microprocessor manual enclosed with the unit.

Caution: For temporary stops (night time, weekend etc.) never switch off the unit by opening the mains switch: this should only be used to disconnect the unit from the power supply when current is not passing through it, i.e. when the unit is in 'OFF' mode. Additionally, with no supply to the crankcase heater, the compressor could be seriously damaged at unit start up.

CONTROL AND SAFETY DEVICE SETTINGS

Control devices - factory settings

CAPACITY STEPS		2		4	
CONTROL DEVICE		Set-point	Differential	Set point	Differential
Control thermostat (summer)	°C	10	2	9	3
Control thermostat (winter)	°C	42	2	43	3

Safety devices - factory settings

CONTROL DEVICE		SET POINT	DIFFERENTIAL	RESET TYPE
Anti-freeze thermostat	°C	4	6	Manual
Electric heater thermostat	°C	4	6	Manual
High pressure switch	bar	28	7	Manual
Low pressure switch	bar	0,7	1	Manual
End defrosting pressure	bar	18	--	Automatic
Defrosting set-point	bar	16	2	Automatic
Water safety valve (Optional)	bar	6	--	--



MAINTENANCE AND PERIODIC CHECKS

All maintenance and service operations **MUST BE CARRIED OUT BY TRAINED PERSONNEL.**

Disconnect the electrical supply before undertaking any work on the unit. (Any servicing performed when the supply is connected will need a suitable risk assessment).

The compressor casing and discharge line of the compressor are usually hot. Care should be taken when working in this area. Aluminium coil fins are very sharp and can cause serious wounds. Care should be taken when working in this area. After any servicing operation ensure that all covers are replaced and fastened with their locking screws.

It is strongly recommended that regular maintenance checks are performed to maintain correct operation of the unit:-

Every three months:

- Check that safety and control devices work correctly as previously described.
- Check all the terminals on the electric board and on the compressor are tight. Periodic cleaning of the terminals of the contactors should be done: if any damage is found, please replace the contactors.

- Verify refrigerant charge by checking the sight glass.
- Check that there is no oil leakage from the compressor.
- Check that there is no water leakage from the hydraulic system.

- If the unit is to be stopped for a long period, the unit hydraulic circuit, including all internal pipework and heat exchanger, should be emptied. This operation is compulsory if, during a seasonal shutdown, the ambient temperature is expected to go below the freezing point of the fluid in the hydraulic circuit (typical seasonal operation).
- Check hydraulic circuit water level.
- Check the flow switch operation .

- Check the compressor crankcase heater power supply and operation.
- Check defrosting procedure.

- Clean drain pan and pipeline.
- Clean mesh on water strainers.
- Clean the finned coils metallic filters with compressed air. This should be in the opposite direction of the normal air flow. If filters become fully clogged, clean them with a water jet.

Every six months:

- Check the colour of the sight glass core (green = no moisture, yellow = moisture present).
If it is yellow, the refrigerant circuit should be dehydrated and the refrigerant filter/drier changed.
- Check the unit noise level.
- Check mounting of fan blades and their balancing, check the tension and the wear of the belt.

REFRIGERANT CIRCUIT REPAIR

If the refrigerant circuits need to be evacuated,, all the refrigerant must be recovered using suitable equipment. The system must be charged with nitrogen, using a gas bottle with a pressure reducing valve, until 15 bar pressure is reached. Search for leaks with a bubble leak finder. If bubbles appear, discharge the circuit before brazing with suitable braze alloy. **Never use oxygen instead of nitrogen: explosions may occur.**



Environmental Protection

European legislation regarding the use of ozone depleting substances forbids the release of refrigerants to the atmosphere. They must be reclaimed and returned to the vendor, or to authorised re-cyclers at the end of their operating life.

R407C refrigerant is deemed to be a controlled substance and is therefore subject to this legislation.

Particular care is required during servicing operations in order to prevent refrigerant loss.

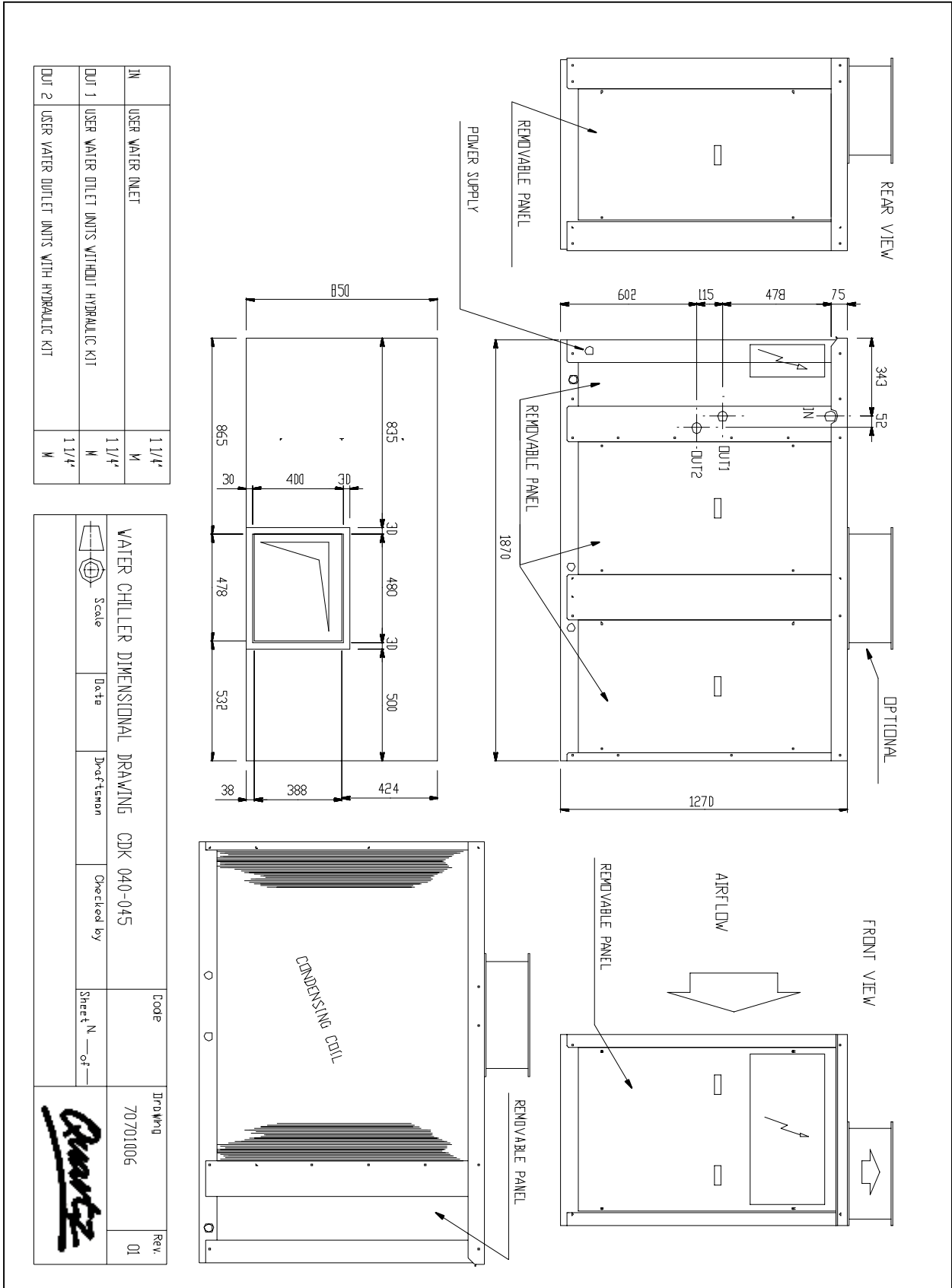
De-commissioning

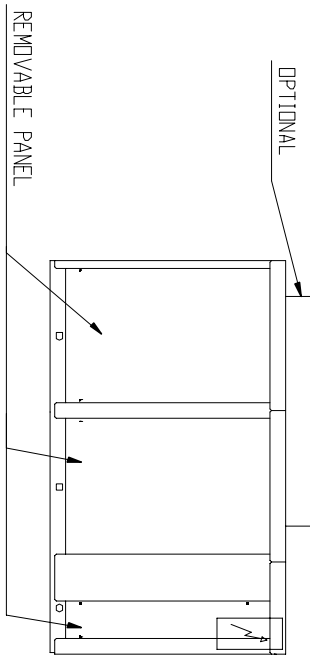
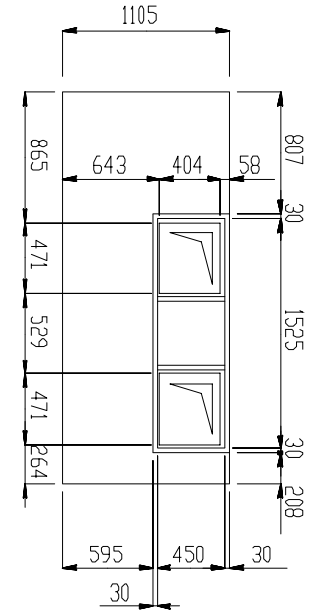
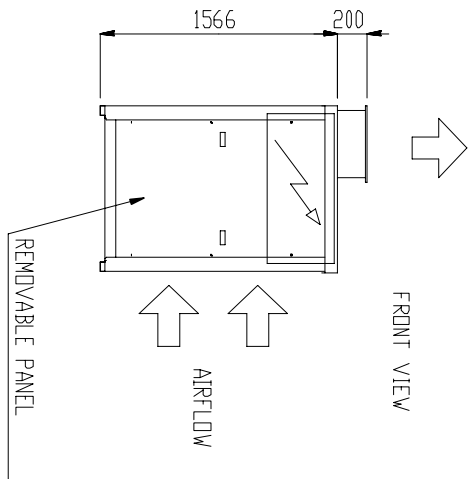
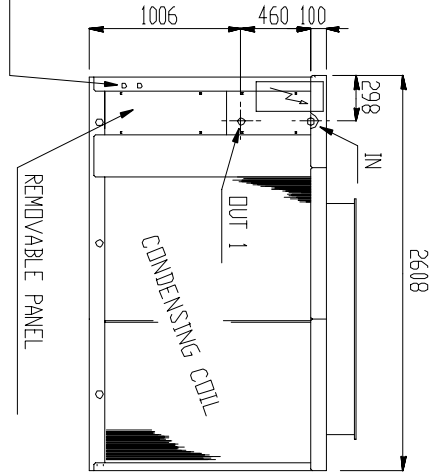
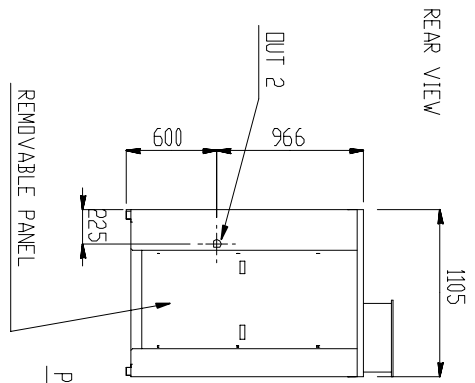
When the unit reaches the end of its service life and requires removal or replacement, the following operations are recommended:-

- the unit refrigerant must be reclaimed by trained personnel and returned to an authorised re-cycling centre
- compressor lubricating oil should be recovered and sent to an authorised re-cycling centre
- the unit frame, coil, heat exchanger etc, should be dismantled and subdivided into material type; bear in mind that copper and aluminium are present in substantial quantities in the unit.

These operations aid material recovery and recycling processes, reducing environmental impact.

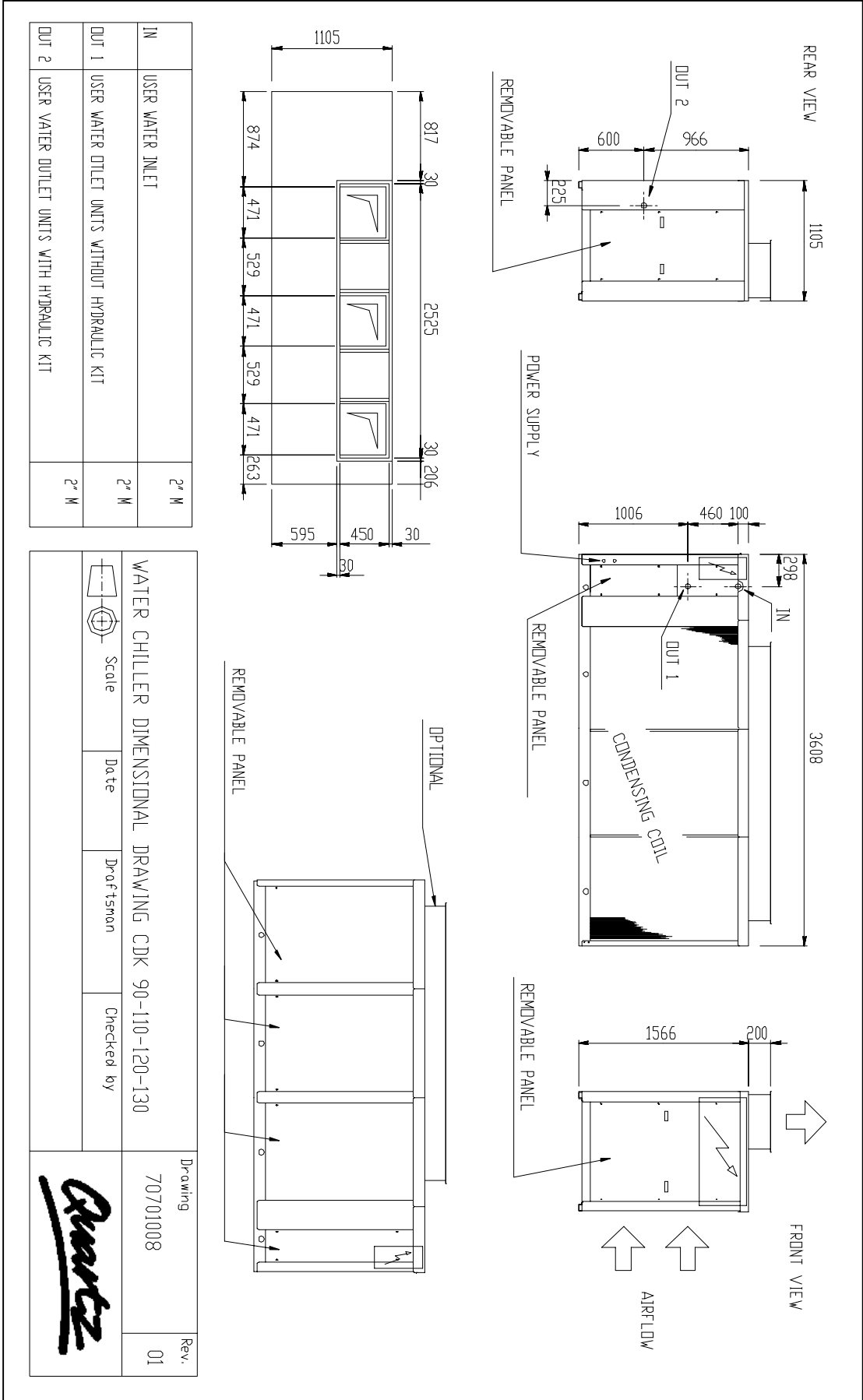
Dimensions

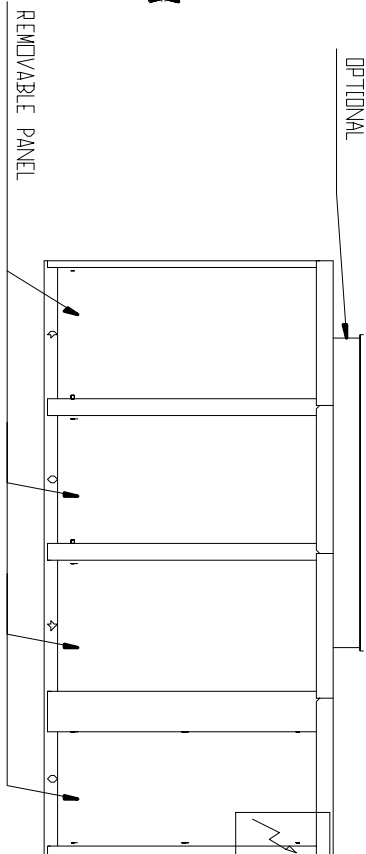
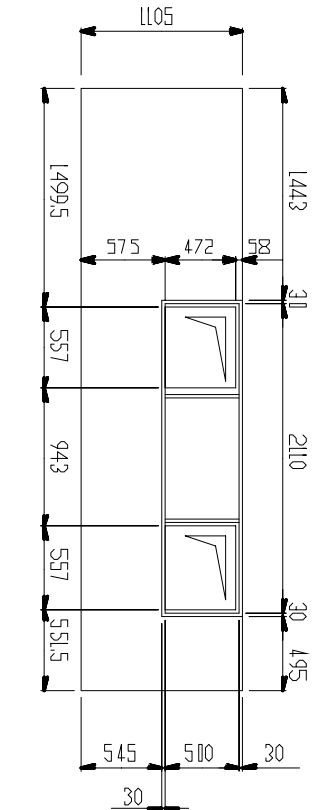
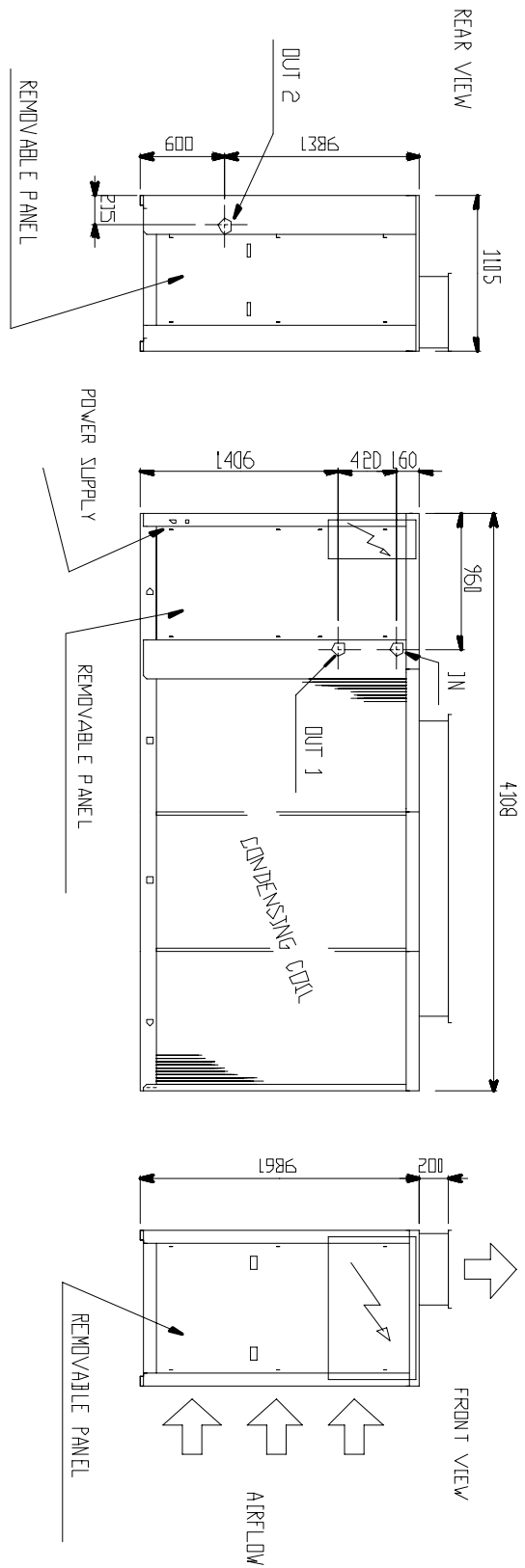




IN	USER WATER INLET	1 1/2"
DUT 1	USER WATER OILET UNITS WITHOUT HYDRAULIC KIT	1 1/2"
DUT 2	USER WATER OULET UNITS WITH HYDRAULIC KIT	1 1/2"

WATER CHILLER DIMENSIONAL DRAWING CDK 50-60-70-80				Code	Drawing	Rev.
Scale	Date	Draftsman	Checked by	Sheet N	of	01





IN	USER WATER INLET	2 1/2" M
OUT 1	USER WATER OUTLET UNITS WITHOUT HYDRAULIC KIT	2 1/2" M
OUT 2	USER WATER OUTLET UNITS WITH HYDRAULIC KIT	2 1/2" M

WATER CHILLER DIMENSIONAL DRAWING CDK 140.160				Drawing	70701009	Rev.	01
	Scale	Date	Proj. Finisher	Checked by			

