TCHE-THHE 4160÷4260
TCEE 4160÷4260
Q-Flow range

Macrosystem
148,4÷262,2 kW

TCHE-THHE - Water cooled water chillers and heat pumps units with environmentally friendly refrigerant. Range with hermetic Scroll compressors.

TCEE - Condenserless units with environmentally friendly refrigerant. Range with hermetic Scroll compressors.

R407C

RHOSS
CLIMA EVOLUTION

main features

Standard use conditions

The TCHE-TCHEI units are packaged water cooled water chillers.
The THHE-THHEI units are packaged water cooled heat pumps, reversible on the refrigerant cycle.
The TCEE-TCEEI units are condenserless water chillers.
They are intended for use in industrial processing or conditioning plants where a supply of chilled water (TCHE-TCHEI - TCEE-TCEEI) or chilled and hot water (THHE-THHEI) is required.
The machine is designed for indoor installation.

ATTENTION!

In order to operate, TCEE-TCEEI condenserless units must be connected to a remote condenser.
The CCAM range of RHOSS remote condensers is available on request. They are manufactured in several versions so as to meet the different system needs concerning the noise levels (for further information, see TECHNICAL NOTE for CCAM units).

The units comply with the following Directives:
• Machine Directive 89/392/CEE (MD);
• Low Voltage Directive 73/23/CEE (LVD);
• Electromagnetic Compatibility Directive 89/336/CEE (EMC);
• Pressurised Equipment Directive 97/23/CEE (PED).

Code guide
"RANGE" code

T	C	H	E	B
Water chiller or heat pump	Cooling only	Water cooled	Scroll hermetic compressors	Standard version
	H	**E**		**I**
	Heat pump	Condenserless		Soundproofed version

"MODEL" code

4	160 ÷ 260
No. compressors	Approximate cooling capacity (in kW)

Example: THHE 4260

○ Water cooled heat pump unit.
○ 4 Scroll hermetic compressors
○ Nominal cooling capacity of roughly 260 kW.

main features

Features

○ Structure made of painted sheet steel with sound insulating material.
○ Scroll type rotary hermetic compressors complete with internal thermal protection
○ Capacity step control according to the following table:

MODEL	Compressors/Steps no.	Circuits no.
4160 ÷ 4260	4 / 4	2

○ Stainless steel plate exchangers complete with insulation with close cellular expanded synthetic rubber.
○ **High and low pressure gauges complete with capillaries.**
○ Differential pressure switch on the evaporator (TCHE-TCHEI - TCEE-TCEEI) or on the evaporator and condenser (THHE-THHEI), to protect the unit as the water flow stops.
○ Phase monitor to protect the compressor.
○ Male threaded hydraulic connections.
○ Every refrigerant circuit is made with mild copper tubes and silver alloy welding, and is complete with: filter drier, charge connections, high and low pressure switches, liquid moisture indicator, thermostatic expansion valves, compressor discharge and suction safety valves, cycle inversion valve (for THHE-THHEI), non-return valve (for THHE-THHEI), taps and flanged joint on the discharge and liquid lines (for TCEE-TCEEI).
○ The TCHE-TCHEI - THHE-THHEI units are complete with R407C refrigerant charge.
○ The TCEE-TCEEI units are pre-charged with R407C refrigerant with the purpose of protecting the refrigerant circuit. The correct charge must be established by the installer based on the length of the lines between the condenserless and the remote condenser.

Electrical board

○ Electrical panel conforming to IEC standards, accessible from the front panel and lockable with special key.
The electrical panel comes complete with: electrical wiring arranged for power supply 400V-3ph+N-50Hz;
• auxiliary power supply: 230V-1ph-50Hz;
• control power supply: 12V-1ph-50Hz;
• power contactors;
• main power supply switch with safety door interlocking isolator;
• automatic protection switches for each compressor;
• automatic compressor protection switch;
• automatic protection switch on auxiliary power circuit;
• remotable machine command and controls;
• arrangement for management of remote condenser (TCEE-TCEEI).
○ Programmable microprocessor electronic board regulated with the keyboard built into the units.
This electronic board controls the following functions:
• adjustment and control of temperature set points of water inlet/outlet of the machine; of the safety delays; of the time-run-meter of the compressor(s); of the automatic sequence inversion of the compressors; of the circulation or use service pump; of the condenser side circulation pump; of the electronic anti-freeze protection which starts automatically with the machine off (if anti-freeze heating element is present); of the functions which control the intervention mode of the single organs which comprise the machine;
• complete protection of the unit, possible cut off of the machine and display of the active alerts;
• visualisation: of set values, of inlet/outlet water temperatures and of alerts, by display; of working devices and chiller or heat pump operation by led;
• self-diagnosis with continual checking of the machine oeprational status
○ Advanced functions:
• arranged for serial connection, with RS485 outlet for logical dialogue with building automation, centralized systems and supervision networks.
• testing of the units assisted by computer.

Versions

○ **B** - Standard version (TCHE-THHE).
○ **I** - Soundproofed version, with soundproof jackets on compressors (TCHEI-THHEI).

Accessories factory fitted

○ **PSC** - Low ambient fan speed control of the CCAM remote condensers (only TCEE-TCEEI versions in conjuction with CCAM units supplied by RHOSS S.P.A.).
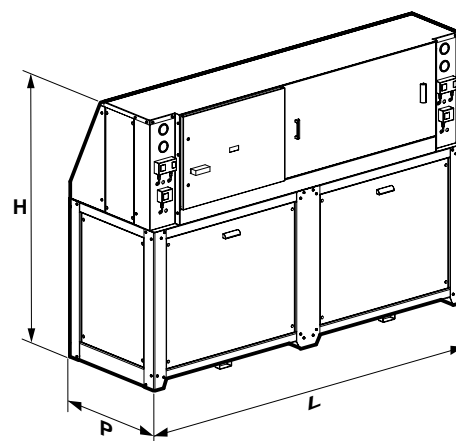
Accessories supplied loose

○ **KSA** - Rubber anti-vibration mountings.
○ **KVP** - Pressure regulating valve (TCHE-TCHEI only).
Kit KVP consists of two pressure valves (one per circuit) which modulate the water flow to the condenser, keeping the condensation pressure constant. The use of the accessory is recommended in the following cases:
• in general when the machine is made to work with set-points much lower than the design set-point without adapting the water flow and/or the inlet water temperature at the condenser to the effective heat to be rejected;
• when the city water entering the condenser has a temperature lower than 15°C (the permitted temperature differential ∆T across the condenser for city water is within the range 12 ÷ 18°C);
• when the water entering the condenser has a temperature lower than 25°C with ∆T less than 12°C (the permitted temperature differential ∆T across the condenser for water is within the range 5 ÷ 15°C: the temperature of the condenser outlet water must however not exceed 50°C).
○ **KVPS** - Pressure regulating valve and water solenoid valve (THHE-THHEI only).
Kit KVPS consists of two pressure valves (one per circuit), each of them paired with a solenoid valve installed in hydraulic parallel. In operation as a chiller, the solenoid valve is closed, allowing the condensation water to pass through the pressure valve which then performs its function as explained in the description of kit KVPS.
○ **KCP** - water manifolds to be used without accessories KVP or KVPS (it is up to the installer to assess the usefulness of accessory KSP).
○ **KCPS** - water manifolds to be used with accessories KVP or KVPS (it is up to the installer to assess the usefulness of accessory KSP).
○ **KSP** - water manifolds brackets: their use is recommended for making manifold kits KCP or KCPS more mechanically rigid when there is a risk that the system's water pipework (responsibility of the installer) will impose a mechanical stress on the manifolds themselves.
○ **KTR** - Remote keyboard and display with the same functions as the one built into the unit.
○ **KIS** - RS 485 serial interface for logical dialogue with building automation, centralized systems and supervision networks.
○ **KCH** - RS232 hardware key to be connected to supervision systems, to combine with one or more KIS serial interface modules in the case of central unit management.
○ **CCAM** - Remote condenser (for further information, see CCAM unit TECHNICAL UNIT).

MODEL **TCHE-TCHEI**		4160	4190	4220	4240	4260
Technical data						
Nominal cooling capacity (*)	kW	157,0	184,6	212,2	237,2	262,2
Condenser heat rejection (*)	kW	196,1	230,9	265,6	296,2	326,9
E.E.R. (*)		3,47	3,46	3,44	3,48	3,51
Refrigerant circuits	No.	2	2	2	2	2
Scroll compressor / steps	No.	4	4	4	4	4
Sound power level (*)	dB(A)	76	78	79	80	80
Evaporator nominal water flow (*)	L/h	27.004	31.751	36.498	40.798	45.098
Evaporator nominal pressure drops (*)	kPa	26	28	28	29	29
Evaporator water connections	∅	2" G	2" G	2" G	2" G	2" G
Condenser nominal water flow (*)	L/h	33.735	39.708	45.681	50.953	56.225
Condenser nominal pressure drops (*)	kPa	43	48	48	48	48
Condenser water connections	∅	2" G	2" G	2" G	2" G	2" G
Evaporator water contents	L	13,0	15,1	17,2	19,3	21,4
Condenser water contents	L	13,0	15,1	17,2	19,3	21,4
R407C refrigerant charge circuit **1** (*****)	kg	8,5	8,5	9,5	9,5	10,0
Polyester oil charge circuit **1**	L	2 x 6,6	2 x 6,6	2 x 8,0	2 x 8,0	2 x 8,0
R407C refrigerant charge circuit **2** (*****)	kg	8,5	9,5	9,5	10,0	10,0
Polyester oil charge circuit **2**	L	2 x 6,6	2 x 8,0	2 x 8,0	2 x 8,0	2 x 8,0
Electrical data						
Total power input (*)	kW	45,2	53,4	61,6	68,2	74,8
Power supply	V-ph-Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50
Auxiliary power supply	V-ph-Hz	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
Control power supply	V-ph-Hz	12/1/50	12/1/50	12/1/50	12/1/50	12/1/50
Nominal current	A	82,4	94,4	106,4	118,6	130,8
Max. current	A	106,4	122,4	138,4	154,0	169,6
Starting current	A	255,2	303,2	320,0	383,0	398,0
Dimensions						
Length	**L** mm	2.407	2.407	2.407	2.407	2.407
Height	**H** mm	1.709	1.709	1.709	1.709	1.709
Depth	**D** mm	873	873	873	873	873

(*) At the following conditions: evaporator inlet/outlet water temperature 12°C / 7°C; condenser inlet/outlet water temperature 30°C / 35°C.

(*****) Indicative value: the correct value is stated on the data plate on board the machine.

MODEL THHE-THHEI		4160	4190	4220	4240	4260
Technical data						
Nominal heating capacity (***)	kW	186,8	220,0	253,2	283,0	312,8
Nominal cooling capacity (**)	kW	157,0	184,6	212,2	237,2	262,2
C.O.P. (***)		3,30	3,32	3,33	3,35	3,37
Refrigerant circuits	No.	2	2	2	2	2
Scroll compressor / steps	No.	4	4	4	4	4
Sound power level (**)	dB(A)	76	78	79	80	80
Condenser nominal water flow (***)	L/h	32.130	37.840	43.550	48.676	53.802
Condenser nominal pressure drops (***)	kPa	37	40	40	41	41
Condenser water connections (***)	$\varnothing$	2" G	2" G	2" G	2" G	2" G
Evaporator nominal water flow (***)	L/h	23.388	27.607	31.815	35.665	39.504
Evaporator nominal pressure drops (***)	kPa	21	23	23	24	24
Evaporator water connections (***)	$\varnothing$	2" G	2" G	2" G	2" G	2" G
Evaporator water contents	L	13,0	15,1	17,2	19,3	21,4
Condenser water contents	L	13,0	15,1	17,2	19,3	21,4
R407C refrigerant charge circuit **1** (*****)	kg	8,5	8,5	9,5	9,5	10,0
Polyester oil charge circuit **1**	L	2 x 6,6	2 x 6,6	2 x 8,0	2 x 8,0	2 x 8,0
R407C refrigerant charge circuit **2** (*****)	kg	8,5	9,5	9,5	10,0	10,0
Polyester oil charge circuit **2**	L	2 x 6,6	2 x 8,0	2 x 8,0	2 x 8,0	2 x 8,0
Electrical data						
Winter working total absorbed power (***)	kW	56,6	66,3	76,1	84,4	92,8
Summer working total absorbed power (**)	kW	45,2	53,4	61,6	68,2	74,8
Power supply	V-ph-Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50
Auxiliary power supply	V-ph-Hz	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
Control power supply	V-ph-Hz	12/1/50	12/1/50	12/1/50	12/1/50	12/1/50
Nominal current (****)	A	96,4	110,4	124,4	138,6	152,8
Max. current	A	106,4	122,4	138,4	154,0	169,6
Starting current	A	255,2	303,2	320,0	383,0	398,0
Dimensions						
Length	**L** mm	2.407	2.407	2.407	2.407	2.407
Height	**H** mm	1.709	1.709	1.709	1.709	1.709
Depth	**D** mm	873	873	873	873	873

(**) At the following conditions: operation as chiller, evaporator inlet/outlet water temperature 12°C / 7°C; condenser inlet/outlet water temperature 30°C / 35°C.

(***) At the following conditions: operating as heat pump, condenser inlet/outlet water temperature 40°C / 45°C; evaporator inlet/outlet water temperature 12°C / 7°C.

(****) The nominal current data are the maximum value between the summer and the winter working.

(*****) Indicative value: the correct value is stated on the data plate on board the machine.
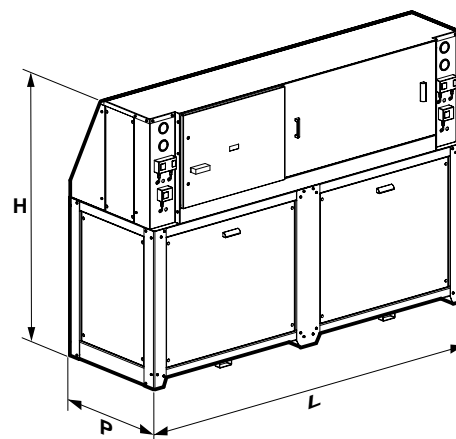
TCEE-TCEEI: technical features

MODEL **TCEE-TCEEI**		**4160**	**4190**	**4220**	**4240**	**4260**
Technical data						
Nominal cooling capacity (*)	kW	148,4	174,6	200,8	224,9	249,0
Condenser heat rejection (*)	kW	193,2	227,2	261,1	291,8	322,4
E.E.R. (*)		2,92	2,93	2,94	2,96	2,99
Refrigerant circuits	No.	2	2	2	2	2
Scroll compressor / steps	No.	4	4	4	4	4
Sound power level (**)	dB(A)	76	78	79	80	80
Evaporator nominal water flow (*)	L/h	25.525	30.031	34.538	38.683	42.828
Evaporator nominal pressure drops (*)	kPa	23	25	25	26	26
Evaporator water contents	L	13	15,1	17,2	19,3	21,4
Evaporator water connections	∅	2" G	2" G	2" G	2" G	2" G
Refrigerant connections	Type	Flange joints	Flange joints	Flange joints	Flange joints	Flange joints
Refrigerant connection: gas lines	mm	35	35	35	35	35
Refrigerant connection: liquid lines	mm	22	22	22	22	22
R407C refrigerant charge circuit **1**		Pre-charge	Pre-charge	Pre-charge	Pre-charge	Pre-charge
Polyester oil charge circuit **1**	L	2 x 6,6	2 x 6,6	2 x 8,0	2 x 8,0	2 x 8,0
R407C refrigerant charge circuit **2**		Pre-charge	Pre-charge	Pre-charge	Pre-charge	Pre-charge
Polyester oil charge circuit **2**	L	2 x 6,6	2 x 8,0	2 x 8,0	2 x 8,0	2 x 8,0
Electrical data						
Total power input (*)	kW	50,8	59,6	68,4	75,9	83,4
Power supply	V-ph-Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50
Auxiliary power supply	V-ph-Hz	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
Control power supply	V-ph-Hz	12/1/50	12/1/50	12/1/50	12/1/50	12/1/50
Nominal current (*)	A	89,6	102,4	115,2	128,4	141,6
Max. current	A	106,4	122,4	138,4	154,0	169,6
Starting current	A	255,2	303,2	320,0	383,0	398,0
Dimensions						
Length	**L** mm	2.407	2.407	2.407	2.407	2.407
Height	**H** mm	1.709	1.709	1.709	1.709	1.709
Depth	**D** mm	873	873	873	873	873

(*) At the following conditions: evaporator inlet/outlet water temperature 12°C / 7°C; dew point 50°C .
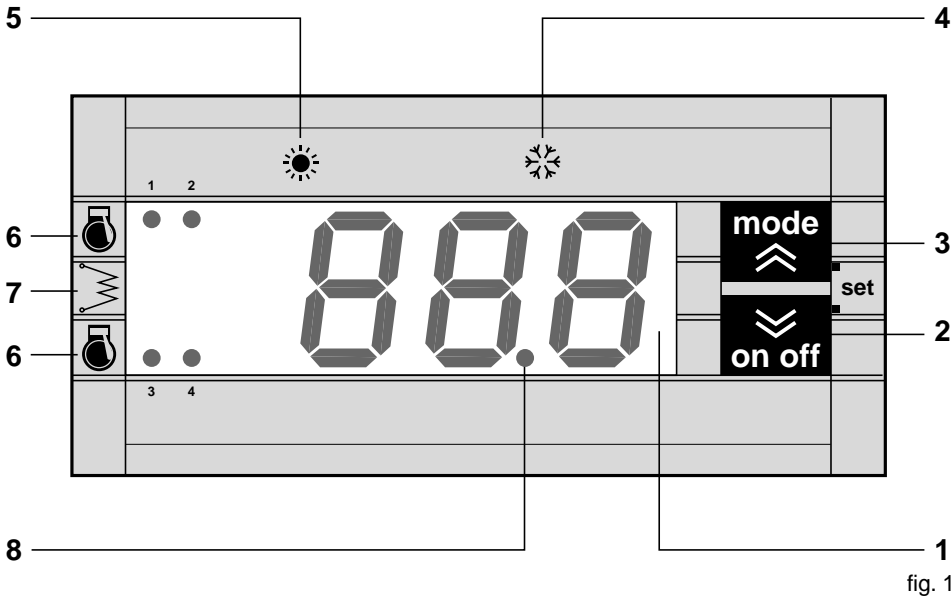(**) At the following conditions: evaporator inlet/outlet water temperature 12°C / 7°C; dew point 45°C .

ATTENTION!
○ The TCEE-TCEEI condenserless units must be connected to the remote condensers; their installation and the realization of the refrigerant circuit are to be handled by the installer and must be performed properly.
○ Poor execution of the refrigerant circuit may substantially reduce the machine's performance and compromise its life cycle.
○ The above data refer only to the condenserless unit, prior to pressure drops due to the condensation refrigerant circuit.
○ RHOSS S.P.A. shall not be held responsible for any malfunctions of the machine resulting from problems connected with the realization of the condensation refrigerant circuit,which is the responsibility of the user.
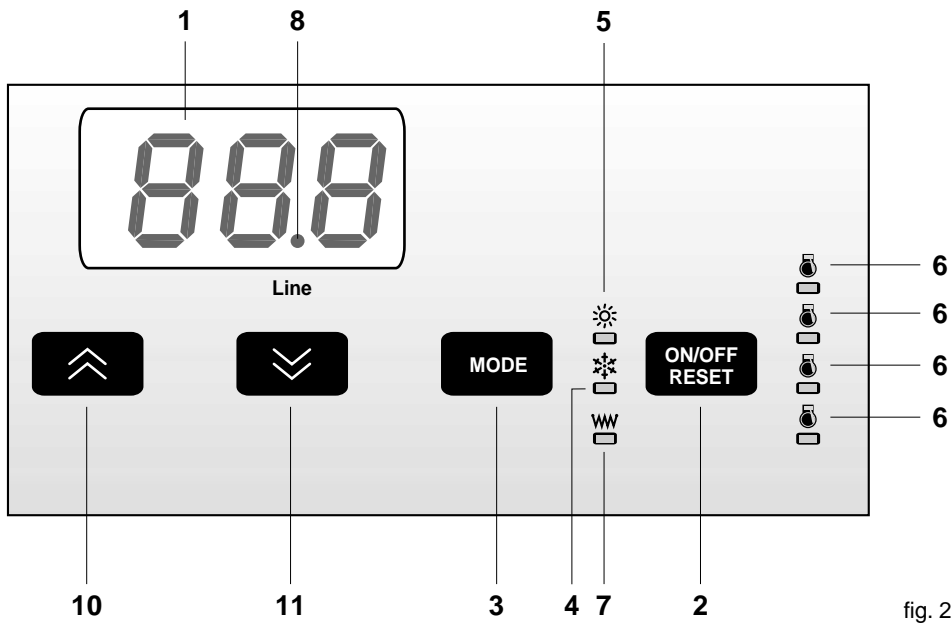
microprocessor electronic control

Keyboard and display description for models 4160 ÷ 4260

fig. 1

The keyboard with display makes it possible to view the working temperature and all process variables of the unit, the access to the setting parameters of the set working values and their modification. For technical service, it makes it possible, with a password, to access the unit management parameters (access allowed only for authorized personnel).

KTR - Remote keyboard with display for remote control for models 4160 ÷ 4260

fig. 2

The remote keyboard with display (KTR), allows the remote control and display of all the process variables, both digital and analog, of the unit.
It is therefore possible to control all functions of the unit directly in the room.

1 = **DISPLAY:**
it displays the value of all the parameters (ex. outlet water temperature etc.), the codes of the possible alarms and the status of all resources.

2 = **ON/OFF, RESET - DOWN key:**
it allows to switch ON, OFF and reset possible alarms of the unit. Furthermore it allows to scroll down the value of the parameters.

3 = **MODE - UP key:**
it allows to select the unit operation (stand-by, summer or winter cycle). Furthermore it allows to roll up the value of the parameters.

4 = **Summer LED:**
it indicates that the unit is working in cooling cycle.

5 = **Winter LED:**
it indicates that the unit is working in heating cycle.

6 = **Compressor LED:**
indicates that the compressor is running or that it is in time-delay mode.

7 = **Plate exchanger heater LED:**
this led is not enabled.

8 = **Power supply LED:**
it indicates the presence of power supply to the unit.

10/11 = **▲ (up), ▼ (down) keys, KTR only**
used to scroll through the list of parameters and any triggered alarms; can also be used to change the programmed set points.

performances

Selection of the chiller or heat pump and use of the performance tables

○ Table "**A**" gives, for each TCHE-TCHEI - THHE-THHEI model, the cooling capacity (QF), the total absorbed electrical power (P) and the heating power to reject (QT), as a function of the water temperature at the condenser outlet and at the evaporator outlet with constant temperature differentials $\Delta T = 5°C$: in the case of THHE-THHEI models the value of QT is the value of the heating capacity available to the user in the winter cycle, i.e. when operating as a heat pump.
○ Table "**D**" gives, for each TCHE-TCHEI and THHE-THHEI model in the summer cycle, the values of QF, P and QT, as a function of the temperature of the well or city water at the condenser outlet with temperature differential $\Delta T = 12°C$, and as a function of the user water temperature at the evaporator outlet with temperature differential $\Delta T = 5°C$.
○ Table "**F**" gives, for each TCEE-TCEEI model, the cooling capacity (QF), the total absorbed electrical power (P) and the heating power to reject (QT) by means of a remote condenser (optional), as a function of the temperature of the evaporator outlet water with temperature differential $\Delta T = 5°C$ and as a function of the condensation temperature (dew point).
○ With respect to the operating limits (see page 14), the values of tables "**A**", "**D**" and "**F**" can allow interpolation of the performances, but extrapolation is not permitted.
○ Tables "**B**", "**C**" and "**E**" give the correction coefficients for the performances, for variations in the temperature differential ΔT between inlet and outlet water at the exchangers.
○ Table "**Q**" gives the correction coefficients to be applied to the nominal values in the event of the use of water with ethylene glycol added.
○ Table "**G**" indicates the values of the pressure drops of the exchanger which functions as evaporator on models TCHE-TCHEI - THHE-THHEI in the summer cycle (operation as a chiller) and as condenser on models THHE-THHEI in the winter cycle (operation as a heat pump): in respect of the permitted temperature differentials (see page 14) it is possible to extrapolate other values for the pressure drops.
○ Table "**H**" indicates the values of the pressure drops of the exchanger which functions as condenser on models TCHE-TCHEI - THHE-THHEI in the summer cycle (operation as a chiller) and as evaporator on models THHE-THHEI in the winter cycle (operation as a heat pump): in respect of the permitted temperature differentials (see page 14) it is possible to extrapolate other values for the pressure drops.
○ Table "**I**" indicates the values of the pressure drops of the evaporator on TCEE-TCEEI models
○ Tables "**L**", "**M**" and "**N**" give the values of the pressure drops of the water manifolds (optional accessory KCP and KCPS).
○ Tables "**O**" and "**P**" contain the values of the sound power level emitted by the individual model in the standard and in the soundproofed version.

Example:

○ Design conditions for a water-cooled chiller:
• Cooling capacity required = 210 kW;
• Water temperature produced at the evaporator = 7°C;
• Temperature differential ΔT at the evaporator = 5°C;
• Inlet temperature at the condenser = 30°C.

Using the values indicated in table "**A**", and assuming a temperature differential $\Delta T = 5°C$ at the condenser, we see that model TCHE 4220 satisfies the requirement with:
QF = 212.2 kW ; P = 61.6 kW;
QT = 265.7 kW.
The water flows G to send to the exchangers are obtained by using the following formulae:
G (L/h) evaporator = (QF x 860) ÷ ΔT = (212.2 x 860) ÷ 5 = 36.498 (L/h);
G (L/h) condenser = (QT x 860) ÷ ΔT = (265.7 x 860) ÷ 5 = 45.700 (L/h).
From tables "**G**" and "**H**" we obtain the values of the pressure drops Δpw of the evaporator and the condenser respectively:
Δpw evaporator = 28 kPa;
Δpw condenser = 48 kPa.
To reduce the water flow to be sent to the condenser, we need to increase the temperature differential ΔT. Assuming therefore that we are working with a ΔT at the condenser of 10°C, for the same outlet water temperature at the condenser Tuct = 35°C the new inlet water temperature at the condenser is found to be:
Inlet temperature at the condenser = 35°C –10°C = 25°C.
○ Using the correction coefficients kct QF and kct P of table "**B**", we calculate the new values for QF^i, P^i and then QT^i:
QF^i = QF x kct QF = 212.2 x 1.016 = 215.6 kW;
P^i = P x kct P = 61.6 x 0.969 = 59.7 kW;
QT^i = $(QF^i + P^i)$ x 0.97 = (215.6 + 59.7) x 0.97 = 267.0 kW.
The new water flows G to send to the exchangers are obtained using the following formulae:
G (L/h) evaporator = (215.6 x 860) ÷ 5 = 37,083 (L/h);
G (L/h) condenser = (267.0 x 860) ÷ 10 = 22,962 (L/h).
From tables "**G**" and "**H**" we can extrapolate the values of the pressure drops Δpw at the evaporator and at the condenser corresponding to the new flow rates.
Or we can use the following simplified formulae:
Δpw^i evaporator = Δpw x $(G^i \div G)^2$ = 28 x $(37,083 \div 36,498)^2$ = 29 kPa;
Δpw^i condenser = Δpw x $(G^i \div G)^2$ = 48 x $(22,962 \div 45,700)^2$ = 12 kPa.

TCHE-TCHEI - THHE-THHEI: performances

Table "A": TCHE-TCHEI - THHE-THHEI performance data (ΔT = 5°C at condenser; ΔT = 5°C at evaporator)

MODEL	Tue (°C)	Tuc (°C)														
		30			35			40			45			50		
		QF	QT	P	QF	QT	P	QF	QT	P	QF	QT	P	QF	QT	P
		kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
4160	5	154,4	188,0	39,4	144,8	183,8	44,7	135,1	179,6	50,1	124,6	175,3	56,1	114,1	171,0	62,2
	7	167,2	200,8	39,9	157,0	196,1	45,2	146,8	191,3	50,5	135,9	186,8	56,6	125,1	182,2	62,7
	10	184,9	218,4	40,3	173,8	212,9	45,7	162,7	207,4	51,1	151,1	202,2	57,3	139,5	196,9	63,5
	13	206,1	239,5	40,8	194,2	233,3	46,3	182,4	227,1	51,8	169,8	221,0	58,0	157,2	214,8	64,3
	15	219,5	252,8	41,2	206,9	246,0	46,7	194,3	239,1	52,2	181,3	232,5	58,5	168,2	226,0	64,7
4190	5	181,3	221,2	46,8	170,3	216,3	52,8	159,2	211,5	58,8	147,3	206,5	65,6	135,3	201,6	72,5
	7	196,4	236,5	47,4	184,6	230,9	53,4	172,9	225,3	59,4	160,5	220,0	66,3	148,0	214,7	73,3
	10	217,3	257,5	48,1	204,6	251,1	54,2	191,9	244,6	60,3	178,5	238,5	67,3	165,2	232,4	74,4
	13	242,8	283,0	48,9	228,9	275,5	55,1	215,0	268,0	61,3	200,6	261,0	68,4	186,3	254,0	75,6
	15	258,6	298,8	49,4	244,1	290,8	55,7	229,7	282,9	61,9	214,5	275,2	69,2	199,4	267,5	76,4
4220	5	208,2	254,5	54,1	195,8	248,9	60,8	183,4	243,3	67,4	169,9	237,7	75,1	156,5	232,2	82,9
	7	225,5	272,1	55,0	212,2	265,7	61,6	199,0	259,2	68,3	185,0	253,2	76,1	171,0	247,2	83,8
	10	249,8	296,6	55,9	235,5	289,2	62,7	221,1	281,8	69,4	206,0	274,8	77,3	190,9	267,9	85,2
	13	279,5	326,4	57,0	263,6	317,7	63,9	247,7	308,9	70,8	231,5	301,1	78,8	215,4	293,2	86,8
	15	297,7	344,7	57,7	281,3	335,7	64,7	265,0	326,6	71,7	247,8	317,8	79,8	230,7	309,1	88,0
4240	5	231,0	281,8	59,5	217,4	276,1	67,2	203,9	270,4	74,9	190,1	265,1	83,2	176,3	259,9	91,6
	7	251,7	302,9	60,5	237,2	296,3	68,2	222,6	289,6	76,0	207,4	283,1	84,4	192,1	276,5	92,9
	10	277,8	329,2	61,5	262,1	321,5	69,4	246,3	313,9	77,3	229,9	306,4	85,9	213,5	298,8	94,6
	13	310,4	362,1	62,9	293,1	353,1	70,9	275,8	344,1	78,9	258,3	335,7	87,8	240,8	327,2	96,6
	15	330,4	382,3	63,6	312,6	372,8	71,8	294,7	363,4	80,0	276,1	354,1	88,9	257,5	344,8	97,9
4260	5	253,8	309,2	65,0	239,1	303,3	73,6	224,4	297,5	82,3	210,2	292,5	91,3	196,0	287,5	100,4
	7	277,9	333,7	66,1	262,1	326,8	74,8	246,3	320,0	83,6	229,8	312,9	92,8	213,3	305,8	102,0
	10	305,8	361,7	67,1	288,7	353,9	76,1	271,5	346,0	85,2	253,8	337,9	94,5	236,1	329,7	103,9
	13	341,4	397,8	68,7	322,7	388,5	77,9	304,0	379,3	87,1	285,0	370,3	96,7	266,1	361,3	106,3
	15	363,2	419,8	69,5	343,9	410,0	78,9	324,5	400,3	88,2	304,4	390,4	98,0	284,3	380,5	107,9

Tue = Evaporator outlet water temperature (inlet/outlet ΔT = 5°C)
Tuc = Condenser outlet water temperature (ΔT inlet/outlet = 5°C)
QF of = Cooling capacity with a fouling factor of 0.35 x 10^{-4} m^2 °C/W
QT of = Heating capacity with a fouling factor of 0.35 x 10^{-4} m^2 °C/W
P = Total absorbed electrical power

Nominal summer operating conditions

evaporator water inlet/outlet 12°C / 7°C, condenser water inlet/outlet 30°C / 35°C

Nominal winter operating conditions (THHE-THHEI)

condenser water inlet/outlet 40°C / 45°C, evaporator water inlet/outlet 12°C / 7°C.

Table "B": correction coefficients for water ΔT at condenser

For ΔT of the water at the condenser different from 5°C (minimum ΔT of 5 °C and maximum ΔT of 15 °C), at the same water outlet temperatures (respectively 30°C, 35°C, 40 °C, 45 °C and 50°C), apply the following correction coefficients to the data in the table (table "A"):

ΔT	kct QF	kct P
5°C	1,000	1,000
10°C	1,016	0,969
15°C	1,030	0,940

ATTENTION!

For water at the condenser inlet with a temperature of less than 25°C and ΔT lower than 12°C, installation of the accessory pressurestat valve is recommended.

Table "C": correction coefficients for water ΔT at evaporator

For ΔT of the water at the evaporator different from 5°C, for the same water outlet temperatures (respectively 5°C, 7°C, 10°C, 13°C and 15°C), apply the following correction coefficients to the data in the table (table "A"):

ΔT	ket QF	ket P
3°C	0,97	0,99
5°C	1,00	1,00
8°C	1,01	1,01

QT = (QF + P) x 0,97

ATTENTION!

At the evaporator the temperature differential ΔT between the inlet water temperature and the outlet water temperature must be between 3°C and 8°C.

TCHE-TCHEI - THHE-THHEI: performances

Table "D": TCHE-TCHEI and THHE-THHEI in the summer cycle performance data (condensation with city water with ∆T = 12°C at condenser and with ∆T = 5°C at evaporator)

MODEL	Tue (°C)	Tuc (°C) 24 (*) QF kW	QT kW	P kW	27 QF kW	QT kW	P kW	30 QF kW	QT kW	P kW
4160	**5**	167,1	191,0	33,9	162,5	188,6	36,1	157,5	186,1	38,4
	7	180,5	204,0	34,2	**175,4**	**201,2**	**36,4**	170,0	198,3	38,8
	10	199,7	222,7	34,7	194,4	219,7	36,9	188,6	216,4	39,3
	13	-	-	-	216,2	240,9	37,4	209,8	237,2	39,9
	15	-	-	-	-	-	-	222,9	249,9	40,2
4190	**5**	196,4	210,6	40,6	191,0	208,1	43,0	185,1	205,3	45,6
	7	212,2	224,9	41,1	**206,2**	**221,8**	**43,4**	199,7	218,7	46,2
	10	235,0	245,5	41,7	228,5	242,1	44,1	221,5	238,6	46,9
	13	-	-	-	254,8	265,9	44,9	246,9	261,7	47,8
	15	-	-	-	-	-	-	262,8	276,2	48,3
4220	**5**	225,8	230,3	47,3	219,5	227,5	49,9	212,7	224,6	52,9
	7	243,8	245,7	47,9	**236,9**	**242,5**	**50,5**	229,4	239,1	53,6
	10	270,3	268,4	48,7	262,7	264,6	51,4	254,4	260,7	54,6
	13	-	-	-	293,4	291,0	52,5	284,1	286,3	55,7
	15	-	-	-	-	-	-	302,8	302,4	56,5
4240	**5**	248,0	269,5	51,0	241,6	267,0	54,4	234,7	264,1	57,9
	7	269,8	289,9	51,8	**262,7**	**286,7**	**55,2**	255,1	283,4	58,8
	10	298,1	315,9	52,7	290,2	312,2	56,2	281,9	308,3	59,9
	13	-	-	-	323,8	343,3	57,4	314,6	338,7	61,2
	15	-	-	-	344,5	362,6	58,2	335,1	357,8	62,0
4260	**5**	270,2	308,7	54,8	263,6	306,4	59,0	256,7	303,7	63,0
	7	295,9	334,0	55,7	**288,4**	**330,9**	**59,9**	280,9	327,7	64,1
	10	325,8	363,5	56,8	317,7	359,8	61,0	309,5	356,0	65,2
	13	-	-	-	354,1	395,6	62,4	345,1	391,2	66,7
	15	-	-	-	-	-	-	367,4	413,2	67,5

(*) Fit the accessory pressurestat valve.

Tue = Evaporator outlet water temperature (inlet/outlet ∆T = 5°C)
Tuc = Condenser outlet water temperature (city water, ∆T inlet/outlet = 12°C)
QF = Cooling capacity with a fouling factor of 0,35 x 10 $^{-4}$ m^2 °C/W
QT = Heating capacity with a fouling factor of 0,35 x 10 $^{-4}$ m^2 °C/W
P = Total absorbed electrical power

Table "E": correction coefficients for ∆T of city water at the condenser

For ∆T of city water different from 12°C, at the same inlet water temperatures (respectively 12°C, 15°C and 18°C), apply the following correction coefficients to the data in the table (table "D"):

∆T	kcp QF	kcp P
12°C	1,000	1,000
15°C	0,980	1,040
18°C	0,975	1,050

QT = (QF + P) x 0,97

ATTENTION!

It is possible to use city water at the condenser with an inlet temperature between 12°C and 18°C and with minimum ∆T of 12°C and maximum ∆T of 18°C.
When the temperature of the condenser inlet water is below 15°C, installation of the accessory pressure valve is recommended.

TCEE-TCEEI: performances

Table "F": TCEE-TCEEI performance data

MODEL	Tue (°C)	Tc (°C) 40			45			50			55			60		
		QF kW	QT kW	P kW	QF kW	QT kW	P kW	QF kW	QT kW	P kW	QF kW	QT kW	P kW	QF kW	QT kW	P kW
4160	5	156,5	191,2	40,6	146,8	186,4	45,3	136,5	181,6	50,7	125,5	176,7	56,7	113,8	171,9	63,5
	7	169,9	204,2	40,7	159,6	198,8	45,4	**148,5**	**193,3**	**50,8**	136,7	187,7	56,8	124,3	182,3	63,6
	10	189,1	223,0	40,7	177,9	216,7	45,5	165,7	210,1	50,9	152,9	203,5	56,9	139,2	196,8	63,7
	13	213,1	246,3	40,8	200,7	238,9	45,5	187,4	231,2	50,9	173,1	223,2	57,0	158,0	215,2	63,8
	15	228,0	260,7	40,8	214,9	252,6	45,6	200,8	244,2	50,9	185,7	235,5	57,1	169,7	226,6	63,9
4190	5	180,4	221,5	48,0	169,8	216,4	53,3	158,7	211,4	59,3	146,9	206,6	66,1	134,7	202,2	73,8
	7	198,2	239,0	48,2	186,6	232,9	53,5	**174,7**	**227,2**	**59,5**	162,0	221,5	66,4	148,9	216,3	74,1
	10	219,8	260,2	48,4	207,3	253,3	53,8	194,0	246,2	59,8	180,3	239,6	66,7	166,0	233,2	74,4
	13	244,6	284,4	48,6	230,9	276,4	54,0	216,6	268,4	60,1	201,5	260,5	67,0	185,6	252,6	74,8
	15	265,7	305,1	48,8	251,3	296,3	54,2	235,9	287,4	60,4	219,6	278,3	67,3	202,6	269,4	75,1
4220	5	204,3	251,9	55,3	192,8	246,4	61,2	180,8	241,2	67,9	168,4	236,5	75,4	155,6	232,5	84,1
	7	226,5	273,8	55,7	213,7	267,0	61,6	**200,9**	**261,1**	**68,3**	187,2	255,3	75,9	173,5	250,4	84,6
	10	250,5	297,4	56,1	236,8	289,9	62,0	222,3	282,3	68,8	207,7	275,6	76,4	192,8	269,6	85,1
	13	276,1	322,6	56,4	261,2	313,9	62,5	245,8	305,6	69,3	230,0	297,7	77,0	213,3	290,0	85,7
	15	303,5	349,4	56,8	287,7	340,0	62,9	271,0	330,7	69,9	253,5	321,0	77,5	235,5	312,1	86,3
4240	5	227,7	279,9	60,9	215,7	274,9	67,7	203,1	270,0	75,2	189,7	265,0	83,6	175,3	260,2	92,9
	7	251,9	303,8	61,3	238,8	297,8	68,2	**224,9**	**291,7**	**75,8**	210,2	285,6	84,2	195,0	280,0	93,6
	10	277,7	329,4	61,8	263,9	322,6	68,7	248,7	315,3	76,4	232,6	308,0	84,9	216,0	301,0	94,4
	13	305,8	357,0	62,3	290,4	348,8	69,3	274,1	340,6	77,0	257,0	332,3	85,6	238,6	323,7	95,1
	15	335,5	386,2	62,7	319,2	377,3	69,8	301,7	368,0	77,7	282,9	358,0	86,2	263,0	348,0	95,8
4260	5	251,1	308,0	66,5	238,7	303,5	74,2	225,4	298,8	82,6	210,9	293,5	91,7	195,1	287,9	101,8
	7	277,2	333,9	67,0	263,9	328,6	74,8	**249,0**	**322,3**	**83,3**	233,2	315,9	92,5	216,5	309,6	102,7
	10	305,0	361,4	67,5	290,9	355,4	75,4	275,1	348,3	84,0	257,5	340,4	93,4	239,1	332,5	103,6
	13	335,4	391,3	68,1	319,6	383,7	76,1	302,5	375,5	84,7	284,1	366,9	94,1	263,9	357,4	104,5
	15	367,5	423,0	68,6	350,8	414,6	76,7	332,4	405,3	85,4	312,3	395,0	95,0	290,5	383,9	105,3

Tue = Evaporator outlet water temperature (inlet/outlet ΔT = 5°C)
Tc = Condensation temperature (dew point)
QF = Cooling capacity
QT = Condenser heat rejection
P = Total absorbed electrical power

ATTENTION!
○ The TCEE-TCEEI condenserless units must be connected to tthe remote condensers; their installation and the realization of the refrigerant circuit are to be handled by the installer and must be performed properly.
○ Poor execution of the refrigerant circuit may substantially reduce the machine's performance and compromise its life cycle.
○ The above data refer only to the condenserless unit, prior to pressure drops due to the condensation refrigerant circuit.
○ RHOSS S.P.A. shall not be held responsible for any malfunctions of the machine resulting from problems connected with the realization of the condensation refrigerant circuit, which is the responsibility of the user.

pressure drops

Table "G": pressure drops at evaporator TCHE-TCHEI - THHE-THHEI (summer cycle) and condenser THHE-THHEI (winter cycle - operation as heat pump)

MODEL																	
4160	G (l/h)	16.878	17.708	18.624	19.640	20.773	22.045	23.482	25.120	**27.004**	28.641	30.489	32.592	35.006	37.806	41.094	45.007
	Δpw (kPa)	10	11	12	14	15	17	20	22	**26**	29	33	38	44	51	60	72
4190	G (l/h)	19.845	20.821	21.898	23.092	24.424	25.920	27.610	29.536	**31.751**	33.676	35.848	38.321	41.159	44.452	48.317	52.919
	Δpw (kPa)	11	12	13	15	17	19	21	24	**28**	31	36	41	47	55	65	78
4220	G (l/h)	22.812	23.934	25.172	26.544	28.076	29.795	31.738	33.952	**36.498**	38.710	41.208	44.050	47.313	51.098	55.541	60.830
	Δpw (kPa)	11	12	13	15	17	19	21	24	**28**	31	36	41	47	55	65	78
4240	G (l/h)	25.499	26.753	28.137	29.672	31.384	33.305	35.477	37.952	**40.798**	43.271	46.063	49.239	52.887	57.118	62.084	67.997
	Δpw (kPa)	11	12	14	15	17	19	22	25	**29**	33	37	42	49	57	67	81
4260	G (l/h)	28.187	29.573	31.103	32.799	34.691	36.815	39.216	41.952	**45.098**	47.832	50.918	54.429	58.461	63.138	68.628	75.164
	Δpw (kPa)	11	12	14	15	17	19	22	25	**29**	33	37	42	49	57	67	81

Table "H": pressure drops at condenser TCHE-TCHEI - THHE-THHEI (summer cycle) and evaporator THHE-THHEI (winter cycle - operation as heat pump)

MODEL																	
4160	G (l/h)	21.085	22.122	23.266	24.535	25.950	27.539	29.335	31.382	**33.735**	35.780	38.088	40.715	43.731	47.229	51.336	56.225
	Δpw (kPa)	17	18	20	23	25	29	33	37	**43**	48	55	63	72	84	100	119
4190	G (l/h)	24.818	26.039	27.385	28.879	30.545	32.415	34.529	36.938	**39.708**	42.115	44.832	47.924	51.474	55.592	60.426	66.180
	Δpw (kPa)	19	21	23	25	28	32	36	42	**48**	54	61	70	81	94	111	133
4220	G (l/h)	28.551	29.955	31.505	33.223	35.140	37.291	39.723	42.494	**45.681**	48.450	51.576	55.133	59.217	63.954	69.515	76.135
	Δpw (kPa)	19	21	23	25	28	32	36	42	**48**	54	61	70	81	94	111	133
4240	G (l/h)	31.846	33.412	35.140	37.057	39.195	41.595	44.307	47.399	**50.953**	54.042	57.528	61.495	66.051	71.335	77.538	84.922
	Δpw (kPa)	19	21	23	25	28	32	36	42	**48**	54	61	70	81	94	111	133
4260	G (l/h)	35.141	36.869	38.776	40.891	43.250	45.898	48.892	52.303	**56.225**	59.633	63.480	67.858	72.885	78.715	85.560	93.709
	Δpw (kPa)	19	21	23	25	28	32	36	42	**48**	54	61	70	81	94	111	133

Table "I": evaporator pressure drops TCEE-TCEEI

MODEL																	
4160	G (l/h)	15.953	16.738	17.604	18.564	19.635	20.837	22.196	23.744	**25.525**	27.072	28.819	30.806	33.088	35.735	38.843	42.542
	Δpw (kPa)	9	10	11	12	14	15	17	20	**23**	26	29	34	39	45	53	64
4190	G (l/h)	18.770	19.693	20.712	21.841	23.101	24.516	26.115	27.936	**30.031**	31.852	33.907	36.245	38.930	42.044	45.700	50.052
	Δpw (kPa)	10	11	12	13	15	17	19	22	**25**	28	32	36	42	49	58	69
4220	G (l/h)	21.586	22.648	23.820	25.119	26.568	28.194	30.033	32.128	**34.538**	36.631	38.995	41.684	44.771	48.353	52.558	57.563
	Δpw (kPa)	10	11	12	13	15	17	19	22	**25**	28	32	36	42	49	58	69
4240	G (l/h)	24.177	25.366	26.678	28.133	29.756	31.578	33.638	35.984	**38.683**	41.028	43.675	46.687	50.145	54.156	58.866	64.472
	Δpw (kPa)	10	11	12	14	15	17	20	22	**26**	29	33	38	44	51	60	72
4260	G (l/h)	26.768	28.084	29.537	31.148	32.945	34.962	37.242	39.840	**42.828**	45.424	48.355	51.689	55.518	59.960	65.174	71.380
	Δpw (kPa)	10	11	12	14	15	17	20	22	**26**	29	33	38	44	51	60	72

G   = Water flow in L/h
Δpw   = Pressure drops in kPa

Table "L": evaporator side TCHE-TCHEI - THHE-THHEI (summer cycle) and condenser side THHE-THHEI (winter cycle - operation as heat pump)

MODEL																	
4160	G (l/h)	16.878	17.708	18.624	19.640	20.773	22.045	23.482	25.120	**27.004**	28.641	30.489	32.592	35.006	37.806	41.094	45.007
	Δpw (kPa)	3	3	4	4	5	5	6	7	**8**	9	10	12	13	16	19	22
4190	G (l/h)	19.845	20.821	21.898	23.092	24.424	25.920	27.610	29.536	**31.751**	33.676	35.848	38.321	41.159	44.452	48.317	52.919
	Δpw (kPa)	4	5	5	6	7	7	8	10	**11**	12	14	16	18	22	25	31
4220	G (l/h)	22.812	23.934	25.172	26.544	28.076	29.795	31.738	33.952	**36.498**	38.710	41.208	44.050	47.313	51.098	55.541	60.830
	Δpw (kPa)	6	6	7	8	9	10	11	13	**15**	17	19	22	25	29	35	42
4240	G (l/h)	25.499	26.753	28.137	29.672	31.384	33.305	35.477	37.952	**40.798**	43.271	46.063	49.239	52.887	57.118	62.084	67.997
	Δpw (kPa)	7	8	9	10	11	13	14	16	**19**	21	24	28	32	37	44	53
4260	G (l/h)	28.187	29.573	31.103	32.799	34.691	36.815	39.216	41.952	**45.098**	47.832	50.918	54.429	58.461	63.138	68.628	75.164
	Δpw (kPa)	9	10	11	12	14	15	17	20	**23**	26	29	34	39	45	53	64

Table "M": condenser side TCHE-TCHEI - THHE-THHEI (summer cycle) and evaporator side THHE-THHEI (winter cycle - operation as heat pump)

MODEL																	
4160	G (l/h)	21.085	22.122	23.266	24.535	25.950	27.539	29.335	31.382	**33.735**	35.780	38.088	40.715	43.731	47.229	51.336	56.225
	Δpw (kPa)	5	6	6	7	8	9	10	11	**13**	15	17	19	22	25	30	36
4190	G (l/h)	24.818	26.039	27.385	28.879	30.545	32.415	34.529	36.938	**39.708**	42.115	44.832	47.924	51.474	55.592	60.426	66.180
	Δpw (kPa)	7	8	9	10	11	13	14	16	**19**	21	24	28	32	37	44	53
4220	G (l/h)	28.551	29.955	31.505	33.223	35.140	37.291	39.723	42.494	**45.681**	48.450	51.576	55.133	59.217	63.954	69.515	76.135
	Δpw (kPa)	9	10	11	13	14	16	18	21	**24**	27	31	35	40	47	56	67
4240	G (l/h)	31.846	33.412	35.140	37.057	39.195	41.595	44.307	47.399	**50.953**	54.042	57.528	61.495	66.051	71.335	77.538	84.922
	Δpw (kPa)	11	12	14	15	17	19	22	25	**29**	33	37	42	49	57	67	81
4260	G (l/h)	35.141	36.869	38.776	40.891	43.250	45.898	48.892	52.303	**56.225**	59.633	63.480	67.858	72.885	78.715	85.560	93.709
	Δpw (kPa)	14	15	17	19	21	24	27	31	**36**	40	46	52	60	71	83	100

Table "N": evaporator side TCEE-TCEEI

MODEL																	
4160	G (l/h)	15.953	16.738	17.604	18.564	19.635	20.837	22.196	23.744	**25.525**	27.072	28.819	30.806	33.088	35.735	38.843	42.542
	Δpw (kPa)	3	3	3	4	4	5	5	6	**7**	8	9	10	12	14	16	19
4190	G (l/h)	18.770	19.693	20.712	21.841	23.101	24.516	26.115	27.936	**30.031**	31.852	33.907	36.245	38.930	42.044	45.700	50.052
	Δpw (kPa)	4	4	5	5	6	7	8	9	**10**	11	13	15	17	20	23	28
4220	G (l/h)	21.586	22.648	23.820	25.119	26.568	28.194	30.033	32.128	**34.538**	36.631	38.995	41.684	44.771	48.353	52.558	57.563
	Δpw (kPa)	5	6	6	7	8	9	10	11	**13**	15	17	19	22	25	30	36
4240	G (l/h)	24.177	25.366	26.678	28.133	29.756	31.578	33.638	35.984	**38.683**	41.028	43.675	46.687	50.145	54.156	58.866	64.472
	Δpw (kPa)	7	7	8	9	10	11	13	15	**17**	19	22	25	29	33	39	47
4260	G (l/h)	26.768	28.084	29.537	31.148	32.945	34.962	37.242	39.840	**42.828**	45.424	48.355	51.689	55.518	59.960	65.174	71.380
	Δpw (kPa)	8	9	10	11	12	14	16	18	**21**	24	27	31	35	41	49	58

G   = Water flow in L/h
Δpw = Pressure drops in kPa

Table "O": sound power TCHE - THHE - TCEE standard version

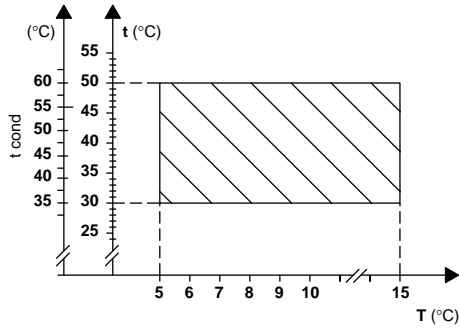| MODEL	Sound power levels in dB per octave band and total sound power level in dB(A)							
	125 Hz	**250 Hz**	**500 Hz**	**1.000 Hz**	**2.000 Hz**	**4.000 Hz**	**8.000 Hz**	**Lw (*)**
4160	75,2	78,8	76,4	69,1	63,9	57,0	53,8	76
4190	82,0	80,1	79,0	69,8	64,1	58,8	55,4	78
4220	85,0	81,0	79,5	71,2	64,0	60,0	56,6	79
4240	84,8	82,0	80,2	72,1	64,0	59,4	57,1	80
4260	84,6	83,1	80,4	72,4	64,0	58,6	57,7	80

Lw = Total sound power level in dB(A)

(*) Sound power emitted in nominal conditions of summer operation: evaporator inlet/outlet water temperature 12°C / 7°C, condenser inlet/outlet water temperature 30°C / 35°C (TCHE-TCHEI - THHE-THHEI), condensation temperature (dew point) 45°C (TCEE-TCEEI).

Table "P": sound power TCHEI - THHEI - TCEEI soundproofed version

MODEL	Sound power levels in dB per octave band and total sound power level in dB(A)							
	125 Hz	**250 Hz**	**500 Hz**	**1.000 Hz**	**2.000 Hz**	**4.000 Hz**	**8.000 Hz**	**Lw (*)**
4160	73,3	77,3	73,0	67,8	63,8	55,0	50,3	74
4190	79,7	78,6	75,6	68,7	64,0	56,8	52,0	76
4220	83,1	79,4	76,3	70,3	64,1	58,4	53,3	77
4240	82,8	80,7	76,8	70,9	64,2	57,7	53,6	78
4260	82,7	81,7	76,9	71,4	64,0	58,4	54,5	78

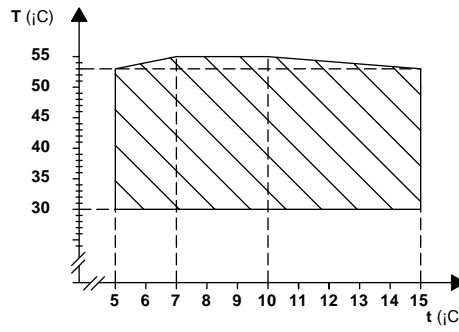## TCHE-TCHEI - THHE-THHEI - TCEE-TCEEI: cooling operation

T (°C)   = evaporator outlet temperature
t (°C)   = condenser outlet temperature
tcond (°C) = dew-point temperature, only for TCEE-TCEEI

 Standard operation R407C.

○ **The graphs of the operating limits are valid for temperature differentials ∆T at the evaporator (TCHE-TCHEI - THHE-THHEI - TCEE-TCEEI) and at the condenser (TCHE-TCHEI - THHE-THHEI) of 5°C.**
○ We can also provide units on demand to supply chilled water at less than 5°C.

THHE-THHEI: heat pump operation

T (°C)   = condenser outlet temperature
t (°C)   = evaporator outlet temperature

 Standard operation R407C.

Permitted temperature differentials across the exchangers:

○ Temperature differential at the evaporator ∆T = 3 ÷ 8°C
○ Temperature differential at the condenser (table "**B**"): ∆T = 5 ÷ 15°C
○ Temperature differential at the condenser (city water - table "**E**"): ∆T = 12 ÷ 18°C

ATTENTION!

○ Water at condenser inlet with temperature below 25°C and ∆T below 12°C: installation of the accessory pressurestat valve is recommended.
○ It is possible to use city water at the condenser with inlet temperature between 12°C and 18°C. When the temperature of the condenser inlet water is below 15°C, installation of the accessory pressurestat valve is recommended.

ATTENTION!

○ The machines are designed and planned **exclusively for indoor installation**.
If outdoor installation is required, it will necessitate modifications which must be evaluated by our technical office.

Use of antifreeze solutions

○ Use of ethylene glycol is a must when water discharge at the hydraulic system is not foreseen during winter or whenever the unit has to supply chilled water at temperatures lower than 5°C. The addition of glycol changes the physical properties of the water and consequently the unit performances. The proper glycol percentage to be put into the system can be obtained from the most demanding operation conditions chosen among those hereunder detailed.

○ Table "**Q**" show the multipliers to obtain the changes of the unit performances according to the necessary percentages of ethylene glycol.
• The multipliers refer to the following conditions: condenser water inlet temperature 30°C, chilled water temperature 7°C; temperature differential at evaporator and condenser 5°C.
• For different operating conditions the same multipliers can be used since the amount of their change is neglectable.

Table "Q" - TCHE-TCHEI - THHE-THHEI 4160 ÷ 4260

% glycol by weight	10	15	20	25	30
Freezing temperature °C	−5	−7	−10	−13	−16
fc QF	0,991	0,987	0,982	0,978	0,974
fc P	0,996	0,995	0,993	0,991	0,989
fc ∆pw	1,053	1,105	1,184	1,237	1,316
fc G	1,008	1,028	1,051	1,074	1,100

fc QF = correction factor of the cooling capacity
fc P = correction factor of the total absorbed current

fc ∆pw = correction factor of the pressure drops at the evaporator
fc G = correction factor of the glycol water flow at the evaporator

TCHE-TCHEI - THHE-THHEI 4160 ÷ 4260: dimensional and installation characteristics

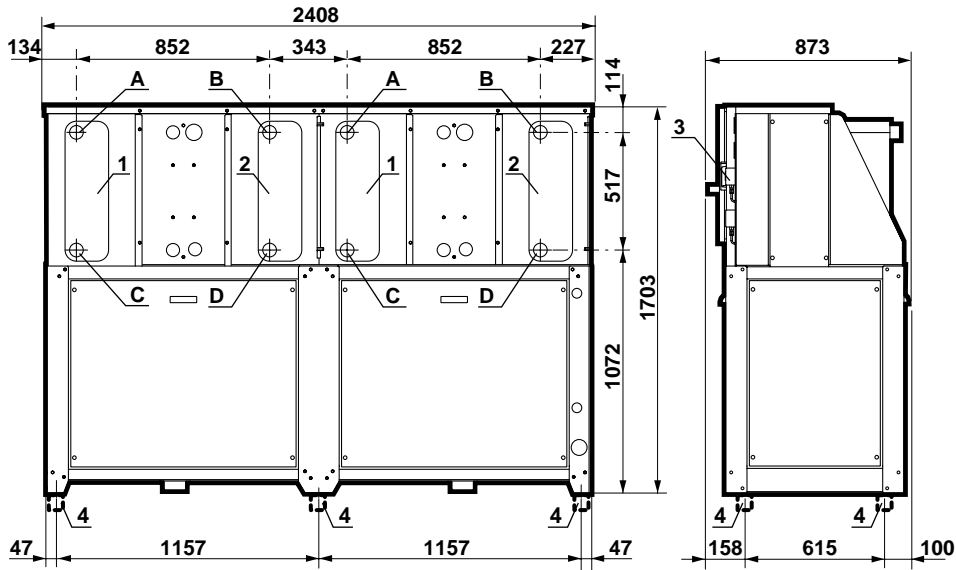## TCHE-TCHEI - THHE-THHEI 4160 - 4190 - 4220 - 4240 - 4260

fig. 3

TCHE-TCHEI

A. Outlet to city water/cooling tower water/dry cooler
B. Evaporator inlet
C. Inlet from city water/cooling tower water/dry cooler
D. Evaporator outlet

THHE-THHEI

A. Outlet to city water
B. User side outlet water connections
C. Inlet from city water
D. User side inlet water connections

1. Condenser
2. Evaporator
3. Electrical panel
4. KSA anti-vibration mountings (accessory)

Water connections

The unit is equipped with male threaded hydraulic connections on the plate exchangers

Exchanger water connections	2" G

Distribution of the weights on the fixing points and clearance spaces

fig. 4

Plan view with KSA anti-vibration supports

fig. 5

TCHE-TCHEI: weight distribution

MODEL	4160	4190	4220	4240	4260
Weight kg	982	1.110	1.217	1.246	1.270
Support point					
A kg	123	152	152	153	154
B kg	282	326	371	377	384
C kg	144	145	170	173	175
D kg	114	121	131	134	139
E kg	207	234	261	274	281
F kg	112	132	132	135	137

THHE-THHEI: weight distribution

MODEL	4160	4190	4220	4240	4260
Weight kg	1.008	1.123	1.231	1.271	1.297
Support point					
A kg	131	153	154	157	159
B kg	284	331	374	382	386
C kg	142	146	176	177	180
D kg	118	121	137	138	144
E kg	210	235	265	275	285
F kg	123	137	134	142	143

TCHE-TCHEI - THHE-THHEI: technical spaces clearance

MODEL	4160	4190	4220	4240	4260
Service spaces					
L1 mm	1.000	1.000	1.000	1.000	1.000
L2 mm	500	500	500	500	500
L3 mm	500	500	500	500	500
L4 mm	500	500	500	500	500

N.B.:
Dimensions on the drawing are in mm.

TCEE-TCEEI 4160 ÷ 4260:
dimensional and installation characteristics
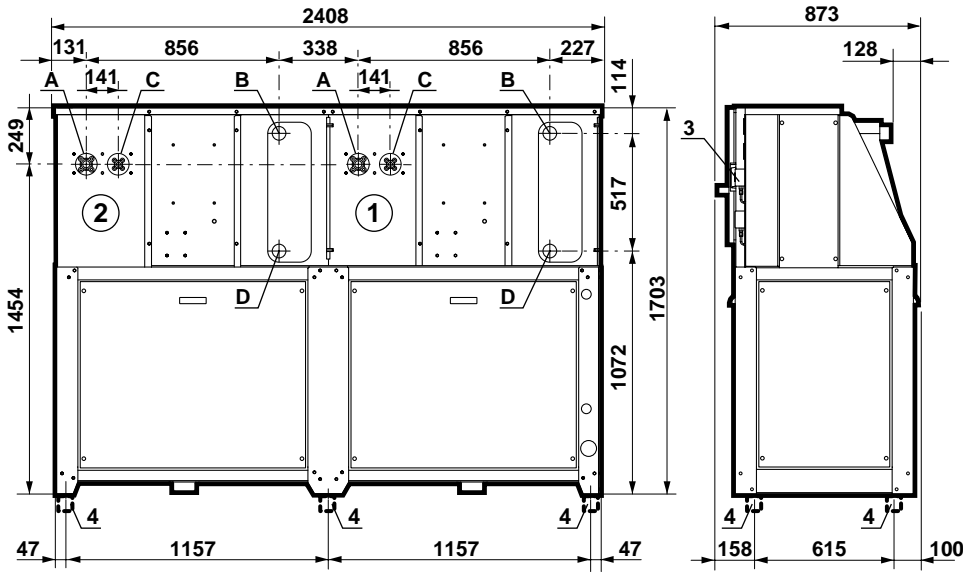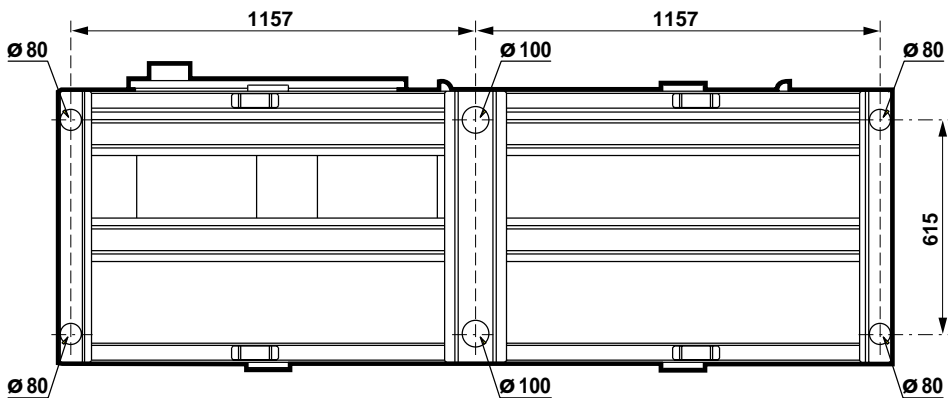
TCEE-TCEEI 4160 - 4190 - 4220 - 4240 - 4260

fig. 6

TCEE-TCEEI

A. Gas line (discharge towards condenser) circuits ① and ②
B. Inlet from system
C. Liquid line (return from condenser) circuits ① and ②
D. Outlet to system

1. Refrigerant connections circuit ①
2. Refrigerant connections circuit ②
3. Electrical panel
4. KSA anti-vibration mountings (accessory)

Water connections

The unit is provided with male-threaded water connections on the evaporator.

Evaporator water connections	2" G

Refrigerant connections

The unit is provided with flanged refrigerant connections as listed in table "**R**":

Distribution of the weights on the fixing points and clearance spaces

fig. 7

Table "R"

MODEL	Circuit	Connections		Diameter
4160	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4190	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4220	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4240	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4260	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35

Plan view with KSA anti-vibration supports

fig. 8

N.B.:
Dimensions on the drawing are in mm.

Distribution of the weights

MODEL		4160	4190	4220	4240	4260
Weight	kg	906	1.015	1.121	1.140	1.157
Support point						
A	kg	117	140	142	145	148
B	kg	278	319	362	367	371
C	kg	140	144	165	168	171
D	kg	111	113	127	130	132
E	kg	172	198	223	227	230
F	kg	88	101	102	103	105

Technical spaces clearance

MODEL		4160	4190	4220	4240	4260
Service spaces						
L1	mm	1.000	1.000	1.000	1.000	1.000
L2	mm	500	500	500	500	500
L3	mm	500	500	500	500	500
L4	mm	500	500	500	500	500

ACCESSORIES: KCP - KCPS water manifolds

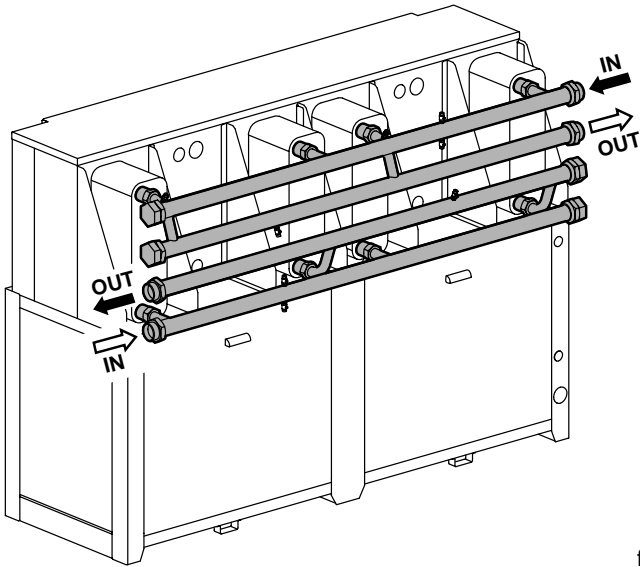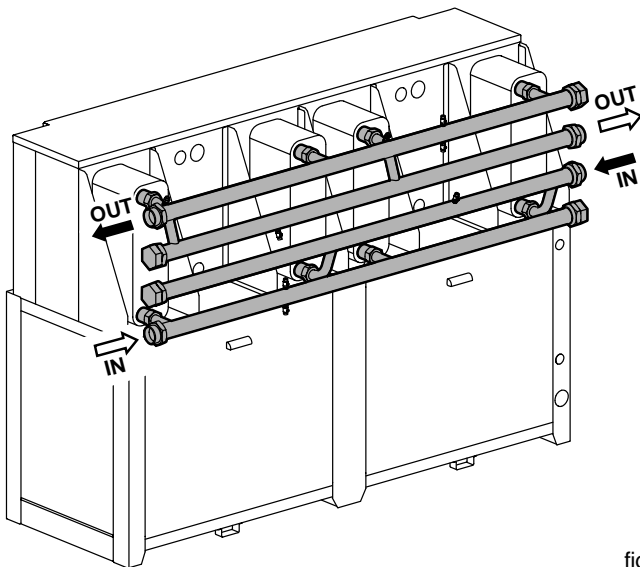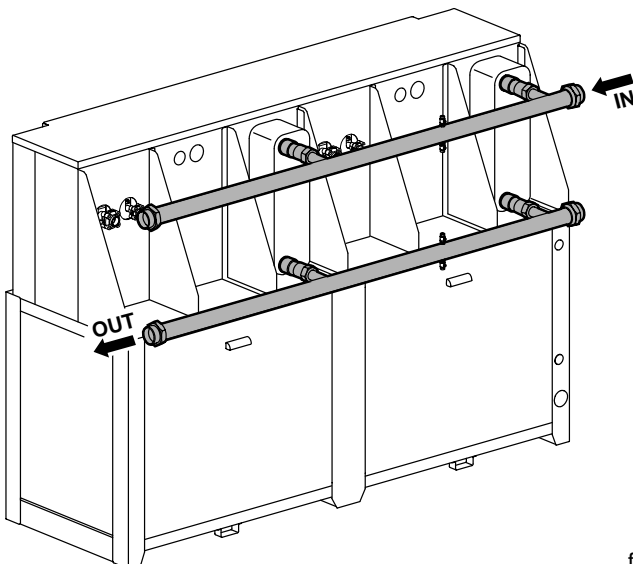**KCP - Connection for water manifolds TCHE-TCHEI 4160 ÷ 4260**

Water connections to water manifolds

Water manifolds KCP and KCPS are provided with male-threaded water connections (2^1/$_2$^{II} G M).

Figure 9 illustrates the positioning of accessory KCP (water manifolds kit) and the water flow direction.
Accessory KCPS differs from accessory KCP only in being usable with KVP pressure valves.

IN
OUT
OUT
IN

fig. 9

KCP - Connection for water manifolds THHE-THHEI 4160 ÷ 4260

Figure 10 illustrates the positioning of accessory KCP (water manifolds kit) and the water flow direction.
Accessory KCPS differs from accessory KCP only in being usable with KVPS pressure valves.

OUT
IN
OUT
IN

fig. 10

KCP - Connection for water manifolds TCEE-TCEEI 4160 ÷ 4260

Figure 11 illustrates the positioning of accessory KCP (water manifolds kit) and the water flow direction.

IN
OUT

fig. 11

TCEE-TCEEI: refrigerant connection to remote condenser

ATTENTION!
○ The TCEE-TCEEI condenserless units must be connected to remote condensers; their installation and the realization of the refrigerant circuit are to be handled by the installer and must be properly executed, in compliance with current law (it is advisable to refer to standard EN 378-2 and subsequent modifications).
○ Poor execution of the refrigerant circuit may substantially reduce the machine's performance and compromise its life cycle.
○ RHOSS S.P.A. shall not be held responsible for any malfunctions of the machine resulting from problems connected with the realization of the condensation refrigerant circuit,which is the responsibility of the user.
○ The CCAM range of RHOSS remote condensers is available on request. They are manufactured in several versions so as to meet the different system needs concerning noise levels (for further information, see TECHNICAL NOTE for CCAM units).

Suggestions for proper refrigerant installation
○ The refrigerant lines for connection with the condensing section must be made of copper pipes for refrigerant systems, type EN 12735-1-2, electrolytic, soft, degreased and de-oxidized. Also ensure that in the pipes there are no impurities or humidity, which are extremely damaging elements for the refrigerant circuit.

○ It is advisable to insulate the liquid line if the outdoor temperature (solar radiation) is higher than the temperature of the liquid itself.
○ It is advisable to insulate the gas discharge line so as to avoid the possiblity of burns due to accidental contact or to avoid heating of the indoor areas.
○ Size the refrigerant lines properly so as to obtain reduced pressure drops and refrigerant fluid speed that guarantees movement of the oil.
○ It is advisable to install, between the outlet of the condenserless unit and the remote condenser, an anti-vibration device and a silencer so as to reduce the transmission of noise and vibrations along the ducting.
○ The horizontal parts of the line must be inclined slightly downwards (in the direction of gas flow) so as to favor the flow of oil (inclination inclusive between 0,5% and 1%).
○ When the condenser is located above the compressor, at the compressor there must be a trap which runs down to floor level; the purpose is to reduce the risks of the return of condensed liquid refrigerant into the line to the compressor when not operating.
○ In the vertical parts of the discharge line there must be traps (for oil collection) every 5 metres.
○ It is advisable to insert, after previous evaluation, a non-return valve near the condenser.
○ It is advisable to install, down the line from the remote condenser, a liquid recipient of suitable capacity (compliant with current standards) in the case of long line length (roughly more than 20 m).
○ The maximum equivalent length of the refrigerant line is 30m. For greater lengths contact RHOSS technical service.
○ The flanged refrigerant connections of evaporating units TCEE-TCEEI 4160 ÷ 4260 are listed in Table "**R**":

Table "R"

MODEL	Circuit	Connections		Diameter
4160	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4190	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4220	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4240	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35
4260	①	Liquid	mm	22
		Gas	mm	35
	②	Liquid	mm	22
		Gas	mm	35

○ The TCEE-TCEEI units are not equipped with a solenoid valve on the liquid line. Its installation must be handled by the installer and is advisable when the condenser is located above the condenserless unit. For this purpose it is possible to use the connections provided in the electrical board of the TCEE-TCEEI condenserless unit. These are terminals (40 and 41) under current (230V/1ph/50Hz) managed by a contact of the compressor contactor which is normally open. This means that when the compressor is active there is current to the terminals.

Refrigerant charge
○ The TCEE-TCEEI units are pre-charged with R407C refrigerant for the purpose of protectign the refrigerant circuit.
The correct charge must be established by the installer based on the length of the refrigerant lines.
○ **The unit has a minimum pre-charge of refrigerant. Connecting the refrigerant pipes with the remote condenser it is essential to make the vacuum in the whole circuit and then to charge with refrigerant.**

Attention
The quantity of refrigerant added to the system for the length of the pipes may lead to an insufficent oil charge in the refrigerant circuit. It is therefore important to check the level of oil in the compressor carefully and if necessary to top it up (for the type of oil to use always refer to the instructions on the tag located on the compressor).

Table "S": diameter and length of refrigerant pipes

MODEL	Circuit	Equivalent distance	m	2	10	15	20	25	30
		Line							
4160	①	Liquid	mm	22 / 20	22 / 20	22 / 20	22 / 20	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32
	②	Liquid	mm	22 / 20	22 / 20	22 / 20	22 / 20	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32
4190	①	Liquid	mm	22 / 20	22 / 20	22 / 20	22 / 20	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32
	②	Liquid	mm	22 / 20	22 / 20	22 / 20	28 / 25	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32
4220	①	Liquid	mm	22 / 20	22 / 20	22 / 20	28 / 25	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32
	②	Liquid	mm	22 / 20	22 / 20	22 / 20	28 / 25	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32
4240	①	Liquid	mm	22 / 20	22 / 20	22 / 20	28 / 25	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32	35 / 32
	②	Liquid	mm	22 / 20	22 / 20	28 / 25	28 / 25	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	42 / 39	42 / 39
4260	①	Liquid	mm	22 / 20	22 / 20	28 / 25	28 / 25	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	42 / 39	42 / 39
	②	Liquid	mm	22 / 20	22 / 20	28 / 25	28 / 25	28 / 25	28 / 25
		Gas	mm	35 / 32	35 / 32	35 / 32	35 / 32	42 / 39	42 / 39

The table "**S**" shows the suggested dimensions for the connection pipes with the remote condenser (external/internal diameter).

electrical connections

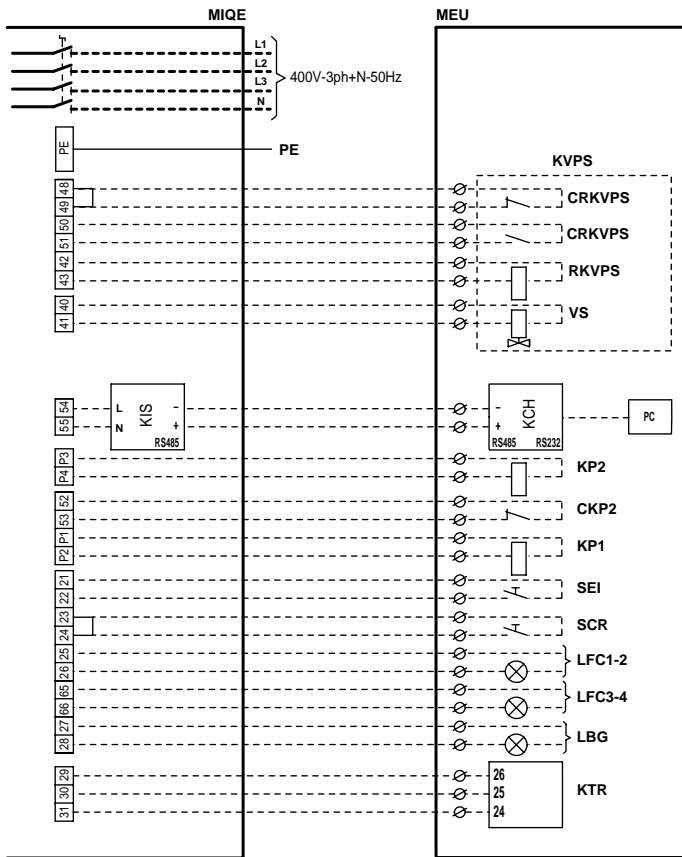## TCHE-TCHEI - THHE-THHEI 4160-4190-4220-4240-4260

fig. 12

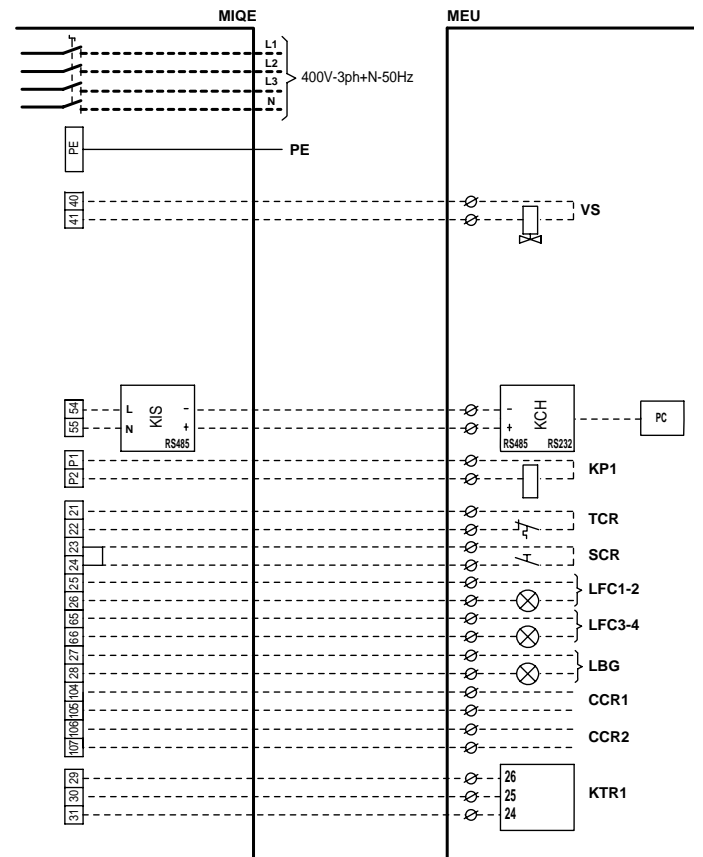## TCEE-TCEEI 4160-4190-4220-4240-4260

fig. 13

Electrical connections

○ The access to the electrical board is possible through the front panel of the unit.
○ The connections have to be carried out as per rules in force and electrical wiring diagram included.
○ Earthing is compulsory by law.
○ Suitable fuses or a main switch of an adequate capacity and switching power must be installed in a sheltered place near the unit.

ATTENTION!

The tables show only connections to be made by the installer.

Key TCHE-TCHEI - THHE-THHEI

MIQE	= Terminal board inside the electric cabinet
MEU	= User external terminal board
KVPS	= Accessory (only THHE-THHEI)
CRKVPS	= KVPS relay contact
RKVPS	= KVPS control relay
VS	= Solenoid valve
CKP2	= Condenser pump relay contact
KIS	= Serial contact
KP1	= System pump relay
KP2	= Condenser pump relay
KTR	= Remote keyboard
LBG	= General main alarm lamp (24 Vac supply)
LFC1-2	= Compressor working lamp, compressors 1-2 (supply 230Vac max)
LFC3-4	= Compressor working lamp, compressors 3-4 (supply 230Vac max)
L	= Lines
N	= Neutral
PE	= Earth clamp
SCR	= Remote control switch (dry contact control)
SEI	= Summer/winter switch (dry contact control)
----	= Connection by the installer

Key TCEE-TCEEI

MIQE	= Terminal board inside the electric cabinet
MEU	= User external terminal board
CCR1	= Remote condenser control, circuit 1 (Dry contact)
CCR2	= Remote condenser control, circuit 2 (Dry contact)
KIS	= Serial contact
KP1	= System pump relay
KTR	= Remote keyboard
LBG	= General main alarm lamp (24 Vac supply)
LFC1-2	= Compressor working lamp, compressors 1-2 (supply 230Vac max)
LFC3-4	= Compressor working lamp, compressors 3-4 (supply 230Vac max)
L	= Lines
N	= Neutral
PE	= Earth clamp
SCR	= Remote control switch (dry contact control)
TCR	= Thermal protection for remote condenser
VS	= Solenoid valve (customer's responsibility)
----	= Connection by the installer

MODEL		4160	4190	4220	4240	4260
Electrical data						
Line sections	mm^2	35	50	50	70	95
PE section	mm^2	16	25	25	35	50
Remote control line section	mm^2	1,5	1,5	1,5	1,5	1,5
Maximum absorbed current	A	106,4	122,4	138,4	154,0	169,6
Starting current	A	255,2	303,2	320,0	383,0	398,0

TCHE-THHE 4160÷4260
TCEE 4160÷4260

Q-Flow range

RHOSS
CLIMA EVOLUTION