Air-condensed water chillers and heat pumps YCSA/YCSA-H 120 and 150 T and TP (R-410A)

YORK
A JOHNSON CONTROLS COMPANY

Ref.: Y-R70161 1205

Technical Information

ACCORDING TO ISO 9001 STANDARDS
AENOR
Empresa Registrada
ER-0028/1991

ACCORDING TO ISO 14001 STANDARDS
AENOR
Gestión Ambiental
CGM-97/013

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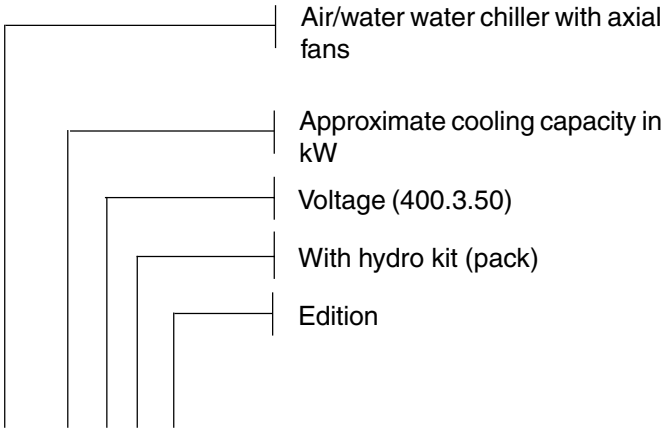
General Information

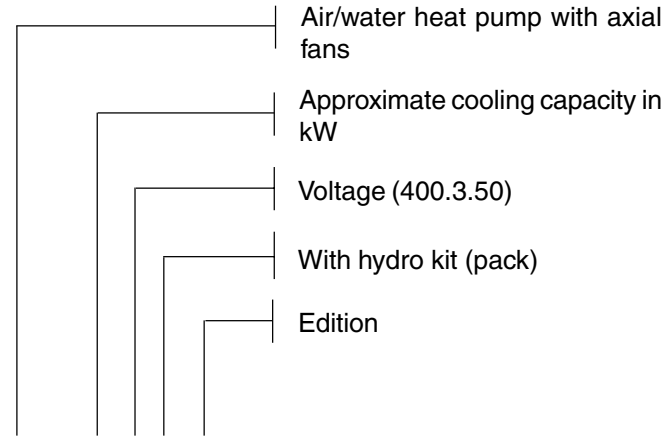
General description

The YCSA/YCSA-H 120 and 150 units are high-performance air-water water chillers and heat pumps using R-410A ecological refrigerant.
These units are designed for air conditioning or industrial applications that require cold or hot water. They are silent and compact units, equipped with vertical air discharge axial fans, that can be installed directly outdoors. They are available in two versions: with and without a hydro kit, which includes a buffer tank and a high head pressure pump.
The control system of these units is a specially programmed electronic controller to be used on air-water water chillers and heat pumps equipped with two compressor tandems.
Easy to use and safe, this system precision controls the water temperature of the installation, carries out defrost cycles, modulates fan speeds and controls compressor, pump and electric heater start-ups. By reading the control probes and safety elements, the controller protects the entire unit against malfunctions. The system allows connecting the unit to a standard RS485 monitoring network. For further information, please see Operating Instructions. For further information, please see Operating Instructions section.
The YCSA/YCSA-H 120 and 150 units are made of proven quality components and manufactured in compliance with standards in force (ISO 9001 certification).

Nomenclature



YCSA 120 T P E2



YCSA-H 150 T P E2

Models available and capacities

Cool only model	**YCSA 120**	**YCSA 150**
Cooling capacity (kW)	119	156

Heat pump model	**YCSA-H 120**	**YCSA-H 150**
Cooling capacity (kW)	114	145
Heating capacity (kW)	119.6	150

Cooling capacities in kW for 12/7° C entering/leaving water temperature, and 35° C ambient temperature.

Heating capacities in kW for 40/45° C entering/leaving water temperature, and 7° C ambient temperature.

Features and advantages

Features	**Advantages**
R-410A refrigerant	Does not harm the ozone layer.
Small footprint	Minimum space for installation.
Low height and weight	Space for installing on terraces.
Factory tested equipment	Operating quality control.
Accessibility	Easy maintenance.
Main switch	Operator safety.
Microprocessor for control and alarms	Easy and safe operation.
Manufactured to ISO 9001	High quality level.
Variable speed fan	Low noise level and condensation control.
Hydro kit	For installations with low water volume.
Communications connection	Ideal for building management.

Technical Specifications

These units are supplied completely factory-assembled and with all refrigerant tubing and wiring ready for installation on the job site. After mounting, these units must undergo an operational test. Refrigerant leaks will also be checked during this process.

Galvanized steel casing

The units are made of galvanized steel sheeting and anticorrosion nuts and bolts. Panels with ¼-turn locks can be removed to access internal components.
The casing parts are painted with white RAL9002 oven-baked polymerized enamel.

Compressors

Four hermetic Scroll compressors mounted on two tandems on rails and antivibratory supports. Both tandems are con-

nected to two independent cooling circuits. Start-up is carried out by four sequential FIFO starters. These compressors are equipped with protection against high operating temperatures. The sump heaters operate only when the compressor is inoperative.

Indoor heat exchanger
Comprises a stainless steel plate exchanger with two refrigerant circuits and a common water circuit. Adequately insulated by a layer of closed-cell elastomer foam. Includes an antifreeze heater monitored by the controller and a differential pressure switch acting as a flow control switch. The refrigerant side of said exchanger accepts an operating pressure of 52 bar, whereas the water side accepts 10 bar. When the unit includes a hydro kit, maximum admissible pressure on the water side is 6 bar (adjustment of the tank relief valve).

Outdoor heat exchangers
Made up of four notched aluminium fin coils and grooved copper tubing mechanically expanded within the fin assembly.

Fans
Of the axial and low sound level type. Equipped with single-phase motors with IP54 protection. These motors allow speed control by means of a phase cut-out shifters controlled by the unit controller. This allows unit operation at low ambient temperatures (-18°C).
On heat pump units, the fan will remain inoperative during defrosts.

Electric and control panel
Located at the front of the unit, and with IP44 protection. The operating and control components are factory mounted, wired and tested. The access door of this control panel is equipped with a locking isolator that turns power supply off. Inside we find the contactors for compressors and the pump, the transformer, magneto-thermal protectors, the controller, two speed controls, connecting strip and the keyboard-display with the unit controls.

Control keyboard-display
This device is accessible through an external leak-tight plastic cover. This is an easy-to-use remote control unit for a distance of up to 500 m., and is accessed by means of a password. For further information, please see Operating Instructions.

Cooling circuit
Made up of two circuits in parallel. Each circuit includes: expansion valve, filter-dryer, liquid sight glass, high and low pressure switches, service valves for isolating the condensing unit, and Schrader valves on the high and low sides. The heat pump model also includes, in addition, a four-way valve (energized in summer cycle and during defrosts), check valves, heating circuit expansion valve and a liquid tank. The suction tubing is coated with closed-cell elastomer insulation.

Hydro kit (pack)
These units include a pack assembled with the components of a hydro kit. This assembly is located within the unit frame and does not increase the footprint of same. It includes the following components: lined buffer tank with an antifreeze heater, centrifugal pump, expansion vessel charged with nitrogen at 1.5 bar, relief valve set to 6 bar, water circuit pressure gauge, air bleed valves, filling valve and drain valve. Also includes a mesh filter for the water circuit. This filter is supplied loose for installation at the most convenient point.

Protecting grids
To protect the coils from possible impacts. Made of steel rods and painted with oven baked polymerized white enamel (RAL9002).

Accessories and options

Unit without hydro kit
Includes the elements described in the previously mentioned specifications, less the hydro kit (pack). The water circuit includes an air bleed valve. Connections are ready for field installation.

Flow switch
For field installation. Insures sufficient water circulation when the unit is in operation.

Anticorrosion protection of fins
Two options are available:
- Aluminium fins with Blue Fin primer.
- Copper fins.

2 ½" water filter
Stainless steel screen with 1mm. diameter perforations. Supplied as a standard element on units that include the hydro kit (pack).
Optional on units that do not include the pack.
The warrantee of the unit will not be valid if a water filter has not been installed.

Remote control unit
Wall-mounted remote control unit with keyboard for cool/heat and ON/OFF functions. Includes power supply, alarm and cool/heat LEDs. Maximum cable length: 50 m.

BMS connections
By means of a serial board, the system can be connected to a standard RS485 monitoring network.

Dual pump
This is a single body, two-motor pump. The operation of same must be enabled and programmed from the *Configuration* menu on the machine control unit. The second pump starts when the magneto thermal protector of the first pump has disconnected, and vice versa. This control allows rotational operation of said pumps in accordance with operating hours or number of starts.

Low noise level (LN) units
These include anti-noise casings mounted on the compressors and sound insulation liming the panels of the compressor chamber.

Physical data, cool only units

Characteristics		YCSA-120 T and TP	YCSA-150 T and TP
Cooling capacity	kW	119	156
Capacity control	%	25/50/75/100%	
Power supply	V/ph	400.3.50	
Compressor consumption	kW	4 x 9.4	4 x 11.53
Compressor amperage	A	4 x 17.7	4 x 21.5
No. of refrigerant circuits		2	
No. of compressors		2 TANDEM	
Compressor type		SCROLL	
Oil charge	l	4 x 3.25	4 x 4.14
Oil type		POLYOL ESTER OIL	
Heat exchanger		PLATES	
Nominal water flow	l/h	20 470	26 830
No. of fans		4	
Fan diameter	mm	630	710
Fan consumption	W	4 x 600	4 x 860
Fan amperage	A	4 x 2.75	4 x 3.9
Total air flow	m^3/h	36 000	48 000
Refrigerant type		R-410A	
Refrigerant charge	kg	2 x 16.2	2 x 23
Sound power level	dB (A)	86	88
Sound power level at 5 m.	dB (A)	64	66
Sound power level at 10m.	dB (A)	58	60
Sound power level LN	dB (A)	82	84
Sound power level at 5 m. LN	dB (A)	60	62
Sound power level at 10m. LN	dB (A)	54	56
Dimensions			
Length	mm	3 416	3 770
Width	mm	1 101	
Height	mm	2 190	2 263
Water connections, socket		2 1/2"	
Water filter		2 1/2"	

Units with hydro kit (version P)

No. of pumps		1	
Available static pressure at nominal flow (without filter) (2)	kPa	205	191
Available static pressure at nominal flow (with filter) (3)	kPa	202	185
Pump consumption	W	3 180	3 400
Pump amperage	A	5.5	6.1
Unit water content	l	18 (T) / 170 (TP)	22.5 (T) / 179 (TP)
Expansion vessel volume	l	25	35
Relief valve setting	Bar	6	
Max. unit power consumption	kW	58.3	74.5
Max. unit current amperage	A	108	135
Start-up amperage (compressor)	A	118	198
Weight (1) / (4)	kg	1 250 / 1 286	1 645 / 1 673

Units without pack

Start-up amperage (compressor)	A	118	198
Water circuit pressure drop	kPa	32	29
Max. unit power consumption	kW	53	71.1
Max. unit current amperage	A	103	129
Weight (1)	kg	1 190	1 585

(1) Weight for unit empty. (2) Available static pressure, Eurovent certified. (3) Pressure with clean filter. (4) Weight with dual pump.

Physical data, heat pump units

Characteristics		YCSA-H 120 T and TP	YCSA-H 150 T and TP
Cooling capacity	kW	114	145
Heating capacity	kW	119.6	150
Capacity control	%	25/50/75/100%	
Power supply	V/ph	400.3.50	
Compressor consumption in cooling	kW	4 x 10.2	4 x 11.8
Compressor consumption in heating	kW	4 x 9.25	4 x 12.5
Compressor amperage in cooling	A	4 x 18.2	4 x 21.4
Compressor amperage in heating	A	4 x 16.9	4 x 21.6
No. of refrigerant circuits		2	
No. of compressors		2 TANDEM	
Compressor type		SCROLL	
Oil charge in litres	l	4 x 3.25	4 x 4.14
Oil type		POLYOL ESTER OIL	
Heat exchanger		PLATES	
Nominal flow in cooling	l/h	19 610	24 940
No. of fans		4	
Fan diameter	mm	630	710
Total fan consumption	W	4 x 600	4 x 860
Total fan amperage	A	4 x 2.75	4 x 3.9
Total air flow	m^3/h	36 000	48 000
Refrigerant type		R-410A	
Refrigerant charge	kg	2 x 20	2 x 29
Sound power level	dB (A)	86	88
Sound power level at 5 m.	dB (A)	64	66
Sound power level at 10 m.	dB (A)	58	60
Sound power level LN	dB (A)	82	84
Sound power level at 5 m. LN	dB (A)	60	62
Sound power level at 10 m. LN	dB (A)	54	56
Dimensions			
Length	mm	3 416	3 770
Width	mm	1 101	
Height	mm	2 190	2 263
Water connections, socket		2 1/2"	
Water filter, socket		2 1/2"	

Units with hydro kit (version P)

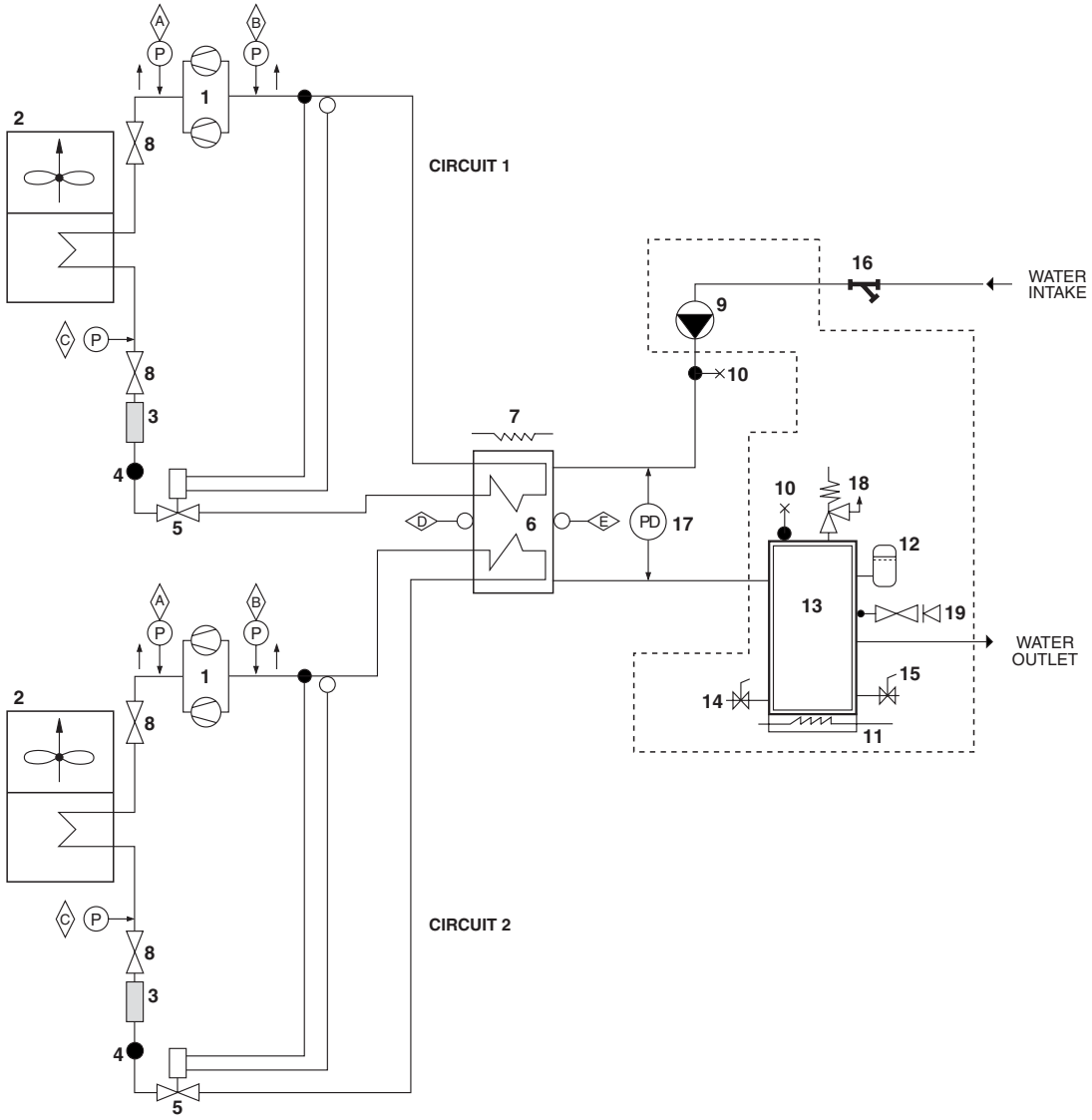
No. of pumps		1	
Available static pressure at rated flow (without filter) for cooling mode (2)	kPa	231	205
Available static pressure at rated flow (with filter) for cooling mode (3)	kPa	228	200
Pump consumption	W	3 180	3 400
Pump amperage	A	5.5	6.1
Unit water content	l	18 (T) / 170 (TP)	22.5 (T) / 179 (TP)
Expansion vessel volume	l	25	35
Relief valve setting	Bar	6	
Max. unit power consumption	kW	58.3	74.5
Max. unit current amperage	A	108	135
Start-up amperage (compressor)	A	118	198
Weight (1) / (4)	kg	1 280 / 1 316	1 675 / 1 703

Units without pack

Start-up amperage (compressor)	A	118	198
Pressure drop	kPa	29.5	25.5
Max. unit power consumption	kW	53	71.1
Max. current amperage	A	103	129
Weight (1)	kg	1 220	1 615

(1) Weight for unit empty. (2) Available static pressure, Eurovent certified. (3) Pressure with clean filter. (4) Weight with dual pump.

Operation, cooling and hydraulic diagram. Cool only unit YCSA 120/150



SAFETY/CONTROL DEVICES

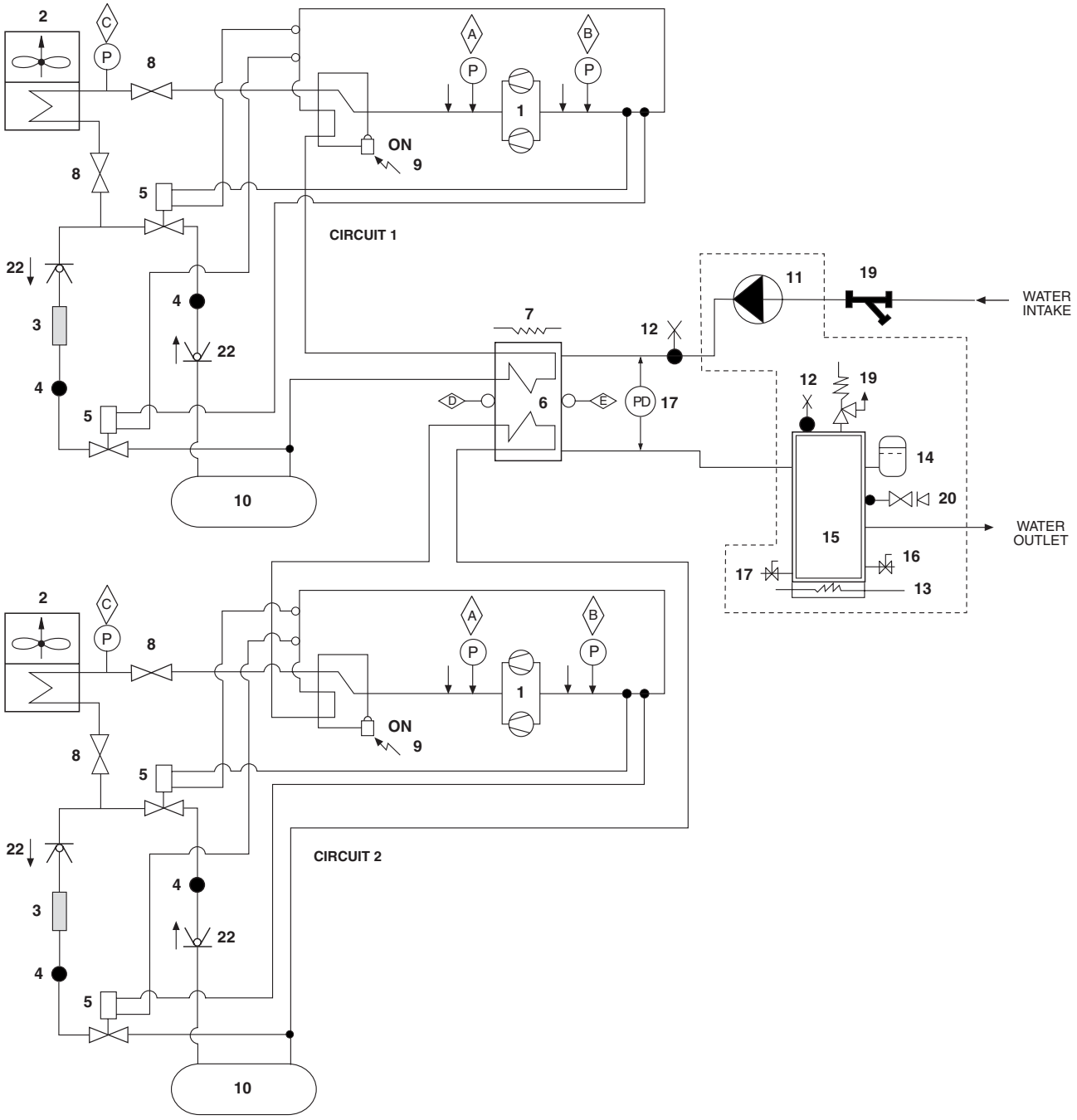
- **A** High pressure switch
- **B** Low pressure switch
- **C** Pressure transducer port (fan speed control - readout of condensing pressure)
- **D** Leaving water temperature sensor (antifreeze, control and display)
- **E** Entering water temperature sensor (control and display)

COMPONENTS

- **1** Compressor (tandem)
- **2** Air cooled condenser
- **3** Filter-dryer
- **4** Sight glass
- **5** Expansion valve
- **6** Plate heat exchanger
- **7** Exchanger antifreeze heater
- **8** Globe valve
- **9** Water pump
- **10** Manual air bleed
- **11** Water tank antifreeze heater
- **12** Expansion vessel
- **13** Water tank
- **14** Charge valve
- **15** Drain valve
- **16** Water filter (not inside the unit)
- **17** Pressure differential switch
- **18** Relief valve
- **19** Pressure gauge
- → Pipe connection with Schrader valve
- ----- For units with hydro kit only

Heat exchange takes place between the heat transfer liquid (water or glycol water) and the refrigerant in the plate heat exchanger. Water is cooled, and refrigerant is evaporated and reheated.
Then the Scroll compressor condenses the refrigerant (gas) until the condensing pressure is reached, and the refrigerant goes to the air cooled condensing unit. In the air cooled condensing unit, heat is exchanged between the air and the refrigerant. The air is heated and evacuated from the chiller (heat rejection). The refrigerant is condensed and sub-cooled. Then the refrigerant (liquid) goes on to the expansion valve, where it is expanded until the evaporating pressure is reached, at which time it goes to the evaporating unit to end the cooling cycle.

Operation, cooling and hydraulic diagram. Heat pump unit YCSA-H 120/150



SAFETY/CONTROL DEVICES

- **A** High pressure switch
- **B** Low pressure switch
- **C** Pressure transducer port (fan speed control, defrost management, readout of condensing pressure [cooling cycle], or of evaporating pressure [heating cycle])
- **D** Leaving water temperature sensor (antifreeze, display)
- **E** Entering water temperature sensor (control and display)

COMPONENTS

- **1** Compressor (tandem)
- **2** Air cooled condenser
- **3** Filter-dryer
- **4** Sight glass
- **5** Expansion valve
- **6** Plate heat exchanger
- **7** Exchanger antifreeze heater
- **8** Globe valve
- **9** Four-way valve
- **10** Liquid receiver
- **11** Water pump
- **12** Automatic air bleed
- **13** Water tank antifreeze heater
- **14** Expansion vessel
- **15** Water tank
- **16** Charge valve
- **17** Drain valve
- **18** Water filter (not inside the unit)
- **19** Relief valve
- **20** Water pressure gauge
- **21** Pressure differential switch
- **22** Relief valve

——→ Pipe connection with Schrader valve

- - - - - For units with hydro kit only

Cooling cycle

The 4-way valve is activated. Heat exchange takes place between the heat transfer liquid (water or glycol water) and the refrigerant in the plate heat exchanger. Water is cooled, and refrigerant is evaporated and reheated. Then the Scroll type compressor condenses the refrigerant (gas) until the condensing pressure is reached, and the refrigerant goes to the air cooled condensing unit. In the air cooled condensing unit, heat is exchanged between the air and the refrigerant. The air is heated and evacuated from the chiller (heat rejection). The refrigerant is condensed and sub-cooled. Then the refrigerant (liquid) goes on to the expansion valve, where it is expanded until the evaporating pressure is reached, at which time it goes to the evaporating unit to end the cooling cycle.

Heating cycle

The cycle is reverse to heating mode. The 4-way valve is not activated. The condensing unit becomes the evaporating unit, and the evaporating unit becomes the condensing unit. The water in the plate heat exchanger is heated.

Table 1. Cooling capacities YCSA 120, 150 T and TP

Model	Water outlet temp. °C	Outdoor ambient temperature °C DB (80% HR)													
		25		30		32		35		40		43		45	
		Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW
YCSA 120 T and TP	**5**	128.9	36.4	119.7	39.6	116.1	40.9	110.7	41.7	101.6	46.1	96.0	47.9	92.3	50.9
	6	132.1	37.0	123.2	40.0	119.6	41.3	114.2	42.1	105.3	46.9	99.8	48.6	96.3	51.3
	7	135.4	37.6	126.6	40.4	123.0	41.9	**119.0**	**43.0**	109.0	47.6	103.6	49.2	100.2	51.7
	8	138.6	38.3	130.1	40.8	126.5	42.6	121.4	43.9	112.7	48.4	107.6	49.9	104.1	52.1
	10	145.2	39.3	136.9	41.7	133.5	43.9	128.5	44.7	120.2	49.2	115.2	50.6	111.9	52.9
	12	152.0	40.1	143.3	43.3	139.9	44.7	134.9	46.7	126.6	50.0	121.5	51.9		
	15	161.6	43.0	153.0	45.9	149.6	47.0	144.6	48.7	136.1	51.6				
YCSA 150 T and TP	**5**	168.9	42.4	156.9	46.1	152.3	47.6	145.1	48.5	133.2	53.6	125.9	55.8	121.1	59.2
	6	173.2	43.1	161.5	46.6	156.8	48.1	149.8	49.0	138.1	54.5	130.9	56.5	126.2	59.6
	7	177.5	43.8	166.0	47.0	161.3	48.8	**156.0**	**50.0**	142.9	55.4	135.9	57.3	131.4	60.1
	8	181.7	44.5	170.5	47.5	165.8	49.5	159.1	51.0	147.7	56.3	141.0	58.0	136.5	60.6
	10	190.3	45.7	179.4	48.5	175.0	51.0	168.5	52.0	157.6	57.2	151.0	58.8	146.6	61.5
	12	199.2	46.6	187.8	50.4	183.5	52.0	176.9	54.3	166.0	58.1	159.3	60.4		
	15	211.8	50.1	200.6	53.4	196.1	54.7	189.5	56.7	178.5	60.0				

Table 2. Cooling capacities YCSA 120 - 150 T and TP (35% ethylene glycol)

Model	Water outlet temp. °C	Outdoor ambient temperature °C DB (80% HR)													
		25		30		32		35		40		43		45	
		Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW
YCSA 120 T and TP	**-5**	78.0	28.8	73.0	31.1	70.9	32.2	67.7	32.9	62.5	36.7	59.3	37.8	56.6	40.7
	-4	81.8	29.5	76.5	31.9	74.3	32.9	70.9	33.6	65.5	37.6	62.2	38.7	59.0	41.7
	-2	89.7	30.9	84.0	33.3	81.5	34.5	77.8	35.2	71.9	39.3	68.2	40.5	64.4	43.5
	0	98.1	32.3	91.9	34.8	89.1	36.0	85.0	36.8	78.7	41.1	74.5	42.3	69.8	45.2
	2	107.1	33.7	100.3	36.4	97.4	37.6	92.9	38.5	85.9	43.0	81.4	44.2	77.6	47.0
	4	116.2	35.2	108.7	37.9	105.6	39.2	100.8	40.1	93.2	44.8	88.3	46.1	84.3	49.6
YCSA 150 T and TP	**-5**	102.3	33.5	95.7	36.2	92.9	37.4	88.7	38.2	82.0	42.7	77.8	43.9	74.2	47.3
	-4	107.2	34.3	100.3	37.0	97.4	38.3	93.0	39.1	85.9	43.7	81.5	44.9	77.3	48.5
	-2	117.6	35.9	110.1	38.8	106.9	40.1	102.0	41.0	94.3	45.7	89.4	47.0	84.4	50.6
	0	128.6	37.5	120.4	40.5	116.9	41.9	111.5	42.8	103.1	47.8	97.7	49.2	91.5	52.6
	2	140.4	39.2	131.5	42.3	127.6	43.8	121.8	44.7	112.6	50.0	106.7	51.4	101.8	54.6
	4	152.3	40.9	142.5	44.1	138.4	45.6	132.1	46.6	122.1	52.1	115.8	53.6	110.5	57.6

Table 3. Correcting factors for other glycol concentrations

% in weight	Ethylene glycol		Propylene glycol	
	Capacity	Absorbed power	Capacity	Absorbed power
10	1.061	1.025	1.097	1.033
20	1.036	1.015	1.067	1.023
30	1.015	1.005	1.026	1.008
35	1.000	1.000	1.000	1.000
40	0.985	0.995	0.974	0.992
50	0.954	0.985	0.923	0.977

If it is necessary to make a selection with different glycol percentages, correct the capacity and obsorbed power values in Table 2 (35% ethylene glycol), multiplying them by the coefficients indicated in Table 3.

Table 4. Cooling capacities YCSA-H 120 - 150 T and TP

Model	Water outlet temp. °C	Outdoor ambient temperature °C DB (80% HR)													
		25		30		32		35		40		43		45	
		Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW
YCSA-H 120 T and TP	**5**	123.5	36.7	114.7	39.9	111.3	41.2	106.0	42.0	97.4	46.4	92.0	48.3	88.5	51.2
	6	126.5	37.3	118.0	40.3	114.6	41.6	109.4	42.4	100.9	47.2	95.6	48.9	92.2	51.6
	7	129.7	37.9	121.3	40.7	117.9	42.2	**114.0**	**43.3**	104.4	48.0	99.3	49.6	96.0	52.0
	8	132.8	38.5	124.6	41.1	121.2	42.9	116.3	44.2	108.0	48.8	103.1	50.2	99.8	52.4
	10	139.1	39.6	131.1	42.0	127.9	44.2	123.1	45.0	115.1	49.5	110.4	50.9	107.2	53.3
	12	145.6	40.4	137.3	43.6	134.1	45.0	129.3	47.0	121.3	50.3	116.4	52.3		
	15	154.8	43.3	146.6	46.2	143.3	47.4	138.5	49.1	130.4	51.9				
YCSA-H 150 T and TP	**5**	157.0	43.4	145.8	47.3	141.5	48.8	134.8	49.7	123.8	54.9	117.0	57.2	112.5	60.6
	6	160.9	44.1	150.0	47.7	145.7	49.3	139.2	50.2	128.3	55.9	121.6	57.9	117.1	61.1
	7	165.0	44.8	154.2	48.2	149.9	50.0	**145**	**51.3**	132.8	56.8	126.3	58.7	122.0	61.6
	8	168.9	45.6	158.4	48.6	154.1	50.7	147.9	52.3	137.3	57.7	131.0	59.5	126.8	62.1
	10	176.9	46.8	166.7	49.7	162.6	52.3	156.6	53.3	146.4	58.6	140.3	60.3	136.3	63.1
	12	185.1	47.8	174.5	51.7	170.5	53.3	164.4	55.6	154.2	59.6	148.0	61.9		
	15	196.9	51.3	186.4	54.7	182.2	56.1	176.1	58.1	165.8	61.5				

Table 5. Heating capacities YCSA-H 120 - 150 T and TP

Model	Water outlet temp. °C	Outdoor ambient temperature °C DB (80% HR)													
		-5		-3		0		5		7		10		15	
		Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW	Cap. kW	Unit kW
YCSA-H 120 T and TP	30	74.6	26.1	78.7	26.3	82.9	26.5	92.1	26.9	130.4	28.6	150.7	28.9	155.5	29.3
	35	72.7	28.1	76.7	28.3	80.7	28.5	89.7	28.9	126.4	31.7	145.4	31.9	154.9	32.1
	40	70.7	30.9	74.6	31.1	78.6	31.3	87.3	31.7	123.7	35.3	141.2	35.7	149.5	35.7
	45	68.8	34.8	72.6	35.0	76.4	35.2	84.9	35.6	**119.6**	**39.6**	135.9	39.6	144.1	39.6
	50					74.3	39.7	82.5	40.1	115.5	44.2	131.8	44.2	138.7	44.2
YCSA-H 150 T and TP	30	93.6	35.3	98.8	35.6	104.0	35.8	115.5	36.4	163.5	38.7	189.0	39.1	195.0	39.6
	35	91.1	38.0	96.2	38.3	101.3	38.5	112.5	39.1	158.6	42.9	182.4	43.1	194.3	43.3
	40	88.7	41.7	93.6	42.0	98.6	42.3	106.5	48.2	155.1	47.7	177.2	48.2	187.5	48.2
	45	86.3	47.1	91.1	47.3	95.9	47.6	106.5	48.2	**150.0**	**53.5**	170.4	53.5	180.8	53.5
	50					93.2	53.6	103.5	54.1	144.9	59.7	165.3	59.7	174.0	59.7

Table 6. Available pressure for the hydraulic circuit, YCSA/YCSA-H 120, 150 with kit

(With filter fitted)

Model	Flow l/h	Kpa
YCSA/YCSA-H 120 TP	15 000	310
	16 000	295
	17 000	279
	18 000	261
	19 000	241
	20 000	217
	21 000	187
	22 000	157
	23 000	123
	24 000	90
	25 000	55
YCSA/YCSA-H 150 TP	18 000	249
	19 000	243
	20 000	237
	21 000	230
	22 000	223
	23 000	215
	24 000	207
	25 000	199
	26 000	192
	27 000	183
	28 000	175
	29 000	165
	30 000	155
	31 000	145
	32 000	132
	33 000	120
	34 000	109
	35 000	95
	36 000	84
	37 000	70
	38 000	57

Table 7. Pressure drop in the hydraulic circuit, YCSA/YCSA-H 120, 150 without kit

(Without filter fitted)

Model	Flow l/h	Kpa
YCSA/YCSA-H 120 T	15 000	18
	16 000	20
	17 000	23
	18 000	25.5
	19 000	28
	20 000	31
	21 000	34
	22 000	37
	23 000	40
	24 000	43
	25 000	46
	26 000	49
	27 000	52.5
	28 000	56.5
	29 000	60
	30 000	63
	31 000	67
	32 000	70.5
	33 000	74.5
	34 000	78
YCSA/YCSA-H 150 T	18 000	12.5
	19 000	14
	20 000	15.5
	21 000	17.5
	22 000	19.5
	23 000	21.5
	24 000	23.5
	25 000	25.5
	26 000	27.5
	27 000	30
	28 000	32.5
	29 000	35
	30 000	37.5
	31 000	40
	32 000	43
	33 000	46
	34 000	49
	35 000	52
	36 000	55
	37 000	58
	38 000	61
	39 000	64
	40 000	67
	41 000	70
	42 000	73

Table 8. Pressure drop filter

2 1/2" filter

Flow l/h	15 000	16 000	17 000	18 000	19 000	20 000	21 000	22 000	23 000	24 000	25 000	26 000	27 000	28 000
Kpa	2	2.20	2.40	2.7	3.0	3.3	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.5
Flow l/h	29 000	30 000	31 000	32 000	33 000	34 000	35 000	36 000	37 000	38 000	39 000	40 000	41 000	42 000
Kpa	7	7.5	8	8.5	9.0	9.7	10.5	11.3	12.1	13.0	14	15	16	17

Data with water at 10°C. In the case of the use of glycol, apply the correcting factors shown in Tables 5 and 6.

Table 9. Gumming coefficients

Evaporating unit		
Gumming coeff. m^2 °C/kW	Capacity factor	Comp. absorbed power factor
0.044	1.000	1.000
0.088	0.987	0.995
0.176	0.964	0.985
0.352	0.926	0.962

Table 10. Altitude factors

Altitude (m)	Capacity factor	Comp. absorbed power factor
0	1.000	1.000
600	0.987	1.010
1 200	0.973	1.020
1 800	0.958	1.029
2 400	0.943	1.038

Selection guide (YCSA and YCSA-H)

Necessary information

The following information is needed to select a YCSA water chiller:

1. Cooling capacity needed.
2. Design cold water input and output temperatures.
3. Design water flow, if any of the temperatures in above point 2 is unknown.
4. Design input temperature of air to air conditioning unit. Normally, this will be the design ambient temperature of summer air, unless influenced by the situation or other factors.
5. Altitude above sea level.
6. Design gumming coefficient of the evaporating unit.

Note: Points 1, 2 and 3 should be related by means of the following:

$$\text{Coolling capacity kW} = \frac{\text{l/h cold water x °C differential}}{860}$$

Selection example

A chiller is required to chill water from 13°C to 7°C, with a cooling capacity 117 kW.

Here are other design conditions:

Ambient air entering the condensing unit	35°C
Gumming coefficient:	0.044 m^2 °C/kW
Altitude:	At sea level

Taking a look at Table 1 we can see that YCSA-120, unit gives an approximate required capacity of 117 kW.
As the factors appearing in Table 9 and 10 are not applicable, conditions will be as follows:

Cooling capacity:	119 kW
Power consumed:	43 kW
Water temperature:	13°C a 7°C (Δt = 6)

$$\text{Water flow: } \frac{119 \times 860}{6} = 17\,056 \text{ l/h}$$

Available pressure in hydraulic circuit of a unit with kit.

- From Table 6 we infer that the YCSA 120 TP, with a 7 052 l/h, flow, has an available pressure of 279 kPa.

Pressure drop in hydraulic circuit of a unit without kit.

- From Table 7 we infer that the YCSA 120 T, with a 17 056 l/h, flow, has a pressure drop of 23 kPa.

Pressure drop in filter.

- From Table 8, 2 1/2" filter, we infer that with a 17 056 l/h flow, said filter has a pressure drop of 2.4 kPa.

YCSA-H selection method

1. Determine the correct size of the YCSA-H unit by selecting a model from Tables 4 and 5 that is closest to the cooling and heating capacities required in the design conditions of the water outlet and air intake temperatures.
2. Apply gumming correcting factors (Table 9) and altitude (Table10) to the capacity and power values that appear in the corresponding capacity tables in cool and heat. Make sure the corrected capacity is still sufficient for your needs.
3. Using the corrected capacities of the unit, select the design temperature differential, or the flow.
4. Check to make sure that these selections are within the YCSA/YCSA-H operating limits.

YCSA-H selection example

A YCSA-H heat pump operating at a 35°C, ambient temperature should chill water from 13°C to 7°C, with a 112 kW cooling capacity.
A 85 kW heating capacity is required in 5°C design ambient temperature and a hot water output temperature of 45°C.
The gumming coefficient is 0.044 m^2 °C/kW, with the unit operating at sea level (no corrections).
With a quick glance of capacity tables 4 and 5, we see that a YCSA-H 120 heat pump gives the approximate required capacities:

Cooling capacity	=	114 kW
Total unit absorbed power	=	43.3 kW
Cold water temperature	=	13°C a 7°C (Δt = 6°C)
Hot and cold water flow	=	16 340 l/h
Heating capacity	=	84.9 kW
Total unit absorbed power in heat mode.	=	35.6 kW
Hot water output temperature	=	45°C
Hot water temp. differential	=	$\frac{84.9 \times 860}{16\,340} = 4.47$°C
Thus, hot water return temperature is	=	40.5°C

All valves are within operating limits.
- Available pressure in hydraulic circuit of a unit with kit.
  - From Table 6 we infer that the YCSA-H 120 TP, with a 16 340 l/h flow, has an available pressure of 289 kPa.
- Pressure drop in hydraulic circuit of a unit without kit.
  - From Table 7 we infer that the YCSA-H 120 T, with a 16 340 l/h flow, has a pressure drop of 21 kPa.
- Pressure drop in filter.
  - From Table 8, 2 1/2" filter, we infer that with a 16 340 l/h flow, said filter has a pressure drop of 2.2 kPa.

Selection guide with glycol (cool only units)

Necessary information

The following information is needed to select a YCSA water chiller:
1. Cooling capacity needed.
2. Design cold water/glycol input and output temperatures.
3. Design water/glycol flow.
4. Design input temperture of air to air conditioning unit. Normally, this will be the design ambient temperature of summer air, unless influenced by the situation or other factors.
5. Altitude above sea level.
6. Design gumming coefficient of the evaporating unit.

Note: Points 1, 2 and 3 should be related by means of the following formulae:

$$\text{Cooling capacity (kW)} = \frac{\Delta t\ (°C) \times \text{Flow (litres/second)}}{\text{Glycol factor}}$$

In which Δt = liquid intake temp. - liquid output temp.

To determina the glycol factor, please see Figure 1 for ethylene glycol, or Figure 3 for propylene glycol. For design output temperature, please see the recommended glycol concentration and the glycol factor in this concentration. This is the minimum concentration to be used for design output temperature. If a greater concentration is required, the glycol factor can be determined by means of Figure 2 on ethylene glycol or Figure 4 on propylene glycol.

Selection method

1. Determine the correct size of chiller by selecting the one that is closest to the capacities required by the design conditions of the glycol outlet and air intake temperatures.

2. Apply the gumming correcting factors that correspond to the gumming coefficient, altitude and glycol concentration, and to the capacity tables. Make sure the corrected capacity is still sufficient for your needs.

3. Using the corrected capacities of the chiller, set the design temperature range, or the flow, to balance the formulae appearing in the "Necessary information" section.

4. Always recheck to make sure these selections are within the design operating limits.

Selection example

Achiller is required to chill ethylene glycol from 1 to -4°C with a capacity of 75 kW.

The following design conditions are applicable:

Gumming coefficient:	0.088m °C/kW
Altitude:	1 200m
Ambient air:	25°C
Concentration of glycol:	30% w/w

For a -4°C, ethylene glycol output, the concentration recommended in Figure 1 is 30%. Therefore, the specified concentration is appropriate.

From Table 2 (capacities with 35% glycol), we infor that a YCSA-120 unit, at the established design conditions, gives a capacity of 81.8 kW and a consumption of 29.5 kW.

With the desing gumming coefficient, use the capacity correcting factors x 0.987 and power x 0.995 (Table 9).

On design altitude, apply the capacity correcting factors x 9.973 and power x 1.020 (Table 10).

On design glycol concentration, apply the capacity correcting factors x 1.015 and power x 1.005 (Table 3).

Applying these factors to the selection: YCSA-120

Capacity = 81.8 x 0.987 x 0.973 x 1.015 = 79.7 kW

Comp. power = 29.5 x 0.995 x 1.020 x 1.005 = 30 kW

For the specified glycol conectration and a -4°C output temperature, Figure 3 shows a 0.248 glycol factor. Thus, the flow can be determined with the formula appearing in the "Necessary information" section.

$$79.7\ \text{kW} = \frac{(1 - (-4)) \times \text{Flow (l/s)}}{0.248}$$

$$\text{Flow} = \frac{79.7 \times 0.248}{5} = 3.95\ \text{(l/s) or } 14\,231\ \text{(l/h)}$$

This covers the limits of use.
The evaporating unit pressure drop can be determined by taking the water pressure drop value (Table 7) for a YCSA-120 unit and multiplying it by the correcting factor (see Fig. 5) for a 30% concentration and an average temperature of -1.5°C, that is to say, $\frac{1 + (-4)}{2} = -1.5$

16 kPa x 1.22 = 19.5 kPa.

Fig. 1 Recommended ethylene glycol concentrations

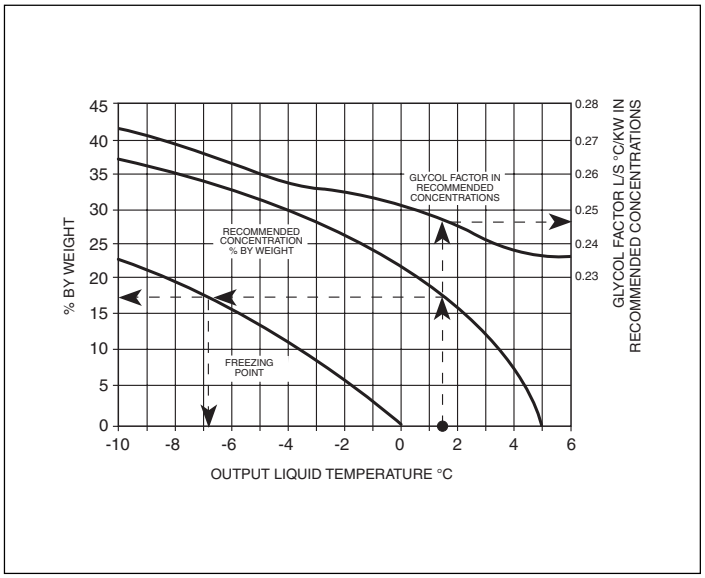


Fig. 2 Ethylene glycol in other concentrations

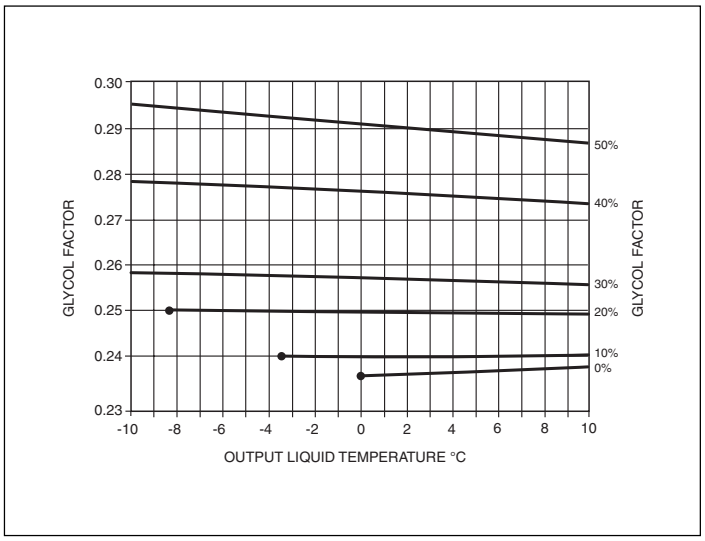


Fig. 3 Recommended propylene glycol concentrations

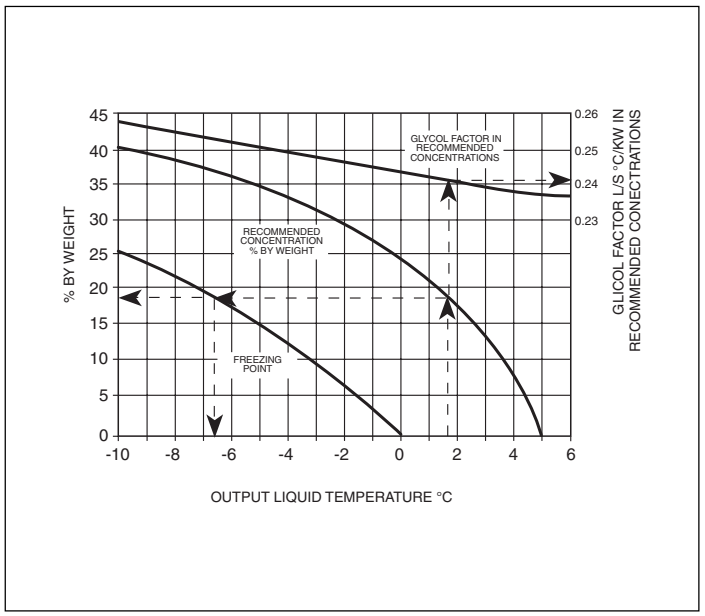


Fig. 4 Propylene glycol in other concentrations

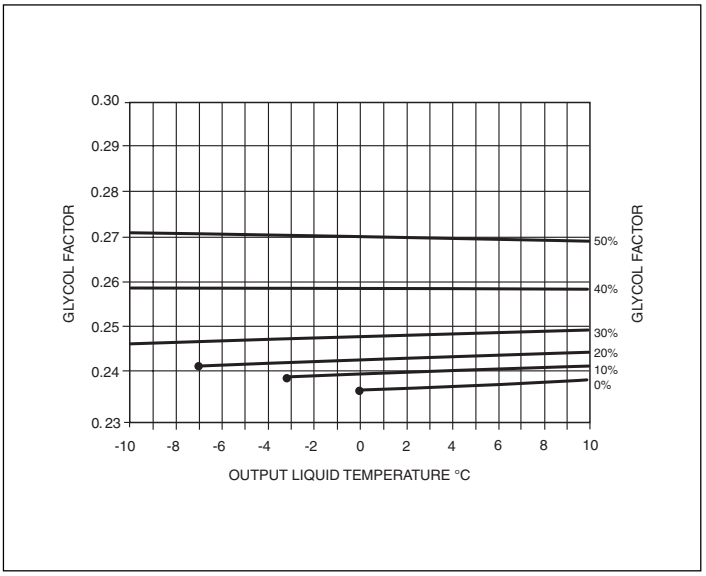


Fig. 5 Ethylene glycol pressure drop correcting factor

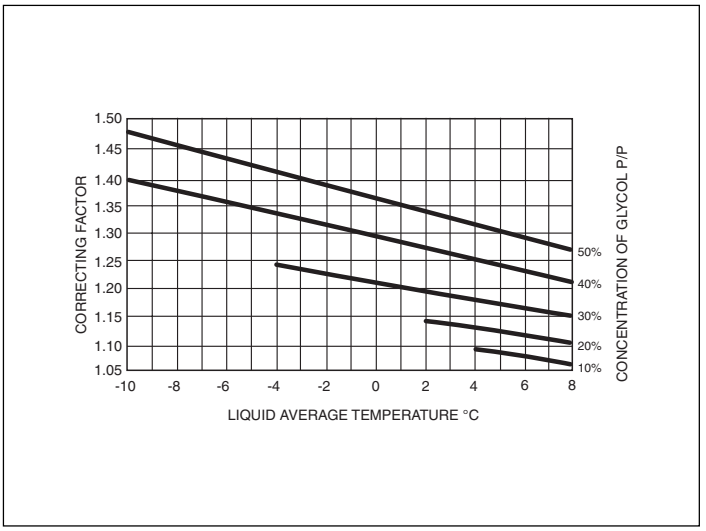
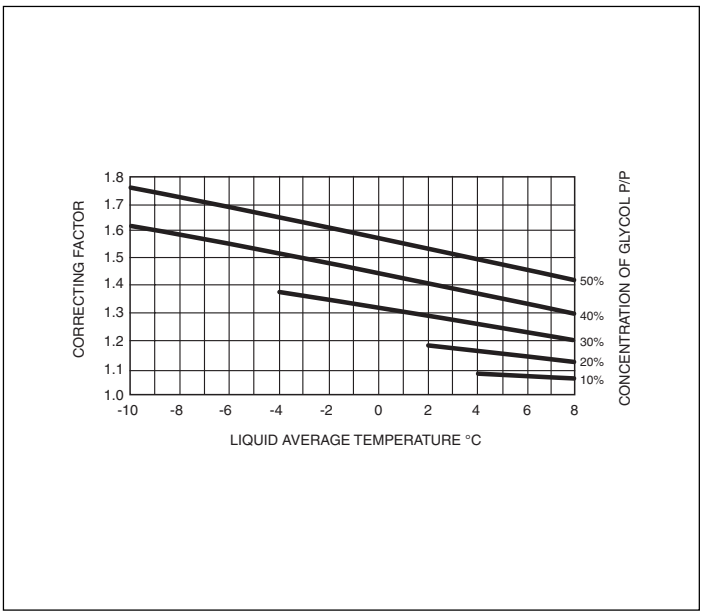


Fig. 6 Propylene glycol pressure drop correcting factor



Installation Instructions

Inspection

Upon reception, inspect the merchandise and notify both the carrier and the insurance company, in writing, of any possible damage.

Environmental protection

Packing

Packing is made of recyclable material. Its elimination should be carried out in accordance with the existing local regulations on selective collection of residual material.

Elimination of the unit

Upon disassembly of the unit, its components should be recuperated ecologically. The cooling circuit contains refrigerant which should be recovered and returned to the gas manufacturer for recycling.
Oil will remain in the sealed compressor and, therefore, it must be returned with the circuit sealed.
The air conditioning unit will be deposited in an area established by the local authorities, for its selective recuperation.

Safety

Installation and maintenance operations of this air conditioning system should be carried out only by qualified and expert personnel. Regular maintenance operations, such as cleaning the coils and air filters, should be carried out so as to keep unit performance at an optimum.

CAUTION

This unit should be installed and used in accordance with:
- Low Voltage Electrotechnical Regulations.
- Safety Regulations for Cooling Plants and Installations.
- Regulations on Pressure Equipment.
- Basic Construction Standards.
- Local ordinances.

Transportation

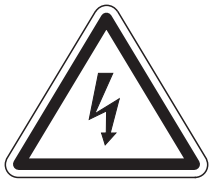
The units should always be transported in a vertical position so as to avoid oil leaking out of the compressor. If, for any reason, this position need be changed sporadically, they will remain in that position a strictly necessary period of time.

Handling

This unit should be handled by using the metal rails supplied for fastening and transportation.

Warning signs

The following signs indicate the presence of possible dangerous conditions for the users or maintenance personnel. When found on the unit, their meaning should be taken into account.



This symbol indicates an electrical risk or hazard.

Caution: The unit is equipped with a remote control system and can start automatically. Before accessing the interior of the unit, disconnect the power supply so as to avoid any contact with the fan turbine in motion.

Caution: Fan in operation.

Caution: It is obligatory to read these instructions prior to any handling.

Caution: Do not touch hot surfaces.

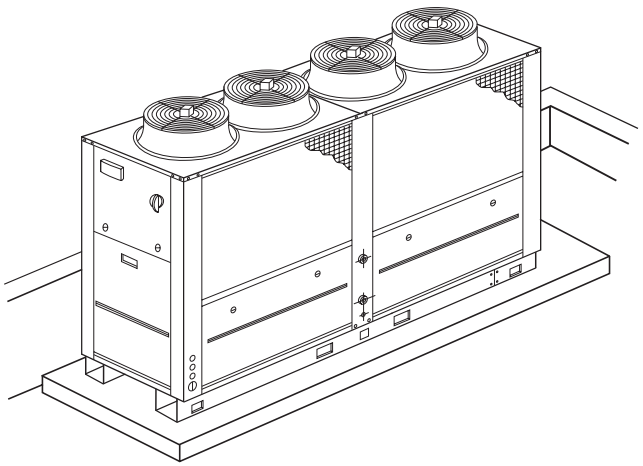
Attention: Possible gas leaks due to inadequate handling.

Location

Before locating the unit in place, check the specifications described on same to be sure you have received the adequate product.
The unit should be placed on a perfectly horizontal plane, making sure the base can support the weight of the unit.
If you want to insure the absence of vibration, the unit can be placed on a cork or similar antivibratory base, or fastened to its base with antivibratory plates or supports.

Fastening the unit

Before installing the unit, make sure the structure can withstand the weight of same.
If the unit is placed on the floor, a concrete base should be prepared so as to distribute its weight evenly.



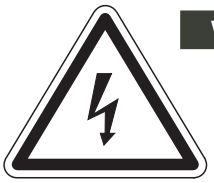
Clearances

The installation of each unit should have clearances for:
a) Air intake and discharge.
b) Maintenance servicing.
c) Power supply connection.
For correct operation, always respect the minimum distances indicated in the general dimensions diagrams with regard to possible obstructions of free air circulation or maintenance servicing.

Wiring

Electrical connections

The **established national regulations** should be followed in all cases.
Each unit is supplied with a control box to which the power supply will be connected through a fused main switch or an automatic switch.



Loose cables can produce overheating of the terminals or an incorrect operation of the unit. A fire hazard may also exist. Therefore, make sure all cables are connected tightly.

Scroll compressors, rotational direction

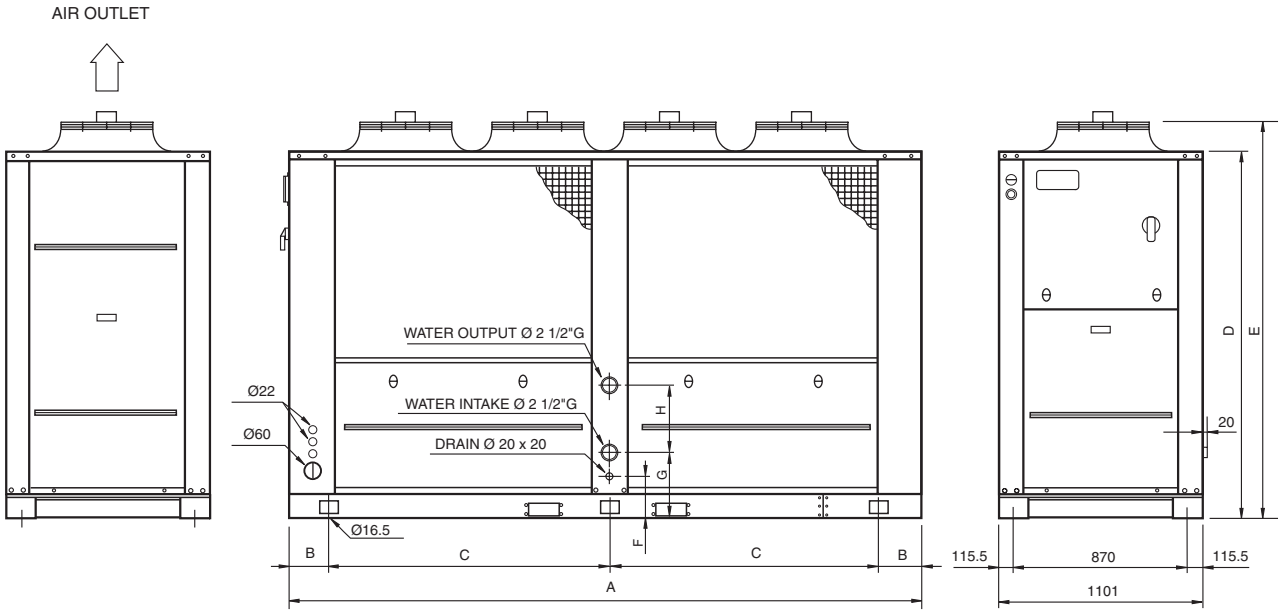
The Scroll compressors operate correctly in one single rotational direction only. Although these units are protected by a phase sequence detector, when starting the equipment make sure this rotational direction is correct.
If it is not correct:
- The compressor does not compress.
- It makes an unusual noise.
- Amperage consumption is lower.
- It overheats.

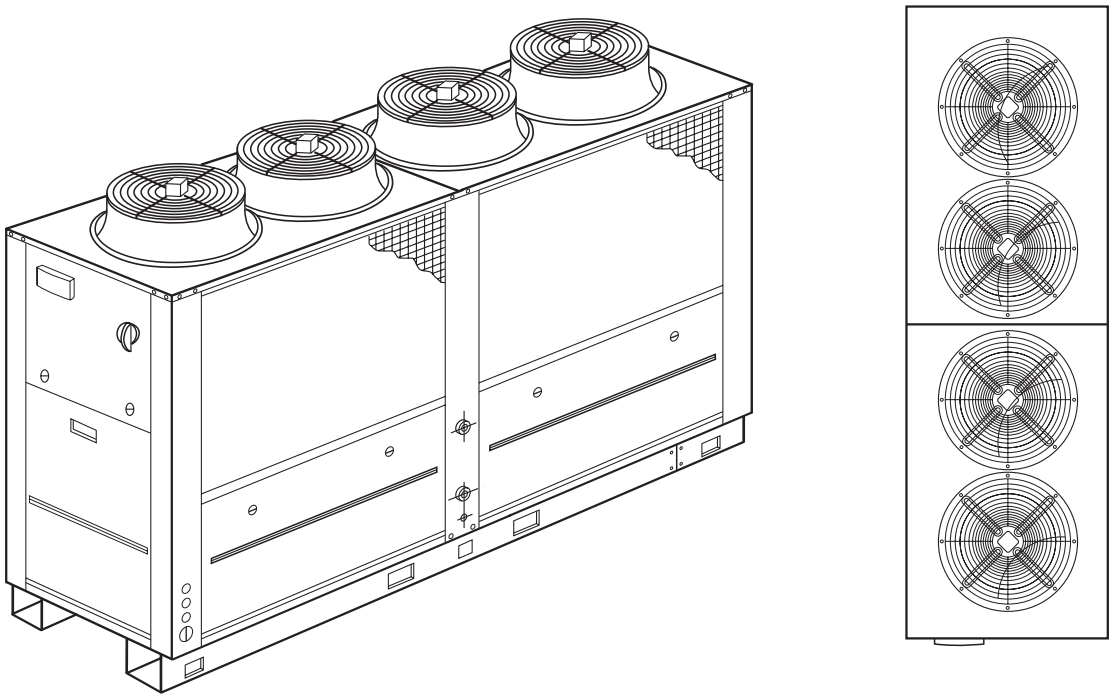
Hydraulic connections

The hydraulic connections of the water intake and outlet of the chiller should be carried out respecting the intake and outlet directions indicated.
Galvanised iron or copper tubing can be use, with dimensions no lower than those indicated, and keeping in mind the pressure drops at said connections and at the indoor exchanger of the installation.
The pump should be sized in accordance with a nominal flow that allows an Δt within the operating limits.
In all cases, a flow switch should be installed so as to avoid the possibility of operation without water circulation.
An expansion vessel should be installed in the water return tubing.
This vessel must be adequate for the total water volume of the installation.
During the winter season, with outdoor temperatures below 0°C, precautions should be taken to avoid water from freezing in the tubing networks.
Usual application is to fill the circuit with an antifreeze mixture (glycol).

Dimensions and hydraulic connections

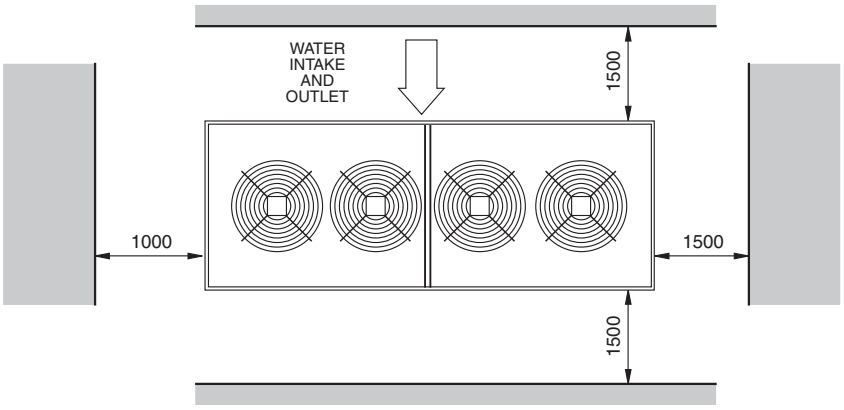
YCSA/YCSA-H 120 and 150T TP

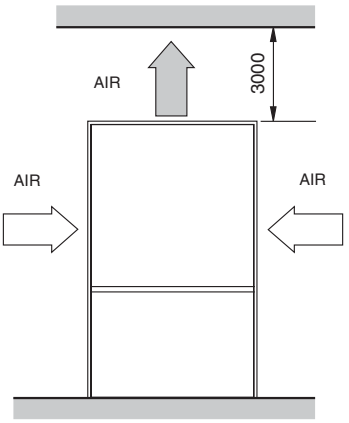


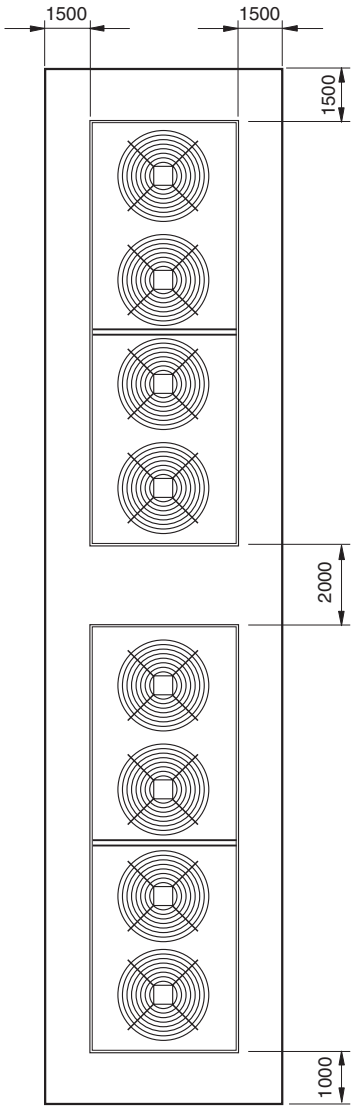


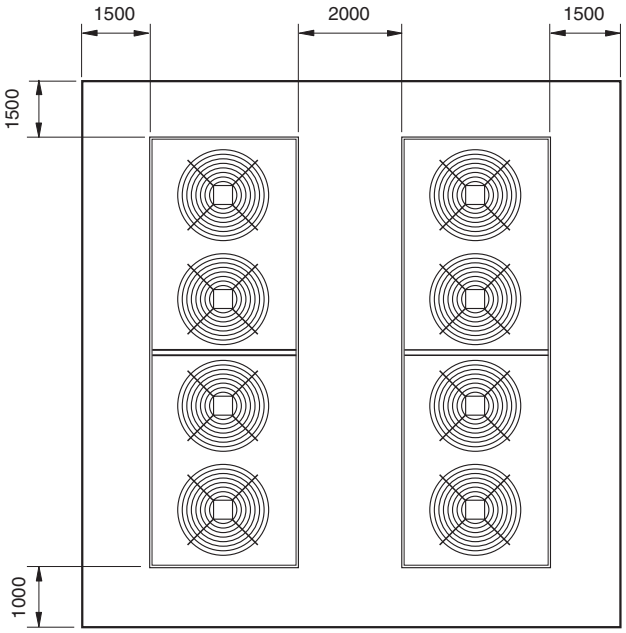
Model	A	B	C	D	E	F	G	H
YCSA/YCSA-H 120	3 416	183	1 525	1 942	2 190	199	289	380
YCSA/YCSA-H 150	3 770	255	1 630	1 993	2 263	145	211	458

Minimum technical clearance

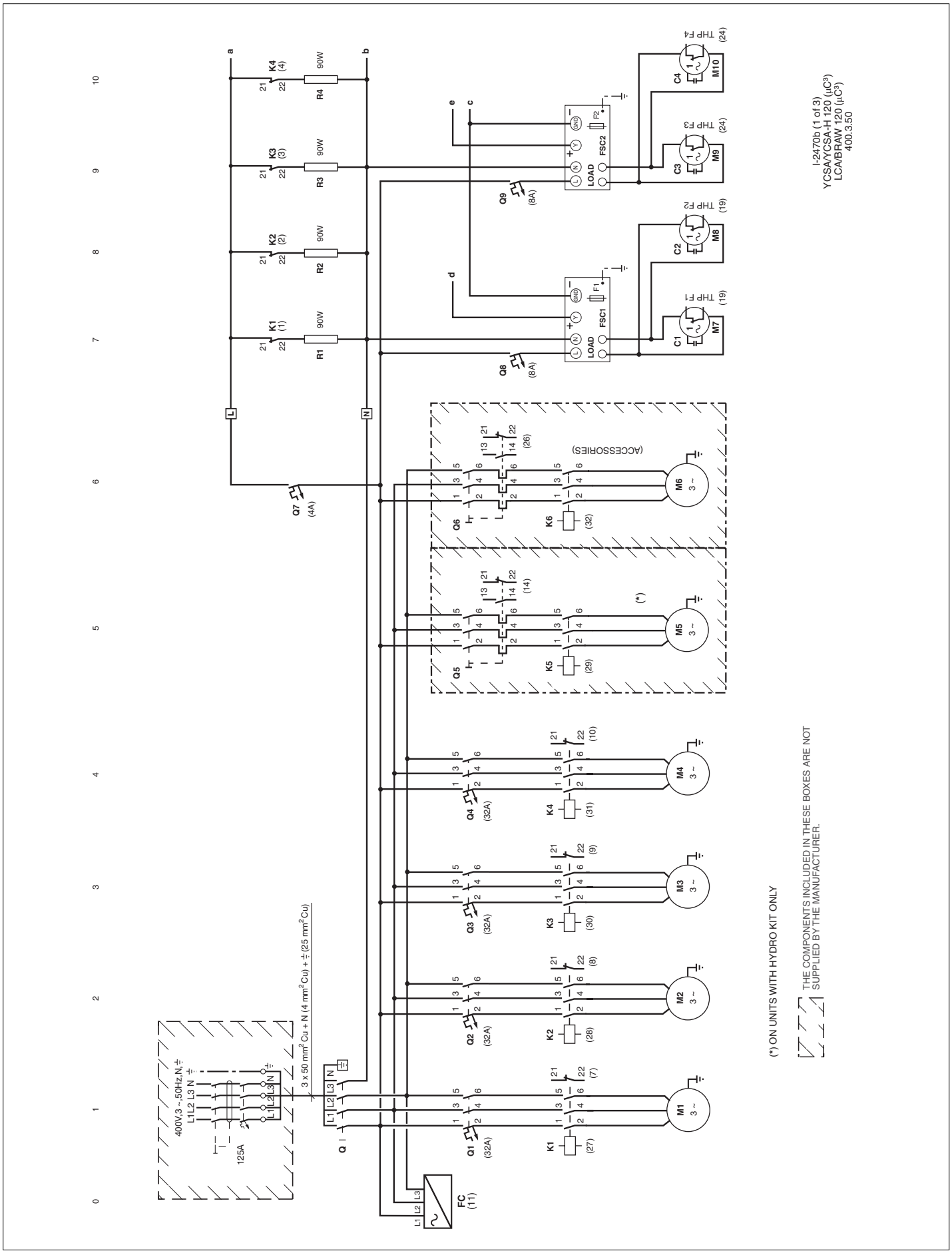




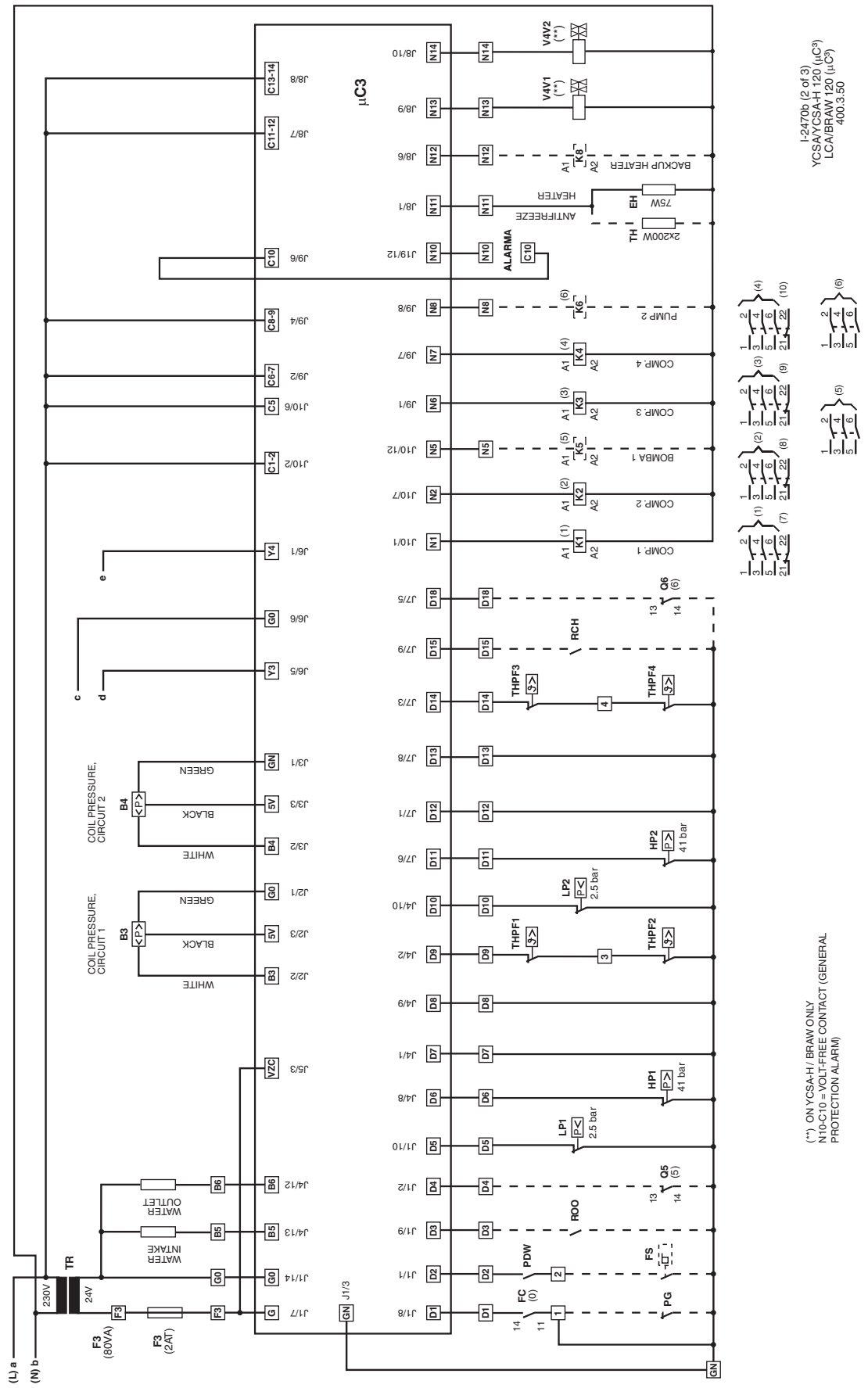




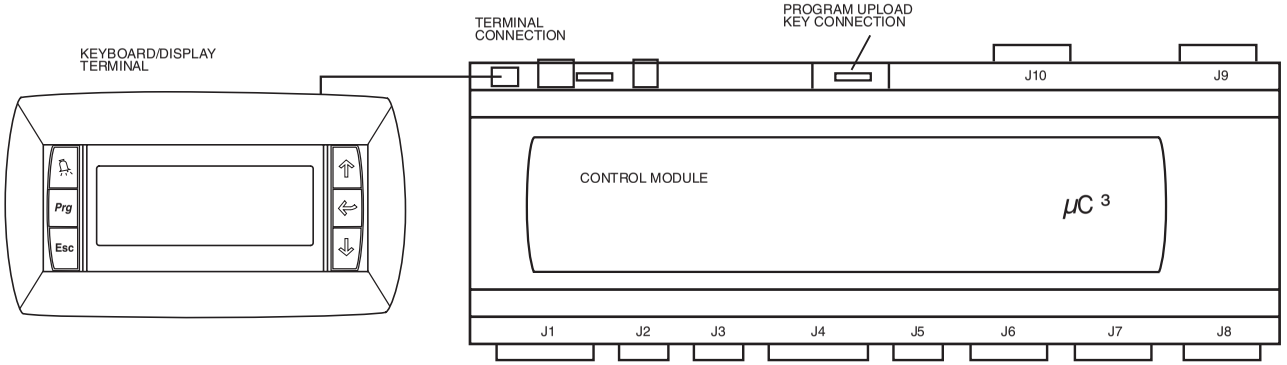
Wiring diagram, YCSA/YCSA-H 120 (µC3), 400.3.50



Wiring diagram, YCSA/YCSA-H 120 (µC3), 400.3.50



B3, 4:	COIL PRESSURE SENSORS CIRCUITS 1 AND 2
B5:	ENTERING WATER TEMPERATURE PROBE (NTC)
B6:	LEAVING WATER TEMPERATURE PROBE (NTC)
C1, 2, 3, 4:	FAN CAPACITORS
EH:	EVAPORATING UNIT ANTIFREEZE HEATER
F1, 2:	FAN SPEED CONTROL FUSES
F3:	CONTROL PROTECTING FUSE µC3 (2AT)
FC:	PHASE CONTROL (COMPRESSOR ROTATIONAL DIRECTION)
FS:	WATER FLOW SWITCH
FSC1, 2:	FAN SPEED CONTROL, CIRCUITS 1 AND 2
HP1, 2:	HIGH PRESSURE SWITCH, CIRCUITS 1 AND 2
K1, 2, 3, 4:	COMPRESSOR CONTACTORS
K5, 6:	PUMP CONTACTORS
K8:	BACKUP HEATER CONTACTOR
LP1, 2:	LOW PRESSURE SWITCH, CIRCUITS 1 AND 2
M1, 2, 3, 4:	COMPRESSOR MOTORS
M5, 6:	PUMP MOTORS (ACCESSORY)
M7, 8, 9, 10 :	FAN MOTORS
mC3:	MICROCHILLER CONTROL 3
PDW:	DIFFERENTIAL PRESSURE SWITCH, WATER CIRCUIT
PG:	GENERAL PROTECTION
Q:	MAIN SWITCH
Q1, 2, 3, 4:	AUTOMATIC SWITCHES, COMPRESSORS
Q5, 6:	AUTOMATIC SWITCHES, PUMPS M5 AND M6
Q7:	AUTOMATIC SWITCH, OPERATING CIRCUIT
Q8, 9:	AUTOMATIC SWITCHES, FANS OF CIRCUITS 1 AND 2
R1, 2, 3, 4:	COMPRESSOR SUMP HEATERS
RCH:	REMOTE COOL/HEAT
ROO:	REMOTE ON/OFF
TH:	TANK ANTIFREEZE HEATER
THPF1, 2, 3, 4:	FAN THERMAL PROTECTORS
TR:	230/24, 80VA TRANSFORMER
V4V1 ,2:	4-WAY VALVES CIRCUITS 1 AND 2



J1

G0	B1	B2	B8	D5	D3	D1
14	13	12	11	10	9	8
7	6	5	4	3	2	1
G	G0	G0	Y1	G0	D4	D2

J2

GN	B3	5VR
1	2	3

J3

GN	B4	5VR
1	2	3

J4

X	B5	B6	B7	D10	D8	D6
14	13	12	11	10	9	8
7	6	5	4	3	2	1
X	GN	GN	Y2	GN	D9	D7

J5

B9	GN	B10
6	5	4
3	2	1
VZC	GN	VDC

J6

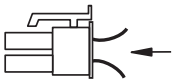
Y5A	Y5	GN	Y3
8	7	6	5
4	3	2	1
Y6A	Y6	GN	Y4

J7

D17	D15	D13	GN	D11
10	9	8	7	6
5	4	3	2	1
D18	D16	D14	GN	D12

J8

N14	N13	C13-14	C11-12	N12
10	9	8	7	8
5	4	3	2	1
X	X	C13-14	C11-12	N11



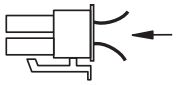
J1, J4, J5
J6, J7 & J8

J9

N6	C6-7	C6-7	C8-9	X	C10
1	2	3	4	5	6
7	8	9	10	11	12
N7	N8	N9	C8-9	X	N10

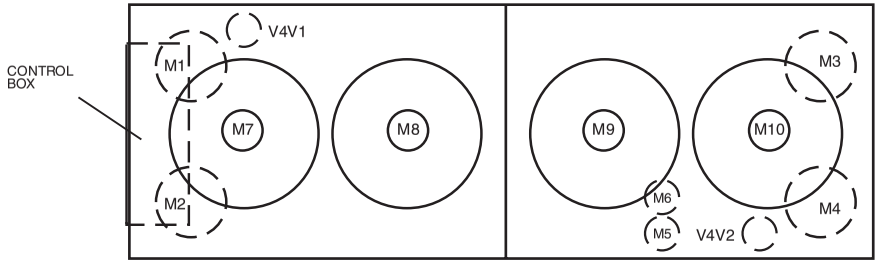
J10

N1	C1-2	C1-2	C3-4	X	C5
1	2	3	4	5	6
7	8	9	10	11	12
N2	N3	N4	C3-4	X	N5



J9 & J10

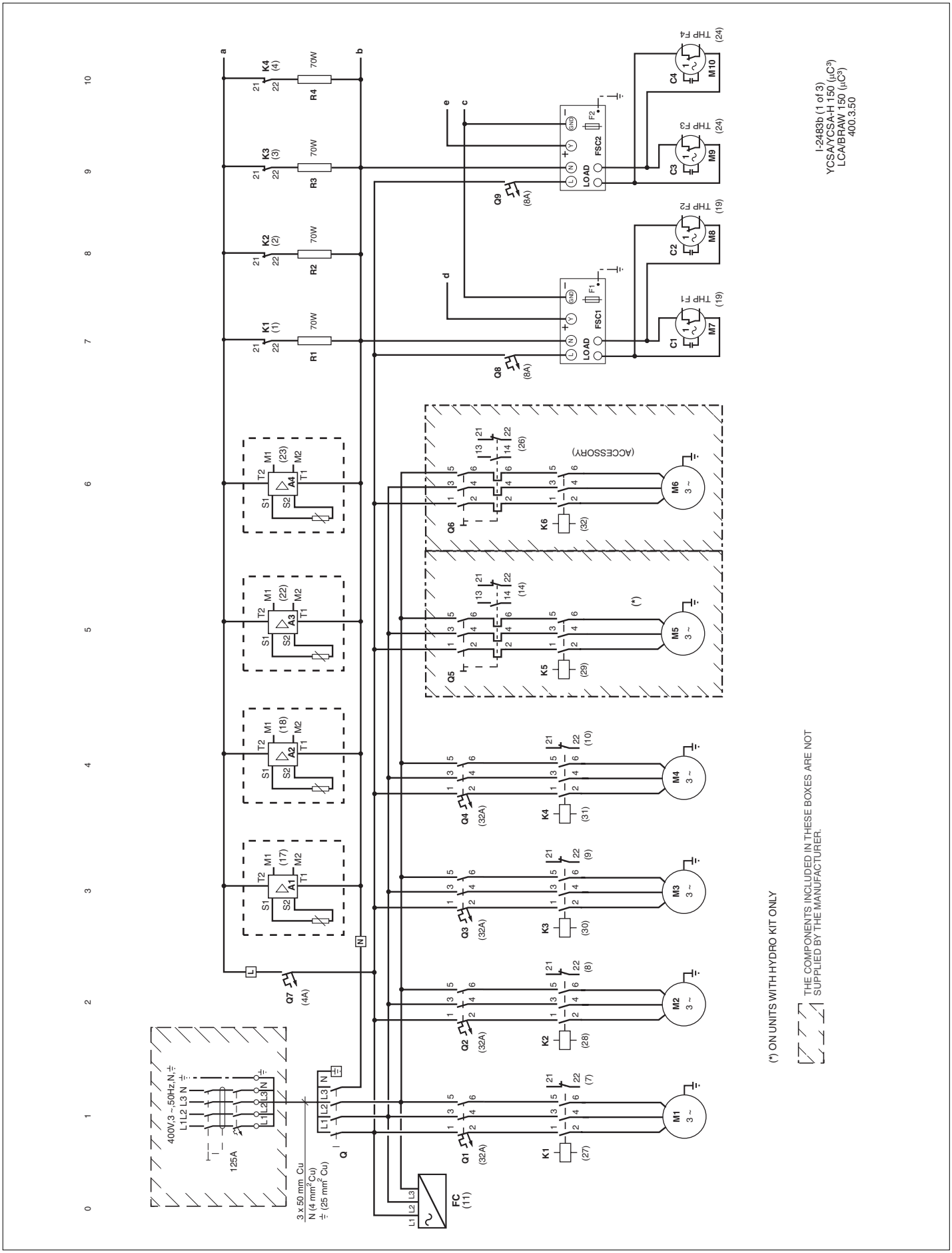
IDENTIFICATION OF CONNECTORS AND THEIR TERMINALS



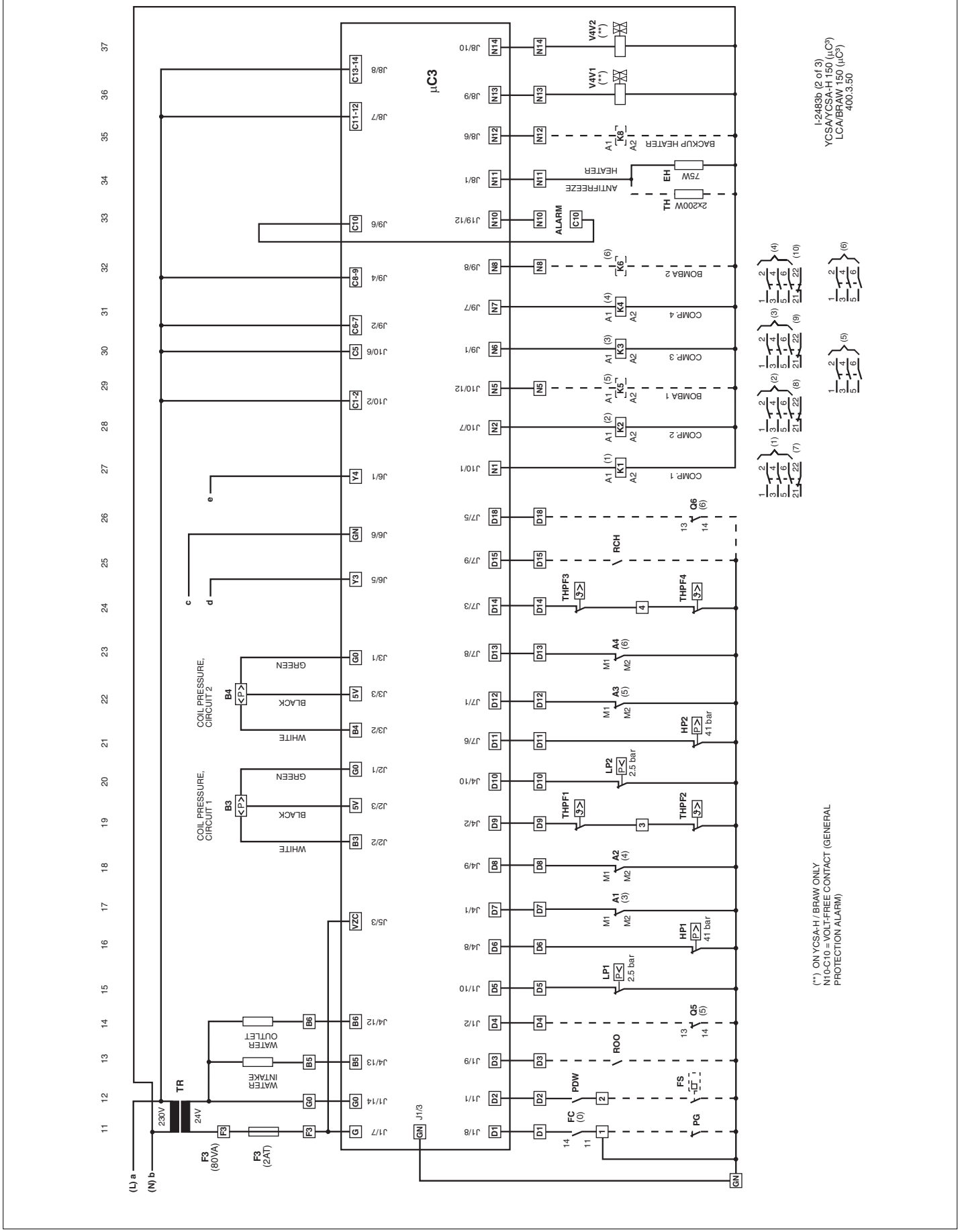
DISTRIBUTION OF MOTORS AND FANS LCA/BRAW

I-2470b (3 of 3)
YCSA/YCSA-H 120 (µC³)
LCA/BRAW 120 (µC³)
400.3.50

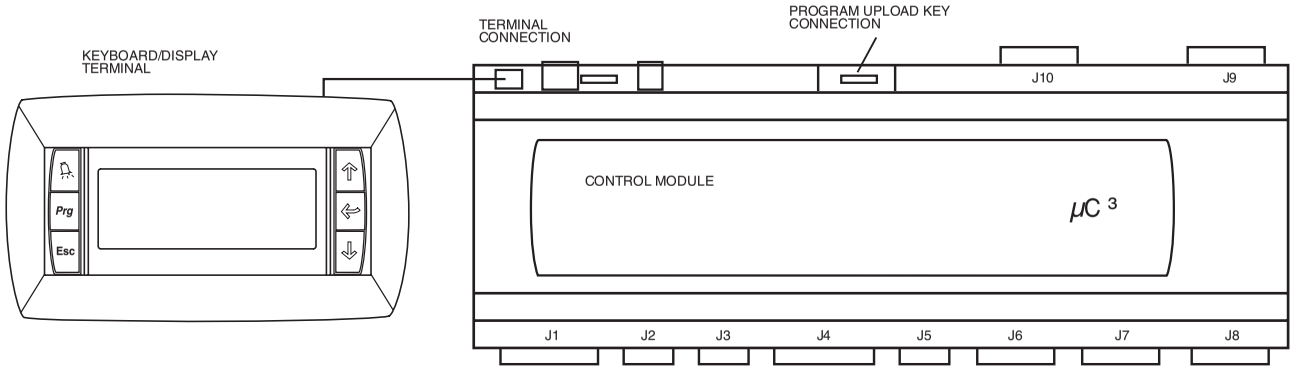
Wiring diagram, YCSA/YCSA-H 150 (µC3), 400.3.50



Wiring diagram, YCSA/YCSA-H 150 (µC3), 400.3.50



A1, A2, A3, A4:	COMPRESSOR THERMAL PROTECTION MODULES
B3, 4:	COIL PRESSURE SENSORS CIRCUITS 1 AND 2
B5:	ENTERING WATER TEMPERATURE PROBE (NTC)
B6:	LEAVING WATER TEMPERATURE PROBE (NTC)
C1, 2, 3, 4:	FAN CAPACITORS
EH:	EVAPORATING UNIT ANTIFREEZE HEATER
F1, 2:	FAN SPEED CONTROL FUSES
F3:	CONTROL PROTECTING FUSE μC3 (2AT)
FC:	PHASE CONTROL (COMPRESSOR ROTATIONAL DIRECTION)
FS:	WATER FLOW SWITCH
FSC1, 2:	FAN SPEED CONTROL CIRCUITS 1 AND 2
HP1, 2:	HIGH PRESSURE SWITCH, CIRCUITS 1 AND 2
K1, 2, 3, 4:	COMPRESSOR CONTACTORS
K5, 6:	PUMP CONTACTORS
K8:	BACKUP HEATER CONTACTOR
LP1, 2:	LOW PRESSURE SWITCH, CIRCUITS 1 AND 2
M1, 2, 3, 4:	COMPRESSOR MOTORS
M5, 6:	PUMP MOTORS (ACCESSORY)
M7, 8, 9, 10 :	FAN MOTORS
mC3:	MICROCHILLER CONTROL 3
PDW:	DIFFERENTIAL PRESSURE SWITCH, WATER CIRCUIT
PG:	GENERAL PROTECTION
Q:	MAIN SWITCH
Q1, 2, 3, 4:	AUTOMATIC SWITCHES, COMPRESSORS
Q5, 6:	AUTOMATIC SWITCHES, PUMPS M5 AND M6
Q7:	AUTOMATIC SWITCH, OPERATING CIRCUIT
Q8, 9:	AUTOMATIC SWITCHES, FANS OF CIRCUITS 1 AND 2
R1, 2, 3, 4:	COMPRESSOR SUMP HEATERS
RCH:	REMOTE COOL/HEAT
ROO:	REMOTE ON/OFF
TH:	TANK ANTIFREEZE HEATER
THPF1, 2, 3, 4:	FAN THERMAL PROTECTORS
TR:	230/24, 80VA TRANSFORMER
V4V1 ,2:	4-WAY VALVES CIRCUITS 1 AND 2



J1						
G0	B1	B2	B8	D5	D3	D1
14	13	12	11	10	9	8
7	6	5	4	3	2	1
G	G0	G0	Y1	G0	D4	D2

J2		
GN	B3	5VR
1	2	3

J3		
GN	B4	5VR
1	2	3

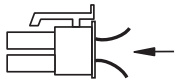
J4						
X	B5	B6	B7	D10	D8	D6
14	13	12	11	10	9	8
7	6	5	4	3	2	1
X	GN	GN	Y2	GN	D9	D7

J5		
B9	G0	B10
6	5	4
3	2	1
VZC	GN	VDC

J6			
Y5A	Y5	G0	Y3
8	7	6	5
4	3	2	1
Y6A	Y6	GN	Y4

J7				
D17	D15	D13	G0	D11
10	9	8	7	6
5	4	3	2	1
D18	D16	D14	GN	D12

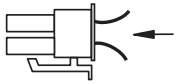
J8				
N14	N13	C13-14	C11-12	N12
10	9	8	7	8
5	4	3	2	1
X	X	C13-14	C11-12	N11



J1, J4, J5
J6, J7 & J8

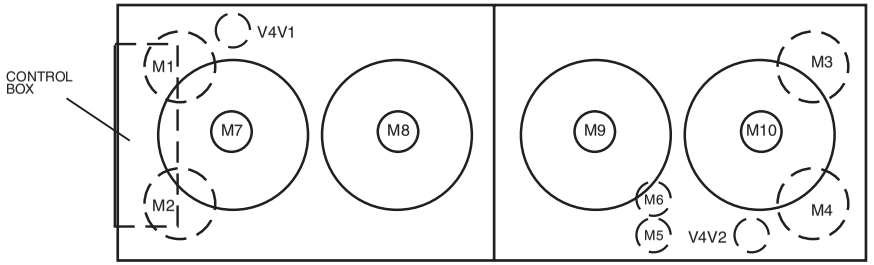
J9					
N6	C6-7	C6-7	C8-9	X	C10
1	2	3	4	5	6
7	8	9	10	11	12
N7	N8	N9	C8-9	X	N10

J10					
N1	C1-2	C1-2	C3-4	X	C5
1	2	3	4	5	6
7	8	9	10	11	12
N2	N3	N4	C3-4	X	N5



J9 & J10

IDENTIFICATION OF CONNECTORS AND THEIR TERMINALS

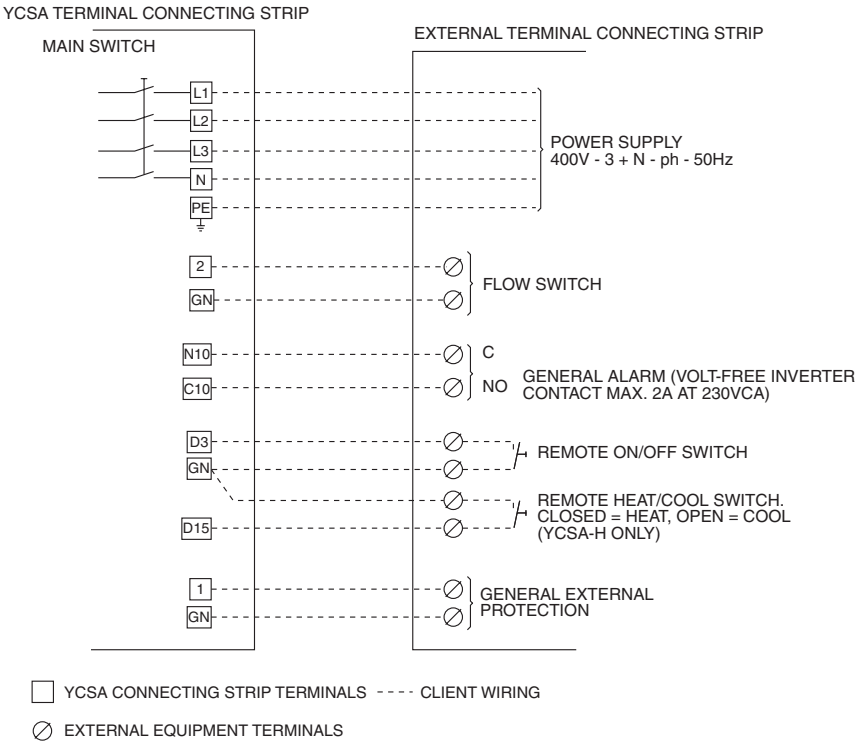


DISTRIBUTION OF MOTORS AND FANS LCA/BRAW

I-2483b (3 of 3)
YCSA/YCSA-H 150 (μC³)
LCA/BRAW 150 (μC³)
400.3.50

Wiring

YSCA/YSCA-H 120 and 150 T/TP



Electrical characteristics

Model	Power supply V.ph.Hz.	Compressor					Fans		Pump	
		Nominal A		Start	Nominal kW		Nominal	Nominal	Nominal	Nominal
		Cool	Heat	A	Cool	Heat	A	W	A	W
YCSA-H 120	400.3.50	4 x 18.2	4 x 16.9	118	4 x 10.2	4 x 9.25	4 x 2.75	4 x 600	5.5	3 180
YCSA 120		4 x 17.7	-		4 x 9.4	-				
YCSA-H 150		4 x 21.4	4 x 21.6	198	4 x 11.8	4 x 12.5	4 x 3.9	4 x 860	6.1	3 400
YCSA 150		4 x 21.4	-		4 x 11.5	-				

Limits of use

Model	Voltage limits		DB air inlet temperature to coil				Water outlet temperature				Temp. differential between the water outlet and intake	
	Nominal at 400		Operating cycle				Operating cycle					
			Minimum °C		Maximum °C		Minimum °C		Maximum °C		Minimum °C	Maximum °C
	Minimum	Maximum	Cool	Heat	Cool	Heat	Cool	Heat	Cool	Heat		
YCSA	342	436	-18	-	46 (2)	-	6 (1)	-	15	-	3	7
YCSA-H				-10		20		30		50 (3)		

(1) At lower water temperatures, it is advisable to use glycol type antifreeze mixtures. Minimum T° with glycol -5° C (2) IPESL - SdM - UMT - TÜV, 38° C SAQ, 40° C DUTCH. (3) 45° C if intake air is -below 0° C.

Prior to final approval of the installation

Check:
- That voltage is always between 342 - 436 V.
- That the power supply cable section is at least equal to the section recommended in the corresponding wiring diagrams.

- That operating instructions have been given to the user.

- That the guarantee card has been filled out.
- That maintenance instructions have been given, or a regular revision contract has been signed.

Operating Instructions

µC3 control

This control unit is specially programmed to control air-water chillers and heat pumps with four capacity stages. These are distributed in two independent cooling circuits with two tandems that act upon a common water circuit. Both systems have two fans each, with speeds controlled by pressure sensors. This control unit operates by means of the following intakes and outlets.

Digital inputs

ID1 - J1/8	General protection (PG)
ID2 - J1/1	Flow switch (FS)
ID3 - J1/9	Remote ON/OFF (ROO)
ID4 - J1/2	Pump 1 protector (Q5)
ID5 - J1/10	Low pressure switch, circuit 1 (LP1)
ID6 - J4/8	High pressure switch, circuit 1 (HP1)
ID7 - J4/1	Thermal protection, compressor 1 (THPC1)
ID8 - J4/9	Thermal protection, compressor 2 (THPC2)
ID9 - J4/2	Thermal protection, fans circuit 1 (THPF 1-2)
ID10 - J4/10	Low pressure switch, circuit 2 (LP2)
ID11 - J7/6	High pressure switch, circuit 2 (HP2)
ID12 - J7/1	Thermal protection, compressor 3 (THPC3)
ID13 - J7/8	Thermal protection, compressor 4 (THPC4)
ID14 - J7/3	Thermal protection, fans circuit 2 (THPF 3-4)
ID15 - J7/9	Remote COOL/HEAT (RCH)
ID18 - J7/5	Pump 2 protector (Q6)

Digital outputs

N01/C1-2	Compressor 1, circuit 1 (K1)
N02/C1-2	Compressor 2, circuit 1 (K2)
N05/C5	Pump 1
N06/C6-7	Compressor 3, circuit 2 (K3)
N07/C6-7	Compressor 4, circuit 2 (K4)
N08/C8-9	Pump 2
N010/C10	Alarm
N011/C11-12	Antifreeze heater, circuit 1-2
N012/C11-12	Backup heater
N013/C13-14	4-way valve, circuit 1 (V4V1)
N014/C13-14	4-way valve, circuit 2 (V4V2)

Analogical inputs

B3 - J2	Coil pressure, circuit 1
B4 - J3	Coil pressure, circuit 2
B5 - J4/13	Water temperature at exchanger intake
B6 - J4/12	Water temperature at exchanger outlet

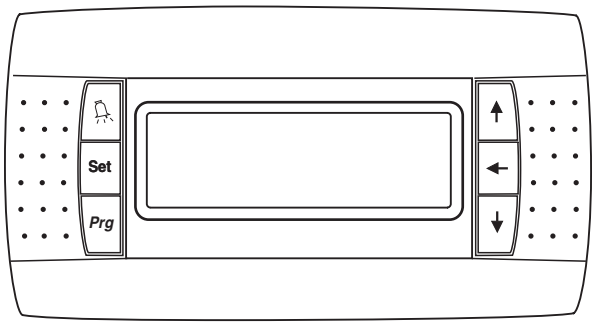
Analogical outputs

Y3	Fan speed control, circuit 1 (PWM)
Y4	Fan speed control, circuit 2 (PWM)

The system is comprised of the following basic components:
- *Keyboard-display*
- *µC3 controller*
- *Fan speed controllers (FSC1 and FSC2)*
- *Pressure sensors (B3 and B4)*
- *NTC probes (B5 and B6)*

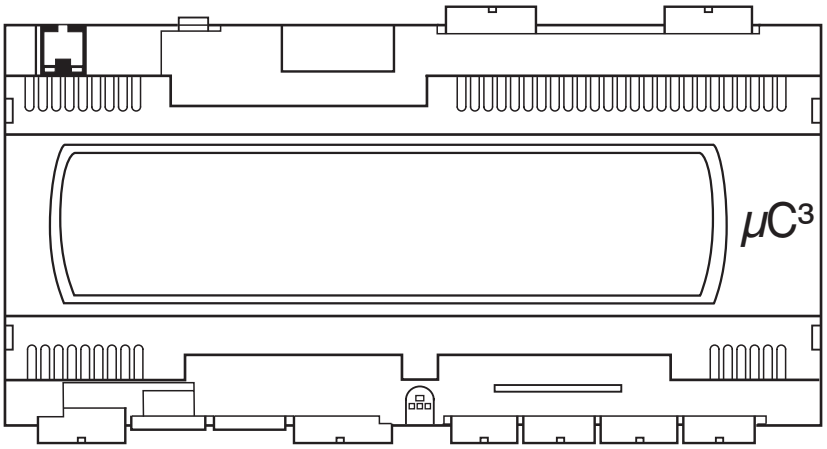
Keyboard-display

A display screen and six keys with the following functions: *Alarm.Prg (Programming)*, *Esc (Escape)*, *Up, Enter* and *Down*. This display allows selecting the ON/OFF and COOL/HEAT, as well as reading the status of the unit, accessing configuration menus (by means of a *password*), reading alarm messages, resetting said alarms, reading operating pressures and temperature, etc.



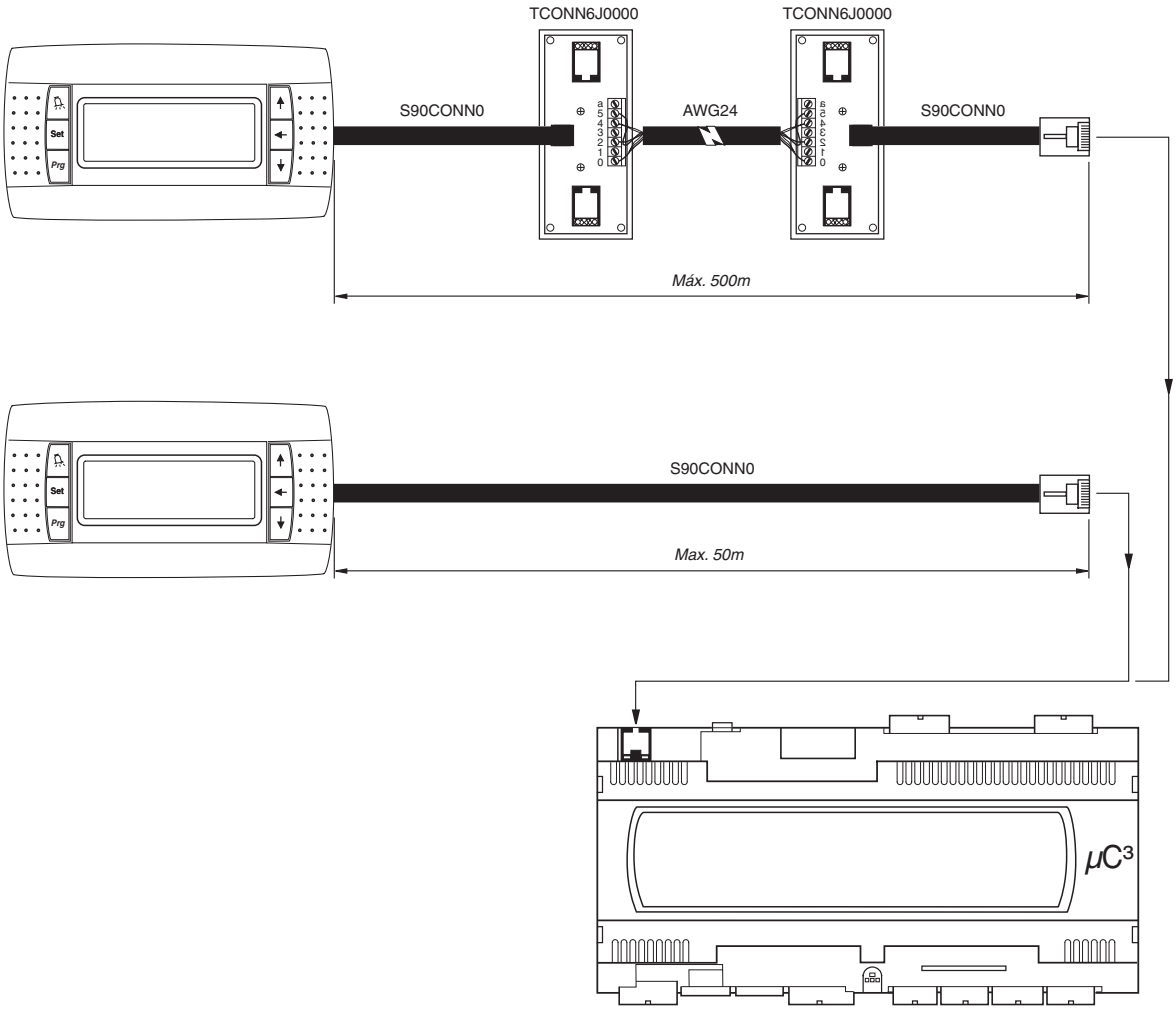
µC3 controller

Contains unit *software* and the entire digital and analogical input and output connectors system. This module is also equipped with connectors for the program upload key and for communication connection in series with a RS485 monitoring system.

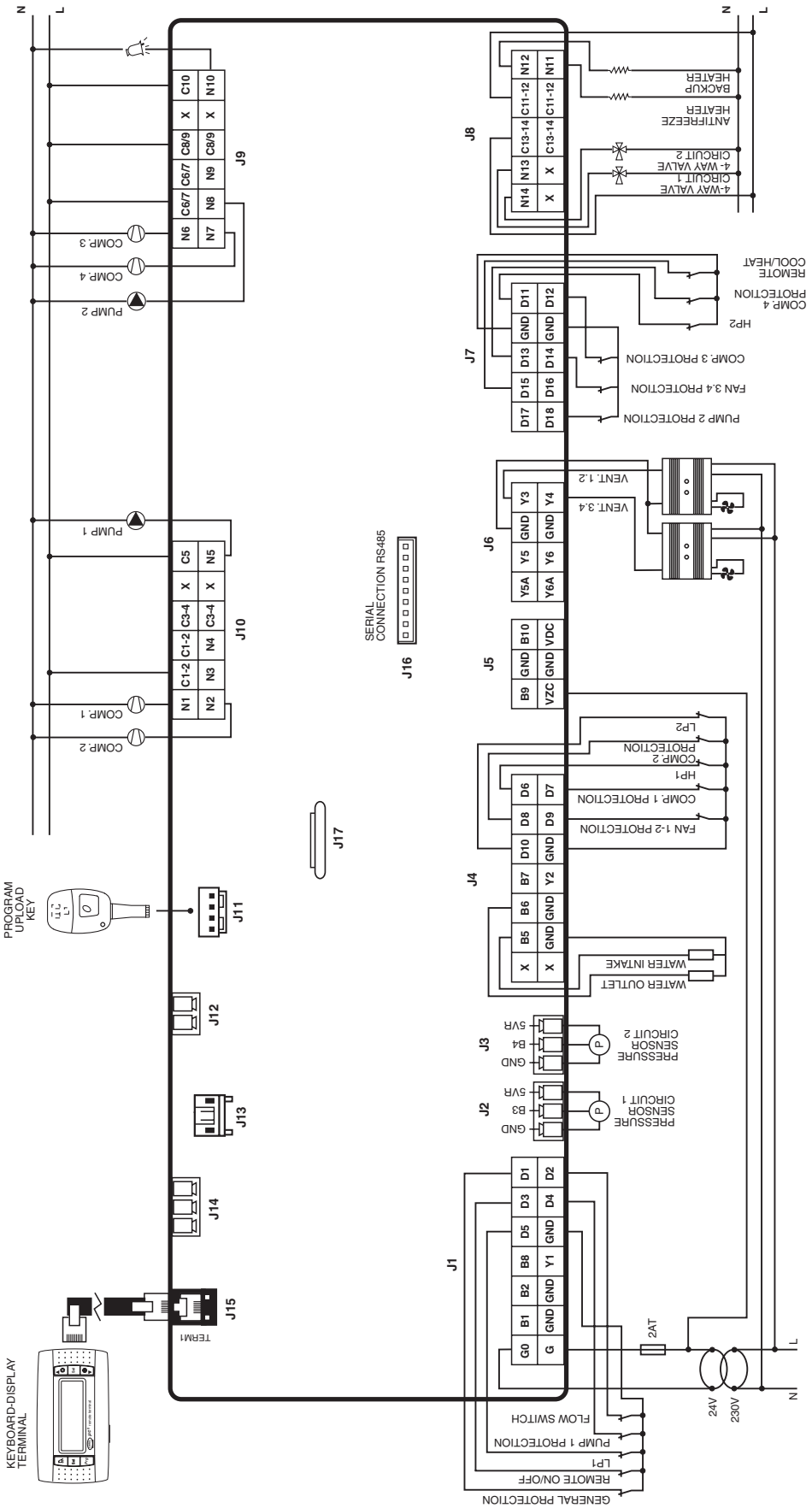


Keyboard-display remoting
The display can be located at 50 m. from the μC3 controller by means of a telephone cable.
This distance can be increased to 500 m. by using an AWG24 screened twisted-2 pair cable. This cable should be inserted between two TCONN6J000 connectors (accessory) which, at the same time, are connected to two S90CONN0 telephone cables (accessory). Please see the following diagram.

Terminal connection with telephone cable and a screened twisted-2 pair cable



General wiring diagram



Pressure sensors (B3 and B4)

One for each cooling circuit, and connected to the coil sumps. These provide information to the system for fan speed control in the summer and winter cycles, management of defrosts on heat pumps, and system high pressure prevent and lockout functions.

NTC probes (B5 and B6)

B5 - Detect and control entering water temperature (cool only and heat pump units).
B6 - Detect and control leaving water temperature.
These probes provide all information necessary for antifreeze protection and control of antifreeze and backup heaters. If necessary, they enable controlling the temperature of the water leaving the exchanger.

Commissioning
The Start screen appears about 45 seconds after connecting the power supply. Default language: English.

1st screen. Start *(water temperature/unit status)*
- Entering water temperature.
- Leaving water temperature.
- Unit status (*ON/OFF*).

Press *"Down"* to access the second screen.

2nd screen. Selection of status and operating mode
Selection of *ON/OFF* status (*Enter, Up and Down keys*).
On heat pump units, select the *Cool/Heat* operating mode (by means of *"Enter", "Up" and "Down"*).
To go back to the 1st screen, press *Esc*.

System configuration *(for authorized servicing personnel only)*

3rd screen. Insert password
The 3rd screen, *Insert password*, is accessed by pressing *"Up"* on screen 1 (Start), or *"Down"* on screen 2 (Selection of status/operating mode).
- From the *Insert password* screen, press *Enter*.
- Enter the *password* by means of the *Up* key.
- Press *Enter* to access the 4th screen, *Menu*.

4th screen. Menu
This screen gives access to an range of submenus that allow obtaining information concerning the unit or setting the operating parameters of same. These submenus are as follows:

-/- Probe configuration
-A- Antifreeze
-B- Input/output
-c- Compressor configuration
-d- Defrost
-F- Condensation *(fans)*
-H- Unit configuration
-P- Alarm settings
-r- Temperature *(param.)* control
-Fr- Software version/language selection
-t- Time configuration *(not available)*

To enter a submenu, press the *Up* or *Down* key to select, and then *Enter*.
Once the desired parameters have been changed by pressing the *Enter, Up* and *Down* keys, press *Prg* to confirm these modifications and go back to the Menu screen.
To exit the Menu screen, press *Esc*.

-/- Configuration of the probes

DESCRIPTION		RANGE	UNIT	VALUE
Probe B3 calib.	Coil pressure, circuit 1	-9.9 / 9.9	bar	0
Probe B4 calib.	Coil pressure, circuit 2	-9.9 / 9.9	bar	0
Probe B5 calib.	Entering water temp., exchanger	-9.9 / 9.9	°K	0
Probe B6 calib.	Leaving water temp, exchanger	-9.9 / 9.9	°K	0
Probe B7 calib.	Outdoor temp.	-9.9 / 9.9	°K	0
Probe B8 calib.	*Dynamic set point*	-9.9 / 9.9	%	0
Probe B1 enable		Y/N	-	N
Probe B2 enable		Y/N	-	N
Probe B3 enable	Coil pressure, circuit 1	Y/N	-	Y
Probe B4 enable	Coil pressure, circuit 2	Y/N	-	Y
Probe B5 enable	Entering water temp., exchanger	Y/N	-	Y
Probe B6 enable	Leaving water temp., exchanger	Y/N	-	Y
Probe B7 enable		Y/N	-	N
Probe B8 enable		Y/N	-	N
Probe B9 enable		Y/N	-	N
Probe B10 enable		Y/N	-	N
Probe B3 config.	Minimum value	-30/150	bar	1
Probe B3 config.	Maximum value	-30/150	bar	46
Probe B4 config.	Minimum value	-30/150	bar	1
Probe B4 config.	Maximum value	-30/150	bar	46

-A- Antifreeze

DESCRIPTION	RANGE	UNIT	VALUE
Antifreeze alarm set point	-99.9/99.9	°C	3
Antifreeze alarm dif. set point	99.9	°K	5
Antifreeze alarm set point, lower limit	-99.9/99.9	°C	3
Antifreeze alarm set point, upper limit	-99.9/99.9	°C	5
Antifreeze alarm reset	MANUAL AUTOMATIC	-	MANUAL
Antifreeze alarm delay (if auto. reset is selected)	0/540	min.	0
Activation set point, antifreeze heater	-99.9/99.9	°C	3
Activation dif. set point, antifreeze heater	-99.9/99.9	°K	2
Backup heater set point (winter cycle)	-99.9/99.9	°C	25
Backup heater dif. set point (winter cycle)	-99.9/99.9	°K	5
Backup heater activation delay	0/60	min.	15
Automatic activation of antifreeze system with the unit OFF	DISABLED HEATER & PUMP HEATER & UNIT HEATER	-	HEATER

-C- Compressor configuration

DESCRIPTION	RANGE	UNIT	VALUE
Min. compressor ON time	0/9999	sec.	120
Min. compressor OFF time	0/9999	sec.	60
Time between starts of different compressors	0/9999	sec.	3
Time between starts of one compressor	0/9999	sec.	300
Time between starts of pump and compressor	0/999	sec.	20
Time between compressor and pump OFF	0/999	sec.	20
Run hours, pump 1			
Run hours, pump 2			
Run hours, compressor 1			
Run hours, compressor 2			
Run hours, compressor 3			
Run hours, compressor 4			
Run hours for pump maintenance warning	1000/999000	hours	2x1000
Clear pump run hours			
Operating hours for maintenance warning of compressor 1 / circuit 1	1000/999000	hours	2x1000
Clearing of operating hours of compressor 1 / circuit 1			
Operating hours for maintenance warning of compressor 2 / circuit 1	1000/999000	hours	2x1000
Clearing of operating hours of compressor 2 / circuit 1			
Operating hours for maintenance warning of compressor 1 / circuit 2	1000/999000	hours	2x1000
Clearing of operating hours of compressor 1 / circuit 2			
Operating hours for maintenance warning of compressor 2 / circuit 2	1000/999000	hours	2x1000
Clearing of operating hours of compressor 2 / circuit 2			
Rotational time of tandem compressors		min.	20
Enable compressors $C^1/_1$, $C^2/_1$, $C^1/_2$ and $C^2/_2$	Y/N		Y
Forced manual operation of compressors	Y/N		N

-d- Defrost

When a defrost cycle is in operation, a DEFROST REQ message appears on the start screen.

DESCRIPTION	RANGE	UNIT	VALUE
Selection of defrost probe	TEMP/PRES. PRESSURE SWITCH	-	PRESIÓN
Separate or simultaneous defrost (contemporary)	SEPARATE SIMULTANEOUS	-	SIMULTANEOUS
End defrost in intervals of	TIME TEMP/PRES.	-	TEMP./PRESIÓN
Defrost start pressure	-99.8/99.9	bar	5.8
Defrost end pressure	-99.8/99.9	bar	26
Defrost call delay	1/32000	sec	1800
Max. duration defrost	1/32000	sec	420
Min. duration defrost	1/32000	sec	0
Time between defrosts in the same circuit	1/32000	sec	0
Time between defrosts in different circuits	1/32000	sec	0
Forced off time of compressor at defrost start and end	0/999	sec	40
Delay in 4-way valve inversion	0/999	sec	15
Manual defrost	ENABLED DISABLED	-	DISABLED

-F- Condensation (fans)

DESCRIPTION	RANGE	UNIT	VALUE
Control typo over fans	TEMPERATURE PRESSURE ON/OFF	-	PRESSURE
Number of condensers	1 - 2	-	2
Control device	INVERTER FANS	-	INVERTER
Power supply frequency	50/60	Hz	50
Max. PWM triac phase cut-out	0/100	%	75
Min. PWM triac phase cut-out	0/100	%	40
Duration triac impulse	0/10	ms	2.5
Condensing pressure in summer cycle	0/99.9	bar	28
Dif. condensing pressure in summer cycle	0/99.9	bar	4
Evaporating pressure in winter cycle	0/99.9	bar	10
Evaporating pressure differential in winter cycle	0/99.9	bar	1
Fan speed minimum differential	-99.9/99.9	bar	5
Max. inverter speed	0/10	V	10
Min. inverter speed	0/10	V	0
Inverter speed up time	0/999	sec	30
Enable prevent function (HP)	Y/N	-	Y
Probe selection for HP prevention	PRESSURE TEMP.	-	PRESSURE
Prevent pressure HP	-99.9/99.9	bar	40
Dif. prevent pressure HP	0/99.9	bar	5
LP safety pressure	-99.9/99.9	bar	3
LP safety pressure differential	0/99.9	bar	2
Fan management in case of probe failure	FAN OFF FAN ON & COMP. ON		FAN OFF
Prevent function timing	0/99	sec	0

-H- Unit configuration

DESCRIPTION	RANGE	UNIT	VALUE
Unit type	0 - 7	-	2 (CHILLER) 3 (HP)
Number of compressors / circuits	-	4 / 2	
Rotation of compressors	LIFO FIFO TIME CUSTOM	-	FIFO
Number of evaporators	1 - 2	-	1
Driver number (EVD400)	0-1-2-4	-	0
Cycle inverting valve logic	NO/NC	-	NC
Number of pumps	1 - 2	-	1 (SINGLE) 2 (DUAL PUMP ACCESSORY)
Pump operation	ON WITH COMP. ON ALWAYS OFF ALWAYS ON SAFETY ON/ OFF		ALWAYS ON
Rotation of pumps	START TIME	-	TIME
Number of hours for pump rotation	0-9999	hours	12
Enable ON/OFF digital input	Y/N	-	Y
Enable WINTER/SUMMER digital input	Y/N	-	Y
Enable ON/OFF with Monitor	Y/N	-	Y
Enable WINTER/SUMMER with Monitor	Y/N	-	Y
Inversion delay SUMMER/WINTER operation		sec	10
Monitor protocol	CAREL MODEM GSM ANALOGUE MODEM RS 232 LONWORKS MODBUS	-	CAREL
Communication speed sel.	1200; 2400; 4800; 9600; 19200	bauds	19200
ID number for Monitor	0-200	-	1
Enable language selection at commissioning	Y/N	-	Y
Restore default values (Attention!)	Y/N	-	N

-B- Inputs/Outputs

DESCRIPTION	RANGE	UNIT	VALUE
Analogue input 3. Coil pressure circuit 1 (B3)		bar	DISPLAY INSTANT.
Analogue input 4. Coil pressure circuit 2 (B4)		bar	DISPLAY INSTANT.
Analogue input 5. Entering water temperature (B5)		ºC	DISPLAY INSTANT.
Analogue input 6. Leaving water temperature (B6)		ºC	DISPLAY INSTANT.
Digital input 1. External alarm	O/C		0 = OPEN C = CLOSED
Digital input 2. Flow switch	O/C		0 = OPEN C = CLOSED
Digital input 3. Remote ON/OFF	O/C		0 = OPEN C = CLOSED
Digital input 4. Pump 1 protection	O/C		0 = OPEN C = CLOSED
Digital input 5. Low pressure switch circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 6. High pressure switch circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 7. Compressor 1 thermal protection, circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 8. Compressor 2 protection, circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 9. Fan 1-2 protection, circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 10. Low pressure switch circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 11. High pressure switch circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 12. Compressor 3 thermal protection, circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 13. Compressor 4 thermal protection, circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 14. Fan 3-4 protection, circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 15. Remote COOL/HEAT	O/C		0 = OPEN C = CLOSED
Digital input 16. No in use			
Digital input 17. No in use			
Digital input 18. Pump 2 protection			0 = OPEN C = CLOSED
Digital output 1. Compressor 1, circuit 1	O/C		0 = OPEN C = CLOSED
Digital output 2. Compressor 2, circuit 1	O/C		0 = OPEN C = CLOSED
Digital output 3. Not in use			
Digital output 4. Not in use			
Digital output 5. Pump 1	O/C		0 = OPEN C = CLOSED
Digital output 6. Compressor 3, circuit 2	O/C		0 = OPEN C = CLOSED
Digital output 7. Compressor 4, circuit 2	O/C		0 = OPEN C = CLOSED
Digital output 8. Not in use			
Digital output 9. Not in use			
Digital output 10. External alarm/phase failure	O/C		0 = OPEN C = CLOSED
Digital output 11. Antifreeze heater	O/C		0 = OPEN C = CLOSED
Digital output 12. Backup heater	O/C		0 = OPEN C = CLOSED
Digital output 13. 4-way valve, circuit 1	O/C		0 = OPEN C = CLOSED
Digital output 14. 4-way valve, circuit 2	O/C		0 = OPEN C = CLOSED

-P- Alarm settings

DESCRIPTION	RANGE	UNIT	VALUE
High pressure alarm set point (transducer B3; B4)	0/99.9	bar	41
High pressure alarm differential (transducer B3; B4)	0/99.9	bar	10
Low pressure alarm, summer	0/99.9	bar	4
Low pressure alarm, winter	0/99.9	bar	3
Low pressure alarm, defrost	0/99.9	bar	1
Low pressure differential	0/99.9	bar	2
Start low pressure alarm delay	0-999	s	60
Operating low pressure alarm delay	0-999	s	0
Start flow switch alarm delay	0-999	s	20
Operating flow switch alarm delay	0-999	s	5
Number OFF cycles per auto reset alarm	0 - 4		1
Max. period for auto. reset alarm	0 - 99	m	60
Selection alarm with auto reset: compressor thermal switch	AUTOMATIC / MANUAL		AUTOMATIC
Selection alarm with auto reset: fan thermal switch	AUTOMATIC / MANUAL		AUTOMATIC
Selection alarm with auto reset: low pressure switch	AUTOMATIC / MANUAL		AUTOMATIC
Selection alarm with auto reset: high pressure switch	AUTOMATIC/ MANUAL		AUTOMATIC

-r- Temperature control

Upon entering this submenu the dynamic *set point* temperatures (if this function is enabled) are displayed. Press *Up* to access the configuration menu.

DESCRIPTION	RANGE	UNIT	VALUE
COOL set point		°C	12
HEAT set point		°C	40
Temperature setting band		°K	3
COOL set point lower limit		°C	6
COOL set point upper limit		°C	15
HEAT set point lower limit		°C	25
HEAT set point upper limit		°C	45
Enable dynamic set point	N/Y	-	N
Max. compensation value	-99.9/99.9	°K	5
Compensation in COOL: start temperature	-99.9/99.9	°C	25
Compensation in COOL: end temperature	-99.9/99.9	°C	35
Compensation in HEAT: start temperature	-99.9/99.9	°C	7
Compensation in HEAT: end temperature	-99.9/99.9	°C	12
Type of temperature setting	INPUT/OUTPUT	-	INPUT
Type of setting with input probe	PROPORTIONAL/P+I		PROPORTIONAL
Type of integration in each adjustment P+1	0/9999	s	600
Max. time call increase (output setting)	0/9999	s	20
Min. time call increase (output setting)	0/9999	s	20
Max. time call decrease (output setting)	0/9999	s	10
Min. time call decrease (output setting)	0/9999	s	10
Temp. differential within flow varies increase & decrease time (output setting)	-99.9/99.9	°C	2
Device forced OFF in COOL cycle (output setting)	-99.9/99.9	°C	5
Device forced OFF in HEAT cycle (output setting)	-99.9/99.9	°C	47
Enable dynamic set point	Y/N		N
Min. dynamic set point	-99.9/99.9	°C	0
Max. dynamic set point	-99.9/99.9	°C	5

F-r. Software version / language selection

- The version and revised date of the μC3 software is displayed.
- The language to be used can be selected with keys *Up, Down* and *Enter*: English or Italian.

Temperature setting

Two different modes are available (*Control Menu*):

1. Setting by means of the water temperature at the exchanger **intake** (probe B5).

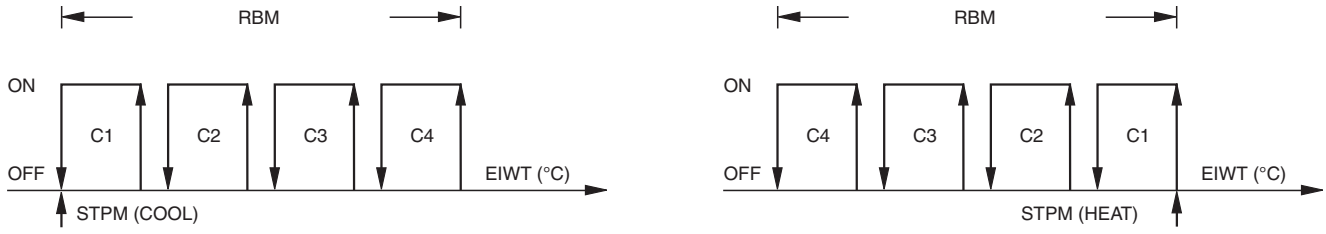
This mode carries out a proportional type setting based on a set point and a proportional band divided into 4 stages. This type of control is included in the controller by default.
It is also possible to carry out a proportional and integral setting. In this case, this function must be enabled and an integration set point established (*Control Menu*).

Control sensor: B5 (entering water temperature of the exchanger).

Parameters to be used:
- Set point.
- Proportional band for intake setting.
- Type of setting (proportional or proportional + integral).
- Integration time set point (if the proportional + integral setting has been enabled).

Control outputs: N1, N6 and N7 (compressor contactors).

Description of operation:
Temperature setting depends upon the average value detected by the probe located at the exchange water intake. It follows a proportional logic in which the proportional band is subdivided into four equal stages that give way to compressor ON/OFF cycles. In proportional + integral mode, operation is similar, but affected by an algorithm that takes the time period into account (*integration time set point parameter*).

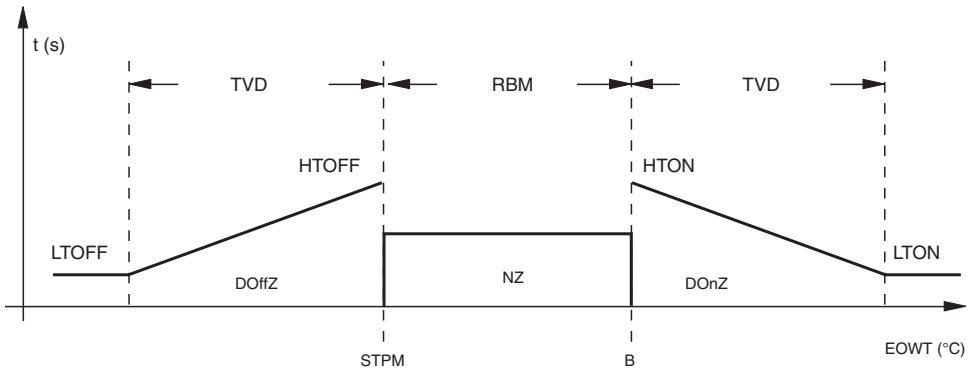


STPM	Set point
RBM	Control band
EIWT	Temperature at interchanger intake
C1, 2, 3, 4	Stages/compressors

2. Setting by means of the water temperature at the exchanger **outlet**.

Thermostatic control is based on the temperature value detected by probe B6.
The set point value (STPM) and the regulating band (RBM) define a neutral temperature zone (NZ).
- The temperature values comprised between the set point and the set point plus the band (STPM ≤ Temperature ≤ STPM + RBM) do not cause compressor ON/OFF cycles.
- Temperature values above the set point plus the band (Temperature > STPM + RBM) cause compressor operation.
- Temperature values below the set point (Temperature < STPM) turn the compressors off.

The compressor ON/OFF process is governed by a variable delay period.
As of the time differential calculated as a delay, and in accordance with the average temperature for probe B6, the control system modulates ON/OFF cycles of the compressors.
If value 0 is set, the minimum delay increase/decrease time of a call for power disables this function.
There is a differential temperature, which is different for operation in heat or cool cycle (below or above...), that turns off all devices installed to avoid excessive heating/cooling.



STPM *Set point*
RBM *Control band*
NZ *Neutral zone*
EOWT *Water temperature at exchanger outlet*
DonZ *Compressor ON zone*
DoffZ *Compressor OFF zone*
TVD *Differential of phase input/output time variations*

HTON *Stage activation maximum time delay*
LTON *Stage activation minimum time delay*
HT OFF *Stage deactivation maximum time delay*
LT OFF *Stage deactivation minimum time delay*
t *Time*

Rotation of compressors
The control unit provides a FIFO type rotation, in which the first compressor to start will also be the first to be turned off.
Start sequence: C1, C2, C3, C4.
Off sequence: C1, C2, C3, C4.

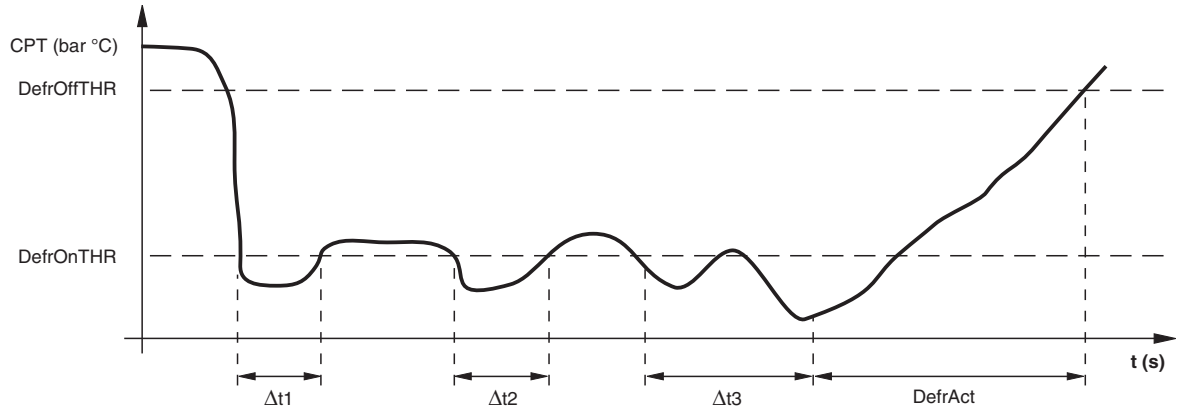
HP prevent
When this function is enabled, the control unit attempts to avoid blocking of the unit due to an excess of high pressure. When said pressure reaches a preestabished value close to the off value, the control increases the fan speed to a maximum (if in cool cycle), or decreases fan speed to a minimum (if in heat cycle). If the operating pressure continues getting closer to the HP Prevent value, the control turns off one compressor of the affected circuit tandem. The parameters of this function are accessible from the Condensation menu.

Defrost cycle
If the evaporating pressure of one of the systems remains below the value set to start the defrost cycle, during an accumulated time equal to the period established as the delay between defrosts, a simultaneous defrost of all the coils of the unit is put into operation. This cycle will terminate once the pressure value set as defrost off is reached, or after the time period set as maximum cycle duration is over.
The defrost sequence is as follows: 1. Compressors are turned off. 2. After 15 seconds, the 4-way valves are inverted. 3. After 45 seconds, the compressors are turned on with fans off. 4. Once defrost is finalized, the compressors are turned off. 5. After 15 seconds, the 4-way valves are inverted. 6. After 45 seconds, compressors and fans are turned on.

Control sensors: Pressure transducers B3 and B4.

Parameters used:
- Simultaneous defrost.
- Defrost start pressure.
- Defrost end pressure.
- Delay upon call for defrost.
- Maximum duration of defrost.
- Minimum duration of defrost.
- Compressor forced off time by cycle inversion.
- Delay of 4-way valve inversion.

Outputs affected:
- Compressors (N1, N2, N3 and N4).
- 4-way valves (N13 and N14).
- Fans (Y3 and Y4).



DefrOff	*Defrost end pressure*
DefrON	*Defrost start pressure*
Δt 1...3	*Partial times in the defrost activation pressure zones*
DefrAct	*Defrost active*
t	*Time*

Antifreeze protection
If temperature sensor B6 (leaving water) detects a temperature below the antifreeze set point, the unit will be blocked and in alarm status (manual reset).
Simultaneously, the protection heaters of the plate exchanger (output N11) are turned on. If the unit includes a hydro kit, the protection heaters of the accumulator tank will also turn on.
These heaters will be turned off when sensor B6 detects a temperature equal to the antifreeze set point plus a preestablished differential.
The antifreeze system will operate regardless of the status or mode of the unit.
The start-up of the pump and the unit can also be included as antifreeze protection (please see parameters in the *Antifreeze* menu).

Backup heater
Once the preestablished period of time is over, after unit start-up in heat mode, and the leaving water temperature detected by B6 has not reached a minimum value, backup heater output N12 will be activated. Once the water temperature has reached said minimum value, plus a preestablished differential, this output will be deactivated (please see parameters in the *Antifreeze* menu).

Remote ON/OFF
A remote digital ON/OFF input can be installed between terminals ID3-G0, enabling it by means of the corresponding parameter on the H - *unit config*. menu.
If the contact is open, the unit will remain OFF. If this contact is closed, the unit will be ON.
If the unit is OFF during this digital input, a message will appear on the user display indicating this situation.
The unit will remain OFF as long as any of its inputs (user keyboard, digital or monitoring input) is OFF.

Remote COOL/HEAT
A remote digital COOL/HEAT input can be installed between terminals ID15-G0, enabling it by means of the corresponding parameter on the H menu.
If the contact is open, the unit is in HEAT cycle. If this contact is closed, the unit will be in COOL cycle.
If the digital COOL/HEAT input is enabled, this selection cannot be made from the user or monitoring keyboard. To change the cycle, whether from the digital input or the user or monitoring keyboard, the unit must be turned OFF first.
If the digital COOL/HEAT input is not enabled, this selection can be made from either the user or the monitoring keyboard.

Second pump
A second pump can be enabled within the system by means of the *H-unit config*. menu. To do this, install its contactor (coil 230-1-50) between terminals N8-N, and the corresponding protector (NC contact) between terminals DI18-G0.
This second pump will operate alternatively with the first pump, depending upon the number of run hours or start cycles. In the case of a failure of one of the two pumps, the available pump will star immediately.

Upload key
The μC3 central module is equipped with a connector (J11) for connecting an upload key (PSOPZKEYAO) to the unit operating program.

Monitoring serial connection
The μC3 controller allows connection to a monitoring system having an RS485 serial board. By using menu H-unit config., this function can be configured and enabled. This system has two monitoring protocols: Carel and Modbus.

AUTO-RESTART
After the unit has been turned off due to a power failure, it will retain the same operating mode and status it was in prior to said power failure.

Alarm system
When an alarm is generated, the upper left key of the user keyboard-display turns red.
Pressing this key displays the cause of said alarm. Then the *Up* or *Down* keys must be pressed to check for any further causes, which will appear on the display successively.
When the alarms are of the automatic reset type, unit operation will be reestablished once the causes have disappeared.
If the failure is of the manual reset type, once the cause has disappeared, the *Alarm* key must be pressed to reestablish unit operation. Then press the *Esc* key to go back to the start screen.

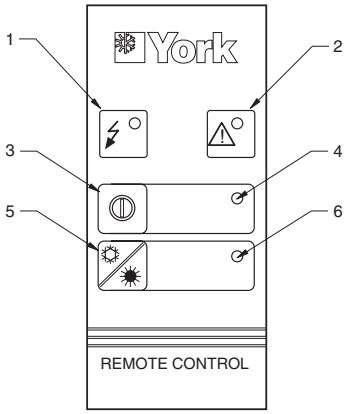
Alarm table

DESCRIPTION	INPUT	OFF CIRC.1	OFF CIRC.2	OFF FAN	OFF PUMP	OFF SYST.	RESE	DELAY	NOTES
Crucial alarm FC, PF	ID1	X	X	X	X	X	MANUAL	-	General protection Phase control
Antifreeze alarm	B6	X	X	X	-	X	MANUAL	-	In *OFF* mode, possibility of having pump ON. See *Antifreeze* menu.
Thermal protection, pump 1, Q5	ID4	X	X	X	X	X	MANUAL	-	If existent, pump 2 starts. If not, the entire system turns off.
Thermal protection, pump 2, Q6	ID18	X	X	X	X	X	MANUAL	-	If available, pump 1 is turned on. If not, the entire system turns off.
Flow switch PDW, FS	ID2	X	X	X	X	X	MANUAL	Selectable	Delays in starts and operating mode.
Thermal protection, fans, circ. 1, THPF1, THPF2	ID9	X	-	Circ. 1	-	-	AUTO/ MANUAL	1st failure in 60' interval, **automatic reset**	2nd failure in 60' interval, **manual reset**
Thermal protection, fans, circ. 2, THPF3, THPF4	ID14	-	X	Circ. 2	-	-	AUTO/ MANUAL	1st failure in 60' interval, **automatic reset**	2nd failure in 60' interval, **manual reset**
Thermal protection, compressor 1, A1 (YCSA 150)	ID7	Comp 1	-	-	-	-	AUTO/ MANUAL	1st failure in 60' interval, **automatic reset**	2nd failure in 60' interval, **manual reset**
Thermal protection, compressor 2, A2 (YCSA 150)	ID8	Comp 2	-	-	-	-	AUTO/ MANUAL	1st failure in 60' interval, **automatic reset**	2nd failure in 60' interval, **manual reset**
Thermal protection, compressor 3, A3 (YCSA 150)	ID12	-	Comp 3	-	-	-	AUTO/ MANUAL	1st failure in 60' interval, **automatic reset**	2nd failure in 60' interval, **manual reset**
Thermal protection, compressor 4, A4 (YCSA 150)	ID13	-	Comp 4	-	-	-	AUTO/ MANUAL	1st failure in 60' interval, **automatic reset**	2nd failure in 60' interval, **manual reset**
High pressure switch, circ. 1 HP1	ID6	X	-	Circ. 1	-	-	AUTO/ MANUAL		**manual reset**
High pressure switch, circ. 2 HP2	ID11	-	X	Circ. 2	-	-	AUTO/ MANUAL		**manual reset**
High pressure switch, circ. 1 LP1	ID5	X	-	Circ. 1	-	-	AUTO/ MANUAL		**manual reset**
High pressure switch, circ. 2 LP2	ID10	-	X	Circ. 2	-	-	AUTO/ MANUAL		**manual reset**
High pressure circ. 1 by transducer	B3	X	-	Circ. 1	-	-	MANUAL		**manual reset**
High pressure circ. 2 by transducer	B4	-	X	Circ. 2	-	-	MANUAL		**manual reset**
Probe B3 failure	B3						MANUAL	60'	
Probe B4 failure	B4						MANUAL	60'	
Probe B5 failure	B5	X	X	X	X	X	MANUAL	60'	
Probe B6 failure	B6	X	X	X	X	X	MANUAL	60'	
Probe B7 failure	B7						MANUAL	60'	
Probe B8 failure	B8						MANUAL	60'	
Maintenance pump 1	System						MANUAL		Set period on *Compressors* menu
Maintenance pump 2	System						MANUAL		Set period on *Compressors* menu
Maintenance compressor 1	System						MANUAL		Set period on *Compressors* menu
Maintenance compressor 2	System						MANUAL		Set period on *Compressors* menu
Maintenance compressor 3	System						MANUAL		Set period on *Compressors* menu
Maintenance compressor 4	System						MANUAL		Set period on *Compressors* menu

Remote control unit

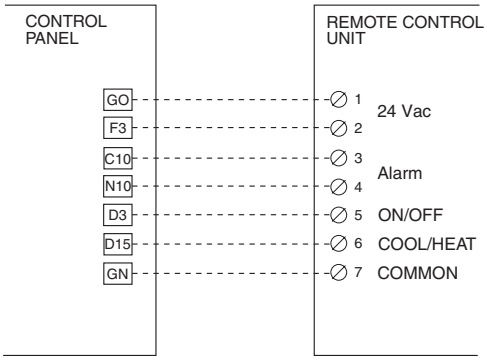
Wall-mounted, with push-buttons for COOL/HEAT and ON/OFF functions. Includes power supply, alarm and COOL/HEAT LEDs. Prior to installation, these inputs must be validated on the H-unit config. menu, giving them value “Y”.

1- Power supply LED
2- Alarm LED
3- ON/OFF selection push-button
4- Unit in operation LED
5- COOL/HEAT selection push-button
6- ON LED in heat operation/
OFF LED in cool operation



- The remote control unit can be located at a maximum distance of 50 m.
- Minimum cable section should be 0.35 mm².
- Avoid routing control cables near power cables.

Connection to control panel



(1) On heat pump units only.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