Air - to - air heat pumps
BCVO/BCVI, CHI models

Ref.: N-26460 0500

Technical information

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ACCORDING TO ISO 9001 STANDARDS
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General

General description

Heat pump models BCVO/I are air-to-air units with centrifugal fans, in both the indoor and outdoor units.

The outdoor BCVO unit includes compressor, condenser, centrifugal fan and controls. The indoor BCVI and CHI-800 unit includes evaporator coil, filter and fan. If necessary, the standard format delivered can easily be converted at the jobsite to compact format, except for the combination BCVO-80/CHI-800 which should always be installed as split units.

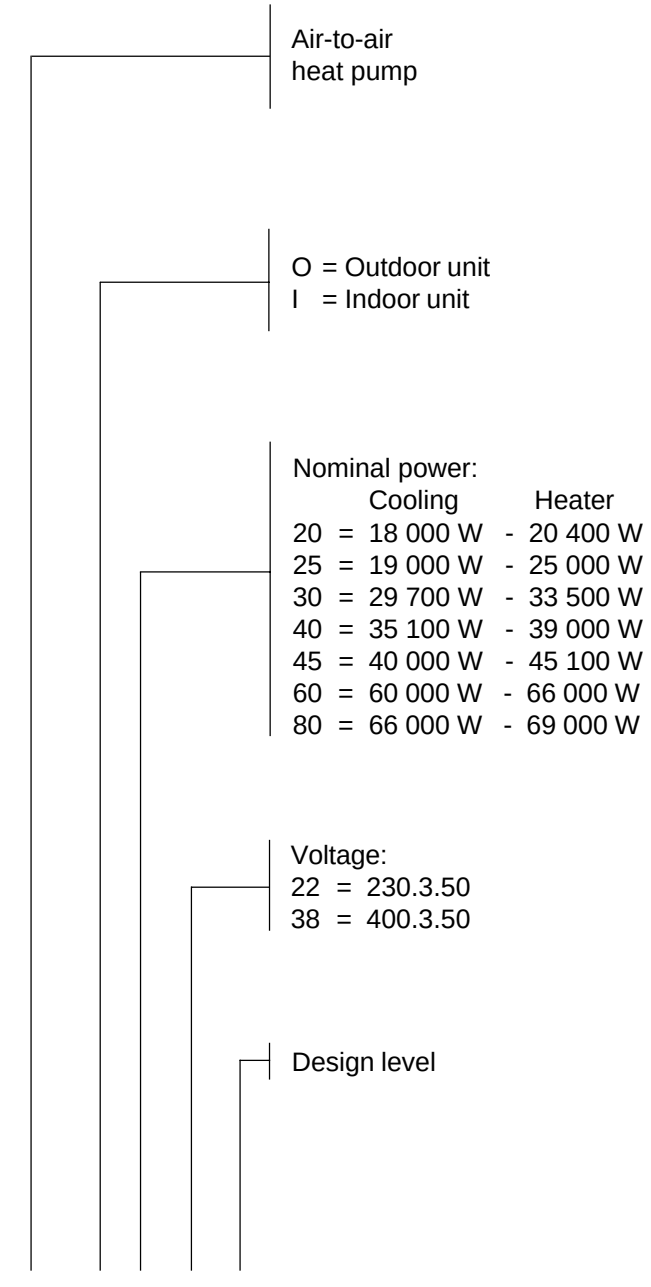
The outdoor unit can be installed indoors or outdoors as it is protected to withstand exterior atmospheric conditions, and its centrifugal fan makes it possible to fit ducking.

It is supplied fully equipped, factory tested, and designed to take electric heaters indoors or in the ducts.

It is designed to achieve considerable energy saving and have a long working life.

Start-up and automatic temperature regulation are controlled through a 24-volt ambient thermostat.

Nomenclature



Control

To bring about maximum energy saving and perfect functioning of the equipment, avoiding breakdowns and ensuring long life. The BCVO/I heat pumps incorporate exclusively an electronic control module with micro-processor.

Its operation, patented, is concentrated mainly on control of the equipment during the heating stage which is, without a doubt, that which requires most rigorous control.

Balance point

As the heat pump functions by absorbing heat from the outside air, there may be moments when the temperature of the latter is so low that it is not possible to extract sufficient heat from it to satisfy the demand. For such moments the control module incorporates six balance points (between 4 and 14°C), one of which can be selected before start-up. On reaching this point, the module automatically switches on the auxiliary electric heater, if necessary. The heat pump nevertheless continues functioning with a performance (COP) superior to that of the electric heaters, down to an exterior temperature of -20°C.

Below this minimum temperature the heat pump switches off automatically, leaving the electric heaters to provide heating on their own. This prevents the compressor from operating at excessively high compression ratios, which could shorten the life of the equipment.

Safety measures for the compressor

A temperature sensor ensures protection of the compressor against excessively high discharge temperatures.

A cut-out device stops the compressor when the discharge pressure is too high. It also functions if there is insufficient air flow through the coils.

Defrost control

The defrost cycle begins after a period of time selectable between 30, 60 or 90 minutes has elapsed since the start-up or the last defrosting, and when the liquid line temperature has dropped to -5°C or less.

Start timer

It prevents frequent stops and starts. After stopping the unit, it does not start again until 2 or 5 minutes, set at will, have elapsed.

Control panel

The complete control of the operation of the BCVO/I heat pumps is carried out through a specially designed thermostat governing the following functions:

1.- Regulation of the temperature required.
2.- Furnishing heating or cooling automatically, according to the requirement.
3.- Determining whether the indoor fan functions continuously, or intermittently in combination with the compressor.
4.- Switching on the electric heaters, disconnecting the rest of the unit.

Technical specifications

Mechanical specifications

Compressor

Of the vertical hermetic type, mounted on anti-vibration elements specially designed for heat pump equipment, with over-dimensioned mechanical components and a reduced consumption motor.

The BCVO-20, 25, 30 & 40 have only one compressor, whilst the BCVO-45 & 60 have two.
It is delivered with a charge of special anti-foam oil, resistant to heat.

Compressor heater
This is to keep the oil in the crankcase warm to facilitate start-ups and prevent the oil being drawn out of the compressor.

Suction accumulator
Connected to the suction tube of the compressor, it protects this letter from sudden movements of liquid which could throw oil out of it.

Coils
With a large surface area, comprising copper tubes and aluminium fins. In the interior of the unit, they are completely protected from knocks during transportation or installation.

Outdoor fan (BCVO-60 & 80)
Of the centrifugal type and with direct drive motor.

Indoor fan (BCVI-20 & 25)
A centrifugal fan is mounted with an independent motor and belt drive.

Indoor fan (BCVI-30, 40, 45 & 60) and outdoor (BCVO-20, 25, 30 & 40)
They feature two centrifugal fans on the same shaft, belt driven from the same motor, and connected to a single plenum.

Outdoor fan BCVO-45
This features two independent centrifugal fans and belt drive. Each one is driven by a separate motor, and they are connected to the same plenum.
These fans have sufficient pressure to take installation of ducts and optional accessories.

Cooling circuit
Made of welded copper tubing, fitted with steel access connections at the high and low pressure sides.

Refrigerant
The BCVO and BCVI units are supplied with connections ready for welding. The refrigerant load should be carried out completely at the jobsite. See, in the installation instructions, the section on refrigerant load.

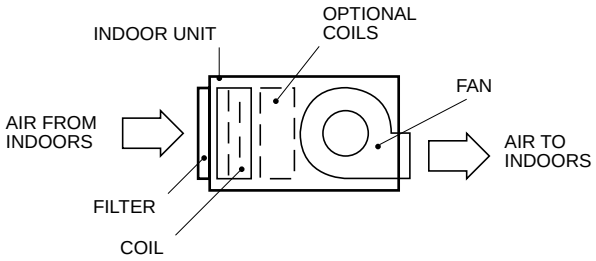
Dryer filter
Connected to the cooling circuit for protection of the refrigerant against humidity.

Casing
Made of aluminium-zinc sheet steel, stamped and enamelled with powder epoxy paint, permitting outdoor installation.

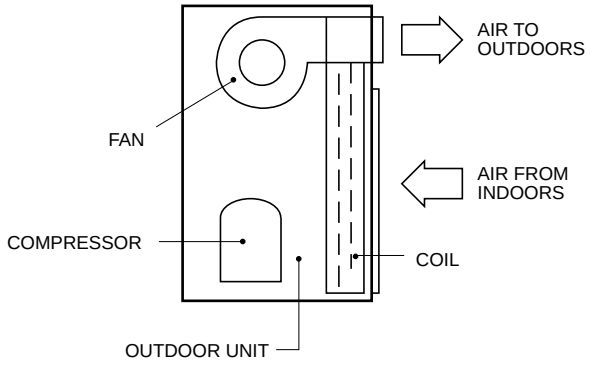
Supplementary heaters
Of the air-exposed wires type to provide rapid heat dispersion, overcoming the temperature inertia which can affect the components.

Operating diagram

BCVI



BCVO



Physical data

Model			BCVO/I-20	BCVO/I-25	BCVO/I-30	BCVO/I-40	BCVO/I-45	BCVO/I-60	BCVO-80/CHI-800
Com-pressor	Quantity		1	1	1	1	2	2	2
	Nominal capacity	kW	6	9.1	10	12.2	2 x 8.4	2 x 10.2	2 x 13.1
	Electric power supply	V.ph.Hz	230.3.50 or 400.3.50					400.3.50	
Indoor fan	Nominal capacity	W	950	950	1 472	1 472	1 472	2 240	3 000
	Electric power supply	V.ph.Hz	230.3.50 or 400.3.50					400.3.50	
	Motor rpm		1 400	1 400	1 400	1 400	1 400	1 400	1 400
	Turbines diameter	mm	320	320	320	320	320	320	380
	Turbines width	mm	320	320	240	240	320	320	380
Outdoor fan	Nominal capacity	W	1 472	1 450	2 944	2 944	2 x 2 200	2 x 3 150	2 x 3 150
	Electric power supply	V.ph.Hz	230.3.50 or 400.3.50					400.3.50	
	Motor rpm		1 400	1 400	1 400	1 400	1 400	960	960
	Turbines diameter	mm	270	270	320	320	320	380	380
	Turbines width	mm	270	270	320	320	320	380	380
Indoor coil	Quantity		1	1	1	1	1	1	1
	Tubes depth x height		4 x 21	4 x 21	4 x 25	4 x 25	4 x 25	4 x 29	4 x 33
	Tubes diameter		3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"
Outdoor coil	Quantity		1	1	1	1	2	2	2
	Tubes depth x height		5 x 37	5 x 37	5 x 40	5 x 40	6 x 40	5 x 42	5 x 42
	Tubes diameter		3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"
Approx. Weight	Nett	Outdoor unit kg	305	325	395	410	545	545	551
		Indoor unit kg	120	120	165	165	195	240	337
	Gross	Outdoor unit kg	340	360	445	460	603	585	591
		Indoor unit kg	142	142	195	195	230	330	427
Packaged dimens. indoor unit	Height	mm	760	760	833	833	833	935	1 025
	Width	mm	1 444	1 444	1 825	1 825	2 125	2 390	2 450
	Depth	mm	930	930	930	930	930	955	973
Packaged dimens. outdoor unit	Height	mm	1 404	1 404	1 534	1 534	1 534	1 720	1 720
	Width	mm	1 444	1 444	1 825	1 825	2 125	2 270	2 270
	Depth	mm	930	930	930	930	930	935	935

Nominal features

Outdoor unit	Indoor unit	Summer		Winter		Available pressure indoor fan Pa
		Cooler capacity W	Consumption W	Heating capacity W	Consumption W	
BCVO-20	**BCVI-20/25**	18 000	10 200	20 400	9 000	50
BCVO-25	**BCVI-20/25**	19 000	10 300	25 000	9 300	62
BCVO-30	**BCVI-30/40**	29 000	13 900	29 000	11 900	75
BCVO-40	**BCVI-30/40**	33 100	16 300	34 000	15 800	75
BCVO-45	**BCVI-45**	40 000	20 600	48 000	18 800	75
BCVO-60	**BCVI-60**	54 000	26 400	54 000	26 400	80
BCVO-80	**CHI-800**	66 000	31 300	69 000	27 100	80

Test conditions

Voltage	Length of interconnection tubing	Summer				Winter			
		Outdoor temp. °C		Indoor temp. °C		Outdoor temp. °C		Indoor temp. °C	
		DB	WB	DB	WB	DB	WB	DB	WB
400	7.5 m.	35	24	27	19	7	6	20	12

Correction factors

Correction factors for the cooling capacities

Correction factors for the cooling capacity for flow-rates different from the nominal ones in the indoor coil.

% Flow	80	90	100	110	120	130
Total capacity	0.960	0.980	1	1.016	1.032	1.046
Sensitive capacity	0.945	0.973	1	1.038	1.075	1.118
Absorbed comp. pot.	0.980	0.990	1	1.009	1.017	1.025

Correction of the real temperature of the air entering the outdoor coil for flow-rates different from the nominal ones.

% Flow	70	80	90	100	110	120	130
Correction in °C over the real air intake temperature at the outdoor battery unit.	5	3	1.5	0	-1	-2	-2.5

Correction factors for the heating capacities

Indoor unit air intake temperature °C DB	Outdoor unit air intake temperature °C WB				
	14	10	6	0	-8
23	1.20	1.04	0.96	0.77	0.58
20	1.25	1.10	1.00	0.80	0.69
17	1.30	1.13	1.04	0.83	0.63

Correction of the real temperature of the air entering the outdoor coil for flow-rates different from the nominal ones.

% Flow	70	80	90	100	110	120	130
Correction in °C over the real air intake temperature at the outdoor battery unit	-2	-1.5	-0.5	0	0.5	1	1.2

Nominal flow-rates

The cooling and heating capacities in the corresponding tables are valid for the following nominal flow-rates.

Model	Indoor fan m^3/h	Outdoor fan m^3/h
BCVO/I-20 & 25	4 725	7 650
BCVO/I-30 & 40	7 500	13 300
BCVO/I-45	10 000	13 600
BCVO/I-60	12 560	18 000
BCVO-80/CHI-800	14 300	18 000

For other flow-rates, apply the correction factors from the corresponding table.

Sensitive cooling capacities

Model	Outside air dry temperature °C (DB)	Air intake humid temperature °C (WB)	Total capacity	Sensitive capacity (W)				Compressor power absorbed
				Dry temperature of air °C (DB)				
				22	24	27	29	
			W	W	W	W	W	kW
BCVO/I-20	25	22	20 400	6 010	9 145	13 848	16 987	4.17
		19.5	18 360	9 955	13 090	17 792	18 360	4.36
		17	17 000	14 086	17 000	17 000	17 000	4.56
	35	22	18 870	5 516	8 651	13 354	16 489	4.71
		19.5	17 000	9 473	12 608	17 000	17 000	4.96
		17	15 640	12 824	15 640	15 640	15 640	5.21
	45	22	17 000	4 964	8 100	12 802	15 937	5.46
		19.5	15 300	8 921	12 056	15 300	15 300	5.70
		17	13 940	12 900	13 940	13 940	13 940	5.95
BCVO/I-25	25	22	25 200	7 600	10 735	15 438	18 577	6.59
		19.5	22 680	11 521	14 656	19 358	22 499	6.91
		17	21 000	15 680	18 815	21 000	21 000	7.22
	35	22	23 310	6 967	10 102	14 805	17 940	7.46
		19.5	21 000	10 905	14 040	18 743	21 000	7.85
		17	19 320	14 107	17 242	19 320	19 320	8.24
	45	22	21 000	6 262	9 397	14 099	17 234	8.64
		19.5	18 900	10 203	13 338	18 040	18 900	9.03
		17	17 220	14 172	17 220	17 220	17 220	9.42
BCVO/I-30	25	22	35 640	10 708	15 289	22 160	26 748	8.65
		19.5	32 076	16 443	21 024	27 896	32 076	9.06
		17	29 700	22 514	27 095	29 700	29 700	9.48
	35	22	32 967	9 817	14 399	21 270	25 851	9.79
		19.5	29 700	15 578	20 159	27 030	29 700	10.30
		17	27 324	20 288	24 869	27 324	27 324	10.82
	45	22	29 700	8 826	13 407	20 279	24 860	11.33
		19.5	26 730	14 589	19 170	26 042	26 730	11.85
		17	24 354	20 392	24 354	24 354	24 354	12.36

Sensitive cooling capacities

Model	Outside air dry temperature °C (DB)	Air intake humid temperature °C (WB)	Total capacity	Sensitive capacity (W)				Compressor power absorbed
				Dry temperature of air °C (DB)				
				22	24	27	29	
			W	W	W	W	W	kW
BCVO/I-40	25	22	39 600	12 050	16 631	23 503	28 091	10.67
		19.5	35 640	17 763	22 344	29 215	33 804	11.18
		17	33 000	23 855	28 436	33 000	33 000	11.68
	35	22	36 630	11 041	15 622	22 493	27 074	12.07
		19.5	33 000	16 783	21 364	28 236	32 817	12.70
		17	30 360	21 363	25 944	30 360	30 360	13.34
	45	22	33 000	9 917	14 499	21 370	25 951	13.97
		19.5	29 700	15 665	20 246	27 118	29 700	14.61
		17	27 060	21 459	26 040	27 060	27 060	15.24
BCVO/I-45	25	22	48 000	14 279	21 015	31 120	37 864	13.69
		19.5	43 200	22 735	29 471	39 576	43 200	14.34
		17	40 000	31 637	38 373	40 000	40 000	15.00
	35	22	44 400	13 099	19 835	29 940	36 676	15.49
		19.5	40 000	21 586	28 322	38 426	40 000	16.30
		17	36 800	30 257	36 800	36 800	36 800	17.12
	45	22	40 000	11 782	18 519	28 623	35 359	17.93
		19.5	36 000	20 271	27 008	36 000	36 000	18.75
		17	32 800	28 814	32 800	32 800	32 800	19.56
BCVO/I-60	25	22	64 800	19 662	27 333	38 841	46 524	15.20
		19.5	58 320	29 237	36 909	48 417	56 102	15.93
		17	54 000	39 432	47 104	54 000	54 000	16.65
	35	22	59 940	18 017	25 689	37 197	44 869	17.20
		19.5	54 000	27 641	35 313	46 820	54 000	18.10
		17	49 680	35 362	43 034	49 680	49 680	19.01
	45	22	54 000	16 187	23 859	35 367	43 039	19.91
		19.5	48 600	25 819	33 491	44 999	48 600	20.82
		17	44 280	35 525	43 197	44 280	44 280	21.72
BCVO-80/CHI-800	25	22	79 200	24 230	33 019	46 203	55 005	17.05
		19.5	71 280	35 168	43 958	57 142	65 947	17.86
		17	66 000	46 873	55 663	66 000	66 000	18.68
	35	22	73 260	22 192	30 982	44 166	52 955	19.29
		19.5	66 000	33 193	41 983	55 167	63 956	20.30
		17	60 720	42 030	50 820	60 720	60 720	21.32
	45	22	66 000	19 928	28 717	41 901	50 691	22.33
		19.5	59 400	30 942	39 731	52 915	59 400	23.35
		17	54 120	42 048	50 837	54 120	54 120	24.36

Outdoor fan performance

Model	Static pressure available		Air flow		Power absorbed
	mm WG	Pa	m³/h	m³/s	W
BCVO-20 BCVO-25	24.3	238.1	5 500	1.53	875
	22.4	219.5	6 000	1.66	960
	20.0	196.0	6 500	1.80	1 050
	17.0	166.6	7 000	1.94	1 150
	14.0	137.2	7 500	2.08	1 280
	11.1	108.8	8 000	2.22	1 400
	7.0	68.6	8 500	2.36	1 530
	3.6	35.3	9 000	2.50	1 690
	0.0	0.0	9 500	2.64	1 840
BCVO-30 BCVO-40	22.5	220.5	9 280	2.58	1 480
	22.2	217.6	9 500	2.64	1 500
	20.6	201.9	10 000	2.78	1 680
	19.3	189.1	10 500	2.92	1 800
	18.1	177.4	11 000	3.05	1 940
	16.3	159.7	11 500	3.19	2 050
	14.3	140.1	12 000	3.33	2 200
	12.5	122.5	12 500	3.47	2 250
	10.7	104.8	13 000	3.61	2 490
	8.3	81.3	13 500	3.75	2 630
	6.2	60.8	14 000	3.89	2 745
	3.4	33.3	14 500	4.03	2 980
	1.5	14.7	15 000	4.16	3 150
	0.0	0.0	15 200	4.22	3 240
BCVO-45	22.5	220.5	10 000	2.78	1 800
	21.4	209.7	10 500	2.92	1 930
	19.8	194.0	11 000	3.05	2 050
	17.7	173.5	11 500	3.19	2 150
	15.7	153.9	12 000	3.33	2 320
	14.0	137.2	12 500	3.27	2 480
	12.0	117.6	13 000	3.61	2 660
	9.5	93.1	13 500	3.75	2 830
	7.3	71.5	14 000	3.88	3 000
	4.6	45.1	14 500	4.03	3 150
	1.3	12.7	15 000	4.16	3 320
	0.0	0.0	15 300	4.25	3 410
BCVO-60 BCVO-80	32.0	313.6	11 800	3.28	3 170
	24.0	235.2	14 000	3.89	3 440
	20.0	196.0	14 800	4.11	4 035
	16.0	156.8	15 600	4.33	4 260
	12.0	117.6	16 500	4.58	4 560
	8.0	78.4	17 300	4.81	4 830
	5.0	49	17 900	4.97	5 040
	3.0	29.4	18 200	5.06	5 160
	0.0	0	18 800	5.22	5 355

Indoor fan performance

Model	Static pressure available		Air flow		Power absorbed
	mm WG (1)	Pa	m³/h	m³/s	W
BCVI-20 BCVI-25	0	0	5 281	1.46	1 070
	2	19.6	5 058	1.40	1 005
	4	39.2	4 860	1.35	955
	5	49	4 723	1.31	920
	6	58.8	4 653	1.29	900
	8	78.4	4 399	1.22	840
	10	98	4 130	1.14	785
	12	117.6	3 885	1.07	740
	14	137.2	3 577	0.99	680
BCVI-30 BCVI-40	17.1	167.6	5 250	1.46	650
	16.5	161.7	5 500	1.53	690
	15.2	149.0	6 000	1.66	770
	13.6	133.3	6 500	1.80	850
	11.5	112.7	7 000	1.94	950
	10.0	98.0	7 500	2.08	1 050
	6.7	65.7	8 000	2.22	1 100
	3.6	35.3	8 500	2.36	1 210
	1.0	9.8	9 000	2.50	1 320
BCVI-45	0.0	0.0	9 200	2.55	1 375
	17.9	175.4	7 000	1.94	896
	17.1	167.6	7 500	2.08	970
	16.0	156.8	8 000	2.22	1 045
	14.8	137.2	8 500	2.36	1 100
	13.3	130.3	9 000	2.50	1 175
	12.1	118.6	9 500	2.64	1 275
	10.0	98.0	10 000	2.78	1 375
	8.5	83.3	10 500	2.92	1 450
	6.5	63.7	11 000	3.05	1 600
	4.3	42.1	11 500	3.19	1 700
	2.0	19.6	12 000	3.33	1 802
BCVI-60	0.0	0.0	12 500	3.47	1 970
	15.9	155.8	11 500	3.19	2 004
	14.2	139.1	12 000	3.33	2 139
	12.6	123.4	12 500	3.47	2 240
	11.0	107.8	13 000	3.61	2 408
	8.6	84.2	13 500	3.75	2 535
	6.5	63.7	14 000	3.89	2 732
	3.9	38.2	14 500	4.02	2 843
	1.3	12.7	15 000	4.16	3 000
	0.0	0.0	15 200	4.22	3 150
CHI-800					
	19.9	195	10 000	2.78	1 395
	18	176	11 000	3.05	1 550
	16.1	158	12 000	3.33	1 565
	13.4	131	13 000	3.61	1 905
	10.7	105	14 000	3.89	2 050
	7.4	73	15 000	4.16	2 240
	3.9	38	16 000	4.44	2 430
	0	0	17 000	4.72	2 675

(1) Performance calculated with wet coil including filters.

Installation instructions

General

The BCVO/I model heat pumps are supplied in standard form as separate units. They are designed for installation with ducking on terraces, roof-tops, in lofts or basements.
When necessary, and at the moment of installation, they can easily be joined together, forming a compact item of equipment, except for the combination BCVO-80/CHI-800 which should always be installed as split units.
Control for starting, stopping and temperature regulation is with a special 24-volt thermostat delivered in the outdoor unit of each set of equipment.

Protection of the environment

Packing

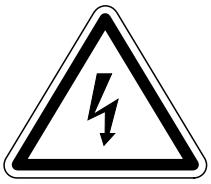
Packing is made of recyclable material. The disposal of same should be carried out in accordance with the regulations on selective residue disposal established by the local authorities.

Disposal of the unit

When dismantling after a long service life, its components should be ecologically salvaged. The cooling circuit is full of HCFC-22 refrigerant which should be salvaged and, finally, returned to the gas manufacturer for recycling.
Oil will remain in the airtight compressor so, it will be returned along with the sealed circuit.
The air conditioning unit will be deposited wherever established by the local authorities for its selective disposal.

Warning signs

The following signs indicate the presence of potentially dangerous conditions for the users or service personnel.
Whenever found on the unit itself, keep in mind the warning indicated by each one.



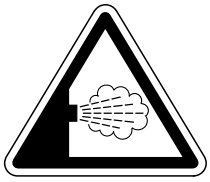
This sing indicates an electrical risk or danger.

Attention: The unit has a remote control system and can start automatically. Two minutes prior to having access to the interior, the power supply should be disconnected so as to avoid any contact with the fan turbine in operation.

Attention: It is compulsory to read the instructions prior to any handling.

Attention: Not to touch the hot surfaces.

Attention: Wheel and belt transmission.



Attention: Possible escape of gas if incorrectly handled.

Transport

The outdoor units must be transported in a vertical position so that the oil does not come out of the compressor. If it is necessary, for some reason, to alter this position from time to time, it should be returned to the vertical position as soon as possible.

Location

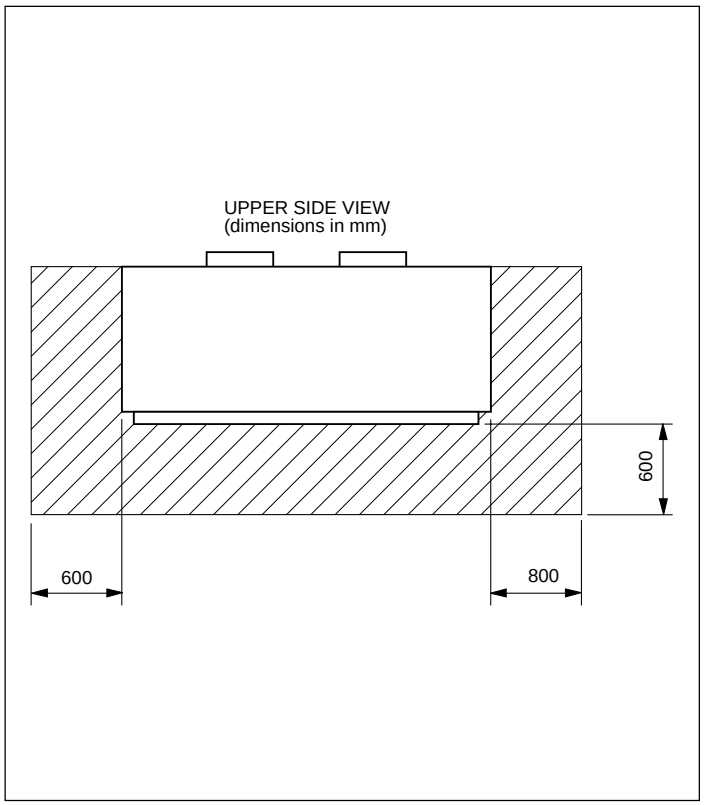
The location should be chosen to provide for access for maintenance at all times, through both the lateral and rear panels.
The exterior unit can be installed directly out of doors. If it is installed indoors, in basements, lofts, etc., air ducts for introducing air from outside and extraction must be connected.

With indoor installations it must be remembered that, in the winter operating cycle, the outdoor coil condenses a lot of water which has to be eliminated through the drainage tube. Provision should be made for the possibility of obstruction of the drain by foreign bodies such as dust, dirt, etc.

Clearances

Clearances should be left in the installation of each apparatus for:

a) Intake and discharge of air from the outdoor unit.
b) Connection of the drainage and electrical tubes.
c) Air ducts.
d) Maintenance service.
e) Electrical wiring.
f) Cleaning the filters.



Fastening the unit (Standing on the ground)

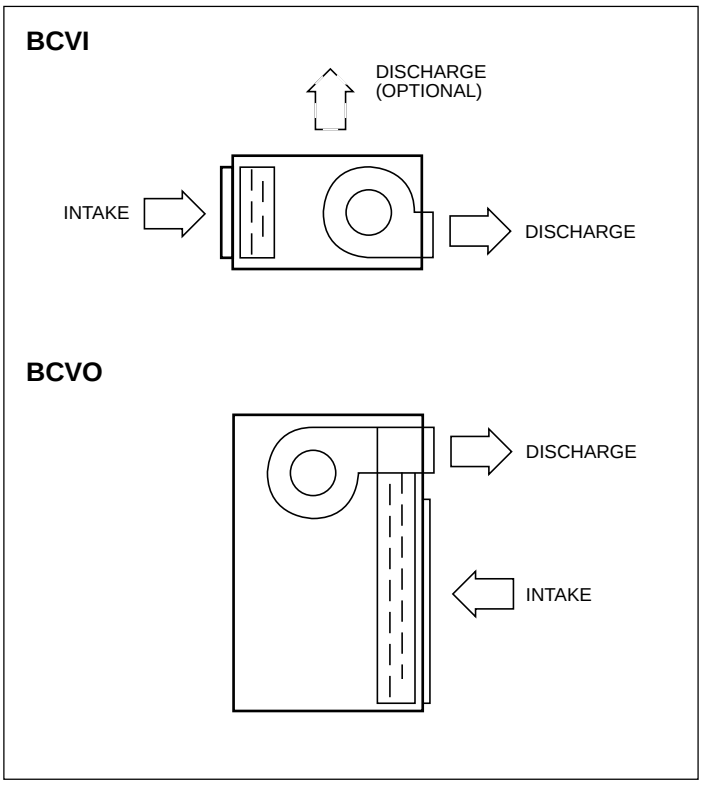
If the unit is stood out doors on the ground, it should be raised up on supports to avoid any possibility of snow obstructing the air intake.

Air ducting

1.- Connect the ducting, insulating it from the apparatus with a flexible complying, preferably of non-combustible material, so as to prevent transmission of vibration from the apparatus itself. If the ducts are made of flexible material the vibration will not be transmitted.
2.- It is advisable to put a damper on each section of the ducting to maintain a correct balance in the system.
3.- Provide easy access for cleaning and changing the air filters.
4.- With the BCVO-45 & 60 units, two independent ducts should be installed, one for each fan to the discharge, so as to avoid recirculation of air.
5.- If the air discharge of the outdoor coil is done through ducts, it is advisable that the first meter section be of galvanized sheet to avoid corrosion produced by water droplets carried by the air.

Orientation of the air intake and discharge

The standard orientations for air intake and discharge are as shown in the drawing.

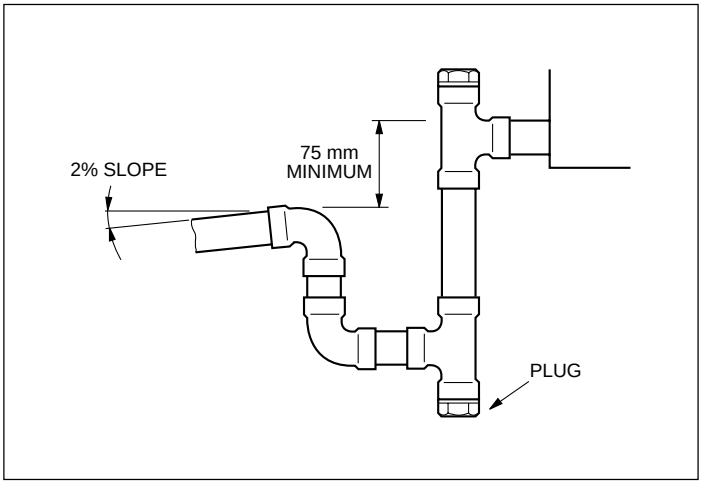


Changes to be made at the jobsite

If required, the apparatus can easily be modified at the jobsite to give a vertical discharge from the indoor fan (BCVI).

Drainage connections

Install the drainage tubes for each drain-pan through a trap. Leave a minimum level difference of 75 mm between the height of the connection to the apparatus and the line after the trap (see drawing). This is to avoid the depression produced by the fan, from interfering with the emptying of the pan. Access should be provided so that the trap can be filled with water at the beginning of each season. The drainage line should have a minimum slope of 2 cm per metre of length.
The connections for the apparatus are of steel tubing with 3/4" G. interior thread.



Attention:
When the heat pump operates at outdoor temperatures of less than 5°C, the drainage tubes may be obstructed by ice.

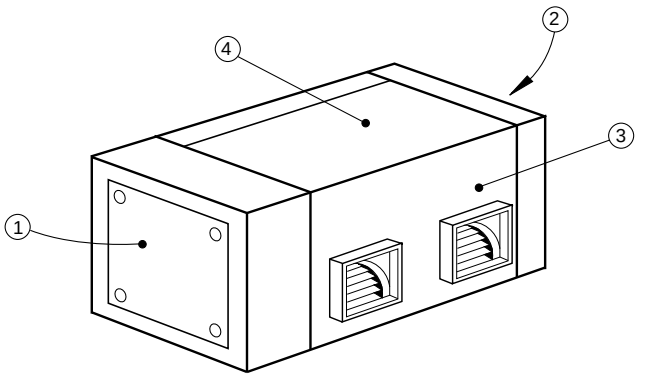
To deal with this possibility it is convenient to install an electric heater in the drainage connection and around the anti-vibration elements of the compressor, connecting it electrically as indicated in the diagrams provided.

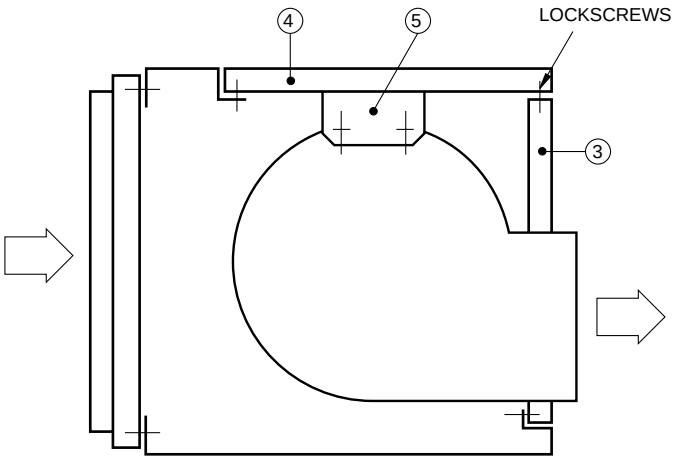
Procedure for discharge transformation from horizontal to vertical

(BCVI-20, 25, 30, 40, 45)

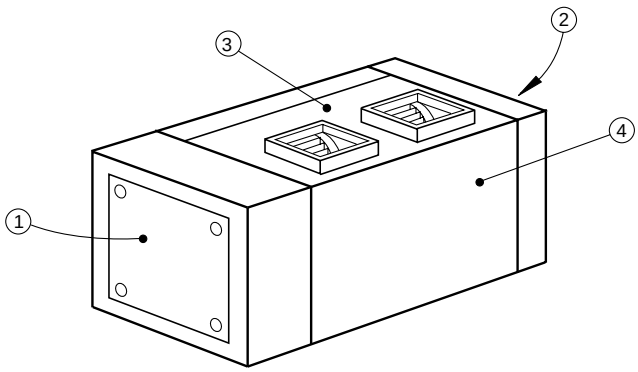
1.- Remove the attachment screws from the side panels 1 & 2 of the upper unit.
2.- Take off side panels 1 & 2.
3.- Loosen the screws attaching the fan motor to its base, and remove the transmission belt.
4.- Through the side accesses, unscrew the panels 3 & 4, as shown in the standard orientation drawing.
5.- Unscrew the attachment of the fan to support 5.
6.- Place panel 3 where panel 4 was previously, and panel 4 where 3 was.
7.- Screw home the panels and the fan to support 5.
8.- Replace the transmission belt and attach the motor to its base.
9.- Screw on the lateral panels 1 & 2.

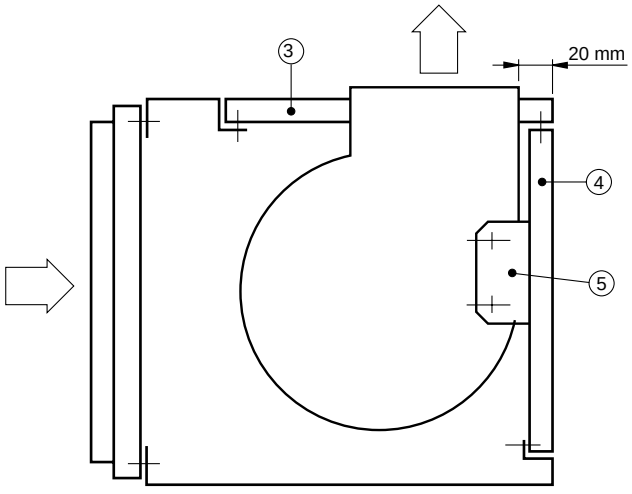
Standard orientation





Orientation variant at the jobsite





BCVI-60 Unit

The BCVI-60 needs a transformation kit which includes: rear and upper panel, belts, motor and fan pulleys.

1.- Remove the standard upper, rear and side panels and the fans, and orient them as shown in the drawing, attaching them to the upper panel included in the transformation kit.

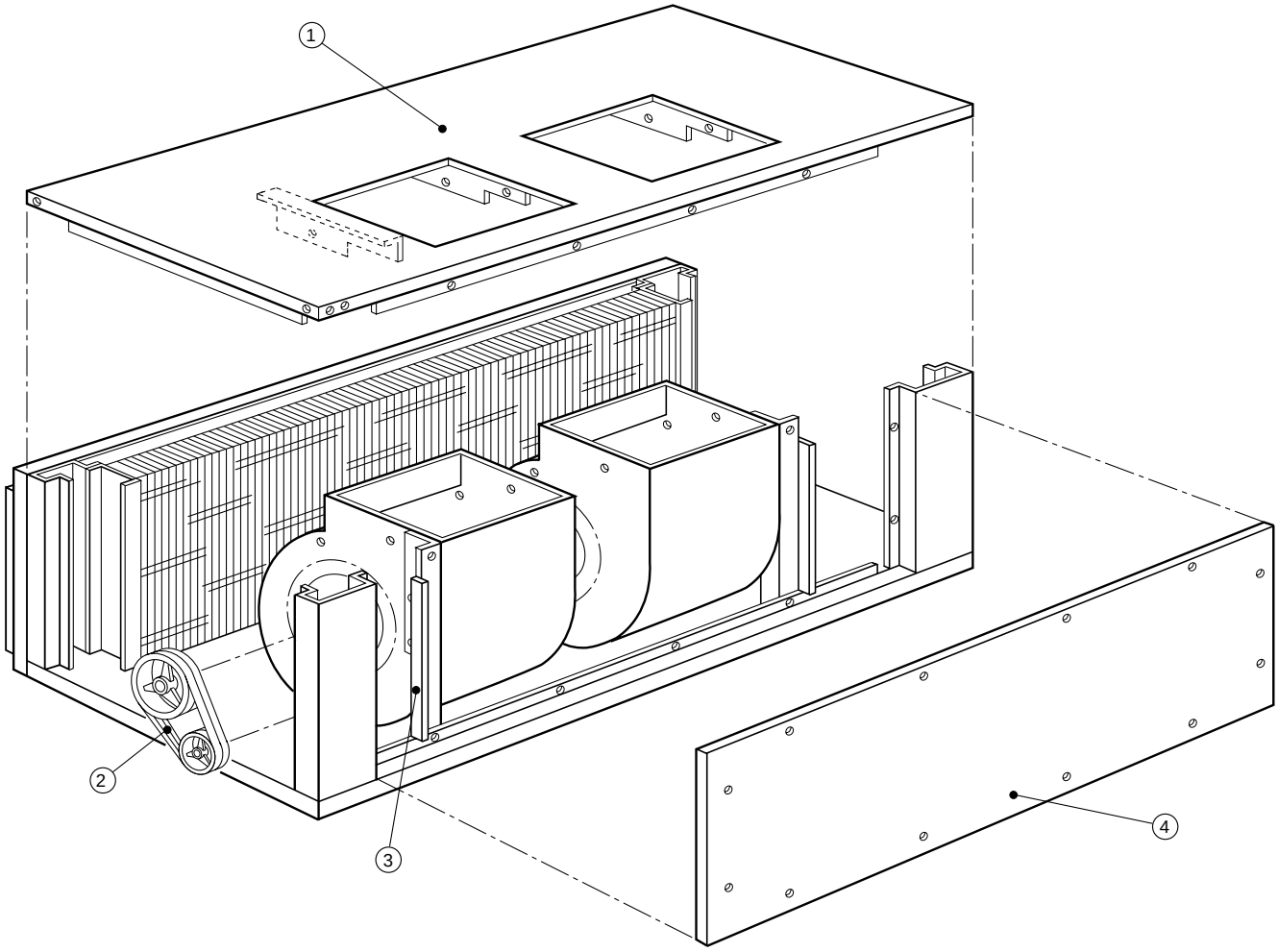
2.- Once the fans are installed, attach the upper panel Ref. 1 to the unit.

3.- Attach the left and right fan brackets, Ref. 3, to the unit.

4.- Install the motor pulleys, fan and belts, Ref. 2, included in the kit.

5.- Install the rear panel, Ref. 4.

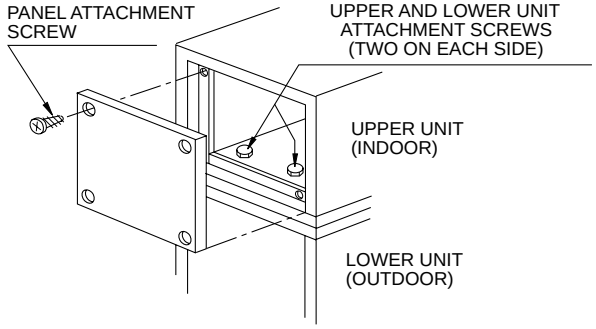
6.- Finally, install the standard side panels.



Compact installation of the units

The units are supplied prepared for cooling and electrical connections.

To install the heat pumps as a compact unit, the outdoor BCVO and indoor BCVI units must be joined by using the holes in each unit and the screws supplied in a bag in the electrical box in the case of BCVO/I-60 and inside the indoor units of BCVI-20/25, 30/40 & 45.



The BCVO and BCVI units are supplied with the refrigerant circuit connections ready for welding, and to be interconnected on the outside of the casing.

The BCVO/I-20, 25, 30 and 40 have only one circuit. The BCV-45, 60 and 80 units have two circuits. The refrigerant load should be carried out at the jobsite.

Charge procedure

1.- De-pressurise the units.
2.- Drain the refrigerant.
3.- Clean out with dry nitrogen.
4.- Solder the tubes, with a dry nitrogen flow inside the tubes.
5.- Use low melting-point rods with a minimum silver content of 5% for soldering.
6.- Fill with 2 kg R-22 refrigerant to detect leaks.
7.- Empty out the refrigerant.
8.- Clean out with dry nitrogen.
9.- Create a vacuum down to 200 microns.
10.- Put in the refrigerant, using scales or a calibrated cylinder. The charge accuracy should be of 30 grams.

The outdoor unit is fitted with pressure and temperature points on the connection outlets, for checking of over-heating and sub-cooling. Check that these values are around 5°C.

Installation of separated units

Separation between the units

The length of interconnection tubing should be kept to a minimum.

Standard installation

The maximum admissible distances with the standard circuit and tube diameters are:

Total length of tubing m	Maximum level difference between units m
20	10

Special installation

For greater lengths, the installation must be made with a project previously approved by our technical service.

Modifications to any of the following may be required for such a project:

- Tube dimensions.
- Refrigerant charge.
- Suction traps.
- Suction accumulator.
- Liquid solenoid valve.

In such cases, the maximum lengths which can be recommended are:

Type of installation		
Units at same livel, maximum length.	m	50
Outdoor unit higher than indoor, maximum length and level difference.	m	50
Outdoor unit lower than indoor, maximum length and level difference.	m	15

Cooling interconnections

When preparing the tubing to join the two units, special care should be taken to keep it clean and dry before the installation. The following recommendations serve as a guide which should be taken into consideration:

1.- Use only copper tubing of cooling quality.
2.- Do not carry out outdoor jobs in the rain.
3.- The ends of the tubes should be kept closed off during the installation.
4.- Do not leave the dryer filters or the compressor open to the elements for more than one or two minutes.
5.- For soldering, use low melting-point rods with a minimum silver content of 5%.
6.- During soldering, and for as long as the tube stays hot, keep up a flow of dry nitrogen to avoid formation of oxides and crusting in the interior, which could cause contamination and blockage.
7.- Do not use stripper for copper-copper unions.

Interconnection tubing diameters

Model	Diameter gas line (wide tube)	Diameter liquid line (narrow tube)
BCVO/I-20, 25 & 45	1 1/8 " (28.5 mm)	1/2" (12.7 mm)
BCVO/I-30, 40 & 60 & BCVO-80/CHI-800		5/8" (15.87 mm)

Refrigerant charge

The nominal charge shown in the table below is calculated for the functioning of a compact unit.

When a split system is installed, the refrigerant charge must be increased in each circuit in function of the length of liquid tubing.

Model	Nominal charge R-22 kg	Number of circuits	Diameter liquid line	Additional charge (per metre)
BCVO/I-20	10	1	1/2"(12.7mm)	104 grs.
BCVO/I-25	10.9	1	1/2"(12.7mm)	104 grs.
BCVO/I-30	15.9	1	5/8"(15.87mm)	170 grs.
BCVO/I-40	18.5	1	5/8"(15.87mm)	170 grs.
BCVO/I-45	9.9 x 2	2	1/2"(12.7mm)	104 grs.
BCVO/I-60	9 x 2	2	5/8"(15.87mm)	170 grs.
BCVO-80/ /CHI-800	9 x 2	2	5/8"(15.87mm)	170 grs.

Charge procedure

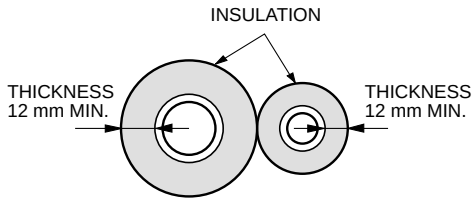
1.- De-pressurise the units.
2.- Drain the refrigerant.
3.- Clean out with dry nitrogen.
4.- Solder the tubes, with a dry nitrogen flow inside the tubes.
5.- Use low melting-point rods with a minimum silver content of 5% for soldering.
6.- Fill with 2 kg R-22 refrigerant to detect leaks.
7.- Empty out the refrigerant.
8.- Clean out with dry nitrogen.
9.- Create a vacuum down to 200 microns.
10.- Put in the refrigerant, using scales or a calibrated cylinder. The charge accuracy should be of 30 grams.

The outdoor unit is fitted with pressure and temperature points on the connection outlets, for checking of over-heating and sub-cooling. Check that these values are around 5°C.

Insulation of tubes

The interconnection cooling tubing must be insulated.

The insulation requires specific characteristics: it must be easy to install C, hard-wearing, water and fire-proof, and have a minimum thickness of 12 mm.



To avoid deterioration in sunlight, it is convenient to treat the insulation with enamel-water paint.

CAUTION

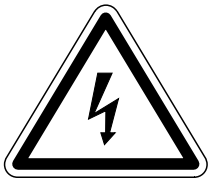
After having insulated the tubing, you must never attempt to bend it excessively as this could cause cracks or breakages.

Electrical installation

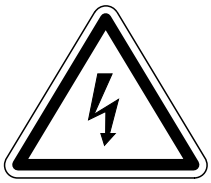
Each heat pump is delivered with a control box for connection to the power supply through a main switch with fuses or an automatic cut-out.

The electric heater, if there is one, must be installed with power line and switches independent of those supplying the conditioner.

In all cases, **established national regulations** must be observed.



Loose cables can produce overheating at the terminals or incorrect operation of the unit. A fire risk may also exist. Therefore you must make sure that all of the cables are firmly connected.



Do not supply energy to the unit or start it up until the piping and electrical connections to the external unit have been finalized.

Make sure that the electrical supply has been correctly connected to the units as shown in the electrical diagrams.

Electrical characteristics

Model	Power supply V.ph.Hz.		Nominal consumption A							Power supply cables min.cross section	Automatic circuit breaker
	Compressor	Fan	Compressor			Indoor fan		Outdoor fan			
		Outdoor-Indoor	Start	Nominal	Max.	Start	Nominal	Start	Nominal	mm^2	A
BCVO/I-20	230.3.50	230.3.50	120	15	19.5	12	3.5	23	5.2	10	50
	400.3.50	400.3.50	60	8.5	11.3	7	2	10	3	4	32
BCVO/I-25	230.3.50	230.3.50	183	22.8	34.5	14	5.2	23	5.2	10	50
	400.3.50	400.3.50	90	13.2	20	7	2	10	3	4	32
BCVO/I-30	230.3.50	230.3.50	170	28.5	33	23	4.7	31	6.6	16	80
	400.3.50	400.3.50	100	16.5	19	10	2.7	25	3.8	10	50
BCVO/I-40	230.3.50	230.3.50	267	38.6	46	23	4.5	31	7	25	80
	400.3.50	400.3.50	135	22.3	27	10	2.6	25	4	10	50
BCVO/I-45	400.3.50	400.3.50	2 x 91	2 x 12.5	2 x 14.5	10	3.5	2 x 13	2 x 3	16	63
BCVO/I-60	400.3.50	400.3.50	2 x 100	2 x 16.5	2 x 19	25	7.1	2 x 18	2 x 7	25	100
BCVO-80/CHI-800	400.3.50	400.3.50	2 x 135	2 x 20.3	2 x 24	30	6.4	2 x 18	2 x7	25/2.5	100/15

Important: The size of the circuit breaker and the cross-section of the supply and control lines are only as guide and should be corrected in accordance with the conditions at the jobsite, distance between units, and current legislation.

Limits of use

Voltage limits				Outdoor coil inlet air temperature DB				Indoor coil inlet air temperature			
Nom. 230 V		Nom. 400 V		Operating cycle				Operating cycle			
				Minimum °C		Maximum °C		Minimum °C		Maximum °C	
Minimum	Maximum	Minimum	Maximum	Cool	Heat	Cool	Heat	Cool WB	Heat DB	Cool WB	Heat DB
198	254	342	436	19	$-20_{(1)}$	46	24	14	$10_{(2)}$	22	25

Notes: WB - Wet bulb. DB - Dry bulb.
(1) At an outdoor temperature of -20°C only the emergency electric heater (optional) continues to operate.
(2) The equipment can work for a short period at a temperature of less than 10°C in order to raise the air temperature in the conditionedspace to 10°C.

Adjustment of the balance point

The balance point is the lowest outdoor temperature at which the pump can heat up the building without additional electric heaters.
The balance point depends upon:
1) Outdoor design temperature.
2) Heat losses from the building.
3) Capacity of the pump.
The balance point is normally predetermined in the installation project. If it has not been predetermined, the factory regulation of 6°C can be left.

Logic module

The logic module is the control centre for the heat pump.
It responds to the demand signals from the thermostat, examines the information from the "exterior", "discharge" and "liquid" sensors, determining whether the heat pump and/or the supplementary heater should function.

"Exterior" sensor

This is a thermistor measuring the air temperature in the entry to the outdoor coil.

It controls the operation of the pump, stopping it when the outdoor temperature approaches -15°C. This prevents the compressor from operating at a high ratio, which could damage it.

It allows for the switching on of the duct heater (optional) controlled by the 2nd phase of the ambient thermostat, if the exterior temperature drops below -15°C.

Through the "balance point", it allows for adjustment of the temperature at which the additional electric heater has to be switched on.

"Discharge" sensor

This is in the discharge tube from the compressor, installed in series with the high cut-out.

It protects the compressor against high operating temperatures.

It protects the compressor against high operating pressures.

It stops the compressor if the discharge temperature exceeds what is permitted, or if the pressure exceeds 28 kg/cm^2.

It protects the compressor if there is a drop in refrigerant charge or a reduction in air flow-rate through the outdoor or indoor coils.

It permits resetting the compressor circuit after a lockout.

"Liquid" sensor

This is in the liquid line of the outdoor coil.

It begins the defrosting cycle after a period of 30, 60 or 90 minutes (as selected) has elapsed from the start-up or since the previous defrosting, when the temperature detected drops to -5°C or less.

It stops the defrost cycle when the liquid temperature reaches 13°C or stays at a minimum of 7°C for at least 5 minutes.

It prevents defrost in mild climates when it does not detect a sufficiently low temperature.

The reading for the beginning of defrost of 30, 60 or 90 minutes is nominal. These periods are based on an outside temperature of 2°C, a highly unfavourable level which causes considerable frost formation.

At lower temperatures the overall humidity content of the ambient air is lower, making it possible to postpone the defrost cycles, thus saving energy. For example, at -10°C outside temperature, the reading times for the beginning of defrost will be 60, 90 & 120 minutes.

Balance point

It prevents functioning of the support system when the outside temperature is higher than the balance point as adjusted on the plaque. In this way, we save the heater's functioning as long as the heat pump is capable of satisfying the building's requirements. The balance point can be adjusted between 14°C and -4°C. This avoids the necessity of fitting an additional outside thermostat.

Timer

This delays the start-up for 5 or 2 minutes in order to prevent repeated starting cycles. It permits operating voltages to even up before the compressor starts. If the thermostat or manipulation lead to incorrect contacts, the heat pump is not affected.

It delays starting up after a power cut, thus allowing the line voltage to return to normal levels.

Switching off indoor fan during defrost (for units with a single compressor)

This module provides the option of stopping the indoor fan during the defrost cycle. The option is only for cases where it is not possible to fit an auxiliary electric heater.

- With the JP-19 bridge in place (as sent out from the factory) the indoor fan will continue operating during defrost.
- With the JP-19 bridge open (jobsite modification) the indoor fan is switched off.

Switch-off delay of the indoor fan (for single compressor units)

The indoor fan will continue functioning for one minute more after the stop order.

This uses up the energy accumulated in the inside interchanger and saves energy.

This option can be deactivated at the jobsite, if preferred, by leaving the module JP-20 bridge open.

Miscellaneous.

- Connector for computer switching.
- Possibility of lowering timer to 2 minutes.
- Buttons:
  - **Test**. Lowers delay. Direction for comunication.
  - **Reset**. Restarts the control.
  - **Filters**. Delete dirty filter counter.
- Leds:
  - **Standby**. Indicates compressor delay.
  - **Filters**. Dirty filters.
  - **Reset**. Self-diagnosis and reset Led.

Operation

Summer cycle

In summer operation, the 4-way valve is activated.

The circuit followed by the refrigerant is shown in the relevant diagram.

Winter cycle

In the winter cycle, the discharge gas goes to the indoor coil, which acts as the condenser. The outdoor coil becomes the evaporator. The 4-way valve is not activated. The circuit followed by the refrigerant is shown in the relevant diagram.

Operating sequences (See relevant wiring diagrams)

Summer cycle:

Thermostat in COOL position

1) The 4-way valve is activated through the thermostat, permitting the refrigerant to circulate in the summer circuit.
2) If the fan operating mode in the ambient thermostat is in FAN ON, the contactor is activated and the fan functions continuously.
3) With the logic module timing, the unit will start up after 5 minutes.
4) When the thermostat contact connects, the contactor is activated and the compressor starts up. If the fan operating mode is in the normal position, the contactor is activated through the thermostat's cooling circuit and the fan starts up.
5) The unit will function intermittently in response to the

corresponding signal from the ambient thermostat to satisfy the cooling demand.

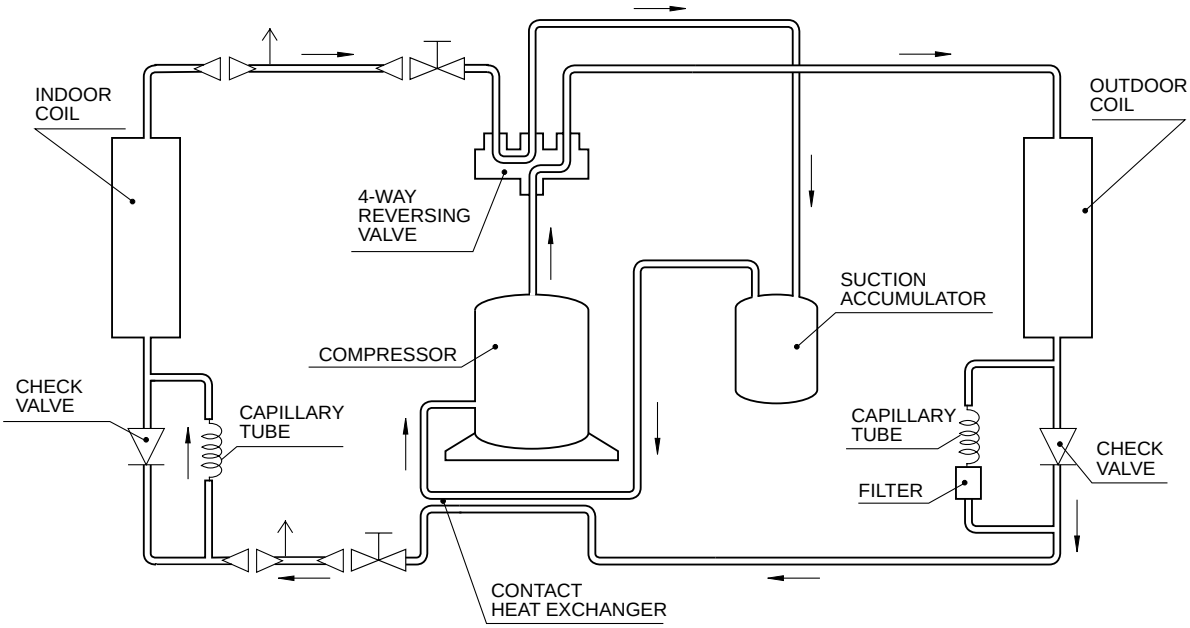
6) When the unit stops at the end of an operating cycle, or through a power failure, the logic module will not allow it to start up again until 5 minutes have elapsed. This is to protect the compressor by allowing the operating voltages to even up.
7) If the discharge pressure exceeds 28 kg/cm^2, or the discharge temperature is over 130°C, the logic module will switch off the unit, leaving the system in lock-out.
8) To re-set after a lock-out, turn off the power supply to the unit. The system will re-set and the unit will start up after 5 minutes.

Winter cycle:

Thermostat in HEAT position

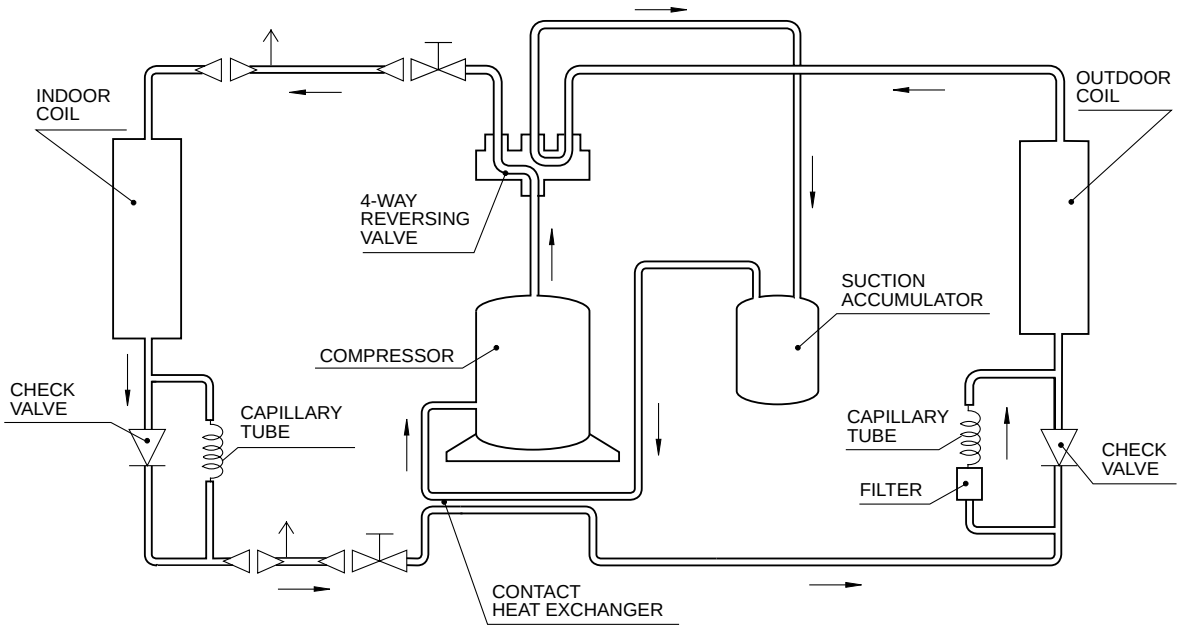
1) The 4-way valve is deactivated, allowing the position for the heating circuit, which means that the indoor coil acts as condenser and the outdoor one as evaporator.
2) If the fan operating mode in the ambient thermostat is in the FAN ON position, the contactor is activated and the fan functions continuously.
3) With the logic module timing, the unit will start up after 5 minutes.
4) When the first stage of the thermostat connects, the contactor is activated and the compressor starts up. If the operating mode of the fan is "normal", the contactor is activated through the thermostat's heating circuit and the fan starts up.
5) The unit will function intermittently in response to the appropriate signals from the ambient thermostat to satisfy the demand for heating.
6) If the unit stops, after an operating cycle, or through a power failure, the logic module will not allow it to start up again until 5 minutes have elapsed. This is to protect the compressor by allowing the operating voltages to even up.
7) If the discharge pressure exceeds 28 kg/cm^2, or the discharge pressure is over 130°C, the logic module will stop the unit, leaving the system in lockout.
8) To re-set after a lock-out, switch off the power to the unit. The system will re-set and the unit start up after 5 minutes.
9) The auxiliary heater is activated when the auxiliary heating stage of the thermostat is connected. The logic module allows the indoor auxiliary heater to function if the outdoor temperature is below the balance point. If the outdoor temperature is above that set as the balance point, the indoor heater does not function.
10) The emergency heater (complementary) is connected when the outdoor temperature is lower than that preselected as the operating limit (-15°C, logic module), and the ambient thermostat demands the second heating stage.

Summer cycle diagram



Note:
The BCVO/I-45 & 60 units have 2 independent circuits with similar characteristics. The diagram shows the circuit followed by the refrigerant in one of them.

Winter cycle diagram



Note:
The BCVO/I-45 & 60 units have 2 independent circuits with similar characteristics. The diagram shows the circuit followed by the refrigerant in one of them.

Defrost cycle (timed)

The ice which is produced on the outdoor coil during the heating cycle must be eliminated when it begins to block the coil.

The defrost cycle begins after a period selected between 30, 60 & 90 minutes from the start-up or the last defrosting, and when the evaporation temperature drops to -5°C or less.

The logic module activates the defrost relay, which:

- Activates the 4-way valve to go into the cooling cycle.
- Switches off the outdoor fan.

The defrost cycle finishes when the liquid temperature is sufficiently high, measured by a thermistor 13°C, or when, if it does not heat up, it reaches a minimum of 7°C for a 5 minute period; also after 12 minutes from its beginning.

When the defrost cycle finishes, the logic module disconnects the defrost relay, reestablishing normal operating conditions of the heating cycle.

If the unit tries to go into another defrost cycle in less than 5 minutes, the logic module switches it off, leaving the system in lock-out.

Operating at -15°C **(optionally -5, -10, -20)**

When the outdoor temperature is less than -15°C there is no justification for running the compressor with the limited amount of heat it generates.

If the logic module detects, through a thermistor in the exterior air entry, a temperature lower than -15°C, it acts as follows:

- It disconnects the compressor.
- It switches on the emergency heater (if there is one installed) controlled by the thermostat's second stage. (The auxiliary heater will also continue to function, governed by the thermostat's second stage).
- It leaves the indoor fan functioning under the first heating stage of the thermostat.

Operating with emergency heat

When the operating mode of the thermostat is in the emergency heat position (flashing HEAT signal on the display):

- The compressor will be in lock-out.
- The auxiliary and emergency heaters (if installed) will be governed by the first stage of the thermostat.

Note:
With the BCVI-45, the auxiliary heater is the indoor one and the emergency one is the second supplementary one in the ducting.

Other safety features of the electric circuit

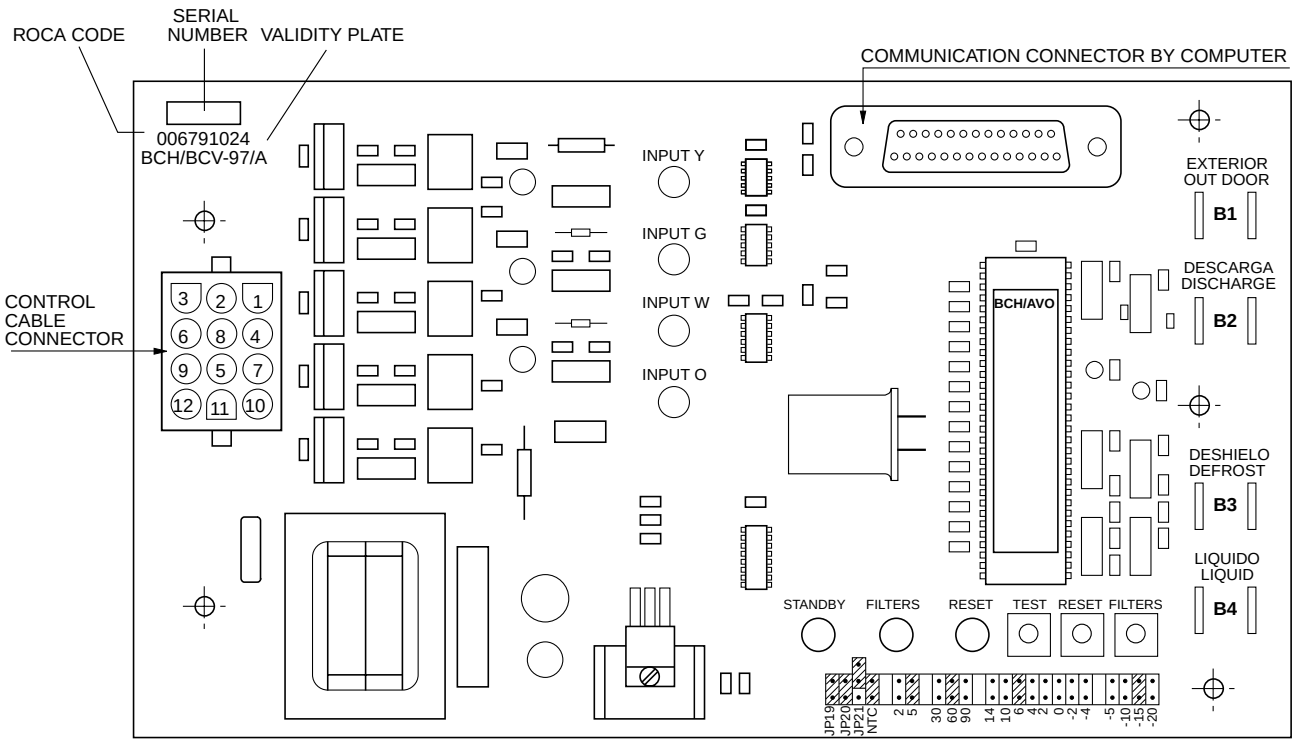
- The three-phase fans have manual re-set protection by thermal relay.
- The circuit is protected against failure of a phase. Re-setting is manual.
- The compressor is protected against overheating by a solid state protector with three sensors inside the windings. This also protects it against failure of a phase.
- The control circuit is protected by a fuse.
- A system of relays prevents the simultaneous function of the defrost system in both the BCVO/I-45 & 60 circuits.
- The casing and components, as a whole, are protected by an earthing circuit.

Compressor sump heater

The compressor is fitted with a heater in the sump to prevent an excessive concentration of refrigerant in the compressor when it is switched off.

If the main switch has been turned off for some time, before starting up the heat pump the main must have been on again for at least 8 hours. This is to allow for refrigerant accumulated in the compressor to be eliminated.

Module



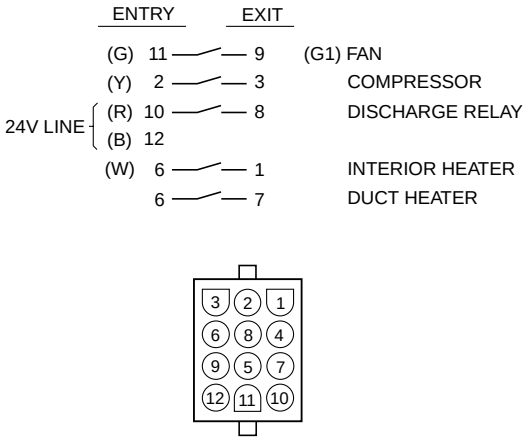
BUTTONS

TEST.- DIMINISHES TIMER/DIRECTOR PLATE COMMUNICATION
RESET.- RESTARTS CONTROL
FILTERS.- DIRTY FILTERS CONTACTOR DELETE

LEDS

STANDBY.- INDICATES COMPRESSOR DELAY
FILTERS.- DIRTY FILTERS
RESET.- SELF-DIAGNOSIS/RESET LED

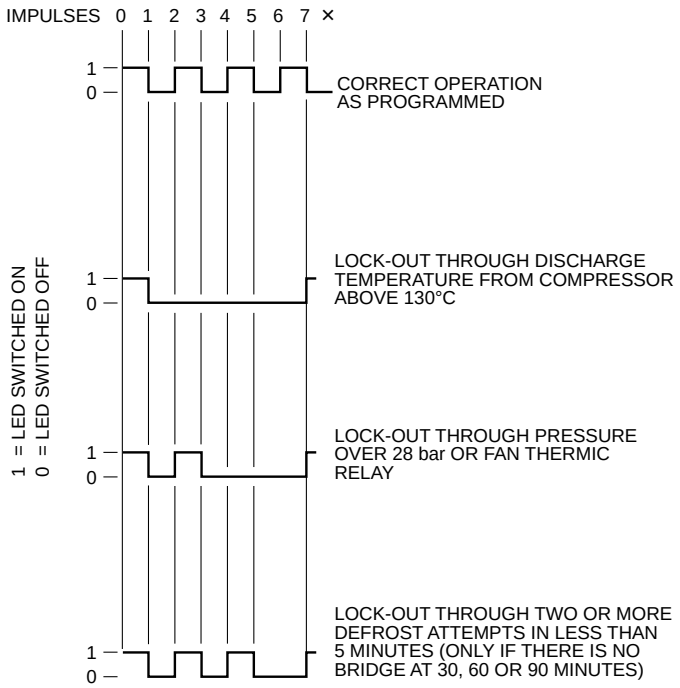
Detail module internal connections to the connector



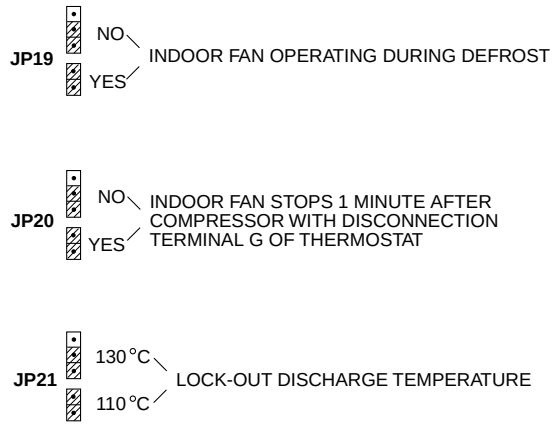
Processes initiated by state of the probes

OUTDOOR PROBE		OPEN	- CONNECTS THE EMERGENCY HEATER - STOPS THE COMPRESSOR
DISCHARGE PROBE		CLOSED	- STOPPAGE COMPRESSOR (LOCK-OUT)
DEFROST PROBE		CLOSED	- (FOR 12 SECONDS WITH LIQUID TEMPERATURE < 4 °C) - BEGINS DEFROST
LIQUID PROBE		OPEN	- REPEATS DEFROST CYCLES ACCORDING TO TIME

Led self-diagnosis indications



Functions of the bridges (pins)

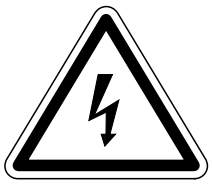


- SCALE OF BALANCE POINTS: 14, 10, 6, 4, 2, 0, -2 & -4°C.
- START-UP DELAY TIME: 2', 5'.
- TIME BETWEEN 2 DEFROSTS: 60', 30', 90'.
- LOW TEMPERATURE DISCONNECTION SCALE: -5, -10, -15, -20°C.

THIS PLAQUE IS DELIVERED WITH 7 JUMPERS (PIN) IN:

CLOSING CIRCUIT: 5', 60', 6°C, -15°C, **JP19 & JP20**.
WITHOUT CLOSING CIRCUIT: **JP21**.

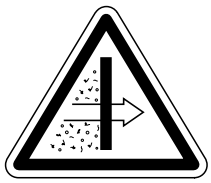
Before finalising the installation



Verify that:
- The voltage is always between 198-254 V or 342-436 V.
- The gauge of the supply cable is at least that which is recommended in the corresponding electrical diagrams.

- The condensation drainage is perfectly assembled and their are no leaks in the water circuit.

- Instructions have been given to the users on how to operate the system.



- The need to clean the air filter has been communicated.

- The guarantee split has been filled in.
- Maintenance instructions have been given or a contract has been made for periodic servicing.

Operating instructions

General introduction

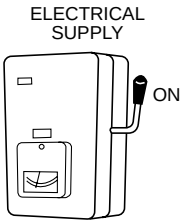
The heat pump is an air to air type of equipment that provides air conditioning in summer and in winter by inverting its operation cycle.

The start and automatic temperature regulation are done by means of the 24 volt room thermostat specially designed for this units.

Important warnings

The thermostat must be located on a wall which is not exposed to direct sunlight; should this not be the case, the temperatures would not be real and the operation of the heat pump would not be appropriate. Before start-up, turn on the main switch so that the electric heater in the compressor crankease begins to operate.

The compressor must not be started up until at least eight hours have passed.



Connection:
The electrical supply must be connected for at least 8 hours before operational start up of the conditioner in order to heat the system. Leave the supply connected, except when the conditioner is going to be out of use for long periods of time.

This is to allow the coolant which, in its liquid form, will have mixed with the compressor oil, to evaporate.

The heat pump is fitted with a safety device for the protection of the compressor which prevents it from being switched on again immediately after a shut down; five minutes must have elapsed between the shut down and the new start up.

Recommendations for better functioning

- Turn the console on before the room gets hot. The heat accumulated on furniture, walls, etc. makes the console take longer to achieve the desired temperature.
- It is advisable to inspect and service your unit in the spring; this avoids damage and insures a long service of your console.

Start up

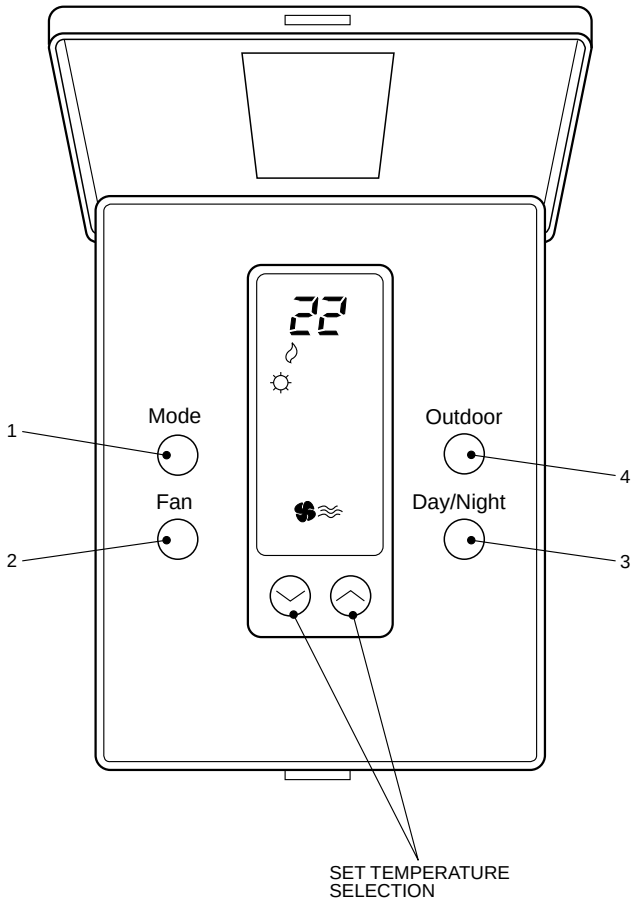
After duly connecting the unit, taking into account the specifications outlined in the installation instructions manual for the heat pump, we can proceed to the start up, which is realised by means of the ambient thermostat.

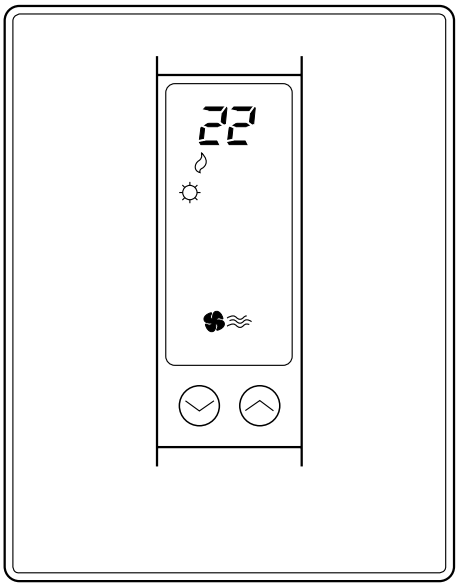
Ambient thermostat units of 1 & 2 circuits

This thermostat has been designed to proportion a precise control of the ambient temperature and to give graphic

Controls and indicators

1.- Operational mode selection.
2.- Fan speed selection.
3.- Day/Night selection.
4.- Outdoor temperature reading option (units with 2 circuits)





information of the mode in which the heat pump is operating. It is a control with a Proportional-Differential-Integral response which, in relation to the difference between the programmed and the ambient temperatures, varies the on/off cycles between 3 and 7.5 cycles per hour.

The liquid crystal display (LCD) normally indicates the ambient temperature, mode of operation, and whether the heating or cooling system is connected.

It allows the selection of different set points for heating and cooling, as well as the choice of °C or °F.

The operation of the fan can be set in continuous mode, or automatic, switching off and operating in unison with the compressor.

The controls are located underneath a cover which prevents their manipulation by unauthorised personnel.

Operation and start up

Start up is implemented by the controls located on the thermostat.

1. MODE

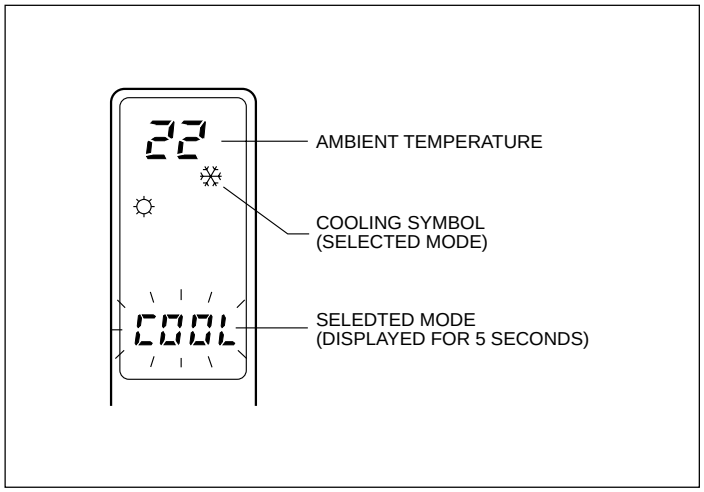
The operational mode of the heat pump is selected by pressing this button. When the button is pressed the following operational modes appear on the liquid crystal display panel:

- COOL - Controls the system in the cooling mode. (The word COOL is displayed on the panel for 5 seconds).
- HEAt - Controls the system in the heating mode. (The word HEAt is displayed on the panel for 5 seconds).
- Auto - Controls the system in cooling or heating according to requirements. (The word Auto is displayed on the panel for 5 seconds).
- E Ht - Controls the system in the emergency heating mode (it is only active if the optional accessory electrical resistance heater has been installed).
- OFF - Disconnects the system.

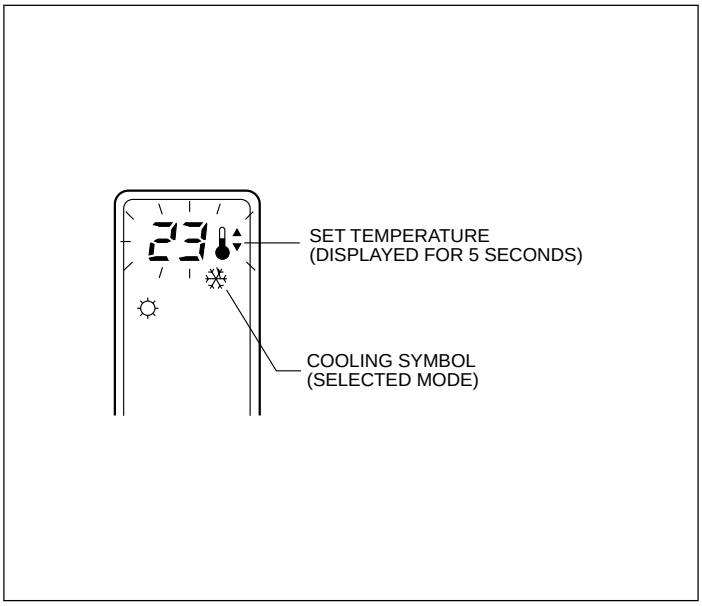
a) Cooling

Press the MODE button repeatedly until the cooling symbol is displayed on the panel (at the same time the word COOL is displayed for 5 seconds).

The cooling symbol continues to be displayed on the panel.



Once the operational mode has been selected, select the set temperature by pressing button ⌃ or button ⌄, whether this be to select a higher or a lower temperature. The set temperature is displayed accompanied by a small symbol which represents a thermometer, and remains visible on the display panel for 5 seconds. Once the set temperature will again be displayed.

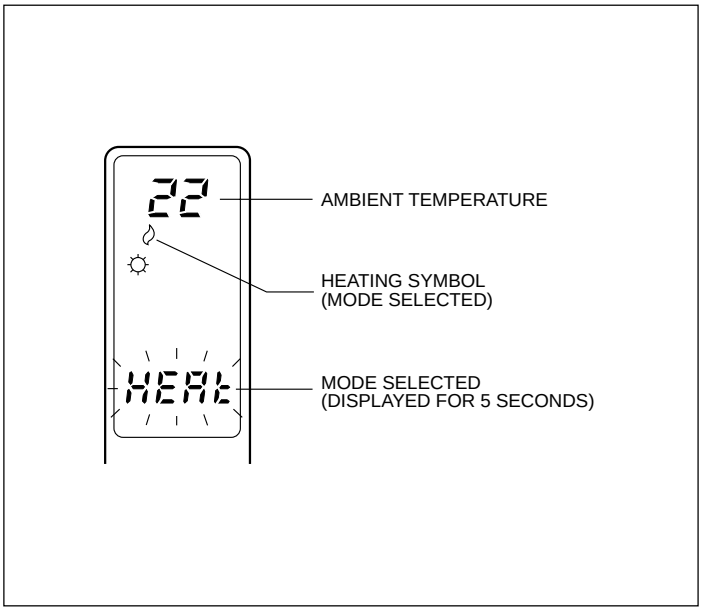


After a few minutes have passed the cooling system will start up, and the cooling symbol, visible on the display, will start to flash.

b) Heating

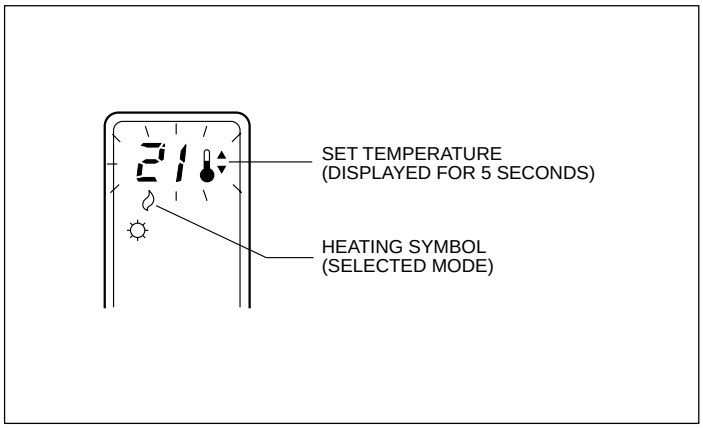
Press the MODE button repeatedly until the heating symbol is displayed on the panel (at the same time the word HEAt is displayed for 5 seconds).

The heating symbol continues to be displayed on the panel.



Once the operational mode has been selected, continue to select the set temperature by pressing button ⌃ or button ⌄, whether this be to select a higher or a lower temperature. The set temperature is displayed together with a small symbol which represents a thermometer, which is displayed on the panel for 5 seconds. After the set tem-

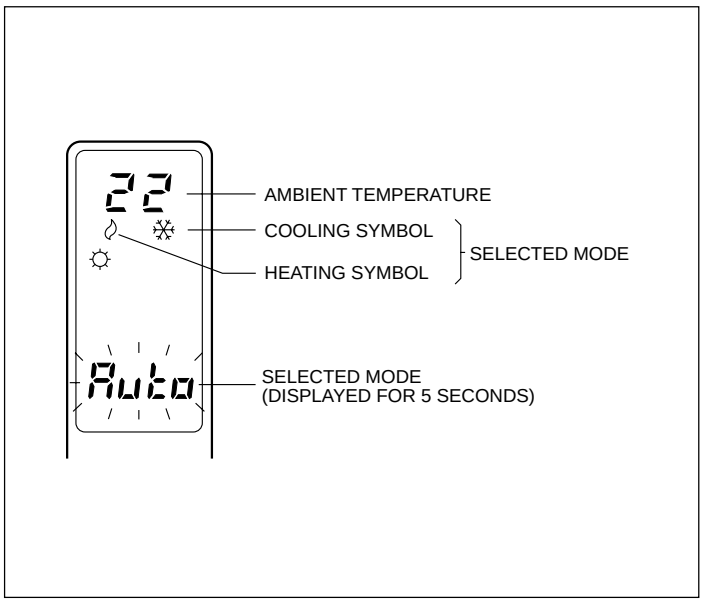
perature has disappeared then the ambient temperature will again be displayed.



After a few minutes have passed the heating system will start up, and the heating symbol, visible on the display, will start to flash.

c) Automatic

Select a set temperature for the cooling mode and another for the heating mode, as described in paragraphs a and b. In this operational mode the set temperature for cooling COOL must be at least 1°C above the heating HEAt temperature, this is the minimum differential allowed by the thermostat. Press the MODE button repeatedly until the heating symbol and cooling symbol are displayed on the panel (at the same time the word Auto will be displayed for 5 seconds). The heating and cooling symbols will continue to be displayed on the panel.

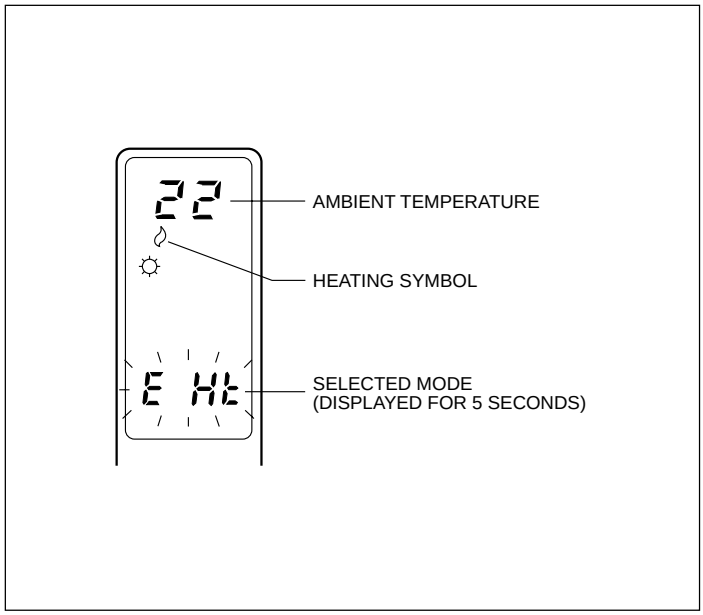


After a few minutes have passed the system will start up, automatically switching to the heating or cooling mode and maintaining the temperature between the selected margins. The symbol corresponding to the operational mode, heating or cooling, will start to flash.

d) Emergency heating

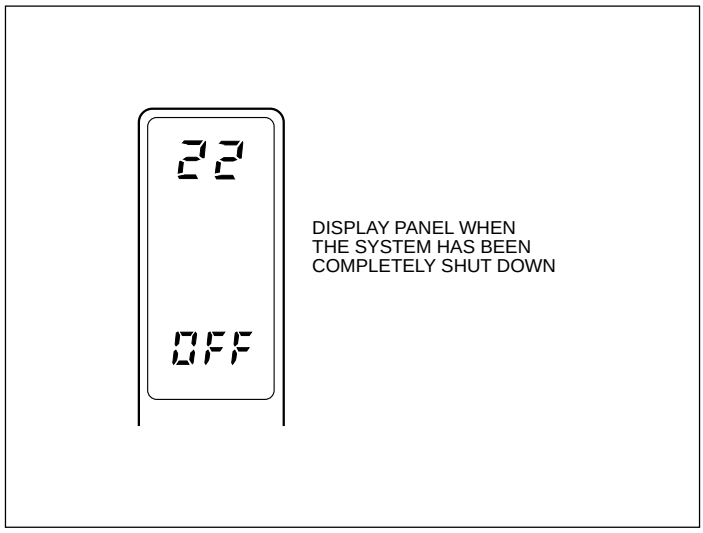
Repeatedly press the MODE button until the letters E Ht (displayed for 5 seconds) appears on the display panel, at the same time the heating symbol will be displayed; once a few minutes have passed the emergency heating will start up, and the heating symbol will start to flash.

In this operational mode the compressor is always shut down and the (optional) auxiliary and emergency resistance heaters, if they are fitted, are used to supply the heat. This operational mode can also be used for heating in case of a compressor breakdown.



e) Off

Repeatedly press the MODE button until the word OFF appears on the display. The heat pump will stop and on the thermostat display panel the word OFF and the ambient temperature will be permanently displayed.



f) °C / °F scale

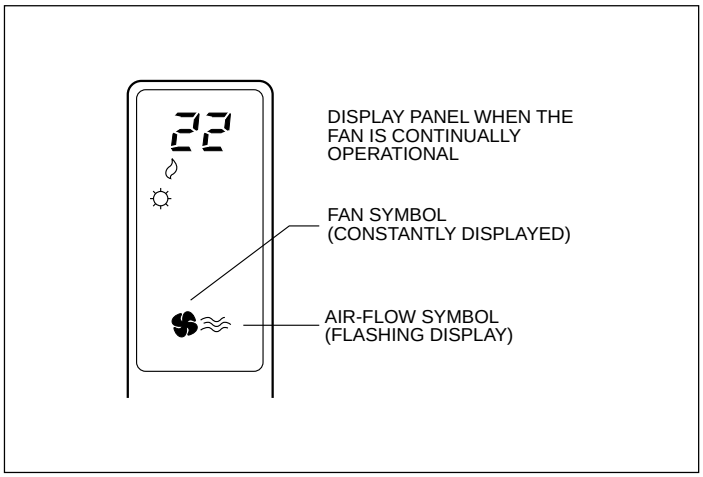
To change the scale of degrees of temperature, press the and buttons simultaneously.

2.- Fan

The Fan is started up in a continuous manner by pressing the FAN button (independently of the operational state of the unit), the fan and air-flow symbols will be displayed on the thermostat display panel, the fan symbol steadily and the flow symbol flashing.

The FAN symbol will disappear when the button is pressed again and the fan will be automatically controlled in

unison with the compressor or the electrical resistance heater (should this be installed).

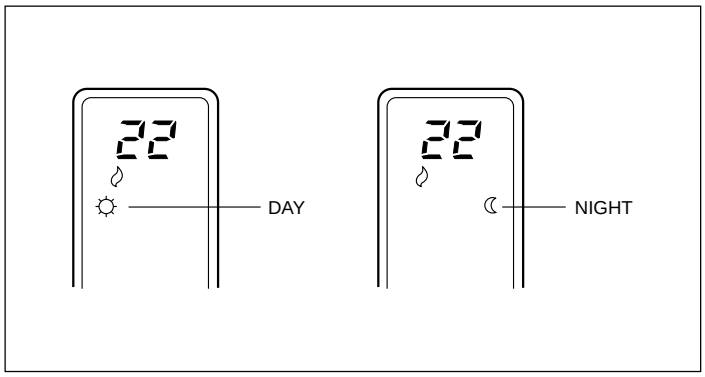


3.- Day/night selection

Different set temperatures can be selected by pressing the DAY/NIGHT button, for day and night (in each of the operational modes).

When installing the thermostat the ☼ symbol will be displayed, indicating that the temperature selected is set for the day. By pressing the DAY/NIGHT button the ☾ symbol is displayed on the panel, indicating that the temperature selected will be set for the night.

Every time that we press this button we alternate the established set temperatures, whether they be for the day ☼ or the night ☾.



4.- Outdoor temperature reading option (units 2 circuits)

The thermostat allows for the option of installing a sensor for taking readings of the outdoor temperature. This temperature can be read off by pressing the OUTDOOR button.

Remote ambient temperture sensor option (units 2 circuits)

The DSL thermostat has been designed to accept a remote sensor which allows for control of the ambient temperature fo premises separated from the room where the DSL thermostat is installed. The remote sensor is connected to the RS1 - RS2 - RS + V, terminal strip inside the thermostat.

LED 1 option (units 2 circuits)

The thermostat has an LED which if it is supplied at 24 V (through an exterior timer or pressure switch signal) can warn of the need to clean the filters.

LED 2 option (units 2 circuits)

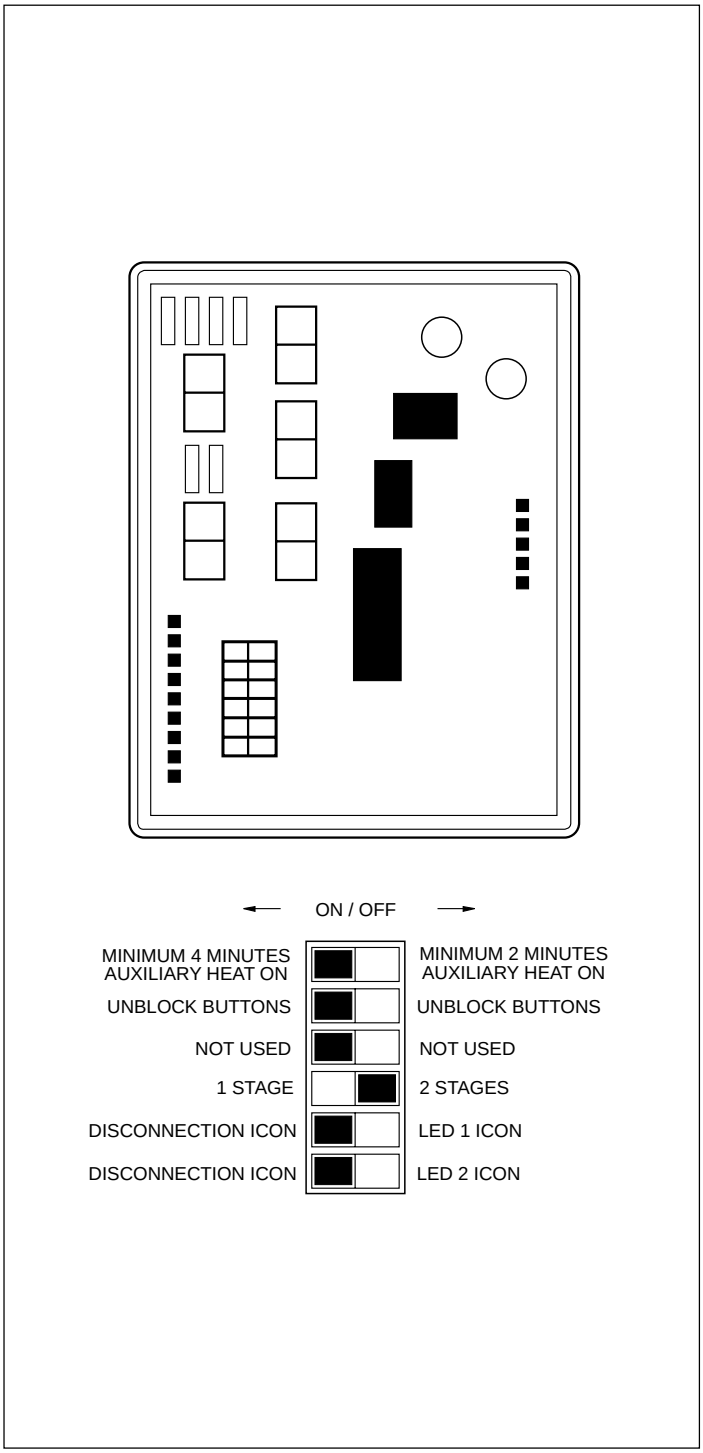
The thermostat has a second LED which, if supplied at 24 V, can be used as a service call.

Internal configuration of the thermostat (units 2 circuits)

The thermostat has a configuration system (option) by means of micro-swiches located on the base board.

The standard configuration of the thermostat must be that which is described in the following section.

Adjustment of the micro-switches (units 2 circuits)

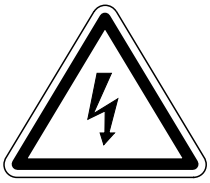


Graphic information

The display panel permanently provides us with information concerning: the ambient temperature, operational mode, day/night, and fan operation. To receive information concerning the set temperatures it is only necessary to press one of the temperature selection buttons once, and the established set temperature for the operational mode which is being displayed at that time will appear on the panel for 5 seconds.

Maintenance

Clean the casing with a vacuum cleaner or a cloth moistened in a mild liquid detergent.



Do not use water to clean the indoor unit. Water may damage the internal components and cause electrical discharges.

Indoor unit outflow ducts

The indoor unit outflow, intended for ducts, is supplied without a protective grill. When maintenance work is being done this must be taken into account.

CAUTION

In cases of an restricted outflow installations for an indoor unit intended for ducting, the outlet opening must be protected with a grill. Failure to fit this protection could result in damages being caused by the fan turbine.

Cleaning the filters

Keep the battery filters in good condition, servicing them at least once a month. If the filters are dirty they will reduce the air-flow and the performance of the unit.

Cleaning the outdoor

Dirt must not be allowed to accumulate on the outdoor unit. This must be cleaned as often as necessary with a brush, vacuum cleaner or detergent.

CAUTION

For safety reasons make sure to switch off the air-conditioner, and to disconnect it from the mains before cleaning.

CAUTION

Check the outdoor unit periodically to see whether either the outlet or the inlet are blocked up with dirt or leaves, etc.
The internal coil and other components of the outdoor unit must also be periodically cleaned. Contact your concessionary or maintenance service.

Priming the drainage siphon

To avoid problems with water from condensation we recommend that the drainage siphon be primed when starting up and before the beginning of each season so as to avoid, from the very beginning, the intake of air into this pipe.

Checking drive belt tension

Each yeatr the tension and wear on the drive belts of the motor must be checked, and if necessary they must be changed. Before making the check disconnect the mains supply switch.

CAUTION

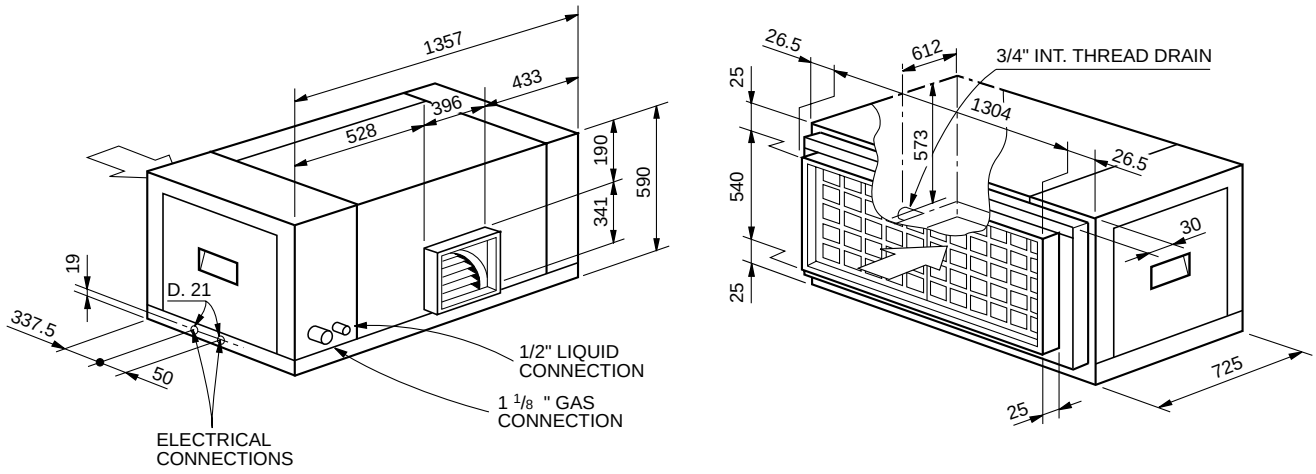
For safety reasons make sure that you switch off the air-conditioner, also disconnecting it from the mains supply, before checking the fan motor drive belts.

Access to the units for maintenance servicing

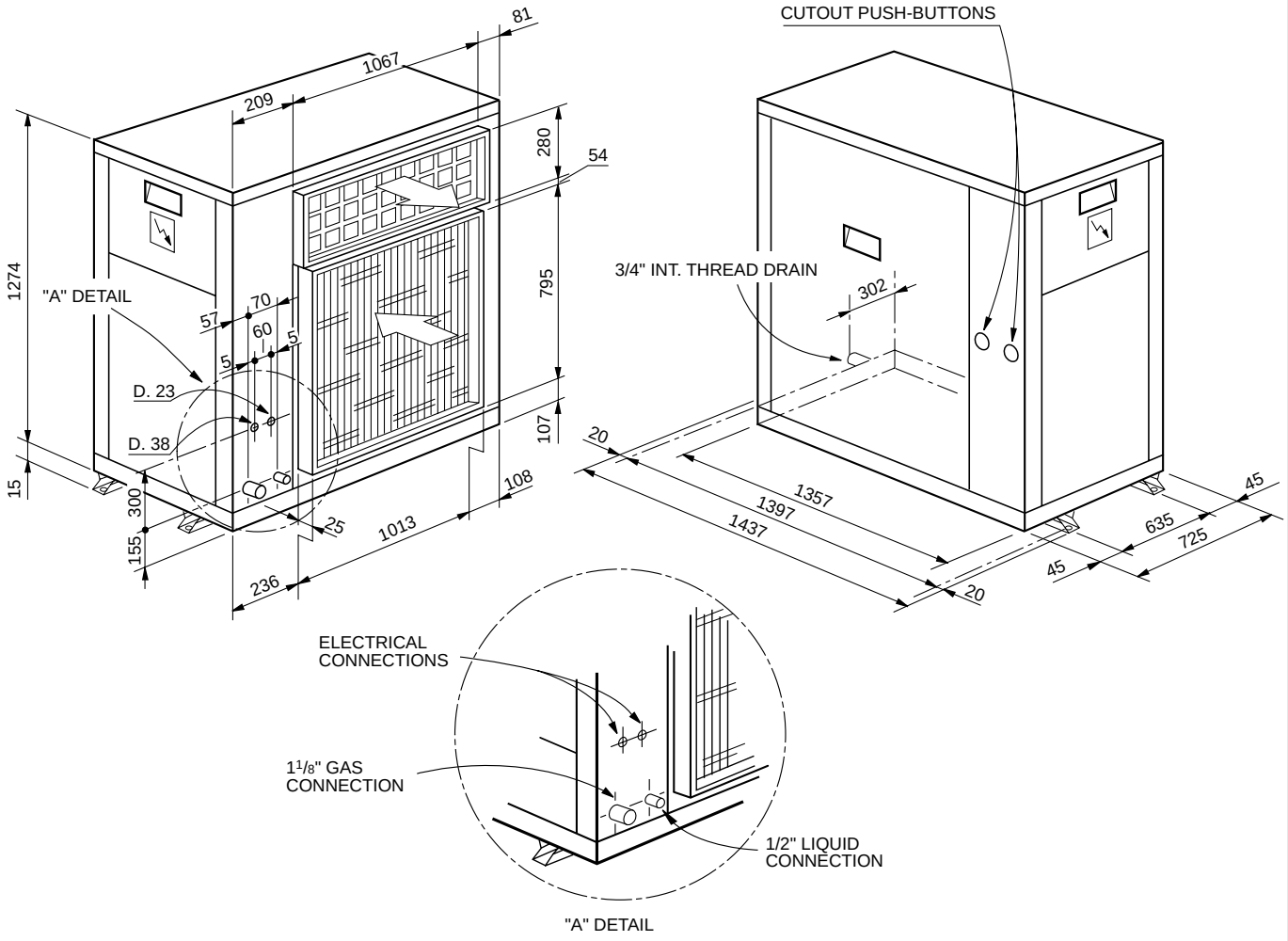
Attention: The unit has a remote control system and can start automatically. Two minutes prior to having access to the interior, the power supply should be disconnected so as to avoid any contact with the fan turbine in operation.

General dimensions mm

BCVI-20 & 25

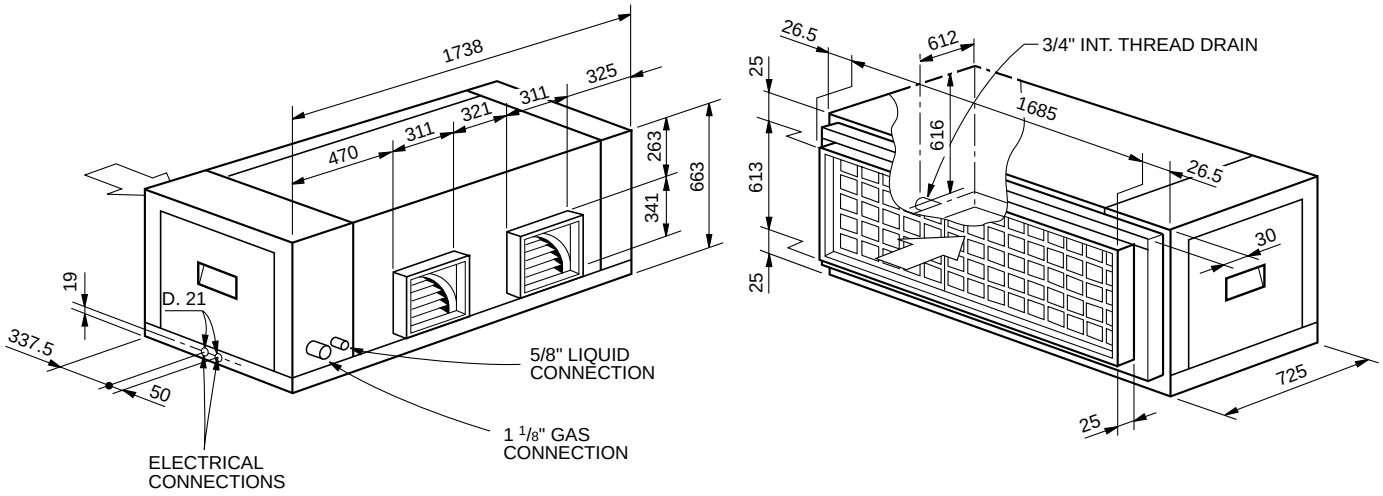


BCVO-20 & 25

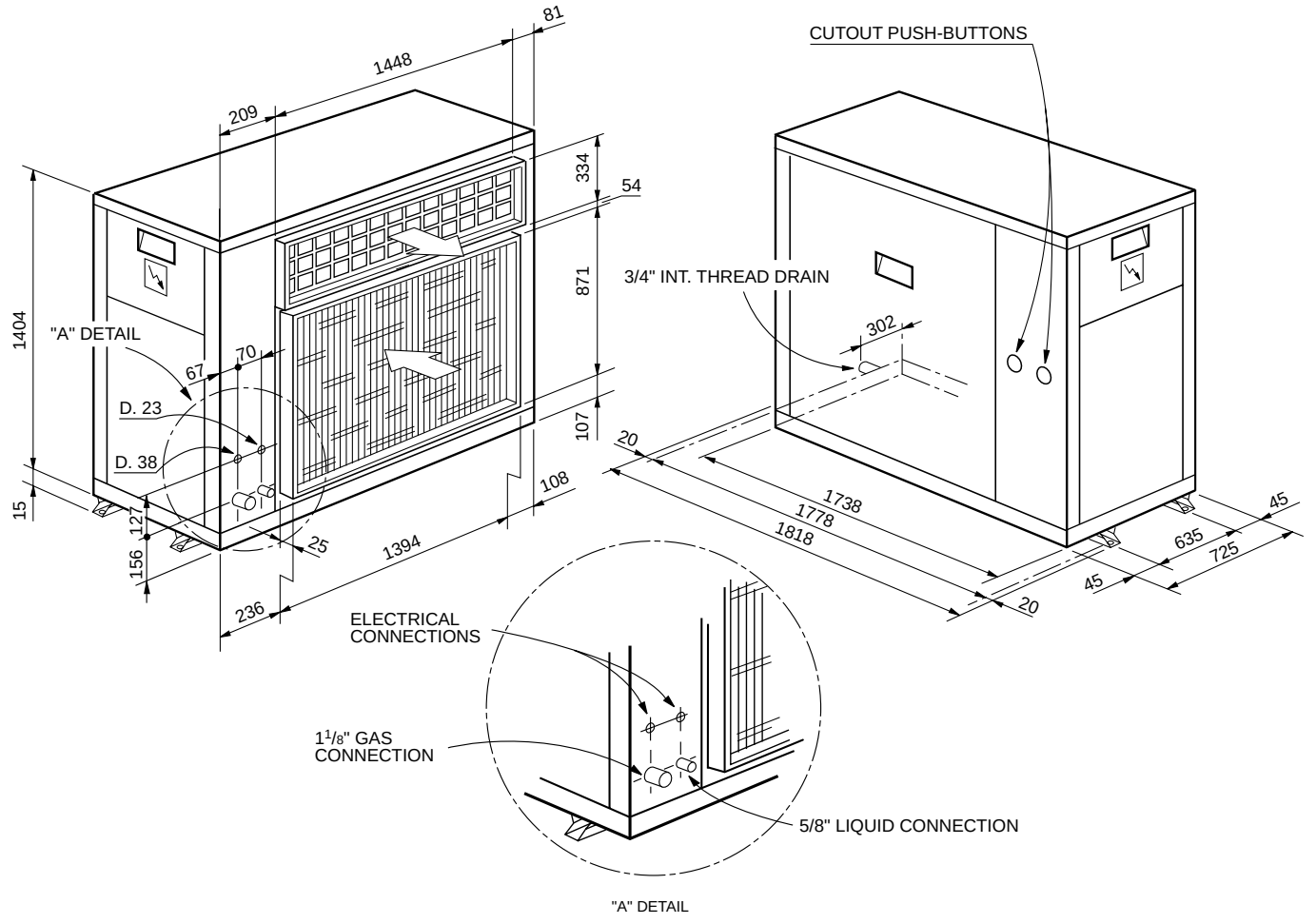


General dimensions mm

BCVI-30 & 40

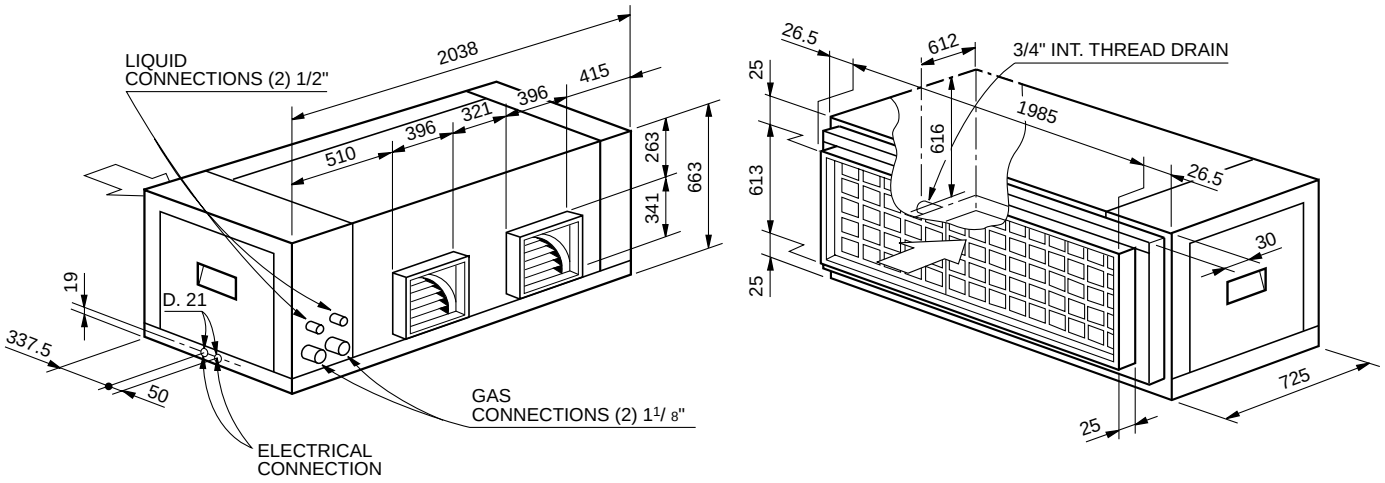


BCVO-30 & 40

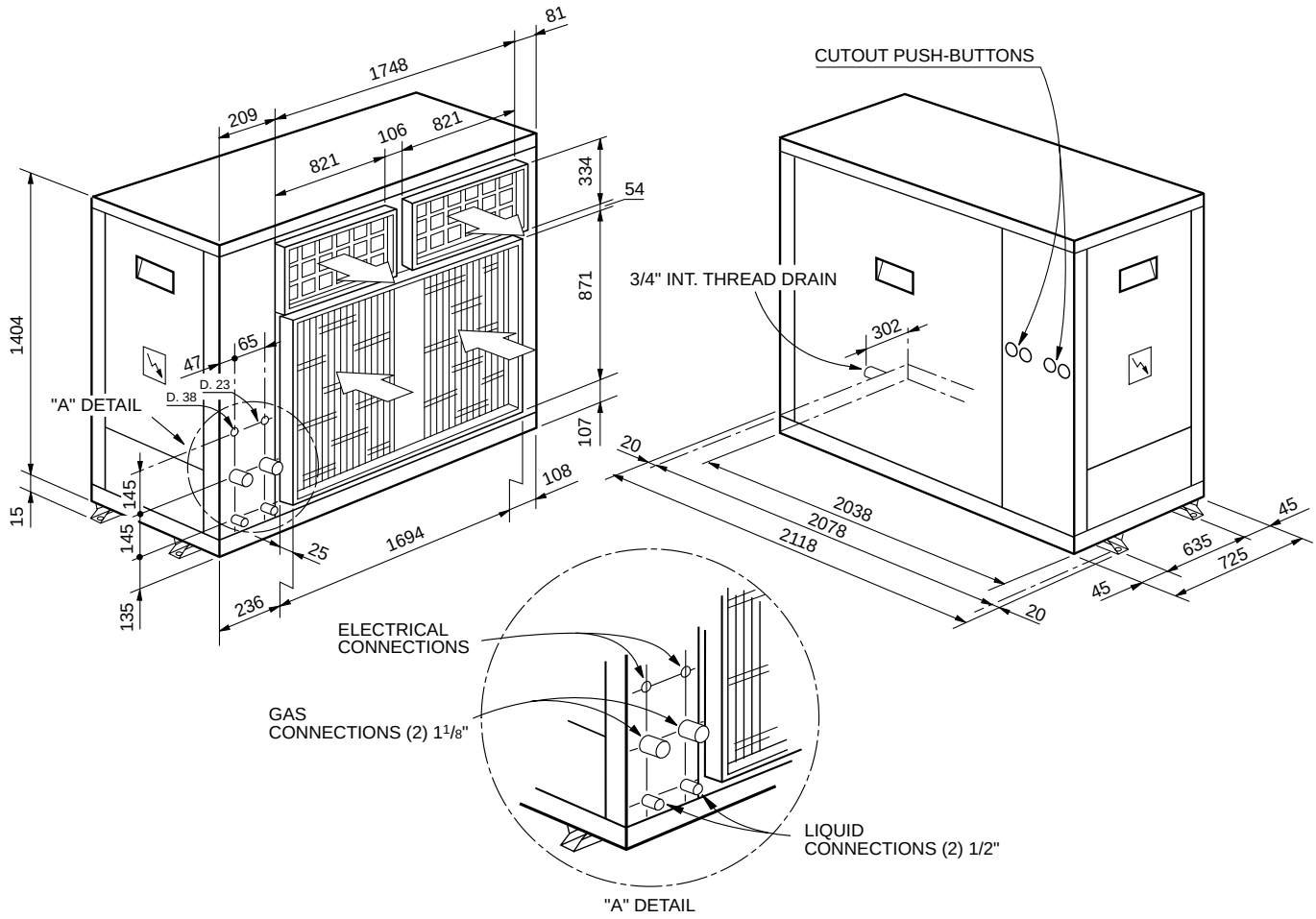


General dimensions mm

BCVI-45

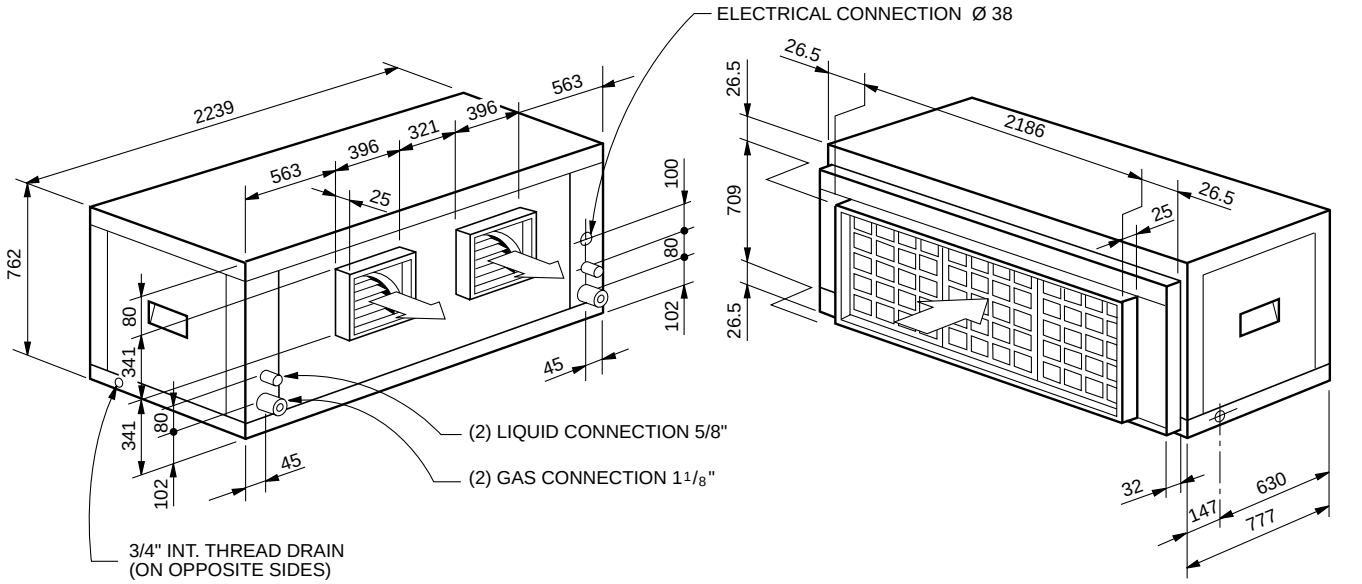


BCVO-45

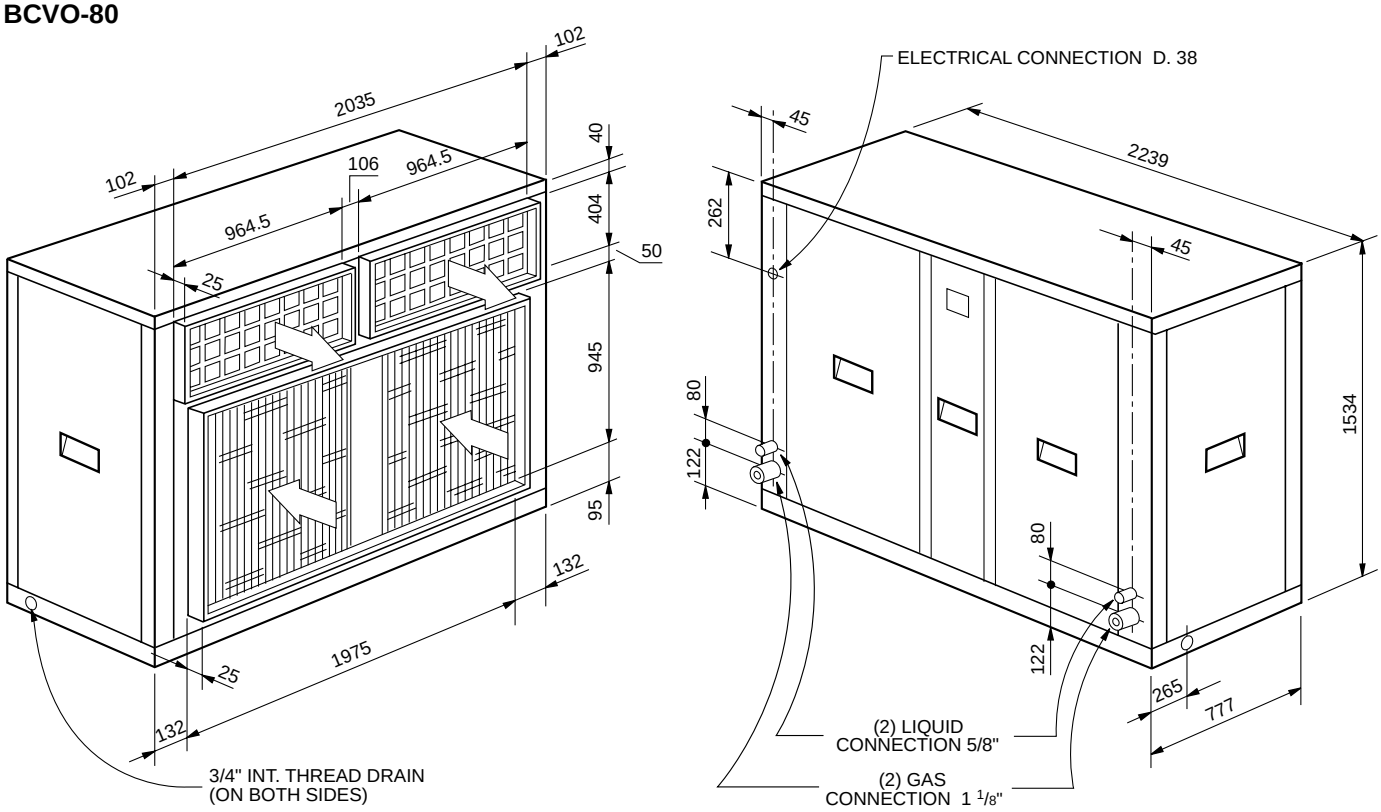


General dimensions mm

BCVI-60

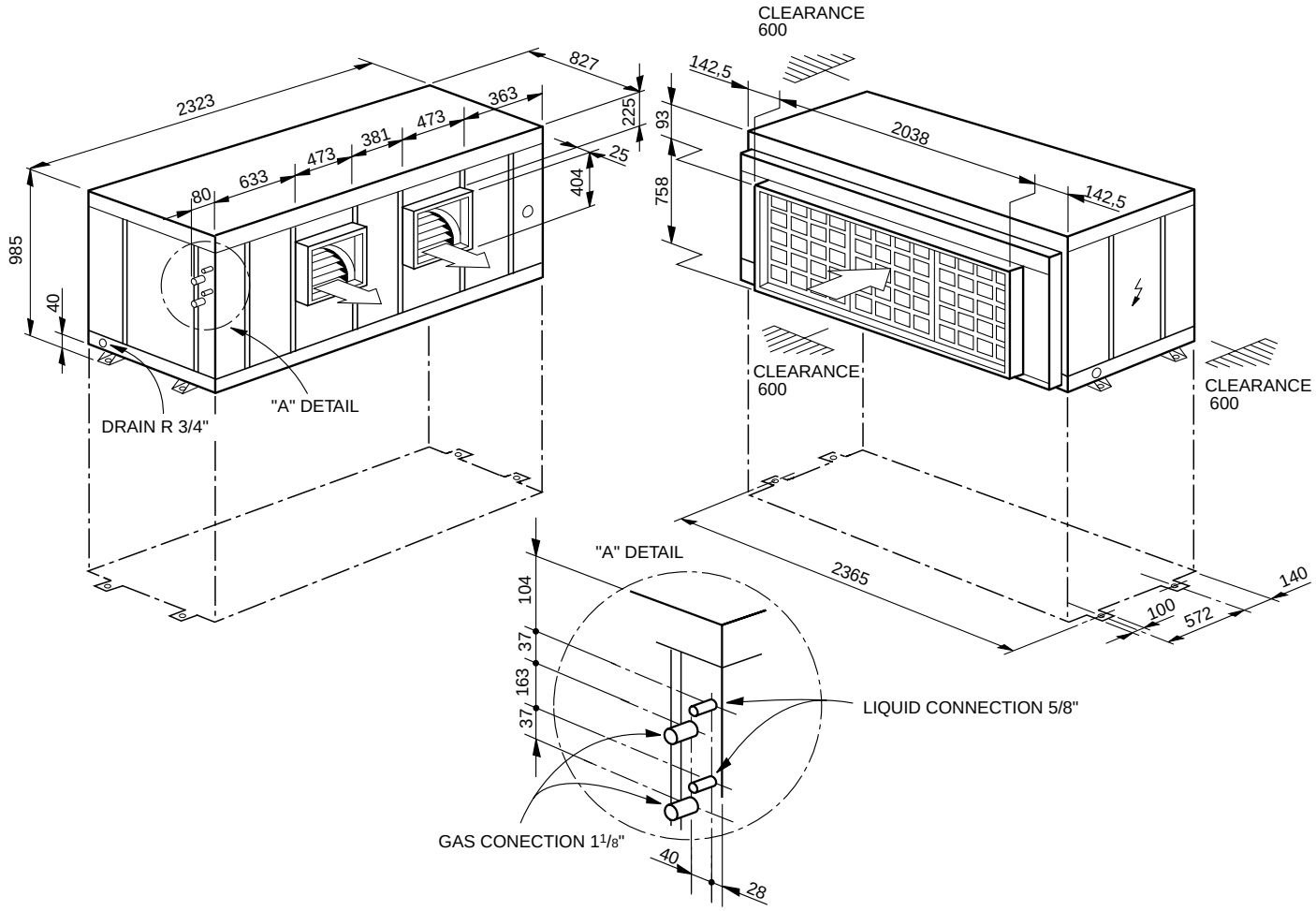


BCVO-60
BCVO-80



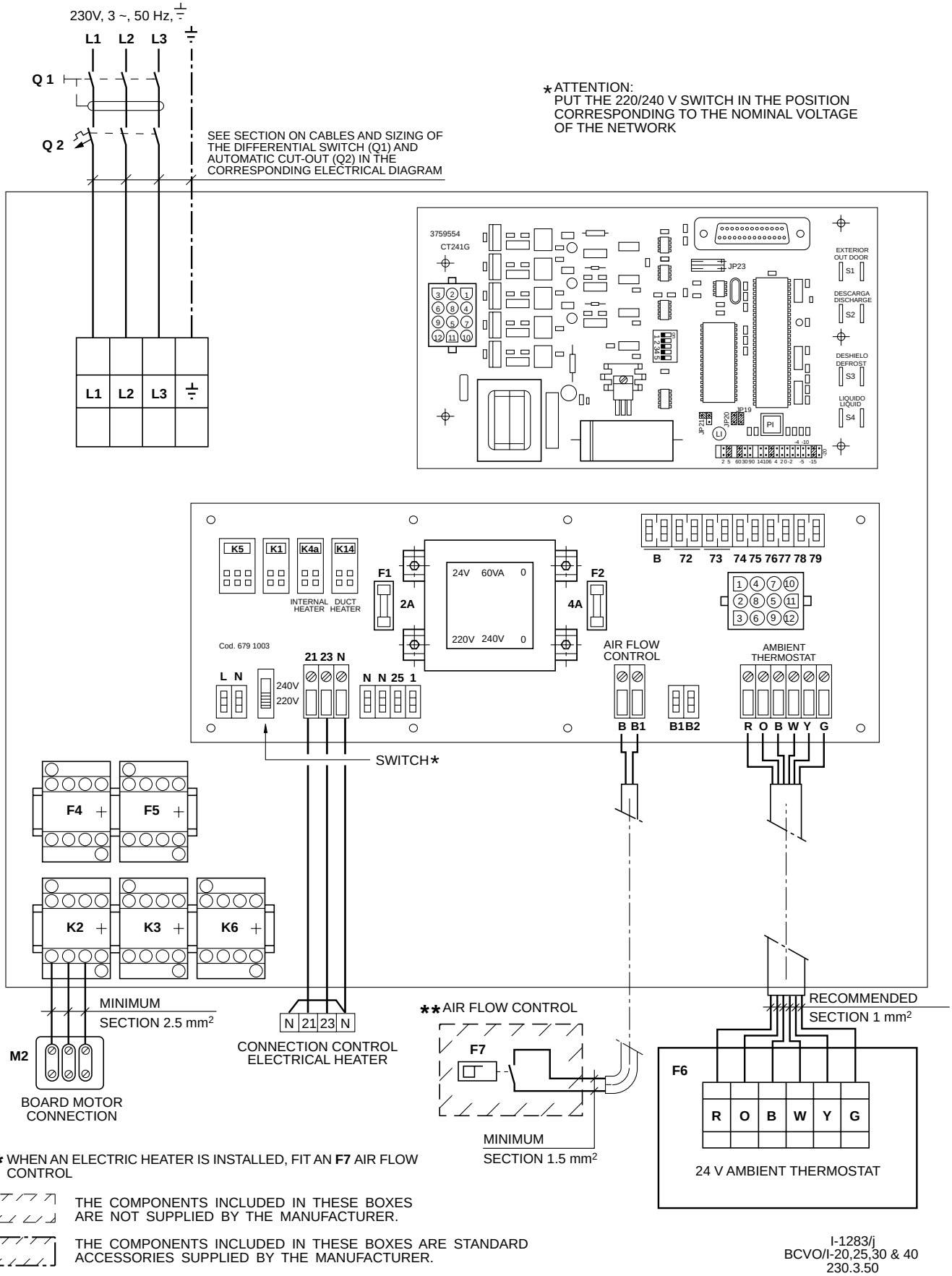
General dimensions mm

CHI-800



Connections diagram

BCVO/I-20, 25, 30 & 40, 230.3.50



** WHEN AN ELECTRIC HEATER IS INSTALLED, FIT AN **F7** AIR FLOW CONTROL

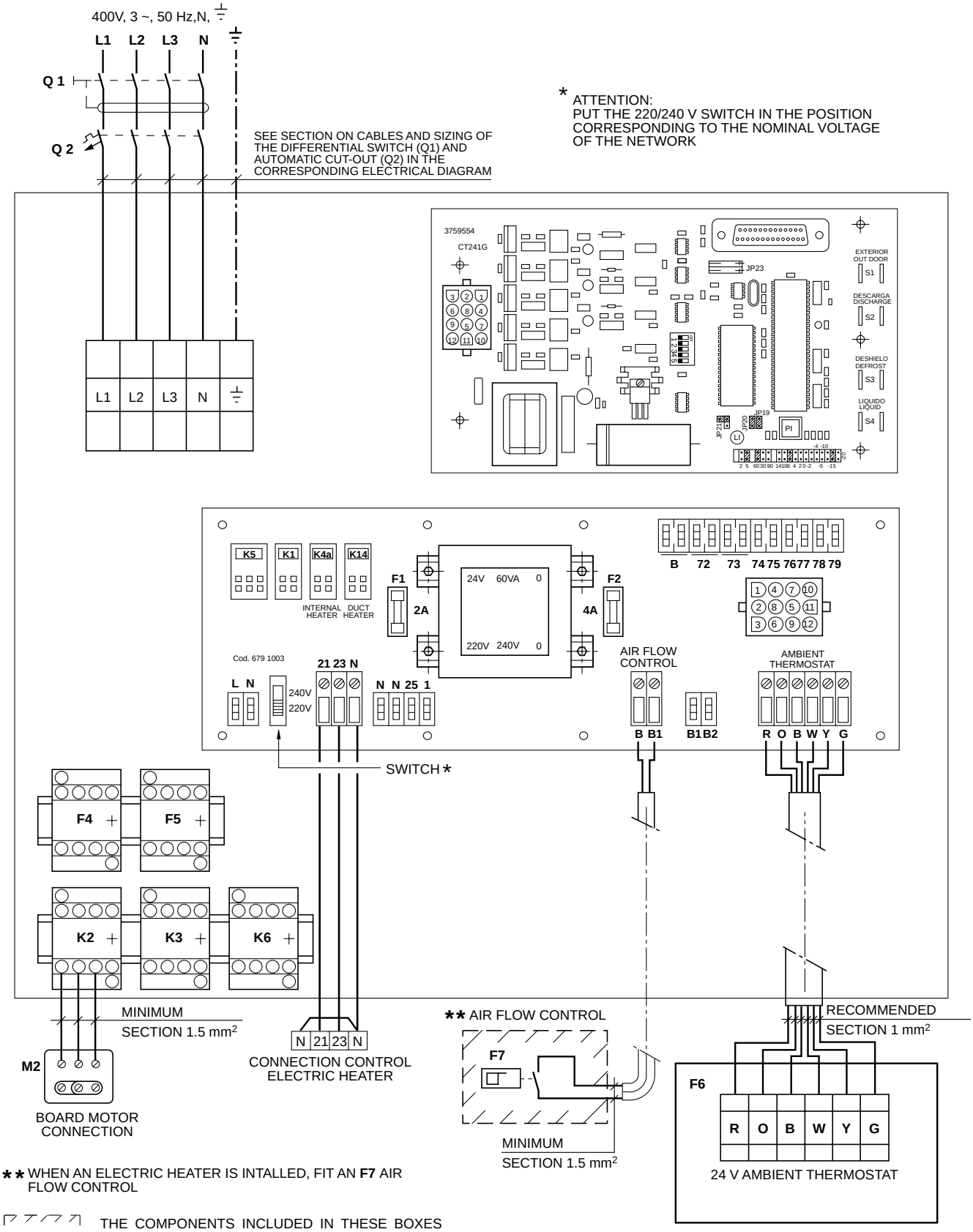
THE COMPONENTS INCLUDED IN THESE BOXES ARE NOT SUPPLIED BY THE MANUFACTURER.

THE COMPONENTS INCLUDED IN THESE BOXES ARE STANDARD ACCESSORIES SUPPLIED BY THE MANUFACTURER.

I-1283/j
BCVO/I-20,25,30 & 40
230.3.50

Connections diagram

BCVO/I-20, 25, 30 & 40, 400.3.50



** WHEN AN ELECTRIC HEATER IS INTALLED, FIT AN **F7** AIR FLOW CONTROL

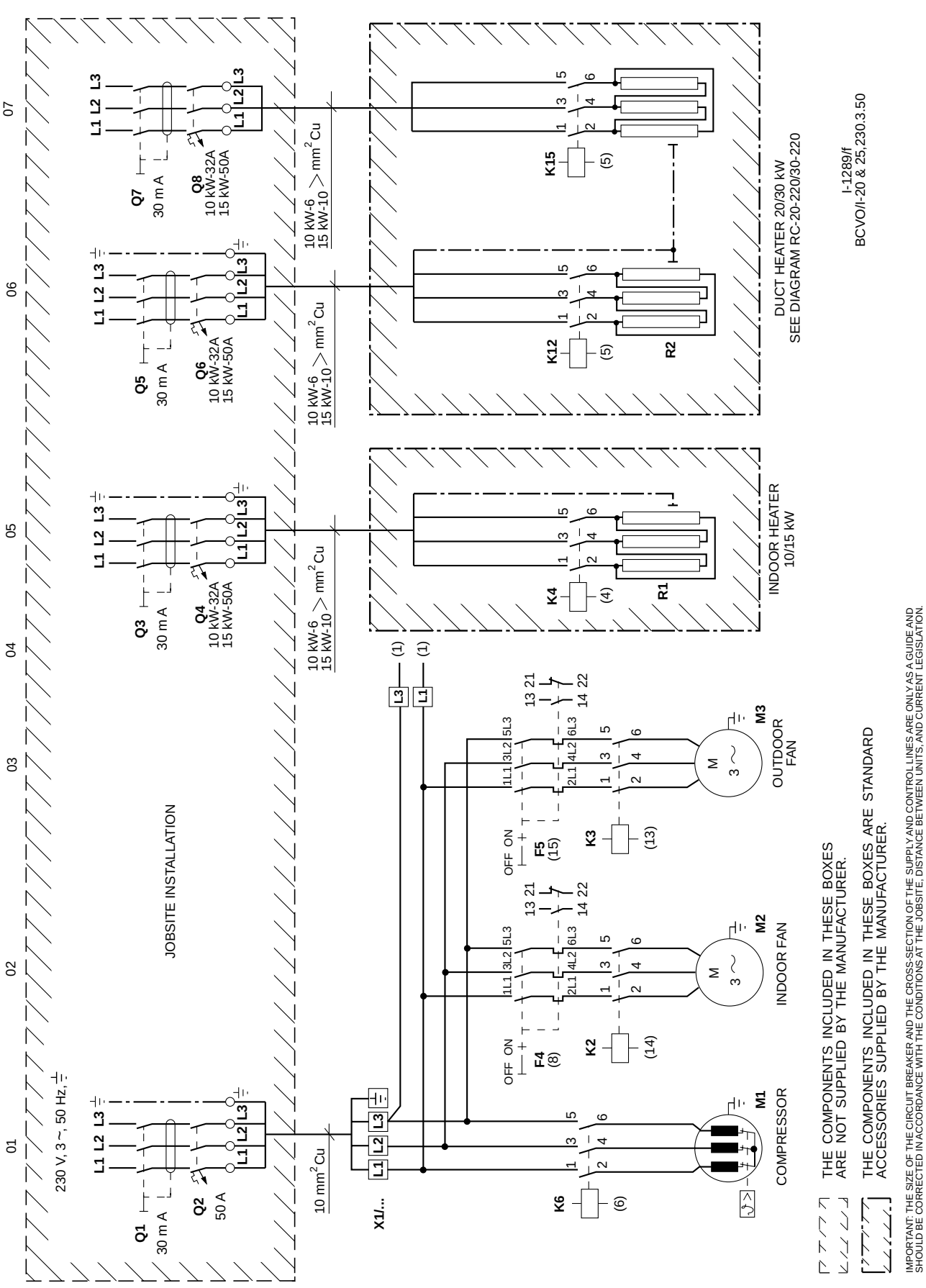
THE COMPONENTS INCLUDED IN THESE BOXES ARE NOT SUPPLIED BY THE MANUFACTURER.

THE COMPONENTS INCLUDED IN THESE BOXES ARE STANDARD ACCESSORIES SUPPLIED BY THE MANUFACTURER.

I-1284/j
BCVO/I-20,25,30 & 40
400.3.50

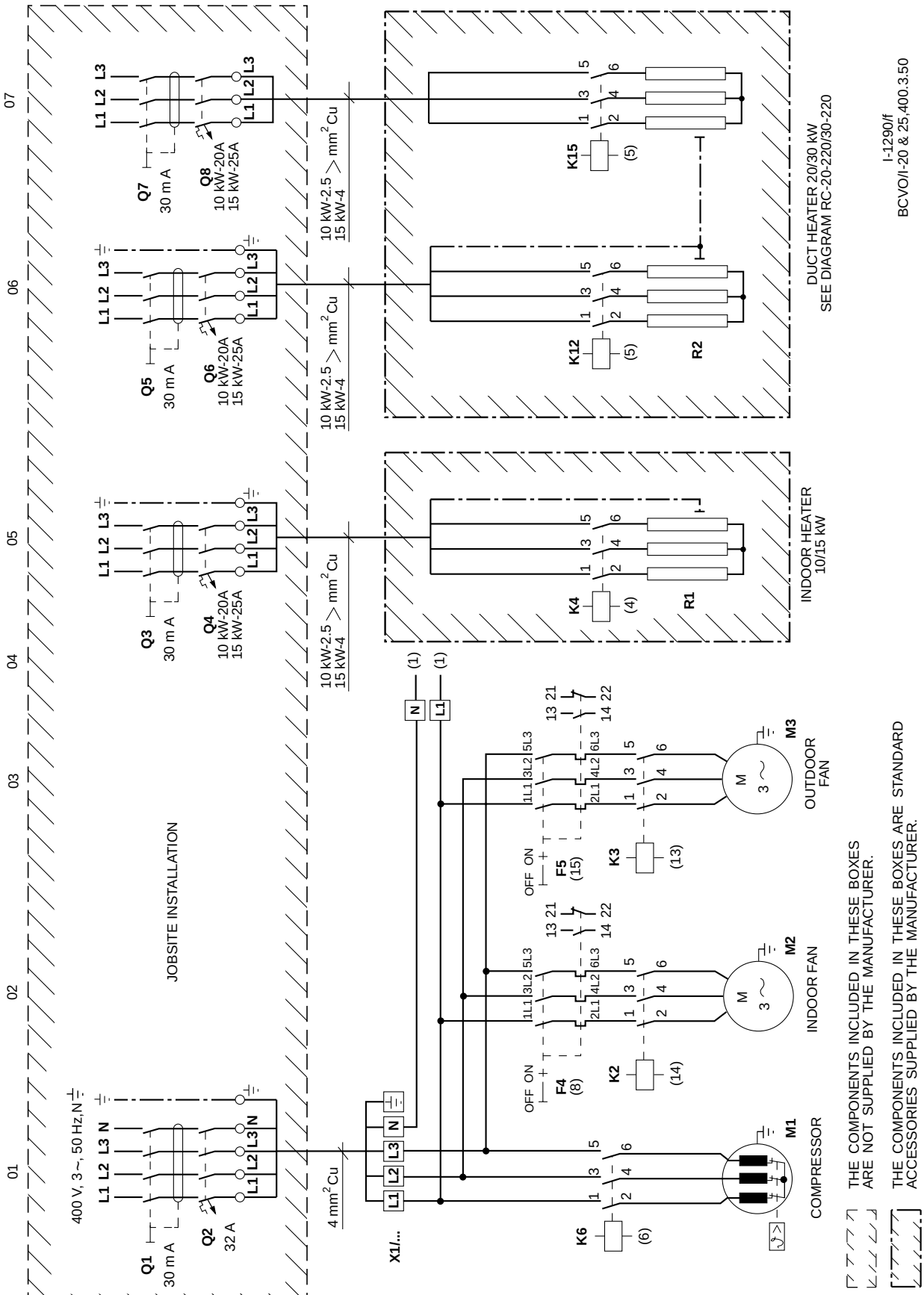
Power diagram

BCVO/I-20 & 25, 230.3.50



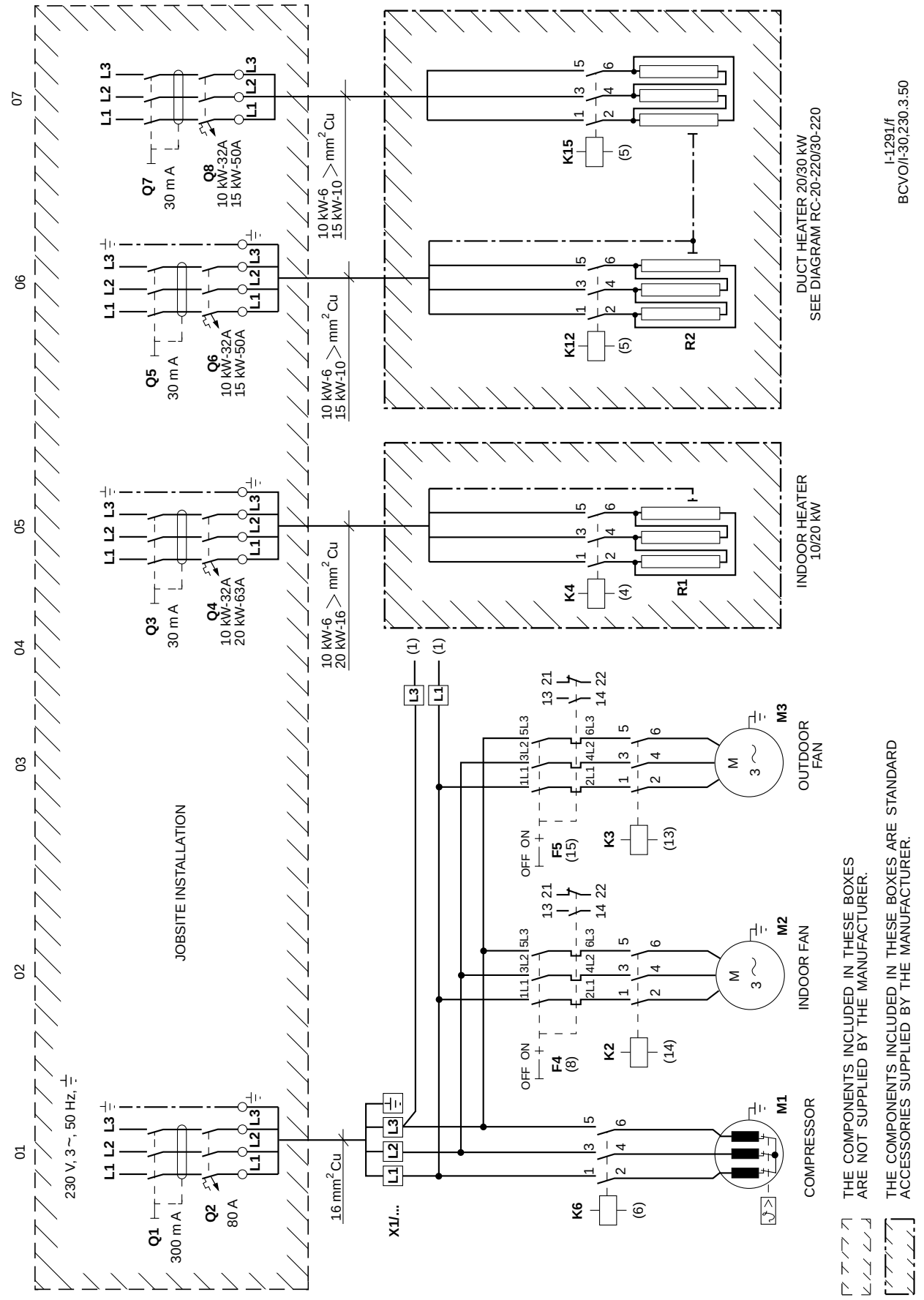
Power diagram

BCVO/I-20 & 25, 400.3.50



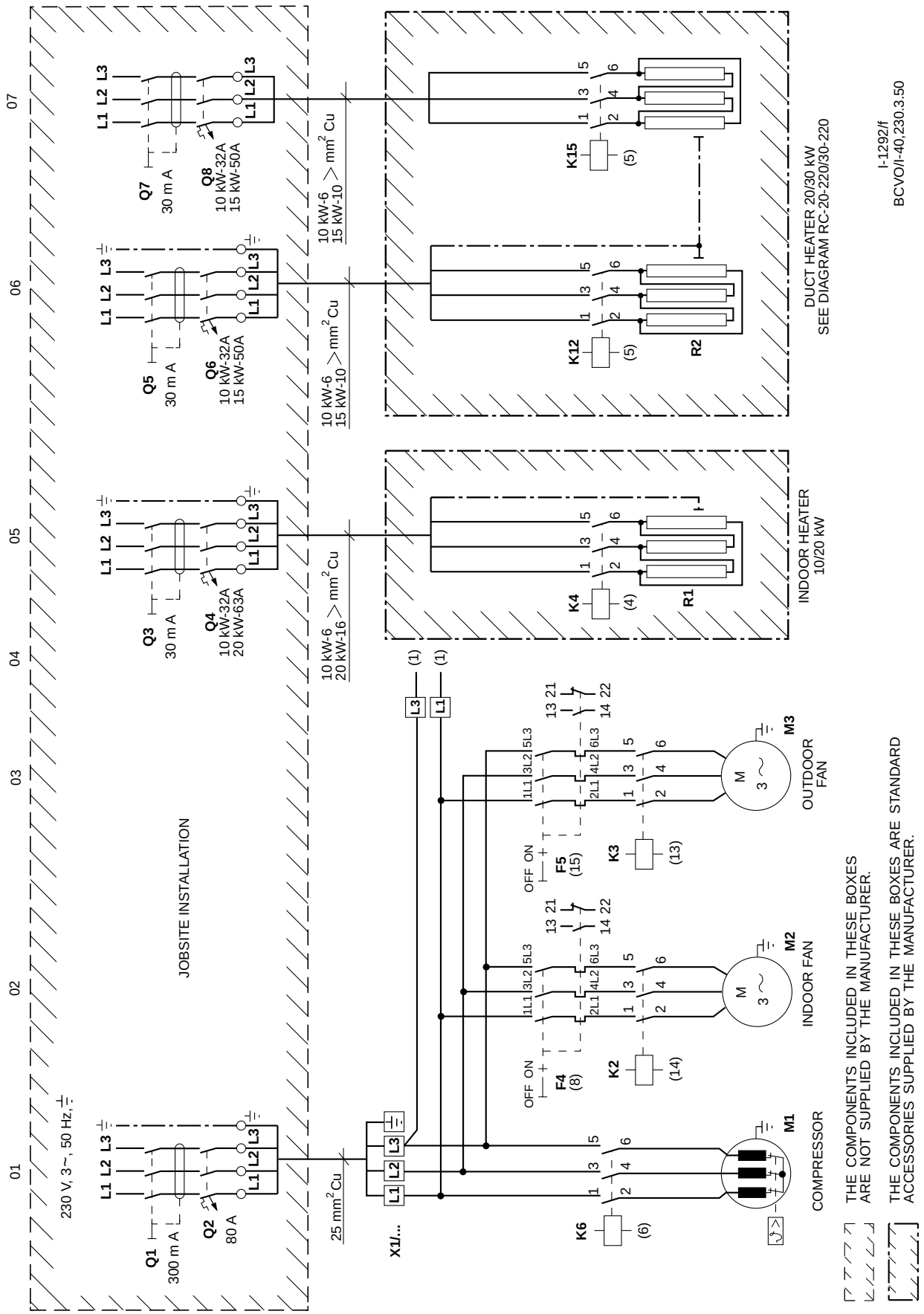
Power diagram

BCVO/I-30, 230.3.50



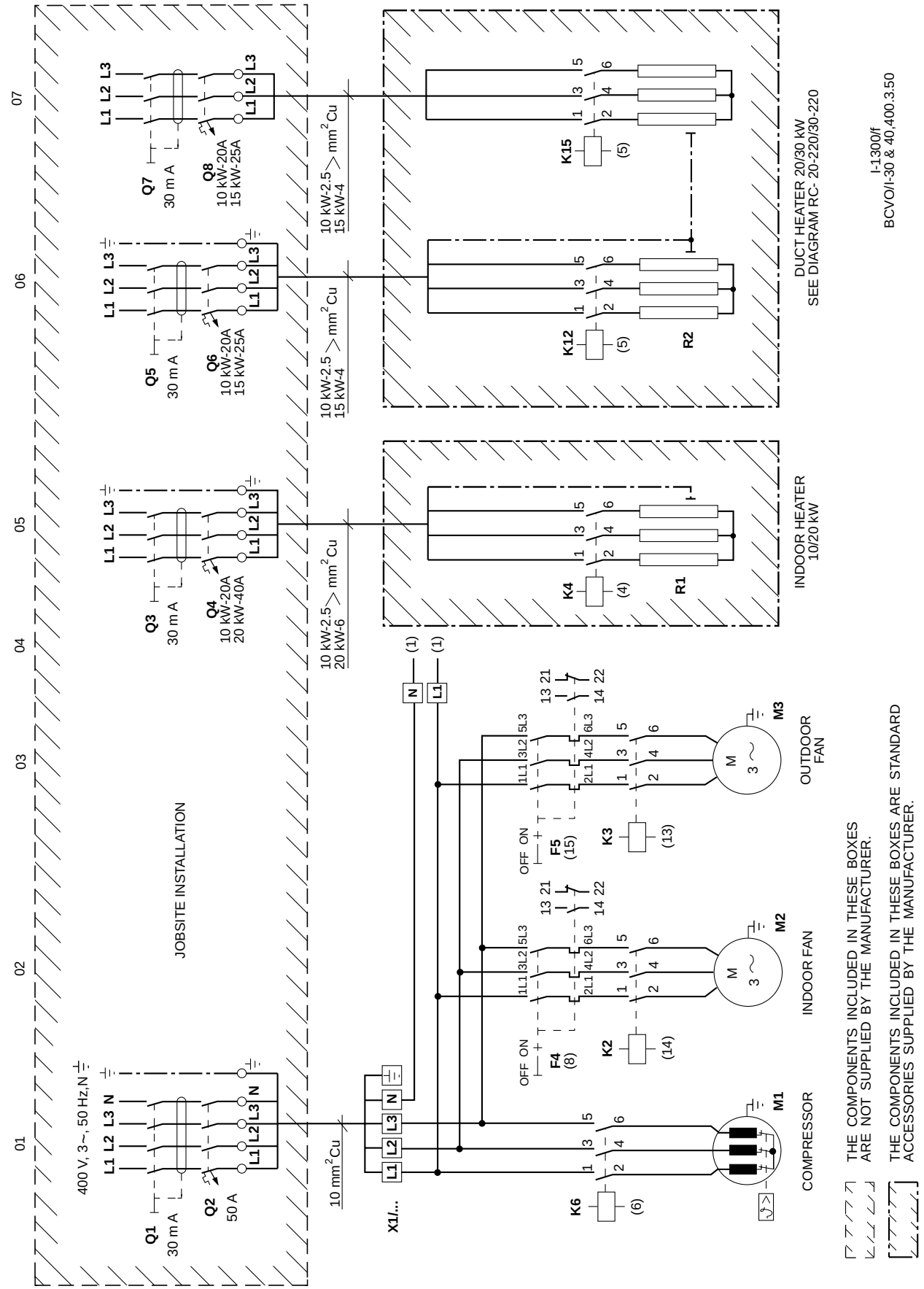
Power diagram

BCVO/I-40, 230.3.50



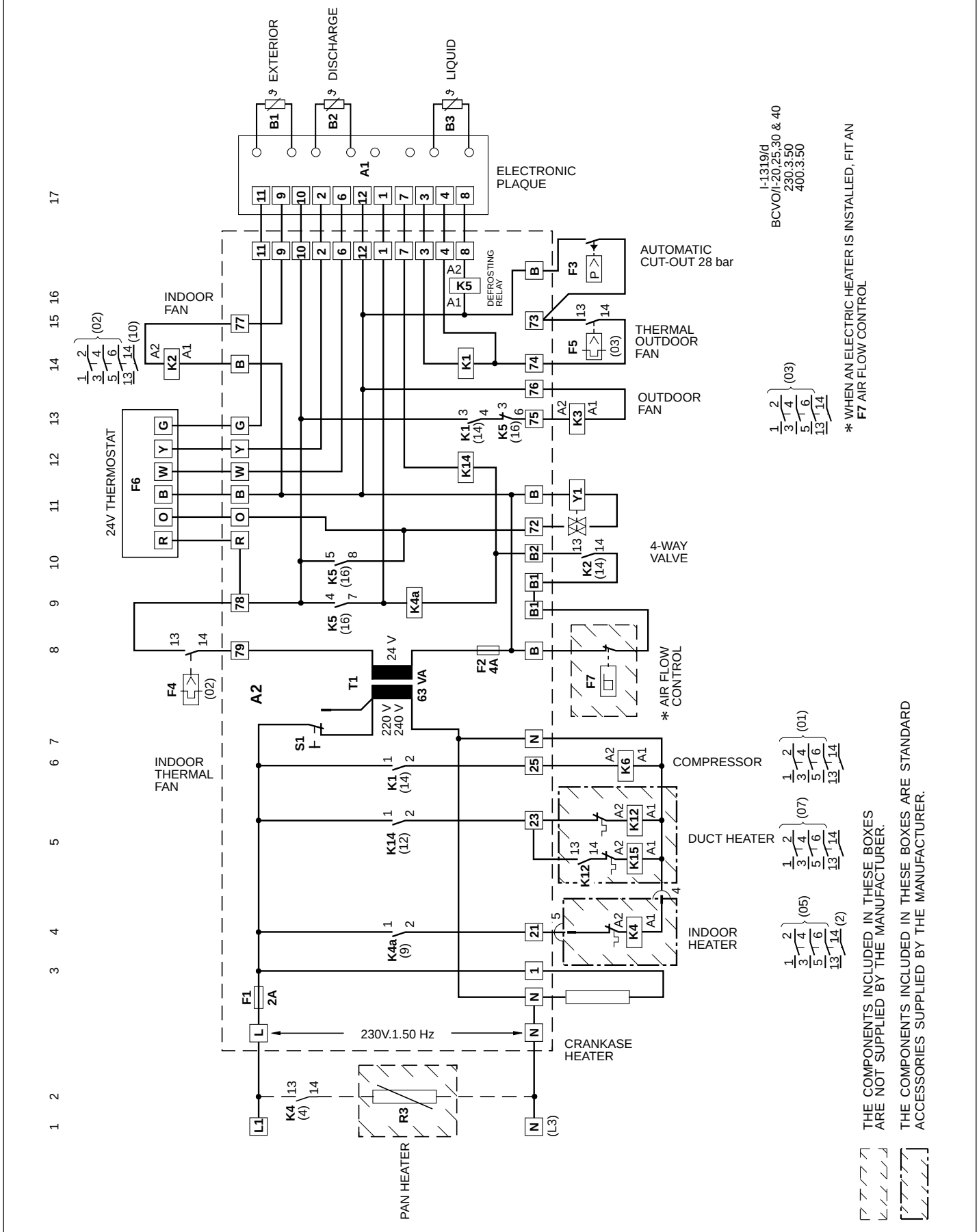
Power diagram

BCVO/I-30 & 40, 400.3.50



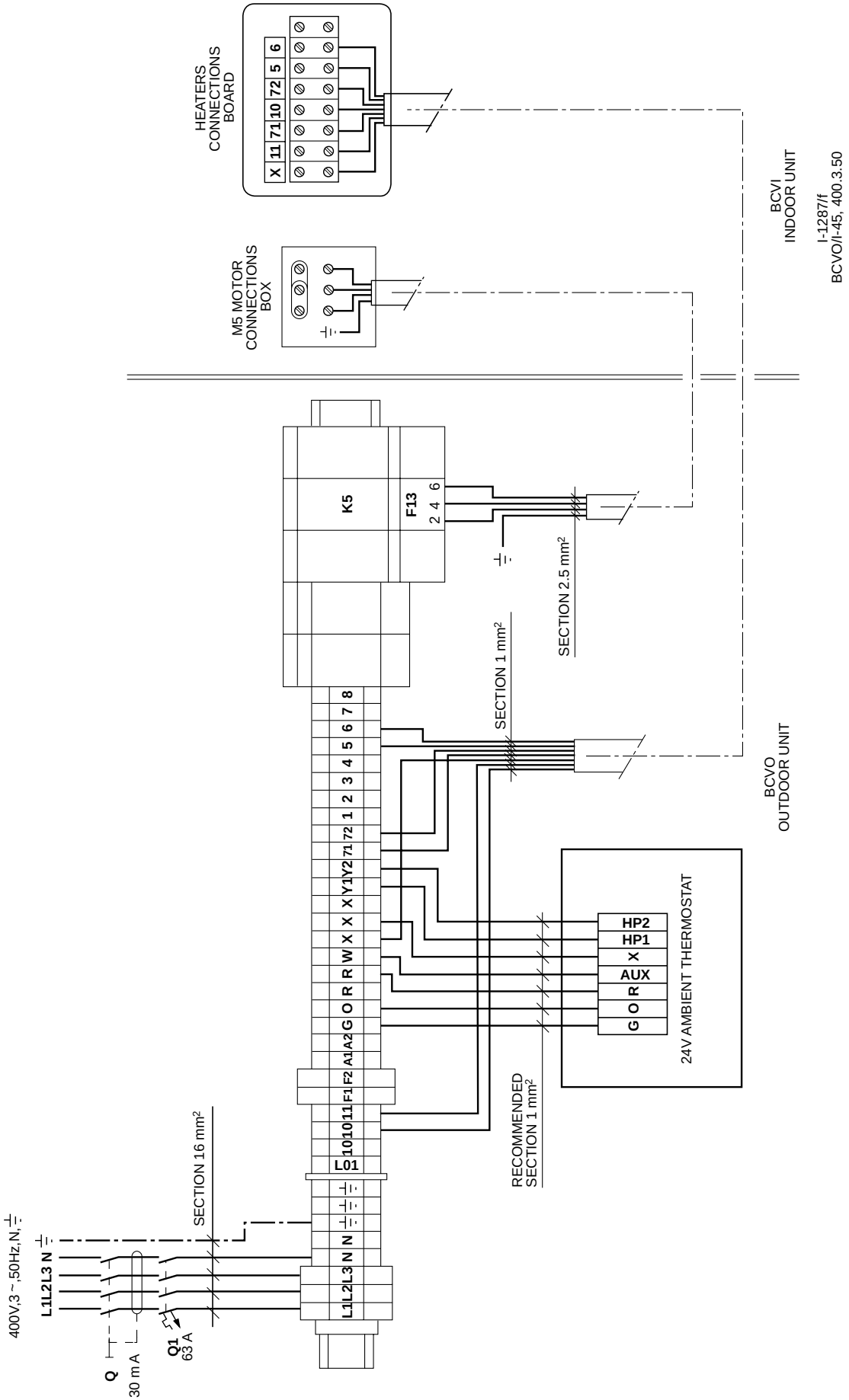
Control diagram

BCVO/I-20, 25, 30 & 40, 230.3.50, 400.3.50



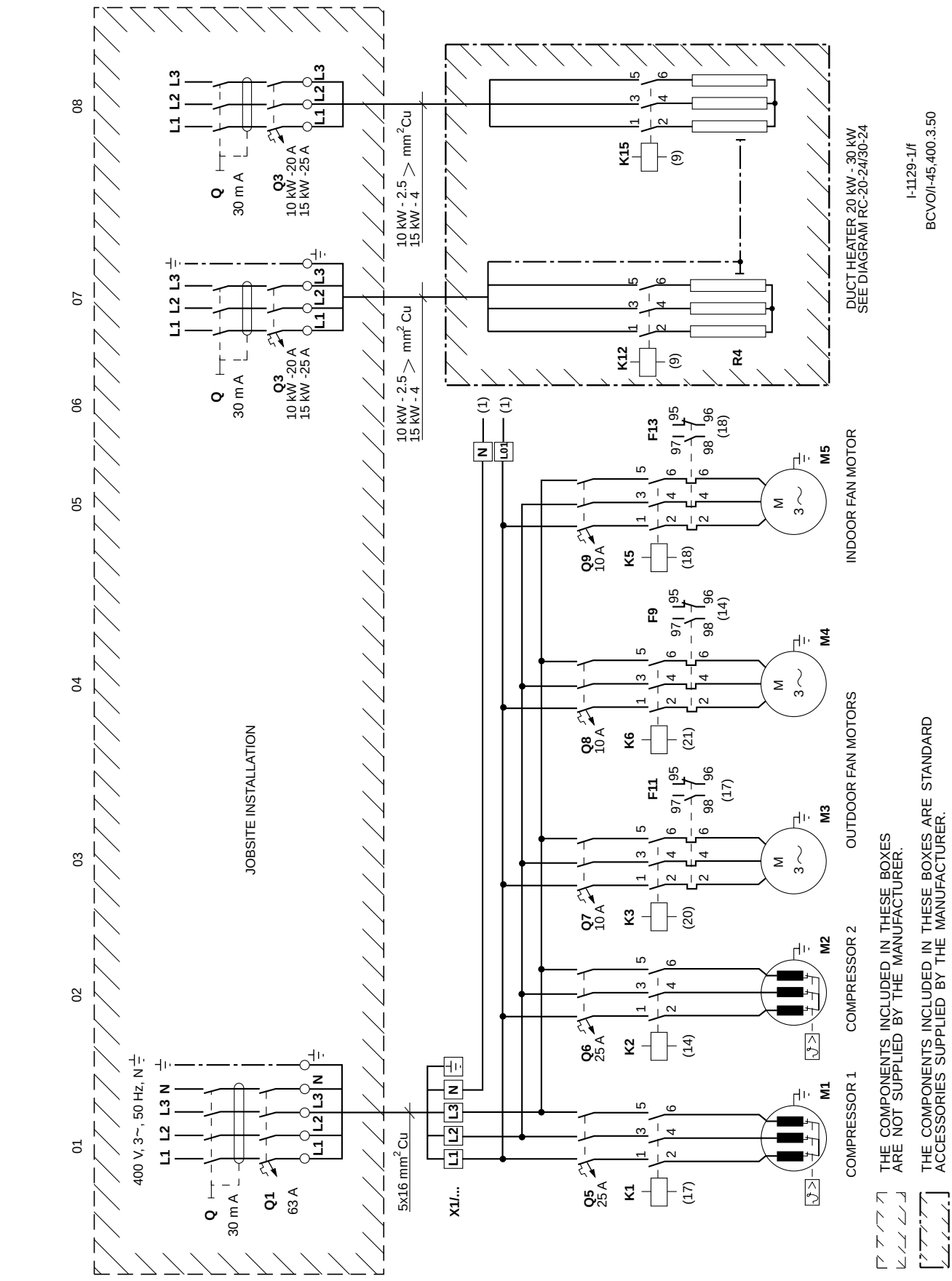
Interconnection diagram

BCVO/I-45, 400.3.50



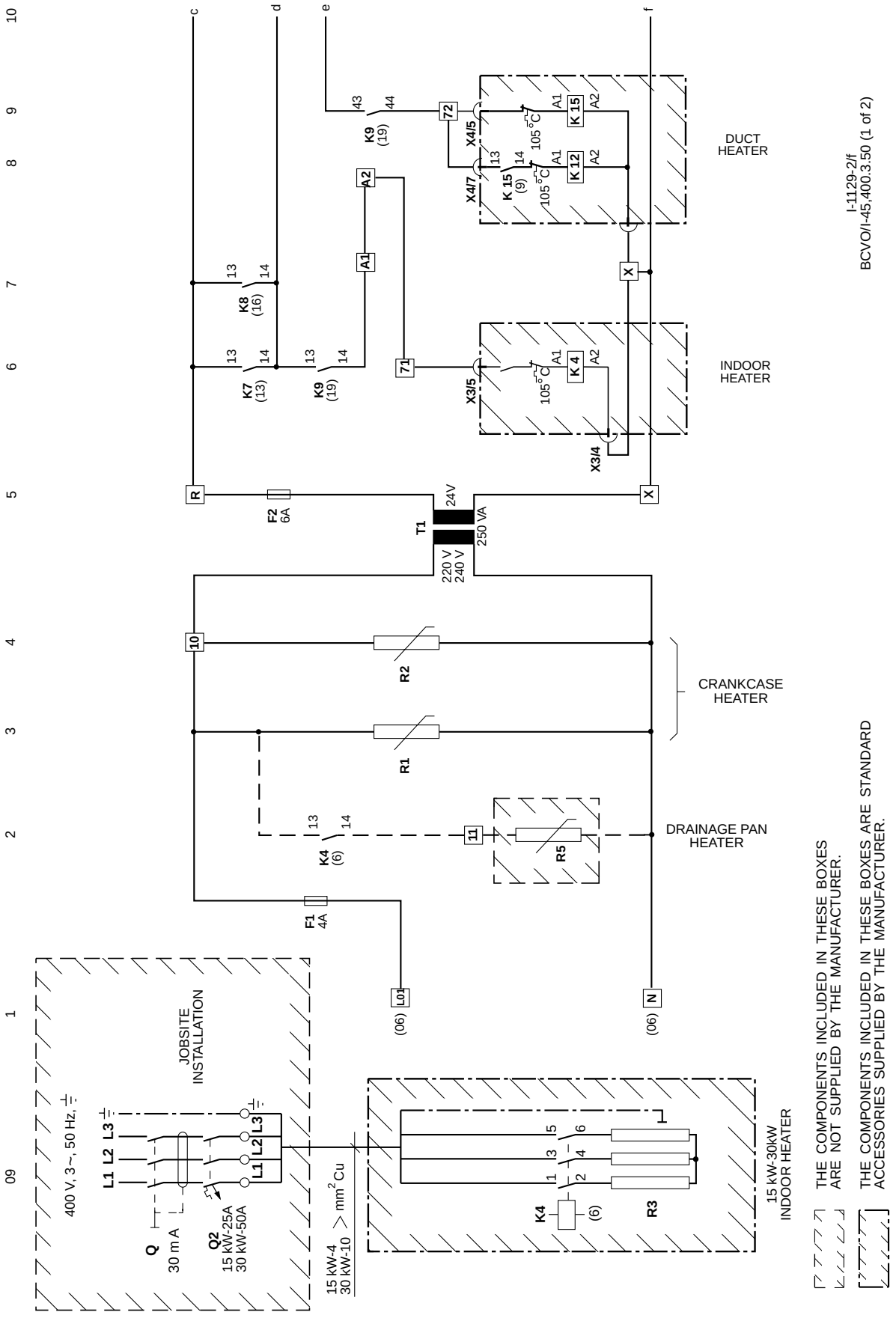
Power diagram

BCVO/I-45, 400.3.50



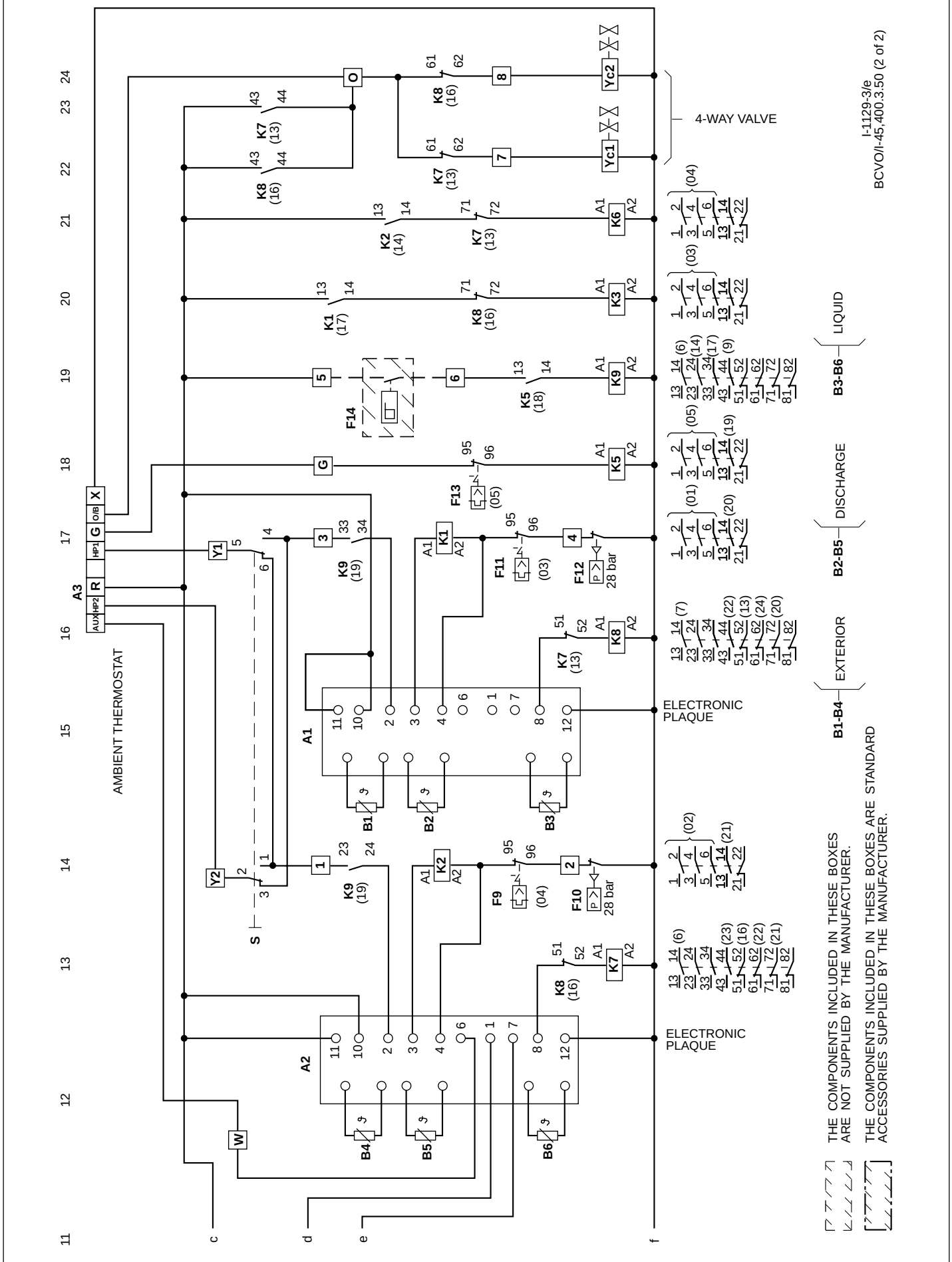
Control diagram

BCVO/I-45, 400.3.50 (1 of 2)



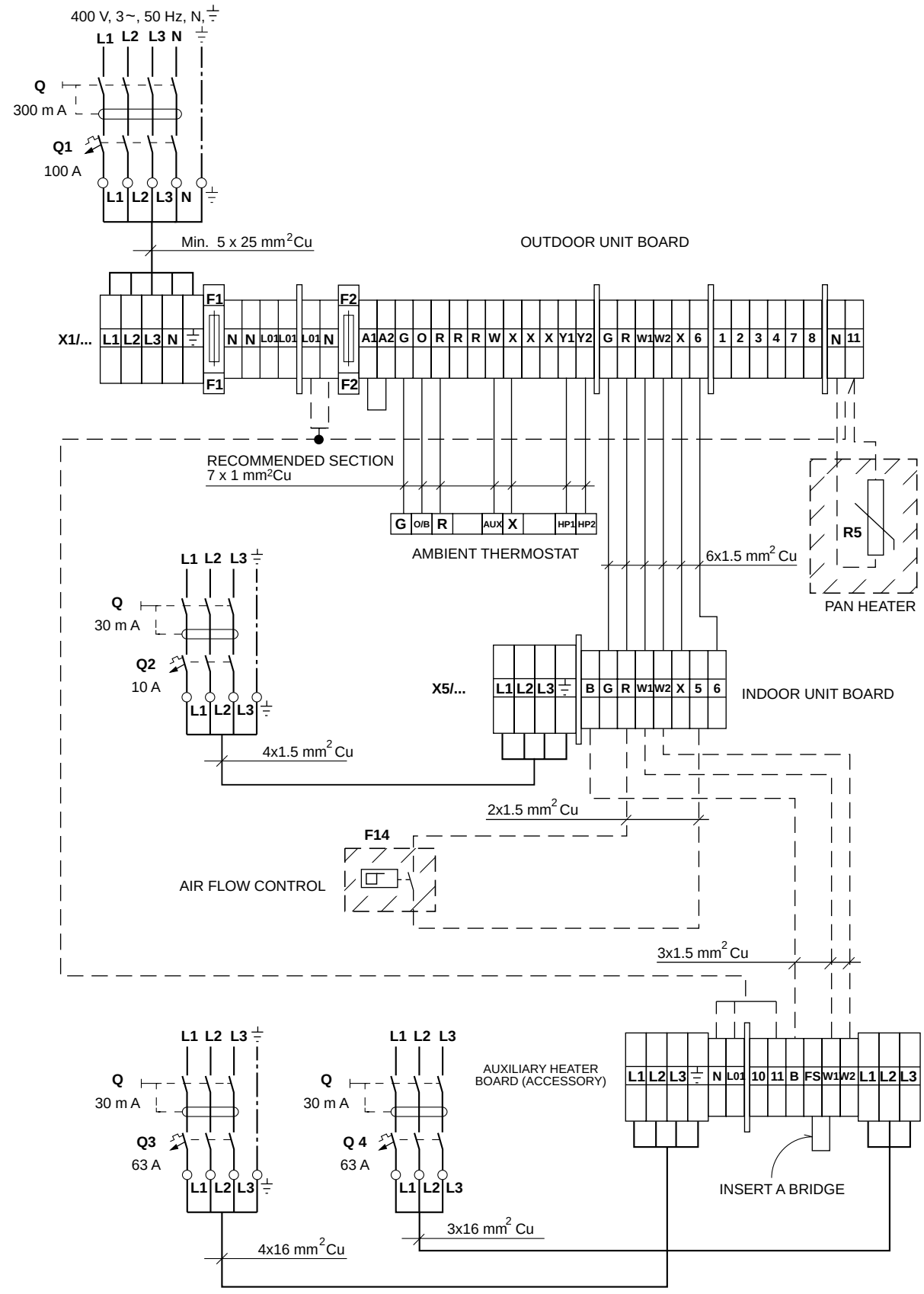
Control diagram

BCVO/I-45, 400.3.50 (2 of 2)



Interconnection diagram

BCVO/I-60, 400.3.50



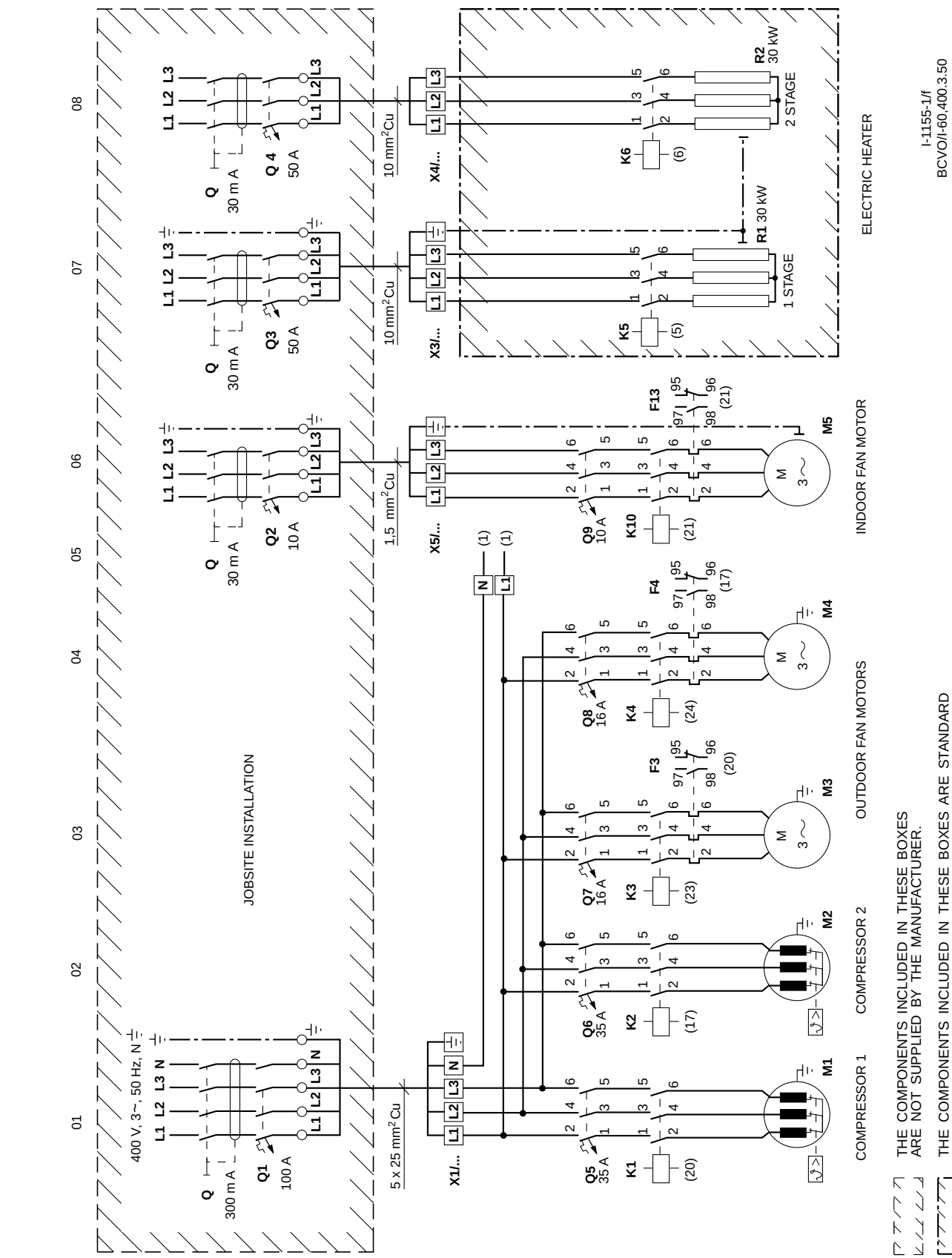
THE COMPONENTS INCLUDED IN THESE BOXES ARE NOT SUPPLIED BY THE MANUFACTURER.

THE COMPONENTS INCLUDED IN THESE BOXES ARE STANDARD ACCESSORIES SUPPLIED BY THE MANUFACTURER.

I-1155-4/h
BCVO/I-60,400.3.50

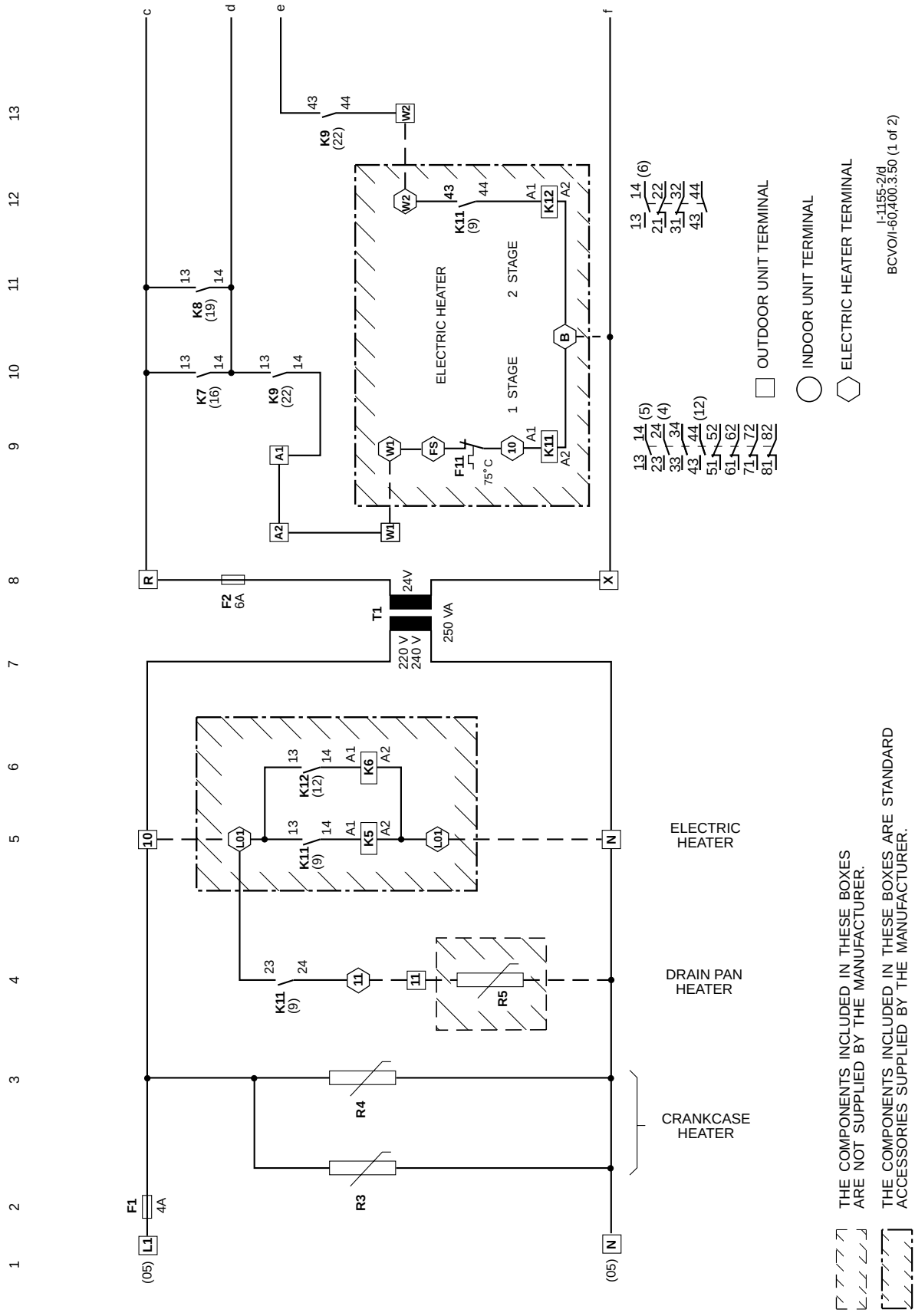
Power diagram

BCVO/I-60, 400.3.50



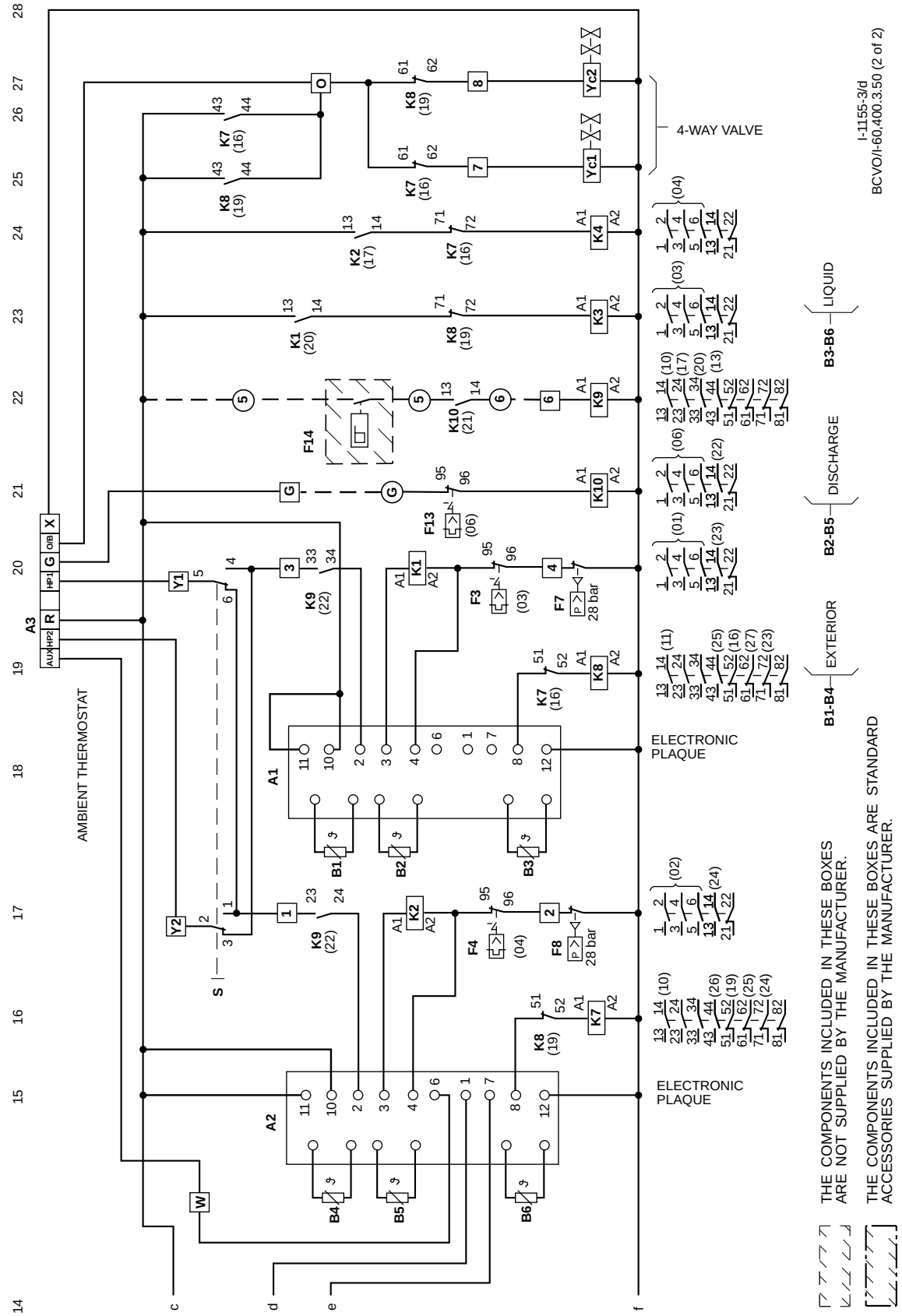
Control diagram

BCVO/I-60, 400.3.50 (1 of 2)



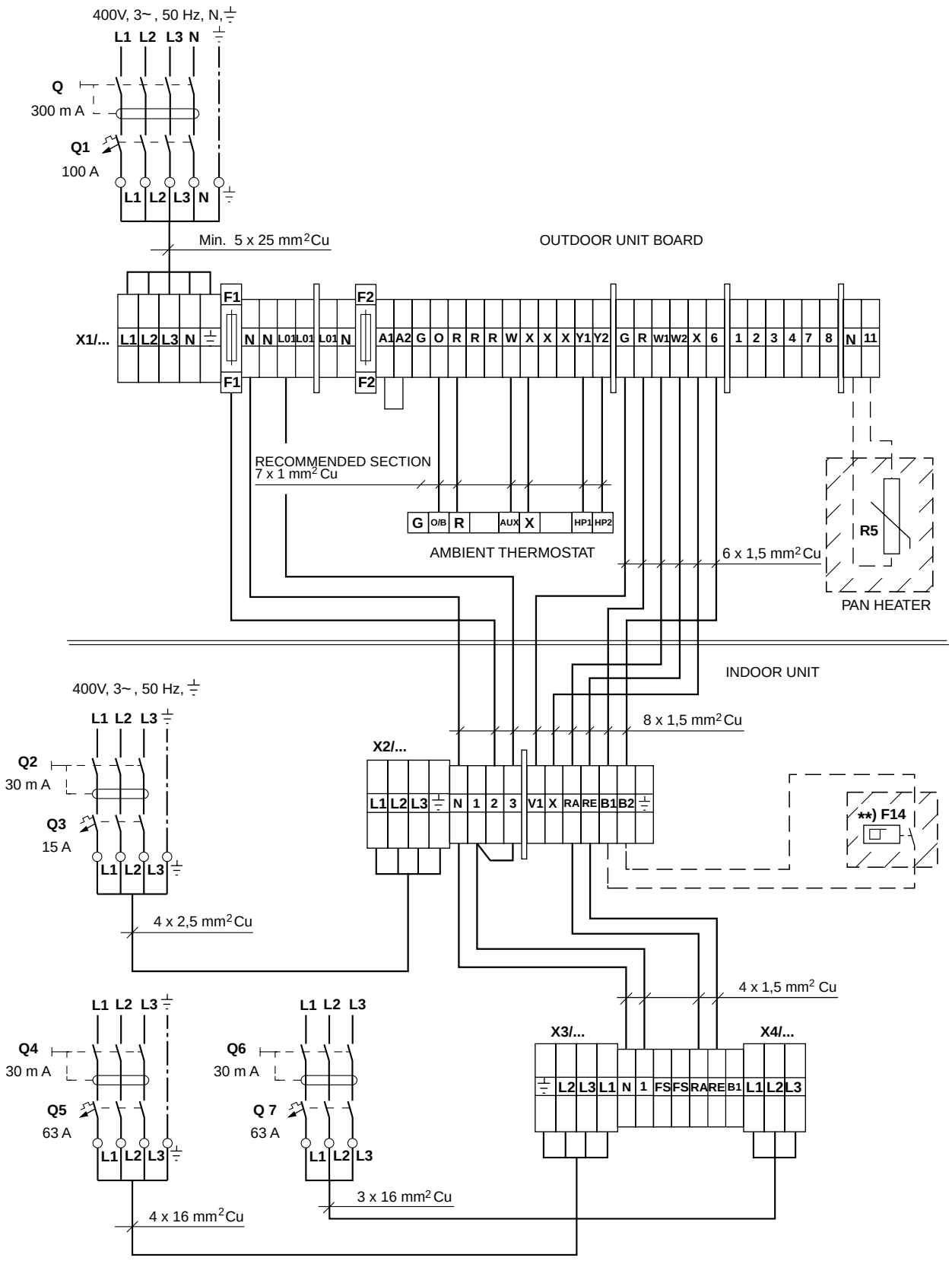
Control diagram

BCVO/I-60, 400.3.50 (2 of 2)



Interconnection diagram

BCVO-80/CHI-800, 400.3.50 (1 of 4)



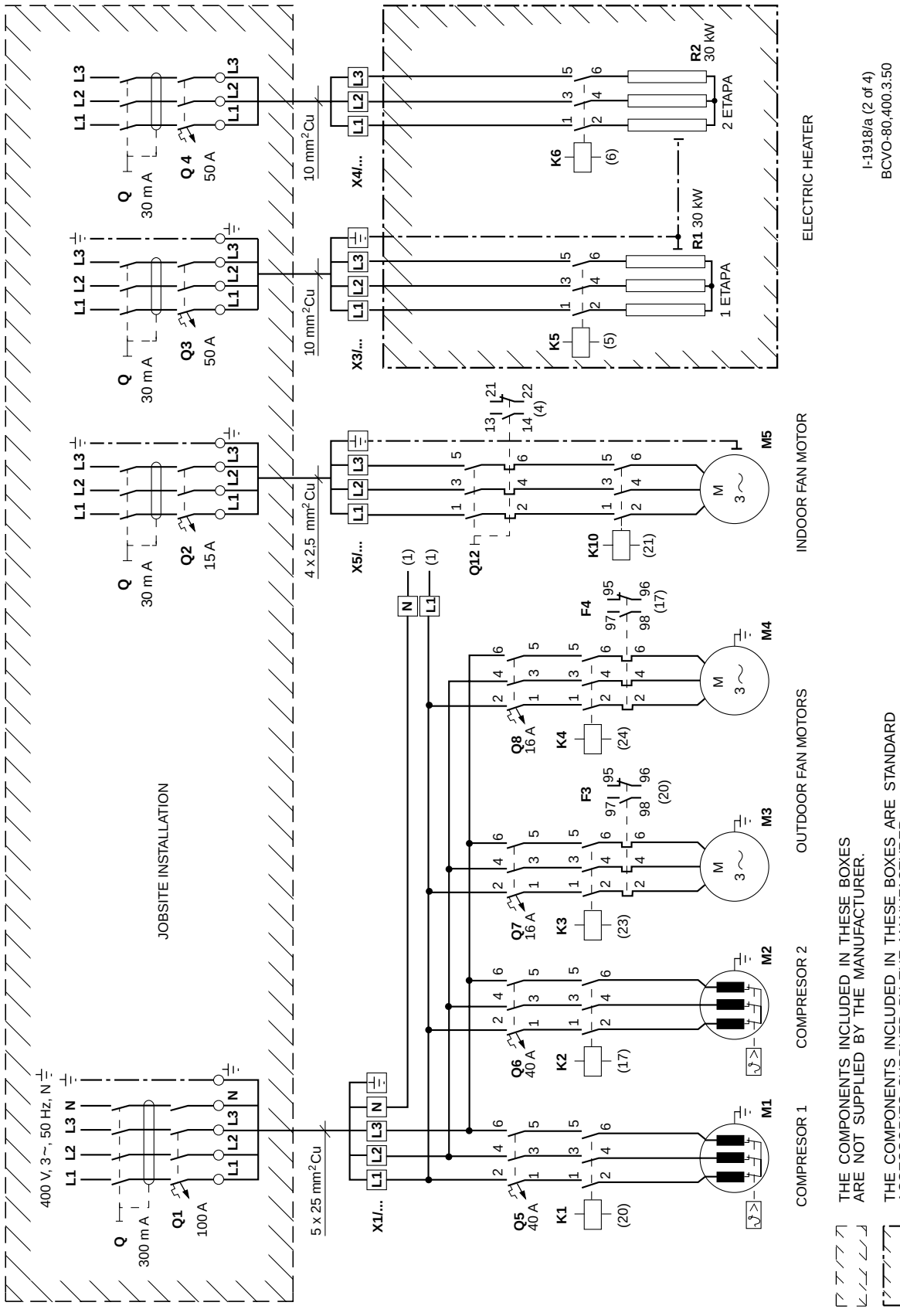
****)** WHEN AN ELECTRIC HEATER IS INSTALLED, FIT AN **F14** AIR FLOW CONTROL

THE COMPONENTS INCLUDED IN THESE BOXES ARE NOT SUPPLIED BY THE MANUFACTURER.

I-1918/a (1 of 4)
BCVO-80/CHI-800
400.3.50

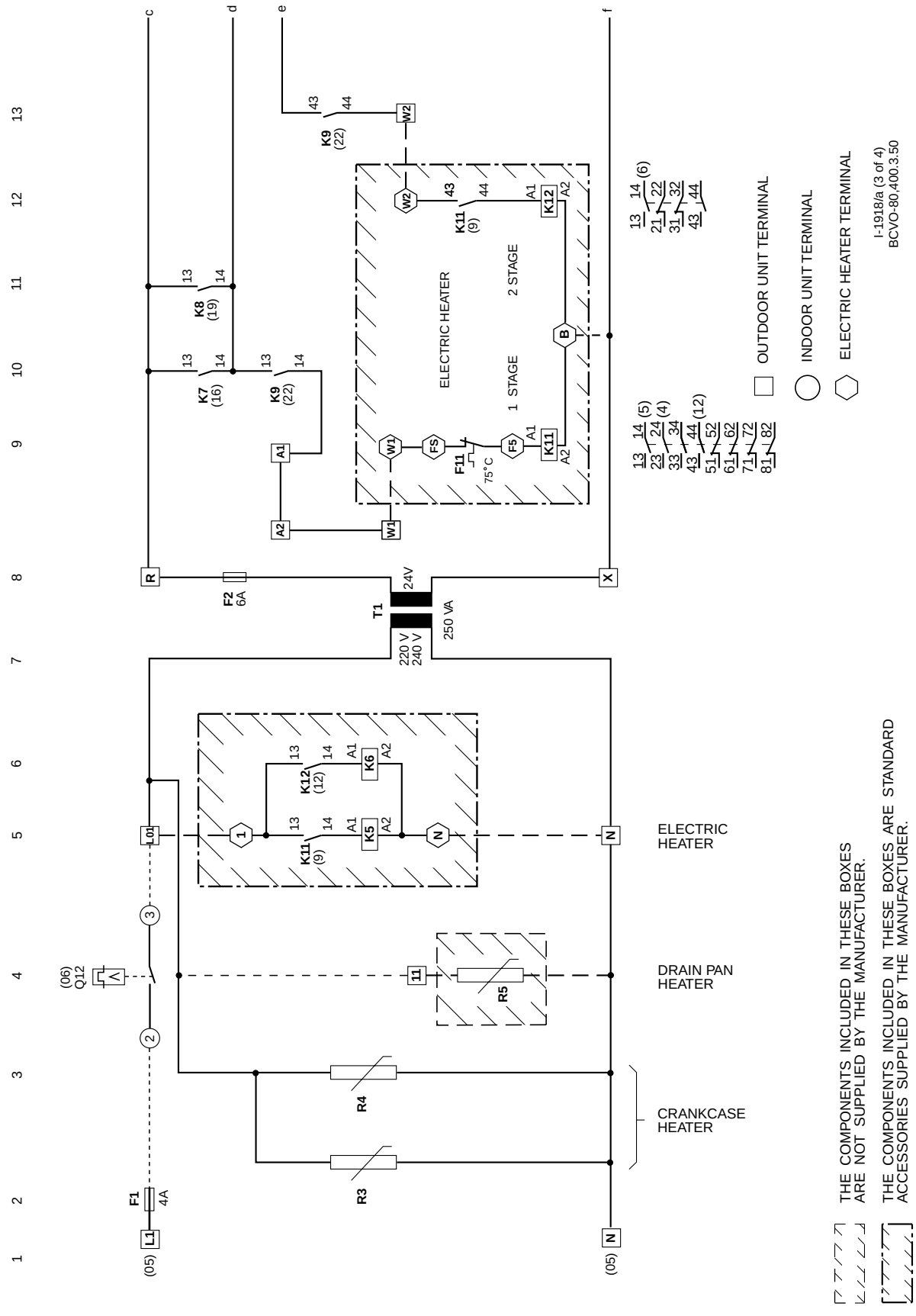
Power diagram

BCVO-80, 400.3.50 (2 of 4)



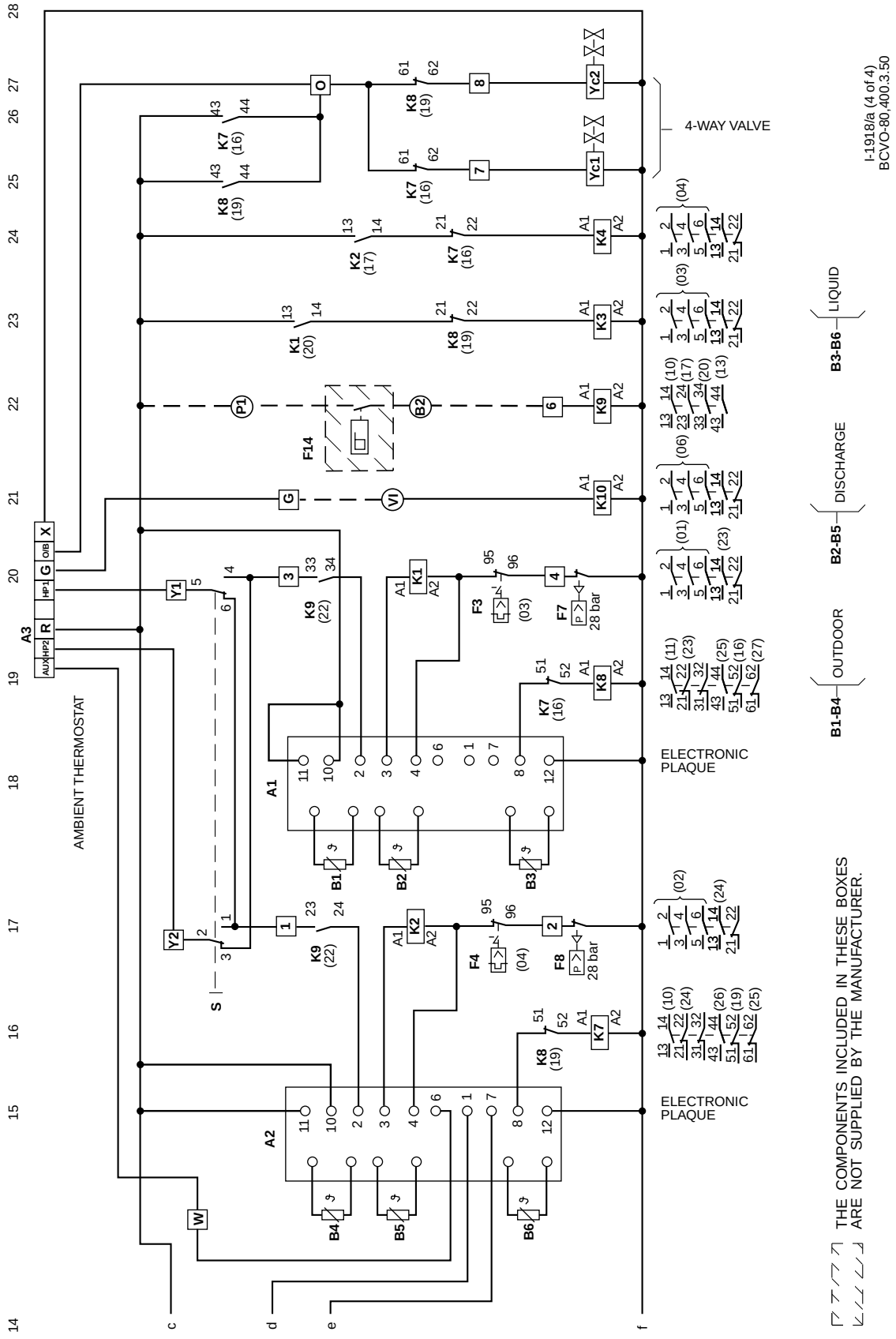
Control diagram

BCVO-80, 400.3.50 (3 of 4)

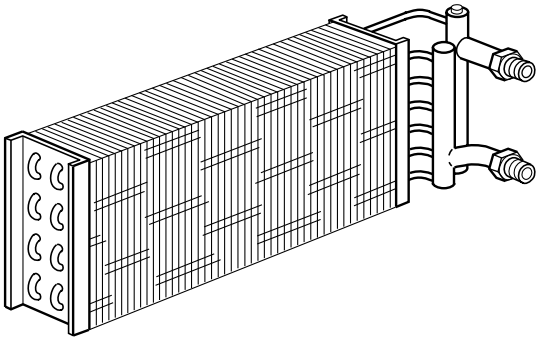


Control diagram

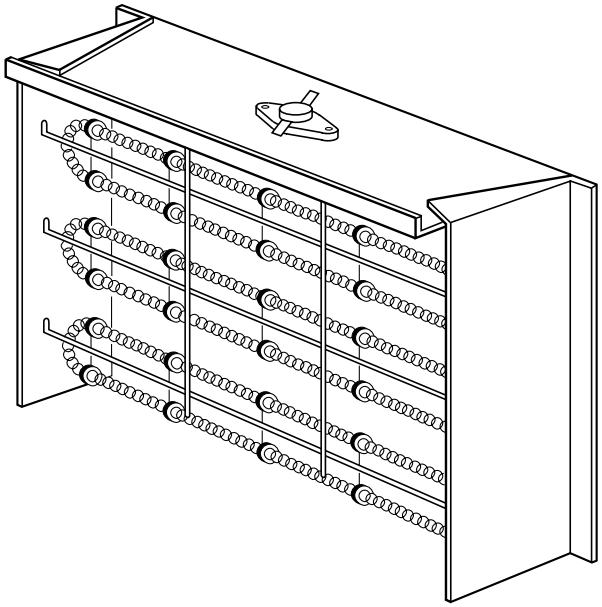
BCVO-80, 400.3.50 (4 of 4)



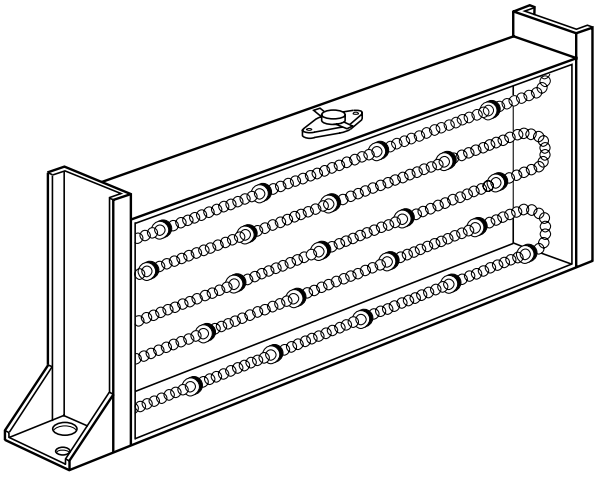
Optional accessories for heat pump models BCVO/I



Hot water heater for BCVI-20, 25, 30, 40 & 45



Indoor electric heater for BCVI-20, 25, 30, 40 & 45



Indoor electric heater for BCVI-60

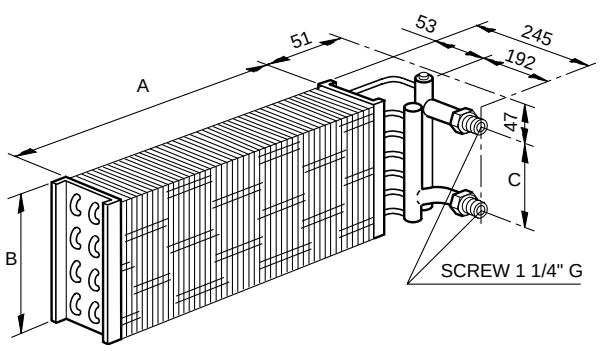
Table of standard accessories

Accessory			Model BCVI			
			20-25	30-40	45	60
Electric coil for model	**BCVI-25-220**	10 kW	X			
Electric coil for model	**BCVI-25-220**	15 kW	X			
Electric coil for model	**BCVI-30-220**	10 kW		X		
Electric coil for model	**BCVI-30-220**	20 kW		X		
Electric coil for model	**BCVI-45-24**	15 kW			X	
Electric coil for model	**BCVI-45-24**	30 kW			X	
Electric coil for model	**BCVI-60-24**	60 kW				X
Water coil for model	**BCVI-25**		X			
Water coil for model	**BCVI-30**			X		
Water coil for model	**BCVI-45**				X	
Transformation kit vertical for model	**BCVI-60**					X

Hot water heater for BCVI-20, 25, 30, 40 & 45

Made of copper tubes and aluminium fins.
Designed to fit inside the conditioner on galvanised steel supports.
Equipped with a 1/8" air purge.

General dimensions mm



For model	A	B	C
BCVI-20/25	1 069	458	340
BCVI-30/40	1 312	534	416
BCVI-45	1 750	534	416

Physical data

For model		**BCVI-20/25**	**BCVI-30/40**	**BCVI-45**
Tubes depth		2	2	2
Tubes height		16	19	19
Fins/inch		12	12	12
Frontal area	m^2	0.49	0.70	0.93
Tubes diameter		3/8"	3/8"	3/8"
Entry/outlet GAS male thread connections		$1^1/_4$"	$1^1/_4$"	$1^1/_4$"

Heating capacity

For model	Nominal flow-rate		Heating capacity (*)	Charge loss air circuit	
	m^3/h	m^3/s	kW	mm WG	Pa
BCVI-20/25	5 130	1.42	40.7	3.9	38.2
BCVI-30	7 500	2.08	59.3	4.4	43.0
BCVI-40/45	10 000	2.77	79.1	4.4	43.0

* The heating capacities given in this table are valid for water temperatures of 90°C at entry, 80°C at outlet and air entry at 13°C. For different conditions apply the correction factors from the relevant table.

Correction factors for the heating capacities of the hot water heating coil

These correction factors are for water intake and outlet temperatures and air entry different from the nominal ones.

Air temperature	Temperature °C water entry/outlet					
	75/65	85/75	90/80	85/70	90/75	90/70
-10	1.03	1.23	1.33	1.13	1.24	1.14
-5	0.97	1.16	1.28	1.07	1.17	1.08
0	0.91	1.09	1.19	1.00	1.10	1.01
5	0.85	1.02	1.12	0.94	1.03	0.95
10	0.79	0.95	1.04	0.88	0.96	0.89
13	0.75	0.91	1.00	0.84	0.92	0.85
15	0.73	0.88	0.97	0.82	0.90	0.83
20	0.68	0.82	0.90	0.76	0.83	0.77
25	0.60	0.74	0.83	0.68	0.75	0.69

Loss of charge in the water circuit of the hot water coil heater

	Hot water folw-rate												
	m^3/h	1.00	1.30	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	7.00
	l/s	0.28	0.36	0.42	0.56	0.69	0.83	0.97	1.11	1.25	1.39	1.67	1.94
For model **BCVI-20/25**	m WG		0.08	0.10	0.17	0.24	0.33	0.42	0.48				
	kPa		0.78	0.98	1.66	2.35	3.23	4.11	4.70				
For model **BCVI-30/40**	m WG				0.13	0.20	0.27	0.36	0.46	0.54	0.66		
	kPa				1.27	1.96	2.64	3.52	4.50	5.28	6.46		
For model **BCVI-45**	m WG					0.25	0.34	0.45	0.57	0.68	0.82	1.17	1.50
	kPa					2.44	3.33	4.40	5.58	6.66	8.03	11.45	14.68

Indoor electric heater for BCVI-20, 25, 30, 40 & 45

Made of chrome-nickel air-exposed wires on soapstone supports and with a galvanised sheet steel frame designed to fit inside the unit. It is supplied with a thermal protector which disconnects the control circuit if it detects an abnormally high temperature.

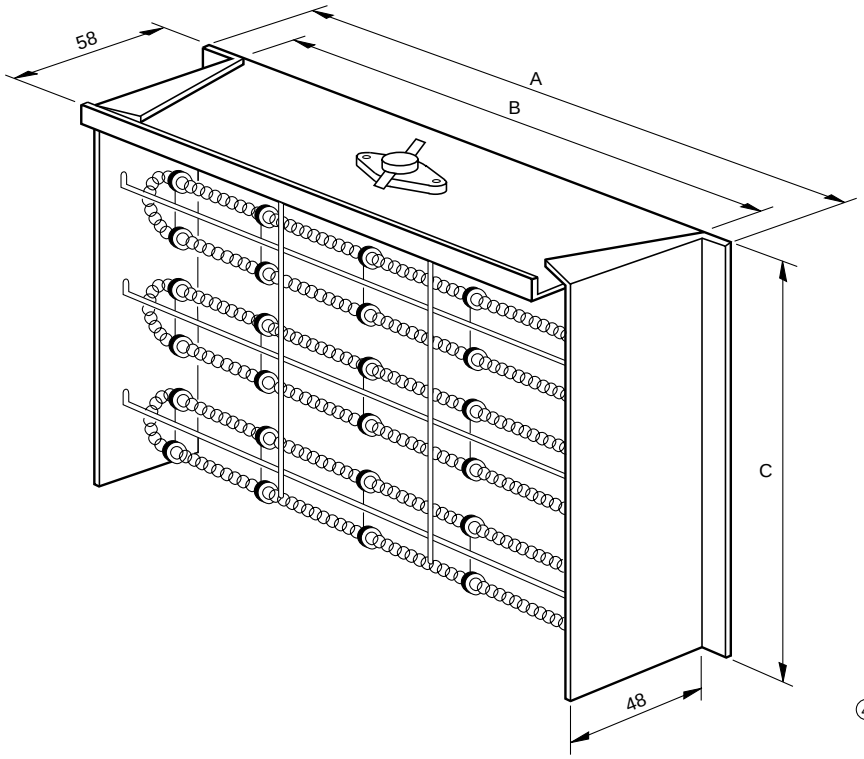
This heater must function always with the air current provided by the indoor unit and the placings, or relays to achieve this end must be calculated. It is necessary to fit an air flow-rate control (see electrical diagrams).

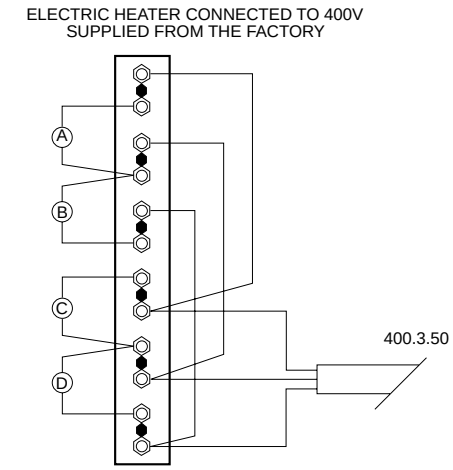
Technical instructions for changing the voltages of the heaters

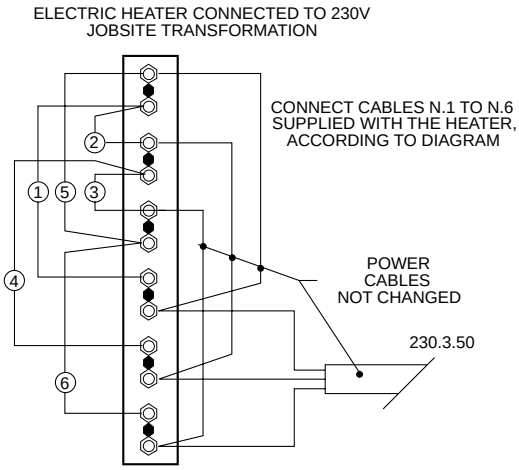
The electric heaters are delivered from the factory connected for a three-phase voltage of 400. Sizing of the contacters as well as of the power lines have been prepared for a strength corresponding to three-phase 230V. For a power supply of 230V, three-phase, the following modifications will have to be made on site:

- Eliminate the cables marked A, B, C, D.
- Fit the cables marked 1 to 6 supplied with the heater, following the indication in the diagrams below.

General dimensions mm







For model	A	B	C
BCVI-20/25-220	1 103	1 069	480
BCVI-30/40-220	1 339	1 305	552
BCVI-45-24	1 777	1 743	552

For model	Nominal power kW	Power supply V.ph.Hz	Nº of stages	Packaged dimensions mm
BCVI-20/25-220	10	230.3.50 or 400.3.50	1	1 200 x 550 x 125
	15			
BCVI-30/40-220	10			1 440 x 620 x 125
	20			
BCVI-45-24	15			1 920 x 620 x 125
	30			

Electric indoor heater for BCVI-60

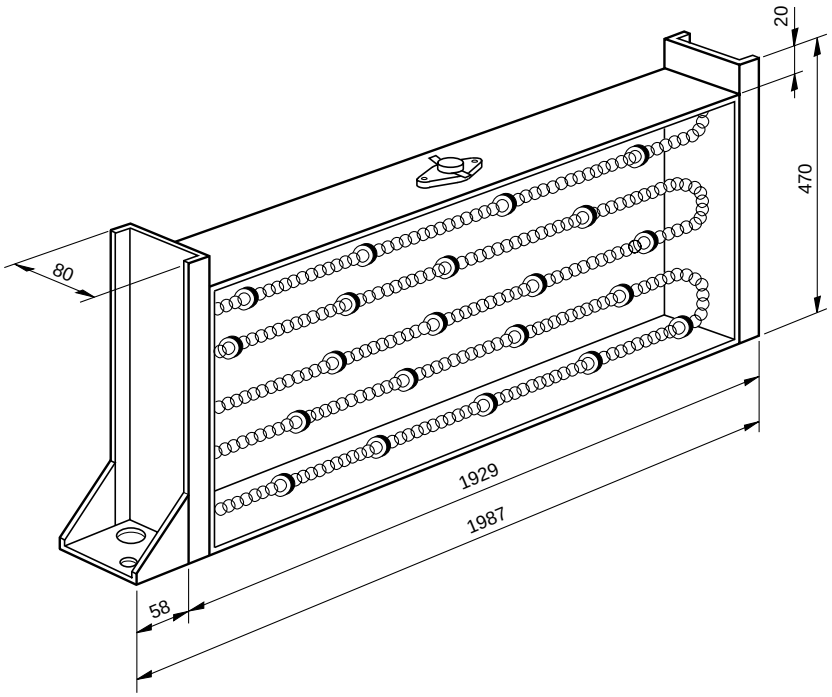
This 60 kW electric heater operates in two stages of 30 kW each; the first is used as an auxiliary heater and the second as an emergency one.

It is made of air-exposed chrome-nickel wires on soapstone supports and with galvanised sheet steel frame designed to fit inside the unit.

It is supplied with a thermal protector which disconnects the control circuit when it detects an abnormally high temperature.

This heater has to function always with the current of air provided by the indoor unit, so that the placements, or relays to achieve this end must be calculated. It is necessary to fit an air flow-rate control (see electrical diagrams).

General dimensions mm



Characteristics

For model	Nominal capacity kW	Power supply V.ph.Hz	Nº of stages	Packaged dimensions mm
BCVI-60-24	60	400.3.50	2	510 x 2 405 x 165

All data subject to change without notice.

AIR CONDITIONING
HEATING
TILES
BATHROOMS

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