Solo Plus Units 2001

Service Manual

SOLO PLUS 2001 REFRIGERATION SYSTEM

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INTRODUCTION

IT IS IMPORTANT TO NOTE THAT ALL WORK SHOULD BE CARRIED OUT BY A COMPETENT PERSON.

Solo Plus is a range of self contained refrigeration units for small or large coldrooms comprising 6 wall mounted and 5 ceiling mounted (3 low temperature models). The systems are pre-charged with refrigerant and pre-wired ready for installation into a coldroom with only electrical connections to be made.
Units will operate up to 43°C ambient conditions (ISO Climate Class 5).

Basic Description Of Operation
Hot gas defrost with crankcase protection.
Capillary Control.
Hot gas vaporisation including heater back up with variable voltage depending on water contact.
Hermetic compressor

Routine Maintenance.
In order to keep the unit operating reliably and efficiently it is necessary to periodically clean the condenser. (The frequency depending on the location in which the unit is installed.) This operation is to be carried out with the unit turned OFF. We advise the use of an air jet blowing from the inside to the outside. If an air jet is not available then use a soft long haired brush on the outside of the condenser taking care not to damage the condenser fins.
Warning.
Condenser fins have sharp edges so care must be taken to avoid injury.

Table 1. Storage Conditions °C

Unit Type	**Refrigerator**		**Meat**	**Freezer**
Temp	+10	+1/+4	0/-2	-18/21
Model	SP101HW	SP101HW	SP101HW	SP101LW
	SP201HW	SP201HW	SP201HW	SP201LW
	SP301HW	SP301HW	SP301HW	SP301LW
	SP401HW	SP401HW	SP401HW	
	SP501HW	SP501HW	SP501HW	
	SP601HW	SP601HW	SP601HW	

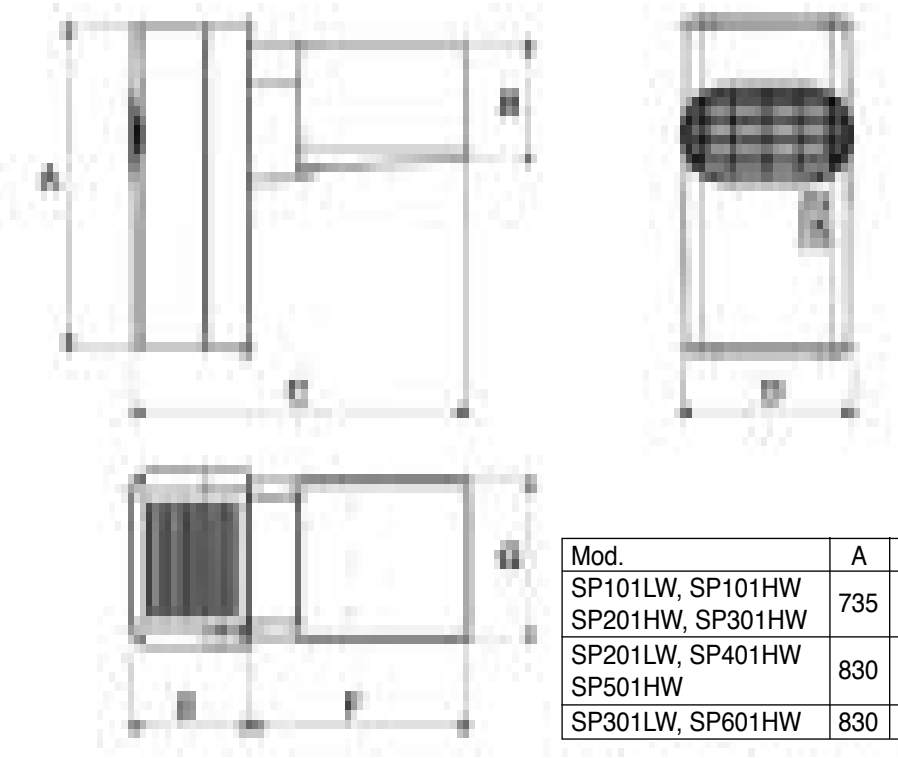
NOTE! Nomenclature "W" refers to Wall Model.

	SP1HC	SP1HC	SP1HC	
	SP2HC	SP2HC	SP2HC	SP2LC
	SP3HC	SP3HC	SP3HC	SP3LC
	SP4HC	SP4HC	SP4HC	SP4LC
	SP5HC	SP5HC	SP5HC	

NOTE! Nomenclature "C" refers to Ceiling Model.

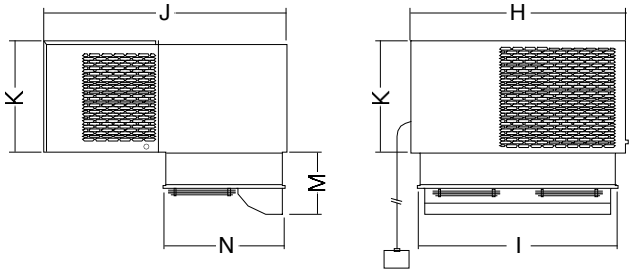
As each models operates at different temperatures it will be necessary to set required operating temperature.
See Parameter List.

PART 1A
Wall Mount Units



Mod.	A	B	C	D	E	F	G
SP101LW, SP101HW SP201HW, SP301HW	735	264	790	400	280	510	368
SP201LW, SP401HW SP501HW	830	264	790	620	280	510	585
SP301LW, SP601HW	830	364	982	620	350	632	585

Ceiling Mounted Units



DIMENSIONS

MODEL	CONDENSER UNIT A x B x C (mm) H x J x K (mm)	EVAPORATOR UNIT G x E x F (mm) I x M x N (mm)	PLUG SIZE W x H (mm)	CUT-OUT SIZE W X H (mm)
SP 1 HC	620 x 719 x 357	545 x 150 x 332	545 x 332	550 x 337
SP 2 H & LC	620 x 719 x 357	545 x 150 x 332	545 x 332	550 x 337
SP 3 H & LC	820 x 809 x 390	745 x 150 x 332	745 x 332	750 x 337
SP 4 HC	820 x 809 x 390	745 x 150 x 332	745 x 332	750 x 337
SP 4 LC	820 x 929 x 427	745 x 220 x 452	745 x 452	750 x 458
SP 5 HC	820 x 929 x 427	745 x 220 x 452	745 x 452	750 x 458

2. SOLO PLUS TECHNICAL DATA

STORAGE TEMP +10°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 101HW	R404A	0.67	1 x 1.5 x 2500
SP 201HW	R404A	0.67	1 x 1.5 x 2500
SP 301HW	R404A	0.64	1 x 1.8 x 2000
SP 401HW	R404A	1.10	1 x 2.0 x 2900
SP 501HW	R404A	0.88	2 x 1.8 x 2500
SP 601HW	R404A	1.11	2 x 2.0 x 2000

STORAGE TEMP +1/4°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 101HW	R404A	0.67	1 x 1.5 x 2500
SP 201HW	R404A	0.67	1 x 1.5 x 2500
SP 301HW	R404A	0.64	1 x 1.8 x 2000
SP 401HW	R404A	1.10	1 x 2.0 x 2900
SP 501HW	R404A	0.88	2 x 1.8 x 2500
SP 601HW	R404A	1.11	2 x 2.0 x 2000

STORAGE TEMP 0/-2°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 101HW	R404A	0.67	1 x 1.5 x 2500
SP 201HW	R404A	0.67	1 x 1.5 x 2500
SP 301HW	R404A	0.64	1 x 1.8 x 2000
SP 401HW	R404A	1.10	1 x 2.0 x 2900
SP 501HW	R404A	0.88	2 x 1.8 x 2500
SP 601HW	R404A	1.11	2 x 2.0 x 2000

STORAGE TEMP -18/-21°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 101LW	R404A	0.53	1 x 1.5 x 2500
SP 201LW	R404A	0.84	1 x 1.8 x 2500
SP 301LW	R404A	1.13	2 x 1.6 x 2800

STORAGE TEMP +10°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air Throw mts	Air Vol m^3/h	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap						Amps	Watts				
SP 101HW	0.375	28	23	------	58	1900	700	1300	11	1160	8	4	600	230	1	50	3.9	600	Hot Gas	Auto	53	74
SP 201HW	0.5	28	23	------	60	2050	700	1450	13	1200	11	4	600	230	1	50	5.5	600	Hot Gas	Auto	56	77
SP 301HW	0.75	28	23	------	60	2700	700	1800	16	1550	14	4	600	230	1	50	5.6	900	Hot Gas	Auto	64	85
SP 401 HW	0.75	28	23	------	60	3650	1400	2550	25	2200	20	4	1200	230	1	50	7	1100	Hot Gas	Auto	80	110
SP 501HW	1	28	23	------	62	5100	1400	3100	33	2700	27	4	1200	400	3	50	5.2	1800	Hot Gas	Auto	80	110
SP 601HW	1.5	28	23	------	63	6900	1500	4700	58	4000	48	9.5	1800	400	3	50	5.9	2200	Hot Gas	Auto	100	135

STORAGE TEMP +1/4°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air Throw mts	Air Vol m^3/h	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap						Amps	Watts				
SP 101HW	0.375	28	23	------	58	1650	700	1050	7	900	6	4	600	230	1	50	3.9	600	Hot Gas	Auto	53	74
SP 201HW	0.5	28	23	------	60	1756	700	1150	9	1050	7	4	600	230	1	50	5.5	600	Hot Gas	Auto	56	77
SP 301HW	0.75	28	23	------	60	2356	700	1450	13	1300	10	4	600	230	1	50	5.6	900	Hot Gas	Auto	64	85
SP 401 HW	0.75	28	23	------	60	3000	1400	1900	20	1600	14	4	1200	230	1	50	7	1100	Hot Gas	Auto	80	110
SP 501HW	1	28	23	------	62	4500	1400	2700	30	2350	24	4	1200	400	3	50	5.2	1800	Hot Gas	Auto	80	110
SP 601HW	1.5	28	23	------	63	6300	1500	4100	50	3300	35	9.5	1800	400	3	50	5.9	2200	Hot Gas	Auto	100	135

STORAGE TEMP 0/-2°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air Throw mts	Air Vol m^3/h	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap						Amps	Watts				
SP 101HW	0.375	28	23	------	58	1450	700	850	6	750	5	4	600	230	1	50	3.9	600	Hot Gas	Auto	53	74
SP 201HW	0.5	28	23	------	60	1550	700	950	7	850	6	4	600	230	1	50	5.5	600	Hot Gas	Auto	56	77
SP 301HW	0.75	28	23	------	60	2100	700	1300	11	1200	9	4	600	230	1	50	5.6	900	Hot Gas	Auto	64	85
SP 401 HW	0.75	28	23	------	60	2800	1400	1700	15	1400	11	4	1200	230	1	50	7	1100	Hot Gas	Auto	80	110
SP 501HW	1	28	23	------	62	4100	1400	2300	21	2000	17	4	1200	400	3	50	5.2	1800	Hot Gas	Auto	80	110
SP 601HW	1.5	28	23	------	63	5550	1500	3350	36	2800	26	9.5	1800	400	3	50	5.9	2200	Hot Gas	Auto	100	135

STORAGE TEMP -18/-21°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air Throw mts	Air Vol m^3/h	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap						Amps	Watts				
SP 101LW	1.25	28	23	2.5	62	1950	700	1050	7	850	5	4	600	230	1	50	5.2	900	Hot Gas	Auto	64	85
SP 201LW	1.5	28	23	2.5	63	3200	1400	1700	14	1400	10	4	1200	400	3	50	4.3	1500	Hot Gas	Auto	80	110
SP 301LW	2.2	28	23	2.5	63	4440	1500	2700	28	2250	20	9.5	1800	400	3	50	4.5	1700	Hot Gas	Auto	105	140

NOTE: The condenser fan pressure stat fitted on Low Ambient units should be set at 17bar with a 1.5bar differential, this applies to high and low temperature models.

3. ACCESS TO THE UNIT COMPARTMENT / EVAPORATOR HOUSING

WALL MODEL

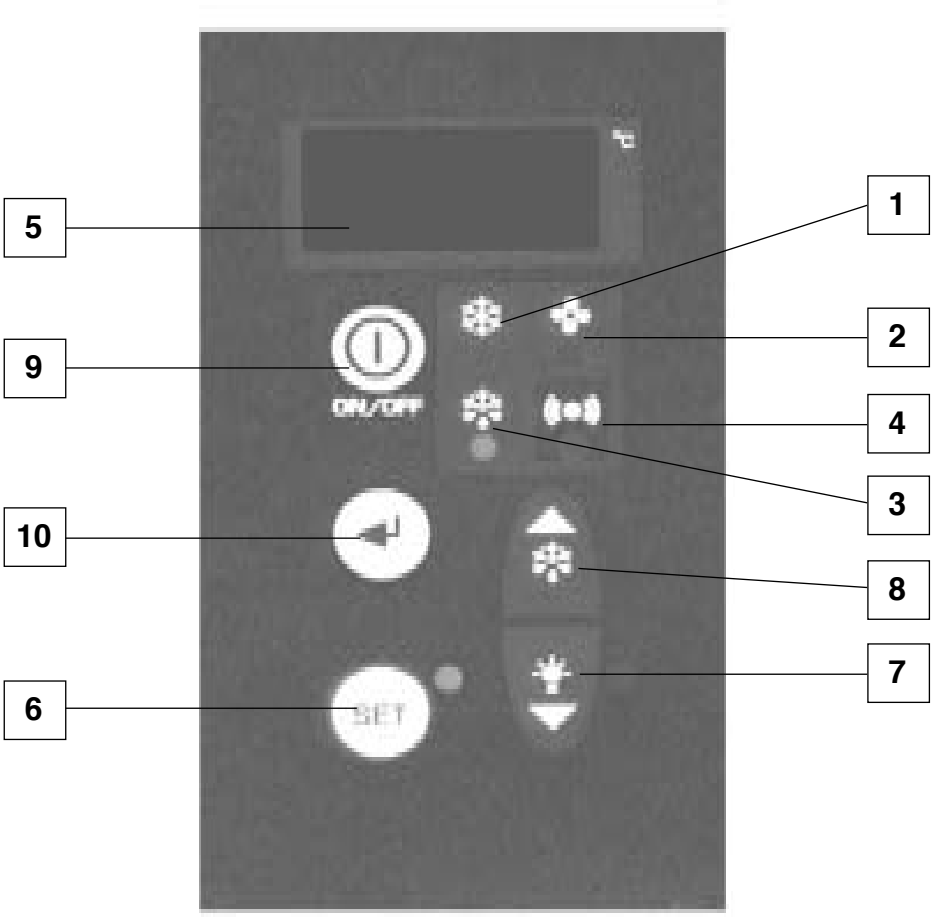
Front Panel: Grasp each side of the front panel and “pull forward” releasing it from the spring clips located down each edge,it may be necessary to separate the front panel from the main body using a flat blade screwdriver and gently ease away.

Condenser Fan Assembly: After removing the front panel “pull upwards” the fan housing assembly releasing it from the 4 “spring clips” located in each corner, it may be necessary to separate the fan housing assembly from the main body using a flat blade screwdriver and gently ease away.

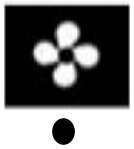
Evaporator Fan Remove the screw securing the drain tube to the drip tray and remover the drain tube.
Remove the four screws securing the drain pan and remove.
Remove the three remaining screws securing the side panel and remove it allowing access into the evaporator fan assembly.

4. CONTROLLER OPERATION

DESCRIPTION OF ELECTRONIC PANEL



1) CONTROL LED (Green):
Lit: Compressor running, unit is refrigerating. FLASHING: Compressor is in start delay mode (waiting for signal to start) OFF: Compressor is OFF. Room is down to set temperature.



2) CONTROL LED (Green):
LIT: Evaporator fan(s) running. FLASHING: Evaporator fan(s) in start delay mode (waiting for signal to start) OFF: Evaporator fan (s) OFF

3) Control LED (Yellow):
LIT: Unit in defrost mode (auto or manual)
Flashing Evaporator drip time with compressor and evaporator fan off.

4) ALARM LED (Red):
LIT: Alarm is active – see separate ALARMS section. OFF: Unit is functioning normally

5) DISPLAY:
When connected to the mains the display will read OFF indicating the condition of the unit. By pressing the ON/OFF key for 3 seconds the unit will turn ON and display the room temperature. During programming mode the various parameters will be displayed and during alarm mode an alarm code will be displayed.

6) SET/ESC KEY:
Pressed for 3 seconds, the led is lit and setting of required room temperature is enabled. During programming it is used to pass from a sub menu to an upper one.

7) DOWN/ ROOM LIGHT KEY:
During programming mode or setting of room temperature it serves to reduce the display value. At other times it serves to control the room light.

8) DEFROST/ UP KEY:
By pressing for more than 4 seconds it activates a manual defrost. During programming mode or setting of room temperature it serves to increase the displayed value.

9) ON/OFF KEY:
To turn the unit ON or OFF press and hold for more than 3 seconds.

10) ENTER KEY:
Permits access to the programming menu and passage to the sub menu. Access to this programming mode should be by qualified persons only.

NOTE:
Prior to switching on the unit the following checks should be made.
All electrical connections are terminated correctly.
All fixing screws are fully tightened.

Having made the pre start checks:
Connect the mains supply.
The display will illuminate and OFF appears on the display.
It is important to note that the condenser fan will run continuously when there is power to the unit and the display is illuminated.

ROOM TEMPERATURE SETTINGS.
Set the required room temperature.

Turn the unit ON using the ON/OFF key (9). 

Programming room temperature.

To set the required room temperature press the SET key (6) 

for more than 3 seconds.

The Green LED will light and the previous set temperature will be displayed.

To increase the set value press the UP key (8)  until the desired temperature is achieved.

To lower the set value press the DOWN key (7)  until the desired temperature is achieved.

On completion press the SET key (6) 

or wait 5 seconds to set the temperature.

5. CONTROLLER PARAMETERS

INSTRUCTION FOR PARAMETER MODIFICATION.

Turn the unit ON using the ON/OFF key (9). 

Hold the ENTER key (10)  for at least 3 seconds FNC will be displayed.

Use the UP key (8)  PL1 wll be displayed.

On reaching **PL1** in the menu press the ENTER key (10)  **PRC** will be displayed.

Press the UP key (8)  **dro** will be displayed.

rE1 menu	=	coP	=	Compressor
rE2 menu	=	deF	=	Defrost
rE3 menu	=	Fan	=	Fans
rE4 menu	=	Luc	=	Light
rE5 menu	=	ALP	=	Temperature Alarms
rE6 menu	=	PP	=	Pressure Alarms
rE7 menu	=	ALP	=	Condensing Alarm

Use the up (8)  or the down (7)  to scroll through the menu list

When you have made the selection press the ENTER key (10)  to accress the parameter.

Press the ENTER key (10)  to get to the next level.

Press the ENTER key (10)  to display the value and use the UP key (8)  or the DOWN key (7)  to change the value.

Press the ENTER key (10)  to store the changes.

Use the up (8)  or the down (7)  to scroll through the parameter labels.

Press SET (6)  to regain access to the code menu.

Press the ENTER key (10)  to confirm the changed value.

When all of the changes have been completed press the SET key (6)  3 times to save the changes and return to the menu.

PARAMETER DESCRIPTION

dro: Allows for the temperature to be displayed in either Celsius or Fahrenheit. 0 = °C. 1 = °F.
CA1: Calibration of Probe 1. Allows the value read by the probe to be adjusted up or down to suit site conditions. Range –12°C to +12°C.

Compressor rE1 menu. coP

diF: differential. Allowable temperature rise between cut in and out of compressor. Range –12°C to +12°C.
HSE: Maximum set point. The maximum value that the set point can be adjusted in the operator functions. Range from Lower set point to plus 150
LSE: Minimum set point. The minimum value that the set point can be adjusted in the operator functions. Range from Maximum set point to minus 50
dbi: Timed delay between 2 compressor start ups. (0 = no delay). Range in minutes 0 to 15.
dOF: Timed delay between compressor Off and next start (0 = no delay). Range in minutes 0 to 15.
Ont: Compressor run time in the event of room sensor failure. Range 0 to 250 minutes.
CFt: Compressor Off time in the event of room sensor failure. Range 0 to 250 minutes.

Defrost rE2 menu. dEF

dit: Timed interval between two subsequent defrost. Range 0 to 37 hours.
dEt: Timed defrost termination. Maximum timed duration of defrost even if termination temperature has not been achieved. Range 1 to 250 minutes.
dCt: Defrost interval time count mode. Allows the setting of the defrost interval time against certain functions (i.e. compressor run time = 0). Range 0 to 3.
0 = Compressor run time.
1 = Real time, interval of defrosts determined on a real time basis (i.e. with **dit** set for 4, defrost would occur every 4 hours).
2 = Defrost occurs each time the compressor stops.
3 = Defrost occurs at set times using the real time clock.
dtY = Defrost type selection (timed , electric, hot gas off cycle). Range 0 to 3.
0 = Timed defrost.
1 = Electric defrost.
2 = Hot gas defrost.
3 = Off cycle.
dt: Drain down time. After the defrost has been completed the compressor and evaporator fan stay off for the duration of the fan delay period. Range 0 to 250 minutes.
dSt: Defrost termination temperature. The temperature at which the defrost relay is de-energised. Range -50°C to +150°C

Fans rE3 menu. FAn

Fdt: Fan delay time. Time in minutes to delay the evaporator start after a defrost. Range 0 to 15 minutes.
FCO: Evaporator fan/s continuously. Allows selection of the fans to cycle with the compressor or to run continuously. Range **Y** for fan/s to run continuously or **N** for fan/s to cycle with the compressor.
dFd: fan/s stops during defrost. Allows for the option of the fan/s to run during defrost or to stop during defrost. Range **N** to run during defrost or **Y** to stop during defrost.
Fod: Fan/s OFF when door opened. Allows selection of the fan/s to run or not when the door is opened. Range **on** for fan/s to run during door openings, **no** for fan/s to stop during door openings.
Fst: Fan/s stop temperature. Allows the setting of the temperature that fan/s will be stopped at. The fan/s will remain off as long as the value read by the defrost probe (placed on the evaporator) is higher than the set temperature value.

Room Light rE4 menu. LUc
No parameters.

Temperature Alarms rE5 menu. ALP

LAL: Low temperature alarm. In the event of the air temperature dropping below the low temperature set point the alarm will sound and the alarm relay will be energised. The alarm set point is the value from the air temperature set point. Warning: the **LAL** parameter must be set to a negative value. Range **HAL** -50°C
HAL: High temperature alarm. In the event of the air temperature going higher than the high temperature set point the alarm will sound and the alarm relay will be energised. The alarm set point is the value from the air temperature set point.
AFd: Alarm differential. Range -12°C to +12°C.
PAO: Alarm delay after start up. Temperature alarms are overridden, in hours, when the unit is switched on. Range 0 to 10 hours.
dAo: Alarm delay after defrost. Temperature alarms are overridden, in minutes, after defrost. Range 0 to 250 minutes.
OAO: Alarm delay after opening. Temperature alarms are overridden, in hours, after door closure. Range 0 to 10 hours.

Pressure Alarms rE6 menu. PP

PEI: Time period for pressure trips. Time interval during which the number of times the high pressure trip is activated for an alarm condition to occur and the subsequent stopping of the compressor. Range 1 to 99 minutes.
Pen: Number of high-pressure trips. Number of high-pressure trips during the time as set in **PEI** for an alarm condition to be activated and the subsequent stopping of the compressor. Range 0 to 15.

Condensing Temperature Alarms rE7 menu. ALP

AL: Maximum condensing temperature alarm setpoint. In the event of the Condenser temperature going higher than the condenser temperature set point the alarm will sound and the alarm relay will be energised. Range 0°C to 99°C.
Afd: Alarm Differential. Allowable temperature rise between alarm activation and de-activation. Range -12°C to +12°C

CONTROLLER ALARMS AND FAULT FINDING.

When an alarm condition occurs the unit will display an alarm code **ERR** (this will differ according to the nature of the alarm):

- Alarm LED will illuminate (4)
- Buzzer will sound (if remote alarm is fitted)
- The alarm relay (for remote alarms) will be energised.

The pressing of any key will mute the alarm buzzer.
When the alarm is muted the LED will continue to flash for as long as the alarm condition persists.
To display the alarm code it is necessary to enter the alarm menu:
Press the ENTER key (10) for more than three seconds. FnC will be displayed. Press the DEFROST/UP key (8) until AL is displayed and then press ENTER (10). At this point the alarm code will be displayed indicating the nature of the alarm.

High Temperature Alarm (HI)
The red LED, buzzer and remote alarm relay are activated; the alarm code HI is displayed in the Alarm Menu.
The cause can be:

- Product to warm
- Excessive door openings
- Excessive product load
- Unit malfunction

Low Temperature Alarm (LI)
The red LED, buzzer and remote alarm relay are activated; the alarm code LI is displayed in the Alarm Menu.
The cause can be:

- Malfunction of the electronic controller

High Pressure Alarm (EO)
Each time the pressure switch trips, the buzzer and red LED are activated. If more than ten trips occur during a 1-hour period then the unit will shut down automatically. The remote relay will be activated and the label **ERR** will flash on the display alternating with the room temperature. The alarm code EO is displayed in the Alarm Menu.
The cause can be:

- Dirty condenser
- Condenser fan not running
- Front cover not fitted
- Obstructed condenser air inlet
- Obstructed condenser air outlet
- Inadequate ventilation

Voltage Monitor Alarm (E8 – only when fitted as an option)
The optional voltage monitor is an electronic device that checks the units' electrical supply. Should the voltage vary by +/- 12% the unit will shut down for a period of 6 minutes (not adjustable) before attempting to re-start automatically providing the voltage has returned to within limits. The red LED, buzzer and remote alarm relay are activated; the label **ERR** will flash on the display alternating with the room temperature. The alarm code E8 is displayed in the alarm menu.
WARNING: if the Voltage monitor is fitted it is important to note that on start up it has a time delay of seven minutes, during this period the power should be on with the controller in the OFF position.

Room Sensor Fault (E1)
The red LED, buzzer and remote alarm relay are activated; the label **ERR** will flash on the display alternating with the room temperature: alarm code E1 in the alarm menu.
Possible causes are:

- Faulty room sensor.
- Room sensor terminals badly connected.

Defrost sensor fault (E2)
The red LED, buzzer and remote alarm relay are activated; the label **ERR** will flash on the display alternating with the room temperature: alarm code E2 in the alarm menu.
Possible causes are:

- Faulty defrost sensor
- Defrost sensor terminals badly connected.

Condenser Sensor Fault (4)
The red LED, buzzer and remote alarm relay are activated; the label **ERR** will flash on the display alternating with the room temperature: alarm code E4 in the alarm menu.
Possible causes are:

- Faulty condenser sensor
- Condenser sensor terminals badly connected.

Condenser Temperature Alarm (H4)
If the condensing temperature exceeds the factory pre set value (not adjustable) the red LED, buzzer and remote alarm relay are activated: The alarm code H4 is displayed in the alarm menu.
Possible causes are:

- Dirty condenser
- Condenser fan not running
- Front cover not fitted
- Obstructed condenser air inlet

TROUBLE SHOOTING

1) Compressor stops. There is an internal over temperature device (Klixon) that stops the compressor each time the admissible temperature of the motor windings is exceeded.
Possible causes are:

- Insufficient ventilation to the compressor
- Mains voltage anomaly
- Faulty condenser fan

The device will re-set automatically when the windings cool down.

2) Formation of ice on evaporator coil impeding airflow.
Possible causes are:

- Excessive door openings
- Door left open for long periods
- Evaporator fan/s faulty
- Door switch faulty (if fitted)
- Faulty defrost heater (if fitted)
- Faulty hot gas solenoid valve (if fitted)
- Pre set defrost routine not sufficient to clear evaporator of ice build up.
- Decrease the time interval between defrosts.

3) Display does not illuminate.

- Is their power to the unit?
- Is the mains cable connected correctly?
- Have the fuses in the electrical panel blown?

7. PARAMETER LIST

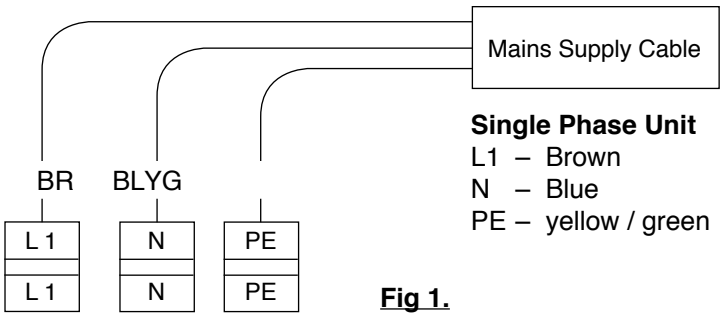
				Medium	Low
Label	**Description**	**Unit of measure**	**Range**	**Hot gas defrost**	**Hot gas defrost**
dro	Display Readout °C or °F (0=°C. 1=°F)	Flag	0 or 1	0	0
CA1	Calibration of room sensor	°C	-12 to +12	0	0
Compressor rE1 menu. coP					
diF	Differential	°C/1	2	2	2
HSE	Maximum set point	°C/1	LSE to 150	10	-15
LSE	Minimum set point	°C/1	-50 to HSE	-5	-25
dbi	Time delay between 2 compressor starts	Minutes	0 to 15	2	2
dOF	Time delay between compressor OFF and next start	Minutes	0 to 15	2	2
Ont	Compressor ON time if room sensor fails	Minutes	0 to 250	10	10
OFt	Compressor OFF time if room sensor fails	Minutes	0 to 250	20	20
Defrost rE2 menu. dEF					
dit	Time interval between 2 defrosts	Hour	0 to 31	3	3
dEt	Defrost time override	Minutes	1 to 250	20	20
dCt	Defrost interval time count mode	Number	0 to 3	0	0
	0 = compressor run time				
	1 = unit run time				
	2 = each time compressor stops				
	3 = determined on a real time basis				
dtY	Defrost type selection	Number	0 to 3	2	2
	0 = Timed defrost				
	1 = Electric defrost				
	2 = hot gas				
	3 = Off cycle				
dt	Drain down time	Minutes	0 to 250	2	2
dSt	Defrost termination temperature	°C/1	-50 to 150	15	15
Evaporator Fans rE3 menu. FAn					
Fdt	Fan delay time	Minutes	0 to 15	3	3
FCO	Evaporator fan/s run with compressor	Flag	n / y	n	n
dFd	Fan/s stops during defrost	Flag	n / y	y	y
Fod	Fan/s off when door opened	Flag	on/off	on	on
FSt	Fan stop temperature	°C/1	-50 to 150	50	50
Room Light rE4 menu. LUc					
No parameters					
Temperature Alarms rE5 menu. ALP					
LAL	Low temperature alarm	°C/1	-50 to HAL	-5	-5
HAL	High temperature alarm	°C/1	LAL to 150	5	5
AFd	Alarm differential	°C/1	-12 to 12	2	2
PAO	Alarm delay after start-up	Hour	0 to 10	3	6
dAo	Alarm delay after defrost	Minutes	0 to 250	60	60
OAO	Alarm delay after door opening	Hour	0 to 10	1	1
Pressure alarms rE6 menu. PP					
PEi	Time period for pressure trips	Minutes	1 to 99	60	60
Pen	Numbers of pressure trips	Number	0 to 15	10	10
Condensing temperature alarms rE7 menu. ALP					
HAL	Maximum condensing temperature alarm setpoint	°C/1	0 to 99	55	55
AFd	Alarm differential	°C/1	-12 to 12	2	2

8. ELECTRICAL CONNECTIONS

The unit operates from a 220/240v1-50hz or a 400v- 3-50hz electrical supply as denoted in the technical data.
For 60hz application consult Foster.
The selection of mains cable depends on the unit (Amps) and on the siting of the cable itself.
The installer will therefore evaluate the most suitable one on a case by case basis.
The table below gives a rough sizing and should be used as a guide only

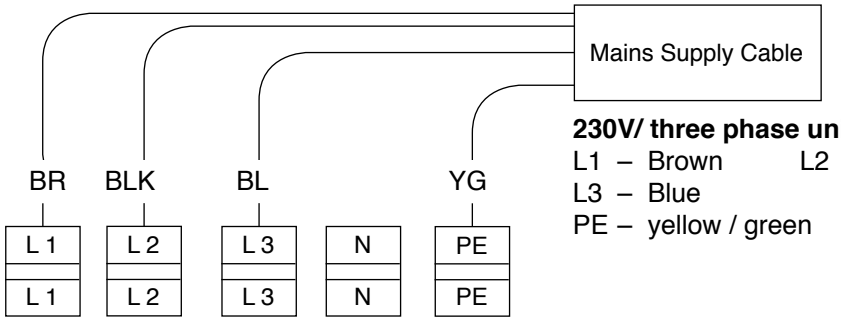
Unit Amps	Cable diameter
Up to 12 Amps	1.5mm^2
12 to 17 Amps	2.5mm^2
Over 17 Amps	4mm^2

Remove the front panel of the unit and connect the cables to the terminal box as per the diagrams in fig 1,2,3 and 4.



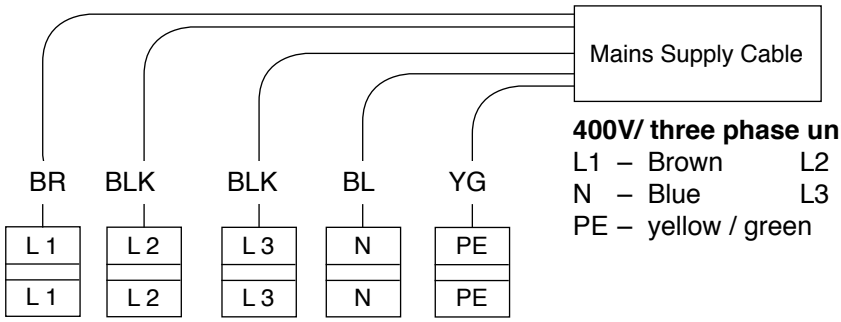
Single Phase Unit
L1 – Brown
N – Blue
PE – yellow / green

Fig 1.



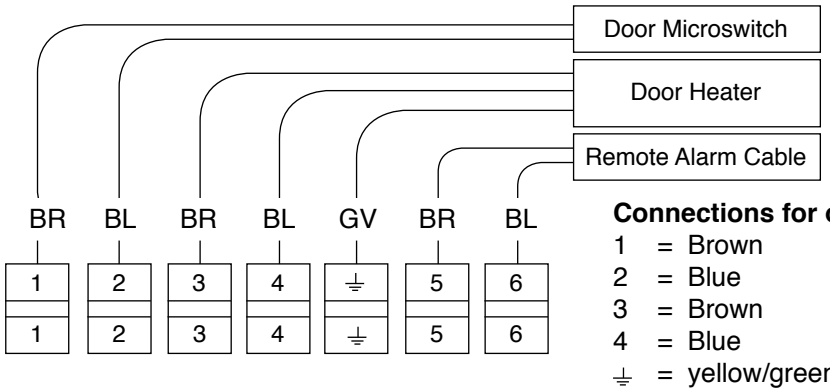
230V/ three phase unit without neutral.
L1 – Brown L2 – Black
L3 – Blue
PE – yellow / green

Fig 2.



400V/ three phase unit with neutral.
L1 – Brown L2 – Black
N – Blue L3 – Black
PE – yellow / green

Fig 3.



Connections for options
1 = Brown 5 = Brown
2 = Blue 6 = Blue
3 = Brown
4 = Blue
⏚ = yellow/green

Fig 4.

9. PROBE RESISTANCE VALUES

The air and defrost probes have the following temperature resistance values (K ohms)

Temperature	Kohms		Temperature	Kohms
+50°C	4,161		0°C	27,280
+40°C	5,828		-10°C	42,450
+30°C	8,313		-20°C	67,740
+20°C	12,090		-30°C	111,300
+10°C	17,960		-40°C	188,400

10. FUSE RATINGS

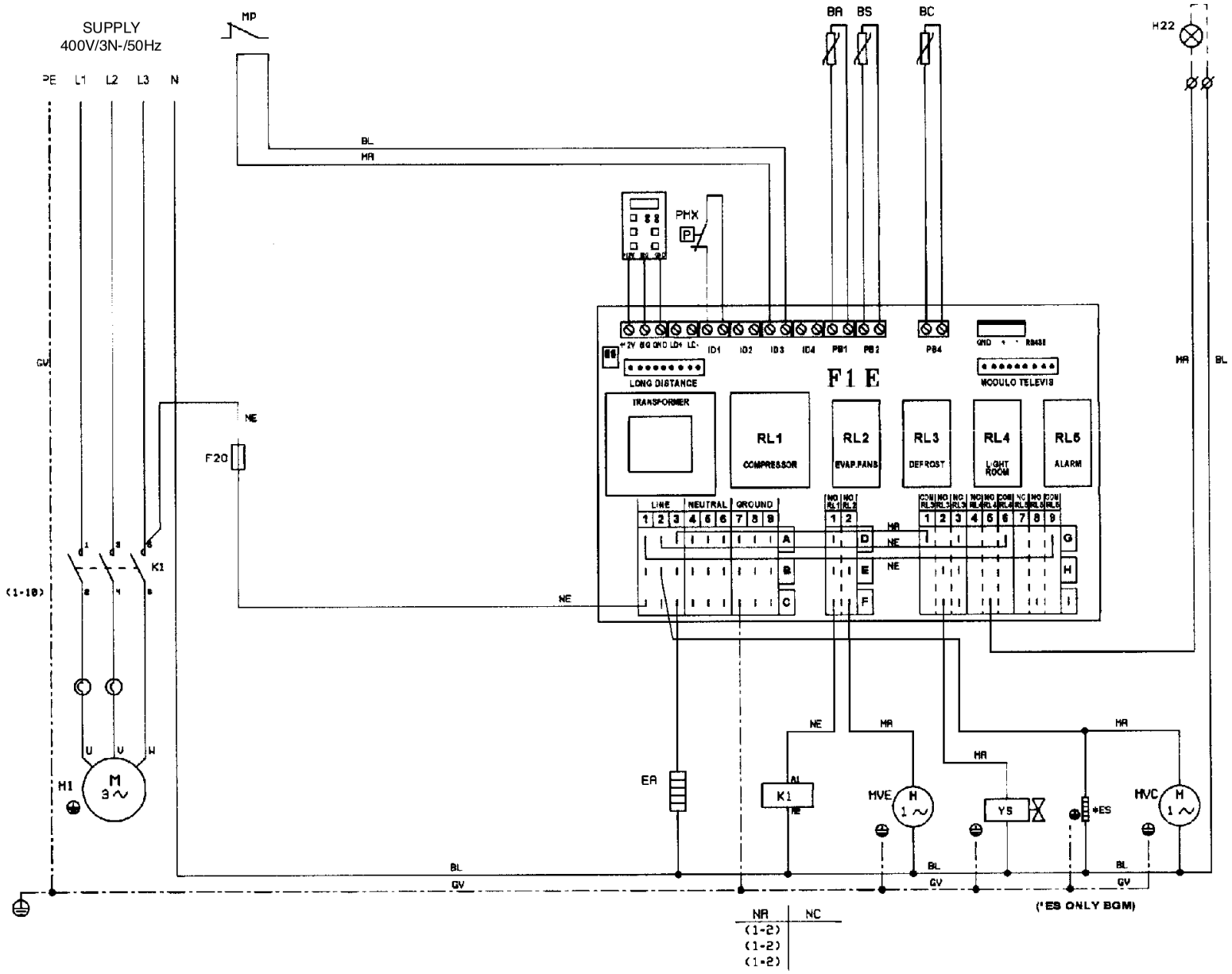
FOSTER CODE	Internal fuse	Wiring diagram
SP101HW	16 A	J1018
SP201HW	16 A	J1018
SP301HW	20 A	J1018
SP401HW	25 A	J1018
SP501HW	No fuses	J2020
SP601HW	No fuses	J2019
SP101LW	20 A	J1018
SP201LW	No fuses	J2019
SP301LW	No fuses	J2019
SP101HW LA	16 A	J1019
SP201HW LA	16 A	J1019
SP301HW LA	20 A	J1019
SP401HW LA	25 A	J1019
SP501HW LA	No fuses	J2021
SP601HW LA	No fuses	J2022
SP101LW LA	20 A	J1019
SP201LW LA	No fuses	J2022
SP301LW LA	No fuses	J2022

NOTE: LA refers to Low Ambient Models

11. WIRING DIAGRAMS

COMPONENT IDENTIFICATION

BA	ROOM SENSOR
BC	CONDENSER ALARM SENSOR
BS	DEFROST SENSOR
BVR	SPEED REGULATOR
BVRS	SPEED REGULATOR SENSOR
E	DEFROST HEATER
E1	RESISTENZA CARTER COMPRESSORE
M1	COMPRESSOR CRANKCASE HEATER
EP	DOOR HEATER CIRCUIT
ER1	CONTROL BOARD HEATER
ER2	VOLTAGE REGULATOR HEATER
ES	CONDENSATE DRAIN HEATER
F13	VOLTAGE REGULATOR FUSE
F1	COMPRESSOR FUSE
F1E	ELECTRONIC CONTROL CAB
F20	AUXILIARY FUSE
FL	ROOM LIGHT FUSE
FM	VOLTAGE REGULATOR
FTE	EMERGENCY ‘STAT
HI	ALARM
K1	CONTACTOR
K11	DEFROST CONTACTOR
M1	COMPRESSOR MOTOR Nr.1
MPC	DOOR MICROSWITCH(ROOM)
MVC	CONDENSER FAN MOTOR
MVE	EVAPORATOR FAN MOTOR
P1MX	COND. FAN STARTING PRESSURE SWITCH
PMI	L/P SWITCH
PMX	H/P SWITCH
Q1	MAIN SWITCH
Q3	COND. FAN SPEED REGULATOR “OFF” SWITCH
T	TRANSFORMER
X	TERMINAL BOARD-CONNECTOR
YG	REFRIGERANT SOLENOID
YS	HOT GAS SOLENOID

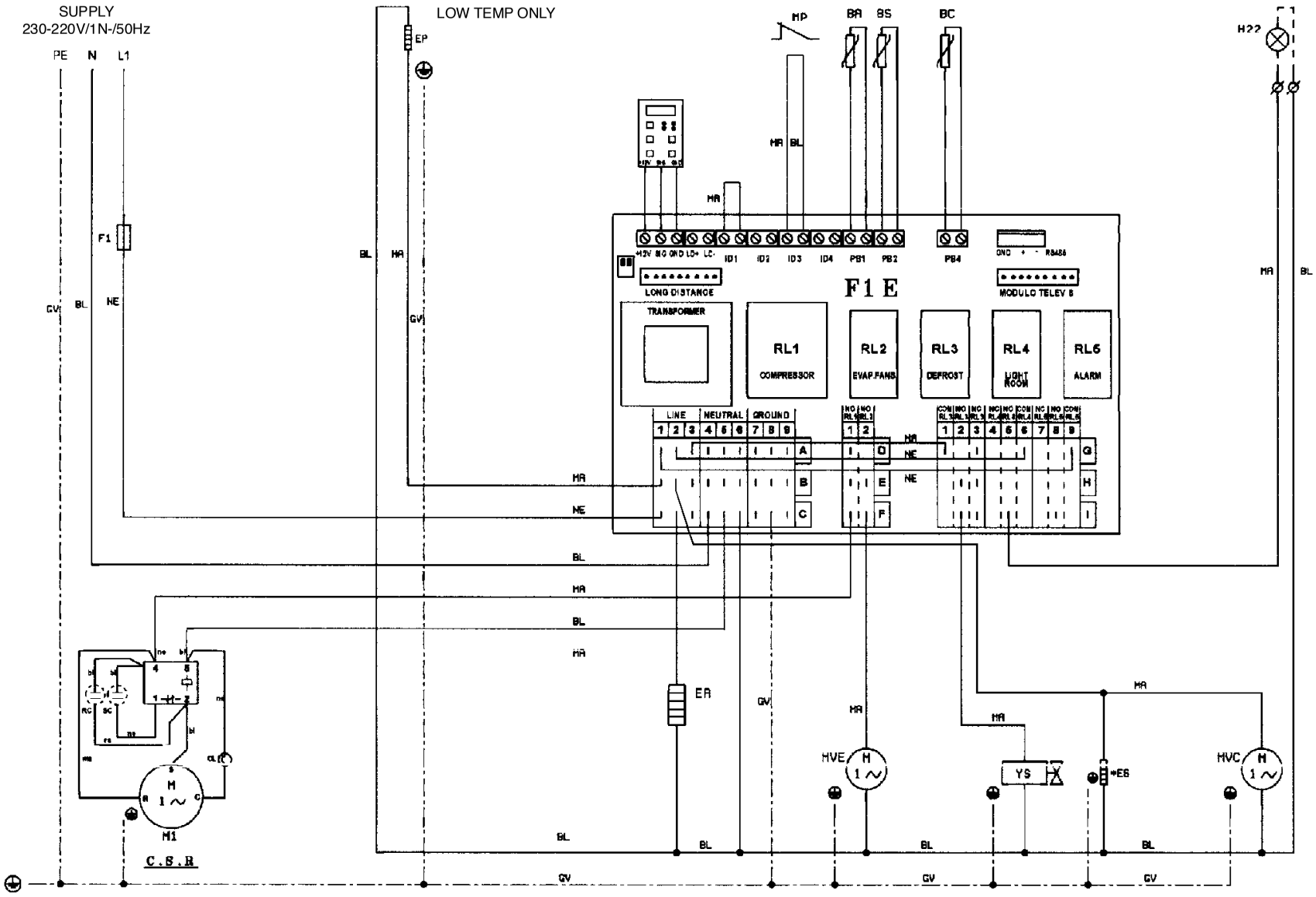


Colour Code
MA - BROWN
BL - BLUE
GV - GREEN/YELLOW
NE - BLACK

FOSTER REFRIGERATOR

FOSTER REFRIGERATOR - A Division of ITW Ltd.

Title	Drawing No.	Sheet No.
SP501HW	J2020	1 of 1
	Drawn By / Approved / Date	

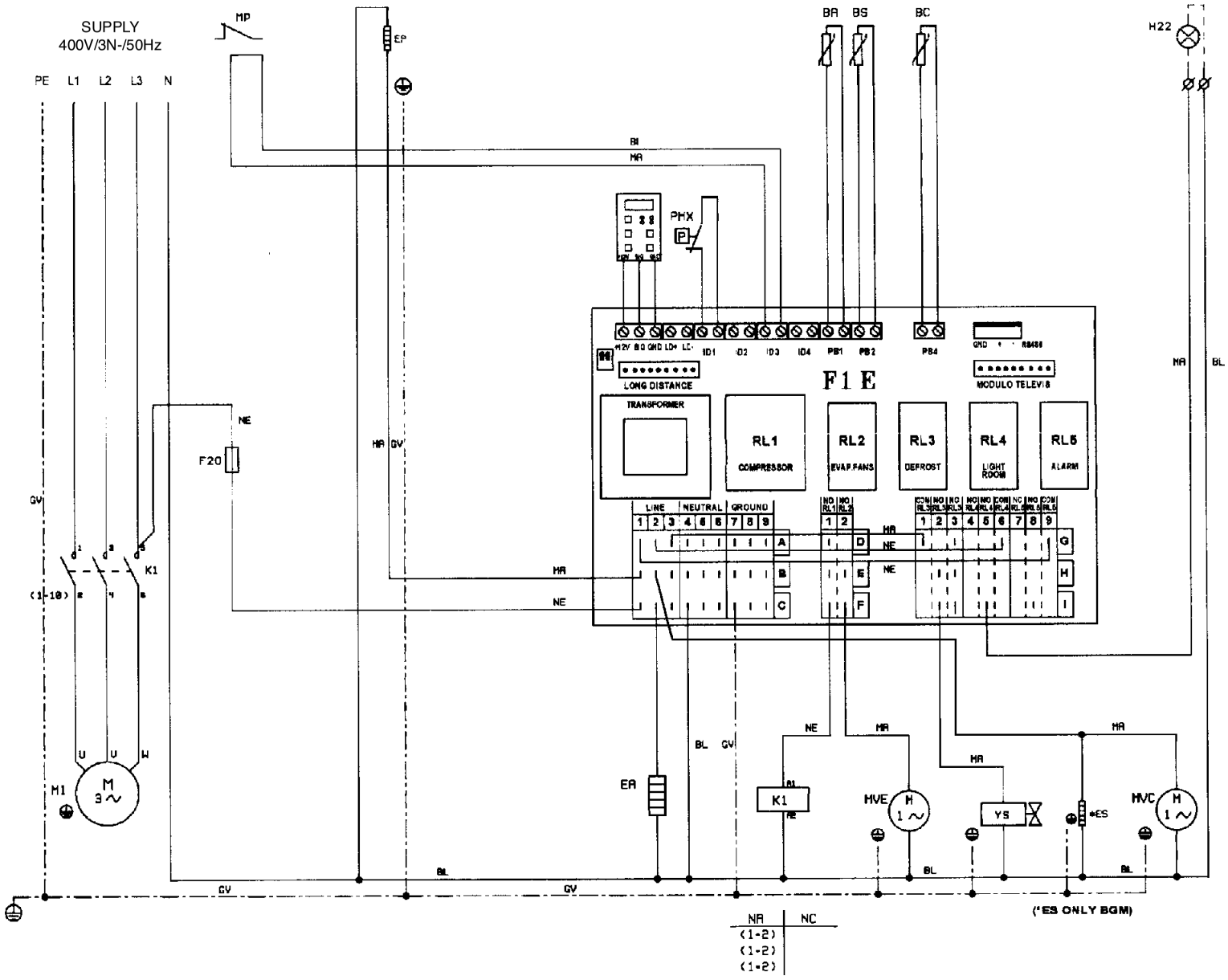


Colour Code
MA - BROWN
BL - BLUE
GV - GREEN/YELLOW
NE - BLACK

FOSTER REFRIGERATOR

FOSTER REFRIGERATOR - A Division of ITW Ltd.

Title	Drawing No.	Sheet No.
SP101LW SP101LW SPE SP101HW SP201HW SP301HW	J1018	1 of 1
	Drawn By / Approved	Date



Colour Code
MA - BROWN
BL - BLUE
GV - GREEN/YELLOW
NE - BLACK

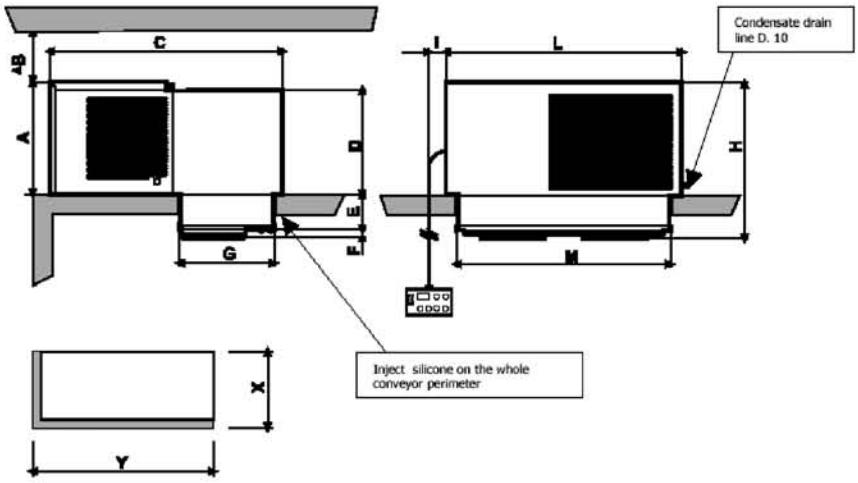
FOSTER REFRIGERATOR

FOSTER REFRIGERATOR - A Division of ITW Ltd.

Title	Drawing No.	Sheet No.
SP201LW SP301LW SP601HW	J2019	1 of 1
	Drawn By / Approved / Date	

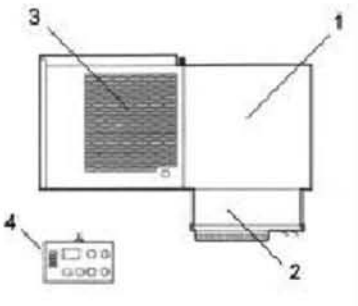
PART 1B
Ceiling Mounted Solo January 2003 Controller Settings

Dimensions



	A	B	C	D	E	F	G	H	I	L	M	X	Y
SP1/SP2	357	250	719	340	122	28	332	506	60	620	545	337	550
SP3/SP4	390	250	809	360	122	28	332	540	60	820	745	337	750
SP5	427	250	929	410	122	98	452	645	60	820	745	458	750

Description



1. Condensing unit and Evaporator (evaporator plaed in an insulated box) located outside of the coldroom.
2. Air inlet and outlet to the evaporator located inside the coldroom.
3. Electrical control panel located in the condensing unit enclosure.
4. Wall mounted control panel.

WALL MOUNT SOLO PLUS TECHNICAL DATA

STORAGE TEMP +10°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 1HC	R404A	0.54	1 x 1.63 x 2200
SP 2HC	R404A	0.60	1 x 1.83 x 3100
SP 3HC	R404A	0.73	2 x 1.38 x 3100
SP 4HC	R404A	0.70	2 x 1.98 x 2900
SP 5HC	R404A	1.10	2 x 1.98 x 2000

STORAGE TEMP +1/4°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 1HC	R404A	0.54	1 x 1.63 x 2200
SP 2HC	R404A	0.60	1 x 1.83 x 3100
SP 3HC	R404A	0.73	2 x 1.38 x 3100
SP 4HC	R404A	0.70	2 x 1.98 x 2900
SP 5HC	R404A	1.10	2 x 1.98 x 2000

STORAGE TEMP 0/-2°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 1HC	R404A	0.54	1 x 1.63 x 2200
SP 2HC	R404A	0.60	1 x 1.83 x 3100
SP 3HC	R404A	0.73	2 x 1.38 x 3100
SP 4HC	R404A	0.70	2 x 1.98 x 2900
SP 5HC	R404A	1.10	2 x 1.98 x 2000

STORAGE TEMP -18/-21°C			
Foster Model No.	Ref Gas	Qty Grms	Capillary Size No. x Dia x Len
SP 1LC	R404A	0.42	1 x 1.49 x 1900
SP 2LC	R404A	0.72	1 x 1.98 x 3000
SP 3LC	R404A	0.96	2 x 1.63 x 2900

STORAGE TEMP +10°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air	Air Vol	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap	Throw mts	m^3/h				Amps	Watts				
SP 1HC	0.625	28	23	———-	59	2300	750	1550	10	1400	7	3	550	230	1	50	4.4	700	Hot Gas	Auto	59	90
SP 2HC	0.75	28	23	———-	60	2675	750	1750	12	1600	10	3	550	230	1	50	5.2	800	Hot Gas	Auto	59	90
SP 3HC	1	28	23	———-	60	3750	1400	2600	20	2200	16	3.5	1100	230	1	50	6.9	1100	Hot Gas	Auto	74	114
SP 4HC	1.2	28	23	———-	60	4200	1400	2900	28	2700	22	3.5	1100	400	3	50	4.4	1500	Hot Gas	Auto	75	115
SP 5HC	2	28	23	———-	63	7200	5200	5200	56	4600	48	6	2300	400	3	50	5.1	2100	Hot Gas	Auto	93	139

STORAGE TEMP +1/4°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air	Air Vol	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap	Throw mts	m^3/h				Amps	Watts				
SP 1HC	0.625	28	23	———-	59	1950	750	1150	7	1050	6	3	550	230	1	50	4.4	700	Hot Gas	Auto	59	90
SP 2HC	0.75	28	23	———-	60	2200	750	1350	9	1250	6	3	550	230	1	50	5.2	800	Hot Gas	Auto	59	90
SP 3HC	1	28	23	———-	60	2850	1400	1900	17	1600	10	3.5	1100	230	1	50	6.9	1100	Hot Gas	Auto	74	114
SP 4HC	1.2	28	23	———-	60	3350	1400	2300	20	2050	12	3.5	1100	400	3	50	4.4	1500	Hot Gas	Auto	75	115
SP 5HC	2	28	23	———-	63	5700	1500	4100	46	3600	28	6	2300	400	3	50	5.1	2100	Hot Gas	Auto	93	139

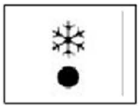
STORAGE TEMP 0/-2°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air	Air Vol	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap	Throw mts	m^3/h				Amps	Watts				
SP 1HC	0.625	28	23	———-	59	1750	750	1050	6	925	4	3	550	230	1	50	4.4	700	Hot Gas	Auto	59	90
SP 2HC	0.75	28	23	———-	60	2000	750	1200	7	1100	5	3	550	230	1	50	5.2	800	Hot Gas	Auto	59	90
SP 3HC	1	28	23	———-	60	2650	1400	1700	12	1450	9	3.5	1100	230	1	50	6.9	1100	Hot Gas	Auto	74	114
SP 4HC	1.2	28	23	———-	60	3150	1400	2000	15	1700	12	3.5	1100	400	3	50	4.4	1500	Hot Gas	Auto	75	115
SP 5HC	2	28	23	———-	63	5100	1500	3600	36	3200	17	6	2300	400	3	50	5.1	2100	Hot Gas	Auto	93	139

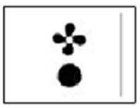
STORAGE TEMP -18/-21°C

Foster Model No.	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	RoomVent m^3/h #	32°C Ambient		43°C Ambient		Air	Air Vol	Volts	Electrical Phase	Hz	Nominal		Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
								Watts	Room Cap	Watts	Room Cap	Throw mts	m^3/h				Amps	Watts				
SP 2LC	1.7	28	23	3	60	2050	750	1200	6	1050	3	3	550	230	1	50	5.9	900	Hot Gas	Auto	68	99
SP 3LC	2	28	23	3	61	2850	1400	1650	11	1400	7	3.5	1100	400	3	50	4.2	1400	Hot Gas	Auto	87	118
SP 4LC	3	28	23	3	63	5000	1400	2400	18	220	13.5	6	2300	400	3	50	4.6	1800	Hot Gas	Auto	102	142

NOTE: Noise levels taken in a room with a concrete floor, no sound attenuation and ceiling height of 7 metres with the unit base 1.5 metres from floor level, installed in a coldroom and the Sound Metre 3 metres distance.

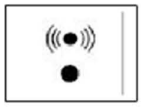


1) Control LED (GREEN)
ON: Compressor running, unit refrigerating.
FLASHING: Compressor is in Start Delay mode.
OFF: Compressor off, Room down to temperature

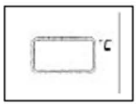


2. Control LED (GREEN)
ON: Evaporator fan running.
FLASHING: Evaporator fan in start delay mode.
OFF: Evaporator fan off. Unit in defrost mode.

3. Control LED (YELLOW)
ON: Unit in Automatic or Manual defrost.



4. Alarm LED (RED)
ON: Alarm activated due to Sensor failure, pressure switch intervention or coldroom temperature outside set values.
OFF: Unit operating normally.



5. DISPLAY: On connection to the main supply OFF is displayed indicating the statues of the unit. By pressing the ON/OFF key for 3 seconds the unit is turned on with the room temperature displayed. In the programming mode the parameters are displayed and if an alarm occurs the code is displayed.

6. SET key: When pressed for two seconds it illuminates and allows the room temperature to be set. During programming it is used to pass from submenu to an upper menu.

7. DOWN/ROOM LIGHT key: In programming mode or when setting room temperature it is used to reduce the displayed value.
At other times it is used to turn the coldroom light on or off.

8. MANUAL DEFROST/UP key: In programming mode or when settings room temperature it is used to increase the displayed value.
Manual defrost initiated if pressed for more then 5 seconds.

9. ON/OFF key: When pressed for 2 seconds it turns the unit off or on.

10. ENTER key: Allows access to the menu and submenus.
Access to the programming mode should only be attempted after reading and fully understanding the service manual, as inserting incorrect information will effect the operation of the unit.

ROOM TEMPERATURE SETTINGS.
Set the required room temperature.

With the unit in normal operating mode press the SET key 

to display the set temperature.

To change the value press either the UP/DEFROST key  or the DOWN/INTERIOR LIGHT key. 

Once you have reached the desired setting press SET key 

to confirm and store the change.

INSTRUCTION FOR PARAMETER MODIFICATION

ACCESSING THE PARAMETERS

Press and hold the ENTER key  for 5 seconds.
“00” will be displayed.

Press the UP/DEFROST key  till it displays “22”

The first parameter to be changed will be displayed.

Press the UP/DEFROST key  or the DOWN/INTERIOR LIGHT key  to scroll through the parameters.

Press the SET key 

to display the value of the parameter selected.

To change the value press either the UP/DEFROST key  or the DOWN/INTERIOR LIGHT key 
until you reach the new value.

Press the SET key 

to display the value of the parameter selected.

To change the value press either the UP/DEFROST key  or the DOWN/INTERIOR LIGHT key 
until you reach the new value.

Press the SET key 

to confirm the value.

Repeat the operation to modify the required parameters.

To memorise the new values and exit the parameters press the ENTER key. 

NOTE: If you do not press the ENTER key  the new values will not be memorised.

If no buttons are pressed for 60 seconds the controller will revert to normal operation.

PARAMETER LIST

Label	Description	Unit of measure	Operating Range		Hot gas Defrost	
			Min	Max	H	L
IC	Setting	C°/ F°	-20	20	0	0
I2	Reading Stability	-	1	15	4	4
I3	Reading Speed	-	1	15	6	6
I4	Virtual Probe	-	0	100	0	0
I5	C°/ F° (0 = C°. 1 = F°)	Flag	0	1	0	0
I6	Decimal Point (0 = Yes. 1 = No)	Flag	0	1	0	0
rd	Differential	C°/ F°	0.1	19.9	2	2
r1	Minimum Allowable Set	C°/ F°	-40	r2	-5	-25
r2	Maximum Allowable Set	C°/ F°	r1	199	10	-15
r3	Not used	-	-	-	-	-
r4	Automatic Variation Set 'Point in Night Time Operation	C°/ F°	0	20	0	0
r5	Activation Checks Least Temperature Min and Max	Flag	0	1	0	0
rt	Monitoring Interval	Hour	0	199	-	-
rH	Max Temperature Measured During rt Time Range	C°/ F°	-50	90	-	-
rL	Min. Temperature Measured During rt Time Range	C°/ F°	-50	90	-	-
c0	Delay After Reset	Minutes	0	15	0	0
c1	Minimum Time Between Two Compressor Start Ups	Minutes	0	15	3	3
c2	Minimum OFF Time	Minutes	0	15	2	2
c3	Minimum ON Time	Minutes	0	15	0	0
c4	Safety Relay (0 = OFF 100 = ON)	Minutes	0	100	8	8
d0	Defrost Type (0 = Electric. 1 = Hot Gas)	Flag	0	1	1	1
d1	Defrost Interval	Hour	0	199	4	4
dt	Defrost Termination Temperature	C°/ F°	-40	199	15	15
d3	Ed Alarm Activation	Flag	0	1	0	0
d4	Defrost After Start Up (0 = NO. 1 = Yes)	Flag	0	1	0	0
d5	Defrost Delay After Reset or External Trigger	Minutes	0	199	0	0
d6	Display Lock During Defrost (0 = No. 1 = Yes)	Flag	0	1	0	0
dd	Dripping Time	Minutes	0	15	2	2
d8	Alarm Delay After Defrost and Door Open	Hour	0	15	1	1
d9	Priority of Defrost Over Compressor Min On and Min Off Time	Flag	0	1	0	0
dI	Defrost Probe Reading	Minutes	-	-	-	-
dC	Time Selection (0 = Hours. 1 = Minutes/ Seconds)	Flag	0	1	0	0
AO	Alarms and Fan Delta	C°/ F°	0.1	20	2	2
AL	Low Temperature Alarm (With Respect to Set Point)	C°/ F°	0	199	3	3
AH	High Temperature Alarm (With Respect to Set Point)	C°/ F°	0	199	3	3
Ad	Temperature Alarm Delay	Minutes	0	199	199	199
A4	Configuration Digital Input No 1 (Door Micro Switch)	-	0	7	1	1
A5	Configuration Digital Input No 2 (Pre – Heating)	-	0	7	5	5
A6	Compressor Failure Due to External Alarm. (0 = Off. 100 = On)	Minutes	0	100	0	0
A7	Delay Time For A4 or A5 Input	Minutes	0	199	0	0
F0	Fan Control (0 = Always On Except F2, F3 and Fd)	Flag	0	1	0	0
F1	Fan Switch Off Temperature (Related to the Room Temperature)	C°/ F°	0	20	20	20
F2	Fans Off While Compressor is Off (0b = No. 1 = Yes)	Flag	0	1	1	1
F3	Fans Off During Defrost (0 = No. 1 = Yes)	Flag	0	1	1	1
Fd	Fans Stop After Dripping	Minutes	0	15	1	1
H0	Serial Address	-	0	15	0	0
P0	Maximum Number of Pressure Switches as Per P1	Flag	0	15	10	10
P1	Pressure Switch Time	Minutes	0	199	60	60
S2	Condenser Probe (0 = No. 1 = Yes)	Flag	0	1	0	0
HAL	Condenser Probe Set Point	C°	-50	90	55	55
AFD	Condenser Probe Differential	C°	-12	12	2	2
TAO	Condenser Alarm Delay Time	Minutes	0	250	0	0

PROBE RESISTANCE VALUES

The air and defrost probes have the following temperature resistance values (K ohms)

Temperature	Kohms		Temperature	Kohms
+50°C	4,161		0°C	27,280
+40°C	5,828		-10°	C42,450
+30°C	8,313		-20°	C67,740
+20°C	12,090		-30°	C111,300
+10°C	17,960		-40°	C188,400

FUSE RATINGS

FOSTER CODE	INTERNAL FUSE	VOLTAGE	WIRING DIAGRAM
SP1HC	16 A	230/1/50	81800LSB
SP2HC	20 A	230/1/50	81800LSB
SP3HC	20 A	230/1/50	81800LSB
SP4HC	10 A	400/3/50	81802LSB
SP5HC	16A	400/3/50	81802LSB
SP2LC	20A	230/1/50	81800LSB
SP3LC	16A	400/3/50	81802LSB
SP4LC	16A	400/3/50	81802LSB

CONTROLLER ALARMS AND FAULT FINDING

When an alarm condition occurs the unit will display an alarm code **ERR** (this will differ according to the nature of the alarm):

High Temperature Alarm.
In the event of a high temperature alarm, **HI** and the room temperature will be displayed alternately.
Possible cause:
To frequent door openings.
The product load in the room exceeds the room capacity.
The temperature of the product stored in the room is too high.
Refrigeration system malfunction.

Low Temperature Alarm.
In the event of a high temperature alarm, **LO** and the room temperature will be displayed alternately.
Possible cause:
Faulty PCB.

Room Temperature Probe Alarm.
In the event of a room temperature probe alarm, **E0** will be displayed.
Room temperature probe not connected correctly.
Faulty probe.

Evaporator Probe Alarm.
In the event of a room temperature probe alarm, **E1** will be displayed.
Evaporator probe not connected correctly.
Faulty probe.

High Pressure Alarm (HH)
Each time the pressure switch trips, the buzzer and red LED are activated. If more than ten trips occur during a 1-hour period then the unit will shut down automatically. The remote relay will be activated and the label **ERR** will flash on the display alternating with the room temperature. The alarm code EO is displayed in the Alarm Menu.
The cause can be:
- Dirty condenser
- Condenser fan not running
- Front cover not fitted
- Obstructed condenser air inlet
- Obstructed condenser air outlet
- Inadequate ventilation

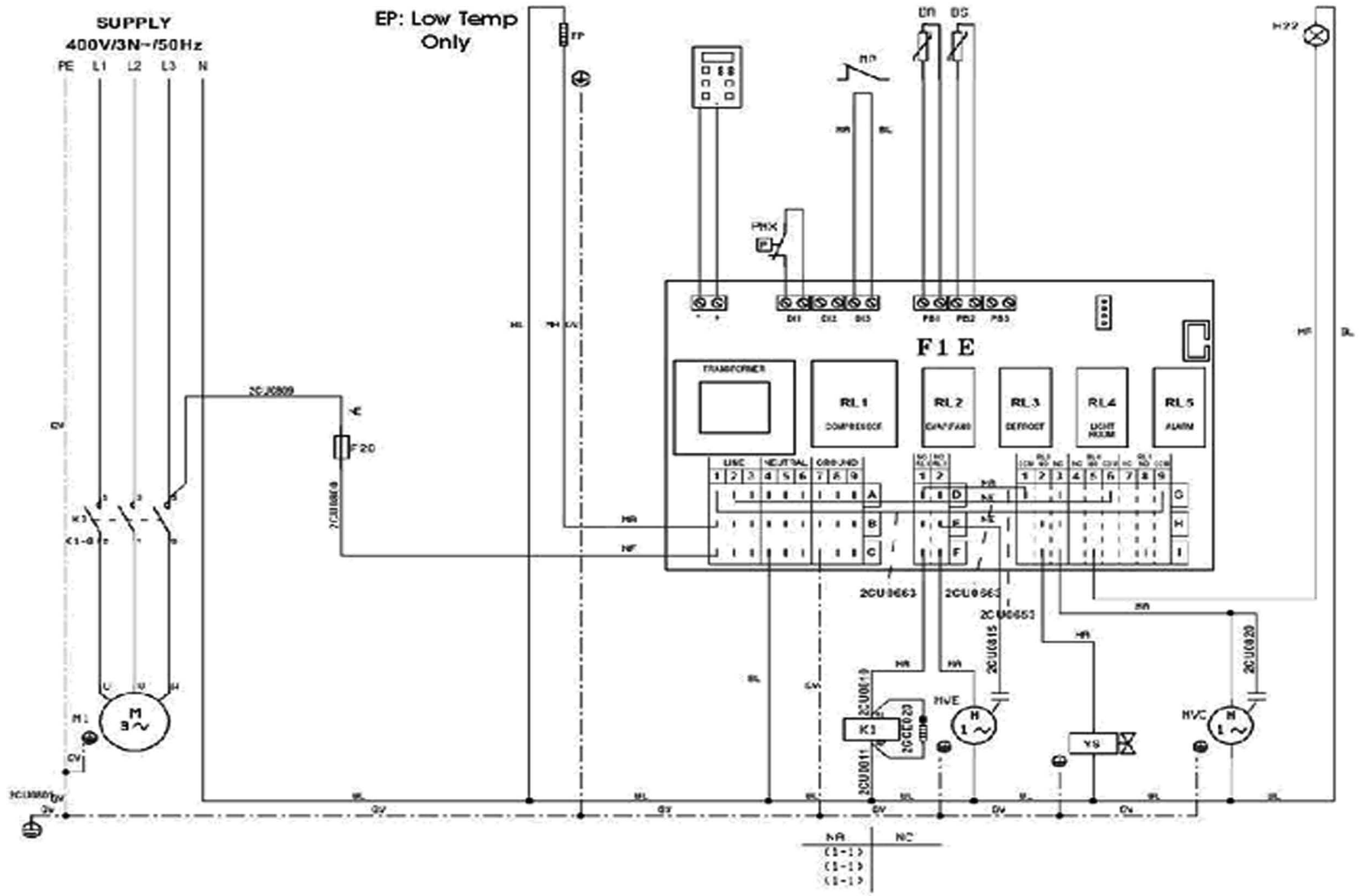
TROUBLE SHOOTING

1) Compressor stops. There is an internal over temperature device (Klixon) that stops the compressor each time the admissible temperature of the motor windings is exceeded.
Possible causes are:
- Insufficient ventilation to the compressor
- Mains voltage anomaly
- Faulty condenser fan

The device will re-set automatically when the windings cool down.

2) Formation of ice on evaporator coil impeding airflow.
Possible causes are:
- Excessive door openings
- Door left open for long periods
- Evaporator fan/s faulty
- Door switch faulty (if fitted)
- Faulty defrost heater (if fitted)
- Faulty hot gas solenoid valve (if fitted)
- Pre set defrost routine not sufficient to clear evaporator of ice build up.
- Decrease the time interval between defrosts.

3) Display does not illuminate.
- Is their power to the unit?
- Is the mains cable connected correctly?
- Have the fuses in the electrical panel blown?



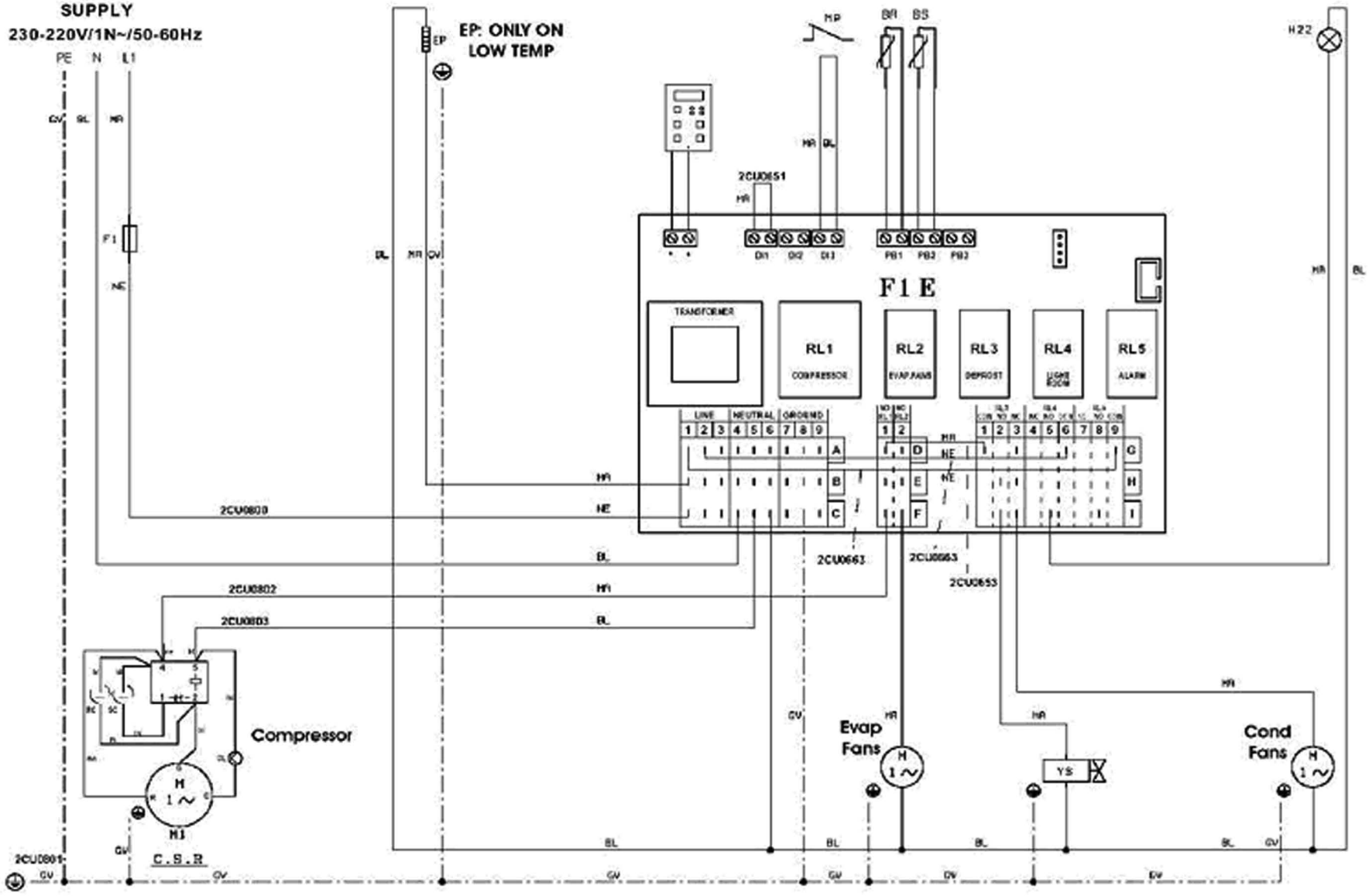
Colour Code
MA - BROWN
BL - BLUE
GV - GREEN/YELLOW
NE - BLACK

FOSTER REFRIGERATOR

FOSTER REFRIGERATOR - A Division of ITW Ltd.

Title
SP3LC
SP4LC
SP4HC
SP5HC

Drawing No.		Sheet No.
81802LSB		1 of 1
Drawn By	Approved	Date



Colour Code
MA - BROWN
BL - BLUE
GV - GREEN/YELLOW
NE - BLACK

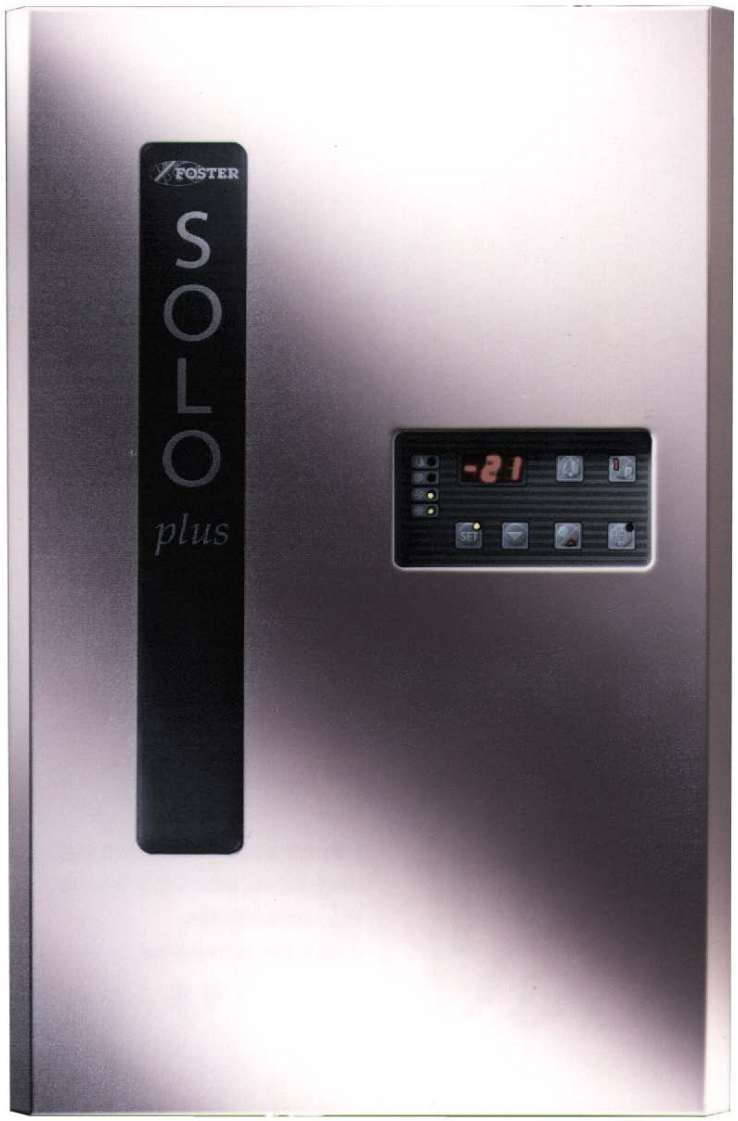
FOSTER REFRIGERATOR

FOSTER REFRIGERATOR - A Division of ITW Ltd.

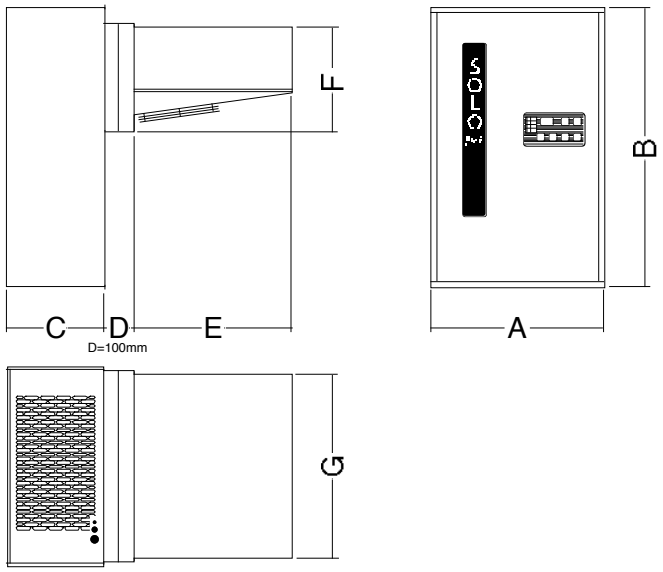
Title	
SP1C	SP3HC
SP1HC SPE	SP3HC SPE
SP2HC	
SP2LC	

Drawing No.		Sheet No.
81800LSB		1 of 1
Drawn By	Approved	Date

SOLO PLUS
Service Manual

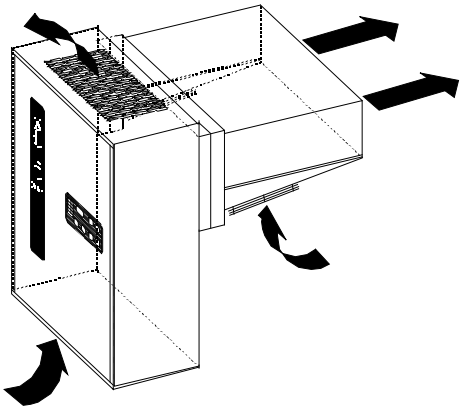


WALL MOUNTED UNITS

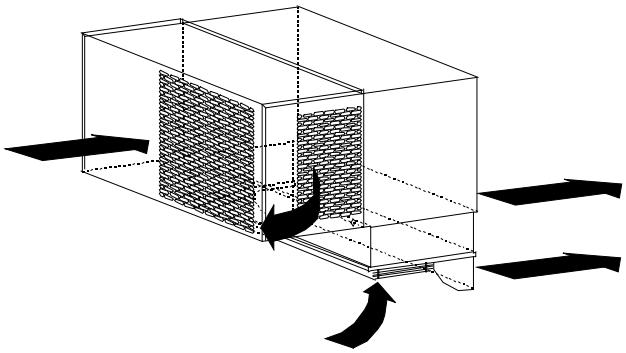


AIR FLOW DIRECTION

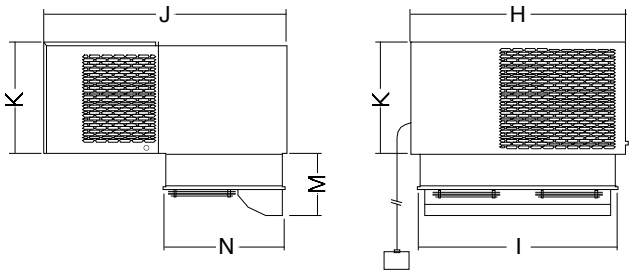
Wall mounted



Ceiling mounted



CEILING MOUNTED UNITS



DIMENSIONS

MODEL	CONDENSER UNIT A x B x C (mm) H x J x K (mm)	EVAPORATOR UNIT G x E x F (mm) I x M x N (mm)	PLUG SIZE W x H (mm)	CUT-OUT SIZE W X H (mm)
SP 1 H & LW	454 x 735 x 305	420 x 420 x 300	420 x 300	425 x 305
SP 2 H & LW	454 x 735 x 305	420 x 420 x 300	420 x 300	425 x 305
SP 3 H & LW	754 x 735 x 305	720 x 420 x 300	720 x 300	725 x 305
SP 4 HW	754 x 735 x 305	720 x 420 x 300	720 x 300	725 x 305
SP 4 LW	754 x 840 x 400	720 x 580 x 470	720 x 470	725 x 475
SP 5 H & LW	754 x 840 x 400	720 x 580 x 470	720 x 470	725 x 475
SP 1 HC	620 x 719 x 357	545 x 150 x 332	545 x 332	550 x 337
SP 2 H & LC	620 x 719 x 357	545 x 150 x 332	545 x 332	550 x 337
SP 3 H & LC	820 x 809 x 390	745 x 150 x 332	745 x 332	750 x 337
SP 4 HC	820 x 809 x 390	745 x 150 x 332	745 x 332	750 x 337
SP 4 LC	820 x 929 x 427	745 x 220 x 452	745 x 452	750 x 458
SP 5 HC	820 x 929 x 427	745 x 220 x 452	745 x 452	750 x 458

NOTE: W = wall mounted unit. C = ceiling mounted unit

SOLO PLUS REFRIGERATION SYSTEM

CONTENTS	PAGE

INTRODUCTION

Solo Plus is a range of packaged refrigeration systems comprising of 10 Wall Models and 8 Ceiling Models.

The systems are pre-charged with refrigerant and pre-wired ready for installation into a coldroom with only electrical connections to be made. No external drain is required.

Units will operate up to 43°C ambient conditions (ISO Climate Class 5). If installed outside neither the coldroom or the Solo is weatherproof, therefore suitable protection must be provided.

Table 1. Storage Conditions °C

Unit Type	Refrigerator		Meat	Freezer	
Temp	+10	+1/+4	0/-2	-18/21	-25
	Model	SP1HW	SP1HW	SP1HW	SP1LW
	SP2HW	SP2HW	SP2HW	SP2LW	SP2LW
	SP3HW	SP3HW	SP3HW	SP3LW	SP3LW
	SP4HW	SP4HW	SP4HW	SP4LW	SP4LW
	SP5HW	SP5HW	SP5HW	SP5LW	SP5LW
	SP1HC	SP1HC	SP1HC		
	SP2HC	SP2HC	SP2HC	SP2LC	SP2LC
	SP3HC	SP3HC	SP3HC	SP3LC	SP3LC
	SP4HC	SP4HC	SP4HC	SP4LC	SP4LC
	SP5HC	SP5HC	SP5HC		

NOTE!

Nomenclature “W” refers to Wall Model and “C” to Ceiling model.

As each model operates at different temperatures it will be necessary to set required operating Temperature. See Operating and Installation Manual.

SOLO PLUS TECHNICAL DATA

Foster Model No.	Refrigerant	Qty Gms	Nom. HP	HP Cut Out Press Bar	HP Cut In Press Bar	Suction Valve Press Bar	Noise Level dBa	Heat Rejected Max Watts @ 32°C	Room Vent. m^3/ h #	32°C Amb. Duty Watts	Room Cap. m^3	43°C Amb. Duty Watts	Room Cap. m^3	Air Throw m	Air Vol m^3/ h	Volts	Electrical Phase	Hz	Nominal Amps	Nominal Watts	Defrost Type	Condensate Vaporisation	Net Wt. Kg	Gross Wt. Kg
STORAGE TEMP +10°C																								
SP 1HW	R 404a	650	0.625				60	2300	700	1450	12	1325	10	3	600	230	1	50	4.4	700	Hot Gas	Auto	53	87
SP 2HW	R 404a	650	0.75				60	2675	700	1750	15	1600	13	3	600	230	1	50	5.3	800	HG	Auto	64	98
SP 3HW	R 404a	900	1				60	3750	1400	2600	25	2200	20	4	1200	230	1	50	7.5	1200	HG	Auto	77	116
SP 4HW	R 404a	900	1.2	28	23		60	4200	1400	2900	32	2650	27	4	1200	400	3	50	5.1	1600	HG	Auto	79	118
SP 5HW	R 404a	1350	2	28	23		61	7200	1500	5200	64	4600	56	7	2300	400	3	50	4.5	1900	HG	Auto	104	149
STORAGE TEMP +1/+4°C																								
SP1HW	R 404a	650	0.625				60	1950	700	1150	10	1050	8	3	600	230	1	50	4.4	700	HG	Auto	53	87
SP 2HW	R 404a	650	0.75				60	2200	700	1350	12	1250	9	3	600	230	1	50	5.3	800	HG	Auto	64	98
SP 3HW	R 404a	900	1				60	2850	1400	1900	21	1600	13	4	1200	230	1	50	7.5	1200	HG	Auto	77	116
SP 4HW	R 404a	900	1.2	28	23		60	3350	1400	2300	25	2050	16	4	1200	400	3	50	5.1	1600	HG	Auto	79	118
SP 5HW	R 404a	1350	2	28	23		61	5700	1500	4100	52	3600	28	7	2300	400	3	50	4.5	1900	HG	Auto	104	149
STORAGE TEMP 0/-2°C																								
SP 1HW	R 404a	650	0.625				60	1750	700	1050	8	925	6	3	600	230	1	50	4.4	700	HG	Auto	53	87
SP 2HW	R 404a	650	0.75				60	2000	700	1200	9	1100	7	3	600	230	1	50	5.3	800	HG	Auto	64	98
SP 3HW	R 404a	900	1				60	2650	1400	1700	15	1450	11	4	1200	230	1	50	7.5	1200	HG	Auto	77	116
SP 4HW	R 404a	900	1.2	28	23		60	3150	1400	2000	18	1700	14	4	1200	400	3	50	5.1	1600	HG	Auto	79	118
STORAGE TEMP -18/-21°C																								
SP 1LW	R 404a	580	1.5			3	61	1600	700	925	5	800	4	3	530	230	1	50	4.1	700	HG	Auto	61	95
SP 2LW	R 404a	530	1.7			3	61	2050	700	1200	8	1050	6	3	600	230	1	50	5.5	900	HG	Auto	64	98
SP 3LW	R 404a	800	2	28	23	3	61	2850	1400	1650	12	1450	9	4	1060	400	3	50	6.1	1000	HG	Auto	88	127
SP 4LW	R 404a	1300	2	28	23	3	62	4100	1400	2100	20	1600	13	7	2300	400	3	50	4.8	2100	HG	Auto	106	151
SP 5LW	R 404a	1300	3	28	23	3	62	5000	1500	2400	25	2200	20	7	2300	400	3	50	4	1700	HG	Auto	112	157
STORAGE TEMP -25 °C																								
SP 2LW	R 404a	530	1.7			3	61	1650	700	950	4	825	3	3	600	230	1	50	5.5	900	HG	Auto	64	98
SP 3LW	R 404a	800	2	28	23	3	61	3300	1400	1200	8	1000	5	4	1060	400	3	50	6.1	1000	HG	Auto	88	127
SP 4LW	R 404a	1300	2	28	23	3	61		1400	1550	11	1300	7	7	2300	400	3	50	4.8	2100	HG	Auto	106	151
SP 5LW	R 404a	1300	3	28	23	3	62	3600	1500	2000	17	1650	11	7	2300	400	3	50	4	1700	HG	Auto	112	157
STORAGE TEMP +10°C																								
SP 1HC	R 404a	570	0.625				59	2300	750	1550	10	1400	7	3	550	230	1	50	4.4	700	HG	Auto	59	90
SP 2HC	R 404a	500	0.75				60	2675	750	1750	12	1600	10	3	550	230	1	50	5.2	800	HG	Auto	59	90
SP 3HC	R 404a	620	1				60	3750	1400	2600	20	2200	16	3.5	1100	230	1	50	6.9	1100	HG	Auto	74	114
SP 4HC	R 404a	600	1.2	28	23		60	4200	1400	2900	28	2700	22	3.5	1100	400	3	50	4.4	1500	HG	Auto	75	115
SP 5HC	R 404a	1040	2	28	23		63	7200	1500	5200	56	4600	48	6	2300	400	3	50	5.1	2100	HG	Auto	93	139
STORAGE TEMP +1/+ 4°C																								
SP 1HC	R 404a	570	0.625				59	1950	750	1150	7	1050	5	3	550	230	1	50	4.4	700	HG	Auto	59	90
SP 2HC	R 404a	500	0.75				60	2200	750	1350	9	1250	6	3	550	230	1	50	5.2	800	HG	Auto	59	90
SP 3HC	R 404a	620	1				60	2850	1400	1900	17	1600	10	3.5	1100	230	1	50	6.9	1100	HG	Auto	74	114
SP 4HC	R 404a	600	1.2	28	23		60	3350	1400	2300	20	2050	12	3.5	1100	400	3	50	4.4	1500	HG	Auto	75	115
SP 5HC	R 404a	1040	2	28	23		63	5700	1500	4100	46	3600	28	6	2300	400	3	50	5.1	2100	HG	Auto	93	139
STORAGE TEMP 0/-2°C																								
SP 1HC	R 404a	570	0.625				59	1750	750	1050	6	925	4	3	550	230	1	50	4.4	700	HG	Auto	59	90
SP 2HC	R 404a	500	0.75				60	2000	750	1200	7	1100	5	3	550	230	1	50	5.2	800	HG	Auto	59	90
SP 3HC	R 404a	620	1				60	2650	1400	1700	12	1450	9	3.5	1100	230	1	50	6.9	1100	HG	Auto	74	114
SP 4HC	R 404a	600	1.2	28	23		60	3150	1400	2000	15	1700	12	3.5	1100	400	3	50	4.4	1500	HG	Auto	75	115
SP 5HC	R 404a	1040	2	28	23		63	5100	1500	3600	36	3200	26	6	2300	400	3	50	5.1	2100	HG	Auto	93	139
STORAGE TEMP -18/-21°C																								
SP 2LC	R 404a	420	1.7			3	60	2050	750	1200	6	1050	3	3	550	230	1	50	5.9	900	HG	Auto	68	99
SP 3LC	R 404a	800	2	28	23	3	61	2850	1400	1650	11	1400	7	3.5	1100	400	3	50	4.2	1400	HG	Auto	87	118
SP 4LC	R 404a	1000	3	28	23	3	63	5000	1400	2400	18	2200	13.5	6	2300	400	3	50	4.6	1800	HG	Auto	102	142
STORAGE TEMP -25°C																								
SP 2LC	R 404a	420	1.7			3	60	1650	750	950	3	825	2	3	550	230	1	50	5.9	900	HG	Auto	68	99
SP 3LC	R 404a	800	2	28	23	3	61	3300	1400	1200	6	1000	4	3.5	1100	400	3	50	4.2	1400	HG	Auto	87	118
SP 4LC	R 404a	1000	3	28	23	3	63	3600	1400	2000	10	1650	6	6	2300	400	3	50	4.6	1800	HG	Auto	102	142

NOTE: Noise levels taken in a room with a concrete floor, no sound attenuation and ceiling height of 7 metres with the unit base 1.5 metres from floor level, installed in a coldroom and the Sound Meter 3 metres distance.
Room Ventilation requirements if the Solo is installed in a confined area. Solo 10.wk4.mgr 23.2.98. Revised 1-8-1998.

ACCESS TO THE UNIT COMPARTMENT / EVAPORATOR HOUSING

WALL MODEL

Front Panel: Remove the 2 fixing screws located under the base of the front panel and “pull forward” releasing it from the 4 “spring clips” located in each corner.

Condenser Fan Assembly: After removing the front panel “pull upwards” the fan housing assembly releasing it from the 4 “spring clips” located in each corner.

Evaporator Assembly: Remove the 4 fixing screws from holding the drain pan in position and the side panel fixing screws. Take the panel allowing access into the evaporator fan assembly.

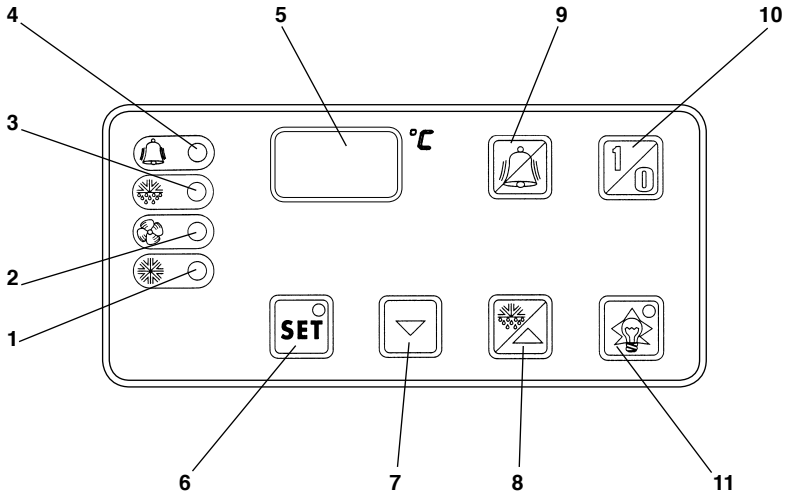
CEILING MODEL

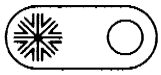
Unit Housing: Remove the 4 fixing screws from the front panel and “pull upwards” to release it from the 2 spring clips located at the top.

Evaporator Assembly: Remove the 4 fixing screws from the fan plate and lower allowing access to the evaporator fan motor and the evaporator assembly.

CONTROLLER OPERATION

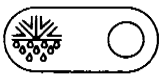
DESCRIPTION OF ELECTRONIC PANEL





1) COMPRESSOR LED (Green)
LIT: the compressor is running. The unit is cooling.
FLASHING: the compressor is in a delayed start mode
OFF: the compressor is OFF. The required room temperature has been reached.

2) EVAPORATOR FAN LED (Green)
LIT: evaporator fan is running.
FLASHING: the evaporator fan is in a delayed start mode
OFF: the evaporator fan is OFF. Unit in defrost mode.



3) DEFROST LED (Yellow)
LIT: automatic or manual defrost in progress.

4) ALARM LED (Red)
LIT: alarm mode: malfunctioning of a sensor, or intervention of pressure-stat or room temperature outside preset limits.
OFF: unit working normally.

5) DISPLAY
When the machine is not in operation, the label “OFF” and the cell temperature are intermittently displayed one after the other on the digital display. When the machine is in operation, during the normal working cycle, the display indicates the room temperature. Parameters being set will be displayed during programming. A “Fault Code” will be displayed during an alarm mode.

6) “SET” KEY - Permits entry of room temperature requirements.

7) “DOWN” KEY - Key to decrease data values.

8) “MAN.DEF./UP” KEY - Key to increase data values
Press for 8 seconds at least to initiate manual defrost as well.

9) KEY “T.A.A.” - Key to mute audible alarm
This alarm is not fitted as standard to the unit but can be added by the client. To connect use the free terminals 1 & 2 (volt free) on the internal electronic panel. Terminal 2 should have a live feed brought to it.

10) “ON/OFF” KEY - Main switch

11) “LAMP” KEY - Push to turn room lamp ON/OFF. A red LED lights when lamp is ON.

ROOM TEMPERATURE SETTING
With the unit in normal operating mode, the only active keys are “ON/OFF” (10) and “LAMP” (11). The latter is always operative except when in programming mode.

Room temperature programming:

- Press key (10) to turn ON unit. The actual room temperature will be shown on the display (5). In this condition the unit is ready for programming. It is necessary therefore to set the required room temperature bearing in mind the limits of the range which the unit is able to operate.

	Minimum Temp	Maximum Temp	Recommended Temp
“H” Range	- 5 °C	+ 10 °C	
General Purpose			+ 3°C
Chilled			+ 1°C
Fresh Meat			- 2°C
“L” Range	-25 °C	- 15 °C	- 21°C

- Press the SET key (6) (the yellow LED will light). The last set temperature will be displayed on the display screen (5)
  which shows the set value.
- Press the SET key (6), the yellowLED will light for one second and the display (5) will start flashing a few seconds later, indicating the set temperature. If you wish to change the setting, use the following keys:

(8) to raise set temperature
(7) to lower set temperature

Once the required setting is displayed, **press the SET key (6) to confirm.**

The unit is now fully operational and no other programming is required. The refrigerating cycle is fully automatic according to factory-set parameters, that can eventually be modified by authorised personnel only.

INSTRUCTIONS FOR PARAMETER MODIFICATION

1. HOW TO SET THE PARAMETERS:

1A. Keep the keys  and 

pressed together for more than 5 seconds.

1B. "00" will be displayed.

1C. Press the key  to display 22 (password)

1D. Confirm with 

1E. The first parameter to be changed will be displayed.

To modify parameters see next section "Parameters modification".

2. PARAMETER MODIFICATION:

To modify a parameter please follow the instruction given here under:

2A. Press   to display the parameter of which you want modify the value (see user parameters).

2B. Press the key 

to display the value connected to the parameter.

2C. Modify the value pressing  and  until you reach the required one.

2D. Press the key 

to confirm temporarily the new value and return to the display of the parameter code.

2E. Repeat every operation code from point **2A** in order to modify the other parameters' values.

3. MEMORISATION OF NEW VALUES:

To modify a parameter please follow the instruction given here under:

3A. Press the key  to memorise all the new values and exit the parameter modification proceedure.

TO EXIT WITHOUT MODIFYING PARAMETERS: do not press any key for at least 60 seconds. (exit for TIME OUT).

ATTENTION:

If you do not press the key  after the parameter changes, all modifications selected will be lost.

PARAMETERS DESCRIPTION

TEMPERATURE PROBE SETTING

C: CALIBRATION
It allows to add an offset to the measured value. It is active only with the air probe, while the evaporator probe cannot be calibrated.

2: DIGITAL FILTER
It allows to define the coefficient used in the digital filter of the measured value. High values for this parameter allow to reduce the noise present in the input lines (but the measure operation is slower). The suggested value is 4.

3: INPUT LIMITATION
It allows to define the maximum range of the measure in a machine cycle. Low values of the parameter allow to threshold the maximum variation of the measure, removing impulsive noise or spikes. The suggested value is 8.

4: VIRTUAL PROBE
The value used for regulation is an average of the value measured by the temperature probe and of the value measured by the defrost probe.

5: CELSIUS / FAHRENHEIT
It allows to choose the operating temperature scale.

6: DECIMAL POINT
It allows to enable the decimal point in the range -9.9 to 19.9. (0=No, 1=YES).

rd: REGULATION DELTA
It defines the temperature differential used in the temperature set-point.

r1: MINIMUM SET ALLOWED
Defines the lower value when tuning the set-point of the device.

r2: MAXIMUM SET ALLOWED
Defines the upper value when tuning the set-point of the device.

r3: DIRECT/REVERSE
Enables or disables the Ed alarm display (defrost stopped for time-out). The alarm is handled anyway to allow the supervisor to defect it.

r4: CURTAIN SET-POINT DELTA
It defines the variation of the set-point when operating with the curtain closed.

r5: MAXIMUM AND MINIMUM ENABLE
It enables or disables the display of the air probe maximum value rH and of the minimum value rL measured in the tr time.

rt: MONITORING INTERVAL
It defines, in hours, the temperature monitoring time interval during which the parameters rH and rL are updated. During the rt parameter display, pressing the down key it is possible to force a timer reset, setting automatically rH = rL = Temperature.
rH e rL parameters reset occurs also when rt timer reaches its maximum value.

rH: MAXIMUM TEMPERATURE MEASURED DURING RT
Shows the maximum temperature measured by the air probe during the time interval rt.

rL: MINIMUM TEMPERATURE MEASURED DURING rt.

Shows the minimum temperature measured by the air probe during the time interval rt.

C0: DELAY AFTER RESET

It delays the compressor and fan activation after the power on of the device, so to dispose the power consumption. It also protects the compressor against repeated activations in case of power loss.
During the delay after reset the compressor LED blinks if the compressor should be activated. During this interval the fan LED also blinks.

c1: MINIMUM TIME BETWEEN TWO COMPRESSORS POWER-ONs

It defines the minimum time pass between two compressor activations (it also defines the number of activations per hour).
The start delay after reset is defined by the previous parameter.

c2: OFF MINIMUM TIME

It defines the time during which the compressor must be OFF after its deactivation.

c3: ON MINIMUM TIME

It defines the minimum time the compressor must be ON after its activation.

c4: SECURITY RELAY

If the air probe fault alarm becomes active, the ON time of the compressor is put to zero and the compressor stays active for the time c4. The OFF time of the compressor is fixed to 15 minutes (the compressor LED blinks). Fan act following the related parameters.
If the machine is in a defrost or in continuous cycle when an alarm for the air probe arises, the devise irreversibly exits the procedures.
If the probe alarm stops, the device comes back to the standard operation mode (not the operation mode it was in before the alarm). If the compressor is OFF, a minimum OFF time is inserted; if it is ON, a minimum On time is inserted.
If c4 = 0 the compressor is always OFF, if c4 = 100 the compressor is always ON.

DEFROST SETTINGS

d0: DEFROST TYPE

It defines the defrost type (0=electric, 1=hot gas, 2=electric with time-out, 3=hot gas with time-out)
If a time-based defrost is selected, the value measured by the defrost probe is ignored during defrost. Ed alarm is never activated.
If the defrost probe results faulty, the E1 error is not displayed (it is then possible not to connect the probe).

d1: DEFROST INTERVAL

Defrost is executed when this parameter time-outs. If the time is 0, defrost is never executed (exception is a manual defrost or a defrost driven by digital input).
During defrost, the temperature alarms are disabled.

dt: DEFROST-END SET-POINT

In the devices where the defrost-end temperature probe is installed, this parameter defines the defrost-end evaporator temperature. This operation mode is active if the time-based defrost is not selected.
If the evaporator temperature is greater than the defrost-end set point when a defrost should be started, the defrost is not initiated.
In any case the defrost is stopped when the dP time finishes. This event is shown displaying the Ed message (defrost stopped for time-out), if Ed message is not disabled.

dP: DEFROST TIME

It defines the maximum duration of defrost.
In the devices where the defrost-end probe is present, or in the case where the time-based defrost is not selected, this parameter represents the defrost time.

d4: AFTER-RESET DEFROST

It allows to activate a defrost cycle when the device is turned on.
The selection of the after-reset defrost option has priority over the compressor regulation and over the continuous cycle activation.

d5: DEFROST DELAY AFTER RESET OR EXTERNAL TRIGGER
It defines the time interval between the reset and the beginning of a defrost.
In case a digital trigger is used to start defrost, it defines the delay between the activation of defrost and its effective start.

d6: DISPLAY LOCK DURING DEFROST
It allows to lock the display to the last value measured before defrost start.
The display comes back to normal operation when the temperature reaches for the first time its set-point or when the d8 alarm exclusion time finishes.
If the display is not locked, during defrost the device displays the message dF.

dd: DRIPPING TIME
Compressor and fan are OFF for this time after a defrost cycle finishes.
If dd is not zero, the defrost stops when the device has turned the compressor OFF (in case of a hot gas defrost) and the reverse cycle relay is turned OFF. If dd=0 the dripping phase is not initiated: after defrost only the reverse cycle relay is deactivated.

d8: ALARMS EXCLUSION TIME AFTER DEFROST AND DOOR OPEN
After defrost the temperature alarm is inhibited for the time defined by this parameter. This allows the temperature to exit the alarm range during and after defrost.
It also defines the time to inhibit the temperature alarm after door is closed if the door switch is active.

d9: FORCE DEFROST START
It allows to ignore the protection times for the compressor (minimum ON, minimum OFF, interval between two ONs) when the defrost is started.

d : DEFROST PROBE MEASURE
↵ It enables the display of the value measured by the defrost probe when this is connected.

dC: TIME BASE
It allows to modify the time base used for the defrost interval (dI) and the defrost duration (dP).
0=dI in hours, dP in minutes
1=dI in minutes, dP in seconds.

ALARMS

A0: ALARM AND FAN DELTA
It represents the temperature hystheresys of the “regulator” of alarm and of the fan regulator.

AL: MINIMUM RELATIVE SET
The low temperature alarm is activated when the temperature has values less than the minimum set relatively to the set point.
If the parameter is 0 the minimum alarm is inhibited.

AH: MAXIMUM RELATIVE SET
The high temperature alarm is activated when the temperature has values greater than the maximum set relatively to the set point.
If the parameter is 0 the maximum alarm is inhibited.

Ad: TEMPERATURE ALARM DELAY
The alarm of high and low temperatures is acknowledged with an Ad delay from the moment the cause starts. This delay is active also at the reset of the device.

After defrost, door open/closed, continuous cycle, the temperature alarm is immediately acknowledged after the delay set by the defrost and the continuous cycle.

A4: DIGITAL INPUT 1
It defines the function of the digital input 1

A5: NUMBER 2 DIGITAL INPUT CONFIGURATION
Establishes the meaning of the number 2 digital input, where present.

A6: COMPRESSOR FAILURE DUE TO AN EXTERNAL ALARM
If an external alarm is active, the compressor remains active for a period of time equal to A6. The compressor's off-time is a fixed 15 minute period (the compressor's arrow flashes intermittently).
Fans are programmed according to the relative parameters.
When A6=0, the compressor is always OFF, when A6=100 the compressor is always ON.

A7: DELAY TIME FOR ENTRY IN A4 OR A5
This establishes the delay between the activation of the alarm signal in a digital input and the activation of the measures envisaged in case an alarm with delaying device is selected.
The first time the alarm occurs, delay A7 is activated. At the end of the timed period, if the alarm is still active, this is indicated. Otherwise, the machine starts again from where it left off.

FANS

F0: FAN MANAGEMENT
0=fans always ON except for parameters F2, F3, Fd.
1=fans controlled by a specific fan regulator and by parameter Fd (post dripping stop).
2=fans controlled by the overall fan regulator (and by a parameter Fd).

The fans are always OFF during the dripping phase.

F1: FAN SWITCH OFF TEMPERATURE
Select the appropriate fan regulator F0=1
The fans will switch off when the temperature detected by the defrosting sensor exceeds the preset temperature minus the value F1.

If the device detects an error in at least one of the two probes the fans regulator is disabled and the machine behaves as if F0=0.

If the absolute fans regulator is selected, then F0=2.
Fans are turned on only when the evaporator temperature is less than Set Point + F1.
A0 is the differential used in this fans regulation.

If the device detects an error in the defrost probe, fans behave as if F0=0.

F2: OFF WHEN COMPRESSOR STOPPED
It is possible to force fans OFF when the compressor is stopped.

F3: FANS DURING DEFROST
The parameter is independent from the others; it defines the status of fans during defrost.

F3=1 OFF in defrost.
F3=0 ON in defrost.

Fd: STOP AFTER DRIPPING
After the dripping time it is possible to stop fans for some time.

OTHER SETTINGS

H0: SERIAL ADDRESS
It defines the device network address for serial link.

H1: LIGHT/ALARM RELAY
It allows to define the function of the fourth relay : LIGHT, normally off ALARM or normally on ALARM.

P0: PRESSURESTAT
It is the maximum number of pressure alarms; when reached the machine gets the blocked status. If the number of alarms is less than the one defined by this parameter, an autoresettable block situation is generated anyway.

P1: PRESSURESTAT TIMER
When the first pressure alarm is detected, a timer is loaded with the value (in seconds) defined by this parameter. At the timeout, the alarm counter is automatically reset.

EA, EB, EE: ERROR IN DATA COLLECTION, CONTROL RESET

To restore correct operation, reset the default parameters:

- disconnect the machine from the mains supply;
- hold down key  and connect to mains;
- the message “-C-” will appear on the digital display;
- in a few seconds, the equipment is in RESET mode and allows parameters to be modified (*);
- should the EE error persist, press  until the error message disappears.

(*) The resetting of the default values cancels any alterations made to the parameters.

FLASHING ED: DEFROSTING TIMED OUT

- Check parameters dt, dP and d4;
- check the efficiency of the defrosting programme;
- if necessary, exclude the Ed alarm by using parameter r3.

FLASHING DF: DEFROSTING IN OPERATION

This is not an alarm signal, but an indication that the machine is defrosting. It appears when parameter d6=0.

USER PARAMETERS

LABEL	UNIT OF MEASURE	MANUFACTURER STANDARDS			
		OPERATING RANGE		HOT GAS DEFROST	
		Min	Max	Range H	Range L
┌ C	°C/F°	-20	20	0	0
┌ 2	-	1	15	4	4
┌ 3	-	1	15	8	8
┌ 4	-	0	100	0	0
┌ 5	flag	0	1	0	0
┌ 6	flag	0	1	0	0
rd	°C/F°	0,1	19,9	2	2
r1	°C/F°	-40	r2	-5	-25
r2	°C/F°	r1	199	10	-15
r3	flag	0	1	0	0
r4	°C/F°	0	20	0	0
r5	flag	0	1	0	0
rt	ore	0	199	-	-
rH	°C/F°	-50	90	-	-
rL	°C/F°	-50	90	-	-
c0	min	0	15	0	0
c1	min	0	15	3	3
c2	min	0	15	2	2
c3	min	0	15	0	0
c4	min	0	100	8	8
d0	flag	0	1	1	1
d1	ore	0	199	4	4
dt	°C/F°	-40	199	15	15
dP	min	1	199	20	20
d4	flag	0	1	0	0
d5	min	0	199	0	0
d6	flag	0	1	0	0
dd	min	0	15	2	2
d8	ore	0	15	1	1
d9	flag	0	1	0	0
d ┌	°C/F°	-	-	-	-
dC	flag	0	1	0	0
A0	°C/F°	0,1	20	2	2
AL	°C/F°	0	199	5	5
AH	°C/F°	0	199	5	5
Ad	min	0	199	199	199
A4	-	0	7	5	5
A5	-	0	7	0	0
A6	min	0	100	0	0
A7	min	0	199	0	0
F0	flag	0	1	0	0
F1	°C/F°	0	20	20	20
F2	flag	0	1	0	0
F3	flag	0	1	1	1
Fd	min	0	15	1	1
H0	-	0	15	0	0
H1	flag	0	1	0	0
P0	flag	0	15	10	10
P1	min	0	199	60	60
			CODE	T1	T2

INPUTS

Air Temperature Probe - Senses coldroom internal temperature. Negative temperature/resistance coefficient thermistor probe.

Evaporator Temperature Probe - Senses temperature at the suction line outlet from the evaporator, required to terminate defrosting. Negative temperature/resistance coefficient thermistor probe.

OUTPUTS

Compressor - Relay output switching single phase mains supply to the compressor direct or via a contactor for three phase models.

Evaporator Fans - Relay output switching single phase mains supply to the evaporator fans.

Condenser Fans - Relay output switching single phase mains supply to the condenser fans.

Defrost - Relay output switching single phase mains supply to the hot gas solenoid valve.

Internal Light - Relay output switching single phase mains supply to the internal light (if fitted).

Door Frame Heater - Direct single phase mains supply to the door frame heater (if fitted).

External Alarm - Relay output switching single phase mains supply to an external alarm (if fitted).

CONTROLLER BOARD ELECTRICAL CONNECTIONS

Terminal Numbers	Output
+/-	Connection to keypad
2	External alarm (if fitted)
3	Mains in (3 phase models only)
19 / 20	Door switch (if fitted)
17 / 18	High pressure switch (SP 4H, 5H, 3L, 4L, 5L only)
13 / 14	Air probe
11 / 12	Defrost probe
45	Hot gas defrost valve
55	Condenser fan
21	Compressor or contractor coil (3 phase only)
22	Mains in (single phase)
44	Internal light (if fitted)
40	Door frame heater (if fitted)
50	Evaporator fan motor
70	Neutrals
60	Earth

RESISTANCE VALUES

The air and defrost probes have the following temperature resistance values (K ohms).

+50°C	4161	+10°C	17,960	–20°C	67,740
+30°C	8015	0°C	27,280	–30°C	111,300
+20°C	12,090	–10°C	42,450	–50°C	329,200

ELECTRICAL CONNECTIONS

1. Check that the mains supply to the SOLO corresponds to the rating stamped on the serial no.plate.Tolerance: +/- 10% of the nominal value.

2. Connection should always be made from a fused isolator or a switch-disconnector with fuses. We advise also the use of a circuit breaker fitted in the line.

3. If a door operated microswitch is fitted to the coldroom connect the door switch to the door switch cable which exits at
the top of the condensing unit. When the door is opened the coldroom light (if fitted, see below) will switch on and the
evaporator fans the compressor will stop.
If a door microswitch is not fitted leave the door switch wire connected together and secure the cable inside the condensing unit housing.
Note: Microswitch operation is closed when the door is closed. No microswitch is supplied with the unit.

4. The light output may be switched on/off using the key light on the controller facia. If the controller is to be used to switch on/off the coldroom light, the supply should be taken from the light cable which exits from the top of the evaporator housing. If an independent light switch is used the light cable from the evaporator housing should not be used. This cable must be insulated and secured inside the evaporator housing.

5. Range “L” units (Low Temperature) are also fitted with a cable for door heater connection. It exits from the top of the
condensing unit. If the door frame heater is rated at 24V, a transformer must be connected to step down the supply voltage.
It is recommended that an appropriate fuse according to the door heater is used. If the door frame heater cable is not used it must be insulated and secured inside the condensing unit housing.

6. Proceed with connection noting the colours of the wires in the mains supply cable provided as follows:

A)	Single-phase supply 230V/1~/50 Hz	3 wires	Blue	=	Neutral
			Green/Yellow	=	Earth
			Brown	=	Phase
B)	Three-phase supply 230V/3~/50 Hz	4 wires	Blue	=	Phase
			Green/Yellow	=	Earth
			Brown	=	Phase
			Black	=	Phase
A)	Single-phase supply 400V/3~/50 Hz	5 wires	Blue	=	Neutral
			Green/Yellow	=	Earth
			Brown	=	Phase
			Black	=	Phase
			Black	=	Phase

N.B: Do not connect light switch cable, door heater or room indicator lamp to 230 V mains supply line. Plates on each cable show the relevant connection to be made.

LIST OF FUSES

SOLO		POWER CURRENT FUSE Type DIAZED		INTERNAL FUSES						CARD FUSE		
				Power fuse			Auxiliary fuse					
MOD.	Voltage	n°	Amp	n°	Dim	Amp	n°	Dim	Amp	n°	Dim	Amp
SP1 HC	230V/1~/50	1	16	1	9x36	16						
SP2 HC	230V/1~/50	1	20	1	9x36	16						
SP3 HC	230V/1~/50	1	20							1	5x20 F	6
SP4 HC	400V/3~/50	3	10							1	5x20 F	6
SP5 HC	400V/3~/50	3	16							1	5x20 F	6
SP2 LC	230V/1~/50	1	20							1	5x20 F	6
SP3 LC	400V/3~/50	3	16							1	5x20 F	6
SP4 LC	400V/3~/50	3	16							1	5x20 F	6

POWER CURRENT FUSE: This is a fuse fitted in the line.
INTERNAL FUSES: We mean those fuses fitted in the control panel. Above list shows quantity, types and power.
N.B: All units are provided with a room light holder and a **60W.** bulb. When replacing, use bulbs having a power not higher than **100 Watt.**

SOLO		POWER CURRENT FUSE Type DIAZED		INTERNAL FUSES						CARD FUSE		
				Power fuse			Auxiliary fuse					
MOD.	Voltage	n°	Amp	n°	Dim	Amp	n°	Dim	Amp	n°	Dim	Amp
SP1 HW	230V/1~/50	1	16	1	9x36	16				1	5x20 F	6
SP2 HW	230V/1~/50	1	20	1	9x36	16				1	5x20 F	6
SP3 HW	230V/1~/50	1	25							1	5x20 F	6
SP4 HW	400V/3~/50	3	16							1	5x20 F	6
SP5 HW	400V/3~/50	3	20							1	5x20 F	6
SP1 LW	230V/1~/50	1	16							1	5x20 F	6
SP2 LW	230V/1~/50	1	20							1	5x20 F	6
SP3 LW	400V/3~/50	3	16							1	5x20 F	6
SP4 LW	400V/3~/50	3	20							1	5x20 F	6
SP5 LW	400V/3~/50	3	20							1	5x20 F	6

POWER CURRENT FUSE: This is a fuse fitted in the line.
INTERNAL FUSES: We mean those fuses fitted in the control panel. Above list shows quantity, types and power.
N.B: All units are provided with a room light holder and a **60W.** bulb. When replacing, use bulbs having a power not higher than **100 Watt.**

CONTROLLER ALARMS AND FAULT FINDING

When a fault is detected, the red Led in key (4) will be lit and a fault code displayed on the screen (5). This code enables a speedy identification of the problem and should be reported when making the service call. (The audible alarm will also sound if fitted)

HIGH TEMPERATURE ALARM
The label (HI) and the room temperature are intermittently displayed one after the other.

Alarm relay activated -
Causes: • The door has been opened to frequently.
• The product load in the room exceeds room capacity.
• The temperature of the products stored in the room is too high.
• Refrigeration system malfunction.

ROOM TEMPERATURE SENSOR ALARM
The label (EO) appears on the digital display.

Alarm relay activated -
Causes: • The sensor is not connected/faulty.
Solution: • Replace sensor.

LOW TEMPERATURE ALARM
The label (LO) and the room temperature are intermittently displayed one after the other.

Alarm relay activated -
Causes: • Electronic control unit malfunction.
Solution: • Call technical assistance service.

EVAPORATOR SENSOR ALARM
The label (E1) and the room temperature are intermittently displayed one after the other.

Alarm relay activated -
Causes: • The sensor is not connected/faulty.
Solution: • Replace sensor.

HIGH PRESSURE ALARM (SP-5H, SP- 4L, SP-L5 only)
The label (HH) and the room temperature are intermittently displayed one after the other; led (4) lights up each time the high pressure switch is tripped. If the high pressure switch is tripped more than 10 times in a one-hour period, the label (PP) and the room temperature are intermittently displayed one after the other on display (5), while the alarm relay will be activated with led (4).

Causes: • Ensure that the condenser fan is working properly.
• Ensure that the condenser is clean.

EVAPORATOR FANS NOT WORKING

• If the evaporator fans are not working and the green LED is illinated check connections on the main control board.
• If a door switch is fitted check connections and operation.

COMPRESSOR NOT WORKING

- If compressor LED is illuminated check output on the main control board.
- Check power going to compressor wiring.

EVAPORATOR ICED UP

- Enquire as to when last manual defrost was initiated.
- Check defrost cycle by initiating manual defrost via front facia operation (see Controller Operation).
- Check output on main control board.
- Check that the hot gas solenoid valve is operating.
- Check termination time and temperature settings in Controller Parameters.
- Check coldroom door seal.

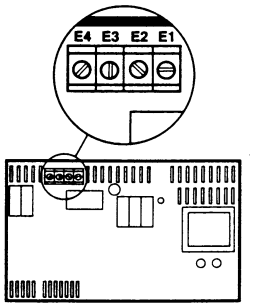
CONTROLLER EMERGENCY REPAIR

In case of fault or malfunctioning of the electronic control panel, if a short-term replacing is not possible, an **EMERGENCY SYSTEM"** can be used to keep the unit running until a new control panel may be installed.

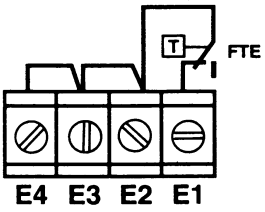
The **"EMERGENCY SYSYEM"** consists of a terminal board sited on the control panel, fitted with 4 terminals, as shown in **picture 9.**

Proceed as follows to use the system:

1. Switch the electronic control panel off by pressing the ON/OFF (10).
   N.B.: The electronic control panel should remain in this condition during the whole emergency period.
2. Switch the unit OFF.
3. Connect a thermostat (6 inductive Amps.) to the terminals **E1** and **E2 (Pict. 10).**
4. Bridge terminals **E2** and **E3** as well as terminals **E3** and **E4 (Pict. 10).**
5. Install the thermostat bulb inside room.
6. Adjust the 'stat at the required temperature and switch the unit on.
7. When the set temperature is reached, compressor, evaporator and condenser fans will stop.
8. During emergency period, defrost-cycle is not operating; it is therefore advisable to reduce door openings to a minimum.
9. When installing a new control panel, **remove all connections stated in items 3 and 4, before switching the unit on.**



Pict.9

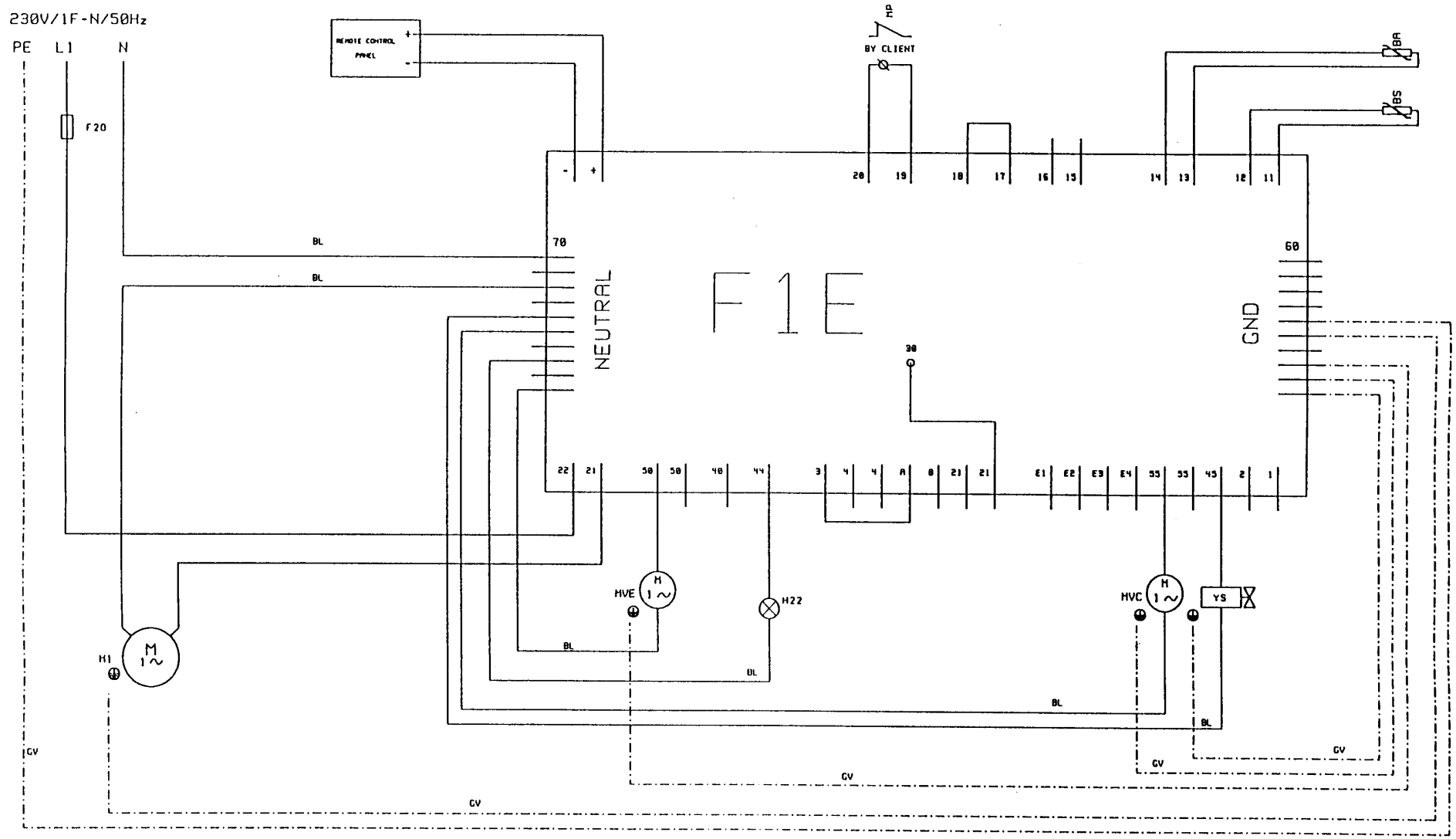


Pict.10

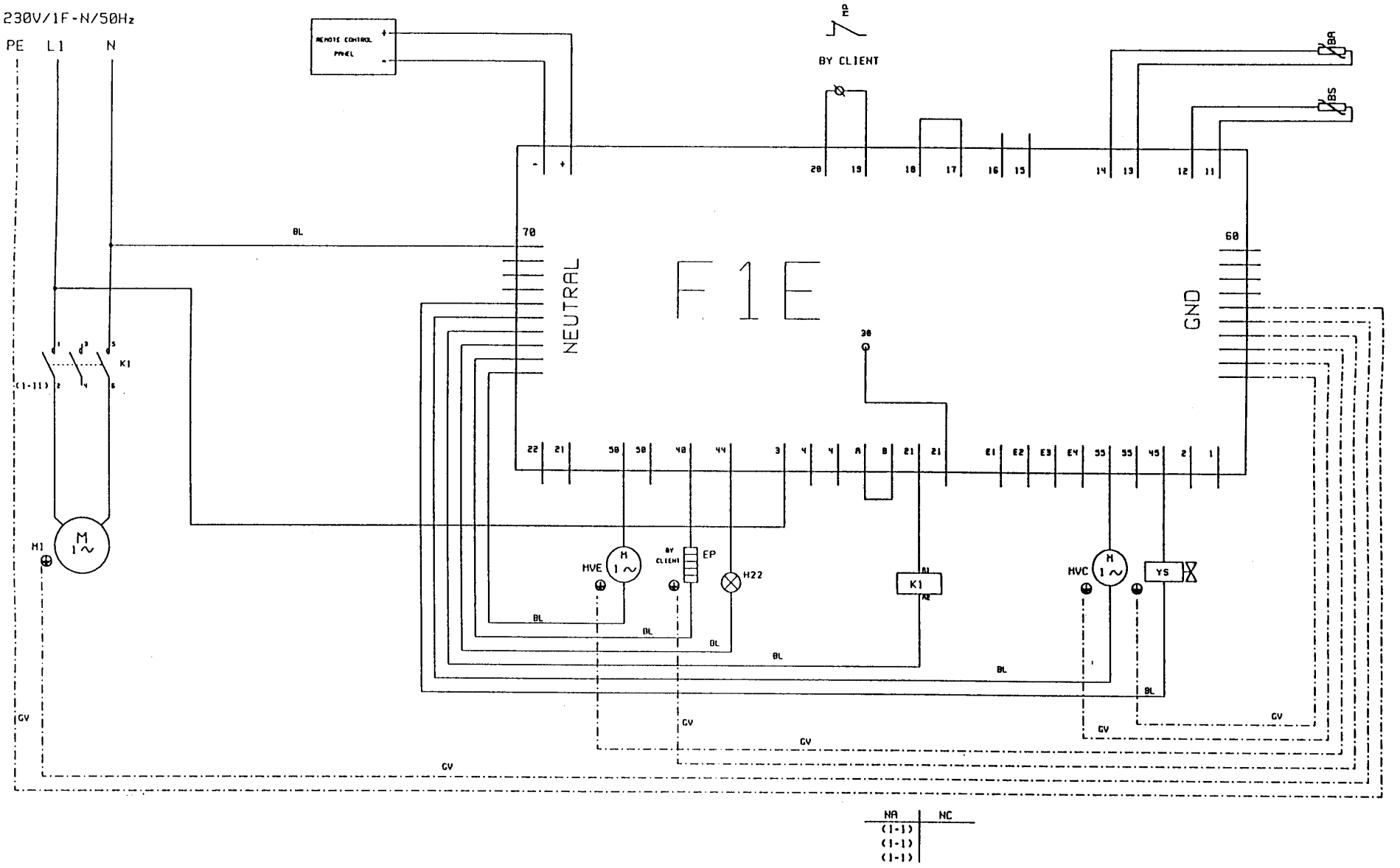
ROUTINE MAINTENANCE

In order to maintain the unit in its optimum operating condition, it is necessary to clean periodically. (The frequency depends on the site conditions where the unit is installed).
This operation should be done with the unit switched OFF and preferably with compressed air blowing from the inside through the condenser. If this is not available, then use a long-haired brush on the outside of the unit. In case of water-cooled units, it is recommended that the cleaning is carried out by a plumber using suitable descaling agents.

All installation, maintenance or repair interventions must be carried out exclusively by authorised personnel.
All repair's and maintenance to be carried out with the unit switched "OFF".
Switch the unit "OFF" through the fused isolator.
Refrigerants must not be disposed of in the environment. No retrofit is allowed unless expressly authorised by the manufacturer.



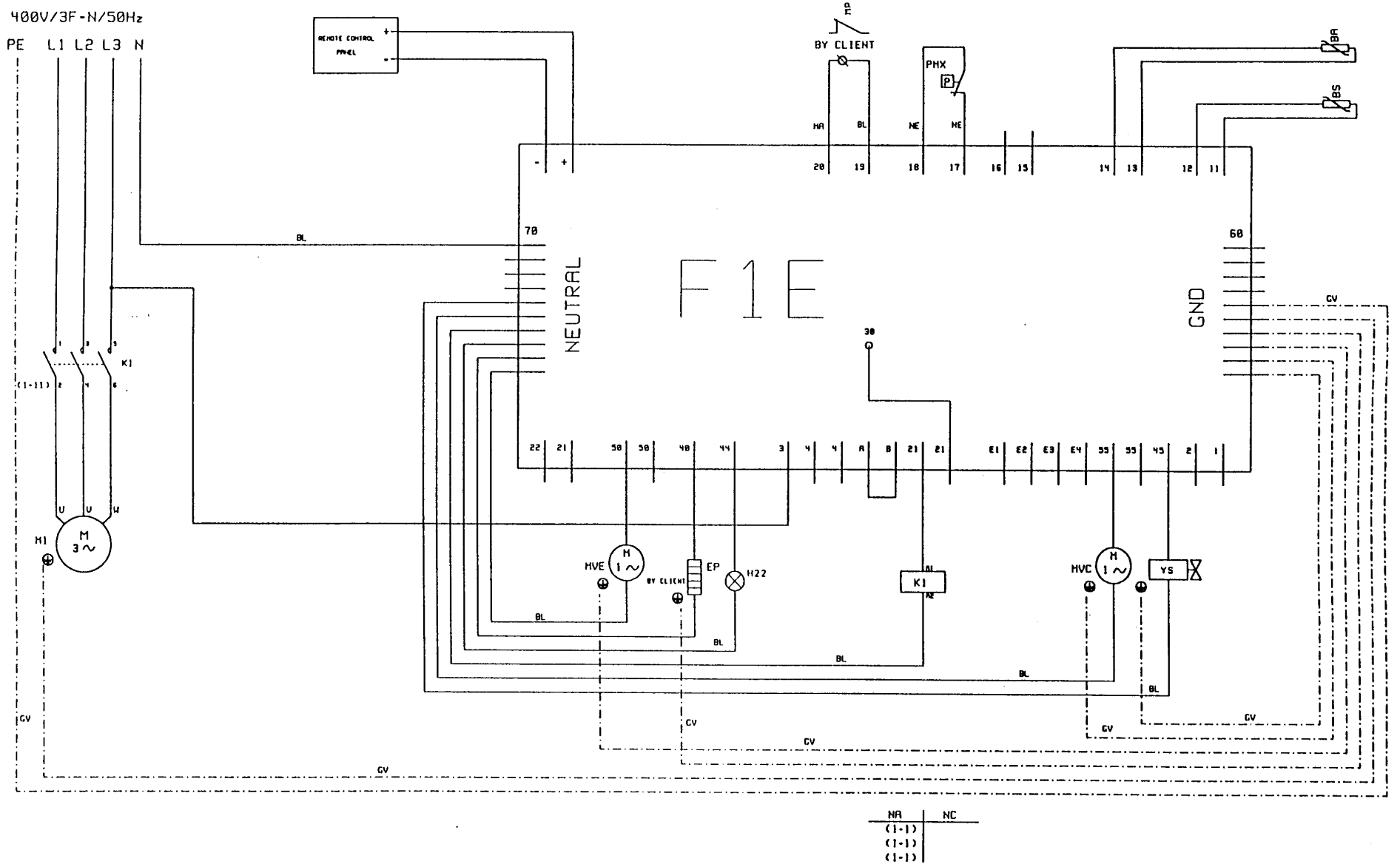
MODEL							
SP 1HC SP 2HC	HVC HVE M1 YS	Condenser Fan Motor Evaporator Fan Motor Compressor Hot Gas Solenoid Valve	H22 MP BS BA	Internal Light Door Switch (if fitted) Defrost Probe Air Probe	Rev No.		Drawing No. 81800L	Sheet No. 1 of 1
					Date:	Approved	Drawn By Sonchl / Approved Martinelli	Date 04-12-1997



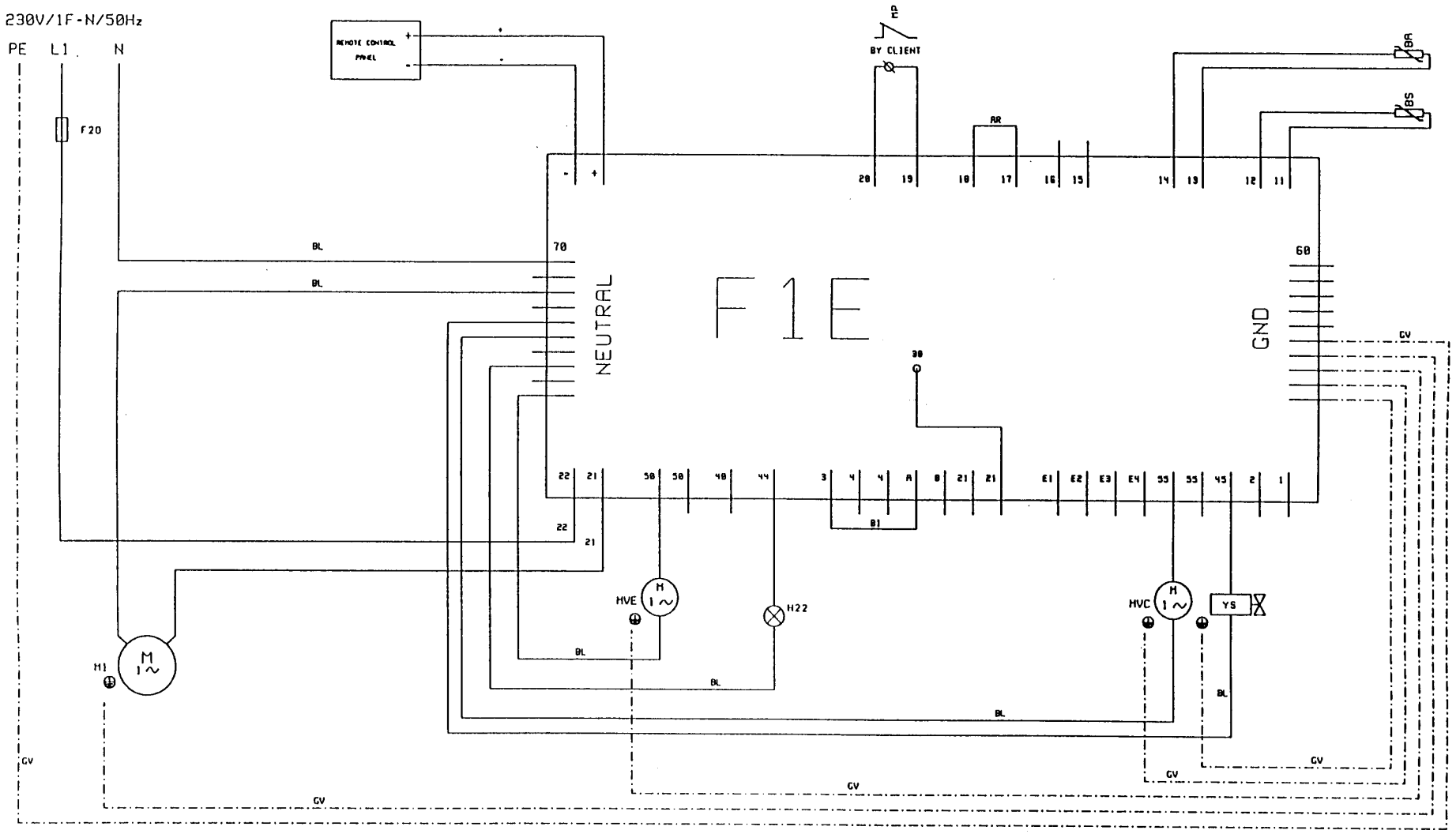
MODEL
SP 2LC
SP 3HC

HVC	Condenser Fan Motor	K1	Compressor Contactor	BS	Defrost Probe
HVE	Evaporator Fan Motor	H22	Internal Light	BA	Air Probe
M1	Compressor	EP	Door Frame Heater		
YS	Hot Gas Solenoid Valve	MP	Door Switch (if fitted)		

Rev No.		Drawing No.		Sheet No.
		81801L		1 of 1
Date:	Approved	Drawn By	Approved	Date
		Sonchl	Martinelli	81801L



MODEL SP 3LC SP 4LC SP 4HC SP 5HC	HVC Condenser Fan Motor HVE Evaporator Fan Motor M1 Compressor YS Hot Gas Solenoid Valve	K1 Compressor Contactor H22 Internal Light EP Door Frame Heater (if fitted) MP Door Switch (if fitted)	PHX High Pressure Switch BS Defrost Probe BA Air Probe	Rev No.	Drawing No. 81802L / Sheet No. 1 of 1
				Date: / Approved	Drawn By Sonchl / Approved Martinelli / Date 04-12-1997

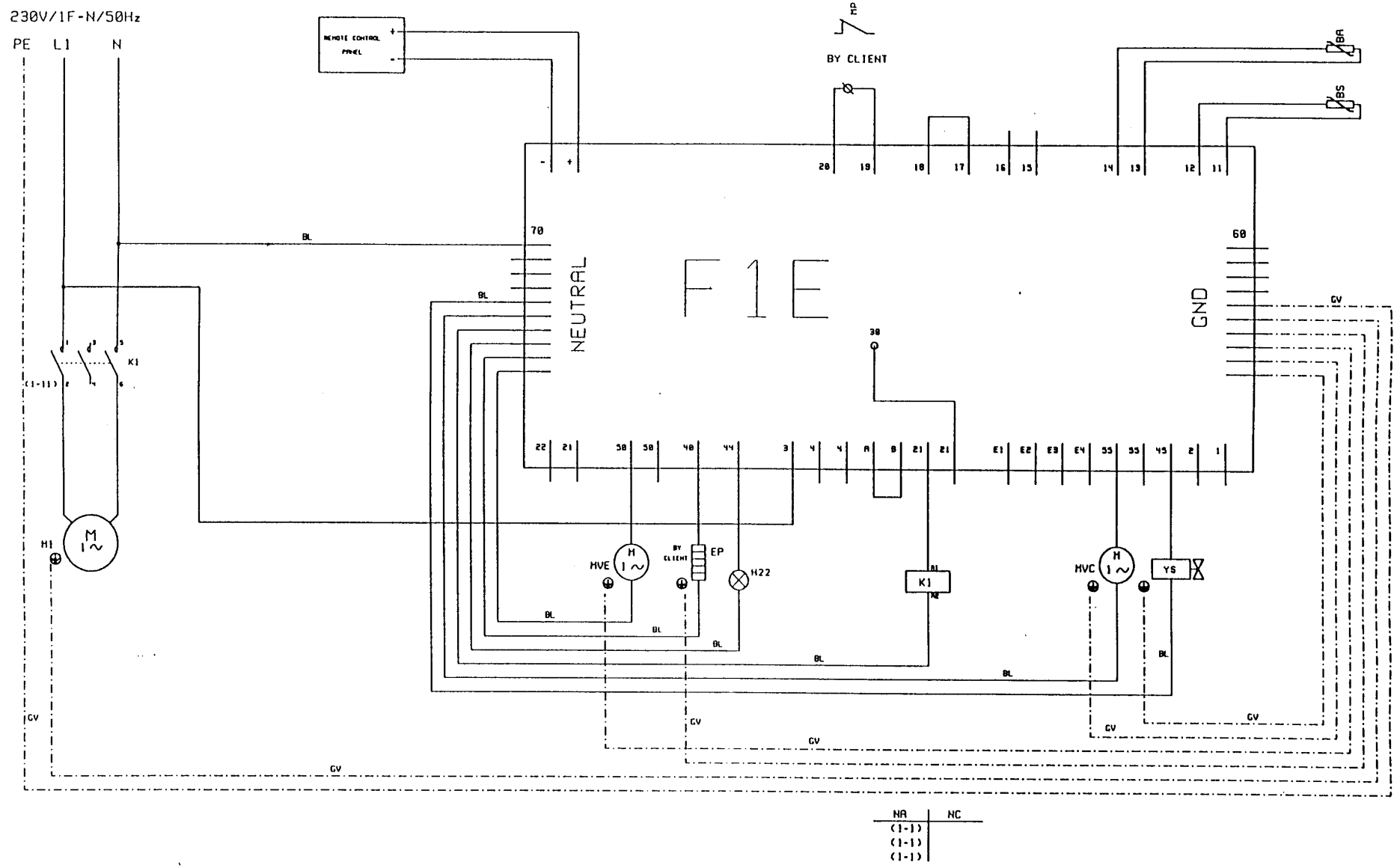


MODEL
SP 1HW
SP 2HW

HVC	Condenser Fan Motor	H22	Internal Light
HVE	Evaporator Fan Motor	MP	Door Switch (if fitted)
M1	Compressor	BS	Defrost Probe
YS	Hot Gas Solenoid Valve	BA	Air Probe

Rev No.			
Date:		Approved	

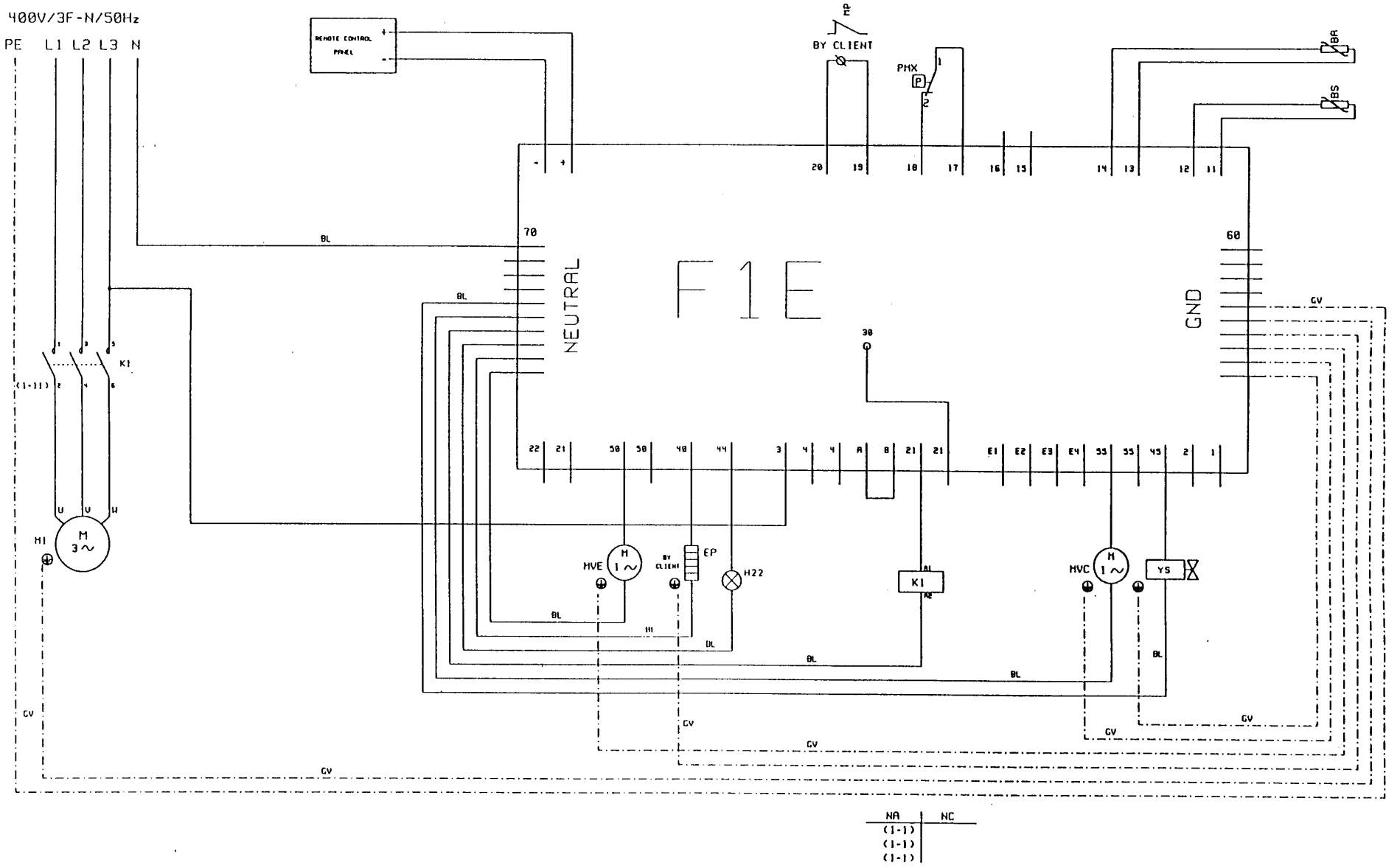
Drawing No.		Sheet No.
81800M		1 of 1
Drawn By	Approved	Date
Sonchl	Martinelli	03-12-1997



MODEL
SP 1LW
SP 2LW
SP 3HW

HVC	Condenser Fan Motor	K1	Compressor Contactor	BS	Defrost Probe
HVE	Evaporator Fan Motor	H22	Internal Light	BA	Air Probe
M1	Compressor	EP	Door Frame Heater		
YS	Hot Gas Solenoid Valve	MP	Door Switch (if fitted)		

Rev No.		Drawing No.		Sheet No.
		81801M		1 of 1
Date:	Approved	Drawn By	Approved	Date
		Sonchl	Martinelli	04-12-1997



MODEL

SP 3LW - SP 4LW - SP 5LW
SP 4 HW - SP 5HW

HVC	Condenser Fan Motor	K1	Compressor Contactor	BS	Defrost Probe
HVE	Evaporator Fan Motor	H22	Internal Light	BA	Air Probe
M1	Compressor	EP	Door Frame Heater	PHX	High Pressure Switch
YS	Hot Gas Solenoid Valve	MP	Door Switch (if fitted)		

Rev No.			
Date:		Approved	

Drawing No. 81802M		Sheet No. 1 of 1
Drawn By Sonchl	Approved Martinelli	Date 04-12-1997

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