Installation and Programming Quadro+ Mark8

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1. INTRODUCTION

Quadro+ is an advanced temperature control offering digital temperature display, up to 8 stages of outputs (4 Cooling + 4 Heating), dual analog 0-10v outputs, economiser function based on 1 or 2 sensors, setback function, sensor calibration and remote set-point adjustment. It can be surface or DIN rail mounted. All parameters are programmed in permanent memory.

Quadro+ is fully automatic in operation and as supplied is ready to use in air conditioning applications. The control sensor temperature is displayed and by pressing the RIGHT key the control status is displayed.

As standard Quadro+ is supplied as a control with a single wall mount temperature sensor. In this configuration it provides $2 \operatorname{cool} + 2$ Heat outputs, and $2 \operatorname{analog} 0-10v$ signals to drive dampers.

2. QUADRO+ AUXILIARY

The auxiliary is a separate enclosure of the same dimensions as the Quadro+ and extends the functions provided by Quadro+. It has a further 2 relays each with dual contacts to allow the extra 2 Cool and 2 Heat outputs, making a possible total of 8 stages. It has an input to accept the remote setpoint adjustment and also sensor inputs for the dual economiser function. There are no indications or switches on the auxiliary, as all programming and operation is accomplished by the Quadro+.



3. REMOTE SET-POINT UNIT (RSPU)

The RSPU is a wall mount accessory (fig. 2.) with a trim pot to allow adjustment of the control setting of Quadro+. The upper (Hi) and lower (Lo) limits of the control setting are set from Quadro+ in programming and can be a narrow (to 1° C) or wide (up to 40° C) band as desired.



Figure 2. Sensor & Housing

The RSPU also has a control sensor in-built which can be used as an control or economiser temperature sensor as required.

As an option, the RSPU can be supplied with an on-off slide switch to be used as on/off or setback (section 12.)

4. INSTALLATION 4A. Enclosure installation

Quadro+ and the auxiliary are housed in a DIN standard enclosure with dimensions as shown in figure 1. The enclosure is the same profile as a standard circuit breaker and 4 units wide. Therefore, many domestic switchboards will mount a Quadro+ and auxiliary side by side. A variety of enclosures are available for this purpose. The enclosure can also be surface mounted. Turn the unit over and snap out the top and bottom tabs which have mounting holes on 90 mm centers when open.

The terminal strips are designed with extra low voltage connections on the top terminal and 240VAC terminals on the bottom to allow segregation of control and sensor wiring.

4B Sensor installation

Both the standard wall mount sensor and the RSPU have a surface mounting enclosure per figure 2. The mounting centers of 84 mm are those of standard GPO's therefore hardware for GPO's is ideal.

Position the sensors in moving air to ensure accurate control and sensing.

The temperature sensor is an NTC thermistor of 0.5°C accuracy and has a non-linear resistance-temperature characteristic (see figure 3). Wiring from the sensor to the control should be routed a minimum of 300mm away from power cables for runs in excess of 2 meters in speaker wire of 0.5mm sq. diameter for mechanical strength.



using Heatshrink on joins

Figure 3. Sensor Resistance

The sensor cabling can be up to 100 meters without affecting accuracy. Where cable joins are made, dirt or moisture at the join will reduce the resistance and give a higher temperature reading. Therefore we highly recommend joins are soldered and covered in heat-shrink as per figure 3.

For applications where condensation is expected, an encapsulated "P" sensor is available.

4C Electrical installation

Please refer to the wiring drawing rear page. Quadro+ and the auxiliary where fitted each require a 24VAC or 240VAC supply. Either or both may be energised.

All relay outputs are rated 240VAC 5Amps resistive or 0.25Hp/200W inductive.

All extra low voltage terminals #1-12 both units should be run away from 240VAC wiring where possible.

5 NORMAL OPERATION

Quadro+ displays the temperature in Celsius, the decimal point being ON indicates 0.5°C. For example, 24 indicates 24.0°C whereas 24. indicates 24.5°C.

Dis	Status	Dis	Status		
C1	Cooling Stg 1	C2	Cooling Stg 1		
C3	Cooling Stg 1	C4	Cooling Stg 1		
db	Deadband (off)	H1	Heating Stg 1		
H2	Heating Stg 2	H3	Heating Stg 3		
H4	Heating Stg 4	* if used by A1/A2			
Table 1. Status Display					

Press either the UP or DOWN buttons momentarily and the display will flash the current control setpoint. Press and HOLD the UP or DOWN button and the setpoint is altered up or down. The limits of the adjustment range are set in programming (defaults are 19°C and 26°C).

After a few seconds the display returns to reading the control sensor temperature.

If a remote set-point unit (RSPU) is fitted, the UP and DOWN buttons do not alter the control set-point.

Press the RIGHT button momentarily and the current control status is displayed. The displays are as shown in table 1.

Note that C3/C4 and H3/H4 may or may not be available depending on how Quadro+ has been programmed.

6. LOADING DEFAULT PROGRAMMING VALUES

Quadro+ may be programmed with default values as shown in table 2. This can be used to restore "normal" air-conditioning parameters. This procedure OVER-WRITES all values previousely entered. To load defaults, press and HOLD the RIGHT key until; Pr then dF is displayed after 15 seconds. The unit then returns to normal temperature display and the new values are active.

7. PROGRAMMING

Val	Default	Description	Range	
Hi	26	Hi user limit °C	1~40°C	
Lo	16	Lo user limit °C	1~39°C	
C1	+1.0	1st Stg Cooling	0~.5°C	
C2	+2.0	1st Stg Cooling	C1~10°	
H1	+1.0	1st Stg Heating	0~.5°C	
H2	+2.0	2 nd Stg Heating	H1~10°	
Cd	0.5	cooling differential	0~2°C	
Hd	0.5	heating differential	0~2°C	
Ct	0.0	cooling delay	0-10 m.	
Ht	0.0	heating delay	0-10 m.	
dt	1.0	deadband delay	0-10 m.	
A1	EE	Analog function-see 8.0		
A2	CH	Analog function-see 8.0		
C3	3.0	3rd Stg Cooling	C2-10°	
C4	4.0	4 th Stg Cooling	C3-10°	
H3	3.0	3 rd Stg Heating	H2~10°	
H4	4.0	4 th Stg Heating	H3~10°	
CA	0.0	Calibration offset	9~+.9	
SF	5	On/Off/Setback	0-9	
Table 2. Programming Parameters				

To program Quadro+, press and HOLD the RIGHT key until Pr is displayed. Next, Hi is displayed with its current setting (default = 26).

The Hi (user set-point upper temperature limit) may be adjusted up or down with the UP or DOWN keys until the desired value is displayed (0.5°C increments are shown as described in 5. normal operation). Press RIGHT key to store and move to the next parameter Lo.

The Lo setting can be similarly adjusted. Each parameter as in table 2 above can be altered and saved to permanent memory.

If no key is pressed Quadro+ will return to normal display after about 20 seconds. The parameters A1 and A2 define the operation of the analog outputs and have special options. These options are described fully in sections 8-11 and Figure 5 page 3.

Depending on which options are set for A1 and A2 parameters C3,C4,H3, H4 may not require setting and will not be displayed.

8. ANALOG OUTPUTS A1 & A2

The analogs can be used in different ways: (i) as an economiser output (A1 only) (ii) as a 0-10v DC signal (iii) as a relay drive for stage outputs

Once an analog has been used for one duty, it cannot therefore be used for another.

For example, if we set up a system with dual temperature sensor economising,

A1 is committed as the economiser output. We can then only have A2 provide a single relay drive, which would be either C3, H3 or C3/H3 depending on whether we program A2 as Co, HE or CH(see Fig.5). Where CH has been programmed, it should be realised that the C3 H3 contacts will energise together in BOTH cooling and heating, and the control wiring must prevent conflicts.

9. ANALOG OUTPUT A1 AS ECONOMISER

A1 (0-10v signal from pin 11 of Quadro+) can be set as an economiser output to drive a fresh air damper. The output will be 0 volts for no economising, 10 volts for full economising. The output starts at 0 volts at setpoint, and reaches full output at C1 or H1.

Figure 4 illustrates the output voltage swing.

There are three options for the economiser sensors:

9.1 Economiser using separate temperature sensor. (Programm A1 as EC)



Figure 4. Economizer output A1

The Quadro+ has a sensor connected across XT(9) and CA(10) and A1 programmed as EC. In this mode, the economiser compares the control sensor temperature to the economiser sensor which would be positioned in the outside air.

In this case the auxiliary & RSPU CANNOT be used.

The Ecomonising output comes ON if the outside air is closer to setpoint than the control sensor. The output varies between 0 volts DC at setpoint to 10 volts at C1 or H1.

9.2 Economiser using dual temperature sensors (Program A1 as EE)

The dual sensor option requires the auxiliary unit to be fitted (connect XT (9), CA (10)) and an outside and return air sensor. Where P probes are used, connect the OUTSIDE AIR SENSOR to 1&2, and the RETURN AIR SENSOR to 3&4. (This is the REVERSE of the Enthalpy sensor connections because the sensors have a negative temperature response (see figure 3.)

The auxiliary unit compares the sensors and enables or disables economising accordingly, in the same way as described in 9.1.

9.3 Economiser with dual Enthalpy Sensors (or PTC temperature sensors)

Connect the auxiliary and enthalpy sensors according to the wiring drawing above. Any enthalpy or temperature sensor with the following characteristics can be used;

(i) Resistance at normal ambient/humidity in the range 100 to 100,000 Ohms. (ii) Increase in enthalpy= increase in resistance.





10 ANALOG OUTPUTS AS 0-10V SIGNALS

Where A1 and/or A2 are to be used as an analog signal to drive variable devices, there are many options available. Figure 5 (page 3) illustrates how the output voltage changes with the control temperature.

11. ANALOG OUTPUTS AS RELAY DRIVES

A1 and A2 can be connected to the auxiliary and used to activate the relay outputs A1 or A2. Auxiliary connections CA (10), A1 (11), A2 (12) are required. The relay outputs are along the bottom terminals 15-24 and are 240VAC 5A rated.

The dotted lines in the wiring drawing above indicate contacts which operate together.

12 SWITCH FUNCTION SF: ON/OFF/SETBACK

Quadro+ can be shutdown (programm setting 0=default) via an extra low voltage switch across XT (9) and CA (10) CLOSING. In this case the display will indicate OF.

Alternatively, the switch input can trigger SETBACK, which shifts C1 and H1 AWAY from the setpoint by 1-9 ~C as programmed. Setback is ideal where it is undesireable to allow the system to shut down completely. * IMPORTANT * remote setpoint and dual economiser options STOP functioning during setback. Wire the setback switch per Fig. 6.

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Ref QPLUS.doc Revision 2 8/2002