



TC-4300 Temperature Controller

Operators Manual

TC-4300(K1P/K2P)

Version 2-1

tecca

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1 INTRODUCTION

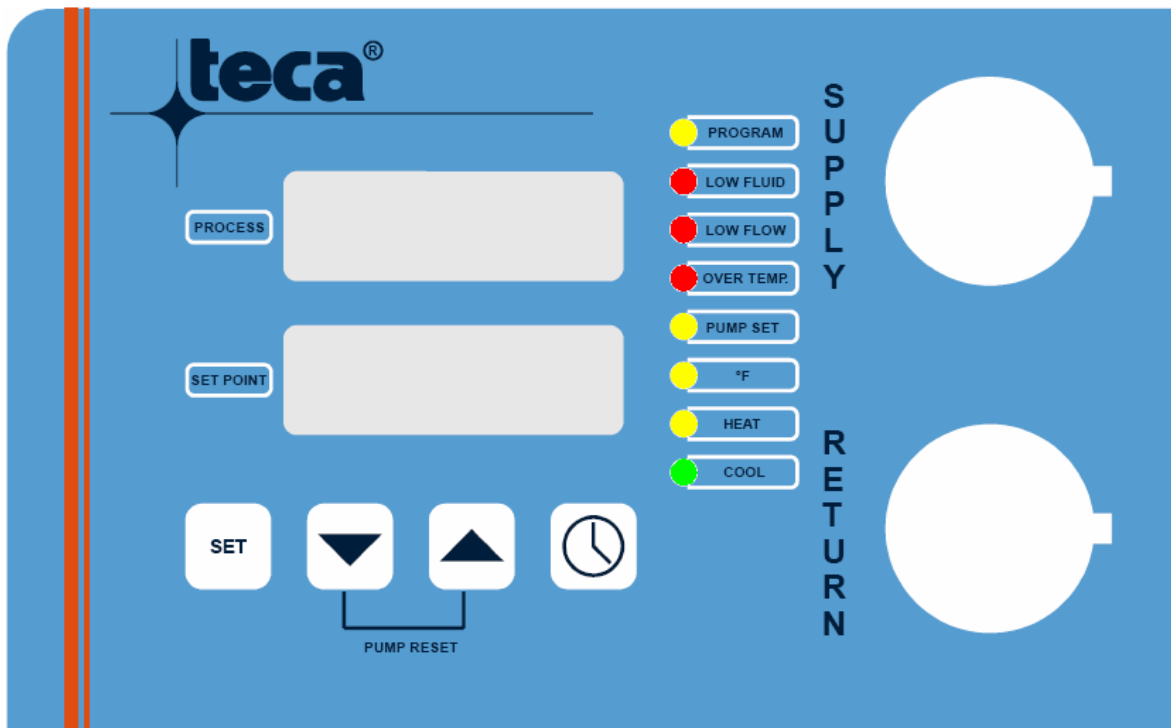
The K2P is the control center for TECA's liquid chiller and cold plate products. This unique controller is a full-featured instrument with advanced control capabilities.

The main features are:

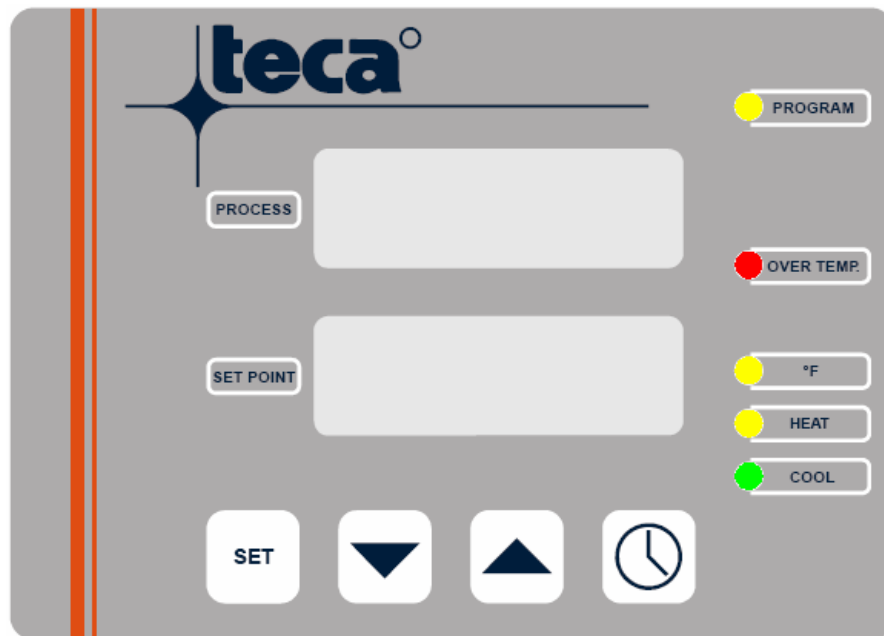
- Dual-line 4-digit display
- Status lights for low fluid level, low flow condition and over temperature condition
- Highly accurate and highly stable temperature control
- High accuracy RTD input
- Proportional-Integral-Derivative (PID) control
- One shot auto tuning for the automatic selection of PID terms
- Programmer with 4 profiles of 8 segments each
- Full-functioned programmer with automatic program repetition, ramp tracking, guaranteed soak, and PV servo.
- Integrated H-Bridge control circuitry
- Integrated pump reset logic (liquid chillers only) low flow situations
- AutoFan control on selected models
- Optionally available RS232 or communication interface

2 FRONT PANEL

2.1 Liquid Chillers



2.2 Cold Plates



2.3 Display Information

When the K2P is in the OP.b, OP.S or OP.P level of operation, the dual 4-digit display will show the following

Upper display: always the process variable

Lower display:

P.OFF	when the control output is disabled (for iTSP = OFF)
Current Setpoint	when the control output is enabled
End	when the program has ended

2.4 Display Navigation

During the parameter navigation, in every operational level, the upper display shows the parameter value, while the lower display shows the parameter identification code.

2.5 Status Indicators

LABEL	COLOR	FUNCTION
PROGRAM	Yellow	If idle the light is OFF. If running the light is ON. If in hold the light will flash.
LOW FLUID	Red	This light will flash if there is a low fluid condition (liquid chillers only)
LOW FLOW	Red	This light will flash if there is a low flow condition (liquid chillers only)
OVER TEMP.	Red	This light will flash if there is an over temperature condition present
PUMP SET	Yellow	When the pump is running, this light is ON. If the pump reset has been activated the light will flash. If the pump is off this light be OFF. (liquid chiller only)
°F	Yellow	This light will be ON if the controller is programmed for °F operation.
HEAT	Yellow	This light is ON when the heating output has been activated.
COOL	Green	This light is ON when the cooling output has been activated.

2.6 Keypad Operation


The keypad is composed of four pushbuttons labelled " **SET** " "▼" "▲" "⌚".

- Pushbutton ▼ is used to decrement/modify a parameter value or to show software version when in configuration / calibration mode.
- Pushbutton ▲ is used to increment/modify a parameter value or to change the information shown on display.
- Pushbutton ▼ + ⌚ is used to reach the minimum value during parameter modification
- Pushbutton ▲ + ⌚ is used to reach the maximum value during parameter modification
- Pushbutton **SET** is used to scroll the display to a new parameter and at the same time to store the previous parameter value (if present).
- Pushbutton ⌚ is used to start / stop / pause / abort the program execution.
If depressed for less than 1.5 s in set up operator mode, programmer mode, configuration mode and input calibration mode it is used to scroll backwards through parameters without storing them.
- Pushbuttons ▲ + **SET** are used, when kept depressed for more than 3s, to enable/disable the control output.
- Pushbuttons ▼ + ▲ if in OP,b or OP.S mode are used to restart the pump (liquid chiller only)
if in CnF mode are used to initiate default parameter loading procedure.
- Pushbuttons ▼ + **SET** are used to enable "lamp test" in any of the operation levels.
- Pushbuttons ⌚ + **SET** are used, when kept depressed for more than 3 s, to start the procedure to select the operating level.

NOTE: All of the above actions which require two pushbuttons must exactly follow the pushbutton sequence as shown.

2.7 Temperature Measurement Malfunction




The K2P can detect a faulty RTD temperature sensor. An over range or under range condition is signalled on the display as %%%.

When an over range condition is detected the control output(s) are set to OFF. If a program is running, it will be forced into a HOLD state. Once the sensor malfunction is corrected, pressing the  pushbutton for 1.5 seconds will restore the programmer to the RUN mode.

3 LEVELS OF OPERATION



There are several levels of operation found within the K2P controller.

- OP.b This is the level of basic operation. From this level an operator can change setpoint, force an auto tuning process, start a predefined program, and reset the pump (liquid chillers only).
- OP.S This is the level for setup. From this level an operator can set PID parameters, setpoint limits, and other key operational parameters.
- OP.P This is the level for editing programs. In this level individual program segments are defined, as well as the number of program cycles.
- CnF This is the level for factory configuration.
- I.CL This is the level for access calibration parameters.

To switch operation levels, press the  and **SET** pushbuttons for more than 3 s. The K2P controller will soon show OPr and the current operational mode mode. Press the  or  pushbutton to select the new level.

- OP.b Basic operator mode
- OP.S Set up mode
- OP.P Program editing mode
- A.CL Auto (2 Pt) calibration (this mode is allowed only from OP.b, OP.S and OP.P)
- CnF. Configuration
- I.CL Input calibration (this mode is allowed only from CnF)

To confirm the selection press the **SET** pushbutton.

OP.S, OP.P, and CnF each have their own pass code for level access. If the selection is other than OP.b The K2P will show display PASS and ---- . Press the  or  pushbutton to set the proper password. Press **SET** to confirm.

If in the OP.P level, and a program is currently running, all parameters in this level will be viewable, but not alterable. While in the CnF level, all outputs are made to be in an off (safe) state.

If an incorrect password is entered the K2P will not change from the current operational level.

3.1 Operation Level Parameter List

OPERATIVE MODES			A-CAL	CONFIG	IP CAL	DESCRIPTION	AUTO RANGE
BASIC	SET UP	PROGRAM EDIT					
nPrG	nPrG	nPrG	s.SP			SELECTED PROGRAM	
SEG	SEG	SEG				SEGMENT IN EXECUTION	
rt	rt	rt				TIME REMAINING TO THE END OF PROGRAM	
r.rpt	r.rpt	r.rpt				REPETITIONS REMAINING TO THE END OF PROGRAM	
rpt..	rpt..	rpt..				TIME REMAINING TO THE END	
						SELECTED SETPOINT	X
L.rS	L.rS					OVER TEMPERATURE MANUAL LED RESET	
	n.rS					ALARM RESET	
OPt	OPt					CONTROL OPTIMIZATION	
	t					TIMER VALUE	
	AL.1					ALARM 1 LIMIT	X
	HS.1					ALARM 1 HYSTERESIS	
	Pb					PROPORTIONAL BAND	
	HS					HYSTERESIS	
	ti					INTEGRAL TIME	
	td					DERIVATIVE TIME	
	IP					INTEGRAL PRE-LOAD	
	C					OUT 1 CYCLE TIME	
	C2					OUT 2 CYCLE TIME	
	rC					RELATIVE COOLING GAIN	
	OLP					HEAT COOL DEAD BAND/ OVERLAP	
	rL					SETPOINT LOW LIMIT	X
	rH					SETPOINT HIGH LIMIT	X
	OLH					OUTPUT HIGH LIMITER	
	F.SEL					SELECTION FOR THE FAN OUTPUT	
	F.Gn					GAIN FOR THE FAN OUTPUT	
	F.OFS					OFFSET FOR THE FAN OUTPUT	
		ITSP				INITIAL SET POINT	X
		SP. 1				SEGMENT 1 TARGET SET POINT	X
		T. 1 / rr.1				SEGMENT 1 DURATION OR RAMP RATE	
		SP. 2				SEGMENT 2 TARGET SET POINT	X
		T. 2 / rr.2				SEGMENT 2 DURATION OR RAMP RATE	
		SP. 3				SEGMENT 3 TARGET SET POINT	X
		T. 3 / rr.3			SEGMENT 3 DURATION OR RAMP RATE		
		SP. 4			SEGMENT 4 TARGET SET POINT	X	
		T. 4 / rr.4			SEGMENT 4 DURATION OR RAMP RATE		
		SP. 5			SEGMENT 5 TARGET SET POINT	X	
		T. 5 / rr.5			SEGMENT 5 DURATION OR RAMP RATE		
		SP. 6			SEGMENT 6 TARGET SET POINT	X	
		T. 6 / rr.6			SEGMENT 6 DURATION OR RAMP RATE		
		SP. 7			SEGMENT 7 TARGET SET POINT	X	
		T. 7 / rr.7			SEGMENT 7 DURATION OR RAMP RATE		
		SP. 8			SEGMENT 8 TARGET SET POINT	X	
		T. 8 / rr.8			SEGMENT 8 DURATION OR RAMP RATE		
		rpt			PROGRAM EXECUTION REPETITIONS		

3.2 OP.b and OP.S Parameter Definition

In both modes, viewed parameters can be inspected or modified.

To inspect or modify parameters press **SET** key. To modify a selection use the ▲ or ▼ buttons. Press **SET** again to store the new value and to advance to the next parameter.

Push ⌚ to scroll backwards through parameters without storing them.

Note: there is a 10 second timeout applied during this operation. If no button is pressed for 10 seconds the K2P will return to the normal display without modifying the last parameter.

SELECTED SETPOINT (TARGET SET POINT)

(Read only parameter in A.CAL mode)

Identification code: S.SP

OVER TEMPERATURE MANUAL LED RESET

(This parameter is only seen if the over temperature light is flashing)

Identification code: L.rS

MANUAL RESET OF AN ALARM CONDITION

(This parameter is skipped if none of the alarms have the manual reset function)

Identification code: n.rS

Note: Change to On and then depress **SET** pushbutton to reset the alarm condition

CONTROL OPTIMIZATION

Identification code: OPt

Selection options:

OFF	=	To start SMART algorithm or no action
On	=	To end SMART algorithm
Fct	=	The PID default value is reloaded. The parameters reloaded by this command are:
		– proportional band
		– integral time
		– derivative time
		– integral pre-load
		– out 1 and out 3 cycle times
		– relative cooling gain
		– dead band/overlap

Note: On the display initially will appear the actual status:

“OFF” SMART Algorithm disabled

“On.t” First part of SMART algorithm (TUNE) is running

The status can be modified only if control is enabled and program is not running.

The choice fct can be selected only if SMART is not running

TIMER

Identification code: t

Range: 1 to 999 sec

ALARM 1 THRESHOLD

(This parameter is present if P5 = 1, 2, 3)

Identification code: AL.1

Range:	Span limits (P2/P3)	(if process alarm	P 5 = 1)
	0 / 500	(if band alarm	P 5 = 2)
	-200 / 500	(if deviation alarm	P 5 = 3)

ALARM 1 HYSTERESIS

(This parameter is present if P5 = 1, 2, 3)

Identification code: HS.1

Range: 0.1% - 10.0%

Note: The alarm hysteresis is a percentage of span value (P3-P2)

When programmed as outside band alarm, the hysteresis will be internally limited by the alarm threshold value.

PROPORTIONAL BAND

Identification code: Pb

Range: 1.0% - 100.0% for one control output

1.5% - 100.0% for heating/cooling

Note: The proportional band is a percentage of span value (P3-P2).

When device is working with self-tuning algorithm (SMART), the value of proportional band will be limited with respect to P16-P18 parameters value.

INTEGRAL TIME

Identification code: ti

Range: 0.01 / 20.00 mm.ss (minutes and seconds)

Above this value the display blanks (exception made for decimal point) and integral action is excluded.

Note: When the device is working with SMART algorithm the Ti minimum value will be limited as selected by parameter P20.

DERIVATIVE TIME

Identification code: td

Range: 0.00 / 10.00 mm.ss (minutes and seconds)

Note: When device is working with SMART algorithm, the value of derivative time will be made equal to a quarter of the value of integral time.

INTEGRAL PRE-LOAD

Identification code: IP

Range: 0% / 100% if one control output

-100% / 100% if heating/cooling (two control outputs)

OUT 1 CYCLE TIME

Identification code: C

Range: 1 / 200 seconds

OUT 2 CYCLE TIME

Identification code: C2

Range: 1 / 200 seconds

RELATIVE COOLING GAIN

Identification code: rC

Range: 0.20 / 1.00

DEAD BAND / OVERLAP BETWEEN HEATING/COOLING OUTPUT

Identification code: OLP

Range: -20% / 50%

SETPOINT LOW LIMIT

Identification code: rL

Range: Low range input value (P2) / rH

SETPOINT HIGH LIMIT

Identification code: rH

Range: rL / High range input value (P3)

OUTPUT HIGH LIMITER

Identification code: OLH

Range: -100% / 100% if heating/cooling (two control outputs)

SELECTION FOR THE FAN OUTPUT

(This parameter is skipped if P53 = OFF)

Identification code: F.SEL

Range: 0 / 100

Above this value the display shows "Auto" meaning that fan is controlled automatically from PID output value

GAIN FOR THE FAN OUTPUT

(This parameter is skipped if P53 = OFF and F.SEL different from "Auto")

Identification code: F.Gn

Range: 0.01 / 99.99

OFFSET FOR THE FAN OUTPUT

(This parameter is skipped if P53 = OFF)

Identification code: F.OFs


Range: 0 / 50

3.3 Configuration Level Parameter List

					DESCRIPTION	AUTO RANGE
			P1			
			P2		LOW SCALE RANGE VALUE	X
			P3		HIGH SCALE RANGE VALUE	X
			P4		OUT 1 ACTION	
			P5		OUT 2 FUNCTION	
			P6		ALARM 1 or COOLING MEDIA	
			P7		ALARM 1 ACTION	
			P8		ALARM 1 STANDBY FUNCTION	
			P11		DISPLAY AUTORANGE	
			P12		FILTER ON MEASURE	
			P13		CONTROL OUTPUT MAX RATE OF RISE	
			P15		SMART FUNCTION	
			P16		MAX VALUE OF THE AUTO TUNE PB RANGE	
			P17		MIN VALUE OF THE AUTO TUNE PB RANGE (1 OP)	
			P18		MIN VALUE OF THE AUTO TUNE PB RANGE (H/C OP)	
			P19		RCG CALCULATION WHEN IN SMART	
			P20		MIN VALUE AUTO TUNE INTEGRAL TIME	
			P21		INHIBIT RESET BAND EXTENSION	
			P27		LOW AUTO-CAL PT	X
			P28		LOW AUTO-CAL STABILITY BAND	
			P29		LOW AUTO-CAL STABILITY TIME	
			P30		HIGH AUTO-CAL PT	X
			P31		HIGH AUTO-CAL STABILITY BAND	
			P32		HIGH AUTO-CAL STABILITY TIME	
			P33		ACCESS PASSWORD - OP.S- Operator setup	
			P34		ACCESS PASSWORD - A .CL- 2pt Cal	
			P35		ACCESS PASSWORD - CnF- Configuration	
			P36		ACCESS PASSWORD - I.CL- Input calibration	
			P37		ACCESS PASSWORD - OP.P - Program edit	
			P41		NUMBER OF PROGRAMS AND SEGMENTS	
			P42		START UP FEATURE	
			P43		SERVO TO PV FUNCTION	
			P44		RAMP TRACKING LOW LIMIT	
			P45		RAMP TRACKING HIGH LIMIT	
			P46		GUARANTEED SOAK LIMIT	
			P47		DELTA TEMPERATURE (FOR TUNE START UP)	
			P48		SWP_LO_LIM (IN TUNE)	X
			P49		SWP_HI_LIM (IN TUNE)	X
			P50		MIN PEAK (IN TUNE)	
			P51		SYSTEM CALIBRATION – “b” COEFFICIENT	
			P52		SYSTEM CALIBRATION – “a” COEFFICIENT	
			P53		ANALOGUE OUTPUT SELECTION	
			P85		INCREASE DECREASE ALGORITHM IN PARAMETER MODIFICATION	
			P97		MODBUS ADDRESS	
			P98		BAUD RATE	
			P99		BYTE FORMAT	

3.4 CnF Parameter Definition

Once access is gained to the configuration level, CnF, pressing ▲ or ▼ will display the software version.

Press **SET** to begin viewing configuration level parameters from the first parameter or  to start from the last. Use **▲** or **▼** to modify a parameters value. No timeout is applied during this process.

P 1 – INPUT TYPE AND RANGE VALUE

0 = TC	L	-100 / 900 °C
1 = TC	J	-100 / 1000 °C
2 = TC	K	-100 / 1370 °C
3 = TC	N	-100 / 1400 °C
4 = TC	T	-100 / 400 °C
5 = TC	S	- 20 / 1760 °C
6 = TC	R	- 20 / 1760 °C
7 = RTD	Pt100	-200 / 800 °C
8 = TC	L	-148 / 1652 °F
9 = TC	J	-148 / 1832 °F
10 = TC	K	-148 / 2498 °F
11 = TC	N	-148 / 2552 °F
12 = TC	T	-148 / 752 °F
13 = TC	S	- 4 / 3200 °F
14 = TC	R	- 4 / 3200 °F
15 = RTD	Pt100	-328 / 1472 °F

Note: When input type is changed the parameters P2, P48 will be forced to min range value.
The parameters P3, P49 will be forced to max range value.
The parameter P27 will be forced to 0.2 of span and P30 to 0.8 of span.

P 2 – LOW SCALE RANGE VALUE

Set low scale for TC/RTD input. See P1 limits.

Note: When this parameter is modified, the parameters P48, rL will be aligned to it.
The parameter P49 will be checked and aligned to P 3 if < P48.
The parameter rH will be checked and aligned to P 3 if < rL.
If process alarm (P5=1) the parameter AL.1 will be checked and aligned if out of range
If process alarm (P22=1) the parameter AL.2 will be checked and aligned if out of range

P 3 – HIGH SCALE RANGE VALUE

Set high scale for TC/RTD input. See P1 limits

Note: When this parameter is modified, the parameters P49, rH will be aligned to it.
The parameter P48 will be checked and aligned to P 2 if > P49
The parameter rL will be checked and aligned to P 2 if > rH
If process alarm (P5=1) the parameter AL.1 will be checked and aligned if out of range
If process alarm (P22=1) the parameter AL.2 will be checked and aligned if out of range

Note: The span value established by the difference between P3-P2 must be equal or greater than 300 °C (540 °F) for TC ranges and 100 °C (180 °F) for RTD ranges.

P 4 – OUT 1 ACTION

rEV = Reverse action (Heating action)
dir = Direct action (Cooling action)

Note: When P5 = 5 this parameter will be only monitored

P 5 – OUT 3 FUNCTION

- 0 = Output not provided
- 1 = Out3 used as Alarm 1 output - Process alarm
- 2 = Out3 used as Alarm 1 output - Band alarm
- 3 = Out3 used as Alarm 1 output - Deviation alarm
- 4 = Out3 used as Alarm 1 output - Measure malfunctioning annunciator
- 5 = Out3 used as Cooling output

Note: When P5 = 1,2,3

- The parameter OLH is set to 100 if < 0
- The parameter IP is set to 30 < 0
- The parameter AL1 will be checked and set to its low limit if out of range

When P5 = 0,4

- The parameter OLH is set to 100 if < 0
- The parameter IP is set to 30 if < 0

When P5 = 5

- The parameter P4 is forced "rEV"
- The parameter P16 will be checked and set to its low limit if out of range
- The parameter Pb is set to 1.5 if < 1.5 and different from 0

P 6 – ALARM 1 or COOLING MEDIA CONFIGURATION

(Skipped if P5 = 0)

If P5 is different from 5

- H.A. = High alarm with automatic reset
- L.A. = Low alarm with automatic reset
- H.L. = High alarm with manual reset
- L.L. = Low alarm with manual reset

Note: For band alarm, H.A./H.L. signifies outside band alarm, while L.A./L.L signifies inside band alarm. For measure malfunctioning annunciator (P5 = 4) the selection high or low has no effect.

If P5 = 5

- Alr = Air as cooling element
- OIL = Oil as cooling element
- H2O = Direct water as cooling element

Note: Changing the parameter P6 will produce the automatic updating of Out 2 cycle time "C2" and relative cooling gain "rC" with their respective default values.

P 7 – ALARM 1 ACTION

(Skipped if P5 = 0 or 5)

- rEV = Reverse action (relay de-energised in alarm condition)
- dir = Direct action (relay energised in alarm condition)

P 8 – ALARM 1 STANDBY FUNCTION

(Skipped if P5 = 0, 4 or 5)

- OFF = Standby function disabled
- On = Standby function enabled

Note: This function masks an alarm condition at start up and at a setpoint change, if the alarm is programmed as band or deviation, until the process variable reaches the alarm threshold plus or minus hysteresis.

For process alarm the standby function masks the alarm condition at start up until the process variable reaches the alarm threshold plus or minus hysteresis.

P11 – DISPLAY AUTOTORANGE

OFF = Display auto-range disabled

On = Display auto-range enabled

P12 – FILTER ON MEASURE

OFF = Filter disabled

On = Filter enabled

P13 – CONTROL OUTPUT MAX RATE OF RISE

Settable from 1%/s to 25%/s.

Above 25%/s the display shows "InF" indicating that no ramp limitation is imposed.

Note: The rate of rise is not applied for ON/OFF control action

P15 – SMART FUNCTION

(Skipped and forced equal 0 if option is not available)

0 = SMART function disabled

1 = SMART function may be enabled (TUNE algorithm followed automatically by ADAPTIVE algorithm).

2 = SMART function may be enabled (Only TUNE algorithm).

P16 – MAX VALUE OF THE PROPORTIONAL BAND CALCULATED BY THE SMART

(Skipped if P15 = 0)

Value settable between P17 or P18 and 100.0%

P17 – MIN VALUE OF THE PROPORTIONAL BAND CALCULATED BY THE SMART

(ONE CONTROL OUTPUT)

(Skipped if P15 = 0 or P5 = 5)

Value settable between 1.0% and P16

P18 – MIN VALUE OF THE PROPORTIONAL BAND CALCULATED BY THE SMART (HEATING/COOLING CONTROL)

(Skipped if P15 = 0 or P5 is different from 5)

Value settable between 1.5% and P16

P19 – RCG CALCULATION WHEN IN SMART

(Skipped if P15 = 0 or P5 is different from 5)

OFF = The self-tuning algorithms (SMART) does not calculate the relative cooling gain

On = The self-tuning algorithms (SMART) calculates the relative cooling gain

P20 – MIN VALUE OF THE INTEGRAL TIME CALCULATED BY THE SMART

(Skipped if P15 = 0)

Value settable between 0.01 and 2.00 m.ss (minutes and seconds)

P21 – INHIBIT RESET BAND EXTENTION

Value settable between -30% and 30% of proportional band

Note: A positive value means extension of inhibit reset high limit (over setpoint value).

A negative value means extension of inhibit reset low limit (under setpoint value).

P27 – LOW AUTO-CAL PT

(Skipped if option is not available)

Threshold value in engineering units between min / max range value (P1).

P28 – LOW AUTO-CAL STABILITY BAND

(Skipped if option is not available)

Value settable between 0.1 and 100.0 engineering units.

P29 – LOW AUTO-CAL STABILITY TIME

(Skipped if option is not available)
0.01 / 90.00 mm.ss (minutes and seconds)

P30 – HIGH AUTO-CAL PT

(Skipped if option is not available)
Threshold value in engineering units between min / max range value (P1).

P31 – HIGH AUTO-CAL STABILITY BAND

(Skipped if option is not available)
Value settable between 0.1 and 100.0 engineering units.

P32 – HIGH AUTO-CAL STABILITY TIME

(Skipped if option is not available)
0.01 / 90.00 mm.ss (minutes and seconds)

P33 – ACCESS PASSWORD – OP.S – Operator setup

0 = None protection. The access at this operator mode is immediate
1 up to 999 = Code to access at this operator mode.

P34 – ACCESS PASSWORD – A.CL – 2pt Cal

(Skipped if option is not available)
0 = None protection. The access at this operator mode is immediate
1 up to 999 = Code to access at this operator mode.

P35 – ACCESS PASSWORD – CnF – Configuration

0 = None protection. The access at this operator mode is immediate
1 up to 999 = Code to access at this operator mode.

P36 – ACCESS PASSWORD – I.CL – Input calibration

0 = None protection. The access at this operator mode is immediate
1 up to 999 = Code to access at this operator mode.

P37 – ACCESS PASSWORD – OP.P – Program editing mode

0 = None protection. The access at this operator mode is immediate
1 up to 999 = Code to access at this operator mode.

P41 – NUMBER OF PROGRAMS AND SEGMENTS

(Skipped if multi program option is not available)
1-32 = One program with 32 segments maximum
2-16 = Two programs with 16 segments maximum each
4- 8 = Four programs with 8 segments maximum each

Note: When this parameter is skipped the device is equipped with 1 program with 8 segments.
When this value is changed all programmer segments are checked and modified if found incongruent.

P42 – START UP FEATURE

0 = At start up the programmer is forced in "Idle" state
1 = At start up the programmer restarts as at power down
See the "Programmer states start up feature" section for further details.

P43 – SERVO TO PV FUNCTION

0 = Servo to PV function disabled
1 = Servo to PV function enabled
See the "Servo to PV function" section for further details.

P44 – RAMP TRACKING LOW LIMIT

OFF = No ramp tracking when the PV is below the setpoint
 From 0.1 to 100.0 engineering units = low limit for the ramp tracking function

P45 – RAMP TRACKING HIGH LIMIT

OFF = No ramp tracking when the PV is above the setpoint
 From 0.1 to 100.0 engineering units = high limit for the ramp tracking function

P46 – GUARANTEED SOAK LIMIT

OFF = No guaranteed soak function when the programmer executes dwell
 From 0.1 to 100.0 engineering units = limit for the guaranteed soak function
 This limit means the half-band for the guaranteed soak function.

Example: SP = 70
 P46 = 2.5
 The program waits when PV > 72.5 or PV < 67.5

P47 – DELTA TEMPERATURE (FOR TUNE START UP)

(This parameter is present only if P15 = 1 or 2)
 Value settable between 2.0 and 40.0 engineering unit

P48 – SWP_LO_LIM (IN TUNE)

(This parameter is present only if P15 = 1 or 2)
 Value settable between P2 and P49 (in engineering unit)

P49 – SWP_HI_LIM (IN TUNE)

(This parameter is present only if P15 = 1 or 2)
 Value settable between P48 and P3 (in engineering unit)

P50 – MIN PEAK (IN TUNE)

(This parameter is present only if P15 = 1 or 2)
 Value settable between 0.2 and 5.0 (in engineering unit)

For more information on the below two parameters see the “Two point manual calibration mode” section.

P51 – SYSTEM CALIBRATION – “b” COEFFICIENT

Range: from –199.9 to 199.9 engineering units

P52 – SYSTEM CALIBRATION – “a” COEFFICIENT

Range: from 0.500 to 2.000

P53 – ANALOGUE OUTPUT SELECTION

0 - 20 = Output range 0 - 20 mA
 4 - 20 = Output range 4 - 20 mA
 0 - 10 = Output range 0 - 10 V
 2 - 10 = Output range 2 - 10 V
 OFF = Analogue output disabled

P85 – INCREASE DECREASE ALGORITHM IN PARAMETER MODIFICATION

0 = Increase or decrease in according to decade algorithm
 1 = Increase or decrease in according to exponential algorithm

P97 – MODBUS ADDRESS

(Skipped and forced equal 0 if option is not available)
 0 / 254

P98 – BAUD RATE

(Skipped if P97 = 0)

600 = 600 baud
 1200 = 1200 baud
 2400 = 2400 baud
 4800 = 4800 baud
 9600 = 9600 baud
 19.20 = 19200 baud

P99 – BYTE FORMAT

(Skipped if P97 = 0)

8E = 8 bit + even parity
 8O = 8 bit + odd parity
 8 = 8 bit without parity

4 SIMPLE SETPOINT CONTROL

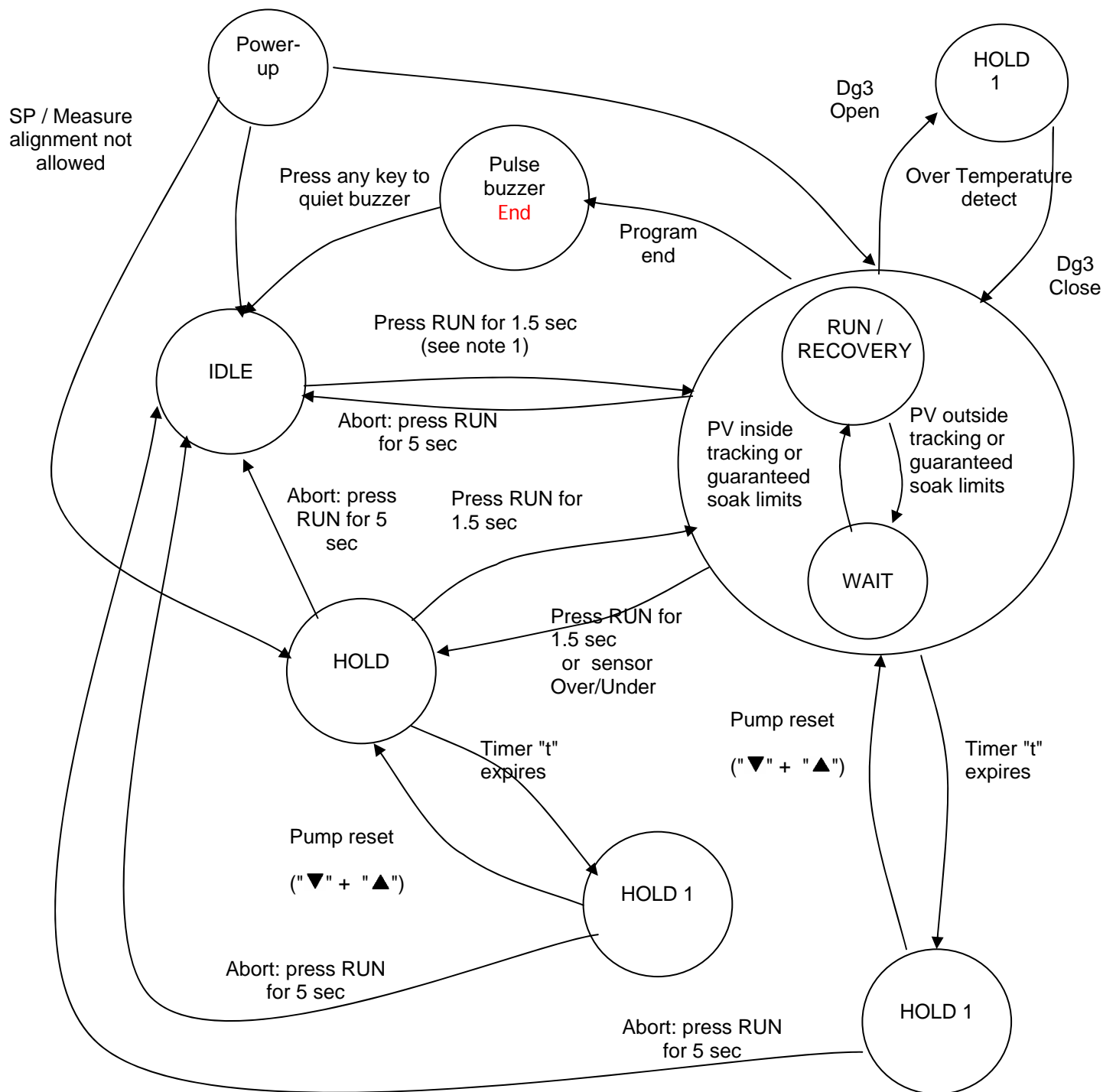
When the K2P is in its normal mode of operation and the programmer status is idle, it is possible to manually change the initial setpoint.

- Press ▼ or ▲ pushbutton for more than 1.5 s to begin modifying the setpoint.
- Continue until the desired setpoint has been reached.
- The new setpoint will be loaded automatically after a 2 second delay.
- By pressing ⌚ or **SET** it is possible to abort the modification..

5 PROGRAMMER STATE DIAGRAM

Programmer states of operation are as follows.

State	K2P Controller	PROGRAM light	Lower Display	Program editing
Idle	Controls at ITSP	OFF	SP, steady	Allowed
Run	Executes the program	ON	SP, steady	Not allowed, read only
Hold	Pauses the program	Blink	Blink SP / HoLd	



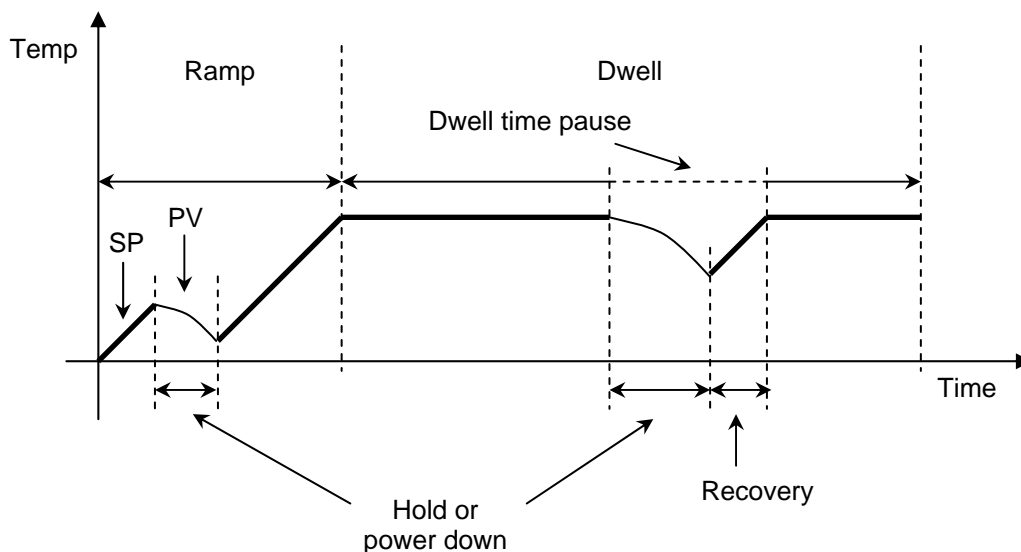
Note that when in the Hold 1 state control is OFF. The program can restart if there temperature sensor has not failed, if the over temperature alarm is inactive, if the control output is enabled and if the pump is energized.

6 OTHER FEATURES OF THE PROGRAMMER

6.1 Servo to Process Value

The servo to process value feature allows a smooth recovery when transitioning from the hold to the run state. The setpoint becomes the current process value and then ramps to the segment set point at a ramp rate determined by the currently running segment.

The basic servo to process value function can be described as follows.



6.2 Program Repetitions

A given program can be selected for a number of repetitions. The number of repetitions can be set from 0, to 9999, to inF (infinite). If one or more repetitions are programmed, the K2P will show the number of the remaining repetitions and the time remaining at the end of the last repetition. When the K2P is programmed with an OFF itSP (initial setpoint) value, the set point will be aligned to the PV value at the first program start and at each repetition. In this case the remaining repetition time is estimated and recalculated at each repetition start.

7 BASIC PROGRAMMER OPERATION

7.1 Running a Program

The programmer always begins from the idle state after a power cycle. To start a program an operator must press the ⏸ button.

During basic operation the following parameters can be viewed.

nPrg

Meaning: number of the selected program

Range: from 1 to 4

Available: always available

Alterable: only when the programmer state is idle

Seg

Meaning: number of the segment in execution
 Range: from 1 to 8
 Available: only when the programmer state is run or hold
 Alterable: never

rt.

Meaning: remaining time to the end of the program
 This value refers to the time remaining to the end of the current execution, regardless the programmed number of executions.

Range:

- from 1 second to 99 min 59 sec
 the upper display shows 12.30 (12 min 30 sec)
 the lower display shows rt.S
- from 1 h 40 min to 99 h 59 min
 the upper display shows 18.45 (18 h 45 min)
 the lower display shows rt.H
- from 100 to 9999 hours
 the upper display shows 125 (125 h)
 the lower display shows rt.H
- over 9999 hours
 the upper display shows %%%
 the lower display shows rt.H

Available: only when the programmer state is run or hold
 Alterable: never

r. rpt

Meaning: remaining repetitions before the end of the program
 Range: - from 0 to 9999 and then inF
 The figure shows the remaining repetitions after the current execution.
 For example 0 means that the program stops at the end of the current execution,
 while inF means that the device is set for endless repetitions.

Available: only when the programmer state is run or hold and the program repetitions parameter is different from 0
 Alterable: never

rpt

Meaning: time remaining to the end of the program, considering also the remaining repetitions

Range:

- from 1 second to 99 min 59 sec
 the upper display shows 12.30 (12 min 30 sec)
 the lower display shows rpt.S
- from 1 h 40 min to 99 h 59 min
 the upper display shows 18.45 (18 h 45 min)
 the lower display shows rpt.H
- from 100 to 9999 hours
 the upper display shows 125 (125 h)
 the lower display shows rpt.H
- over 9999 hours
 the upper display shows %%%
 the lower display shows rpt.H

Available: only when the programmer state is run or hold and the "Program execution repetitions" parameter is different from 0
 Alterable: never

7.2 Editing a Program

Modify the nPrg parameter to select the program to edit. Then access the OP.P level of operation to access the following parameters.

itSp

Meaning: The initial setpoint is the setpoint used by the programmer during the "idle" state.
 Range: OFF, and then from rL (setpoint low limit) to rH (setpoint high limit)
 If set to OFF control outputs will be disabled during the "idle" state. At a program start, the setpoint will be aligned to measure value and then ramp to SP. 1.
 Available: always
 Alterable: only when the programmer state is idle

Sp. 1

Meaning: target setpoint of the first segment
 This parameter is used also to select the segment type:
 - setting it equal to the previous setpoint creates a dwell segment
 - setting it different from the previous setpoint creates a ramp segment
 Range: from rL (setpoint low limit) to rH (setpoint high limit)
 Available: always
 Alterable: only when the programmer state is idle

t. 1 or rr. 1

Meaning: duration or ramp rate of the first segment
 Range: three ranges are available
 - from 1 sec to 99 min 59 sec (the lower display shows t.s. 1)
 - from 1 min to 99 h 59 min (the lower display shows t.H 1)
 - from 0.1 to 3000 engineering units (°C or °F) per minute (the lower display shows rr. 1)
 The third range is available only if the segment is a ramp.
 Use the ▼ or ▲ pushbutton to select the desired value within the current range.
 To change the range, travel to the high or low limit, release and press again the ▼ or ▲ key. The lower display will change to point out the next or previous available range.
 Available: always
 Alterable: only when the programmer state is idle

Sp. 2

Meaning: target set point of the second segment
 This parameter is also used to select the segment type:
 - setting it equal to the previous setpoint creates a dwell segment
 - setting it different from the previous setpoint creates a ramp segment
 Range: End, and then from rL (setpoint low limit) to rH (setpoint high limit)
 The End value, selectable from the second to the seventh set point, is used to end the program before the last segment.
 Available: always
 Alterable: only when the programmer state is idle

Then t. 2 (or rr. 2), Sp. 3, t. 3 (or rr. 3), ... , Sp. 8, t. 8 (or rr. 8) as above.

rpt

Meaning: number of program repetitions of the selected program

Range: - from 0 to 9999 and then inF

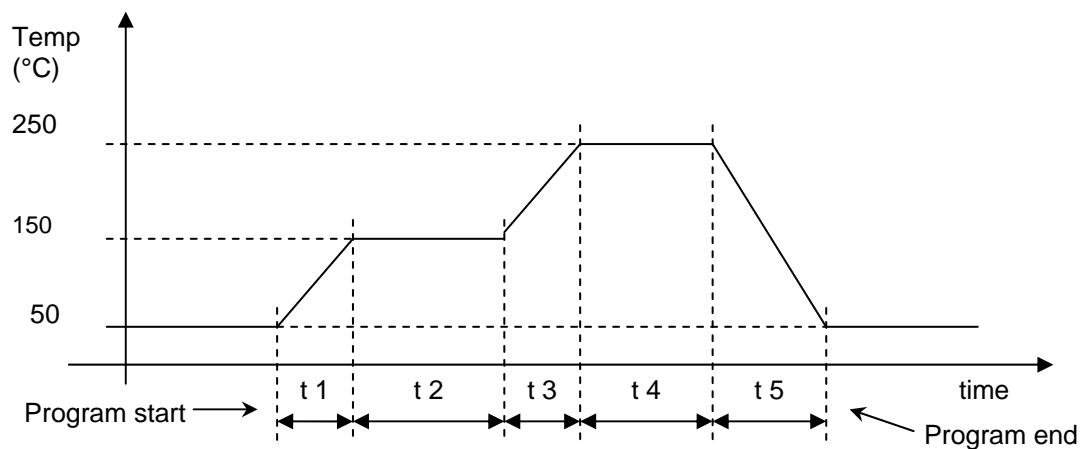
The figure expresses the repetitions after the first execution.

For example, if 2 is selected, the program will be executed 3 times, while inF means that the device is set for endless repetitions.

Available: always

Alterable: only when the programmer state is idle

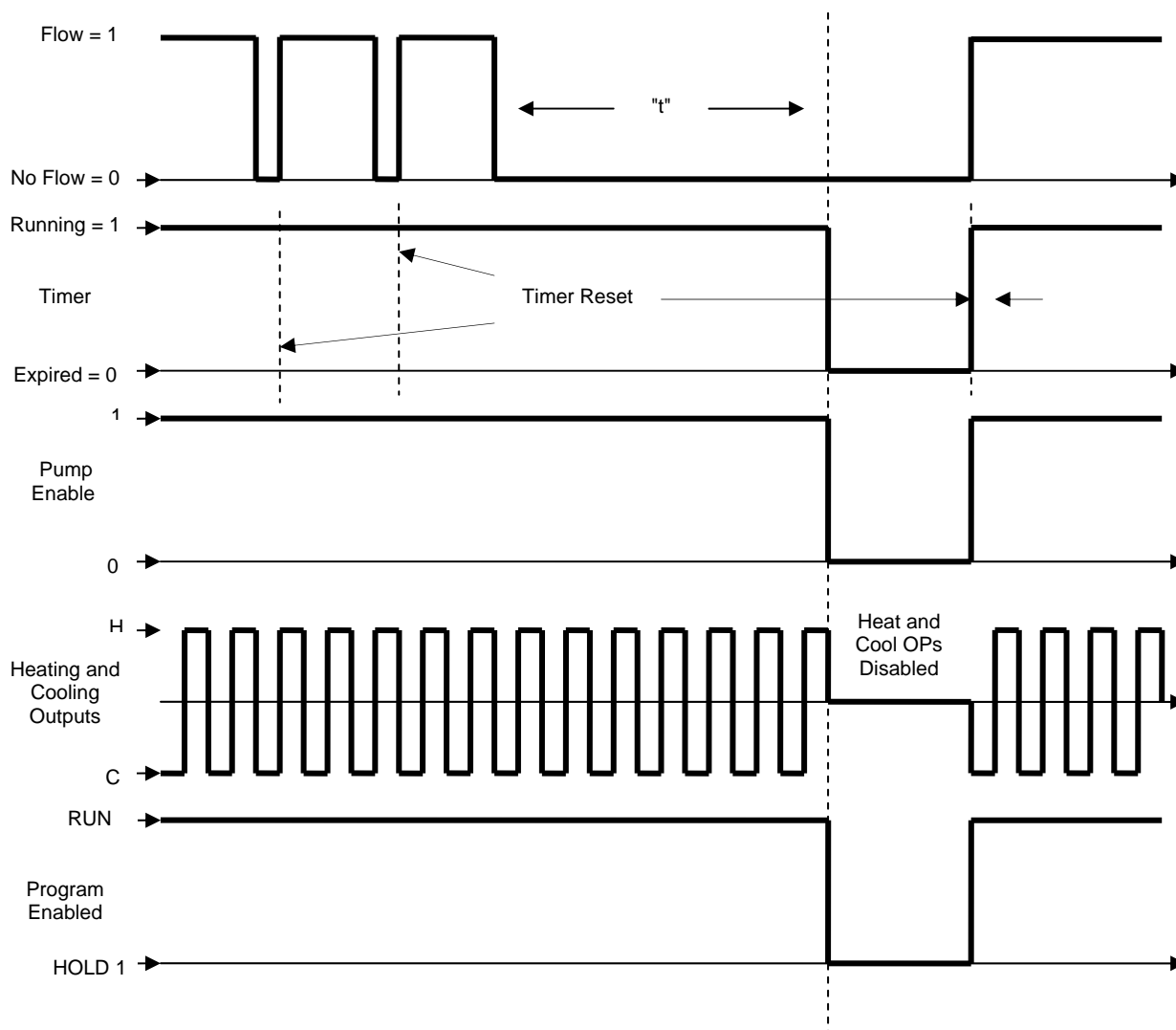
7.3 Program Example



Segment number	Temperature (°C)		Segment		Time (hh.mm)	Segment type
Initial	itSp	50	-	-		Dwell
1	Sp. 1	150	rr. 1	2.0 °C/min	0.50	Ramp up, set-up in gradient
2	Sp. 2	150	tH. 2	3.00 h.mm	3.00	Dwell
3	Sp. 3	250	TH. 3	0.50 h.mm	0.50	Ramp up, set-up in time
4	Sp. 4	250	TH.. 4	3.00 h.mm	3.00	Dwell
5	Sp. 5	50	rr. 5	2.0 °C/min	1.40	Ramp down, set-up in gradient
6	Sp. 6	End		-	-	-
7		-		-	-	-
8		-		-	-	-

8 PUMP RESET LOGIC (LIQUID CHILLER ONLY)

If a low flow condition exists for more than 30 seconds, the pump will turn OFF. If the pump turns OFF while a program is running, the program will be placed in a hold state. In this state, heating and cooling will be OFF. The pump can be reset by pressing ▼ + ▲ at the same time. The program will return the RUN state. If flow established the pump will remain ON. If the low flow condition still exists after 30 seconds, the pump will turn OFF.



9 OVER TEMPERATURE SAFETY

An over temperature safety is provided to protect that equipment. When an over temperature condition occurs the following will occur.

- The OVER TEMP light will be on.
- System heating and cooling will be disabled.
- The pump reset function will be disabled.
- If a temperature program is running, the program will be placed in the "hold" mode.

When the over temperature condition has cleared, normal operation will resume. Heating and cooling will be enabled. It will be possible to reset the pump. The OVER TEMP light will flash until the over temperature condition has been acknowledged using the L.rS parameter.

10 SMART AUTO TUNING

The SMART auto tuning feature allows for the automatic selection of the correct PID parameters. The SMART auto tuning algorithm accomplishes this by changing the control output from full ON to full OFF around a calculated switch point. The disturbance created allows the algorithm to judge the thermal characteristics of the process, and set the PID parameters accordingly.

SMART auto tuning is initiated by scrolling to the OPt parameter and changing the setting to On. While the auto tuning algorithm is running, the K2P will alternatively display the process temperature and Opt on the upper display. The auto tuning procedure can be aborted by scrolling to the OPt and changing the setting to OFF. While the auto tuning is in process, parameters Pb, Ti, Td and rC can only be inspected, not changed.

SMART auto tuning cannot be On when the control outputs are disabled, or when a program is running.

11 FAN CONTROL (AVAILABLE ON SPECIFIC MODELS)

Some TECA liquid chillers and cold plates are fitted with advanced feature that automatically controls the speed of the fan, based on control requirements. When the temperature is close to the setpoint, and fan speed is not needed, it is automatically throttled back to a slower speed. This can greatly reduce the noise generated by this component.

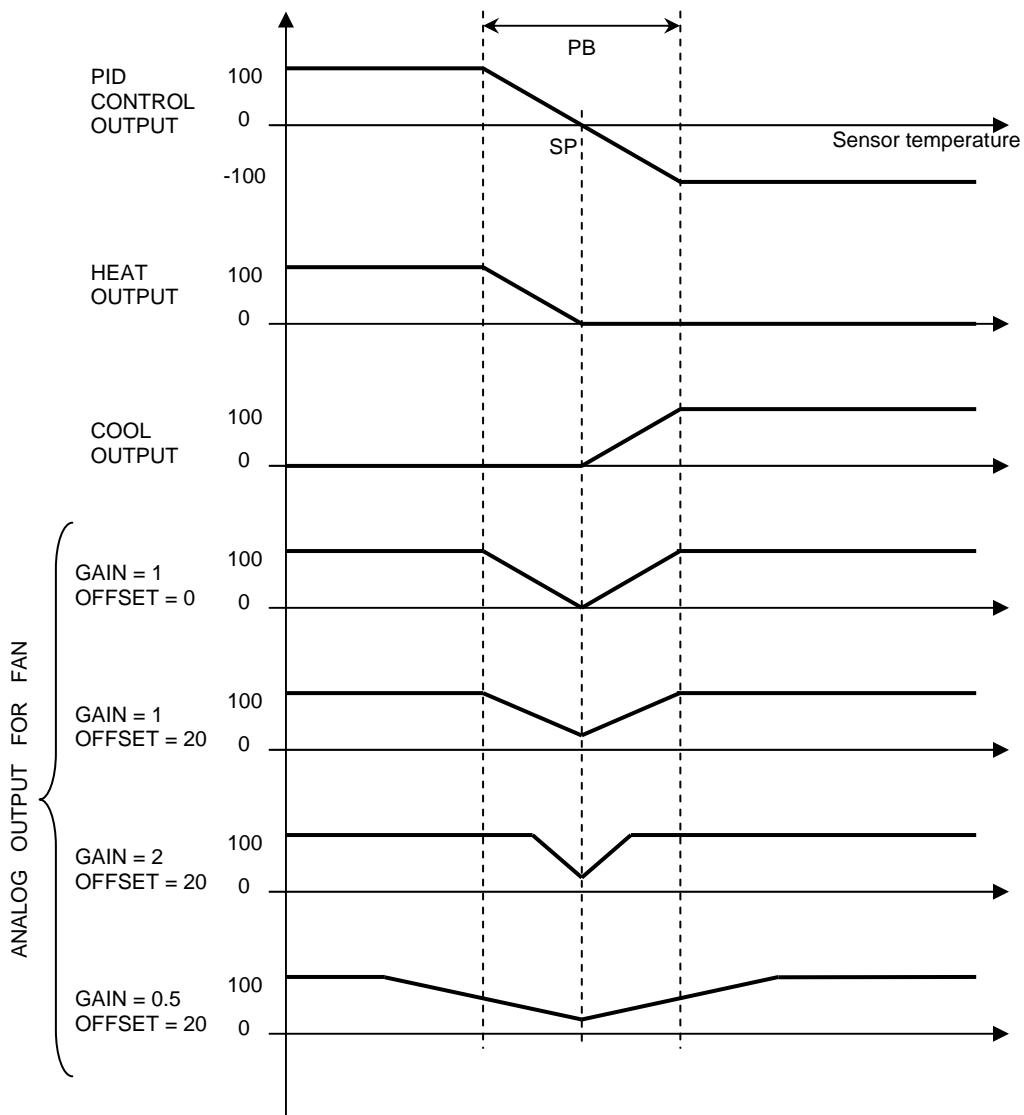
Adjustments associated with the fan speed can be found in the OP.S level of operation.

F.SEL This parameter can be set from 0%, to 100%, to Auto. When set to Auto, the fan speed is automatically controlled by the K2P.

F.OFS Usually, the fan speed should not be reduced below a critical threshold. This offset parameter serves as a low limit for fan speed.

F.Gn This setting changes the gain in the relationship between the absolute value of the PID output and the fan speed.

The diagram below shows the behaviour of the PID control output, the physical heating and cooling outputs, and the fan speed for a fan with different gain and offset settings.



12 DIGITAL COMMUNICATIONS OPTION

An optional and external RS232 digital communication module can be provided for communication to a host system. The protocol (language) is Modbus RTU. From this interface it is possible to monitor all K2P information (temperature, setpoint, alarm status, power output, etc). Operational level parameters can also be modified. Configuration level parameters can only be modified if the K2P has been forced into configuration mode.

A number of software options exist for digitally communication with TECA liquid chillers and cold plates.

- TECA EasyLog
- Eurotherm iTools Engineering Studio
- Eurotherm iTools OPCServer (for connection to Labview™, etc.)

13 TWO-POINT AUTO CALIBRATION

This procedure uses two points to adjust for temperature measurement errors. The following formula is applied.

$$Y = a X + b$$

Y is the corrected and displayed value

X is the value read on the sensor input

Note: The process value shown during calibration is adjusted with stored coefficients (a, b) and has the engineering unit selected at P1

13.1 How to Perform an Auto Calibration

Access the A.CL mode. On entering this mode the K2P indicates if it is using a factory coefficient (Fct) or a coefficient from a previous calibration (CaL). Use ▼ or ▲ keys, to change. Press **SET** to confirm. Note that there will be no display timeout during this procedure.

If Fct is confirmed the K2P restores the factory coefficients (a=1; b=0) and reverts to Op.b mode.

If CaL is confirmed the K2P begins the calibration procedure. The K2P will drive the control outputs to reach the calibration low point P27. The display shows Lo and the process value. The controller waits for temperature stability, which is defined as the process value remaining within a band (P27±P28) for a time interval (P29).

An operator is alerted to the condition being reached by the display changing to C.Lo .

Use the ▼ or ▲ keys to input the adjusted value then press **SET** to enter, and continue the calibration procedure.

As with the low point, high point calibration reaches the calibration high point of P30, and then waits for stability (P30 ± P31 for P32) and prompts the operator with C.Hi once reached. Use the ▼ or ▲ keys to change the value then press **SET** to enter, continue the calibration process.

After calibration of the high point the K2P computes new calibration coefficients. If they are out of range ($0.5 < a < 2$ and $-199.9 < b < 199.9$), error E.183 is shown and new coefficients are discarded. Pressing **SET** will abort the calibration procedure and return the K2P to the Op.b mode. If the coefficients are acceptable, the controller enables the end parameter, presenting the following choices.

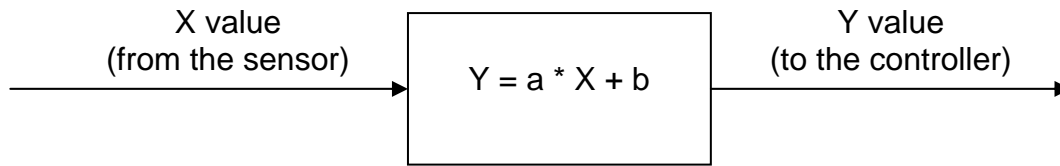
saV = To store the new coefficients and return in Op.b operating mode

Abr = To abort calibration and return in Op.b operating mode. The calibration coefficients will not be altered.

Note that the calibration procedure can be aborted at any time by selecting a different operating mode.

14 MANUAL CALIBRATION OFFSET

The K2P allows for a manual change to without having to execute a specific procedure.



The two calibration coefficients ("a" for slope and "b" for offset) can be manually entered using the two configuration parameters.

To remove any adjustments set the "a" coefficient to 1 and the "b" coefficient to 0, This will cause the Y value to be always equal to the X value.

14.1 How to Perform a Manual Offset Calibration

In many cases, calibration can be corrected with a simple offset adjustment. If this is the case, set the "a" coefficient to 1 and the "b" coefficient to the desired difference between the Y and the X values. This offset will be applied to the whole input range.

Example 1:

X_0 value: 20.3 °C Y_0 value: 20.7 °C Set "b" to $Y_0 - X_0$ ($20.7 - 20.3$) = 0.4 °C

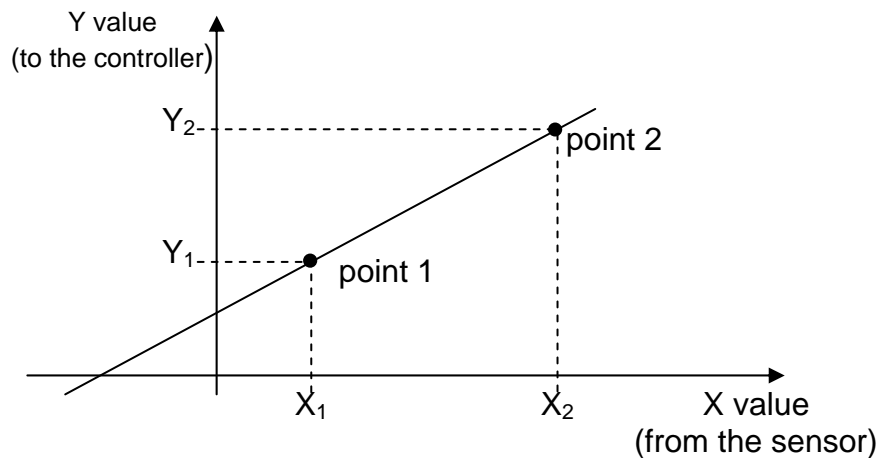
Example 2:

X_0 value: 37.3 °C Y_0 value: 36.5 °C Set "b" to $Y_0 - X_0$ ($36.5 - 37.3$) = - 0.8 °C

14.2 How to Apply and Offset and a Slope Adjustment

To adjust both offset and gain, follow the procedure below.

- Clear any previous adjustment setting the "b" coefficient to 0 and the "a" coefficient to 1
- Select two points within the measurement range. In these points the error will be zeroed by the offset and slope adjustment procedure. Mark the co-ordinates of the two points.



Compute the "a" and "b" coefficients using the below formulas

$$"a" = (Y_2 - Y_1) / (X_2 - X_1)$$

$$"b" = Y_1 - X_1 * (Y_2 - Y_1) / (X_2 - X_1)$$

Or use the table below.

Point 1	X1	20	20	0	20,1
	Y1	20	25	0	18,5
Point 2	X2	90	90	70	80,4
	Y2	90	95	77	85,3
Coefficient	"b"	0,0	5,0	0,0	-3,8
	"a"	1,000	1,000	1,100	1,108
Comments		No adjustment	Offset adjustment	Slope adjustment	Offset and slope adjustment

15 SIGNAL CALIBRATION

15.1 Input Calibration

Signal input calibration can be accomplished once the K2P is placed in the calibration mode; I.CL.

The voltage and resistance input steps are logically divided in groups of two parameters each (initial and final scale) followed by a calibration check in which the input is measured and displayed in counts (30000 at fsv).

During the calibration checking procedure the upper display shows the identification code (t. P.) on the left 2 digits, while the lower display shows the next 3 digits of the value measured.

For reference junction calibration the set and the check are in tenths of degrees C.

Use ▲ or ▼ to select On or OFF or to set ambient temperature for reference junction calibration.

To enable calibration and go to the next parameter press **SET** when On or **SET** when the temperature is displayed. To go to the next parameter without calibration push **SET** when OFF is displayed.

Press ⌚ to scroll back without calibration. There is no display timeout during input calibration

If an error on input signal is found during calibration error E.182 is shown and the actual stored calibration will not be altered.

15.2 Fan Output Calibration

Before beginning this calibration procedure, select the appropriate output type.

Output Type	Jumper 1-2	Jumper 3-4	Jumper 5-6	Jumper 7-8	Jumper 9-10
Current	Open	Open	Open	Open	Open
Voltage	Close	Close	Close	Close	Close

Low scale calibration (AL or VL) ...

Set by using ▲ and ▼ buttons, a value (from 0 up to 400) to be read on terminal 32(+) and 33(-) for zero ($\pm 10 \mu\text{A}$ for current or $0 \pm 5 \text{ mV}$ for voltage).

Full scale calibration (AH or VH) ...

Set by using ▲ and ▼ buttons, a value (from 2600 up to 3000) to read on terminal 32(+) and 33(-) for span ($\pm 10 \mu\text{A}$ [20mA] or $\pm 5 \text{ mV}$ [10V]).

Calibration check (A. or V.) ...

Set by using ▲ and ▼ buttons, a value (from -200 up to 10200) to read on terminal 32(+) and 33(-) a value corresponding to ...

$$\text{Out} = \text{Displayed value}/10000 * \text{Output full scale} + 0.1\%$$

Note: A value > 10000 will be shown with a ← on the MSD

15.3 Digital Input Test

The parameter d.in. is used to test the status of the digital inputs. Status will be as follows.

- 1 if digital input 1 is closed
- 2 if digital input 2 is closed
- 4 if digital input 3 is closed
- 7 if all 3 digital inputs are closed

15.4 Calibration Sequence and Parameter List

					DESCRIPTION	
				tL		
				tH	VOLTAGE INPUT MAXIMUM VALUE (60 mV)	
				t.	VOLTAGE INPUT CALIBRATION CHECK	
				rJ	REFERENCE JUNCTION CALIBRATION	
				rj.	REFERENCE JUNCTION CAL. CHECK (IN 1/10 °C)	
				PL	RESISTANCE INPUT MINIMUM VALUE (0 OHM)	
				PH	RESISTANCE INPUT MAXIMUM VALUE (375 OHM)	
				P.	RESISTANCE INPUT CALIBRATION CHECK	
				aL	CURRENT OUTPUT LOW SCALE CALIBRATION	
				aH	CURRENT OUTPUT HIGH SCALE CALIBRATION	
				A.	CURRENT OUTPUT CALIBRATION CHECK	
				VL	VOLTAGE OUTPUT LOW SCALE CALIBRATION	
				VH	VOLTAGE OUTPUT HIGH SCALE CALIBRATION	
				V.	VOLTAGE OUTPUT CALIBRATION CHECK	
				D.in.	DIGITAL INPUT TEST	

8.8.8.8. 8.8.8.8.	Max load (the display and the LED's are lit, the relays are energised)
· · · · · · · ·	Min load (the display and the LED's are off, the relays are de-energised)

Note: The visualisation in counts of a resistance input (RTD) is not linear. Check the system in accordance with the following table.

OHM	COUNTS
0	0
175	14213
275	22166
375	30000

16 DEFAULT DATA LOADING

16.1 Default Data Loading Procedure

The K2P features two tables of default parameters. Default table 1 is used for °C. Default table 2 is used for °F. The selection of default table 1 or default table 2 is made while in the configuration or calibration mode (CnF or I.CL).

1. Press the ▲ and ▼ buttons together while CnF or I.CL is displayed. The K2P display will change to ...

dL.OF

- 2a. If from the CnF mode, press the ▲ or ▼ button to select between table 1 or table 2 default parameters. The K2P display will show ...

dL. 1

or

dL. 2

- 2b. If from the I.CL mode, press the ▲ or ▼ buttons to enable default parameter loading. The K2P display will show ...

dL.On

3. Press the **SET** button. The K2P display will show ...

LOAd

The default parameter loading procedure has now been initiated. After about 1 second the loading procedure is terminated and the K2P reverts to the display seen in step 1 above.

Note that if this procedure is executed from the configuration mode (CnF), default values for operational and programmer parameters are also loaded.

16.2 Default Data for Configuration Level Parameters - CnF

Parameter Mnemonic	Description	Table 1 Default Value (°C)	Table 2 Default Value (°F)	Units
P1	RTD INPUT TABLE	7	15	
P2	LOW SCALE RANGE OF SENSORS	-20	-4	degrees
P3	HIGH SCALE RANGE OF SENSORS	80	176	degrees
P4	OUTPUT 1 CONTROL ACTION (HEATING)	rEV	rEV	
P5	OUTPUT 3 FUNCTION (COOLING)	5	5	
P6	COOLING TYPE	Alr	Air	
P7	ALARM 1 ACTION	rEV	rEV	
P8	ALARM 1 STANDBY FUNCTION	OFF	OFF	
P11	AUTO-RANGING DISPLAY	On	On	
P12	FILTER SENSOR VALUES	On	On	degrees
P13	CONTROL OUTPUT MAX RATE OF RISE	InF	InF	%
P15	SMART FUNCTION	2	2	
P16	MAX VALUE OF THE PROP BAND	100	100	%
P17	MIN VALUE OF THE PROP BAND (ONE OP)	1	1	%
P18	MIN VALUE OF THE PROP BAND (COOL/HEAT OPS)	1.5	1.5	%
P19	RCG CALCULATION WHEN IN SMART	OFF	OFF	
P20	MIN VALUE OF THE INTEGRAL CALC. BY SMART	0.01	0.01	m.ss
P21	INHIBIT RESET BAND EXTENSION	10	10	%
P27	LOW AUTO-CAL POINT	-40	-40	degrees
P28	LOW AUTO-CAL STABILITY BAND	2	4	degrees
P29	LOW AUTO-CAL STABILITY TIME	1.00	1.00	mm.ss
P30	HIGH AUTO-CAL POINT	140	284	degrees
P31	HIGH AUTO-CAL STABILITY BAND	2	4	degrees
P32	HIGH AUTO-CAL STABILITY TIME	1.00	1.00	mm.ss
P33	OP.S PASSWORD	1	1	
P34	AC.L PASSWORD	415	415	
P35	CONF PASSWORD	415	415	
P36	I.CL PASSWORD	415	415	
P37	OP.P PASSWORD	2	2	
P41	NUMBER OF PROGRAMS AND SEGMENTS	4-8	4-8	
P42	START-UP FEATURE	0	0	
P43	SERVO TO PV FEATURE	1	1	
P44	RAMP TRACKING LOW LIMIT	Off	Off	
P45	RAMP TRACKING LIMIT	Off	Off	
P46	GUARANTEED SOAK LIMIT	Off	Off	
P47	DELTA TEMPERATURE (FOR TUNE START UP)	4.0	7.2	degrees
P48	SWP_LO_LIM (IN TUNE)	40.0	104.0	degrees
P49	SWP_HI.LIM (IN TUNE)	180.0	356.0	degrees
P50	MIN PEAK (IN TUN2)	0.2	0.4	degrees

P51	SYSTEM CALIBRATION – B COEFFICIENT	0.0	0.0
P52	SYSTEM CALIBRATION – A COEFFICIENT	1.000	1.000
P53	ANALOG OUTPUT SELECTION	2	2
P85	INCREASE/DECREASE ALGORITHM	1	1
P97	COMMUNICATION ADDRESS	1	1
P98	COMMUNICATION BAUD RATE	9.60	9.60
P99	COMMUNICATION WORD SIZE	8	8

16.3 Default Data for Programmer Level Parameters – OP.P

Parameter Mnemonic	Description	Table 1 Default Value (°C)	Table 2 Default Value (°F)	Units
ITSP	INITIAL SET POINT	20	68	degrees
SP.1	TARGET SP 1	70	158	degrees
T.1	DURATION OF SEGMENT 1	30.00	30.00	mm.ss
SP.2	TARGET SP 2	70	158	degrees
T.2	DURATION OF SEGMENT 2	30.00	30.00	mm.ss
SP.3	TARGET SP 3	120	248	degrees
T.3	DURATION OF SEGMENT 3	30.00	30.00	mm.ss
SP.4	TARGET SP 4	120	248	degrees
T.4	DURATION OF SEGMENT 4	30.00	30.00	mm.ss
SP.5	TARGET SP 5	170	338	degrees
T.5	DURATION OF SEGMENT 5	30.00	30.00	mm.ss
SP.6	TARGET SP 6	170	338	degrees
T.6	DURATION OF SEGMENT 6	30.00	30.00	mm.ss
RPT	PROGRAM EXECUTION REPETITIONS)	0	0	

16.4 Default Data for Set Up Level Parameters – OP.S

Parameter Mnemonic	Description	Table 1 Default Value (°C)	Table 2 Default Value (°F)	Units
nPrG	SELECTED PROGRAM	1	1	
n.rS	MANUAL RESET OF ALARM CONDITION	OFF	Off	
OPt	CONTROL OPTIMIZATION	NA	NA	
t	TIMER VALUE	30	30	seconds
AL.1	ALARM 1 THRESHOLD	100	212	degrees
HS.1	ALARM 1 HYSTERESIS	0.1	0.1	%
Pb	PROPORTIONAL BAND	4.0	4.0	%
HS	HYSTERESIS	0.5	0.5	%
ti	INTEGRAL TIME	4.00	4.00	mm.ss
tD	DERIVATIVE TIME	1.00	1.00	mm.ss
IP	INTEGRAL PRE-LOAD	10	10	%

C	OP1 CYCLE TIME	1	1	seconds
C2	OP2 CYCLE TIME	1	1	seconds
rC	RELATIVE COOL GAIN	1.00	1.00	
OLP	DEADBAND BETWEEN HEATING AND COOLING	0	0	%
rL	SETPOINT LOW LIMIT	-20	-4	degrees
rH	SETPOINT HIGH LIMIT	80	176	degrees
OLH	OUTPUT LIMIT	100	100	%
F.SEL	FAN OUTPUT SELECTION	Auto	Auto	
F.Gn	GAIN FOR THE FAN OUTPUT	1.00	1.00	
F.OFS	OFFSET FOR THE FAN OUTPUT	20	20	%

Note that the loading of default data also clears the calibration values and restore the factory calibration

17 FAULT CODES

The operational parameters of the K2P are checked at start up. If an error is found, the K2P shows E. followed by numerical error code. The K2P will then rest after a timeout of 2 seconds (4 seconds if serial communications is active).

The following is a list of possible errors.

CODE	DESCRIPTION
xx	Error on configuration parameter. The two digits will show the number of the wrong parameter
161	Error on RTD input calibration value
165	Error on voltage input calibration value
167	Error on reference junction measure calibration value
168	Error on current Analogue output calibration value
169	Error on voltage Analogue output calibration value
170	Error on operative mode parameters

To correct a parameter related error, enter the configuration mode (CnF), and then load the appropriate default parameter table. This will correct an error associated with wrong parameter. If an calibration error is detected, switch to the configuration mode (CnF), and then the calibration mode (I.CL), and to perform a proper calibration.

During normal operation other errors can present themselves as follows.

CODE	DESCRIPTION
150	Error during data storing in EEprom. The device resets after a time-out of 2 s.
180	Error on auto-zero measuring
181	Error on cold junction measuring
182	Error during on input signal during calibration
183	Error during on Auto (2Pt) calibration

Other events or errors are detected and signalled with a code on most significant digit of the display. The device resets after a time-out of 2 s.

CODE	DESCRIPTION
4.	Error on EEprom control signals
5.	Wrong program sequence during EEprom access
6.	Time-out from watchdog or operating mode switch
9.	Connection/disconnection of Configuration Port Interface.