

# 902-904

SERIES



EUROTHERM  
CONTROLS

## Programmer/Controllers



Product  
data

# 902 Temperature Controller

## 902-904 Programmer Controller

The 902, 903 and 904 are a range of advanced controller/programmers which combine simplicity of operation with clear concise display of programme state.

The 902S is a high accuracy temperature controller designed to meet the exacting requirements of today's industry. The combination of features available has been carefully selected to allow the 902 to be specially adapted to individual process requirements. All operational functions are configurable from selections resident in the instrument software and all hardware options are made with the use of plug-in modules.

### **Programmer**

The 902P provides the facility of storing a single programme, of 16 segments (8 Ramps and 8 Dwells) for use where only limited changes are made to a basic process recipe.

The 903P provides storage for 4 programmes of the same size (16 segments) and the 904P can store up to 15 such programmes. This allows the system builder to select a programmer tailored to the needs of the process and the number of recipe changes anticipated.

The 902P/903P/904P range of programmers is designed to be usable in a wide range of industries in vastly varying environments. All include the ability to drive program event outputs.

**Operator interface** - The innovative use of the front panel keys of the controller has made operation and configuration easy to use. Separate scroll lists for the operator and commissioning engineer highlight only the information the user requires. The display used is a high brightness, high contrast, vacuum fluorescent indicator panel which is clearly viewable even in high ambient light. Also the front panel is sealed to IP65 so that operation in environments where large amounts of dust or moisture are present is easily achieved.

**Inputs/outputs** - Four channels can be configured with a number of different output types. This includes alarm relay outputs, program event outputs, parameter retransmission outputs, remote inputs and valve position indicator in addition to PID control outputs.

Three separate digital inputs are fitted as standard and can be configured to activate a particular function when external contacts are closed.

**Communications** - Digital communications are available and include MODBUS® and JBUS® support. Analogue communications can be installed as a monitoring and control access for SCADA systems.

## TECHNICAL SPECIFICATION

<b>Input</b>		
General	Input range	-10 to +100mV or -1 to +10V
	Minimum span	5.0mV
	Maximum zero offset	20% of span
	Common mode rejection	140 db
	Series mode rejection	60 db
	Input impedance	> 1M ohm resistance (includes 0.5µA open circuit sensor current)
	Resolution	14 bit for all ranges (20 000 counts)
	Sample period	125 milliseconds
	Linearity error	Better than $\pm 0.1\%$ of input span
	Calibration error	Better than $\pm 0.25\%$ of span
Thermocouple	Standards	British BS4937 (1973) German DIN 43710 US ASTM E230 (1972)
	Linearisation	Better than $\pm 0.2^{\circ}\text{C}$ for standard thermocouple
	Source resistance error	0.5µV/ohm
	CJC	Internal or $0^{\circ}\text{C}$ , $45^{\circ}\text{C}$ , $50^{\circ}\text{C}$ external
RTD	Internal CJC error	Typically $0.04^{\circ}\text{C}/^{\circ}\text{C}$ ambient change (30:1)
	Standards	British BS1904 German DIN43760 PT 100
	Linearisation	Better than $\pm 0.05^{\circ}\text{C}$
	Connection	3 wire automatic lead compensation
	Bulb current	0.2mA
Volts	Lead compensation error	With up to 22 ohms in all three leads no change in display indication
	Range	-1.0 to +10.0V
	Input impedance	> 10M ohms
Current	Range	0-20mA or 4-20mA. 5 ohm burden resistors are mounted on the rear terminals

## Outputs (2)

	Relay	Maximum of 264V 2A ac into resistive load, with spark suppression
		Minimum switched voltage 30V rms or dc.
		On/off or time proportional
	Triac	Leakage current through spark suppression network = 2mA at 264V ac 50Hz
		Maximum of 264V 1A ac into resistive load
		Minimum voltage 85V rms
	Isolated logic	On/off or time proportional
		Leakage current through spark suppression = 2mA at 264V ac 50Hz
		20mA at 15V min. On/off or time proportional
		0.3 to 100 seconds at 50% power (relay 10 to 100 seconds)
Outputs general	Power feedback	Normally fitted to any of the above when using channel 1 as heat
	Analogue	Isolated dc 0-10V at 20mA max or 0-20mA at 12 volts. Offsets provided as software option i.e. 4-20mA. Output impedance on voltage ranges is < 1.1 ohms (including connectors)
	Isolation	Both output 1 and 2 are isolated from each other and the remainder of the instrument
	Reverse/direct	Time proportioning and analogue in channel 1 (heat) can be configured either reverse or direct. Channel 2 (cool), if time proportioning or analogue, is configured as acting opposite to output 1.
	Non-Linear	Channel 2 (cool), when not on/off, can be configured as either linear or non-linear characteristic.
		The non linear characteristic is ideal for controlling water which may flash off to steam.

## Alarms (2)

	Relays	Maximum loading 264V 2A into resistive load, with spark suppression
		Minimum switching voltage 30 volt rms or dc
		Leakage current through spark suppression = 2mA at 264V ac 50Hz
	Hysteresis	0.1-10.0% variable, in 0.1% resolution
	Type	Full scale high and low, deviation high and low; deviation band
	Range	Alarms may be set over the complete instrument range

## Analogue communications

	Isolation	The analogue communication link and all other inputs and outputs are isolated as defined under 'Electrical Safety' in the Environmental section
Range input	Voltage	Max 10V range lying between -5.0 to +10.0V
		Input impedance >75k ohms
	Current	0-20mA or 4-20mA
		Remote impedance 50 ohms mounted on rear terminals
Retransmission	Configuration	Remote setpoint, remote trim, heat or cool output power limit, motor valve position
	Resolution	12 bit
	Accuracy	Better than 0.5%
	Sample period	625 milliseconds
	Potentiometer supply	10V 10mA max. potentiometer supply available (0.5 for motor valve position)
	Voltage	Max. 10V range lying between -5V to +10V
		Internal impedance <0.1 ohms (including connectors)
		Load impedance must be >500 ohms
	Current	0-20mA or 4-20mA at 12V min
	Configuration	Setpoint, measured value, error, or output power
	Resolution	12 bit
	Accuracy	Better than 0.5%

## Digital communications

Isolation	The digital communication link and all other inputs and outputs are isolated as defined under General Electrical Safety
Protocol	Variable speed link. ASCII format RS232 or RS422/485 protocol ANSI X 3.28 (1976) at variable baud rates of 300, 600, 1200, 2400, 3600, 4800 and 9600, alternatively Modbus ® RTD or 2.5 A4 J-Bus® RTD at variable rates of 600, 1200, 2400, 3600, 4800 and 9600.
Format	Start bit - seven data bits - even parity bit one stop bit (ANSI protocol) Start bit - eight data bits - one stop bit (Modbus® or J-Bus® protocol)
Address	Two digits

## Logic inputs (3) Standard for all instruments

Isolation	Logic inputs are not isolated from one another or the process variable input Logic inputs are isolated from all other inputs and outputs as defined under General Electrical Safety
Drive	Volt free contact operation. The input is non-active in the rest state, active when closed with an impedance of <100ohms
Voltage level limits	For logic active level must be less than 0.7V For logic input non-active the input level must be greater than 4V
Configuration (one only per logic input)	Input current 0.5mA maximum Auto/Manual, Remote/Local, SP2, Dual PID, Adaptive Tune, Self Tune, Remote Up/Down Key, Parameter Modification Security, Keylock, Run, Hold, Run/Hold, Hold/Run

## Programming (902P, 903P,904P)

Timing accuracy	Better than (0.5sec ±0.1% of duration) per segment			
Number of programs	One (902P), four (903P), fifteen (904P)			
Program length	Maximum of 8 ramps + 8 dwells per program:	ramp	1 -	6000 units/min(hr)
			0.1 -	6000.0 units/min(hr)
		Dwell	0.1 -	999.9 mins(hrs)
Program cycles	Maximum of 999			
Holdback	Deviation low, high or band which can be configured for whole program			
Run/Hold	Operation by single push button			
Programme controlled outputs (3)	One or both alarm outputs plus O/P2 can be driven from segments of the program			

## Tuning

Self-tune (ST)	A single shot approach which calculates the three term parameters after a defined period
Adaptive tune (AT)	A continuous appraisal and redefining of three term parameters
Dual PID	An alternative set of PID parameters may be selected by digital input

## General

Front panel	Upper display	5 x 7 segment 12mm high fluorescent indicator. Display range + 19999 to -9999
	Resolution	±1 least significant digit
	Lower display	5 x 7 segment 5mm high fluorescent indicator
	Resolution	±1 least significant digit
Modes of operation	Auto/Manual	Bumpless procedure auto to manual to auto Manual output variable from 0 to 100% for heat only outputs and from -100 to +100% for heat/cool outputs
	Local/Remote	A selection of: 1) Full scale local or full scale remote setpoint or 2) Add an external trim to full scale local setpoint or 3) Add an external full scale setpoint to local trim
	Dual PID	The instrument may be configured so that separate values of Pb, ti td and rES are installed when setpoint 2 (SP2) is selected or by use of a digital input
Commissioning parameters		
	Integral time (ti)	Off, 1 to 9999 secs or 1 to 150 mins
	*Proportional band (Pb)	0.1 to 999.9% based on the range 'display max' - 'display min' or 1 to span in Engineering Units
	Heat-Cool deadband (db)	-5 to +5% of input range
	Manual reset (rES)	0 to 100% or -100 or 100% (automatically selected if integral time is 'off')
	Derivative time (td)	Off, 0.1 to 999.9 secs or 0.1 to 150 mins
	Cut-back (cbL/cbH)	Off, 0.1 to display range for both low and high
	Heat output limit (HL)	0 to 100%
	Cool output limit (CL)	0 to -100%
	Heat cycle time (Hc)	0.3 to 100 seconds (10 to 100 secs for relay)
	Cool cycle time (Cc)	0.3 to 100 seconds (10 to 100 secs for relay)
	Relative cool gain (Cr)	0.1 to 10.0 of proportional band (PB)
	Setpoint rate limit (SPr)	1 to 60000 units per min or hour with decimal position as display e.g. XX.XXX display gives 0.001 to 19.999
	Emmissivity (PE)	0.01 to 1.00
	Sensor break power (SbP)	0 to 100% (heat only) or -100% to 100% (heat/cool) or open/closed (VP) Activated by 10% over or under range
	** Travel time (tt)	10-1000 secs
	** Pot min limit PL	0-100%
	** Pot max limit Ph	0-100%
	* For on/off outputs proportional band is replaced by Deadband. ** Parameters for VP output only	

## Environmental

The 902, 903 and 904 are compliant with 'Low Voltage Equipment Directive' and EMC Directive when installation instructions are followed

Supply voltage	85-264V ac, 17-40V ac or 20-40V dc
Supply frequency	48-62Hz
Power consumption	8.5 watts
Supply fuse	500mA (anti-surge)
EMC	Emissions: EN50081-2 (94) Immunity: Follows the general requirements of EN50082-2 (95). Radiated fields may cause PV to deviate by 1% of span. see Technical Construction File for details
Relative humidity	5-90% non-condensing
Operating temperature	0 to 55°C
Storage temperature	-40 to 70°C
Altitude	Not for use above 2000m
Atmosphere	Not suitable for use in explosive or corrosive atmospheres without further protection
Panel sealing	The instrument fascia meets IP65 when mounted into a cut-out as defined
Customer connections	Screw terminals with terminal cover
Ambient temperature coefficient	Typically ±50ppm/°C of instrument input span. Excluding CJC on the thermocouple instruments
Warm-up drift	< ±0.5% of display range (from 1 to 30 mins)
Supply voltage coefficient	< ±0.1% of display range over full supply voltage range
Mounting	Plug-in with panel mounting sleeve. Panel cut-out to DIN 43710
Weight	1.2Kg (2.6lbs) including sleeve and clamp
Rear cover	Gives electrical safety to rear terminals
Electrical safety	EN61010(95) Installation category II, pollution degree 2
Installation category	Voltage transients on any mains power connected to the instrument must not exceed 2.5kV
Pollution degree 2	Conductive pollution must be excluded from the cabinet in which the instrument is mounted

## ORDERING CODE

### 902/904 HARDWARE

Basic Product	Input	Channel 1	Channel 2	Channel 3	Channel 4	Supply Voltage	Digital Comms	Analogue Comms or VP	Language
<b>Basic Product</b>	<b>Code</b>		<b>Channel 4</b>		<b>Code</b>		<b>Reccommended</b>		
Basic Controller	902S		Relay (Alarm 2, Prog)		SRE		<b>Lin Type</b>	<b>Range</b>	<b>Code</b>
1 Programmer/Controller	902P		Logic (Alarm 2)		SLO		Iron Constantan J	0C to 600C	01
4 Programmer/Controller	903P		Remote I/P (1)		MV		Fe/Const (DIN) L	0C to 600C	02
15 Programmer/Controller	904P		Remote I/P Current (1)		MC		Ni Cr/Ni AL K	-250C to 1200C	03
<b>Input</b>			<b>Supply Voltage</b>				Ci/Con T	-250C to 400C	04
T/C, RTD, Volts, mV	IS		85V to 264V		VH		Pt13% Rh/Pt R	0C to 1600C	05
Current	IC		24V ac/dc		VL		Pt10% Rh/Pt S	0C to 1600C	06
Pyrometer	IP		<b>Digital Comms</b>				Pt30% Rh/Pt6% Rh B	200C to 1820C	08
<b>Channel 1</b>			None		XN		W/W26%/Re	0C to 2300C	09
Relay	HRE		RS232		XS		W5%Re/W26%	10C to 2300C	11
Logic	HLO		RS422/485		XM		Ni Cr/Con E	0C to 780C	12
Triac	HTR		<b>Analogue Comms or VP Pot.</b>				Pt10%Rh/Pt40%Rh	200C to 1800C	23
DC Current	HDC		<b>Analogue</b>				W5%Re/W26%Re C	0C to 2300C	24
DC Volts	HDV		Input Type (3)				Pt20%Rh/Pt40%Rh	0C to 2000C	25
<b>Channel 2</b>			Voltage		QV		Platinel 11	0C to 1200C	28
Relay (Cool, Alarm 1, Prog)	CRE		Current		QC		W/W26%Re	0C to 2200C	29
Logic (Cool, Alarm 1)	CLO		Output Type (3)				Ni/Ni18%Molybednum	0C to 1100C	33
Triac (Cool)	CTR		Voltage		ZV		W3%Re/25%Re D	0C to 2400C	35
DC Volts (Cool)	CDV		Current		ZC		W/Re5%W/Re26%	0C to 2000C	38
DC Current (Cool)	CDC		<b>VP. Pot. (4)</b>		QP		Nicrosil/Nisil N	0C to 1300C	45
Remote I/P Volts (1)	EV		<b>Language</b>				Pt100 ohm at 0°C	-200C to 800C	70
Remote I/P Current (1)	EC		English		LE		Pyrometer (Q004 Land)	800C to 1550C	48
Retrans Volts (2)	RV		French		LF		Pyrometer (Q003 Land)	700C to 1400C	51
Retrans Current (2)	RC						Pyrometer RO 26	100C to 500C	54
<b>Channel 3</b>							Pyrometer IVDI	1000C to 2500C	61
Relay (Alarm 1, Prog)	ARE						Pyrometer DTI	1200C to 2500C	62
Logic (Alarm 1)	ALO						Pyrometer RO 23	800C to 1700C	64
Retrans Volts (2)	TV						Pyrometer FP/GP 10	500C to 900C	82
Retrans Current (2)	TC						Pyrometer FP/GP 11	700C to 1300C	83
							Pyrometer FP/GP 12	1000C to 1850C	84
							Pyrometer FP/GP 20	400C to 750C	85
							Pyrometer FP/GP 21	500C to 1100C	86
							Linear	-9999 to 19999	00*
							Square Root	-9999 to 19999	92*

\* For linear inputs sensitivity must not be less than 5µ Vs/digit

#### Notes:

- (1) Only one Remote Input option may be specified.
- (2) Only one Retransmission Output may be specified.
- (3) If Analogue Comms is specified, Remote Input and Retranmission Output are not available in channels 2, 3, or 4.  
A 10V supply is available for Pot. excitation.
- (4) If VP Pot. Input is specified then a Remote Input is not possible.
- (5) Maximum of 2 alarms can be specified in either channels 2, 3, 4
- (6) In Programmer/Controller. Up to 3 Prog Drive Relays can be fitted in channels 2, 3, 4

#### Example:

Hardware -

**902S/IS/HRE/CLO/ARE/SRE/VH/XM/QV/ZC/LE**

Configuration -

**IT/HAP/COL/AA/SA/XA/QAA/ZCF/0/600/C/01**

T/C Type J 0 to 600°C - Reverse PID Heat relay -

ON/OFF Cool Logic - Two FSH alarm relays -

Dig comms EI-BISYNC - Remote Setpoint input 0-5V

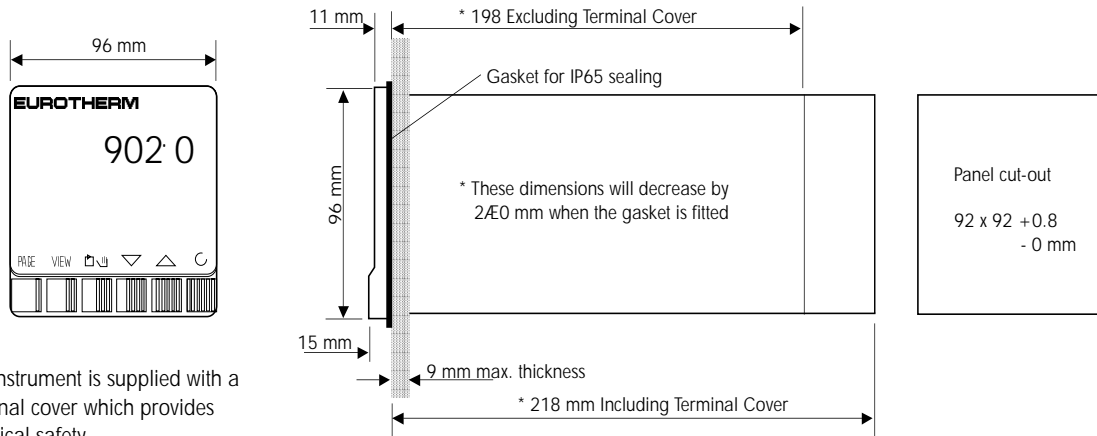
- Retrans of error 4-20mA - 240V - English



## 902/904 CONFIGURATION

Input	Channel 1	Channel 2	Channel 3	Channel4	Digital Comms	Analogue Comms I/P	Analogue CommsO/P	Display Low	Display High	Units	Linear Type
<b>Input</b>				<b>Code</b>				<b>Digital Communications</b>			
<b>Type (code = 1 + 1)</b>				<b>1</b>				EI BISYNC® XA			
Thermocouple I T				1-5V B				JBUS® XB			
RTD I R				0-10V C				MODBUS® XC			
Pyrometer I Y				2-10V D							
0-5V I A				0-20mA E				<b>Analogue Comms I/P and O/P</b>			
1-5V I B				4-20mA F				<b>Remote Input (code Q + 1 + 2)</b>			
0-10V I C				<b>Alarm (code C + 1)</b> 1				S/P Q A			
2-10V I D				Alarm FSH C A				S/P + Trim Q B			
0-20mA I E				Alarm FSL C B				Heat Power Limit Q D			
4-20mA I F				Alarm DH C C				0-5V A			
-10mV + 10mV I G				Alarm DL C D				1-5V B			
0-100mV I H				Alarm DB C E				0-10V C			
				Prog Drive C P				2-10V D			
				<b>Channel 3</b>				0-20mA E			
<b>Channel 1</b>				<b>Type (code A + 1)</b> 1				4-20mA F			
<b>Type (code H + 1 + 2)</b> 1 2				Alarm FSH A A				Valve Position Q P P			
Reverse O/P H A				Alarm FSL A B				Retrans Output (code Z + 1 + 2) 1 2			
Direct O/P H B				Alarm DH A C				PV Z A			
On/Off (RE, LO, TR) O				Alarm DL A D				SP Z B			
PID (RE, LO, TR) P				Alarm DB A E				Error Z C			
PID 0-5V A				Prog Drive A P				Power Z D			
PID 1-5V B				<b>Retrans Type (code T + 1 + 2)</b> 1 2				0-5V A			
PID0-10V C				PV T A				1-5V B			
PID 2-10V D				SP T B				0-10V C			
PID 0-20mA E				Error T C				2-10V D			
PID 4-20mA F				Power T D				0-20mA E			
VP (RE, LO, TR) V				0-5V A				4-20mA F			
If VP is chosen Channel 2 function is not available.				1-5V B				<b>Display Low/High</b>			
<b>Channel 2</b>				0-10V C				Define the max. operation span of the instrument -			
<b>Type (code C + 1 + 2)</b> 1 2				2-10V D				9999 to 19999. Include required decimal point			
Cool On/off C O L				0-20mA E				position. Example: Linear 0.0 to 100.0			
Cool Non-Lin C N L				4-20mA F				<b>Units</b>			
Cool Linear C L				<b>Channel 4</b>				None -			
0-5V A				<b>Type (code S + 1)</b> 1				Deg C C			
1-5V B				Alarm FSH S A				Deg F F			
0-10V C				Alarm FSL S B				Kelvin K			
2-10V D				Alarm DH S C				Millivolts MV			
0-20mA E				Alarm DL S D				Volts V			
4-20mA F				Alarm DB S E				Milliamps MA			
Non-DC L				Prog Drive S P				Percentage %			
<b>Retrans Type (code 1 + 2 + 3)</b> 1 2 3				<b>Remote I/P Type (code M + 1 + 2)</b> 1 2				<b>Linear Type</b>			
PV R A				S/P M A				See Range list on opposite page			
S/P R B				S/P + Trim M B							
Error R C				Heat Power Limit M D							
Power R D				0-5V A							
<b>Remote I/P Type (code 1 + 2 + 3)</b>				1-5V B							
S/P E A				0-10V C							
S/P + Trim E B				2-10V D							
Heat Power Limit E D				0-20mA E							
				4-20mA F							

## DIMENSIONAL DETAILS



The instrument is supplied with a terminal cover which provides electrical safety.

**EUROTHERM CONTROLS LIMITED** <http://www.eurotherm.co.uk>

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