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		Customer Support
		Customer Support
		Customer Training
mation on our products	Order form to acquire additional	Instant Access

### **Eurotherm Controls Inc**



#### **Eurotherm Controls Inc - The Company**

Since 1967 Eurotherm Controls Inc, part of a worldwide group of Eurotherm companies engaged in the design, manufacture and sale of industrial electronic equipment, has been providing high accuracy electronic temperature and process control instrumentation to the American market. Over the years Eurotherm Controls has grown to be a leading supplier, providing solutions with a unique combination of innovative products and services that improve the quality and efficiency of its customers' processes.

In 1998 Eurotherm became a part of the Siebe group of companies, becoming the center of excellence for world class temperature control for that group. In 1999 the new Invensys plc group of worldwide automation companies was formed with the goal of achieving global leadership in automation and controls. As a member of the Invensys group, Eurotherm Controls Inc is proud to contribute to the achievement of that vision.

Eurotherm Controls Inc and Barber-Colman Company in the United States have integrated their sales, marketing, support and product offerings, bringing their customers even greater benefits through the combined strengths of these two respected organizations. Combined, Eurotherm and Barber-Colman are now the largest supplier of temperature controls to the US market.

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#### **Eurotherm Controls Inc - The Products**

Eurotherm Controls Inc provides innovative products that provide solutions for the temperature and process applications of its customers. Our products are organized in the following broad categories:

• Temperature and Process Controllers	Single and multiloop DIN panel mount and rail mount general and special purpose PID controllers and setpoint programmers
• Indicator and Alarm Units	DIN panel mount indicators, alarm units and FM approved alarms
• Products for Integrated Solutions	Multiloop products and software for plastics machine control systems, production monitoring and process control systems
Power Control Products	Solid state relays, solid state contactors and SCR power controllers for electrical heating applications
Actuators	Low, medium and high torque actuators for control of combustion valves and dampers
Thermosensors	Thermocouples, RTD's and accessories for general purpose temperature measurement

Eurotherm has an active program to provide customization of its products for unique solutions to its customer requirements. Eurotherm also provides a full range of product support and application services to its customers.

#### **Eurotherm Controls Inc - The Sales Channels**

Eurotherm has a strong network of distributors and value added resellers throughout North and South America who work closely with the company to insure the best service to its customers. Eurotherm's distributors are friendly and knowledgeable and can provide the customer with a convenient local source of products, application expertise and timely services. Eurotherm's value added resellers provide our customers with detailed systems hardware and software services and application expertise. Backing up this nationwide network of channel partners is a series of Eurotherm direct strategic sales offices located throughout the US. Contact Eurotherm to find your nearest sales channel for Eurotherm products.

#### Incorporation, Warranty and Trademarks

#### Incorporation

Eurotherm Controls Inc, located at 741-F Miller Drive, Leesburg, VA 20175-8993, was incorporated in the city and state of Dover, Delaware on October 25, 1977.

#### Warranty

Eurotherm Controls Inc warrants to the Purchaser that the equipment manufactured by Eurotherm Controls will be free from defects in material or workmanship for such period after shipment by Eurotherm as is stated in the applicable product's data sheet of Eurotherm as in effect at such date or two years if none is stated. This warranty does not apply to any mechanical devices, such as switches, relays, etc. and SCR's or Triacs, which shall be subject only to the warranty of their own manufacturer. If the equipment delivered does not meet the foregoing warranty, Purchaser shall promptly notify Eurotherm, which shall thereupon cause to be corrected, at its expense, any defect either, at its option, by repairing any defective or damaged parts of the equipment or by supplying replacement equipment. The liability of Eurotherm under this warranty, whether the claim is based on contract or negligence, shall not exceed the cost of correcting defects in the equipment or of supplying replacement equipment as herein provided and upon the expiration of the warranty period all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties (except as to title), whether written, oral, implied or statutory. NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS MADE.

Products manufactured by others and resold by Eurotherm are subject to the terms of the manufacturer's warranty and are warranted for a term as established by the manufacturer. Contact Eurotherm for details on the warranties of these products.

Thermocouples and RTD's are warranted to be free of defects in materials and workmanship at the time of delivery. There is no extended warranty period for sensor products.

#### Trademarks

The following are trademarks of **Eurotherm Controls:** PDSIO<sup>®</sup> (Patent 5,793,754), Instant Accuracy™ (Patent 5,484,206) and Series 2000™ The following are trademarks of Barber-Colman Industrial Instruments MACO<sup>®</sup>, MACO<sup>®</sup>Breeze<sup>™</sup>, FoxTraker<sup>®</sup>, Impact<sup>™</sup>, Auto-tune<sup>™</sup>, Insta-Set<sup>™</sup>, Optima<sup>™</sup>, OptiGrafix<sup>™</sup> and Veridepth<sup>®</sup> The following are trademarks of Modicon, a Group Schneider Company Modbus®andModbus®Plus The following is a trademark of Profibus Trade Organization **Profibus**<sup>®</sup> The following are trademarks of Microsoft Corporation Microsoft<sup>®</sup> Windows<sup>®</sup> 95, Microsoft<sup>®</sup> Windows<sup>®</sup> 98 and Microsoft<sup>®</sup> WindowsNT<sup>®</sup> The following is a trademark of the **Open DeviceNet Vendors Association** DeviceNet<sup>®</sup> The following are trademarks of Allen Bradley Company PLC<sup>™</sup>andControlNet<sup>™</sup> The following are trademarks of Wonderware Corporation Wonderware<sup>®</sup> and Wonderware<sup>®</sup> InTouch<sup>™</sup> The following is a trademark of Intellution Inc. Intellution<sup>®</sup> FIX The following is a trademark of SpecView, LLC. SpecView<sup>®</sup> Eurotherm Controls Inc has used all reasonable

Eurotherm Controls Inc has used all reasonable resources and efforts to indicate and supply information regarding trademarks used in this catalog. The absence of a trademark identifier is not a representation that a particular word or technology is not a trademark.

#### **NEW PRODUCTS**

#### 2704 High Performance Controller/Programmer

- high visibility graphical user interface
- advanced features include PV/SP trending
- · up to three control loops
- · PID, ON/OFF, maintained value
- · cascade, ratio, override modes
- extensive program functions





#### **Eurotherm Suite**

- enterprise, plant and unit process solutions
- · distributed scalable control
- · open systems
- $\cdot$  intuitive tools
- high plant availability
- precision analog and PID
- SCADA functionality

#### DeviceNet<sup>™</sup> communications



#### DeviceNet<sup>™</sup>

- · cost-effective
- simple to use
- device interchangeability
- open standard
- reliable communications
- supported by 2204e, 2208e,
- 2216e, REMIO, MACO<sup>®</sup> DS/EM3
- and other products

#### **Product enhancements**

#### 2604

- · additional modular
- expandable I/O
- · Profibus®
- one, two and three control loops

#### **2500**

- expanded I/O options
- · Profibus<sup>®</sup> support
- · up to eight PID loops

#### iTools

- multiple languages supported
- · support 2000 series
- enhanced Toolkit block supported
- configure, upload, download, "clone" and instrument documentation

#### **NEW FEATURES**

#### **Products available with Profibus® communications**



### CONTROLLERS

#### **TEMPERATURE AND PROCESS CONTROLLERS**



Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

TEMPERATURE AND	PROCESS CO	ONTROLLERS	2200	2204	
Series 2000™		81	eeus autori	6674	
	2132 & 2116	2216e	2208e	2204e	
	Simple h Smallover Trace hea Packaging	eating and cooling ns,Chillers,Sterilizers ting			
		Plastics a Solid extru Wire extru Film extru	nd rubber usion usion sion, Pipe extrusion		
			Heat tr Ovens Furnace	reatment	
		Heating Gas burne	and ventilation er and boiler control		
DIN		Food and Blending, Refrigerat Fermentat	d brewing Baking tion tion and pasteurization		
Contr	olle	ers			
Panel Size (mm)	48 x 24 48 x 48	48 x 48	48 x 96	96 x 96	
Display	4 digit	4 digit	4 digit	4 digit	
Setpoint Programmer					
Motorized Valve Control		•	•	•	
Digital Communications		•	•	•	
DC Retransmission		•	•	•	
Remote Setpoint Input					
Page Reference	1-4	1-6	1-6	1-6	

 	2108	2404	26040	
2416	2408	2404	2604	2704
Ceramics Driers Kilns	and bricks		Aerospace a Carburizing fi Environmenta Engine test b	and Automotive urnaces, Creep testing al chambers, Autoclaves eds, Infra-red paint drying
Glass Melting fur Forehearth Lehrs	naces s		Semicondu Crystal grow Diffusion Molecular b	ictor ving eam epitaxy
		Chemical Reaction v Fermenter Pressure, F	and Pharmaceutical essels s :low, Level, Ph control	
 48 x 48	48 x 96	96 x 96	96 x 96	96 x 96
 4 digit				
 •	•	•	•	•
 •	•	•	•	•
 •	•	•	•	•
	•	•	•	•
1-8	1-8	1-8	1-10	1-10

#### 2132 and 2116 Simple PID Controllers



- Small ovens
- Chillers
- Sterilizers
- Trace heating
- Heat sealing



Available in compact 1/32 and 1/16 DIN panel sizes, the 2100 series uses advanced PID algorithms to give stable 'straight line' temperature control. Self tuning is included to optimize the control performance without the need for specialized knowledge or training.

A universal input, employing patented Instant Accuracy<sup>™</sup> technology, allows selection of nine internally stored thermocouple types and the Pt100 resistance thermometer. Other input linearizations may be factory downloaded. Linear inputs can be scaled to the desired display range. Two outputs are configurable for heating, cooling or alarms. Three internal alarm setpoints are provided, configurable as high, low or deviation alarms. Alarms can be 'blocked' on start-up to prevent unnecessary operator alerts.

Heater failure can be detected when the controller is used with a TE10S Solid State Relay. Tactile buttons ensure positive operation. The operator interface can be customized to present only those parameters that an operator needs to see and adjust, while all other parameters are locked away under password protection.

#### Ramp-dwell programming

Simple baking profiles can be programmed using the built in setpoint ramp generator and dwell timer.



#### Specifications:

Control modes:	trol modes: PID or On/Off		Nine standard thermocouple types.		
Supply voltages:	85-264Vac, 5.0watts maximum 20-29Vac or dc. 5.0watts maximum		Pt100. 4-20mA linear. Custom input available		
Operating ambient:	0-55°C, 0-90%RH non-condensing	Output ratings:	Relay: Logic:	2A, 264Vac resistive 9Vdc, 18mA	

#### **Rear Terminal Connections:**





\* External relay module part # SUB21/OARELAY// Order separately



Model Number		Function		Supply Voltage	
2132 1/32 DIN 2116 1/16 DIN	CC NF TC TN	PID Controller On/Off Controller PID Controller +Timer On/Off Controller +Timer	VH VL	85-264Vac 20-29Vac/dc	

Manual				
XXX	No manual			
ENG	English			
FRA	French			
GER	German			
NED	Dutch			
SPA	Spanish			
SWE	Swedish			
ITA	Italian			

## 2216e, 2208e and 2204e General Purpose PID Temperature Controllers

#### Ideal for:

- Extrusion with optimized fan, water or oil cooling
- Ovens and furnaces
- Lab applications



Model 2208*e*: 48W x 46H x 105D mm Model 2208*e*: 48W x 96H x 103D mm Model 2204*e*: 96W x 96H x 103D mm

Available in 1/16, 1/8 and 1/4 DIN panel sizes the 2200*e* series are configurable for PID, On/Off or motorized valve control - satisfying both electrical and gas heating applications. Self-tuning is included to optimize control performance. These units employ patented Instant Accuracy<sup>™</sup> technology on scaleable universal inputs accepting nine standard thermocouple and RTD inputs, DC process inputs or downloadable custom inputs.

Modular heating and cooling outputs are provided, plus one or two alarm relay outputs. The 1/8 and 1/4 DIN units have two digital inputs to select auto/manual transfer, standby mode, second set-



Digital communications with Modbus<sup>®</sup> RTU or DeviceNet<sup>™</sup> protocols are available for easy connection to PLC<sup>™</sup> or PC based supervisory control and data logging systems.

A simple ramp and hold profile can be programmed using the internal ramp generator and dwell timer.

Eliminate ammeters using PDSIO<sup>®</sup> current monitoring facility. Heater current may be displayed and open and short circuit faults detected and alarmed.



# PDSIO® 2-wire Solid State Relay

#### Specifications:

Control modes:	PID, On/Off or motorized valve contro
Supply voltage:	85-264Vac, 10.0watts maximum
Operating ambient:	0-55°C, 0-90%RH non-condensing
Inputs:	Nine standard thermocouple types. Pt100. 4-20mA linear. Custom input available

ratings:	Relay:	2A, 264Vac resistive
	Logic:	18Vdc, 20mA
	Triac:	1A, 264Vac resistive
	DC:	Isolated 0-20mA, at 12Vdc

Output

#### **Terminal Connections:**

#### Model 2216e



#### Model 2208e/2204e



(Note: The 10A output for the Model 2204e is wired to additional terminals 4A through to 6D)



Model Number	Output 1	Output 2	Output 3	Output 4	10 Amp Output	Manual
2216e 1/16 DIN 2208e 1/8 DIN 2204e 1/4 DIN	XX Not fitted Relay: 2-pin R1 Fitted unconfigured RH Heating output	XX Not fitted Relay: 2-pin R1 Fitted unconfigured RC Cooling output	XX Not fitted Relay RF Fitted unconfigured RH PID heating	XX Not fitted Relay RF Fitted unconfigured RH PID heating	XX Not fitted R5 Fitted unconfigured RH Heating output	XXX No manual ENG English FRA French GER German
Function CCPID Control	FU Valve raise output FH High alarm 1 FL Low alarm 1 DB Dev. band alarm 1 DL Dev. low alarm 1	RH Heating output RW Valve lower output FH High alarm 2 FL Low alarm 2 DB Dev. band alarm 2	FL Low alarm 3 FL Low alarm 3 DB Dev. band alarm 3 DL Dev. low alarm 3	FL High alarm 4 FL Low alarm 4 DB Dev. band alarm 4 DL Dev. low alarm 4	Comms	SPA Spanish SWE Swedish ITA Italian
NFOn/off control VCMotorized Valve control	DH Dev. high alarm 1 Logic L1 Fitted unconfigured LH Heating output	DL Dev. low alarm 2 DH Dev. high alarm 2 AL High & low alarms 1 & 2	DH Dev. high alarm 3 AL High & low alarms 3 & 4 PDSIO® Alarms <sup>(1)</sup>	DH Dev. high alarm 4 AL High & low alarms 3 & 4 PDSIO <sup>®</sup> Alarms <sup>(1)</sup>	2YM 2-wire RS485 2FM 4-wire RS422 2AMRS232 EI-Bisynch protocol	
Supply Voltage	MT PDSIO® neaterbreak detect (note 1) M2 PDSIO® current monitoring (note 2)	Logic output L1 Fitted unconfigured LC Cooling output LH Heating output	LF Heater break detect HF Current monitoring heater break SF Current monitoring SSR failure	LF Heater break detect HF Current monitoring heater break SF Current monitoring SSR failure	2YE 2-wire RS485 2FE 4-wire RS422 2AE RS232 PDSIO® input	
VH 85-264Vac	T1 Fitted unconfigured TH Heating output TU Valve raise output DC control (Isolated)	AM Auto manual select S2 Setpoint 2 select AC Alarm ack/reset EH Integral hold	Note 1. PDSIO <sup>®</sup> heat transmit the p	er break detect will ower demand signal	2DN DeviceNet™ protocol	
	D3 Fitted unconfigured H6 0-20mA PID heating H7 4-20mA PID heating C6 0-20mA PID cooling	SB Standby mode SR PDSIO® remote SP sel. M5 CTX M5 current I/P	to a TE10S Sol read back a h	id State Relay and eater break alarm.		
	C7 4-20mA PID cooling D6 DC Retransmission	Triac T1 Fitted unconfigured TC Cooling output TH Heating output TW Valve lower output				

#### 2416, 2408(f) and 2404(f) High Stability Temperature and Process Controller/Programmer

#### Ideal for:

- Single and multi-zone ovens, furnaces and kilns
- Environmental chambers
- Simple ratio and cascade control

Available in 1/16, 1/8 and 1/4 DIN panel sizes, the 2400 series are high stability controllers with an extensive range of options. Either PID, on/off or motorized valve control can be configured, satisfying both electrical and gas heating applications. Dual PID settings, advanced 'one shot' and continuously adaptive tuning are available to optimize control performance.

The controllers employ universal inputs with Instant Accuracy<sup>™</sup> and accept a range of plug-in modules for heating, cooling, analog retransmission, second process value input and remote setpoint. High speed Modbus<sup>®</sup>, Profibus<sup>®</sup> and ASCII communications provide easy connection to PLC<sup>™</sup>, PC based supervisory control and data logging systems.

One, four or 20 setpoint programs can be stored with 16 ramp-dwell segments and three or eight event outputs.

Eliminate ammeters using PDSIO<sup>®</sup> current monitoring facility. Heater current may be displayed and open and short circuit faults detected.

The 2408*f* and 2404*f* models are available with ProfiBus<sup>®</sup> communications.

**Specifications:** 

# Control modes:PID, On/Off or motorized<br/>valve controlInputSupply voltage:85-264Vac, 15watts maximum<br/>20-29Vac/dc, 15watts maximumOutpOperating ambient:0-55°C, 0-90%RH non-condensingOutp





Model 2416: 48W x 48H x 150D mm Model 2408(f): 48W x 96H x 150D mm Model 2404(f): 96W x 96H x 150D mm



#### Model 2408(f)/2404(f)



Inputs:	Nine standard thermocouple types. Pt100. 4-20mA linear. Custom input available			
Output ratings:	Relay: Logic: Triac:	2A, 264Vac resistive 18Vdc, 20mA 1A 264Vac resistive 2000 or 0 10Vdc configurable		
	DC:	0-20mA or 0-10Vdc configurable		

N	Nodel Function Sup Winber Volta	oly Module 1 Module 2	Module 3 Comms	Manual		
ŕ	416					
Function         Standard PID control       CC Controller only         CG 1 x 8 seg Program       CP 1 x 16 seg Program         CP 1 x 16 seg Program       On/Off Control         NF Controller only       NG 1 x 8 seg Program         NM 1 x 16 seg Program       Nd 1 x 8 seg Program         VM 16 seg Program       Nd 4 x 16 seg Program         VC Controller only       VG 1 x 8 seg Program         VP 1 x 16 seg Program       VP 1 x 16 seg Program         VA 4 x 16 seg Program       VI 4 x 16 seg Program         VH 85-264Vac       VL 20-29Vac/dc	Module 1 XX None Relay: 2-pin R2 Fitted unconfiguree RH Heating output RU Valve raise output RU Valve raise output RU Valve raise output FH High alarm 1 DB Dev. band alarm 1 DH Dev. high alarm 1 LOgic L2 Fitted unconfiguree L4 Heating output M1 PDSIO* heater bread detect (note 1) M2 PDSIO* current monitoring (note 2: Triac T2 Fitted unconfiguree TH Heating output TU Valve raise output TV	Module 2           XX         None           Relay: 2-pin         R2           R2         Fitted unconfigurer           RC         Cooling output           RW Valve lower output         FH           RW Valve lower output         FH           FL         Low alarm 2           DB         Dev. high alarm 2           DH         Dev. low alarm 2           DH         Dev. high alarm 2           DH         Dev. high alarm 2           DH         Dev. high alarm 2           PO         Program event 1           I         (not with 8-seg           programmer)         PE           PE         Proorgram END output           LC         Cooling output           Triac         12           D         C cooling output           TG         Cooling output           TG         2           DZ         Critted unconfigurer           CI         0-20mA PID cooling           C2         4-20mA PID cooling           C3         0-5V PID cooling           C4         15V PID cooling           C5         0-10V PID cooling	Module 3           XX None Relay: 2-pin           R2 Fitted unconfigu           FH High alarm 4           DB Dev. band alarm           DL Dev. low alarm 4           DH Dev. low alarm 4           DE retran (Non-isola           DD Z Fitted unconfigu           DI Z Fitted unconfigu           DI Z Fitted unconfigu           DI Z Fitted unconfigu           DI Z Fitted unconfigu           DE retran (Non-isola           DS Setpoint retrans           Setpoint retrans           Setpoint retrans           Setpoint netrans           Setpoint netrans <td>XX     None       2     wire, RS485       Y2     Fitted unco       4     RS232       4     AZ       4     RS232       4     AZ       4     RS232       5     A2       4     Fitted unco       4     AWre, RS422       rog.)     FZ       Fitted unco     FM Modbus* pr       FE     El-Bisynch p       FE     El-Bisynch p       FE     El-Bisynch p       FE     Et-Bisynch p       M6     Fitted unco       RS     Setpoint ing       PDSIO* Output     M7       M7     Fitted unco       RT     FItted unco       RS     Setpoint ing       PDSIO* Output     M7       FIT<pv retrans<="" td="">     TS       Setpoint ret     OT       Output retr     V</pv></td> <td>Man SXX No mai ENG English FRA French GER Germai NED Dutch SPA Spanish SWE Swedsi ITA Italian SWE Swedsi ITA Italian A Italian SWE Swedsi SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE</td> <td>ual nual nual n h DSIO® heater break detect ill transmit the power emand signal to a TE10S olid State Relay and read ack a heater break alarm. DSIO® current monitoring ill transmit the power emand signal to a TE10S</td>	XX     None       2     wire, RS485       Y2     Fitted unco       4     RS232       4     AZ       4     RS232       4     AZ       4     RS232       5     A2       4     Fitted unco       4     AWre, RS422       rog.)     FZ       Fitted unco     FM Modbus* pr       FE     El-Bisynch p       FE     El-Bisynch p       FE     El-Bisynch p       FE     Et-Bisynch p       M6     Fitted unco       RS     Setpoint ing       PDSIO* Output     M7       M7     Fitted unco       RT     FItted unco       RS     Setpoint ing       PDSIO* Output     M7       FIT <pv retrans<="" td="">     TS       Setpoint ret     OT       Output retr     V</pv>	Man SXX No mai ENG English FRA French GER Germai NED Dutch SPA Spanish SWE Swedsi ITA Italian SWE Swedsi ITA Italian A Italian SWE Swedsi SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE SWE	ual nual nual n h DSIO® heater break detect ill transmit the power emand signal to a TE10S olid State Relay and read ack a heater break alarm. DSIO® current monitoring ill transmit the power emand signal to a TE10S
Mi Nu 24( 240	bdel Function Suppl Noter Voltag	y Module 1 Module 2	-2 4-20mA -3 0-5V -4 1-5V -5 0-10V Module 3 Alarm Relay	10amp Output     Comms 1       Ornit for 2408(f)     Comms 20	Comms 2 Manual	ack load current and pen and short circuit larms.
2408     1/4 DIN       2404     1/4 DIN       2404     1/4 DIN       2404     1/4 DINProfibus*       2404     1/4 DINProfibus*       Standard PID control       CC Controller     CG 1 x 8 seg Prog       CP 1 x 16 seg Prog     P4 x 16 seg Prog*       On/Off Control     NF Controller only       NF Controller only     NG 1 x 8 seg Prog       M 20 x 16 seg Prog*     Motorized valve control       VC Talve positioner     VG 1 x 8 seg Prog       VV 20 x 16 seg Prog*     Motorized valve control       VC Valve positioner     VG 1 x 8 seg Prog       VH 85-264Vac     VL 20-29Vac/dc       * not available with 2408f and 2404f Profibus® controllers	XX Not fitted Relay: 2-pin R2 Fitted unconfigured RH Heating output RU Valve raise output Relay: change over R4 Fitted unconfigured VH Heating output Or alarm 1 from table A Logic: (Non-isolated) L2 Fitted unconfigured LH Heating output M1 PDSIO* heater break detect (note 1) M2 PDSIO* current monitoring (note 2) Triac T2 Fitted unconfigured TH Heating output TU Valve raise output DC control (Isolated) D4 Fitted unconfigured H6 0-20mA PID heating H3 0-5V PID heating H4 0-20mA PID heating H4 0-20mA PID heating H5 0-10V PID heating H5 0-10V PID heating H5 0-10V PID heating H5 0-5V PID heating H5 0-10V PID heating H5 0-5V PID heat	XX Not fitted Relay: 2-pin R2 Fitted unconfigured RC Cooling output RW Valve lower output Relay: change over R4 Fitted unconfigured YC Cooling output PO Program event 1 (not with 8-seg programmer) PE Program END output Or alarm 2 from table A Dual relay RR Fitted unconfigured L2 Fitted unconfigured L2 Fitted unconfigured L2 Fitted unconfigured TC Cooling output Triac T2 Fitted unconfigured CC Cooling output DC control (Isolated) D4 Fitted unconfigured C6 0-20mA PID cooling C7 4-20mA PID cooling C7 4-20mA PID cooling C3 1-5V PID cooling C3 1-5V PID cooling C3 0-15V PID cooling C3 0-15V PID cooling C3 0-15V PID cooling DigitalI/O (unconfigured) TK Triple logic input TP Triple logic output Power supply MS 24Vdc transmitter DC retran. (Isolated) Select from Table B Potentiometer input VU Fitted unconfigured VS Valve position feed back VR Setpoint input	XX Not fitted Relay: 2-pin R2 Fitted unconfigured Relay: change over R4 Fitted unconfigured PO Program event 4 (not with 8-seg programmer) PE Program END output Or alarn 3 from table A Logic 12 Fitted unconfigured Triac T2 Fitted unconfigured PP Programevent 4 & 5 Digital I/O (unconfigured) PP Programevent 4 & 5 Digital I/O (unconfigured) TK Triple contact input TD Triple logic output Power supply M5 24Vdc transmitter DC remote input D5 Fitted unconfigured W2 4-20mA setpoint W5 0-10V setpoint W5 0-10V setpoint W5 0-10V setpoint W5 Setect from Table B Potentiometer input VU Fitted unconfigured VU Fitted unconfigured VU Fitted unconfigured VU Fitted unconfigured VU Fitted unconfigured VU Fitted unconfigured VS Valve position feed back VR Setpoint input	XX Not fitted Alarm 4 relay RF Fitted unconfigured Table A alarm options plus: RA Rateofchangealarm PDSIO <sup>®</sup> Alarms LF Heater break detect HF Current monitoring heater break SF Current monitoring SSR failure PO Program event 7 (not with 8-segprog) PE Program END output <b>10amp Output</b> XX Not fitted R6 Fitted unconfig. RH PID heating	XX Not fitted 2 wire, RS485 Y2 Fitted unconfigured YM Modbus* protocol R5232 A2 Fitted unconfigured AM Modbus* protocol AE EI-Bisynch protocol AW ire RS422 F2 Fitted unconfigured FM Modbus* protocol PDSIO® Output FE EI-Bisynch protocol PDSIO® Output FE EI-Bisynch protocol PDSIO® Output FE FIBISYNCH protocol PDSIO® Output FE FIBISYNCH protocol PDSIO® Output FE FIBISYNCH protocol PDSIO® Output FE FIBISYNCH protocol PDSIO® Input M7 Fitted unconfigured RS Setpoint retrans TS Setpoint retrans TS Setpoint input PDSIO® Output M7 Fitted unconfigured FS Setpoint input PDSIO® Output M7 Fitted unconfigured FT PV retrans TS Setpoint retrans TS Setpoint retrans TO Output retrans ** The PB Profibus® C only works in the 2400	XXX No manual         ENG English         FRA French         GER German         NED Dutch         SPA Spanish         SWE Swedish         ITABLE A: alarm codes         FH High alarm         FL Low alarm         DB Dev. band alarm         DL Dev. low alarm         DH Dev. high alarm         Table B: DC retransmission         D6 Fitted unconfigured         First character         V. PV retrans         Z- Setpoint retrans         Second character         1 -0-20mA         -2 4-20mA         -3 0-5V         -4 1-SV         -5 0-10V

# 2604, 2604*f*, 2704 and 2704*f* High Performance Multiloop Controller/Programmer

#### Ideal for:

- One, two or three control loops
- Atmosphere heat treatment
- Reliability test chambers
- Composite curing autoclaves
- Vacuum furnaces
- Ceramic and brick kilns
- Glass furnaces/forehearths

#### Melt pressure

2604 and 2704 are high stability temperature and process controllers. The 2604 has a dual five digit display and a two line LCD panel. The 2704 has a high visibility graphical user interface, enabling many advanced features including PV/SP trending. Both units are available in a single, dual or triple loop format and employ universal inputs with Instant Accuracy<sup>™</sup>.

A setpoint programming option is available allowing storage of up to 50 programs, each program can profile up to three setpoints. Using internal Toolkit Blocks, including timers and totalizers, customized user configurations and special machine controllers can be created.

2604 and 2704 have fixed and modular I/O and can use the 2000 I/O expansion unit to provide further input and output connections.

The (*f*) versions are available with ProfiBus<sup>®</sup> communications

#### Specifications:

Dimensions (mm):	96W x 96H x 150D
Control modes:	3 Control loops PID, On/off and Motorized Valve, Cascade, Ratio & Override
Setpoint programmer:	50 Programs, 500 segments 16 Event outputs
Supply voltages:	85-264Vac, 24Vac/dc



#### 2000 I/O Expander

The Series 2000<sup>™</sup> I/O is a DIN rail mounting digital I/O expansion unit. It is used in conjunction with the 2604 and 2704 controllers to allow the number of digital I/O points to be increased by a maximum of 20 inputs and 20 outputs.

Two product offerings are available allowing either 10 inputs/outputs or 20 inputs/outputs. Supply to the unit is 24Vac/dc. Communications between the Series 2000<sup>™</sup> I/O and its host controller is performed serially via a proprietary two wire interface.



#### **Ordering Codes:**

#### 2604, 2604f, 2704 and 2704f Controllers



# 2500 DIN rail Multiloop Controller and Data Acquisition Unit

#### Ideal for:

- Furnaces and Conveyor furnaces
- Environmental chambers
- Baking conveyor ovens
- Packaging lines
- Improving PID in PLC<sup>™</sup> systems

The System 2500 is a DIN rail or panel mounted multi-loop PID controller and data acquisition I/O system that is the latest addition to our class leading and field proven Series 2000<sup>™</sup> PID controllers and indicators. With its modular scalable construction, advanced self-tuning PID algorithms, high-density I/O modules, combinational logic, mathematics functions and multiple fieldbus capability, maximum flexibility and interoperability are ensured today and tomorrow.

The System 2500 consists of a base (rack), I/O processor (IOC), terminal units (TU), plug-in I/O modules and an externally mounted 24Vdc power supply.

The passive base is available in three sizes to accept four, eight or sixteen quick release I/O modules. Up to sixteen bases can be multi-dropped simply by using standard low-cost RJ45 cables. The base may be mounted on a DIN rail or panel for location close to the control reducing the length of signal wiring since twisted pair communications wire now replaces the previous bundle of wire approach.

The System 2500 I/O processor (IOC) is responsible for the continuous and combinational logic control strategies, mathematical functions and I/O data acquisition telemetry. With up to 8 PID self-tuning loops per base, multi-loop solutions up to 128 loops are possible. All run-time parameter values are automatically stored in EEPROM in the event of power failure. The IOC also supports the serial



digital communications interface to host Operator Interfaces, PCs or PLC<sup>™</sup>s. It does this using either Modbus<sup>®</sup> RTU or Profibus<sup>®</sup>-DP serial digital communications.

An expanding selection of I/O module types provides up to 48 analog inputs or 32 analog outputs, or 128 digital inputs or 64 digital outputs–or any combination thereof–per base (16 position). I/O modules are isolated ensuring high system reliability and may be replaced without powering down.

For display purposes the System 2500 can be used with the T2900, a multi-setpoint programmer and data logger that auto-configures when connected to a 2500 base. As the 2500 can be either a Modbus<sup>®</sup> or Profibus<sup>®</sup> slave, any HMI, PLC<sup>™</sup> interface or SCADA system can also be connected.

Common with all Series 2000<sup>™</sup> instruments, the 2500 uses the Microsoft<sup>®</sup> Windows<sup>®</sup> 95, Microsoft<sup>®</sup> Windows<sup>®</sup> 98 or Microsoft<sup>®</sup> Windows NT<sup>®</sup> compatible configuration software called iTools for I/O, PID, logic and analog Toolkit block configuration. Complete 2500 configurations can be saved by iTools and used to clone other 2500's or used offline to create new configurations.

The System 2500 can be also be used as remote I/O for the Model 2604 and 2704 controllers. This permits the use of more sensor inputs that can be used in a min/max/average/switch-over mode in a targeted application.

#### **Specifications:**

#### Analog Inputs (AI2/AI3)

Low level High level Sample Rate Thermocouple RTD Potentiometer Custom

-100 to +100mV 0-20mA or 0-10Vdc, -23mA to + 23mA for Al3 J, K, L, R, B, N, T, S, PL 2, C 2/3-wire PT100 330 to 15K ohm Up to 3 downloadable

#### Quad/Octal Digital Inputs (DI4/DI8)

Contact Closure (voltage), Logic

#### Quad Relay/Digital Output (RLY4/DO4)

2A Relay, Quad logic output, Quad 24V output

#### Dual Analog Output (AO2) 0-20mA, 0-10Vdc

#### **Control Functions (IOC)**

 PID Loops
 Up to 8 control blocks per base

 Loop Types
 Simple, cascade, override and ratio

 Tuning
 One-shot and continuous adaptive tuning

#### Alarms

Number Alarm types

4 per loop, 2 per input and 4 user High, low, deviation high/low/band, rate of change

#### Serial Digital Communications Modbus<sup>®</sup> RTU, Profibus<sup>®</sup> DP

#### **Toolkit Blocks**

8 User, 16 Analog, 16 Logic

#### General

2500C Supply	24Vdc nominal, 18.0 to
Operating temp:	0 to 55°C and 5 to 95%
EMC standards	EN50081-2 (emissions) &
Agency approvals	UL and CSA approvals pending
	pending

#### Dimensions

Vertical Height	180mm (3.94")
Width	4 way base: 137mm (5.39")
	8 way base: 239mm (9.41")
	16 way base: 442mm (17.4")
Depth	105mm (4.13")

#### Features:

#### **Benefits:**

Distribute the PID loops or data acquisition I/O where it is needed using twisted pair cables

Single point of failure keeps process running in the event of failure.

Pre-configured Toolkit blocks for auto-tuning PID loops, cascade, ratio, carbon and other loop types, provide accurate, reliable repeatable control.

Reduce PLC<sup>™</sup> processor utilization, use less expensive PLC<sup>™</sup> and reduce configuration time.

Same AI module for all inputs.

Protects hardware and eliminates ground loops.

Reduces noise and spurious signals, more accurate transducer readings.

Predict failures before they happen and reduce maintenance schedules.

Go with the leader in precision PID control and serial digital communications.

Digital Communications

PID Loop and Data Acquisition integrity 'Out of the Box' Advanced or Specialized PID Loops

Offloads PID from the PLC<sup>™</sup>

Universal Inputs Fully Isolated Analog Inputs Shorter Signal Wire Runs

Local Diagnostic Information

Choice in Best in Class Automation Devices

#### Ordering Codes:

Base Unit			
2500B/S04/CLAMPS/ENG			
2500B/S08/CLAMPS/ENG			
2500B/S16/CLAMPS/ENG			

Analog inputs		
Universal Dual Isolated Input	2500M/AI2/UNIV	
3 Channel Isolated Input 0-20mA	2500M/AI3	
Terminal Unit for AI2 with CJC	2500T/AI2/TC/NONE	
Terminal Unit for AI2 dc/PT100	2500T/AI2/DC/NONE	
Terminal Unit for AI2 mA	2500T/AI2/DC/SHUNT	
Terminal Unit for AI3	2500T/AI3/NONE	
Terminal Unit for AI3w/Disconnects	2500T/AI3/DISCONNECT	

Digital inputs		
Quad 24 v input	2500M/DI424V/EXTPWR	
Eight x Isolated Contact Input	2500M/DI8contact	
Eight x Isolated Logic Input	2500M/DI8logic	
Terminal Unit for DI4	2500T/DI4/UNIV	
Terminal Unit for DI4 w/Disconnects	2500T/DI4/UNIV/DCONNECT	
Terminal Unit for DI8	2500T/DI8/UNIV	
Terminal Unit for DI8 w/Disconnects	2500T/DI8/UNIV/DCONNECT	

Analog Outputs		
Universal Dual Isolated Output	2500M/AO2/UNIV	
Terminal Unit for AO2	2500T/AO2/UNIV	
Terminal Unit for AO2 w/Disconnects	2500T/AO2/UNIV/DCONNECT	

Digital Output		
Quad Logic o/p 10mA (24v required)	2500M/DO4/LOGIC/EXTPWR	
Quad 24V 100mA (24v required)	2500M/DO4/24V/EXTPWR	
Terminal Unit for DO4	2500T/DO4/UNIV	
Terminal Unit for DO4 w/Disconnects	2500T/DO4/UNIV/DCONNECT	

Relay Output		
Quad 2 Amp Relay (3 n/o, 1 form C)	2500M/RLY4	
Terminal Unit for RLY4	2500T/RLY4/NOFUSE	
Terminal Unit for RLY4 w/2A Fuses	2500T/RLY4/FUSE2A	

Power Supply		
DIN Rail 24v 2.5 Amp Supply	2500P/2A5/ENG	
DIN Rail 24v 5 Amp Supply	2500P/5A0/ENG	
DIN Rail 24v 10 Amp Supply	2500P/10A0/ENG	

#### Accessories

2500C Configuration Cable 3.0 Meter Interconnecting Cable Between Bases 0.5 Meter InterconnectingCableBetween Bases Modbus® Termination Load(for last base in link) Profibus® Termination Load(for last base in link)

#### 2500A/CABLE/CONFIG/RJ11/9PINDF/3M0 2500A/CABLE/MODBUS/RJ45/RJ45/3M0 2500A/CABLE/MODBUS/RJ45/RJ45/0M5 2500A/TERM/MODBUS/RJ45 2500A/TERM/PROFIBUS/RJ45

Communication			
For Data Acquisition and Alarm	2500C/S/ACQIO/comms		
With Toolkit blocks and Acquisition	2500C/S/UW/comms		
With 2 PID blocks	2500C/S/2LOOP/comms		
With 2 PID blocks + Toolkitand Acquisition	2500C/S/2LOOPUW/comms		
comms = with Modbus® RTU Communications	/MODBUS		
comms = with Profibus® DP Communications	/PROFIBUS		
Terminal Unit for Modbus® RTU Controller	2500T/IOC/S/MODBUS		
Terminal Unit for Profibus® DP Controller(with RJ45 connector)	2500T/IOC/S/PROFIBUS/RJ45		
Terminal Unit for Profibus® DP Controller(with 9 Pin female D connector)	2500T/IOC/S/PROFIBUS/9pinD		

\* Consult factory

# T2900 Operator Interface and Setpoint Programmer

#### Ideal for:

- Environmental chambers
- Heat treatment furnaces
- Autoclaves
- Vacuum furnaces
- Kilns

The T2900 is a graphical programmer providing up to 16 analog setpoint profiles and up to 32 digital output profiles on a single time base. It is designed to work as an HMI with the 2500 DIN rail PID controller. Up to 16 model 2500 units may be multidropped from the T2900.

The display of the T2900 is a 137mm 1/4VGA active matrix color LCD display with cold cathode back light, and has a durable resistive analog touchpanel which extends below the display area to give six extra function keys.

A standard 3.5" floppy disk drive is fitted behind an IP65 sealing door, and can be used for loading and saving programs, for logging running data or for updating the application program.

#### Specifications:

Programmer	:
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Up to 50 Programs Up to 500 segments Up to 16 setpoint profiled per program Up to 32 digital events per program 1 timebase Graphical program preview Real time trend with setpoint pre-plot Real Time Clock Schedule (future start time) Run from (mid-program start)



Clear graphical displays	Simplifies operator training
Physical distribution	Reduced wiring cost
Local data-logging	Simple product/process

The 2900 is configured using iTools, Project Studio software. This configurator, which runs under a standard Microsoft\* Windows\* 95 or Microsoft\* WindowsNT\* operating system may be used to create Programs, and to develop 'User Screens', displays on which the OEM defines which variables, buttons and text are shown.

Internationalization is available by selecting the appropriate text file containing the foreign language or the industry specific words used on all standard displays. European or US date and time formats are also selectable.

Access level:	Locked, Operator, Commission, Engineer
Alarms:	Alarm and Event management, time- stamped
Communications:	Modbus <sup>®™</sup> RTU master and slave (RJ45) 3.5mm floppy disc for data- logging and program load/save
Diagnostics:	Health relay contacts and LEDs
Dimensions:	144H x 144W format by 200Dmm (138mm x 138mm cut-out)

Eurotherm project studio CD

#### Ordering Codes:

T2900-24-1-0-1-1-0-1-1-1-2-2-0-0-0-0-0-E-E-0-0-0-312-0-0

T2900 Programmer and Data-logger, 1/4VGA TFT color touch with floppy disc

#### **iTools Configuration Software**

#### Ideal for:

- Series 2000<sup>™</sup> Controller configuration and cloning
- Ramp/soak (program) configuration
  - OPC compatibility

iTools is a Microsoft<sup>®</sup> Windows<sup>®</sup> based software package designed for configuration and cloning of the industry leading Series 2000<sup>™</sup> family of PID controllers and indicators. There are three Editions of iTools; demo, standard and open. The Demo Edition of iTools is restricted and may be downloaded free from our web site for evaluation. Communication is limited to 30 minutes.

The standard version has all features avialable, but communications to third party OPC is limited to 30 minutes. The open version has all features available, including the iTools ModBus<sup>®</sup> OPC server supporting all requirements of OPC data access custom interface specification 1.0 and 2.0.

iTools operates on any personal computer running Microsoft<sup>®</sup> Windows<sup>®</sup> 95, Microsoft<sup>®</sup> Windows<sup>®</sup> 98, Microsoft<sup>®</sup> Windows NT<sup>®</sup> or Microsoft<sup>®</sup> Windows<sup>®</sup> 2000. For instruments with Modbus<sup>®</sup> RTU communications, iTools will scan the Modbus<sup>®</sup> network on request and automati-

<b>₩iTools</b>				_ 🗆 ×
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C: \tools\current\tools	ProcessVar	29.741	SPselect [SSEL]	SP 1 🗖
	TargetSP	30.000	SP1 [SP 1]	0.000
🖃 🧰 Operator 📃 🔺	ManOutput	-42.295	SP2 [SP 2]	0.000
🖲 🔄 NOT_IN_UI	WorkingSP	30.000	Ratio_Setpoint [rAt]	OFF
🖲 🧰 Main 🛛 🔟	CommsRemInput	0.000	LSPTrim [Loc t]	0.000
	II Course	0.226	SP1Low [SP11	0.000
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BUN     PROG	SPrrHbk_Status	0.236	SP1High [SP H]	0.000
● 📄 RUN ● 📄 PROG ● 📄 AL	SPriHbk_Status ValvePosition	0.236 OFF 0.000	SP1High [SP H] SP2Low [SP2 L]	0.000
●	SPrrHbk_Status ValvePosition	0.238 OFF 0.000 •	SP1High [SP H] SP2Low [SP2 L]	0.000 0.000 •

# FeaturesBenefitsAuto Node DetectionSimplifies operator trainingClone File Save & LoadGuaranteed configurationRamp/Soak Editor (SPE)Visualization of ramp/soak<br/>profileModem/Network SupportRemote monitoring and serviceActiveX ControlsPowerful SCADA displays with<br/>minimum configuration

cally identify any Series 2000<sup>™</sup> instrument. Noncommunicating instruments use the optional Series 2000<sup>™</sup> Configuration Station that does not require the instrument to be line powered.

Copying the complete set of parameter values from an attached instrument to a file can be done at the click of a button. This same file can then be cloned to another instrument to provide an exact duplicate. Files can also be edited off-line, distributed, or used to compare configurations.

iTools is written using the latest software technology ensuring interoperability with industrial and desktop software you use today. This tech-

Minimum platform:	Microsoft®Windows®95, Microsoft® Windows®98, 16Mb RAM;
	Microsoft® WindowsNT®, 32Mb RAM;
	Microsoft®Windows®2000, 64Mb RAM VGA (SVGA preferred)
Disk space:	10Mb

Communications:	OPC Driver for Modbus® RTU via serial port Networked client/server Operates over Internet/Modem
Target Instruments:	Series 2000" Family Generic IDM support - 2404 Carbon, 2208/2204 FM Alarm

#### Specifications

nology is demonstrated by the inclusion of two ActiveX controls (a Series 2000<sup>™</sup> faceplate and parameter control), a Modbus<sup>®</sup> RTU OPC Server (EuroMBus) that can operate as a standalone OPC server, a visual Setpoint Programmer Editor (SPE) and OPC Scope - a trend plot and data logger tool. Both Active X controls and the OPC Server can be used with industrial visualization software available today

#### **Ordering Codes:**



#### SpecView<sup>®</sup> Plus SCADA Supervisory Software

SpecView<sup>®</sup> Plus is a cost effective, auto-configuring SCADA package which communicates with Series 2000<sup>™</sup> instrument, Series 4100 recorders and other control products of the company via Modbus<sup>®</sup> or EI-Bisynch serial communications. Available from SpecView<sup>®</sup> Corp., the product features auto-detection, run-time instrument views, graphical user interfaces, trending, data logging, historical replay, recipe, DDE and strategy controller. SpecView<sup>®</sup> is available with up to nine communications ports and runs under Microsoft<sup>®</sup> Windows<sup>®</sup> 95, Microsoft<sup>®</sup> Windows<sup>®</sup> 98 or Microsoft<sup>®</sup> Windows NT<sup>®</sup>. It supports a wide variety of our instrumentation products.





#### **Profibus® configuration Software**

#### Ideal for:

Generates 'GSD' files for Profibus®-DP master

Supports 2408f, 2404f, 2604f, 2704f, 2500 controllers, 2408i indicator, T630 and TU/TC Series SCR units

The Configurator is a Microsoft<sup>®</sup> Windows<sup>®</sup>95, Microsoft<sup>®</sup> Windows®98 or Microsoft® WindowsNT® operating system based software utility that creates 'GSD' files. 'GSD' files define the parameters that a PLC<sup>TM®</sup> or Profibus<sup>®</sup> master will be able to address.

The 'GSD' file is imported into a master Profibus® Configuration tool which in turn produces a file that is used by a PLC<sup>™</sup> or Profibus<sup>®</sup> master to communicate with remote devices.



#### **Ordering Codes:**

PROF - ENG (English language) FRA (French language) GER (German language)

For more information ask for the Profibus® **Communications Handbook** 

#### Series 2000<sup>™</sup> Configuration Station

#### Ideal for:

- Setting-up new configurations
- Storing configurations
- **Cloning controllers**

This station is used for fast set-up and secure storage of Series 2000<sup>™</sup> and T630 controller configurations. The station will directly connect to iTools and create and store configurations on the computer and an interface box which connects the computer to the controller under configuration.

The iTools software can create a new configuration, retrieve a previously stored configuration or upload the configuration from the controller. This configuration can then be modified and downloaded to the controller.





The interface box connects to the RS232 port of the computer. Connection to the controller is through a special sleeve mounted connector. No additional module or power connection is required to use the Series 2000<sup>™</sup> Configuration Station..

#### **Specifications:**

Supply:

110Vac or 240Vac ±10% switch selectable

**Operating ambient:** 

0-55°C, 5-95% Rh non condensing

#### **T630 Process Controller**

#### Ideal for:

- Combustion control
  Furnace
  Boilers
  Incinerators
- All single and cascade loop process applications

The T630 process controller is a low cost 1/2 DIN single loop, ratio, dual loop cascade or manual station controller in a traditional process 3" X 6" format. The controller's selectable algorithms and connectable logic I/O make it ideal for a wide range of stand-alone and system applications. This unit is available with 3 An In, 2 An Out, 4 Dig In, 4 Dig Out, Autotune, standard universal isolated inputs (TC, RTD, 4-20mA configuration, password protection and serial communications.



**T630: 72W x 144H x 253D mm** \* T630 shown above with optional T730 sleeve

#### Specifications:

PID, single loop, ratio, dual loop cascade, override control or manual station. Analog or incremental (raise/lower) output
90-265Vac or 19-55Vdc at 25VA
0-50° C, 5-95% non-condensing
0-10V, 0-20mA, 4-20mA
J, K, T, S, R, B, N, PT100
0.1% of range
RS422/485
Modbus <sup>®</sup> /JBus RTU slave or PROFIBUS <sup>®</sup> -DP slave
NEMA 4/IP65



#### **Other Available Products**

#### 800, 900 and 90 Series controllers

808/809, 847/849, 818S, 818P, 818P4, 818P15, 902S, 902P, 903P, 904P, 900EPC, 91e, 92, 93, 94, 94C

- Single and multi-zone ovens and furnaces
- Extrusion control
- Environmental chambers
- Auto claves
- Chillers and dryers



#### Associated Auxiliary Products

- B&B Port Powered
   Communications Converter
- DuTec Baudmaster
   Communications Converter
- Prosoft A-B PLC<sup>™</sup> Interface Modules
- IPSG Instrument Programming Software

Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

## **INDICATOR AND ALARM UNITS**



#### **INDICATOR AND ALARM UNITS**



Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

#### **INDICATOR AND ALARM UNITS**

# 2132*i* and 2116*i* Compact Indicator and Alarm Units

#### Ideal for:

- Temperature indication
- 4-20mA process inputs
- Over-temperature protection
- Process value trip unit







Model 2132i: 48W x 24H x 103D mm Model 2116i: 48W x 48H x 103D mm

The 2132*i*/2116*i* are compact high performance 4 digit units with large, bright green LEDs for measurement and display of temperature and other process variables in standard 1/32 and 1/16 DIN panel sizes.

Both models include an optional alarm relay output and logic connection for either a second external alarm relay or alarm acknowledge input.

The universal input employing patented Instant Accuracy<sup>™</sup> technology, of the 2132*i*/2116*i* accepts a wide range of two wire temperature sensors and process inputs.

#### Features:

Universal input:	covers a wide range of temperature and process inputs
Three software alarm setpoints:	separate warning and shut-down limits
One or two alarm outputs:	alarm alert and shut-down outputs
Front panel configuration:	easy, on-site set-up
Wide-range:	85-264Vac, or 20- 29Vac/dc supply can be installed world-wide
Plug-in from front:	rapid replacement, reducing downtime

#### **Specifications:**

Display: Supply voltage: Operating ambient: Green four digit 10mm LED 85-264Vac 20-29Vac/dc 15watts maximum 0-55°C, 5-95%RH non-condensing

Inputs:	nine standard thermocouple types, Pt100, Linear mV/mA
Sample rate:	5Hz
Relay output rating:	2A, 264Vac resistive

#### **Rear Terminal Connections**



\* External relay module part # SUB21/OARELAY// Order separately



Model Number	Function	Supply Voltage	Manual
2132 <i>i</i> 1/32 DIN Indicator 2116 <i>i</i> 1/16 DIN Indicator	AL Indicator with one logic I/O and one alarm output	VH 85-264Vac VL 20-29Vac/dc	XXX No manual ENG English FRA French GER German NED Dutch SPA Spanish SWE Swedish ITA Italian

#### **INDICATOR AND ALARM UNITS**

#### 2108*i* Indicator and Alarm Unit

#### Ideal for:

- Temperature indication
- 4-20mA process inputs
- Over-temperature protection
- Process value trip unit



The 2108*i* provides accurate four digit measurement and display of temperature and other process variables in a standard 1/8 DIN format. Two alarm relay outputs are provided from up to three internal soft alarms. External digital keylock and alarm acknowledge inputs are standard.

The 2108*i* employs patented Instant Accuracy<sup>™</sup> technology and accepts outputs from all popular temperature, pressure, flow and level measurement sensors.

#### Features:

Universal input:	covers a wide range of temperature and process inputs
Two alarm relay outputs:	for operator alert and plant protection
Wide-range 85-264Vac, supply:	can be installed worldwide
Plug-in from front:	rapid replacement, reducing downtime
Front panel configuration:	easy, on-site set-up
Tactile buttons:	friendly operation

#### **Specifications:**

Display: Supply voltage: Operating ambient: Red or green four digit 15.9mm LED 100–240Vac 15%, +10% 0-55°C, 5-95%RH non-condensing Inputs:

Sample rate: Relay output ratings: nine standard thermocouple types, Pt100, Linear mV/mA 5Hz 2A, 264Vac resistive

#### **Rear Terminal Connections:**

#### Model 2108*i*





#### **INDICATOR AND ALARM UNITS**

# 2408*i* Universal Process Indicator and Alarm Unit

#### Ideal for:

- Temperature indication
- Pressure, flow and level monitoring
- Differential measurement
- Process protection

Accurate, stable measurement of temperature, pressure, level, flow and other process variables are provided by the 2408*i* universal indicator. An optional second process value input allows the average, difference, minimum or maximum of two values to be displayed.

Temperature linearization functions for nine thermocouple types and Pt100 resistance thermometers are selectable. Other input linearizations can be factory downloaded.

Strain gauge and pressure sensor inputs can be energized from an internal 5 or 10Vdc supply. An automatic calibration routine is provided to remove zero and span offsets.

For flow measurements, square root extraction is available as standard.

The 2408*i* employs Instant Accuracy<sup>™</sup> technology in its universal input. Large, bright, red or green displays ensure good visibility in high and low ambient lighting.

# Model 2408i: 96W x 48H x 150Dmm

For level measurement, an eight-point fit may be applied to any part of the input signal to give an accurate displayed value.

#### Features:

Four alarm setpoints	for alert and plant protection
Serial communications	for supervisory control and data acquisition
DC retransmission	fully isolated retransmission to remote control and monitoring equipment
Second PV input	for monitoring auxiliary signals
Strain gauge input	for pressure monitoring communications

#### Specifications:

Display:	Red or green five digit 15.9mm LED 85-264Vac, 20-29Vac or dc, 15watts maximum			
Supply voltages:				
Operating ambient:	0-55°C, 5-95%RH non-condensing			
Inputs:	Single or dual; nine standard thermocouple types, Pt100 Strain gauge, Linear mV/mA			

Sample rate:	9Hz
Relay output ratings:	2A, 264V resistive
Digital communications:	RS232, 2-wire RS485 and 4-wire RS422 Modbus <sup>®</sup> , ASCII and Profibus <sup>®</sup> -DP protocols

#### **Rear Terminal Connections:**

Model 2408*i* 





#### **INDICATOR AND ALARM UNITS**

# Factory Mutual Approved Alarm Units 2132FM, 2116FM, 2208FM and 2204FM

#### Ideal for:

Single and multi-zone ovens, furnaces and kilns

The Series 2000<sup>°°</sup>FM family consists of four instruments; 2132FM, 2116FM, 2208FM and 2204FM. A digital input for alarm acknowledgement/reset is included as standard.

#### **Universal input**

A universal input circuit employing patented Instant Accuracy<sup>™</sup> technology with an advanced analog to digital convertor samples the input and continuously corrects it for drift. This gives high stability and rapid response to process changes. High noise immunity is achieved by rejection of 50/60Hz pick-up and other sources of noise. The input covers all thermocouple types, Pt100 RTD linear millivolts or milliamps or DC volts. Input filtering from 1.0 to 999.9 seconds is included.

#### **Customized operation**

Front panel LEDs provide a bright, clear display of the process value. Tactile push buttons insure positive operation.



#### **Features:**

Standard 1/4, 1/8, 1/16, 1/32 DIN panel cutout

Independent alarm outputs

**Customized operator interface** 

Digital input for alarm reset

EIA-485 communications (2208FM and 2204FM)

Plug-in from the front

Simple front panel acknowledgment and reset of alarms

FM approved operation

Compliant with European EMC and low voltage safety directives

Access to other parameters is simple and easy to understand and can be customized to present only those parameters that need to be viewed or adjusted. All other parameters are locked away under password protection.



Function	Alarm 3	Alarm 4	Alarm 1	Alarm 2	Comms	Manual
NS FM approved	XX Not Used R1 Relay: 2-pin	XX Not Used R1 Relay: 2-pin	XX Not Used RF Relay: Form C	XX Not Used RF Relay: Form C	XX Not Used YM 485 Modbus	XXX No manual
# **INTEGRATED SOLUTIONS**

#### **PRODUCTS FOR INTEGRATED SOLUTIONS**



Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

**SECTION** 

#### INTEGRATED SOLUTIONS

#### MACO<sup>®</sup> DS/EM3 Plastic Machine Control System

#### Ideal for:

- Complete control of injection, extrusion, blow molding applications
- Multiple network, multi-processor distributive based design for precise control of time critical operations
- Standalone control of temperature, injection, parison and pressure
- Industrial PC operator station applications
- Any application requiring terminal I/O blocks

The new MACO<sup>®</sup> DS/EM3 is the first control system specifically designed to save plastic OEMs and producers time and money. It is based on a revolutionary building block architecture that is designed to adapt to the ever changing needs of the plastics industry. The result is an open and scalable system that contains four decades of injection, extrusion and blow molding knowledge. MACO<sup>®</sup> DS/EM3 is a complete family of control products: PC based operator station (Optima<sup>™</sup> PC), application specific I/O



blocks (ASB's) and terminal I/O blocks (TB's). The Optima<sup>™</sup> PC, ASB's and TB's can be networked to form an overall control scheme. Applied as a total machine controller, or as an individual component, MACO<sup>®</sup> DS/EM3 creates a system that meets your needs perfectly today, and is adaptable to ensure a perfect fit in the future.

#### Specifications:

OPtima PC Based	Wonderware <sup>®</sup> InTouch <sup>™</sup> Display	/O Terminal Blocks:	Over 20 I/O Configurations	
Operator Station:	Microsoft <sup>®</sup> Windows NT <sup>®</sup> , ISA and PCI Expansion Slots		Snap-on Communication Adapters for Modbus <sup>®</sup> Plus, Profibus <sup>®</sup> -DP, Interbus-S, Ethernet, ControlNet <sup>™</sup>	
	10.4" or 15.0" Touch Screen		and DeviceNet <sup>™</sup>	
	Device Bus or PC Configurable		Terminal Block Type Packaging	
	Push-buttons		DIN Rail Mount with Removable Connectors	
Application Specific	Up to 24 Zones of Temperature			
Blocks:	Control or Two Process Control Assemblies	XL PB Pushbutton Station:	23 Pushbuttons with 23 independent LEDs	
	High Speed Analog I/O		Slide-in legends to identify buttons	
	Discrete 24Vdc Inputs and Outputs		and LEDs	
	Sequence Control with Online Editing and Diagnostics		Either direct wiring to 24Vdc Inputs or Outputs or Snap-on	
	DIN Rail Mount with Removable Connectors		Modbus <sup>®</sup> Plus, Profibus <sup>®</sup> DP, Interbus-S, Ethernet, ControlNet <sup>™</sup> and DeviceNet <sup>™</sup>	

#### **Benefits:**

- Labor and Material Savings by Wiring Directly to I/O TBs
- Fewer Failures From Robust Hardware
- Higher Productivity From Advanced Control Algorithms
- Scalable One Control Solution for Large and Small Machines
- Reduced Installation Costs Fast and Easy DIN Rail Mounting
- Shared Database Between Screen Programming Tool (Wonderware  $^{\!\!\circ}$  InTouch  $^{\!\!"}$  ) and Sequence Editing Tool
- Global Multi-Lingual
- Flexibility of Distributed or Centralized I/O
- Internationally Accepted IEC Standards
- Connectivity to Third Party Devices
- Small Profile to Reduce Panel Space
- Large Color Graphical Interface for Easy Use
- Pre-configured Screens and Sequence for Rapid Start-up
- Efficient Sequence Programming Tool for Reduced Development Costs (On-line Editing, Diagnostics and Simulation)

#### **INTEGRATED SOLUTIONS**

#### MACO<sup>®</sup> 4000, 5000, 6000 and Breeze<sup>™</sup> Control Systems

#### Ideal for:



#### Total Injection, Extrusion and Blow Molding Machine Control

The MACO<sup>®</sup> 4000, 5000 and 6000 Series of Injection, Extrusion and Blow Molding Control Systems is a scalable family, designed to meet even the most demanding applications. Its' open design allows you to integrate the control of virtually any process variable. Control is integrated into a single, 9, 12 or 16 slot chassis with expansion into multiple chassis. Operator stations ship complete with information display screens for the specified application. With the OptiGrafix<sup>™</sup> Screen Editor software package you can change or add screens to suite your specific applications.

The MACO<sup>®</sup> 4000 Series offers the advantage of a totally integrated package that includes closed loop injection process control, clamp control, linear positioning control, machine auxiliary functions, pressure/flow control, Auto-Tune<sup>™</sup> heat/cool temperature control, sequential machine control and built in timing and counting.

The MACO<sup>®</sup> 5000 Series will increase your singlescrew, twin-screw, co-extrusion or blown film productivity. With automatic tuning, simply enter temperature setpoints, ramp setpoints and cycle times.

#### **Functions:**

- Multiple Bus, Multi-Processor Rack based Design (for Precise Control of Time Critical Operations)
- Fully Programmable Sequence Logic and Displays
- Auto-Tune<sup>™</sup> Heat/Cool Temperature Control
- IMPACT<sup>™</sup> Advanced Auto-Tune<sup>™</sup> Injection Process Control
- 100 Segment Parison Profile Control with 100µ Loop Speeds
- Bumpless Extrusion Melt Pressure Control





Accurate stable control is achieved quickly without overshoot. Drive functions can be used for monitoring and alarming, open loop or manual control, cascade control or in conjunction with pressure to achieve closed loop PID control.

The MACO<sup>®</sup> 6000 Series provides total machine control of accumulator-based, reciprocating screw or continuous extrusion blow molding processes. The process of changing wall thickness is easy. Enter as few as two parison setpoints and all other setpoints are calculated for you. Actual tooling performance is graphically displayed against your programmed profile.

The MACO<sup>®</sup> Breeze<sup>™</sup> is designed for easy stand-alone blow molding parison control. The controller can be added as a retrofit to a wide variety of blow molding machines to provide consistent wall thickness of blow molded product for improved product quality, less material consumption and reduced scrap. The all-in-one unit does not require screen and sequence programming.

- High Speed operator screen updates (375K baud)
- Multi-level security codes and setpoint change logging (to reduce production problems)
- Twenty-four machine function buttons with backlight LEDs on the Operator Stations (to replace expensive pilot lights and controls switches)
- Recipe storage to Insta-Set<sup>™</sup> cartridges or floppy disks
- Built in statistical process control (SPC)
- Automatic Heat start-up

# FoxTraker<sup>®</sup> Production Monitoring and Reporting Software

#### Ideal for:

Plastic and Heat Treating Applications

FoxTraker<sup>®</sup> is a complete, ready-to-run system for production monitoring of plastic and heat treating applications. Each FoxTraker<sup>®</sup> system includes all the necessary software to setup a complete production monitoring and reporting system for four machines or furnaces (continuous, batch or endo-generators). Just provide a PC with the appropriate Microsoft® Windows<sup>®</sup> operating system and configure the FoxTraker® for your Eurotherm Controls/ Barber-Colman instrument and take advantage of the latest automation technology to give your company a competitive edge. The use of standard Wonderware® InTouch<sup>™</sup> software on an open architecture permits easy expansion when you're ready to grow the system. Unlike other solutions available, the FoxTraker<sup>®</sup> combines flexibility, scaleability and is preconfigured. There is no need to purchase, wire and configure duplicate sensors for most of Eurotherm Controls/ Barber-Colman controllers. FoxTraker<sup>®</sup> connects directly to the communication port. This simplifies the installation process and guarantees that you never have mismatched data between your controller and your production monitoring system.





#### **INTEGRATED SOLUTIONS**

#### **Functions:**

#### **General Functions:**

- Production Overview Display
- Long Term Data Storage
- Historical Data Logging
- Historical Trend Graphing
- Job Summary Report
- Shift Summary Report
- Statistical Process Control (SPC)
- Trend graph displays of select parameters

#### **Optional Functions:**

- Additional machine or furnaces
- MIS/MRP system displays, reports or connections
- Recipe creation/download
- Production Scheduler

#### Plastic Production **Overview Display**

#### -Machine and operator IDs

- —Machine status
- -Part and mold numbers
- -Run Quantity
- —Good and reject part counts
- -Parts to go
- -Actual and standard cycle time
- scrap rates

#### **Overview Display** —Furnace, operator and

**Heat Treating** 

Production

- load ID
- -Part number
- —Load quantity —Setpoint
- program ID
- -Up and downtime
- -Production and

#### **Requirements:**

**Required Items:** (not included in basic package)

personal computer with Microsoft<sup>®</sup> Winows<sup>®</sup> 98 or Microsoft<sup>®</sup> WindowsNT<sup>®</sup>

wiring

comunication adapter for Eurotherm/Barber-Colman controllers\*

configuration of the FoxTracker® database to each controller on the network

\*Consult the factory for non-Eurotherm/Barber-Colman controllers

**Base package includes** 

single CPU Wonderware<sup>®</sup> InTouch<sup>™</sup> runtime license, FoxTraker® Screens **DDE Server** 

#### **PC3000 Production Controller**

#### Ideal for:

- Multizone furnaces
  Kilns
  Heat treatment
- Carbon potential



The PC3000 is a multi-loop control system that is configured using an OS/2<sup>®</sup> IEC1131-3 compliant PC based tool with a function block library including

- Autotune PID
- Ramp Dwell Programmer
- Communication Drivers

Standard multiloop applications are available.

The PC3000 includes sequencing using Sequential Function Charts (SFC) for start up strategies, shut down and other machine or process changes. The PC3000 supports downloadable function blocks and can communicate with external devices like drives and gauges.

# Supervisor Local HMI

#### Specifications:

I/O modules:	An. Input x 4: mV, T/C, mA, PT100 (indiv. channel isolation and CJC) An. Output x 4: mV, V Dig Input x 14: 24Vdc, 240Vac, vfc Dig Output x 12: Relay 1A, Logic
CPU:	8020 LCM-plus with 3 ports (RS422/RS485/RS232)

Operating temperature:	0-50°C
Relative humidity:	5 to 95% non-condensing
Supply:	85-264V ac
Mounting:	3U 19' rack (12 modules) panel or bulkhead

#### **INTEGRATED SOLUTIONS**

#### **Eurotherm Suite Process Automation**

#### Ideal for:

#### A dependable systems partner

Eurotherm Process Automation is the systems integration arm of Eurotherm. The company specializes in the supply of enterprise automation solutions to a wide range of industries. Numerous successful installations of both small control sub-systems and large-scale integrated automation systems in operation across a range of industries have won the company global recognition as a systems provider. Whatever the demand you're facing you need a reliable, experienced automation supplier who understands your needs and knows how to address them.

#### **Global Automation Solution Provider**

Eurotherm has provided system solutions to a wide range of international industries for over 25 years. We have extensive installations and our expertise spans continuous and batch processes; we can supply small sub-systems to large scale integrated automation systems, from packaged plant to tightly coupled MIS/MES applications.

SU SU	
Metals	Furnaces
Glass	Refining
Automotive	Chemical

Glass	Pharmaceutical		
Utilities	Refining		
Automotive	Chemical		
Oil and Gas	Ceramics		
Minerals	Textiles		
Energy	Wire and Cable		
Boilers	Environmental		
Rubber/Plastics	Chambers		
Waste/Water	Engine Testing		
Food/ Drink	Semiconductors		

#### **Project Studio 2000**

Eurotherm Project Studio 2000 is a Microsoft<sup>®</sup> Windows<sup>®</sup> operating system based comfiguration tool with iTools, LinTools, and Online books supporting our complete hardware range:

$\bullet$	T640	Loop controller
ullet	T103	Unit Controller
ullet	Т800	Visual Supervisor
•	<b>T940</b>	Process Supervisor
lacksquare	2500	Remote I/O Unit



#### **T640 Loop Controller**

- up to four loops of control and batching
- micro DCS—DCS in instrument format
- system integration—high speed peer-to-peer communications for integration within the Network 6000 and RS422 option supporting the EPA Bi-Synch protocol
- high speed 2.5 mb/sec ALIN control network provides peer-to-peer and workstation communications
- I/O options—high level process I/O, thermocouple I/O
- plant mounting—IP65 panel mounting seal with supporting fixtures for rack and bin mounting
- features—multi-language support, secure access to engineering settings

#### T103 Unit Controller and T303 Unit Supervisor

- up to 20 loops of control and batching
- distributed Control Units with up to 128 I/O points per node
- full function continuous and sequence control
- redundant CPU option for continuous control with procedureless bumpless takeover
- live replacement of CPU and I/O modules
- direct T640 controller integration
- Modbus<sup>®</sup> communications in simplex units
- high speed 2.5 mb/sec ALIN control network provides peer-to-peer and workstation communications

#### **T800 Visual Supervisor**

- up to 20 loops of control and trending
- combined controller and operator panel in one package
- powerful multi setpoint programmer with touch-screen display
- open communications: Profibus®-DPV1, Modbus® RTU
- distributed I/O reduces wiring costs
- alarm and historical data logging
- comprehensive alarm and event management
- extensive pre-formatted displays and up to 99 HMI configurable pages
- high speed 2.5 mb/sec ALIN control network provides peer-to-peer and workstation communications
- uses the 2500 remote I/O on third party I/O







#### **INTEGRATED SOLUTIONS**

#### **T940 Process Supervisor**

- up to 100 control loops and batching
- distributed process controller
- redundant processor option with automatic and seamless switchover
- large application capacity
- live replacement of processor and automatic initialization
- ALIN control network provides peer-to-peer and supervisory communications
- open I/O network supports Profibus®-DPV1 and Modbus® RTU
- redundant Profibus<sup>®</sup>-DPV1 with redundant processor option
- multiple network support for interface to supervisory systems
- extensive health monitoring and diagnostics including watchdog relay
- uses the 2500 I/O or third party I/O

# 2500 Remote Process Interface I/O for T940 and T800

- distibuted scalable remote I/O system
- individual module and channel status indication
- live plug in modules
- direct wiring on a DIN rail mounting
- up to eight loops of PID control with self tuning
- extensive high accuarcy range of analog and digital modules
- alarms, math functions and combinational logic
- standard communication protocols: Profibus®-DPV1 and Modbus® RTU

#### SCADA System Solutions for Process Automation Equipment

- Third party OPC server based on an OPC license
- Intellution<sup>®</sup> Fix 7.0 (T3500)
- Eurotherm Suite unit, plant and enterprise solutions featuring Wonderware® Factory Suite 2000



CE



### **POWER CONTROL PRODUCTS**

SECTION

4

#### **POWER CONTROL PRODUCTS**



\* For a more complete listing of products and related information, please ask for our Power Controls and Actuators Catalog.

Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

# **Power control products**

**THREE PHASE** 

SINGLE PHASE

					Two leg s 3 wire	switching loads	Three leg 3 or 4 w	switching vire loads
	SSDA SSAA	RSDA RSAA	TE10S	TE10A	TE200S	TE200A	RS3DA RS3AA	TE300
HEATER TYPE								
Constant resistance								
Variable resistance								
Inductive								
Transformer coupled								
Short wave infrared <sup>(1)</sup>								
RATING								
Maximum current <sup>(2)</sup>	75A	100A	50A <sup>(1)</sup>	50A <sup>(1)</sup>	63A	63A	30A	63A <sup>(1)</sup>
Controlled phases	1	1	1	1	2	2	3	3
INPUT	L	L	L	А	L	А	L	А
FIRINGMODE	В	В	В	Р	В	В	В	В
OPTIONS								
Partial Load Failure (PLF)								
Current limit								
PAGE REFERENCE	4-3	4-4	4-5	4-5	4-6	4-6	4-7	4-8

<sup>(1)</sup> Max, current ratings are derated for burst firing SWIR application, no I<sup>2</sup>t fusing (consult factory)

<sup>(2)</sup> Due to voltage and load variations, we recommend that a 20% safety factor be added to the current rating of the unit

For a complete selection of our power control products, please refer to the Power Controls and Actuators Catalog or ask for our SCR Power Controller Selection Guide HA136393

#### SSDA/SSAA

#### Panel Mounted Single Phase Solid State Relay

#### **Features:**

- 10-75 amps, 330Vac max.
- 50–75 amps, 500Vac max.
- 1Ø zero-fired
- LED input indicator
  - Clear safety cover included
  - Separate heat sinks available

#### **Specifications:**

Dimensions (mm):	57.1H x 44.5W x 34.8D When mounted on a vertical panel.
Load type :	Resistive, solenoid, etc.
Inputs :	
<b>SSDA - DC Input</b> DC Logic: Input impedance :	ON=>4Vdc, 28Vdc max. OFF=<1Vdc 1.5k
<b>SSAA - AC Input</b> AC Logic:	ON=>100V, 280Vac max. OFF=<20Vac
Input impedance :	330V-40k 500V-20k
Current ratings* :	10A, 25A, 40A and 75A @ 330V max. and 50A and 75A @ 500V max.
Operating temperature :	0°C to 40°C (up to 80°C

SP ( ( )

#### **Solid State Relay Derating Curves**



50 and 75 amp at 500V

at 330V

at 330V



75A free air

**Ordering Codes:** 



with derating)

Optional Heatsinks				
SUBSSR/HSINK/A/2.1	101.6 H	120.7 W	66.8 D	
SUBSSR/HSINK/B/1.5	76.2 H	120.7 W	66.8 D	
SUBSSR/HSINK/B/1.0	139.7 H	120.7 W	66.8 D	

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\* These units must be correctly installed on an appropriate heatsink in order to dissipate the heat generated.

#### **POWER CONTROL PRODUCTS**

#### RSDA/RSAA — Din Rail Mounted Single Phase Solid State Contactor

#### Features:

- 25–100 amps, 500Vac max.
- 1Ø zero-fired
- Integral heatsink design
- LED input and fault indicators
- Internal I<sup>2</sup>t fusing ( 50 amps)

#### **Specifications:**

Dimensions (mm) :		25A-	87H x 30W x 100D
		40A-	87H x 60W x 100D
		50A-	126H x 61W x 128D
		75A-	126H x 90W x 128D
		100A-	126H x 120W x 128D
Mountin	ng:	Panel or	r symmetrical DINrail
Inputs:	RSDA - DC Input		
Low voltage DC Logi High voltage DC Log		c (LDC) :	ON=>4V, max. = 28Vdc OFF=<1V
		ic (HDC):	ON=>20V, max. = 30Vdc OFF=<1V
	Input current :		LDC 15mA, HDC 13mA
<b>RSAA - AC Input</b> AC Logic: Input impedance :			
			ON=>100V, max.=280Vdc OFF=<20V
			40k

# ( **9**



#### Solid State Relay Derating Curves



Load type : Firing mode - Logic : Operating temperature :

Resistive

Zero crossing switching

 $0^\circ\text{C}$  to  $40^\circ\text{C}$  (up to  $80^\circ\text{C}$  with derating)



#### TE10S/TE10A — DIN Rail Mounted Single Phase Solid State Contactor/SCR Power Controller

#### Features:

- 16–50 amps, 500Vac max.
- 1Ø zero-fired or phase fired
- **LED** status indicator
- Optional load monitoring and alarms



# 

#### **Specifications:**

Dimensions (mm): TE10S (as TE10A or as TE10S with PLF)		Inputs:		
		TE10S		
16A– 115H 25A– 115H	x 35W (53W) x 93D, 320g/550g x 53W (70W) x 93D, 500g/700g	DC Logic (LGC):	ON=>5V, 32V max. and >5mA, 10mA max., OFF=<2V or <0.5 mA	
50A- 115H	x 105W(123W) x 93D, 880g/1200g	AC Logic (LAC):	ON=>30V, 55V max., input impedance 2k OFF=<5V	
Load type:	TE10S resistive or short wave infrared TE10A resistive, variable resistance, short wave infrared or inductive	AC Logic (HAC):	ON=>85V, 265V max., input impedance 9.6k , $OFF=<10V$	
Firing mode:	TE10S zero voltage switching	PDS <sup>(2)</sup> : <b>TE10A</b>	Bi-directional diagnostic control input	
	(synchronized to line). TE10A fast cycle, single cycle, advanced single cycle and phase angle	DC current: DC voltage: Potentiometer:	4-20mA, input impedance 250k 0-5V or 0-10V, input impedance 100k 10k (customer supplied)	
Operating temp:	U°C to 45°C (60°C with derating)			



#### **POWER CONTROL PRODUCTS**

#### TE200S/TE200A — DIN Rail Mounted Three Phase, Two Leg Solid State Contactor/SCR Power Controller

#### **Features:**

- **16–63** amps, 500Vac max
- 3Ø, 3-wire loads (two leg switching)
- Finger safe
- LED status indicator



#### Specifications:

Dimensions (mm): 50A- 189H x 116W x 131D, 2.3kg		Inputs:	TE200A	
	63A– 195H x 116W x 131D, 2.9kg	DC Current:	4–20mA, input impedance 250k	
Load type:	Resistive	DC Voltage:	0-5Vdc or 0-10Vdc, input impedance 100K	
Inputs:	TE200S	0		
DC Logic :	ON=>5V, 32V max. and >5mA, 10mA	Potentiometer:	10K (customer supplied)	
	self limiting OFF=<2V or <0.5mA	Firing mode:	TE200S logic. TE200A burst firing or single	
AC Logic (LAC):	ON=>20V, 53V max. input impedance		cycle	
	2.2k OFF=<5V	Operating temperature:	0 to 45°C	
AC Logic (HAC):	ON=>85V, 253V max., input impedance 9.6k OFF=<10V	Mounting:	Symmetrical DINrail or bulkhead	

#### See page 4-10 for optional Model Voltage kits and spare fuses. **TE200s 99** 00 Mounting **Fuse Option** Voltage Input Logic Language Current Fan Supply BKD Bulkhead 240V FUSE 2 leg fuse kit NO FUSE Fuse not incl. 000 FNG English French 16 amps 200-240 volts None (below 63) Universal DC 25 amps 480V LAC DIN DIN rail 380-480 volts 115 volts 48Vac input Germai 50 amps 500V 500 volts 230 volts HAC 100-240Vac 63 amps Model TE200A 00 **99** Firing Mode Voltage Fan Supply Manual Current **Fuse Option** 16 amps ENG FRA GER English French FUSE 2 leg fuse kit NO FUSE Fuse not incl. 200 volts 400V 400 volts 000 None (below 63) Fast cycle 230V 230V 240V 277V 400V 415V 440V 480V 115V 230V 25 amps 230 volts 415 volts 115 volts Single cycle 50 amps 50A 240 volts 277 volts 440 volts 230 volts German 480 volts 63 amps Mounting 380 volts 500 volts Options Input \* Auxiliary supply option BKD DIN Bulkhead DIN rail only required for voltages not shown in voltage 115V Auxiliary 115V\* 0V5 0-5V 0V10 0-10V 230V Auxiliary 230V\* selection box. 4ma20 4-20mA

#### RS3DA/RS3AA — DIN Rail Mounted Three Phase Solid State Contactor

#### Features:

- **30** amps, **500Vac** max.
- Economical three phase control
- Zero Switching
- Suitable for resistive loads
- Finger Safe

**Specifications:** 



#### Solid State Relay Derating Curves

Dimensions (mm):	87H x 90W x 100D
Load type:	Resistive
Inputs for RS3DA:	
DC Logic (LDC):	ON=>4V, 28V max. and >10mA, 18mA max. OFF=<1V)
DC Logic (HDC):	ON=>20V, 30V max. and >11mA, 21mA max. OFF=<15V
Input for RS3AA:	
AC Logic (HAC):	ON=>90V, 280V max., input impedance 0.9k OFF= <20V
Firing mode:	Logic, ON/OFF



Ambient temperature, measured 1" (25mm) below relay when mounted to vertical surface

#### **Ordering Codes:**



Operating

See page 4-10 for optional fuse kits and spare fuses.

#### **POWER CONTROL PRODUCTS**

#### **TE300 DIN Rail Mounted Three Phase** Solid State Contactor/SCR Power Controller

#### Features:

- 16–63 amps, 500Vac max.
- 3Ø, 4-wire loads (three leg switching)
- Advanced firing modes
- Finger safe
- LED status indicator



#### **Specifications:**

Dimensions (mm):	16-50A– 215H x 155W x 186D, 3.1kg 63A 235H x 155W x 186D, 3.5kg	Firing mode:	Logic, Single Cycle, Fast
Load type:	Resistive or short wave infrared		Cycle, Slow Cycle and
Inputs :			Advanced Single Cycle (4 or 6 wire load configuration)
Logic (LGC):	5V or 10V, 20mA; ON 50%	Operating temperature:	0 to 45°C without derating
	OFF 25% of the nominal level	Mounting:	Symmetrical DINrail
DC Current (4mA20):	4 to 20mA, input impedance 250		or bulkhead
DC Voltage (0V5 or 0V10):	0 to 5V or 0 to 10V, input impedance 100k		
Potentiometer:	10k (customer supplied)		

#### **Ordering Codes:**



See page 4-9 for optional kits and spare fuses.

# **REMIO Digital Communications Interface for Solid State Contactors**

#### Ideal for:

- Controls up to 48 zones
- LED diagnostics
- DeviceNet<sup>™</sup>, Modbus<sup>®</sup> and Profibus<sup>®</sup>-DP ready
- DIN rail mounted
- Connection to PC's and PLC<sup>™</sup>'s





#### Specifications:

Dimensions:	Base modu Base modu Base modu	ıle: ıle w/extension: ıle w/two extensions:	115 x 87.5 x 92.5 115 x 105 x 92.5 115 x 122.5 x 92.5	Firing Modes:
Supply Voltage:		24Vac or 24Vdc (24VA max.)		Communication:
Base Module Type:		Time Proportioned Output (TPO) Module or Digital input/output (Digital) Module		communication.
Expansion Mo	dules:	two max.		
TPO Module:		16 outputs, 20Vdc modulated with time proportioning output variable from 0-100%, internal 6.5mA current limit		Ambient:
Logic Module:		16 outputs, 20Vdc with internal 6.5mA current limit or 8 outputs and eight Inputs per module		

Fast Cycle (8 cycles on/ 8 cycles off @ 50% output)
Intelligent Half-Cycle
Modbus <sup>®</sup> configurable for 9.6 or 19.2 kbaud
Profibus <sup>®-</sup> DP 1.5 mbaud
DeviceNet <sup>™</sup> configurable for 125, 250 or 500 kbaud
0-45°C



#### **POWER CONTROL PRODUCTS**

#### **Fuse Kits and Spare Fuses**

#### Ideal for:

Semiconductor protection



We recommend fuse protection through the use of properly selected I<sup>2</sup>t fusing (semiconductor fuses). Devices such as circuit breakers and general purpose fuses, while sufficient and necessary for load and installation protection, do not provide adequate protection for the semiconductor device.

The tables below represent the available factory approved fuse products for semiconductor protection.

#### **External Fuse and Fuseholders:**

Current	TE105/	TE10A	TE200/T	FE300
	Part number	Dimension	Part number	Dimension
16A	FU1038/16A//	81H x 18W x 68D	FU3038/16A//	81H x 53W x 68D
25A	FU1038/25A//	81H x 18W x 68D	FU3038/25A//	81H x 53W x 68D
50A	FU2258/50A//	140H x 35W x 90D	FU3258/50A//	150H x 108W x 90D
63A			FU3760/63A//	150H x 114W x 90D

#### **Spare Fuses:**

RS Series	TE Series	
	CH260024	
	CH260034	
	CH330054	
FUSE/SEMIBR/50A*	CS173087U063	
	CS173246U080	
FUSE/SEMIBR/75A*		
FUSE/SEMIBR/100A*		
	RS Series FUSE/SEMIBR/50A* FUSE/SEMIBR/75A* FUSE/SEMIBR/100A*	RS Series         TE Series           CH260024         CH260034           CH330054         CH330054           FUSE/SEMIBR/50A*         CS173087U063           CS173246U080         CS173246U080           FUSE/SEMIBR/75A*         FUSE/SEMIBR/100A*

\* Internal fuse

If in doubt, please contact your sales representative

#### **Ancillary Equipment**

#### Ideal For:

Equipment to enhance the use of solidstate contactors and SCR power controllers

#### CE Filters

In order to comply with the EMC test standards required by CE, it may be necessary, in certain applications, to add series or parallel filters to an installation using SCR units. Many SCR units contain internal filters to meet CE requirements. However, if external filters are considered to be a requirement, particularly when SCR's are used in the phase angle firing mode, a range of filters is available.



#### **PD/CTX Intelligent Current Transmitter**

PD/CTX is an intelligent current transmitter designed for use with Series 2000<sup>™</sup> controllers and load contactors. These two wire devices can transmit load status and RMS load On-state current and also provide diagnostic information on the Solid State Relay switching device. The status and current information can be presented on a Series 2200 or 2400 controller which can be set up to alarm on high and low load currents as well as on status alarms.

Available with two modes of operation, the PD/CTX can be used to fire a TE10S SSC via the PDSIO<sup>®</sup> link (Mode 2), a conventional third party SSR or a mechanical contactor (Mode 5).



#### **POWER CONTROL PRODUCTS**

#### **Other Available Products**

#### 400, TE10P, TC and TU Series

We have a complete range of SCR Power controllers to suit all your needs: For more information on these products, please see our Power Controls and Actuators Catalog.



Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

#### ACTUATOR PRODUCTS AND ACCESSORIES



\* For a more complete listing of products and related information, please ask for our Power Controls and Actuators Catalog

Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

#### ACTUATORS

#### EA40 Low Torque Spring Return Actuator

#### **Features:**

- Proportional actuators with built-in feedback potentiometer
- 24Vac, 120Vac and 240Vac models available
- Oil immersed motor and gear train
- SPDT auxiliary switch standard
- 50 in-lbs torque

The spring return actuator will proportionally position a fuel valve, butterfly valve, damper and similar devices which require return to a normal position on power interruption. The output shaft is power operated in both directions. An internal electrical holding circuit maintains the proper damper position at setpoint. The enclosed spring drives the output shaft and gear train to return the damper to a normal position on power interruption. Standard features includes 100  $\Omega$  internal feedback slidewire and single internal SPDT switch.

#### Specifications:

#### ACTUATOR

Control Action:	Floating. Requires SPDT switch with floating (center off) position rated at 0.9 amps., proportional with slidewire feedback, electronic
Connections:	Coded screw terminals.
Shaft Rotation:	Reversible proportional can stop at any point in the stroke.
Spring Return:	To normal position on power inter- ruption.
Auxiliary Switch:	Adjustable SPDT snap acting. Factory set to close one contact and open the other at end of clockwise rotation.
Ambient Temperature	Limits: -40 to 136°F (-40 to 58°C).



#### **Mounting Dimensions**



#### **Bottom View**



1. Low and medium torque and spring return output shafts have a standard 12 tooth spline. Reference ANSIB5.15

 Mounting should be upright for the longest life. Models with adjustable speed must not be mounted upside down or with the output shaft upward.

Humidity:	5 to 95% rh, non-condensing.
Case:	Die cast aluminum with two 1/2" conduit knockouts each side.
Mounting:	Damper – upright. Valve – upright with actuator above centerline of valve body.
Dimensions:	7" H x 5-3/8" W x 8-1/8" D (178 mm x 137 mm x 206 mm)
Weight:	8 lbs.
Power Consumption:	40W

#### **Specifications:**

#### ANALOG INPUT MODULE

Control action:	Current input: Factory set at 4-20mA. Span adjustable from 10- 23mA. Zero point adjustable from 0-6mA
	Voltage input: Three ranges 0-1Vdc, 1-5Vdc and 3-15Vdc. Adjustable to other values between these ranges
	Resistance input. Any potentiometer between 100 and1000 ohm full scale
Direction of Travel:	Factory set to CCW with increas- ing signal. Can be changed in configuration mode.
Stroke length:	Factory set for 180° rotation at full scale. Can be changed to 90° by setting a switch. Other stroke lengths can be achieved by use of the zero and span trim pots
Control overrides:	Dry contact closure can force the actuator to either end of travel.
Deadband:	Adjustable from 1% to 6% of span in 0.4% increments.
Ambient Temp:	-40° to 58°C

#### **Analog Input Module**

The microprocessor based integral control circuit accepts current, voltage and resistance input signals. Calibration is field adjustable. Control overrides allow forcing the actuator to either end of travel on demand. Stroke lengths of 90° or 180° are switch selectable. Other stroke lengths can be set by adjusting the zero and span potentiometers. Direction of travel is also field selectable. Default calibration is 4-20mA. Other ranges are switch selectable. A plugin option board provides a 4-20mA position signal and two form C relays that can be set to activate at any position.

0° e	Humidity:	5 to 95% rh, non-condensing
he	Power Requirements:	See individual model number breakout. Rated to operate within 10% of nominal voltage
an	Option Board: (check factory for availability)	Provides a 4-20mA position signal and two form C relays rated at 3 amps resistive load. They can be set to activate at any point within the operating range.



#### ACTUATORS

#### EA50 and EA60 Medium Torque Gear Train, Non-Spring Return Acutators

#### **Features:**

- Proportional actuators with built-in feedback potentiometer
- 24Vac, 120Vac and 240Vac models available
- Oil immersed motor and gear train
- SPDT auxiliary switch standard
- 60, 220, 450 in-lbs torque

The medium torque actuator is ideal for proportional positioning of a fuel valve, butterfly valve, damper and similar applications. Units are available with either fixed or adjustable speed. Timing of adjustable speed units can be increased (decreasing the speed) by turning a slotted adjustment screw on the outside of the case. Adjust range is approximately ten times rated. 100  $\Omega$  feedback slidewire and a single SPDT switch are standard features.

#### **Specifications:**

#### ACTUATOR

Control Action:	Floating. Requires SPDT switch with floating (center off) position rated at 0.9 amps., proportional with slidewire feedback, electronic.
Connections:	Coded screw terminals.
Shaft Rotation:	Reversible proportional can stop at any point in the stroke.
Auxiliary Switch:	Adjustable SPDT snap acting. Factory set to close one contact and open the other at end of clockwise rotation.
Ambient Temperature:	Limits: -40 to 136°F (-40 to 58°C)

#### **Mounting Dimensions**



1. Low and medium torque and spring return output shafts have a standard 12 tooth spline. Reference ANSIB5.15

 Mounting should be upright for the longest life. Models with adjustable speed must not be mounted upside down or with the output shaft upward.

Humidity:	5 to 95% rh, non-condensing.
Case:	Die cast aluminum with two 1/2" conduit knockouts each side
Mounting:	Damper – upright. Valve – upright with actuator above centerline of valve body.
Dimensions:	7" H x 5-3/8" W x 8-1/8" D (178 mm x 137 mm x 206 mm)
Weight:	8 lbs.
Power Consumption:	45W

#### **Specifications:**

#### ANALOG INPUT MODULE

Control action:	Current input: Factory set at 4-20mA. Span adjustable from 10-23mA. Zero point adjustable from 0-6mA
	Voltage input: Three ranges 0-1Vdc, 1-5Vdc and 3-15Vdc. Adjustable to other values between these ranges.
	Resistance input. Any potentiometer between 100 and 1000 ohm full scale
Direction of Travel:	Factory set to CCW with increasing signal. Can be changed in config- uration mode.
Stroke length:	Factory set for 180° rotation at full scale. Can be changed to 90° by setting a switch. Other stroke lengths can be achieved by use of the zero and span trim pots
Control overrides:	Dry contact closure can force the actuator to either end of travel.
Deadband:	Adjustable from 1% to 6% of span in 0.4% increments.
Ambient Temp:	-40° to 58°C
Humidity:	5 to 95% rh, non-condensing

#### **Analog Input Module**

The microprocessor based integral control circuit accepts current, voltage and resistance input signals. Calibration is field adjustable. Control overrides allow forcing the actuator to either end of travel on demand. Stroke lengths of 90° or 180° are switch selectable. Other stroke lengths can be set by adjusting the zero and span potentiometers. Direction of travel is also field selectable. Default calibration is 4-20mA. Other ranges are switch selectable. A plug-in option board provides a 4-20mA position signal and two form C relays that can be set to activate at any position.

Power Requirements:	See individual model number breakout. Rated to operate within 10% of nominal voltage
Option Board: (check factory for availability)	Provides a 4-20mA position signal and two form C relays rated at 3 amps resistive load. They can be set to activate at any point within the operating range.



#### ACTUATORS

#### **EA70 High Torque Actuator**

#### **Features:**

- Proportional actuators with built-in feedback potentiometer
- 24Vac, 120Vac and 240Vac models available
- Die cast housings with four 1/2" conduit openings
- Oil immersed motor and gear train
- SPDT auxiliary switch standard
- **550, 1100, 1300 in-lbs torque**

The high torque actuator will position a heavy damper, globe valve, blast gate, air or gas valve. It can be used for vortex control and hydraulic coupling, and will drive a speed changing screw or slide gate requiring a torque proportional actuator. Standard features include 100  $\Omega$  feedback slidewire and a single SPDT switch. Weather resistant models are NEMA 4.

#### **Specifications:**

#### ACTUATOR

Control Action:	Requires SPDT switch with neutral (floating) or two position and proportional
Connections:	Coded screw terminals.
Shaft Rotation:	Reversible proportional can stop at any point in the stroke.
Auxiliary Switch:	Adjustable SPDT snap acting. Factory set to close one contact and open the other at end of clockwise rotation.
Ambient Temperature	Limits: -40 to 130 °F (-40 to 54 °C).
Humidity:	5 to 95% rh, non-condensing



#### **Mounting Dimensions**



1. Low and medium torque and spring return output shafts have a standard 12 tooth spline. Reference ANSIB5.15

2. Mounting should be upright for the longest life. Models with adjustable speed must not be mounted upside down or with the output shaft upward.

Mounting:	Damper – upright recom- mended Valve – any upright position with actuator above center- line of valve body.
Dimensions:	9-9/16" H x 9-1/2" W x 10-1/2"D (243mm x 241mm x 267mm)
Weight:	30 lbs.
Power Consumption:	190W

#### Specifications:

#### ANALOG INPUT MODULE

Control action:	Current input: Factory set at 4- 20mA. Span adjustable from 10 to 23mA. Zero point adjustable from 0-6mA
	Voltage input: Three ranges 0-1Vdc, 1 to 5Vdc and 3 to 15Vdc. Adjustable to other values between these ranges.
	Resistance input. Any potentio- meter between 100 and 1000 ohm full scale
Direction of Travel:	Factory set to CCW with increasing signal. Can be changed in configuration mode.
Stroke length:	Factory set for 180° rotation at full scale. Can be changed to 90° by setting a switch. Other stroke lengths can be achieved by use of the zero and span trim pots
Control overrides:	Dry contact closure can force the actuator to either end of travel.
Deadband:	Adjustable from 1% to 6% of span in 0.4% increments.
Ambient Temp:	-40° to 58°C
Humidity:	5 to 95% rh, non-condensing

#### **Analog Input Module**

The microprocessor based integral control circuit accepts current, voltage and resistance input signals. Calibration is field adjustable. Control overrides allow forcing the actuator to either end of travel on demand. Stroke lengths of 90° or 180° are switch selectable. Other stroke lengths can be set by adjusting the zero and span potentiometers. Direction of travel is also field selectable. Default calibration is 4-20mA. Other ranges are switch selectable. A plug-in option board provides a 4- 20mA position signal and two form C relays that can be set to activate at any position

he	Power Requirements:	See individual model number breakout. Rated to operate within 10% of nominal voltage
l. van	Option Board: (check factory for availability)	Provides a 4-20mA position signal and two form C relays rated at 3 amps resistive load. They can be set to activate at any point within the operating range.

#### **Ordering Codes:**



90° travel limit, 20 sec., 550 in-lbs torque Analog input module	0 None 1 Two auxiliary SPDT	0 120Vac 60Hz	
180° travel limit, 40 sec., 550 in-lbs	switches 2 Four auxiliary SPDT switches	1 120Vac 50Hz (not available w/EA76) 3 240Vac 60Hz	0         10052           1         135Ω           2         500Ω           3         1000Ω**
torqueinput (available0390° travel limit,EA76 only)0433 sec., 1100 in-lbsA1Analog input module05180° travel limit,factory set to 4-20mA6565 sec., 1100 in-lbsboard with two aux.07	3         Rear shaft           4         100Ω rear slidewire           5         100Ω rear slidewire           with two switches         1000Ω rear slidewire           6         1000Ω rear slidewire           7         1000Ω rear slidewire           with two switches         1000Ω rear slidewire	4 240Vac 0012 (available with EA73, EA75 only) 24 240Vac 50Hz (available with EA71,EA73, EA75 only)	Special O None * Available with input signa
0° travel limit,     position signal     41       57 sec., 1300 in-lbs     (available w/EA72,     41       torque     EA74 and EA76 only)     42       180° travel limit,     115 sec., 1300 in-lbs     42	1 One 100Ω rear slidewire, weather resistant 2 Two 100Ω rear slidewire, weather resistant	Transformer00None01Built-in 120-24Vac*02Built-in 240-24Vac*	<ul> <li>** Code 3 required with inpu singal code A0 or A1</li> </ul>

NEMA 4 weather resistant cover

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#### ACTUATORS

#### **Option Kits for Option field in Actuator Coding**

All kits mount in place of the back plate on the actuator. The following options are available for the high torque, medium torque and low torque actuators.

#### **NEMA 4 Weather Resistant Cover Kit:**

Kit No. AM-369 (option 37) for EA70 Series;

Kit No. A-9301 (option 37) for EA 40, 50 and 60 Series.



#### **Auxiliary Switch:**

A built-in, cam operated, snap acting, SPDT switch is normally included. The point of switch actuation is readily adjustable, but is factory set to close one contact and open the other at the end of the clockwise stroke. The auxiliary switch housing is not weather resistant.

**Rating:** Running Current Locked Rotor Non-Inductive **120 Vac** 5.8 Amps 34.8 Amps 12 Amps **240 Vac** 2.9 Amps 17.4 Amps 6 Amps



Maximum total load not to exceed 2000 VA.

Actuator	Kit for	Kit for
Option	90° Unit	180° Unit
02	A	<b>\-9280</b>
05	A-9284	A-9283
07	n/a	71-589

Actuator Option	Kit for 90° Unit	Kit for 180° Unit
01	A	-9279
04	A-9282	A-9281
06	71-586	71-588

A-9280: 3-7/16"W x 4-3/16"H x 4"D

A-9279: 3-7/16"W x 4-3/16"H x 2"D

#### **Rear Slidewire:**

#### (Retransmitting Slidewire)

5 W variable resistor for driving other actuators in parallel. Slidewire housing is weather resistant. Plate size for all kits is 4-1/8" W x 6-7/8" H. Box depth as shown in photo caption. When ordering rear slidewire kit (actuator model no. option 31, 32, 33, 41, 42 or 43), write complete part number as shown.



One slidewire:	1-7/8" deep
Two slidewire:	2-7/8" deep
Three slidewire:	3-7/8" deep



#### Accessories



#### **Analog Input Retrofit Kit for Actuators**

These Kits provide the materials to convert EA40, EA50 and EA70 Series actuators to analog input models. Each kit includes the circuit board, slidewire, wire harnesses and an instruction manual. Kits are not available for the EA60 series.

Used With
120 and 240 Volt EA40 and EA50 Series actuators
24 Volt EA40 and EA50 Series actuators
120 and 240 Volt EA70 Series actuators
24 Volt EA70 Series actuators

#### Model A-60159 Option Board for Analog Input Actuators (Contact us for availability)

The plug-in option board works with actuators that already have the integral analog input circuit installed. It provides two auxiliary relays with form C contacts rated at 3 Amps. The relays can be set to activate at any point of travel. Also included is a 4-20 mA output signal that indicates the position of the actuator.

## RECORDERS

#### **CHART AND GRAPHIC RECORDERS**



Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

#### **RECORDERS**

#### 4101C and 4101M **Basic 100mm Chart Recorder**

#### Ideal for:

•	Six pen multipoint
•	Analog display with high pen visibility

Up to four continuous writing pens

- Pre-configured universal isolated inputs
- 236mm total depth behind panel
- Front access to pen zero/span adjust
  - Ready for immediate use

The 4101 is a basic 100mm chart recorder available as a one to four continuous pen, or as a six pen multipoint instrument.

A unique door design gives exceptional high visibility to the traces and current values. The short case (236mm) allows the 4101 to fit into standard instrument panels.

Pre-configured inputs cater for fit and forget installations, however, should the need arise, the inputs etc. can be easily reconfigured using the Configuration Editor software.



CE

Options	
Relay outputs	two change-over relays are available for each channel
Annotation	provides printing of scales, time and date to the chart

#### Specifications:

Chart type:	16 metre z-fold/32 metre roll
Update rate:	4Hz (continuous), 1Hz (multipoint)
Input types:	<b>Thermocouple:</b> B, C, D, E, G2, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel, <b><i>RTD:</i></b> 2/3 -wire resistance temperature, PT100, PT100A, PT1000, Ni100,

Input to paper accuracy: 0.25% **Temperature limits:** Operation 0-50°C **Humidity limits:** Operation 5 to 80% RH **Dimensions (mm):** 144W X 144H X 275D (terminal cover closed)

NI1000, JPT100, Vdc, mVdc, mAdc

(with shunt)

# 4102C and 4102M 100mm Chart Recorder with Digital Display

#### Ideal for:

- One to four pen continuous or three or six pen multipoint
- Three color digital display
- Pre-configured universal isolated inputs
- 236mm total depth behind panel
- Front access to pen zero/span adjust
- User configurable
- Ready for immediate use

The 4102 is a 100mm chart recorder with a clear three color digital display in place of the analog scale.

It is available as a one to four continuous pen, or a three or six pen multipoint instrument.

A vacuum fluorescent display with large characters gives excellent visibility of process variables. The short case (236mm) allows the 4102 to fit into standard instrument panels.

Pre-configured inputs enable fit-and-forget installations. Should the need arise, however, the inputs can be easily reconfigured, either through the display keyboard or using the Configuration Editor software.

#### Specifications;

Chart type:	16 meter z-fold/32 meter roll
Update rate:	4Hz (continuous), 1Hz (multipoint)
Input types:	Thermocouple: B, C, D, E, G2, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel, RTD 2/3 -wire resistance temperature PT100,PT100A, PT1000, Ni100, NI1000, JPT100, Vdc, mVdc, mAdc (with shunt)



#### Options

two change over relays are available for each channel
provides printing of scales, time and date to the chart
fluorescent tube lighting that enhances chart visibility
three or six current loop supplies
a robust portable carrying case is available with plug and socket input connections

Input to paper accuracy:	0.25%
Temperature limits:	Operation 0-50°C
Humidity limits:	Operation 5 to 80% RH
Dimensions (mm):	144W X 144H X 275D (terminal cover closed)

#### RECORDERS

#### 4103C and 4103M High Specification 100mm Chart Recorder with Digital Display

#### Ideal for:

- One to four pen continuous, or three or six pen multipoint
- Four color digital display
- Front panel, or PC config
- Universal isolated inputs
- Chart illumination
- Basic maths
- PC memory card
- Modbus<sup>®</sup> and Profibus<sup>®</sup> communications
- Up to 16 relay outputs
- 16 event inputs
- Annotation

he 4103 is a 100mm chart recorder which can be viewed as a complete data acquisition centre. It has local printing, communications and memory storage, and it can be fully configured from the front panel.

It is available as a one to four pen continuous, or three or six pen multipoint, while retaining the short case design (236mm) of the rest of the 4100 range.

Annotation provides printing of scales, time and date to the chart.

#### Specifications:

Chart type:	16 metre z-fold/32 metre roll	
Update rate:	8Hz (continuous), 2Hz (multipoint)	
Input types:	<i>Thermocouple:</i> B, C, D, E, G2, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel. <i>RTD</i> 2/3 -wire resistance temperature PT100, PT100A, PT1000, Ni100, NI1000, JPT100, Cu10, Ohms, Digital inputs mVdc, Vdc, mAdc (with shunt)	



#### Options

Chart Illumination	fluorescent tube lighting that enhances the chart visibility
Relays	12 change-over or 16 nor- mally open or normally closed
Retransmission	four linearized current or voltage outputs
Memory card	storage of data and configu- rations on industry standard PC memory cards. Enables data to be transferred to commercial spread sheet packages.
Communications	Modbus <sup>®</sup> RTU and Profibus <sup>®.</sup> DP slave communications up to 19200 baud
Pen offset compensation	on a continuous recorder all pens operate to the same time on the chart
Maths pack	simple maths supplied as standard. Advanced maths provides more complex functions and timers, totalizers and counters
Portable	a robust portable carrying case is available with plug and socket input connections plus AC monitoring facilities

Input	to	paper	accuracy:	0.25%
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Temperature limits:	Operation 0-50°C	
Humidity limits:	Operation 5 to 80% RH	
Dimensions (mm):	144H X 144W X 275D	
	(terminal cover closed)	

#### 4181M 180mm Multipoint Chart Recorder

#### Ideal for:

Up to 48 inputs



- Up to 24 concurrent traces
- 80 character, vacuum fluorescent display
- English, French or German language
- Data storage to PC memory card
- High speed scanning (all inputs in 1 sec)
- Simple maths included
- Optional powerful maths capabilities

The model 4181M is a versatile and compact 180mm multipoint chart recorder, capable of accepting up to 48 inputs. The recorder features an 80 character, vacuum fluorescent display and is easily configured for direct connection to a wide variety of signal types. A wide range of powerful options are available, including maths pack, serial communications and data archiving to memory card.



# CE

0	pti	ons
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Relays	change-over
Serial Communications	Modbus <sup>®</sup> RTU slave commu- nications at up to 19200 baud
Chart Illumination	fluorescent tube lighting that enhances chart visibility
Memory Card	storage of data and configu- rations to industry standard, PC memory card
Maths Pack	simple maths supplied as standard. Advanced maths provides more complex func- tions and timers, totalizers and counters
Portable	a carrying handle is available for portable use

#### **Specifications**

Chart type:	22 metre z-fold	Max chart speed:	1500 mm/hr
Protection:	IP54 (door and bezel)	Max power consumption:	70W
Max trending rate:	24 channels in 3 seconds	Temperature limits:	Operation 0-50°C
Input types:	<i>Thermocouple:</i> B, C, E, J, K, L, N, R, S, T, U, Ni/NiMo, <i>RTD</i> (2/3 -wire) PT100, PT1000, Ni100, Ni120, Cu10, mVdc, Vdc, mAdc (with shunt)	Humidity limits:	Operation 5 to 80% RH non condensing
		Dimensions (mm):	288W X 288H X 304D (terminal cover closed)
# RECORDERS

# 392 Circular Chart Recorder

## Features:

- Up to four continuous writing pens
- 40 character vacuum fluorescent digital display
- Four alarms per channel
- EEPROM memory for security
- On-site configuration using front key panel
- Powerful maths capabilities
- Four totalizers with nine digit readout
- Two single or dual output controllers

The 392 is a continuous writing circular chart recorder. This provides easy viewing of data, which is ideal for a variety of applications. Individually configurable, the recorder can be quickly and easily set up to the exact requirements for your application, using the integral keyboard and display.



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Options	
Relays	eight change-over for alarm outputs
Controllers	two PID control loops with single or duplex outputs of either current or duration adjusting type
Setpoint generator	program control for con- trollers. Four programs of twenty segments
NEMA 4X (IP65) case	the NEMA 4X case option is fully submersible
Transmitter PS	current loop supplies for up to four transmitters
Retransmission	four linearized current or voltage outputs

# Specifications:

Chart type:	Circular	Humidity limits:	Operation 10 to 90% RH
Input types:	Thermocouple: B, C, E, J, K, L, N, R,S,	-	non condensing
	I, Ni/NiMo, <b>RTD</b> (2/3 -wire) PT100, 10Cu, 100Ni, 120Ni, mVdc, Vdc, mAdc (with shunt)	Dimensions (mm):	380H X 380W X 186D (terminal cover closed)
Temperature limits:	Operation 0-50°C		

# 394 Annotating Chart Recorder

#### Features:



The 394 is a multi point annotating circular chart recorder. This provides easy viewing of data, which is ideal for a variety of applications. It has local printing communications and memory storage facilities. Individually configurable, the recorder can be quickly and easily set up to the exact requirements for your application, using the integral keyboard and display.

# Specifications:

Chart type: Input types:

#### Circular

*Thermocouple:* B, C, D, E, G2, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel *RTD:* 2/3 -wire resistance temperature PT100, PT100A, PT1000, Ni100, NI1000, JPT100, Cu10, Ohms, Digital inputs mVdc, Vdc, mAdc (with shunt)





# Options

Relays	up to 18 change-over for alarm outputs
Controllers	two PID control loops with single or duplex outputs of either current or duration adjusting type
NEMA 4X (IP65) case	the NEMA 4X case option is fully submersible
Transmitter PSU	current loop supplies for up to six transmitters
Retransmission	two or four linearized current or voltage outputs
Communications	Modbus® RTU
Annotation	provides printing of time, date, scales, logs etc. to chart Maths

Temperature limits:	Operation 0-50°C
Humidity limits:	Operation 5 to 80% RH non condensing
Dimensions (mm):	380H X 380W X 186D (terminal cover closed)

## RECORDERS

# 4100G and 4100Ge High Specification 100mm DIN Paperless Recorder

#### Features:

- Paperless chart recorder
- High quality color TFT display
- 1.4 Mbyte floppy disk, or >1Gbyte
- PC card data archiving
- Powerful maths capabilities
- Modbus<sup>®</sup> RTU communications
- Up to 12 input channels

The model 4100G is a high quality paperless recorder accepting up to 12 universal input channels. With IP65 (optional) rating it is designed for the most rigorous of operating conditions. A powerful range of optional features allow maths calculations, serial communications, data archiving etc. These features combine to give operators and supervisors the widest range of management information. More than 6 inputs and floppy disk drives are only available in the 4100G



## Options

Relays	NO, NC or CO for alarm out- puts
Serial comms	RS485, RS232, Modbus RTU for connection to SCADA sys- tems, or Profibus®
Floppy disk or PC memory card	for archiving and historical analysis
Maths pack	for simple or complex calcu- lations
Totalizers, Timers and Counters	for common process require ments
Additional memory	for more real time display history
Retransmission	to output real, or calculated values
File transfer	transfer of data from data card to PC
Portable	a robust portable carrying case is available with plug and socket input connections plus AC monitoring facilities

# Specifications:

Archiving:

Input types:

Floppy disk or PC card 1.44 Mbyte to 1Gbyte. **Thermocouple:** B, C, D, E,

G2, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel,

**RTD** (2/3-wire) PT100, PT100A, PT1000, Ni100, Ni120, Ni1000, JPT100, Cu10, mVdc, Vdc, mAdc

Protection:	IP54, IP65 optional
Max power consumption	: 100VA
Temperature limits:	Operation 0-50°C
Humidity limits:	Operation 5 to 80% RH non condensing
Dimensions (mm):	144H X 144W X 290D (terminal cover closed)

# 4181G and 4181Ge High Specification 180mm Display Recorder

#### Features:

- High quality TFT full VGA touch screen display
- Up to 48 inputs
- Optional integral printer for up to 24 traces
- Text annotation as standard
- Data archiving up to 520Mbyte to PC card
- Modbus<sup>®</sup> communications
- Simple maths included
- Optional powerful maths capabilities
  - Over 500 points available using remote I/O racks

The model 4181G is a high specification intermediate size recorder giving all the functions of the most sophisticated instrument within a 180mm format. A range of powerful options allow maths calculations, serial communications, data archiving, etc. All these features give operators and supervisors the widest range of management information. Available without printer as the 4181Ge.

# Specifications:

Protection:	IP54 (Display and Bezel)
Archiving:	Up to 520 Mbyte PC memory card for storage of data or configuration
Input types:	mVdc, Vdc, mAdc Thermocouple:B, C, E, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel II, RTD (2/3 -wire) PT100, PT1000, Ni100, Ni120, Cu10



# Options

Relays	change-over for alarm outputs
Serial communications	RS232/485, Modbus® for connection to SCADA systems
PC memory card and Counters	for archiving and historical analysis
Maths pack	for simple or complex calculations
Totalizers, Timers	for common process requirements
Input card	eight Channel universal or 16 channel dc
Portable	a robust carrying handle is available

Max power consumption	<b>n:</b> 130W
Temperature limits:	Operation 0-40°C
Humidity limits:	Operation 5 to 80% RH non- condensing
Dimensions (mm):	288H X 288W X 304D (terminal cover closed)

# THERMOSENSORS

# THERMOCOUPLES AND RTD'S



\* For a more complete listing of products and related information, please ask for our Sensor Catalog.

Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

### **THERMOSENSORS**

# Sensors for Plastic Machinery

# Ideal for:

6	
	,

Plastic forming machinery

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The following types of J and K thermocouples and industry standard PT-100 RTDs are for use on plastic forming machinery. Other types of sensors are available. We have a broad offering of styles and accessories. Please see our Sensor Product Guide for the complete selection.

#### **Element Construction**

Elements are made from fiberglass insulated wire inside a 304 stainless steel protection tube. Type J elements



are silver soldered for rapid response. Type K assemblies are welded for strength at temperature.

#### Construction

Protection tubes can be	
either 1/8" or	
3/16" diameter.	
Flexible exten-	1
sions are avail-	
able with "BX" style armor, stainless steel over-	

braid, or regular fiberglass insulation

#### **Mounting Fittings**

These assemblies are available with plain tubes, industry standard bayonet fittings and either nickel plated brass or stainless steel compression fittings

#### Configuration

Thermocouples and RTDs are available in straight, 45° or 90° configuration in either single or dual elements. Dual element assemblies use 24 gage wire.



#### Terminations

Several terminations are available

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#### **Order Codes:**



# THERMOSENSORS



# Accessories

#### **Bayonet Lock Adapters**

To determine the nominal adapter length, proceed as follows:

Adapters with 1/8 NPT: "Z" dimension minus hole depth minus 3/8".

Adapters with 3/8-24 thread: "Z" dimesion minus hole depth minus 1/4".

Round the adapter to the nearest 1/8".



#### Adapters with Slot—Common Lengths

Model	Length	Thread
A-02709-001	13/16"	1/8 NPT
A-03076-001	15/16"	3/8–24
A-03077-001	1-1/2"	1/8 NPT
A-03179	1-1/2"	3/8-24



#### THERMOSENSORS

# **Sensors for Industrial Processes**

## Ideal for:



For use in heat treat and forging furnaces, bright annealing, ceramics and glass furnaces and salt baths

Some common types of sensors for industrial processes include types B, R, S, J, K, E & T thermocouples and industy standard PT-100 RTDs. We have a broad offering of styles available. Please see our Sensor Product Guide for the complete selection.

Base metal thermocouples are used in severe and demanding environments. Noble metal thermocouples provide accuracy and extended life in high temperature applications.

# Industrial Thermocouples with Metal Protection Tubes

These assemblies feature eight gauge wire elements, ceramic insulation and cast aluminum general purpose heads. Protection tubes are schedule 40 pipe, spun down and welded at the tip. Inconel is a high temperature alloy commonly used with type K elements. 304 S.S. is a quality stainless steel usually used with type J elements. Tubes are 1/2" NPT schedule 40 with 3/4" NPT mounting threads. Protection tubes are stocked in six inch increments from 12" to 48".



Model	Element	"X" Dimension	"U" Dimension	Head	Mounting	Protection Tube
K08I-163XX-000-F-UU	Type K, single end	Specify (6" increments)	Specify (whole inches)	Aluminum	3/4" welded bushing	Inconel 601, 1/2" NPT
J08I-193XX-000-F-UU	Type J, single end	Specify (6" increments)	Specify (whole inches)	Aluminum	3/4" welded bushing	304 S.S., 1/2" NPT

# Straight Industrial Thermocouples with Ceramic Protection Tubes

Ceramic protects the element at temperatures that are too high for metal tubes. Economical mullite is a porcelain that is suitable for protecting base metal thermocouples up to  $2300^{\circ}$ F. Alumina is used to protect platinum based elements where mullite or metal tubes would contaminate the element. Tubes are 11/16" O.D.



with 3/4" NPT mounting threads. Protection tubes are stocked in six inch increments from 12" to 36".

Model	Element	"X" Dimension	Head	Mounting	Protection Tube
K14I-243XX-000-7-00	Type K, single end	Specify (6" increments)	Aluminum	Double ended bushing	Mullite, 11/16" OD
B24I-303XX-000-7-00	Type B, single end	Specify (6" increments)	Aluminum	Double ended bushing	Alumina, 11/16" OD
R24I-303XX-000-7-00	Type R, single end	Specify (6" increments)	Aluminum	Double ended bushing	Alumina, 11/16" OD
S24I-303XX-000-7-00	Type S, single end	Specify (6" increments)	Aluminum	Double ended bushing	Alumina, 11/16" OD

#### **BARCOPAC Magnesium Oxide Insulated** Thermocouples

Thermocouples with Magnesium Oxide insulation are recommended where the thermocouple is immersed in liquid, high moisture, corrosive gasses or high pressures. MgO insulated thermocouples provide superior performance in small diameter packages. The assemblies have an alloy outer jacket surrounding the element conductors. The remainder of the internal volume is filled with tightly compacted Magnesium Oxide.

MgO is a ceramic with excellent thermal transfer characteristics. It also compacts well. All MgO thermocouples can be bent on a radius of twice the sheath diameter. The tightly sealed assemblies protect the element from contact with the process



atmosphere, thus providing longer life than an unprotected element.

The thermocouples on this page represent a small portion of our full offering. Please see our Sensor Product Guide for the complete selection.



#### Thermocouples with Flexible Leadwire Extensions



#### **Ordering Codes:**



	Туре		Diameter	×	Dimen	ion		Μοι	unting Fittin	ngs		Termination
м	MGO insulated	3 4 5	.063 inch .125 inch .188 inch	Rigid inches see ta	length in s (use 3 di Ible below	whole gits)		0 N 4 1/	one /4 inch NPT b ompression fi	rass tting	00 01 03	Stripped leads Spade lugs 6 Quick disconnect
1	Type I	6	.250 inch	Y	/ Dimens	ion		5 1/ le si	ess steel components	ores-	04	plugs Quick disconnect plug and jack
2	Type K Type E, (304 SS Only)	1	Single, grounded	Flexib	ole length s (use 3 d	in whole igits)	•	7 D b in	ouble-ended ushing (speci ich, 1/2 inch,	fy 1/4 3/4	07 08	Jack General purpose cast iron head
4	Type T, (304 SS Only)	2	Single, ungrounded				l			NF 1)	09 10	General purpose aluminum head Weatherproof cast
	Sheath	FU	ex Lead Material	ТАВ	LE 1						22	iron head
	Jileatti	0	None, no flexible	Shea	th O.D.	J	к	I	E T		22	head
1 2	304 SS Inconel-600	1	lead Fiberglass	.063 .125		180 700	100 430	90 555	0 200 5 330		27	Weatherproof aluminum head
3	316 SS	2	insulation Fiberglass with armor	.188 .250		1600 3181	877 1934	722 152	2 1750 1 3885			
		3	Fiberglass with SS overbraid	Ungro	unded sing	le element	TC's have	e limitat	ions on rigid le	ngth.		

# **TC and Extension Wire**

We offer both bare and insulated thermocouple wire as well as insulated extension wire. Two conductor and three conductor insulated extension wire is commonly used with thermocouples; and three conductor wire with RTD's. We also offer multi-pair insulated thermocouple extension wire and cable for panels or other wiring needs.



The wires in this catalog represent the most common wire usages. Please see our Sensor Product Guide for a complete offering of our wires.

# **Ordering Codes**



Cataloged Wires	;		
WE20-11304-000-0-00 WE20-51502-000-0-00	WJ20-11305-000-0-00 WJ20-11507-000-0-00 WJ20-51502-000-0-00	WK20-11305-000-0-00 WK20-11507-000-0-00 WK20-51502-000-0-00	WT20-11305-000-0-00 WT20-51502-000-0-00

# Plugs and Jacks: General Purpose

#### **General Purpose**

Quick disconnect plugs and jacks are molded, glass filled plastic with the attaching parts made of material to match a particular thermocouple type. Made to exacting specifications, these devices provide rapid connection/disconnection between thermocouple and lead wire with negligible contact resistance for transmission of the lowest millivoltages. Frequent make or break will not impair the accuracy of the mating parts. They are ideally suited for laboratory or industrial uses where the ambient temperature does not exceed 450°F. The minimum size is 33 AWG; the maximum size is 14 AWG.

#### Miniature

These plugs and jacks can be used where space is at a premium. The temperature should not exceed 300°F. Each item weighs one-half ounce. General Purpose plugs and jacks 1–1/4" diameter cutout

1-1/4" diameter cutout



Miniature plugs and jacks 1–1/4" diameter cutout



## **Ordering Codes: General Purpose**



# **Plug and Jack Accessories**

#### **Connector Lock**

The connector lock prevents accidental separations of plug and jack. Two can be usd for additional protection. The material is nickel plated piano wire. The lock fits standard size plug or jack.

Part number: 25-00170-100



#### **Tube Adapters**

The tube adapter attaches to either plug or jack with screws provided. The tube adapter makes rigid connection with tube and prevents twisting wires. The material is nickel plated steel. Each weighs one-half ounce.

Part number:	A-10911	1/25" tube	single plug or jack
Part number:	A-07389	1/16" tube	single plug or jack
Part number:	A-07120	1/8" tube	single plug or jack
Part number:	A-07121	3/16" tube	single plug or jack
Part number:	A-07390	1/4" tube	single plug or jack
Part number:	A-10872	1/16" tube	dual plug or jack
Part number:	A-10485	1/8" tube	dual plug or jack
Part number:	A104863	/16" tube	dual plug or jack
Part number:	A108731	/4" tube	dual plug or jack

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#### Single Plug Cable Clamp

The clamp attaches to either plug or jack with screws provided. It is "made of nickel plated steel and weighs one-half ounce.

Part number: A-07124

#### **Dual Extension Bracket**

The dual extension bracket weighs one-half ounce

Part number: A-10380







# **MEMOCAL 2000 Hand Held Calibrator**

## Ideal for:

- Two-line 16 character back-lit LCD display
- Calibration for T/C, RTD, mAdc, mVdc, Vdc & Ohms
- Reference accuracy to 0.015%
- Temperature drift of 0.1µV/•C span
- **Battery or AC adapter operated**

The MEMOCAL 2000 is a lightweight, versatile, hand-held calibrator for use both in the field and laboratory. The small size, simple programming, friendly interface, high noise immunity and long battery life make the MEMOCAL ideal for field maintenance calibration. The optional leather carrying case features an over the shoulder strap and allows for viewing of both the display and the keypad. The high accuracy, large range of I/O capabilities and digital interface make the MEMOCAL ideal for laboratory use. A standard 120/240 Vac adapter saves battery capacity when working at the bench.

The MEMOCAL 2000 simulates and measures 15 different thermocouples, 2 RTDs, mAdc, mVdc, Vdc and Ohms signals. A built-in auxiliary power supply allows excitation and measurement of 2-wire and 4-wire transmitters. Standard features also include configurable internal or external cold junction compensation, square root extraction and quadratic signal generation.



## **Optional Features:**

Commu	nicatio	ns:		RS-232 Digital Communications
Accesso	ries*:			Desk Stand with RS-232/RS-485 Converter and Battery Charger
				Leather Carrying Case
				Battery Kit – Four long life N-H rechargeable Batteries
<b>ب</b>		,	,	

\*accessories can be ordered separately

# Ordering Info:

MEM2090000ER	Hand Held Calibrator with AC Adapter, 120/240 Vac
MEM2090RS0ER	Hand Held Calibrator with AC Adapter, RS-232, 120/240 Vac
MEM2090001ER	Hand Held Calibrator with Leather Bag
MEM2090RS1ER	Hand Held Calibrator with Leather Bag and RS-232 Option
08M44000000	Leather Carrying Bag for Hand Held Calibrator
MEM2000DT0ER	Desk Stand with RS-232/485, battery charger
MEM2000BATT0	Kit – Four Long Llfe Ni-H Rechargeable Batteries
MEM2000CALER	Calibration Certificate (at time of order)

# **TECHNICAL INFORMATION**

# **TECHNICAL NOTES, TRAINING AND SUPPORT**



Phone us, check our website or use the Instant Access Order Form at the end of the catalog to request more information on any of these products.

SECTION

# **Principles of PID Control and Tuning**

If you need help in choosing the controller most suitable for your application, please do not hesitate to contact our technical help desk.

Our controllers will automatically control process variables such as temperature, humidity, pressure, flow rate, level or Ph - in fact, almost any physical variable that can be represented as an analog signal.

The example below assumes that the variable is temperature, which is the most common, but the principles are equally applicable to all analog variables.

#### The Automatic Control Loop

The diagram below shows an automatic temperature control 'loop'. It consists of a sensor to measure the temperature, a controller and a power regulator.

The controller compares the measured temperature with the desired temperature, called the 'setpoint', and regulates the output power to make them the same.

The measured temperature is referred to as the Process Value, or 'PV' for short.

The difference between the setpoint and the measured value is called the 'error signal'.

#### **Input Sensors**

An automatic controller requires some means of measuring the process value.



Our controllers will accept an input from almost any type of sensor. Linearization of the measured value, if necessary, will be performed within the controller.

In temperature applications, either a thermocouple or resistance thermometer is typically used. The type will depend on the temperature range and the environment in which it has to operate.

Please refer to the sensor section in this catalog for details of thermocouples and RTDs.

In applications where it is difficult to attach a fixed temperature sensor, non-contact temperature measurement can be made using infra-red or optical pyrometers. Our controllers support inputs from a wide range of pyrometers.

Our controllers will accept direct inputs from strain gauges and pressure, flow, or Ph transducers.

In large process control applications, signal conditioners are normally used to convert the sensor measurement into a 4 to 20mA or 0 to 10Vdc signal for transmission to the controller. In our controllers it is a simple matter to scale these inputs to the desired display range.

#### **Controller Outputs**

An automatic controller requires some means of varying the heating power, or flow rate, or pressure, to the process under control. The main output types are:

**Relay**, is used to operate a contactor or solenoid valve in heating and cooling applications.

**Logic,** is used to switch a solid state relay or contactor. The benefits are: long life, no maintenance and the ability to rapidly switch heaters which have a small thermal mass.

**Triac,** are solid state switches primarily used to operate solenoid valves. They are also ideal for the positioning of motorized gas burner valves.

**DC milliamps or volts,** are used for positioning control valves and to drive analog input SCR units (used in phase angle and three phase heating applications).

#### Types of Control

There are three main types of control:

- On/Off control
- PID control
- Motorized Valve Positioning

#### **On/Off Control**

On/Off control action is shown in the graph below. The heating power is either fully On when the temperature is below setpoint or fully Off when it is above. As a result the temperature oscillates about the setpoint.



The amplitude and time period of the oscillation is a function of the thermal lag between the heating source and the temperature sensor.

To prevent the output 'chattering' as the measured temperature crosses the setpoint, the controller does not turn On and Off at precisely the same point. Instead a small differential known as the 'hysteresis' is applied. A typical value is  $1^{\circ}$ C

On/Off control is satisfactory for non-critical heating applications where some oscillation in the temperature is permissible.

#### **PID Control**

Most industrial processes such as plastic extrusion, metals treatment or semiconductor manufacturing require stable 'straight-line' control of the temperature as shown. Our controllers employ advanced PID control algorithms to provide exactly that.

PID control is also referred to as "Three-term" control.



The three terms are:

for	Proportional
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- for Integral
- D for Derivative

The output of the controller is the sum of the above three terms.

The combined output is a function of the magnitude and duration of the error signal, and the rate of change of the temperature or process value

#### **Proportional Term**

The Proportional term delivers an output which is proportional to the size of the error signal. In the example below, the proportional band is 10°C and an error of 3°C will produce an output of 30%.



Proportional only controllers will not, in general, control precisely at setpoint, but with an offset corresponding to the point at which the output power equals the heat loss from the system.

#### **Integral Action**

The Integral term removes steady state control offsets by ramping the output up or down in proportion to the amplitude and duration of the error signal. The ramp rate (Integral time constant) must be longer than the time constant of the process to avoid oscillations.

#### **Derivative Action**

The Derivative term is proportional to the rate of change of the temperature or process value. It is used to prevent overshoot and undershoot of the setpoint and to restore the process value rapidly to the setpoint if there is a sudden change in demand, such as when an oven door is opened.

#### High and Low Cutback

While the PID parameters are optimized for steady state control at or near the setpoint, high and low cutback parameters are used to reduce overshoot and undershoot for large step changes in temperature. They respectively set the number of degrees above and below setpoint at which the controller will start to increase or cutback the output power.



#### **Time Proportioning Action**

To obtain 'straight-line' temperature control, a PID controller requires some means of varying the power smoothly between 0 and 100%.

Time proportioning varies the % on time of relay, triac and logic outputs to deliver a variable output power between 0 and 100%. The graphs below illustrate the principle.



The cycle time must be short enough to allow the thermal mass of the load to smooth out the switching pulses. 20 seconds is typical. Systems with a small thermal mass will need shorter cycle times than can be provided with a relay. In these cases, a solid state relay is typically used with cycle times down to 0.2 seconds.

In practice Cycle Time may not be a constant, but vary with Power Demand, particularly at the extremes of the range 0.100%.



#### **Motorized Valve Positioning**

Motorized valves have two windings, one for opening the valve and the other for closing it. Control is achieved by sending raise or lower pulses to the appropriate winding. Some valves are fitted with a feedback potentiometer to indicate their position, while others are not.



Our controllers provide a control algorithm specifically designed for use with motorized valves. This algorithm works equally well with or without a position feedback potentiometer.

#### **Automatic Tuning**

In tuning, you match the characteristics of the controller to those of the process being controlled in order to obtain good control. Good control means:

- Stable, 'straight-line' control of the temperature at setpoint without fluctuation.
- No overshoot, or undershoot, of the temperature setpoint.
- Quick response to deviations from the setpoint caused by external disturbances, thereby rapidly restoring the temperature to the setpoint value.

Tuning involves calculating and setting the PID terms and cutback values. This can be performed manually following the instructions given in the user handbooks or automatically by the controller. Two automatic tuning procedures are available in our controllers:

**One-shot tuning** which is performed once when commissioning the process and then turned off. However, it can be repeated as often as required should the process characteristics change.

**Adaptive tuning** which continuously monitors the error from setpoint and, if instability is detected, will modify the PID values accordingly.

#### **Other Features**

Our controllers offer many other control features such as;

- Transfer between automative and manual control.
- Remote setpoint inputs
- Digital communication
- Ramp soak programming
- Cascade control
- Ratio control
- Override control
- Gain Scheduling

If you would like information about any of these features please contact us.

# **TECHNICAL INFORMATION**

# SCR Switching Principles

#### What is an SCR Power Controller?

An SCR, or thyristor, is a semiconductor device which switches AC power ON and OFF. It is used to control the electrical power delivered to heating elements.

Our SCR units incorporate the SCR devices, together with the driver electronics and heatsink which dissipates the heat generated by the SCR devices. Some SCR units include internal fuses to protect the thyristor while others require external fusing. One benefit SCR units offer is a reliable long term alternative to electromechanical devices, reducing the necessity for maintenance.

SCR units are particularly cost effective for fast systems, for complex loads involving transformers and/or heaters whose resistance changes with temperature or time. They are the best means of controlling electrical heating power.

SCR units generally offer improved controllability, which gives economy, easy serviceability and reduces down time and maintenance costs.

Almost silent in operation, SCR units can eliminate the switch-on surge by operating in synchronization with the supply improving the electrical environment.

Solid state relays (SSR) or solid state contactors (SSC) are SCR units that replace mechanical relays or contactors. These units turn power on when commanded by an input signal and turn power off when the signal is removed.

# Logic Firing Mode for SSR, SSC or Logic Fired SCR Unit

The control input for this type of SCR unit is a 'Logic' output from a temperature controller. The SCR operates like a relay or contactor, i.e. when the logic signal is low the SCR unit is OFF and when it is high the SCR unit is ON.



Solid state relays (SSR) or solid state contactors (SSC) are SCR units that replace mechanical relays or contactors. These units turn power on when commanded by an input signal and turn power off when the signal is removed

#### Cycle Proportioning, Zzero Crossing or Burst Firing (Fast Cycle, Slow Cycle, Single Cycle)

These firing modes provide a means of controlling power by time proportioning the available power. The 'burst repetition' rates come under the headings of fast cycle, slow cycle and single cycle and are intended to serve the requirements of different applications. The table below gives further details. Typical analog control inputs for this type of SCR unit are 0-5V or 4-20mA.



Control mode	50% Power
Fast cycle (F.C.)	200ms ON and
	200ms OFF typically
Slow cycle (S.C.)	20s ON and
	20s OFF typically
Single cycle (F.C.1.)	One cycle ON and
	one cycle OFF

To minimize interference, the SCR unit always switches on when the voltage across the heater is zero and switches off when the current through the heater is zero. Each 'burst' is therefore a complete number of cycles of the supply.

#### **Advanced Single Cycle Firing**

Advanced Single Cycle is a zero-fired mode for use with various resistive loads and especially with Short Wave Infrared (SWIR) loads. Output power is controlled by regulating the number of complete cycles and half cycles going to the load. The typical output waveform for a



power controller set for a 66% output is shown below. When comparing traditional phase-angle fir-

ing to Advanced

Single Cycle Firing, the Advanced Single Cycle Firing does not lead to Power Factor degradation, which reduces power utility penalties and does not generate RFI interference, which can interfere with other equipment.

#### Intelligent Half-Cycle Firing

Similar to Advanced Single Cycle Firing, Intelligent Halfcycle Firing is only available when using the Remote I/O (REMIO) Digital Interface and the TE10S/425S solid-state contactors (SSC). Power to the load is regulated by the number of half cycles on and off to the load. Intelligent Half-Cycle Firing is ideal for Short Wave Infrared loads (i.e. tungsten lamps). Intelligent Half-Cycle Firing offers the same benefits as the Advanced Single cycle Firing (i.e., high power factor, reduced RFI switching interface)

#### Phase Angle (P.A.)

In this mode, power is controlled by allowing the SCR to conduct for part of the ac supply cycle only, (see diagram below). The more power required the more the conduction angle is advanced until virtually the whole cycle is conducting for 100% power.

The major disadvantage with phase-angle firing is the possible emissions interference generated by the rapid switching action at non zero voltage.

#### Phase Angle Start Fast Cycle (P.A. Start F.C.)



This is a variant of the cycle proportioning mode in which each on-period consists of a run up over several supply cycles to full conduction in phase angle. Once this state is achieved the remainder of the on-period will be at full conduction.

#### **Power Feedback**

Supply voltage changes will obviously result in power to the load changing. To overcome the effect of supply voltage changes, the controllers which drive the SCR unit have power feedback to automatically compensate for this.

In brief, a 100KW load rated for 500Vac would experience a 19% drop in power if the supply voltage decreases by 10%. Upon sensing a decrease in voltage, the instrument would immediately increase the output level to maintain the desired power going to the load. This reduces the likelihood of a process variation.

#### Partial Load Failure (PLF)

This is an optional circuit which continuously monitors the load resistance and detects an increase arising, for example, from failure of one leg of a parallel connected load. When a partial load failure is detected, an output to an external alarm can be given. The PLF setting is adjusted with the SCR unit working normally and delivering current to the load. A decrease in load resistance is not acted upon.

#### Partial Load Unbalance (PLU)

Similar to PLF, the PLU monitors and detects changes in 3Ø current greater than 25%. If an unbalance is detected, a latching or non-latching alarm relay contact opens or closes (specify when ordering).

#### **Overload Circuit**

This option is only available with PLF on certain equipment and is designed to detect overload currents in the region of twice the partial load failure setting or greater. When it operates, the SCRs are prevented from firing, a front panel lamp lights and a relay or logic alarm output is activated.

#### **Current Limit**

With low cold-resistance loads, if used with cycling modes, the first complete cycle could cause a current surge and blow a fuse. Phase-angle operation starts from zero and the phase-angle is advanced slowly until a current limit threshold is reached to keep the current within the safe limits of the element and the wiring, independent of load resistance.

#### Inhibit or Enable

A voltage applied to the input of the circuit will stop (or alternatively enable) the output at the next zero crossing. The external circuit is usually arranged so that the SCR is quenched at switch-on, to enable the circuit conditions to stabilize.

#### Preset Delayed Triggering

Preset delayed triggering is used in conjunction with cycle proportioning where a mixed inductive/resistive load such as a transformer supplied heater is used. A preset angle can be adjusted corresponding to the 'lag' angle which will prevent inrush surge currents when using zero voltage switching of inductive loads. Highly inductive loads will require 'soft-start' or current limiting.

#### **Power Control**

This is not usually required in applications using a temperature controller with relay or logic output. Power control requires I and V to be measured and is sometimes needed when loads cannot sensibly use Power Feedback, i.e. those with a low cold resistance. Power control may be an advantage in open loop non-temperature controlled applications where it is the energy input which is to be controlled.

#### **Pulse Gating**

Gating of the SCR firing pulses may be necessary on phase-angle SCR units particularly for applications with a leading power factor or cross-coupling between phases. The triggering of the SCR is inhibited until the voltage has risen through zero. Once the SCR has fired, the trigger pulses are removed to ensure that the SCR turns off as the forward direction current reduces to zero. (Again some degrees before the voltage waveform).

#### Pulse Density Signaling I/O (PDSIO®)

PDSIO<sup>®</sup> is a bi-directional communication method for model TE10S Solid-state contactors and Series 2000<sup>™</sup> controllers. PDSIO<sup>®</sup> passes additional control loop status data transparently on the same wires that carry the primary analog or logic control signals. It's not another digital communications protocol that requires external smart I/O interfaces or special software drivers.

PDSIO<sup>®</sup> can detect problems like open heater burn-out, blown heater fuse, open SCR device, no line voltage, and broken controller signal wire. By detecting these problems early, contingency plans can be implemented quicker thus saving money and maximizing valuable production time. It can also monitor load current.

#### **Digital Communications**

We offer SCR power controllers with digital communications of various protocols. This allows the heater load to be monitored with a computer. In addition, the load can be controlled directly from the digital communications. This minimizes wiring, the need for signal transducers and provides vital process information.

#### **Agency Ratings**

All of our power controllers have approval ratings for CE. Some models are approved for UL, cUL and VDE.

#### Installation

The SCRs must be installed in accordance with recommendations expressed in the installation guide supplied with each unit, and also in accordance with local wiring regulations. It is important to be aware that each controlled phase in a SCR generates a heat loss calculated at approximately 1.3 watts per amp (per phase) load current. Adequate ventilation or forced cooling must be provided to maintain the ambient conditions inside the control panel enclosure within the operating specification.

#### **Fuse Protection**

Our SCR regulators are generally available with high speed fuses, designed to protect the SCR device against short circuit currents resulting from load or wiring faults. The high speed fuse does not provide protection against sustained medium scale overload, and it is therefore necessary to fit a standard circuit protection fuse (HRC fuse or circuit breaker) in the supply lines to the regulator or load.

#### **Mounting and Enclosures**

Most SCR units are designed to work in ambient temperatures up to 45°C. It should be noted that SCR units generate a significant amount of heat internally through the SCR itself, the fuse and the cabling. A general rule is to reckon that a SCR unit, and its fuse, will generate 1.3 watts of heat per amp per phase.e.g. 100 amp three phase SCR unit type TC3000 will generate 390 watts. With a TC3000 in a standard cubicle 2.1m x 600mm x 600mm with no ventilation the internal temperature will rise 20-30°C. Adequate ventilation-tion is therefore essential preferably forced by fan. Mushroom tops and louvers are not particularly effective in removing this heat.

# Neutral Currents on Three phase Installations

Under certain circumstances, such as four wire phase angle installations, open circuit heaters or unbalanced loading, substantial neutral currents can flow. Neutral cable sizing should therefore be chosen with care. With balanced load resistances neutral cable current rating should be twice the line current for safety under all possible circumstances.

#### **Power Factor**

In large installations poor power factor may increase the cost of the electrical power supplied. Phase angle firing gives a sharp rise in current when turned on and may cause a distorted supply waveform. The apparent power factor can therefore be adversely affected. Fast cycle, slow cycle, single cycle, advanced single cycle and intelligent half cycle are all zero switched firing modes with no current waveform distortion and therefore do not affect power factor.

#### **Plant Safety**

The SCR regulator is a control device, and should not be used as the safe means of removing power from the load. When plant or personnel safety is at risk, a circuit breaker or contactor should be fitted in the supply lines to the regulator, and arranged to automatically trip in the event for example of a plant emergency stop, or overtemperature switch operating.

#### **Personnel Safety**

The SCR regulator does not provide an effective means of isolation in its turned "OFF" or "DISABLED" state, due to leakage currents through the various protection components around the SCR itself. In particular, when using a 2 phase SCR to control a 3 phase load, the complete load and associated wiring will be at the potential of the uncontrolled phase in the OFF state.

It is therefore imperative that an effective means of isolation is provided, and working practices set up to ensure that the regulator and associated circuitry are made safe before any maintenance work takes place.

#### If In Doubt; Ask

If you are in any doubt about the application of these or any of our control products, please ask for guidance.

#### **Special Applications**

There are many possible circuit connections other than those described in this guide. Our Applications Department has a wide range of experience in special applications which need particular attention for successful operation.

# **TECHNICAL INFORMATION**

# **Sensors Construction**

Several methods of measuring temperature using sensing elements have been developed. Industrial processes usually require that the temperature sensing device be remote from the measuring or controlling equipment. Of the various thermal sensing devices, the thermocouple is most commonly used, offering the best compromise of cost, accuracy and reliability. In certain applications requiring greater accuracy, resistance temperature detectors (RTD's) are a better choice for temperature measurement.



#### Thermocouples

A thermocouple is formed by connecting two wires of dissimilar metals together at a single point. This junction is commonly known as the "hot junction". The measurement of temperature is not made at the hot junction alone however, but is actually made by looking at the differential measurement between this hot junction and another reference junction called the "cold junction". Typically the cold junction occurs where the thermocouple wires connect to the terminals of the measuring instrument or controller, where a second thermocouple joint of dissimilar metals is made. An EMF is generated at the controller terminals, which is dependent on the temperature difference between the hot and cold junctions. For accurate measurement, any variation in the temperature of the cold junction must be corrected for by the controller. This process is called cold junction compensation.

For the purposes of calibration of a thermocouple, use is made of standard tables that indicate thermocouple output (EMF) versus "hot" junction temperature with the reference "cold" junction at 0 deg C (ice point). Where it is impractical to maintain the cold junction at 0 deg C, when measuring temperature it is necessary to accurately measure the actual cold junction EMF and add it to the measured EMF. That total EMF is then converted to temperature using the standard table. In practice this process is automatically done in temperature controllers as part of the cold junction compensation (CJC) feature.

An industrial thermocouple assembly generally has four major components. The element consists of the two dissimilar metal wires joined at the tip. The EMF developed by this junction versus temperature is very small, typically microvolts per degree C temperature change. The protection tube is a metal or ceramic tube, usually closed at one end that protects the element from the process environment. The head or cold end termination of the thermocouple assembly is a terminal block or protective closure assembly provided for connection of the thermocouple extension wire. The fourth component is the extension wire made from alloys compatible with the element. Although not a part of the assembly itself, the extension wire is a critical part of the total circuit. The extension wire, or compensating cable, resembles the thermoelectric characteristic of the thermocouple over a limited range of ambient temperature, typically 0-80 deg C. These cables emulate closely the performance of the thermocouple cold junction, but do so at great cost savings to using extension wires made of the actual metals used in the true thermocouple.

There are a great number of thermocouple types used in industrial processes, each with different metal alloy combinations with characteristics ideal for specific temperature measurement requirements. Each alloy set has certain characteristics (cost, temperature range, corrosion resistance, etc.) that have advantages for specific applications. Some of the more common base metal alloys include Type J (Iron vs. Constantan), Type K (Chromel vs. Alumel), and Type T (Copper vs. Constantan). Some of the more common noble metal alloys used in thermocouples are Type R (Platinum vs, Platinum/13% Rhodium), Type S (Platinum vs. Platinum/10% Rhodium) and Type B (Platinum/6% Rhodium vs. Platinum/30% Rhodium).

Please see the Sensor Product Guide for additional information on available sensors and product selection.



#### **Platinum Resistance Thermometers**

The resistance temperature detector is a thermal sensor that changes resistance with temperature. The amount of change is dependent on the change in temperature and the specific alloy of the conductor. Temperature is measured indirectly by determining the resistance from reading the voltage drop across the sensing resistor in the presence of a constant current flowing through it and then using Ohm's Law. Many common RTD's are made of platinum alloys and are called platinum resistance thermometers (PRT's). The resistance of platinum changes with temperature at a known rate, the most common standard being 100.00 ohms at 0 deg C and 138.5 ohms at 100 deg C. RTD's may be manufactured from several alloys, including copper, nickel and platinum based material. Industry standard tables are available for a variety of RTD types that provide the temperature vs. resistance profile for the element type.

The RTD sensing element is a coil of wire, precision wound to a specific resistance value. The element is hermetically sealed in glass to prevent influence from moisture. This element is then mounted in the tip of a metal protection tube for physical protection. Physical configuration of the complete assembly is similar to a thermocouple. Compared to thermocouples, RTD and PRT assemblies are much more accurate and stable and permit greater resolution of measurement.

Fundamentally, every sensing resistor is a two wire device. When terminating the resistor with extension wires that lead to the measurement instrument, a decision must be made about what termination arrangement is needed for measurement purposes. It is essential that in any resistance thermometer the resistance value of the external leadwires be taken into account and if this value affects the required accuracy of the thermometer, its effect should be minimized. Extension wire for RTD's is a simple copper conductor whose resistance depends on length, number of conductors and wire gauge. Various methods have been developed to compensate for this lead resistance. This has resulted in RTD's being manufactured in two wire, three wire and four wire configurations.

The two wire element has no provision for lead compensation other than increasing the size of the lead wire. It is suitable for installations where the distance to the measuring instrument is short

The three wire element is the industry standard. Two red wires are tied together at the end of the element and the third white wire is terminated at the other end of the element. The measuring instrument can sense the resistance of the two red joined wires and subtract this from the resistance between one of the red wires and the white wire. This is accurate as long as all three wires are the same length and gauge.

Four wire elements have two red wires terminated at one end of the resistance element and two white wires terminated at the other. Current to the sensor is supplied on one wire and the voltage value is measured on the other. Since there is no current flowing in the measuring wires, no error is contributed by lead wire resistance. Four wire sensors are usually only found only in laboratory environments.

One common way of compensating for the lead resistance for the various configurations is by connecting the wires from a two, three or four wire RTD into an appropriately modified Wheatstone Bridge circuit at the input of the measuring or controlling instrument. Such input configurations are standard in our instrumentation, usually for three wire RTD's.

Please see the Sensor Product Guide for additional information on available sensors and product selection.

# **TECHNICAL INFORMATION**

# **Digital Communications**

We have always been a leader in serial digital communications in intelligent PID controllers. This capability enables configuration of intelligent distributed industrial automation networks. A PC with SCADA or other supervisory software can read and write parameter data from one or more of our PID controllers. That data may be displayed numerically or in a trend plot, logged to a file for storage, change setpoints or download recipes. PLC<sup>™</sup>'s fitted with OEM or 3rd party serial digital communications modules are also available to build distributed industrial automation networks utilizing our intelligent PID controllers.

# What is a Serial Digital Communications Network?

A serial digital communications network describes a way to exchange data between a Master and one or more Slaves using a Bus. The Master is typically a PC or PLC<sup>™</sup> and the Slaves can be any type of intelligent automation device supporting digital communications. The Bus is called a Fieldbus because it connects remote field devices located close to the point of control to a PC or PLC<sup>™</sup> that is located in a central location. The distances involved can be from 1 ft to 4000 ft or more with repeaters. Figure 1 below shows a PC as Master communicating to multiple Series 2000<sup>™</sup> controllers using Modbus<sup>®</sup> RTU.

This exchange of information is normally quite complex and involves both hardware and software standards. Hardware standards define the electrical and mechanical interface of a fieldbus. Examples of hardware standards are CAN (Controller Area Network) and TIA/EIA-485 (RS485). Software standards define the Protocol of a fieldbus. A Protocol precisely defines a set of rules about the format and meaning of how messages are encoded so that the devices on a fieldbus can communicate using the same language. Examples here include Modbus<sup>®</sup> and Profibus<sup>®</sup>. Today, there are many such standards, each having the goal of ensuring interoperability between industrial automation suppliers.



'Slave' PID controllers

#### Figure 1. Digital Communications Network

#### Why Use Serial Digital Communications?

Digital communications is preferable to analog communications (e.g. 0-5V) because:

- It is high-speed from 9600 to 12M baud
- It is low-cost and reliable
- It supports one-to-one and one-to-many (multi-drop) communication links
- It's accuracy is not effected by distance
- It does not require calibration of the communications interface

#### What is the Plant Communications Model?

The plant communication topology is an ongoing attempt to model corporate data requirements. Today, we can consider 3 layers as shown in Figure 2; Information Technology (IT), Automation and Field. Many models include the Sensor layer that would be below the Fieldbus layer.

For each bus layer, the requirements, bus type and devices used are listed in Table 1. Plant data flows from layer to layer in both directions. Not all layers are necessarily required and each layer has it's own data requirements. For example, as shown in Figure 1, there is no automation bus in the connection of the PC to the distributed controllers and the PC could easily interface to the corporate network by using Ethernet.



Figure 2. Plant Communications Model

# **TECHNICAL INFORMATION**

Layer	Requirements	Bus Type	Devices
Information	Large Data Packet Size	Ethernet	Corporate Mainframe
Technology	Wide Access		
	Multi-vendor support		
	Production schedules/recipe		
Automation	Fast Response time	Ethernet	PC
	Determinism	ControlNet™	PLC™
	Repeatability	Modbus <sup>®</sup> Plus	
	Multi-vendor support	Profibus® FMSPC	
Field	Small Physical Size	DeviceNet <sup>™</sup>	PLC <sup>™</sup> , Operator Interface, Panel Displays
	Low Connect cost	Profibus <sup>®</sup> -DP	PID Controllers, Indicators, Drives, SCR's,
	Config & Diagnostics	Interbus	Valve Manifolds, Solid State Contactors
	Multi-vendor support	Modbus <sup>®</sup> RTU	

#### Table 1. Network Layer Topology

#### Why Use a Fieldbus?

Traditional PC or PLC<sup>™</sup> based automation control systems use a central processor fitted into a rack that also contains the I/O cards or modules. The backplane is the PC's or PLC<sup>™</sup>'s internal bus. I/O terminals are connected to actual physical points using point-to-point cabling, often requiring intermediate terminal boxes. This architecture requires an greater amount of up front engineering, higher installation costs and is harder to troubleshoot.

In a fieldbus based system, a fieldbus is used to exchange data between automation devices. The PC I/O boards or PLC<sup>™</sup> I/O modules are replaced with a communication module that communicates to automation devices that are physically located close to the point of control using a single fieldbus cable replacing bundles of wires and intermediate terminal boxes. This can substantially reduce up front engineering, installation costs and troubleshooting in the event of problems.

Replacing PLC<sup>™</sup> I/O boards with PLC<sup>™</sup> I/O with distributed intelligent I/O devices can provide other advantages, especially when considering our PID controllers:

Feature	Benefit
Single loop integrity with local interface	Single point of failure keeps process running in the event of failure
No configuration required for Advanced or Specialized PID Loops	Plug & Play for auto-tuning PID loops, cascade, ratio,carbon and otherloop types
Offloads PID from the PLC <sup>™</sup>	Reduce PLC <sup>™</sup> processor utilization, use less expensive PLC <sup>™</sup> , reduce config- uration time
Universal Inputs with Isolation	Protects hardware and eliminates ground loops
Shorter signal wire runs	Reduces noise and spurious signals, more accurate transducer readings
Local and more automatic Diagnostic information	Predict failures before they happen, reduce maintenance schedules
Choice in Best in Class automation devices	Increase process efficiency through precision control and increased infor- mation feedback

#### What Fieldbus Networks Do We Offer?

Today, we offer the industry leading fieldbus interfaces for the markets that we serve. In Tables 2 and 3 are fieldbus comparisons for those field buses offered by us. To learn more about each fieldbus, please visit the Web URL listed.

Fieldbus	Introduced	Developer	Web URL	Products
DeviceNet <sup>™</sup>	1994	Allen-Bradley	www.odva.org	2200e, REMIO, MACO <sup>®</sup> Optima <sup>™</sup> PC, MACO <sup>®</sup> XL PB
EI-Bisync	1983	Eurotherm	www.of our.com	808/847, 94C, 815/818 900 EPC, 2200 & 2400, 2408I, 2600, TU/TC SCR's
Interbus	1984	Phoenix Contact	www.interbus.com	MACO <sup>®</sup> DS ASB MACO <sup>®</sup> Remote Terminal I/O, MACO <sup>®</sup> XL PB
Modbus <sup>®</sup> Plus		Modicon	www.modicon.com	MACO® OPTIMA™ PC, MACO® DS ASB, MACO® XL BP
Modbus <sup>®</sup> RTU	1979	Modicon	www.modicon.com	94C, 818, 900 EPC, 2200, 2400, 2408I, 2500, 2600, REMIO, TU/TC SCR's
Profibus <sup>®</sup> -DP	1994	РТО	www.profibus.com	2400f, 2408I, 2500, 2600, REMIO, TU/TC SCR's, MACO <sup>®</sup> XL PB

#### Table 2. Fieldbus Comparison

	Transmission Media	Maximum Devices	Maximum Distance	Transmission Speed	Data Packet Size
DeviceNet <sup>™</sup> 1	CAN	64	328 ft @ 500 K	125Kb, 250Kb	8 bytes w/o frag
	Twisted pair,		1,640 ft @ 125K	500Kb	unlimited w/frag
	Signal & Power				
EI-Bisync2	TIA/EIA-232	2	50 ft	Up to 19,200b	7 bit word
	TIA/EIA-422	11	4000 ft		
	TIA/EIA-485	32	4000 ft		
		99 w/repeaters			
	Twisted pair				
Interbus1	TIA/EIA-485	256	1/,312 ft	500K	512 bytes
	Twisted pair				
	fiber				
Modbus® Plus1	TIA/EIA-485	32	1500 ft	1 Mb	32 word Global
		64 w/repeater	6000 ft		100 word Pt-Pt
	Twisted pair				500 word Peer Cop
Modbus® RTU2	TIA/EIA-232	2	50 ft	Up to 19,200b	125 registers
	TIA/EIA-422	11	4000 ft		
	TIA/EIA-485	32	4000 ft		
		247 w/repeaters	15,000 ft		
	Twisted pair				
Profibus <sup>®</sup> -DP1	TIA/EIA-485	32	328 ft @ 12Mb	Up to 12Mb	244 bytes
		127 w/repeaters	3,936 ft @ 9600b		
	Twisted pair, fiber				

#### Table 3. Fieldbus

Note: Requires host controller card and software driver. Can use standard PC serial COM ports

#### Which Fieldbus Should I Use?

One size does fit not all in the industrial automation marketplace. This is true for fieldbus offerings as well. Market fragmentation and application requirements that vary by geography, industry and process guarantee that a single fieldbus solution is not inevitable any time soon. So how does one choose a fieldbus?

The number one reason users choose a fieldbus over another is the availability of products for a particular fieldbus. Customer requests for a particular bus in the specification to an OEM often dictates the fieldbus of choice. Control systems are shipped having a fieldbus already installed so that system expansion decisions are based on the original OEM fieldbus choice. Or the fieldbus choice may be made based on the experience of a local Systems Integrator as they offer the technical expertise in the configuration tools, have the inventory, training, and support for that fieldbus. There is no clear-cut answer.

As an active member in multiple fieldbus organizations, we understand communications to be an important enabler in todays automation marketplace. You can be sure that we will continue to strive to maintain a leadership position in fieldbus automation devices by offering market leading fieldbus enabled products along with the training, support, knowledgeable sales channels and more to help you in making the intelligent choice.

#### **Connecting Your Communicating Instrumentation**

While you are purchasing your digital communicating instrumentation, it is a good idea to consider what hardware and software you will be using to interface to it. From a hardware perspective, we consider two hardware platforms - a PC or PLC<sup>™</sup> fitted with internal or external communications adapters. The choice of adapters depends on the fieldbus chosen – e.g. DeviceNet<sup>™</sup>, Profibus\*-DP or Modbus\* RTU. Software considerations include industrial visualization (SCADA) software and server – DDE, OPC (OLE for Process Control) or custom. The following section describes the most common choices in these areas in order to make your communications less of a challenge experience.

When considering your choice of a PC or PLC<sup>™</sup> communications adapter, that the PC and PLC<sup>™</sup> are always Masters to the instrumentation that are always Slaves. In addition, for the remainder of this section, TIA/EIA-232 will be referred to as RS-232, TIA/EIA-422 as RS-422 and TIA/EIA-485 as RS-485. The electrical specifications are the same, only the controlling authority has changed. See www.tia.ch for additional information.

#### PCs

Fieldbus adapters for PCs can be divided into 2 classes – those that use the PC's serial ports or those that require a plug-in adapter card. In general, low-speed (38K4 baud or less) communications interfaces can use the PC's built-in serial port and high-speed (125K baud or greater) require a plug-in fieldbus adapter. The only supported instrumentation protocols capable of using a PC's serial port are Modbus<sup>®</sup> RTU and EI-Bisync. Modbus<sup>®</sup> Plus, DeviceNet<sup>™</sup> and Profibus<sup>®</sup>-DP are higher speed protocols and require an internal adapter card. The reason for this is that the lower speed protocols can use the PC's internal serial port transceivers (typically 16550 UARTs) while the higher speed protocols use specially designed transceivers.

If using EI-Bisync or Modbus<sup>®</sup> the next consideration is whether the installation will be using a single instrument or multiple instruments in a multi-drop arrangement. As COM ports on PCs are typically RS-232, a direct connection from the PC to a single instrument also with RS-232 is possible. If the application requires multiple instruments in a multi-drop arrangement then the instruments must be fitted with either RS-422 or RS-485 (recommended); they cannot be directly connected to the PC and a low-cost internal or external converter is necessary. Table 4 below lists recommended converter manufacturers and suggested adapters, both internal and external.

	Internal (ISA)	External
FAI/EIA-4222	B&B Electronics 3PXOCC2A Sealevel #3189	B&B Electronics 422NOICR duTec BaudMaster
	Quatech DS200/300S	
TIA/EIA-485 (RS-485) B&B Electronics 3PXOCC2/ Sealevel #3189	A B&B Electronics 485OIC 485SD9TB (not isolated) duTec BaudMaster	

#### Table 4. Internal/External RS-422/RS485 Converters

\*PCI or PCMCIA models are available in many cases, please check with the manufacturer.

# **TECHNICAL INFORMATION**

It is important when considering an RS-485 converter that the converter have automatic 'send data' control. This feature automatically disables the transmitter of the converter whenever there is no transmit activity on the RS-232 side.

Please contact the manufacturers before ordering the part numbers listed above to determine the suitability to the intended application. Each manufacturer offers many models for which individual requirements may dictate an alternate choice. If in doubt, please contact the manufacturer or contact us.

Internal cards and external converters are isolated models except where noted. If using an unisolated converter be aware that the potential exists to cause damage to the PC due to induced line noise or faults. All of our communications interfaces are isolated and have high immunity to line induced noise or faults. The Series 2000<sup>TM</sup> Communications manual (HA026230) provides an excellent source for the wiring, protocol, and parameter addresses of our instrumentation supporting Modbus<sup>®</sup> and EI-Bisync. It is available at our web site. A useful diagnostic tool also available from our web site is the Eurotherm Sampler. This free Microsoft<sup>®</sup> Windows<sup>®</sup> software is useful for troubleshooting communications problems.

The DeviceNet<sup>™</sup>, Profibus<sup>®</sup>-DP and Modbus<sup>®</sup> Plus fieldbus interfaces require internal adapter cards in the PC. They all support multiple instruments in a multi-drop or trunkline/dropline topology. In addition, special connectors and cabling is required. In Table 5 below, find information on recommended suppliers and model numbers. Each supplier provides the necessary configuration software and communication servers that work specifically with their hardware. Communication servers are available that support either DDE or OPC for interfacing to industrial visualization (SCADA) software in most cases.

Manufacturer Allen-Bradley	DeviceNet 1770-KFD (external) 1784-PCD (PCMCIA) 1784-PCIDS (PCI)	Profibus-DP	Modbus Plus
SST	5136-DN-ISA 5136-DN-PCM (PCMCIA)	5136-PFB-ISA 5136-PFB-PCI 5136-PFB-PCM (PCMCIA)	
Synergetic	SMS-CIF30-DNM (ISA) SMS-CIF50-DNM (PCI) SMS-CIF60-DNM (PCMCIA)	SMS-CIF30-DPM (ISA) SMS-CIF50-PB (PCI) SMS-CIF60-PB (PCMCIA)	
Schneider (Modicon)			416 NHM 212 03 (PCMCIA) AM-SA85-000 (ISA)

#### Table 5. High Speed Fieldbus Adapter Cards

Please contact the manufacturers before ordering the part numbers listed above to determine the suitability to the intended application. If in doubt, please contact the manufacturer or contact us.

#### PLC™

In general, most PLC<sup>™</sup>s do not come with a serial COM port supporting Modbus® RTU natively. None are commercially available for EI-Bisync though there has been some custom applications implemented. Nor do PLC<sup>™</sup>s support DeviceNet<sup>™</sup>, Profibus®-DP or Modbus® Plus directly from their CPU – unless that fieldbus is native to the PLC<sup>™</sup> manufacturer. For example, Modbus® Plus is native to many Modicon PLC<sup>™</sup>s. Thus – though not true in every case – a communications module is necessary to interface to any of the high-speed protocols.

Table 6 lists industry standard PLC<sup>\*\*</sup>s that can be fitted with 3rd party or native communication ports that interface to the fieldbus supported our instruments. The manufacturers name are in italics. Check their websites for more information. Each of these communications adapter modules requires configuration software available from the manufacturer. This configuration software is used to configure the communications adapter card –also known as a scanner - so that it knows the quantity and type of instruments connected, their network address and parameters that can be read and written. The adapter card then asynchronously reads from the connected instruments and maps the parameter data into the PLC<sup>™</sup>s CPU memory.

For DeviceNet<sup>™</sup> and Profibus®-DP, we provide the EDS and GSD file respectively. These ASCII files define the device parameter profile simplifying the configuration of these fieldbus networks. In addition, a GSD file editor is available free from our web site that allows custom creation of GSD files, where the standard GSD file parameter set is not adequate for the intended application.

	Allen-Bradley	GeneralElectric	Modicon	Siemens	Automation Direct
Modbus <sup>®</sup> RTU	ProSoft MCM 3100 (SLC 500) MCM 3150 (PLC-5)	Horner Electric HE693RTM705 (90-30)		CTI 2573-MOK (SIMATIC 505)	F4-MAS-MB (DL405)
DeviceNet™	Allen-Bradley 1771-SDN (PLC-5) 1747-SDN (SLC 500) 1756-DNB (Logix5550)	Horner Electric HE693DNT250		CTI 2576 (SIMATIC 505)	
Profibus <sup>®</sup> -DP	SST SST-PFB-SLC SST-PFB-PLC5	Horner Electric HE693PBM100 SST		Siemens, native to SIMATIC 505, S5, S7	
Modbus® Plus 3300-MBP (SLC 500) 3350-MBP (PLC-5)	ProSoft	SST-PFB-GE (90-70)	Momentum		

#### Table 6. PLC Fieldbus Adapter Modules

# **TECHNICAL INFORMATION**

# CE Conformance (E

Our products are marked 'CE' to show conformance with two European Directives:

The Low Voltage Equipment Directive 73/23/EEC The EMC Directive 89/336/EEC as amended by 93/68/EEC

#### The Low Voltage Equipment Directive

Products comply with the requirements of the Low Voltage Equipment Directive by the application of the following standards;

For Controllers:

**EN 61010-1:** Safety requirements for electrical equipment for measurement, control, and laboratory use

#### For SCR Units:

**EN 50178 (Draft)** is used for guidance in the preparation of a Safety Technical File describing the safety strategy. This file will be endorsed by a Notified Body.

#### Safety Installation Guidelines

It is essential to follow the detailed instructions found in the relevant installation manual, but two points are often overlooked regarding safe installation. Most products are designed to operate in an environment of pollution degree 2, (only dry non conducting dust) and installation category II, (transients and spikes are limited to 2.5kV). SCR units are designed to operate in installation category III (transients and spikes are limited to 4.0kv). To achieve this it may be necessary to install the instruments in a cabinet with a filtered air intake and to fit transient suppression devices to the mains supply.

#### The EMC Directive

Technical Construction Files approved by a Competent Body show that our products comply with the requirements of the EMC Directive. The following generic electromagnetic compatibility standards are referenced in compliance testing;

**EN 50081-1:** Generic emission standard, Part 1: Residential, commercial and light industrial **EN 50082-1:** Generic immunity standard, Part 1: Residential, commercial and light industrial **EN 50081-2:** Generic emission standard, Part 2: Industrial environment **EN 50082-2:** Generic immunity standard, Part 2: Industrial environment

In some cases to be compliant with the emissions requirements of the light industrial environment it will be necessary to fit an approved mains filter. SCR power control units are designed to be compatible with only the industrial environment. See the specific installation instructions of a product for more details.

#### **EMC Installation Guidelines**

Although each product will have its own particular installation instructions there are some general good wiring principles that will improve the electromagnetic environment. To help customers with this we have published a booklet, EMC Installation Guidelines, HA025464 which is available on request.

The following are some of the basic principles described in this document:

- Create an equipotential ground by interconnecting all the metal parts of an installation. Ensure there are good RF connections by using braided cable and clean, paint free contact areas on metal panels. Bond panels at several closely spaced positions.
- Separate power, digital and analog signal cable types. The ideal way to this is to use separate metal cable trays. If using a single metal tray then position cables systematically to separate different cable types.
- When wiring inside a cabinet or metal enclosure, keep the cables against the metal panels to benefit from a screening effect.
- For very sensitive signal cables or digital communications cables use a screened or double screened cable.
- Route outward and return cable together to minimize the loop area of a circuit. Fit snubbers close to inductive loads.
- Take care when including filters; Make a good RF quality ground connection. To avoid crosstalk bypassing the filter, separate input and output cables. Keep the input leads short and preferably shielded.
- EMC Installation Guide Booklet : HA025464

# **Customer Support**

#### A System of Integrated Customer Support

We recognize the importance of providing our customers with an integrated system of support services to compliment the products we sell. We have a dedicated support team whose mission is to provide the customer with a full range of outstanding support services, stressing continuous improvement and customer satisfaction. The same standards and practices that have been established to achieve ISO 9001 certification of the design, development and production facilities extend to our customer support organization. Whether it's a product inquiry, an order status update, an application problem, a repair question, a documentation request, a start-up issue, a training schedule or any other subject of customer interest, our customer support team stands ready to provide the answer.

#### A Complete Range of Services

We offer a complete range of support services including:

- Status of orders and deliveries
- Product technical support
- System technical support
- Applications engineering support
- Installation and commissioning support
- Factory and on-site training
- Warranty and non-warranty repairs
- Spare parts availability
- Calibration services
- Website information
- Fax on demand technical documents
- Application Notes
- Site surveys
- · Product technical manuals and documentation
- Electronic documentation

#### Worldwide Support Network

We have an international network of locally based sales and service engineers in over 30 countries. Capable of providing local on site assistance, this network is backed by central repair facilities in major industrial areas and a world class design and manufacturing facility. The central facility for the US, Canada and South America is located in Leesburg, VA.

#### **Product Standards**

Our products are made in an ISO 9001 approved facility. All products sold for delivery in Europe meet international CE standards. Many products sold for delivery in the US and Canada are UL and cUL approved or registered. Some products used in certain safety applications carry FM approvals. See the product catalog to determine approvals available on specific product models. Many products are available with communications options, which meet open standards for commonly used industrial protocols, including Modbus<sup>®</sup>, Profibus<sup>®</sup>, DeviceNet<sup>™</sup>, SPI and others.

#### **Product Warranty**

Our products come with a product manufacturer warranty on parts and labor. Most products manufactured by us carry at least a two-year warranty. In most cases, warranty service is available locally through our worldwide network. Contact us for details on our product warranty.

#### **Technical Information**

Detailed technical information on the products appearing in this catalog is available. Contact us for any of the following product information:

- Product brochures and specification sheets
- Product technical manuals
- Wiring or installation information
- Application notes

Note that some technical information is available in foreign languages.

#### Website Address

Technical information on the products of Eurotherm Controls may be accessed on our website: www.eurotherm.com
# **Customer Training**

#### Training as Part of a System of Integrated Customer Support

We recognize the importance of providing our customers with an integrated system of support services to compliment the products we sell. An important component of these services is a comprehensive training program that focuses on our products and their application to the control of industrial processes. We are committed to provide a training program with elements structured to address the needs of our customers.

- Knowledgeable training and engineering staff
- Convenient scheduled training at our factory facility
- Optional custom courses at the customer site or remote venue
- · Training equipment that emulates plant conditions
- Appropriate documentation
- A mix of product, system, application and skills training
- An appropriate balance of theory and "hands on" practical examples
- A complimentary mix of hardware and software skills

## Who Can Benefit?

Our training courses are designed to serve the technical requirements of the various types of customers purchasing our products, including End Users, Distributors, OEM Resellers, System Integrators and Value Added Resellers (VAR's). Some of those who can benefit from this training that are in the organizations of these diverse customers are:

- Design, System and Instrument Engineers
- Process Supervisors and Operators
- Repair, Maintenance and Test Technicians
- Programmers
- Field Engineers and Installers
- Trainers and Documentation specialists
- Sales and Marketing Personnel

### **Overview of Training Program**

Due to the diverse requirements of our customers, our training program offers a wide variety of training activities. Regularly scheduled classes on products and applications that are given in the factory with predefined syllabi are announced and published in advance periodically and through the website. Customers may formally sign up for these courses, which are often repeated at various times throughout the year. Custom training designed to fulfill the specific needs of individual customers is also available in the factory, at the customer site or at other remote venues by special arrangement.

Some of the training courses that are available focus on the following products of the company or other relevant technical topics including:

- Discrete Controllers and Indicators
- Multiloop Controllers and I/O Systems
- Power Controllers
- Actuators
- Sensors
- MACO\*DS / EM-3 (extrusion, blow molding, injection molding)
- Process Control Instrumentation made by Eurotherm Process Automation
- PID Control theory
- SCR Control theory
- Digital communications

#### Training Schedules and General Information

Training enrollment forms, class schedules, course syllabi, and information about course costs, travel and local accommodations are available upon request from our training department. Alternatively, training information is also periodically published and circulated by the company or is also available on the website, www.eurotherm.com. We reserve the right to insert, cancel, reschedule, or modify training courses and pre-announced schedules to meet the needs of our customers or of our company. Contact our Training Department for latest details on courses or schedules.

# **Instant Access Order Form**

For information on products from Eurotherm Controls



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#### Comments