



closing the loop on thermal solutions



Temperature Control Solutions

Standard, Custom, Panel, and Sensor Technologies



www.durexindustries.com

Durex Industries designs and manufactures the industry's leading thermal loop solutions including temperature controllers, sensors and heaters. Our experience and understanding of an application's thermodynamic requirements leads to superior solutions. Selecting the best temperature controllers with advanced control algorithms and optimizing the sensor's design assures that your application will have precise temperature control and fast response to changes in the process environment.

This brochure highlights Durex's capability to deliver solutions that best meet a customer's temperature control requirements. In some applications, our standard predesigned family of temperature controls will be the best solutions, while in other applications, custom or integrated controls are the best solution. No matter what the thermal application, Durex has a potential controller solution that will meet our customers' requirements.

Durex Industries Capabilities

Design

- Conduction, radiation and convection heat transfer expertise
- Analog, digital, and microprocessor design
- Custom electronic hardware and firmware
- Electromechanical integration
- CAD/CAM and solid modeling
- Finite Element Analysis (FEA) thermal system modeling
- R&D laboratory and qualification systems
- Rapid prototyping

Manufacturing

- Printed Circuit Board (PCB) assembly
- Through hole and surface mount assembly
- Prototype through high volume production
- Electromechanical panel and box build
- CNC equipment for repeatable precision machining
- Supply chain management
- RoHS compliant

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High Performance • Fast-Reacting

By having a broad range of temperature control and sensor solutions available, Durex Industries has the capability of providing standard, custom, and integrated control panel solutions for our customers.

Many thermal applications start with standard stocked temperature controllers and other electrical-mechanical devices. It is our experience that, in many applications, the OEM's requirements extend beyond what is available or cost effective in standard temperature controllers. For these custom applications, Durex Industries provides design and manufacturing services based on proven product development processes that reduce OEM design and production costs while providing rapid prototyping and highly reliable solutions.

Durex Industries temperature controller and sensor solutions are commonly found in the Analytical Instrumentation, Foodservice, Medical, Photovoltaic, Process and Semiconductor Industries. Our ability to provide knowledgeable technical and industry application engineering support make Durex Industries a preferred design partner.

From concept to design to manufacturing a complete solution, Durex's custom control team has the expertise to deliver superior custom electronic solutions to our customers. Our philosophy is to design

unique custom solutions while using time and cost saving techniques that are based on our proven hardware and firmware platforms. OEMs generally choose a custom electronics solution because they need to integrate firmware functions, hardware functions, or mechanical and human-machine-interface (HMI) features that are not readily available in standard control solutions. Competitive (market) uniqueness and cost can also be driving forces in pursuing a custom solution.



solutions

Quick development design process

Durex Delivers Product Design From Concept to Production in as quickly as 8 -12 Weeks.

Discovery

Business & Product Definition

Discovery is the early product definition stage for most projects. Concepts are reviewed from a business and technical standpoint. In this phase, a budgetary quotation is delivered and evaluated within the context of the OEM's business planning.

Phase 1

Specifications, Schedule & Budget

Phase 1 is the a detailed step where the findings in the discovery phase are expanded to include the electrical, mechanical, HMI, and firmware specifications that will be delivered in the final product.

Phase 2

Product Development

Phase 2 represents the parallel control and OEM product development activities. By working closely with OEMs, Durex delivers a sequence of mechanical, electrical and firmware prototypes that enable parallel design activities on the OEM's product.

Phase 3

Product & Product Validation

Phase 3 is when the completed control is validated in the OEM's equipment. This includes form, fit, and function for both the controller and the OEM's market acceptance. In parallel, Durex is validating our internal production and test processes.

Production

Durex Delivers!

Production schedules with material purchases have been reviewed and planned throughout the design project. By using a modular platform, Durex can quickly ramp from prototype to production quantities in as quickly as 8-12 weeks.

Product Life Cycle

Product Life Cycle addresses technical and logistic support required to effectively manage costs, delivery, and component obsolescence. Durex's intimate knowledge of the hardware and firmware design enables quick customization of the controller for new applications during the life of the product.

Durex Temperature Control Platforms are a cost saving, fast prototype and production solution for applications requiring combinations of temperature, humidity, time, pressure, and logic process functions. Durex's control platform leverages proven control designs. Most applications only require customization of firmware and hardware that is unique to the application. By using a common platform, Durex's designers cost effectively achieve the distinctive operation and user interface required for our customers.

You can get the exact control you need... at a price that fits. Time, temperature, motion, speed, pressure and humidity, as well as serial communications and data logging, are just a few of the variables that can be included in your unique controller. In most multi-function control systems, cost is reduced by integrating the control functions into a single custom control.

Custom Design Capabilities:

Manufacturing

- PCB assembly; surface mount (SMT), through-hole and mixed technology
- Automated conformal coating and potting
- Custom PCB and cable/wiring engineering and assembly solutions
- Electronics supply chain management
- Turnkey and consignment services
- Timely and accurate pricing, quote, and ordering
- Rapid response prototype and development
- RoHS compliant processing

Design

- Digital control design, including C, C++, Assembly...
- Printed circuit board (PCB) design and layout
- Thermocouple, RTD, and thermistor inputs
- Advanced display (HMI) technologies
- Product specification and design processes
- Design and manufacturing verification processes



If you can Measure it, Quantify it, or even just Describe it... Durex can Build a Control for it!

Durex Industries' Qd Platforms are a family of predesigned mechanical, electrical and firmware modules that are the basis for fully functional custom control solutions. By incorporating predesigned elements, Durex is able to substantially reduced design costs and time while delivering a highly reliable custom solution. Our philosophy is that you do not need to reinvent-the-wheel for every custom design. Furthermore, by reusing these building blocks, we substantially reduce the cost of a custom control.

All Durex controllers are designed so our OEM customers only purchase features that they need for their applications. In some applications, the simple **Series 1000** on/off temperature control is required. In other applications, the **Series 5000** with advanced Human Machine Interface (HMI) and multiple loops of control and communications is required.

Whether an OEM requires Series 1000, 5000, or functions in between, Durex Industries incorporates the same time and cost saving methodology to deliver a superior and reliable solution.



Qd series custom controls

Qd series	1000	2000	3000	4000	5000
Product View					
Display	None	Numeric LED	Single or Multi-line alpha-numeric LCD	Graphic LCD	Resistive or Capacitive color touch screen
HMI	On board, or remote pot	Mechanical keyswitches	Mechanical keyswitches, or keypads	Mechanical keyswitches, or keypads	Touch screen
Input	RTD, T/C, Thermistor	RTD, T/C, Thermistor, Process	RTD, T/C, Thermistor, Process	RTD, T/C, Thermistor, Process	RTD, T/C, Thermistor, Process
Output	One open collector	Multiple open collector, mechanical or solid state switching	Multiple open collector, mechanical or solid state switching	Multiple open collector, mechanical or solid state switching	Multiple open collector, mechanical or solid state switching
Control Mode	On/off	On/off, PID, PWM	On/off, PID, PWM	On/off, PID, PWM	On/off, PID, PWM
Mounting	Sub-panel	Panel, from back	Panel, from back	Panel, from back	Panel, from back
Firmware	Customized to application	Customized to application	Customized to application	Customized to application	Customized to application
Communications	None	Serial	USB/Serial	USB/Serial	USB/Serial

Notes: 1. Line voltage input/output typically handled via a separate PC Board with all high voltage components separate from the controller board.

2. Basic diagnostics are included, additional diagnostic software available.

3. Proportional, Integral, Derivative (PID) / Pulse Width Modulation (PWM)

This chart above represents just a sampling of the custom controls that Durex can build for you.

RB and SA Series Panel Mount Temperature Controllers

The **RB and SA Series panel mount controls** from Durex Industries represent the next generation of high performance standard 1/32, 1/16, 1/8, and 1/4 Din PID temperature controllers. This controller family offers many control options that provide superior performance. The easy to read LCD display technology represents a major usability improvement over controls that used LED display technology. From the simplest control to more advanced controls with multiple I/O functions, control algorithms, and digital communications the Durex controls provide the industry's best value in control solutions.

Features:

- Large 11-segment LCD display that is easy to read at long distances
- Advanced PID auto-tuning algorithms optimize PID values to stabilize control of the system
- Rapid 0.25 second sampling rate provides quick response to changes in the temperature process
- Recipe storage of set point menus to allow easy set up during process changeovers
- RS-485 Serial Communications with Modbus/ANSI protocol
- Programmable Ramp / Soak Control
- USB port for easy control parameter setup
- Burst fire power output
- Compact 2.36 inch (60 mm) housing depth reduces the space requirement in a control panel
- 90 to 264V AC (50/60Hz) supply voltage
- RB Compliance: , , and C-Tick standards
- SA Compliance: , , , and C-Tick standards



MA and SRZ Series Multi-loop Temperature Controllers

A multi-loop temperature controller is a very practical solution when an application requires 4 or more loops of temperature control. The M900 family of panel mount controllers is available as 4 or 8 zone solution. The SRZ controls are compact DIN rail mounted 4 loop control modules that can be expanded up to 64 control loops. Communications protocols make it easy to interface with a computer or PLC. The multi-loop controls are available with numerous input and output options.

MA900/901 Multi-loop Features:

- 4 or 8 control channels
- Memory storage of 8 process recipes
- Serial Communications: RS-232C, RS-422A or RS-485
- MODBUS or ANSI protocol
- Digital inputs and multiple alarm functions
- 1/4 Din housing and IP65 water/dust proof front cover
- Compliance with  ,  ,  standards

SRZ Modular Multi-loop Process Features:

- Multi-zone space-saving
- System simplification and cost reduction
- 2 or 4 loop temperature control modules
- Maximum of 16 modules for up to 64-control loops
- Serial Communications: RS -485 (MODBUS protocol)
- Digital inputs/outputs and alarm functions
- Din Rail mounting
- Compliance with  us ,  , and C-Tick standards



FB High Performance Process Controllers

The FB family of high performance ramp/soak process controllers extends the Durex product line to provide solutions for applications requiring multiple process functions such as environmental chambers, food processing, semiconductor and photovoltaic equipment. Other control features include advanced PID algorithms for challenging process applications, auto-temperature-rise with learning function, temperature ratio setting, and cascade control.

Features:

- High accuracy with selectable sampling rates
- Digital inputs/outputs and alarm functions
- Programmable Ramp/Soak Control
- Inter-controller communication for up to 32 controllers configuration
 - ▶ Auto-temperature-rise with Learning Function
 - ▶ Temperature Ratio Setting
 - ▶ Cascade Control
 - ▶ Group Run/Stop Function
- Serial Communications: RS -485 (MODBUS protocol)
- Compliance with  us ,  , and C-Tick standards.



Power Controllers

The THV Series of power controllers features an LED display to show set values and input signals with keys for easy setup. The THV operates at single-phase 100 to 240VAC and is available in 20, 30, 45, 60, 80, or 100 amp models. Compliance with **UL** (20, 30 A), **cULus** (45 A), **CE**, **SP** standards.

Control Types:

- Phase angle control
- Zero-cross control (Continuous proportional)
- Zero-cross control (Input synchronization system)
- Gradient setting between input and output voltage
- Soft-start & soft-down ramp function
- Output limiter (High & Low)



Durex's SSN DIN rail mount solid state relays (SSR) and SSJ (SSR) are an excellence solution for switching resistive current loads of up to 35 amps. Designed in a compact size, SSRs with integrated zero-cross or phase fired control switching offer superior temperature process control in most applications.

Features: Solid State Relay SSN

- Single-phase, 60 to 280VAC (50/60Hz)
- Load current: 15, 25, and 45 A
- Din-rail mounted with compact SSR including heat sink
- Compliance with **cULus**, **CE**, **TÜV Rheinland** standards.



Features: Solid State Relay SSJ

- Single-phase, 35 to 264 VAC (50/60Hz)
- Load current: 15, 25, and 45 A
- Screw mount SSR with optional heat sink
- Compliance with **cULus**, **CE**, **VDE** (REG.-Nr. 40005190) standards.



Control Panels

Durex has an extensive line of standard control panels to meet a wide variety of industrial requirements. Control panels can also be custom designed for specific applications. All panels are fully pre-wired and tested at the factory and come with a set of drawings including schematics and I&M manuals. Standard panels include NEMA 12 enclosure, main power disconnect, process temperature controller, pilot lights, panel labels, primary and secondary fusing, and ventilation fan /filter (if required).

Among the options are:

- UL listing
- High limit controller
- NEMA 4, 4X or 7 enclosure
- Meters and chart recorders
- Lamps and annunciators
- Circuit breakers
- Enclosure heater
- Air cooling
- Multi-zone
- Class 1 Div. 2, Groups B, C, D hazardous location ratings
- Solar and drip shields



Control Consoles

Durex E-Series Control Consoles

integrate temperature controllers, power switching devices, power connectors, fuses, sensor connectors and other electromechanical devices into a compact system. The integration of discrete components into a complete self-powered turnkey system saves design and manufacturing cost, while providing a robust, reliable temperature control system of many applications.

Durex can design and manufacture your electronic and electromechanical box build for small and large production quantities. Our expertise from concept through production provides customers with time-saving integrated cost effective solutions.

Electronic Box-Build Capabilities

- Electromechanical box build engineering
- PCB or cable and wiring harness design, layout and assembly
- Completed product assembly
- Component procurement
- Technical service solutions
- Packaged to your specifications
- Stocking/storage solutions ready to ship
- Turnkey or consignment services



Integrated Temperature Control Application



Manufacturing of semiconductor devices (wafer processing) requires deposition of multiple layers of materials to create the transistors. Aluminum or tungsten is deposited to fill the vias between layers and completes the electrical circuit. The metal layer requires an etch process in a metal etch chamber.

A byproduct of the etching process includes materials that can condensate in the exhaust lines and result in frequent equipment maintenance and reduced production yield. Heating of the exhaust lines at about 100°C with silicone rubber pump line heaters from the metal etch chamber substantially reduces the condensation.

In order to control the temperature in remote locations, process engineers needed a turnkey integrated control system that included process temperature and limit controls, solid state relays, high limit relays and other electromechanical components.

Durex designed and manufactured a dual integrated control console that could control two 20 amp 240 Vac circuits. This rugged integrated package was easy to install and completed the thermal system on the metal etch tool.

Durex Temperature Sensor Assemblies complete the thermal loop and are designed for repeatability, accuracy and stability. Durex's sensor assemblies can be specially designed for challenging applications using our applied expertise in thermodynamics, metallurgy, and electrical properties of materials.



- Single or multipoint sensor assemblies
- NIST traceable calibration on refractory thermocouple materials
- 100, 1000, and 2000 Ω RTD assemblies
- Thermocouple & RTD probes and assemblies
- Stock and standard designs for quick delivery
- Teflon® coated probe capability

Durex RTD Temperature Sensor Assemblies are commonly used in analytical, foodservice, medical, photovoltaic, process, and semiconductor applications. Sensor assemblies are designed to meet the application requirements with optimized selection of resistance accuracy, materials, and electromechanical design.



- RTD Materials: Copper, Nickel, Nickel Iron, and Platinum
- Sheath Materials: 304, 316 Stainless Steel, Inconel®
- Sheath Diameters: 1/8", 3/16", 1/4", 3/8" OD and metric sizes
- Sheath Options: Bayonet fittings, compression fittings, welded bushings, flanges, & Teflon® coating
- Sheath Termination: Spade lugs, RTD plugs, and special connections
- Configuration: Screw cover and explosion proof heads, miniature heads, lead wires, and custom constructions
- Custom Designs: Electromechanical designs to meet most application requirements

Durex Thermocouple Sensor Assemblies are an excellent solution for most high temperature and rugged industrial equipment and process applications. Thermocouple sensor assemblies are typically used in foodservice, plastics, process heating and other industrial applications. Sensor assemblies are designed to meet the thermodynamic and electromechanical requirements of most applications.

- Base metal thermocouple types: J, K, T, E, N
- Noble metal thermocouple types: B, R, S
- Sheath materials: 304 and 316 stainless steel, carbon steel, Inconel® 600 and 601
- Thermocouple options: Wire gage size 8 to 30 gage, bare wire or ceramic insulated, single or multiple sensor elements, standard or special limit materials, grounded or ungrounded junctions
- Protection tube options: Pipe sizes from 1/4" to 1"NPT with 40, 80 or 160 wall, 3/8" to 1(1/4)" OD ceramic tubes, welded mounting bushings, mounting flanges, nipple and sleeve mountings, hex mounting fittings, temperature check-port fittings
- Assembly Options: Aluminum, 316L SS, terminal heads, Cast Iron/Aluminum or 316L stainless steel explosion-proof terminal heads



Commercial Foodservice Equipment Application

A foodservice equipment OEM had a contract to supply floor mount fryers to a global restaurant chain. Since consistency of meals at all restaurant locations is critical, the restaurant chain had tight specifications for the cooking processes. Repeatable temperature sensor accuracy and location is absolutely critical for achieving food consistency in New York, Paris, Tokyo and all geographic locations.

Durex's engineering team worked closely with the OEM to design a RTD sensor assembly that would provide fast temperature response with precision accuracy. To assure that the sensors are consistent within the restaurant chain's defined parameters, Durex's quality validation tests included x-rays, coordinate measurement, and thermal response procedures. All design and manufacturing test procedures are documented under Durex's ISO 9001 processes. Today, thousands of Durex sensors are working to help provide the signature meals offered by the restaurant chain.

About Durex Industries

Founded in 1980 by Ed Hinz, CEO & President, Durex Industries is a privately owned thermal solutions company specializing in electric heaters, temperature sensors, and temperature controls. Durex's 145,000 sq. ft. business, engineering, and manufacturing campus is conveniently located 25 miles northwest of Chicago in Cary, Illinois.

Since our founding, providing customers with reliable products and excellence in all aspects of the business have been the hallmark of Durex and the basis of our name. "Dur" means durable and "ex" means excellence. Durex Industries, an ISO 9001/2008 registered company, supplies engineering and manufactures thermal solutions for most global industrial equipment markets, including food service, life sciences, packaging, photovoltaic, plastics, process, and semiconductor. Our focus on lean design, manufacturing, and business systems continues to provide customers with the best design and product value in our industry.



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