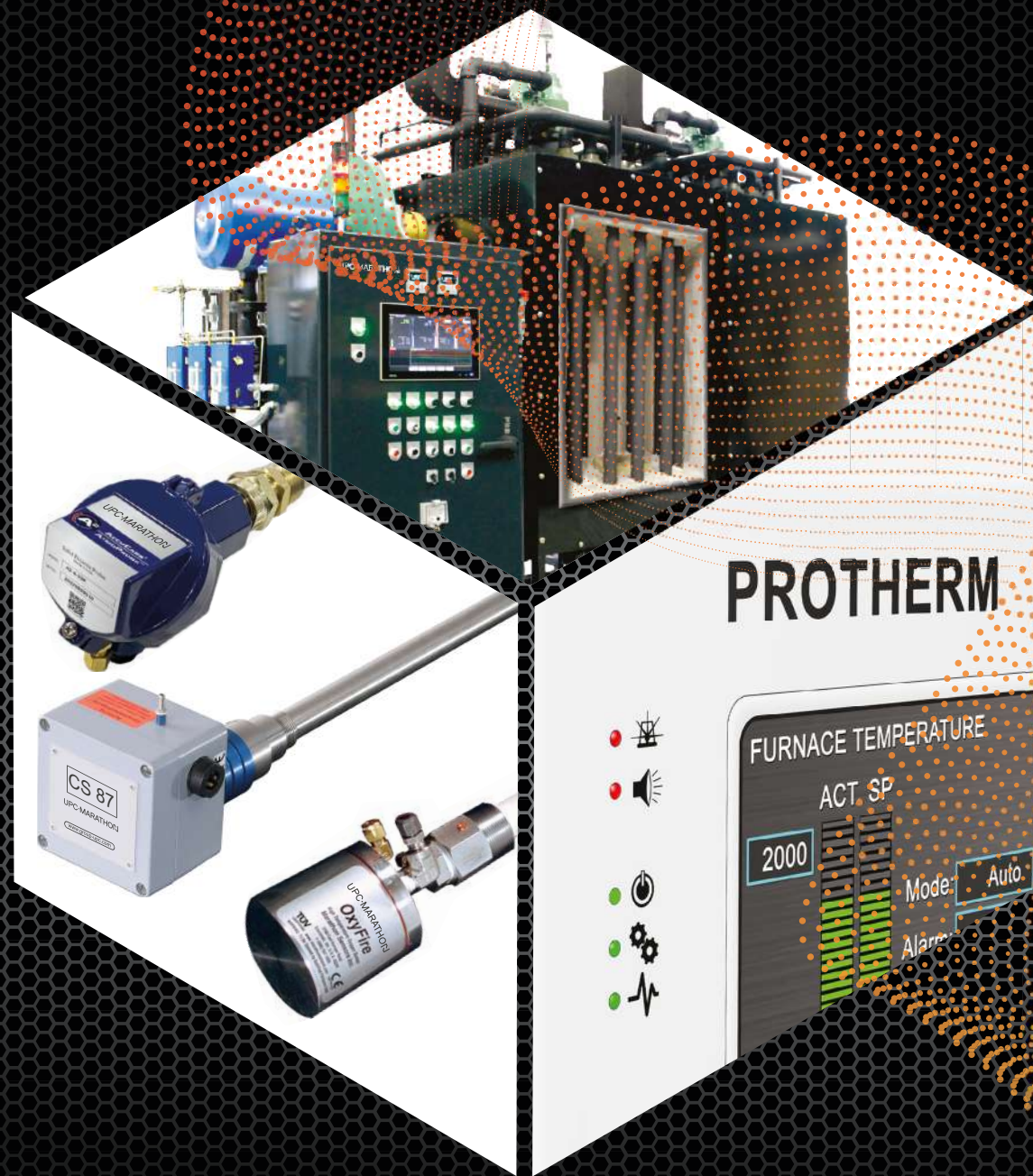


# UPC-MARATHON

MASTERING STRENGTH. WORLDWIDE.



**SENSORS, PROCESS CONTROLS  
& AUTOMATION SOLUTIONS**

## CARBON / OXYGEN PROBES

Highly accurate rugged probes for a variety of heat treating applications such as carburizing, carbonitriding, hardening, and endothermic generators.

ACCUCARB®/ATMOPROBE™ - High accuracy oxygen sensors used in low and medium carbon applications, or generators where frequent burn off is not required.



QUICKSILVER™ - Economical rugged sensor with superior thermal shock resistance. Installs in seconds.



CARBONSEER™ - The industry standard for high carbon applications.



CS87™ - Our most rugged oxygen probe with in-process mechanical cleaning for the toughest environments and superior thermal shock resistance.



Specialty probes also available for annealing and nitrocarburizing atmospheres that require a vacuum-tight probe construction.

## OXYGEN PROBE SIMULATOR & TESTER



Probe Buddy™ is a smart testing device that checks the integrity and health of oxygen probes. It's also used to imitate the output signals of a working probe to check the scaling and operation of the process control system.

## HYDROGEN ANALYZER



The H2Smart™ and SGS™ analyzers are designed to measure hydrogen content with high accuracy in nitriding and nitrocarburizing atmospheres and to calculate the parameters necessary for process control:  $p_{H_2}$ ,  $p_{NH_3}$ ,  $p_{O_2}$ ,  $p_{CO}$ ,  $p_{CO_2}$ ,  $K_N$ ,  $K_C$ ,  $K_O$  and % dissociation. Both analyzers are fitted with an integrated sampling system that eliminates the need for an external sampling pump.

## FIXED SINGLE-GAS ANALYZER



The fixed AtmoSense™ analyzer provides precise and real-time measurements of process gas variables - Dew-point, %RH,  $CH_4$ ,  $C_3H_8$ , CO, or  $CO_2$  - in a wide variety of atmosphere control applications. AtmoSense™ can be fitted with a sample pump to draw atmosphere samples in low-pressure applications.

## INFRARED GAS ANALYZER



The FurnaceDoctor®-Pro provides accurate infrared measurement of CO,  $CO_2$ , and  $CH_4$  and computes the % carbon, Dew-point and expected carbon probe millivolts.  
CQI-9 COMPLIANT

## PORTABLE SINGLE-GAS ANALYZER



The portable FurnaceDoctor®-SG Analyzer provides real-time measurement of process gas variables - Dew-point, %RH,  $CH_4$ ,  $C_3H_8$ , CO, or  $CO_2$ .  
CQI-9 COMPLIANT



## CONTROLLERS & PROGRAMMERS



AE25

From simple single loop carbon controller to sophisticated programmers with multiple loops and process modelling capability. These support all types of furnaces such as batch, continuous and pusher and all types of processes such as nitriding, nitrocarburizing, carburizing, carbonitriding, plasma and vacuum. Standard connectivity allows for integration with SCADA systems.

**AE25** - ¼ DIN multi-loop process controller. Controls carbon potential, dewpoint, temperature, and oxygen concentration.

**PROTHERM 455** - ½ DIN multi-loop embedded programmer with a color touch-screen interface, and built-in chart recorder function. Calculates variables such as % carbon, dew point, or millivolts, and percent oxygen. Stores up to 200 19-step recipes. Direct drop-in replacement for Marathon Monitors' CarbPro, DualPro, MultiPro, and Carb PC. Works with internal and/or external I/O's.

FOR CQI-9, AMS 2750, & AMS 2759/10-12 COMPLIANCE.



PROTHERM 455



PROTHERM 470

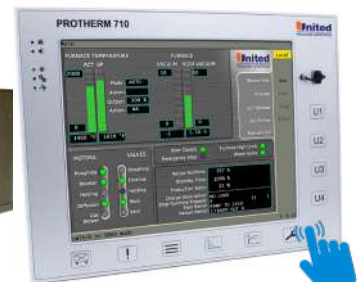
**PROTHERM 470** - ½ DIN multi-loop embedded programmer with a color display and turn-and-push knob navigation. Up to 32 programmable PIDs included, plus built-in calculators for real-time carbon and/or nitrogen diffusion, and hardness profile, a mathematical model for calculating atmospheric parameters, and integrated web server for browser-based remote access. Works with internal and/or external I/O's.

FOR CQI-9, AMS 2750 & AMS 2759/10-12 COMPLIANCE.

**PROTHERM 510/610/710** - Universal configurable programmers that monitor, control and record processes running in a single furnace or simultaneously in multiple chambers. Up to 32 programmable PIDs included, plus built-in calculators for real-time carbon and/or nitrogen diffusion, and hardness profile, a mathematical model for calculating atmospheric parameters, and integrated web server for browser-based remote access. FOR CQI-9, AMS 2750 & AMS 2759/10-12 COMPLIANCE.



PROTHERM 610



PROTHERM 710



AE06L  
Limit Controller

### OVER TEMPERATURE LIMIT CONTROLLER

The AE06L is easily configured for most thermocouple and signal types. The 3 alarm outputs can be setup with different set points for multiple limit alarm logic capability.



KD7



### CHART RECORDER

The KD7 is a 1/2 DIN paperless chart recorder with a 5.7" color touchscreen interface and Ethernet communication.

**CARBURIZING / CARBONITRIDING CONTROL SOLUTION FOR BATCH FURNACES**

Supplied with a PROTHERM universal programmable controller. Optional online carbon and nitrogen diffusion and  $\beta$ -control modules available for even more precise control. Compliance: AMS 2750, CQI-9, NFPA 86-C, NADCAP\*



**NITRIDING / NITROCARBURIZING CONTROL SOLUTION**

Supplied with a PROTHERM controller, hydrogen analyzer and optional NitroCarb™ probe for nitrocarburizing. Precise atmosphere control:  $K_{N_2}$ ,  $K_C$ ,  $K_O$  or % dissociation. Compliance: AMS 2750, CQI-9, NFPA 86-C, NADCAP\*, AMS 2759/10, AMS 2759/12 (FNC).

**VACUUM CONTROL SOLUTION**

Supplied with a PROTHERM programmable controller and optional multiple load thermocouple inputs for soak guarantees. Interfaces to popular vacuum gauges. Compliance: AMS 2750, CQI-9, NFPA 86-C, NADCAP\*



**ANNEALING / BRIGHT ANNEALING / NORMALIZING SOLUTION**

Supplied with a PROTHERM controller and either an AccuCarb® LTA probe or FurnaceDoctor® FX analyzer or with Protherm ActivePLC™, FurnaceMeter™, AtmoSense™ and UPC-Marathon oxygen probes for a variety of furnace types. Compliance: AMS 2750, CQI-9, NFPA 86-C, NADCAP\*

\* depending on the options chosen

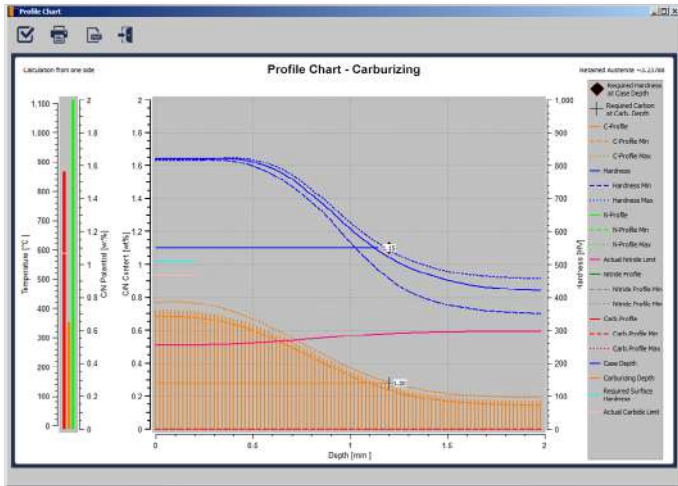
**NITROGEN-METHANOL CONTROL SOLUTION**

The SmartMeth™ control system is a fully automated nitrogen methanol mixing system for heat treating furnace atmosphere production. It utilizes the latest in precision differential pressure flow measurement and touch screen controller design.



**TURNKEY SOLUTIONS, ENGINEERING SERVICES & COMMISSIONING**

UPC-Marathon has the experience and know-how to provide complete turnkey solutions for your next furnace installation and replacement project including project management, engineering, system integration, implementation, and maintenance. Services include unloading/loading equipment, design and construction, electrical & gas setup, programming, start up, testing, training, and responsive technical support.



## HT-TOOLS PRO CALCULATES

- Compound layer thickness and composition
- Diffusion (precipitation) layer
- Total diffusion depth; Effective case depth
- Nucleation
- Hardness profile with tolerances
- Carbon percentages; Surface carbon/nitrogen content
- Alloy factor; Carbide limit; Nitride limit; Soot limit
- Recommended process setpoints including KC and KN

## HT-TOOLS PRO SIMULATION SOFTWARE FOR CARBURIZING, CARBONITRIDING, NITRIDING, & NITROCARBURIZING PROCESSES

**HT-TOOLS PRO** is a powerful simulation tool for designing and optimizing recipes for carburizing including low-pressure carburizing, carbonitriding, as well as nitriding and nitrocarburizing processes. It can significantly reduce the lead time for process development, replacing time-consuming evaluations and trials.

The software determines the most efficient recipe for a given application based on its specifications, which include part characteristics such as steel composition and, where applicable, design geometry as well as quench conditions, or quenched and tempered conditions for nitriding/nitrocarburizing processes. HT-Tools Pro analyzes the data entered and models the carbon and/or nitrogen content and hardness profiles. For nitriding and nitrocarburizing, the software produces models in accordance to AMS 2759/10A and 2759/12A recommendation.

HT-Tools Pro includes a materials database that can be populated with steels of various chemical compositions. Depending on the alloying elements in the steel, HT-Tools Pro calculates alloying factors and solubility limits versus carbide and nitride precipitation. Additionally, a recipe database makes it possible to store and analyze multiple recipes. The simulation of different alternatives by changing parameters allows the user to quickly evaluate a recipe so that optimal results are achieved.

## BENEFITS

- Short recipe optimization time
- Faster sampling-to-production time
- Possibility of in-flight parameter modifications reduces the need for expensive testing
- Recipes can be transferred to any PROTHERM controller via the PROTHERM 9800 production management software.

## FEATURES

- Calculation of the expected hardness distribution - carbon and/or nitrogen profiles for the required case depth.
- Progression of process curves with zoom options.
- Profile curves of the expected carbon and/or nitrogen and hardness distribution with zoom options.
- Database of recipes with automatic calculation of limits versus soot formation and carbide/nitride precipitation.
- Materials database that can be populated with the chemical composition of various steels.
- Possibility of accounting for a part's geometrical characteristics.

## CREATING/MODIFYING RECIPES

Recipes are created and modified by setting the:

- temperature in heating, holding and cooling stages;
- furnace atmosphere in carburizing/carbonitriding - specifying the carbon and/or nitrogen potentials, soot limit, carbide limit, and surface carbon content;
- furnace atmosphere in nitriding/nitrocarburizing - specifying the nitriding and/or carburizing potentials and nitrogen dilution.



## INTEGRATION OF HEAT TREATING OPERATIONS

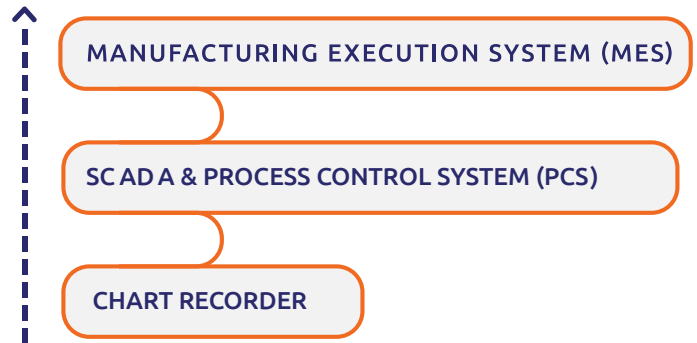
The **PROTHERM 9800** delivers everything to optimize the performance and efficiency of a heat treatment plant operating with a wide a variety of furnaces as well as automatic handling machinery. By combining process control, equipment integration, and automation capabilities, the Protherm 9800 provides a comprehensive approach to plant wide supervisory control and management.

## SCALABLE SYSTEM

Protherm 9800 is a modular system consisting of basic modules for data acquisition and load reporting, and extended with a set of modules for recipe management, alarm and event logging.

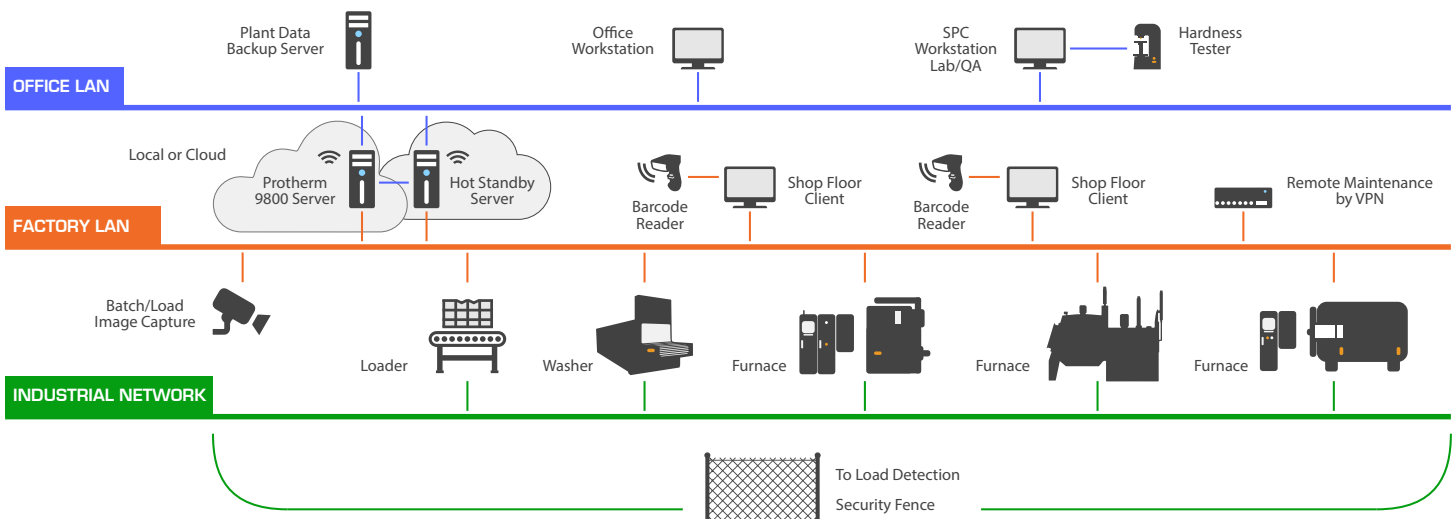
A fully complemented system includes plant utilization calculations, maintenance tracking along with SMS and email alarm messaging, real-time carbon and nitrogen diffusion calculations, modeling as well as load planning and interface to Manufacturing Execution Systems such as SAP. Protherm 9800 can also be configured to allow complete lights- out plant automation.

### FULLY AUTOMATED LIGHTS-OUT PRODUCTION CELL



## FEATURES

- Scalable set of functions
- Module for fully automated production system/cell (lights-out)
- Easily implementable interface to existing planning and production systems
- Possibility of simulating heat treating processes



EXAMPLE OF A NETWORK LAYOUT FOR A PROTHERM 9800 LIGHTS-OUT OPERATION

## VARIABLE AREA METERS FOR PRECISE & RELIABLE CONTROL OF ATMOSPHERE GASES & LIQUIDS

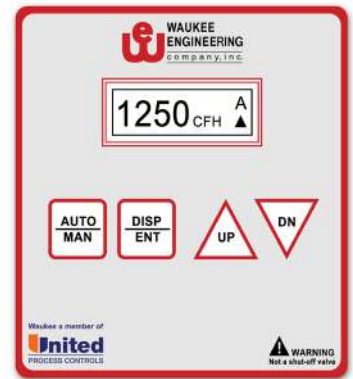
**FLO-METER™** - "The Heat Treater's Favorite" provides precise visual indication of rates of flow of air, liquids and industrial gases. All Waukee FLO-METER™'s are calibrated in our ISO/IEC 17025:2005 certified lab and traceable to NIST (National Institute of Standards and Technology).

**FLO-ALARM™** - includes our basic FLO-METER™ with or without a manual flow control valve. The FLO-ALARM™ provides either a high or low flow alarm.

**FLO-TRONIC Plus™** - includes a basic FLO-METER™ with or without a manual flow control valve. The FLO-TRONIC Plus™ provides visual flow rate indication as well as an analog output signal proportional to the flow rate. Waukee's new magnetic sensor technology is immune to problems associated with dirty oil. Ideal for customers who need to data log flow rates for compliance to NADCAP, AMS2750D, or CQI 9.

**SAV Plus™ Control Valve** - includes a standard Waukee FLO-METER™ scaled to your requirements and an electronic control valve that modulates flow based on a signal from your control system delivered via 4-20mA or digital communications such as Modbus TCP. The SAV Plus™ features a bright, easy to read LCD display, and user friendly key board for configuration and manual operation. Ideal for precise control of industrial gases or liquids used in heat treat processes. Built-in web server for remote access to SAV Plus™ settings and alarm logs.

**VALVE-TRONIC Plus™** - Complete electronic control valve and meter. Includes a Waukee FLO-METER™ scaled to your requirements, and an electronic control valve that modulates flow based on a signal from your control system delivered via 4-20mA or digital communications such as Modbus TCP. The VALVE-TRONIC Plus™ features a bright, easy to read LCD display, and user friendly key board for manual operation. Ideal for precise volumetric flow control of industrial gases used in heat treat processes. Other features include totalization, and alarms.



FLO-TRONIC Plus™

SAV Plus™

VALVE-TRONIC Plus™

INTEGRATED VISUAL FLOW INDICATOR

All flow data may be accessed over digital communications for easy integration into your control or SCADA system. Waukee's new magnetic sensor technology is immune to problems associated with dirty oil. These meters are best for customers who need to control and data log flow rates for compliance to NADCAP, AMS2750D, or CQI 9. A built-in web server provides remote access to the SAV Plus™ and Valve-Tronic Plus™ settings and alarm logs.

## DIFFERENTIAL PRESSURE METERS FOR PRECISE & RELIABLE CONTROL OF ATMOSPHERE GASES & LIQUIDS

### FurnaceMeter™ Touch Product Line



Electronic  
FurnaceMeter™



With Electronic  
Motorized Valve



With Liquid  
Motorized Valve

The **FURNACEMETER™ TOUCH** and **VERSAMETER™ TOUCH** are precision flow measurement instruments designed specifically to meet the rugged requirements of industrial heat-treatment applications. The meters utilize precision, field-proven and certifiable differential pressure flow measurement technology. The advanced calibration and display modules on the electronic versions include integrated flow rate alarm and flow consumption totalizing functions. The meters meet NFPA86 guidelines for safe application in the thermal processing industry. In addition, every meter is calibrated to NIST transfer standard and ships complete with a 10-point calibration certificate. The meters can also be field calibrated to meet CQI-9, ISO, NADCAP, and QS quality audit systems.

### INTEGRATED FLOW CONTROLLER & MOTORIZED VALVE

The electronic FurnaceMeter™ Touch and VersaMeter™ Touch integrated flow controllers can be fitted with a motorized flow control valve designed to provide a complete solution for flow control applications. The desired flow rate setpoint can be programmed locally using the touchscreen or remotely using 4-20mA signal or ethernet TCP/IP communications.

### VersaMeter™ Touch Product Line



Electronic  
VersaMeter™



With Electronic  
Manual Valve



With Electronic  
Motorized Valve

## FEATURES & BENEFITS

- Flow measurement can be checked anytime
- Touchscreen interface
- Paperless chart recording of flow
- Precision flow measurement and control
- NIST traceable 10-point calibration with every meter
- Manual or electronic flow control valve
- Integrated flow alarms and flow switch (optional)
- Integrated flow totalizer
- Direct visual indication of flow (meets NFPA86)
- Ethernet TCP/IP communications
- 4-20mA flow feedback and set point signals
- No fragile sight glass tubes or float assemblies to wear out
- No oil or float assemblies to clean or maintain
- Fast and accurate response to flow changes
- Flow Sensor can be calibrated in-situ, without disassembly
- Not susceptible to soot or particulates in the gas stream as long as particles can fit through orifice
- Retrofit or simplify existing piping
- USB port for transferring data



## CUSTOM PANEL ASSEMBLIES

### FLOW PANELS

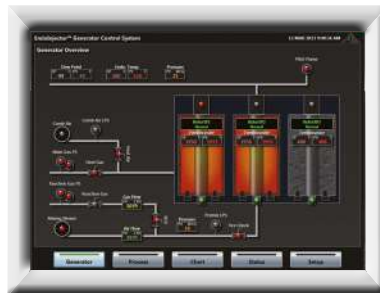
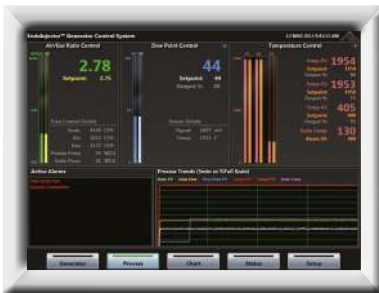
Turnkey flow control panels are designed to provide installation ready assemblies for any process control application. These panels include all process flow control components pre-piped and wired to a NEMA enclosure to reduce installation time. All assemblies include detailed dimension drawings, component documentation, and calibration records.

Our design engineers utilize the latest 3D modeling software to ensure proper fitting and system operation prior to production, while our assembly technicians use best piping and wiring practices to provide a reliable and fully tested system ready for installation.



Complete Flow Control Panel

## PROTHERM ACTIVE PLC™



PROTHERM ACTIVEHMI™



### INDUSTRIAL PROCESS CONTROL SOLUTION

The **PROTHERM ACTIVEPLC™** provides a single, universal process control platform that can be standardized on many different applications, machines and projects, reducing development time, training, and spare part requirements. This industrial standard programmable logic controller runs on the Protherm ActivePLC™ process control platform with its universal PLC program that is ready to run “out of the box” without PLC programming required. The platform provides a completely flexible and uniform system to define and setup inputs, outputs, alarms, timers, advanced math functions, logic operations, PID loops, recipe operation, analog signal scaling, and even thermocouple type selection and calibration on an industry standard controller.

Configuration is accomplished via the Protherm ActiveHMI™ touchscreen. Settings and logic can be backed up locally and replicated to any other Protherm ActivePLC™ hardware regardless of the manufacturer.

## APPLICATIONS

- Complete furnace control system
- (multi-zone temperature and atmosphere)
- Annealing Furnace Control
- Gas Generators (Endo/Exo/DA)
- Batch Type and Continuous
- Applications & many others

## FEATURES

- Customizable HMI
- Data Logging and Paperless Chart Recorder
- Recipe Control
- Alarm Log
- Calibratable Temperature Inputs
- Advanced Math and Logic Capabilities & many others

**GAS AIR MIXORS™**



Gas Air Mixer™

The **WAUKEE MIXOR™** is a precision compressor-carburetor device which accurately mixes gas and air in any selected ratio, and compresses it for use with endothermic cracking, or exothermic cracking generators, or as a source of pre-mixed gas and air for torch brazing, flame heat treating, or sort metal melting.

**GAS MIXING PANELS**



**GAS MIXING PANELS** include the reliable rotary Waukee vane compressors, air and gas Flo-Meters, and either a mechanical carburetor or RatioProver for precise ratio control. Panels are available with additive trim gas or air Flo-Meters. Various capacities and options are available to meet the needs and demands of almost any application.

**ENDO/EXO MIXING SYSTEMS**



EndoInjector™

The **ENDOINJECTOR™** is a precision gas mixing and control system for endothermic gas generators. The system incorporates a patented fuel injection design that utilizes electronic flow measurement and precise ratio control to consistently provide the ideal gas mixture for high quality endothermic gas generation. The fuel injection design automatically delivers gas mixture on demand, providing only as much endothermic gas as your furnaces require. This design feature makes it possible to significantly reduce operating costs and eliminate gas waste. Designed to easily replace existing carburetor/pump designs, the EndoInjector™ typically pays for itself in less than one year.



EndoInjector™ Generator Overview

**FEATURES & BENEFITS:**

- Large turndown capability.
- Reduce operating costs.
- Touch-Screen control interface.
- Minimize generator setup/startup time.
- Eliminate gas waste.
- No lubrication required.
- Precision dew point control.
- Eliminate sooting of catalyst due to mistuned carburetors.

## TURNKEY GAS GENERATORS

EndoFlex™  
Endothermic Gas Generator

The advanced **ENDOFLEX™** endothermic gas generator combines the patented EndoInjector™ fuel injection generator control system with the high-efficiency ReactionCore™ technology to lower operation and maintenance costs associated with producing high quality endothermic gas for your heat treatment furnaces. The generator is equipped with the latest sensors to monitor dew point, unreacted methane, and energy consumption. The touchscreen interface provides easy access to review generator operations, and the integrated paperless chart recorder tracks generator performance to meet production auditing requirements.

**REACTIONCORE™ TECHNOLOGY** is a proprietary generator design that replaces a single large retort with several smaller centrifugally-cast retorts to significantly increase the surface area, improve the heating efficiency of the reaction chamber, and reduce the heating energy required for the production of endothermic gas. In addition, the smaller retort design significantly reduces the cost of replacement when necessary.

Dissociated Ammonia Generator  
Available capacity ranges from  
0-300 cfh (0-8.5 m<sup>3</sup>/h)

## FEATURES &amp; BENEFITS:

- Lower operating costs and emissions waste from 20-80% of generator capacity.
- Automatic endothermic gas pressure control eliminates regulator adjustments.
- Multi-retort design reduces cost, allowing for quick replacement of components.
- Separate methane sensors provide data for scheduling retort burnout.
- Filter change indicator improves system efficiency and operation time.
- Built-in software for ease of scheduling, maintenance, and paperless data logging.



ExoFlex™

The ExoFlex™ line of exothermic gas generators is designed to generate lean or rich exothermic gas. The generator includes automatic output turndown to 20% of the generator capacity with little loss of efficiency using the patented, maintenance-free ExoInjector™ gas mixing system. Thanks to a patented fuel injection technology that utilizes electronic flow measurement and precise ratio control, ExoFlex™ consistently provides the ideal mixture for high quality gas production. Another innovative design feature is the trim control input with programmable control range for precise generator control, which also eliminates the need for extra meters or valves. The ExoInjector™ easily replaces existing carburetor/pump designs for a significant reduction in process costs.



# ask

## about our Field Services & System Upgrades

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UPC Pro App

## TRY IT OUT

