

# ER5000 Series

## Electropneumatic Controllers/Motors

DER502060X012

### Description

The ER5000 Series (the latest generation of TESCO M electronic controllers) is a microprocessor based PID (Proportional, Integral, Derivative) controller that brings precise algorithmic pressure control to a wide range of applications.

It can be used as a standalone unit to control the pressure of clean, dry inert gases from 0–100 psig / 0–6.9 bar, or be connected to any pneumatically actuated regulator or valve. Used with TESCO M regulators, the ER5000 provides pressure control of gases and liquids from vacuum to 30,000 psig / 2068 bar, with a  $C_v$  of up to 12+. Whether piloting a mechanical regulator or used standalone, it provides for true closed loop control with exceptional accuracy and response time.

### Applications

- Test equipment
- Calibration stands
- Proof & burst testing
- Production equipment
- Metal or plastic forming/molding



### Features and Benefits

#### ER5000SI-1 – Standard ER5000

- Precise accuracy
- 16 Bit for Data Acquisition
- Compatible with TESCO M's extensive dome loaded and air actuated pressure regulators available from vacuum to 30,000 psig / 2068 bar, with flow capacities from  $C_v$  .02 to  $C_v$  12.0
- Control algorithms for Internal Feedback, External Feedback or Cascade Control modes
- Selectable **SETPOINT Signal** Source
  - USB
  - RS485
  - External analog (4-20mA or 1-5VDC)
  - Downloadable Profile (runs independent of PC or external analog source)
- Selectable **FEEDBACK Signal** Source
  - Internal Sensor (0-100 psig / 0-6.9 bar)
  - External Analog: 4-20mA or 1-5VDC
- Selectable Control Limits
  - Programmable limits for analog setpoint, feedback and error signals
  - Selectable control states: "Hold Last Pressure", "Vent", or "Full Open"
- TESCO M ERTune™ software provided for data acquisition, PID tuning (real time graphic display of setpoint and feedback), creating and downloading profiles
- TESCO M DLL provided for easy custom software development
- Software examples are provided for VB.NET, LabVIEW, C and C#

- USB cable included for quick computer connection
- NEMA 4X IP66 enclosure (water tight, corrosion resistant)
- 1/2" SAE x 1/8" NPTF fitting included (mates to most TESCO M air actuated regulators)
- Automated solenoid valve leak test
- Trigger data acquisition based on system events

#### ER5000SV-1 – Standard ER5000

- All features of the ER5000SI-1 except with 0-10VDC Setpoint and Feedback signals

#### ER5000FI-1 and ER5000FV-1 –Enhanced ER5000

- All features of the ER5000SI-1 and ER5000SV-1 are included plus two additional analog/digital inputs and two digital outputs that allow the user to:
  - Monitor an external signal in addition to feedback (e.g. flow, temp, force)
  - Alternate between two separate external feedback sources
  - Start/Stop or Resume/Pause pressure profiles
  - Wait for event to occur before proceeding to the next step in a downloaded profile (digital input)
  - Indicate that an event occurred in a downloaded profile (digital output)
- Analog output of the internal pressure sensor
- Conditional control with "IF/THEN" and "GoTo" profile commands
- Suspend control feature to lock output pressure for an extended period of time

Contact your TESCO M representative for available Explosion Proof options.

## ER5000 Series Electropneumatic Controller

### Specifications

For other materials or modifications, please consult TESCOM.

#### ELECTRICAL

##### Power Requirement

22 to 28.5 VDC, 340 mA maximum, 180 mA nominal

##### Turn-on Time

< 240 milliseconds

##### Restart from Power Interruption

< 1.9 seconds

#### SUPPLY REQUIREMENT

##### Media Type

Clean, dry inert gas or instrument grade air

##### Pressure

**Minimum:** Outlet pressure +1 psig / 0.07 bar

**Maximum:** 120 psig / 8.2 bar

**Nominal:** 110 psig / 7.5 bar

##### Temperature

-22°F to 167°F / -30°C to 75°C

#### INPUT SIGNALS

##### Setpoint

USB, RS485, 4-20 mA, 1-5 VDC (0-10 VDC for ER5XX0XV-1), downloaded Profile

##### Feedback (external)

4-20 mA or 1-5 VDC (0-10 VDC for ER5XX0XV-1)

#### PERFORMANCE

##### Accuracy

**Linearity:** ± 0.05% Full Scale Output (FSO)

**Hysteresis:** ± 0.05% (FSO)

**Repeatability:** ± 0.05% (FSO)

**Resolution Sensitivity:** ± 0.03% (FSO)

**Measured Reference Accuracy (total accuracy all effects including zero and span error):** ± 0.10 % (FSO)

**Low Pressure Capability with External Transducer**  
± 0.25 inches water (0.635 g/sq. cm) into 2 liter volume

##### Response Time

**Sensor Update Rate:** 25 milliseconds

**Lift Off:** < 70 milliseconds

**Rise Time (10-90 psig / 0.69-6.2 bar):** 350 milliseconds  
(1 cubic inch volume / 32.8 cc)

**Fall Time (90-10 psig / 6.2-0.69 bar):** 650 milliseconds  
(1 cubic inch volume / 32.8 cc)

##### Frequency Response

**Amplitude Attenuation:** -3db at 2 Hz

**Phase Shift:** -90 degrees at 2 Hz

**Flow Capacity:** C<sub>v</sub> = 0.01 (Maximum Flow = 18 SLPM)

**Solenoid Valve Rated Cycle Life:** > 150 million cycles

#### PHYSICAL

##### Size

**Gas Port (Inlet, Exhaust and Gauge):** 1/8 inch - 27 NPTF

**Controlled Outlet Port:** 1/2 inch SAE

**Enclosure Volume:** 16.3 cubic inches / 267 cc

**Flow Stream Volume:** 0.73 cubic inches / 11.96 cc

**Height:** 3.9 inches / 99 mm

**Length:** 3.72 inches / 94.5 mm

**Width:** 3.72 inches / 94.5 mm

**Conduit Openings:** Two, 1/2 inch NPTF

##### Weight

3.1 lbs / 49 oz / 1.4 kg

##### Housing

**Standard:** NEMA 4X IP66 (aluminum and epoxy polyester paint)

##### Flow Stream Materials

**Solenoids:** Nickel-plated Brass, FKM Seat and O-rings

**Sensor:** Glass, Ceramic, Silicon, RTV, Nickel

**Tubing:** Polyurethane

**Plug:** Brass

**O-Rings:** Silicone, Buna-N, FKM

##### Outlet Fitting

Stainless Steel

##### Mounting

Four #10-32 UNF / M5x0.8 mounting holes

##### Mounting Orientation Effect

None

#### ENVIRONMENT

##### Temperature Range

-22°F to 167°F / -30°C to 75°C

##### Relative Humidity

To 100% R.H. (non-condensing @ 32°F to 167°F / 0°C to 75°C)

##### Vibration

**Resonance:** 10-2000 Hz at 3.0 g constant acceleration

Tested per IEC 61298-3 (3.0 g standard)

##### Storage Temperature

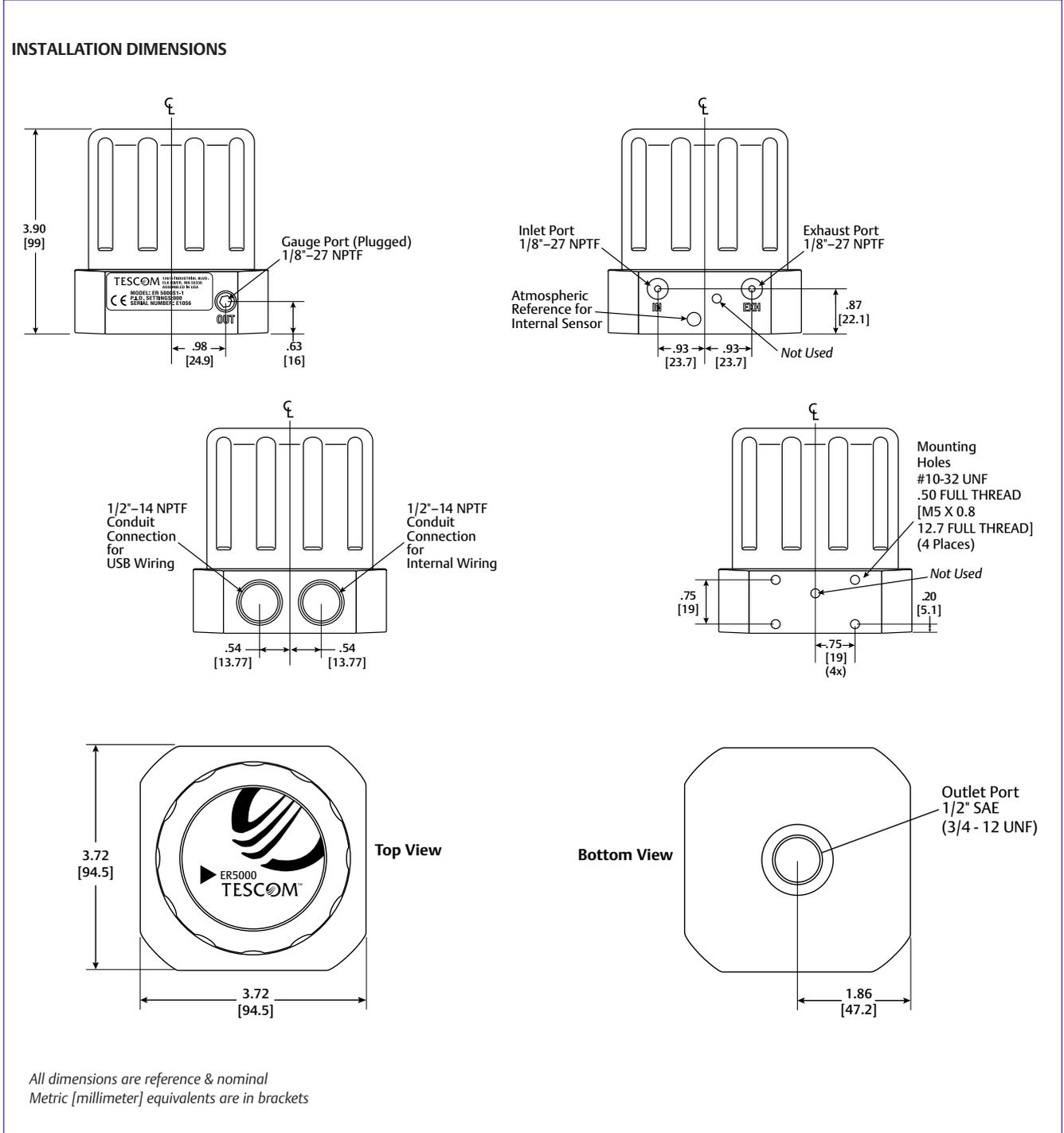
-58°F to 200°F / -50°C to 93°C

#### CERTIFICATIONS

##### CE Approval

All ER5000 Series units have CE approval when wired per CE approved wiring instructions in the *ER5000 User Manual*

# ER5000 Series Electropneumatic Controller Installation Drawing

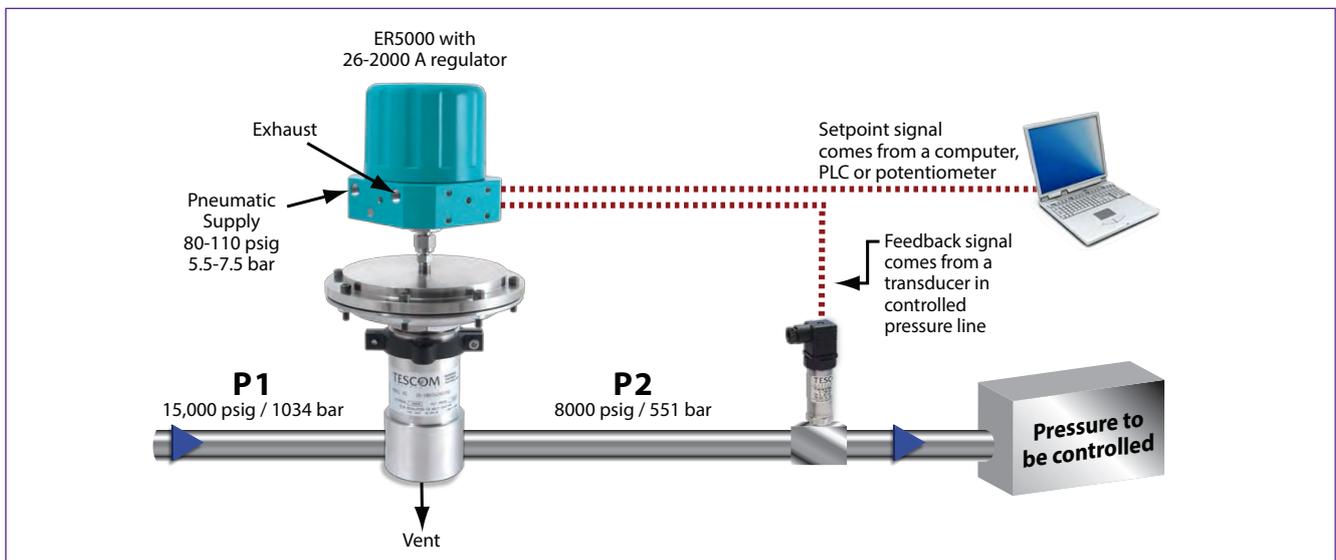


## ER5000 Typical Applications

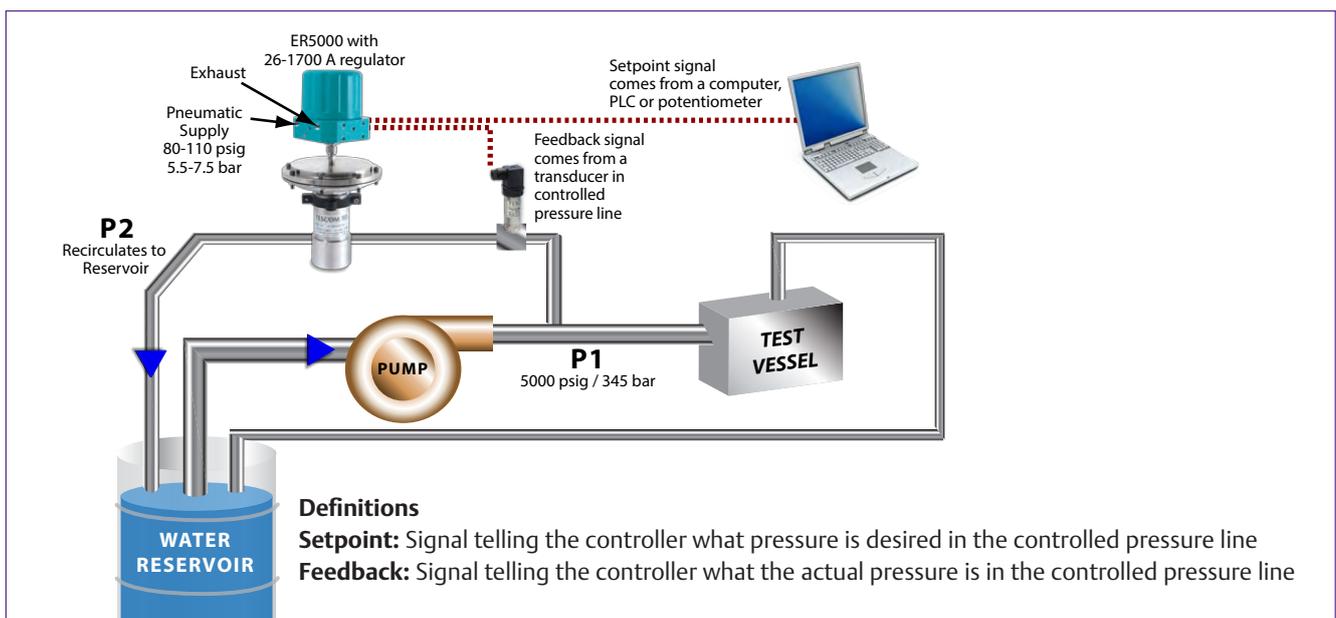
The variety of applications is limitless. Any process variable that can be manipulated using the pneumatic output of the ER5000 can be controlled. Some possibilities include controlling pressure, flow, temperature, position, speed, force, consistency, torque, and acceleration. The ER5000 improves both speed and accuracy because it implements the control strategy directly at the control element (valve or regulator). Some possible applications include:

- Test stands
- Calibration
- Laser cutting systems
- Vacuum forming
- Super plastic metal forming
- Plastic extrusion
- Gas assisted plastic injection molding
- Lamination and composite material curing
- Tire molding
- Chromatography capillary inlet pressure
- Spray coating
- Water jet cutting
- Burst testing
- High pressure gas or liquid injection
- Replacement for valve positioners and I/Ps
- Spot welding pressure control

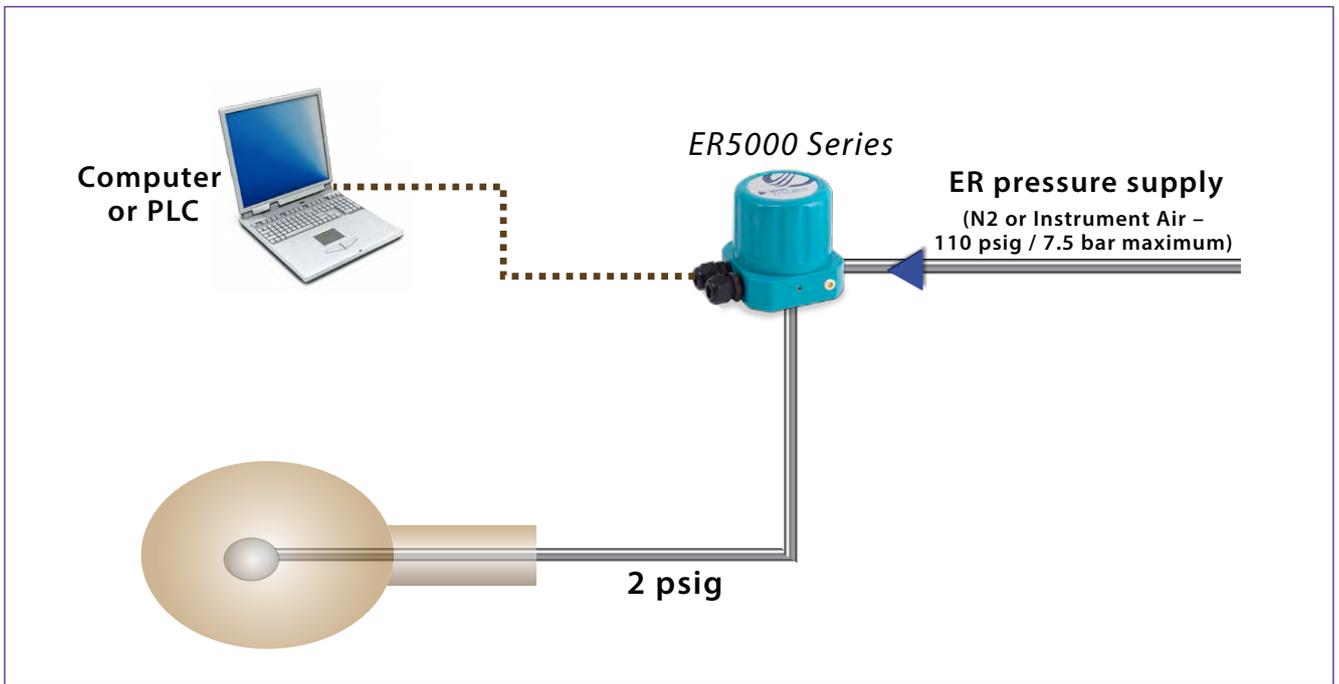
## ER5000 Typical Pressure Reducing Application



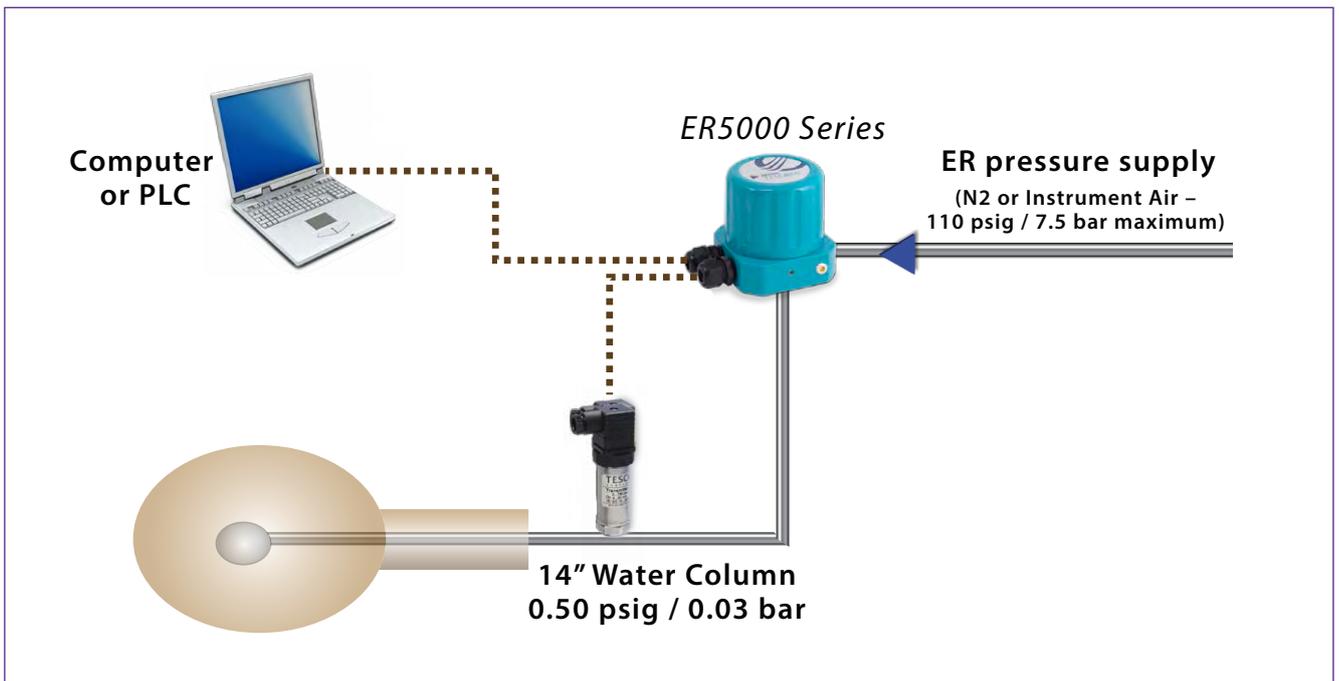
## ER5000 Typical Back Pressure Application



**ER5000 Standalone Application - Internal Feedback Mode**



**ER5000 Standalone Application - External Feedback Mode**



## ER5000 Basics

### ER5000 System Requirements

All ER5000 controllers require:

- Power: 24 VDC, 340 mA maximum, 180 mA nominal
- Pressure: Up to 120 psig / 8.2 bar maximum clean, dry inert gas
- Setpoint signal: From PC, PLC, Analog
- Feedback signal: Internal or External

The ER5000 senses system pressure using either its internal sensor or a user supplied external transducer (4–20 mA, 1–5V or 0–10V) placed within the actual process line. You can operate the ER5000 in one of three control modes:

- Internal Feedback, which uses only the internal sensor;
- External Feedback, which uses only the external source;
- Cascade, which uses both internal and external sources in a “loop within a loop” configuration

### ER5000 Communication

The ER5000 communicates using a USB or RS485 interface. The onboard USB port and included USB cable provide for quick and easy direct communication to a PC. The required USB driver is provided on the ER5000 User Support Software and Manual CD or online. An RS485 communications link can be established between the ER5000 and a PC using either a USB to RS485 or RS232 to RS485 converter. RS485 communication must be used for daisy-chaining two or more (up to 32) ER5000s on the same network.

### ERTune™ Software Features

TESCOM's ERTune™ program is an all encompassing software package which allows the user to address the ER5000 controller using a PC. ERTune™ allows users to tune the PID loop, monitor system operation, create and download profiles, specify control limits, enable password protection, acquire data and review previously recorded data. The basic screens are Tuning, Profile, Data, Configure and Diagnostic Tools.

### ER5000 Software Development Support

The ER5000 protocol document is provided to assist in developing process control software that communicates with the ER5000 on any platform. Sample programs in VB.NET, LabVIEW, C and C# are available on the included CD along with the source code for the ER5000 DLL for Windows.

The TESCOM implementation of the protocol uses six functions to communicate: StartUp, ReadNetVar, WriteNetVar, ReadProfileSegment, WriteProfileSegment and Shutdown.

### ER5000 Tuning

The ER5000 is factory set to default PID parameters that work well for many TESCOM regulators in laboratory conditions. During initial startup, the user has the option to download the PID parameters for a specific TESCOM regulator series. The user can also adjust the Proportional, Integral and Derivative (PID) variables to:

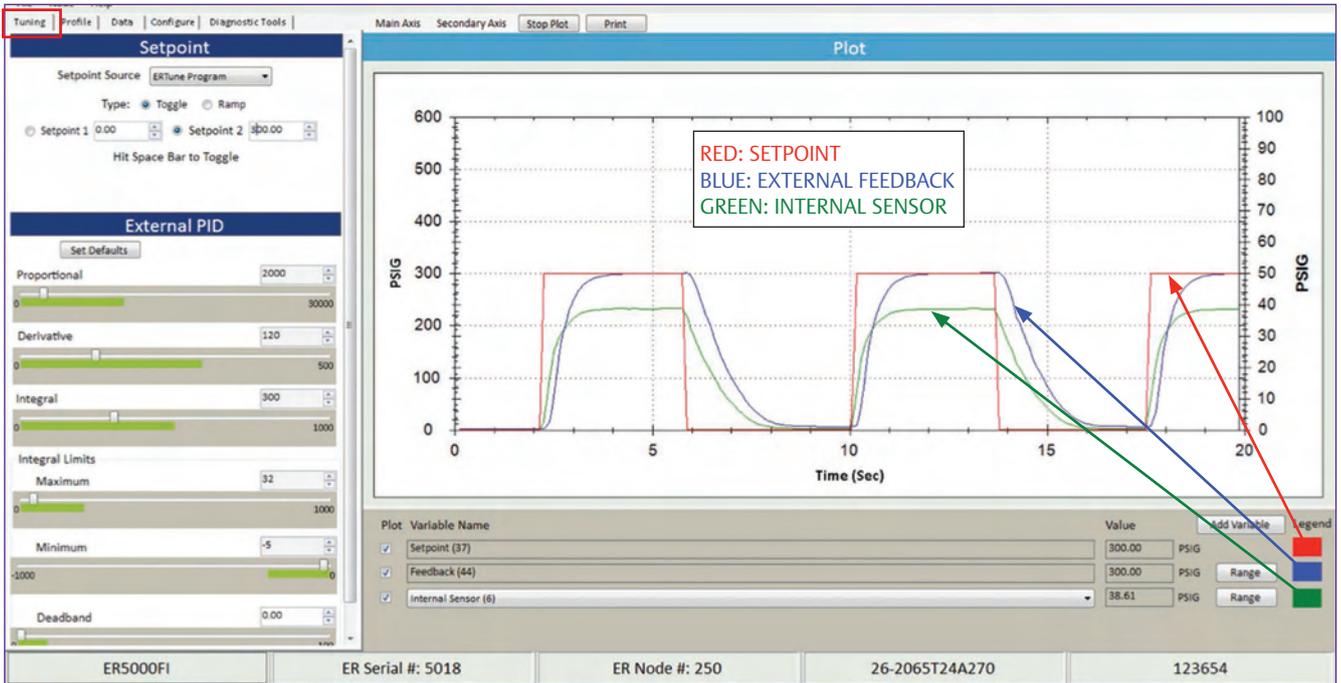
- Achieve the quickest response to a setpoint change without overshoot or oscillation
- Achieve the best performance for a non-changing setpoint
- Optimize performance in the specific application conditions

*Windows and Visual Basic are registered trademarks of Microsoft Corporation in the United States and other countries.*

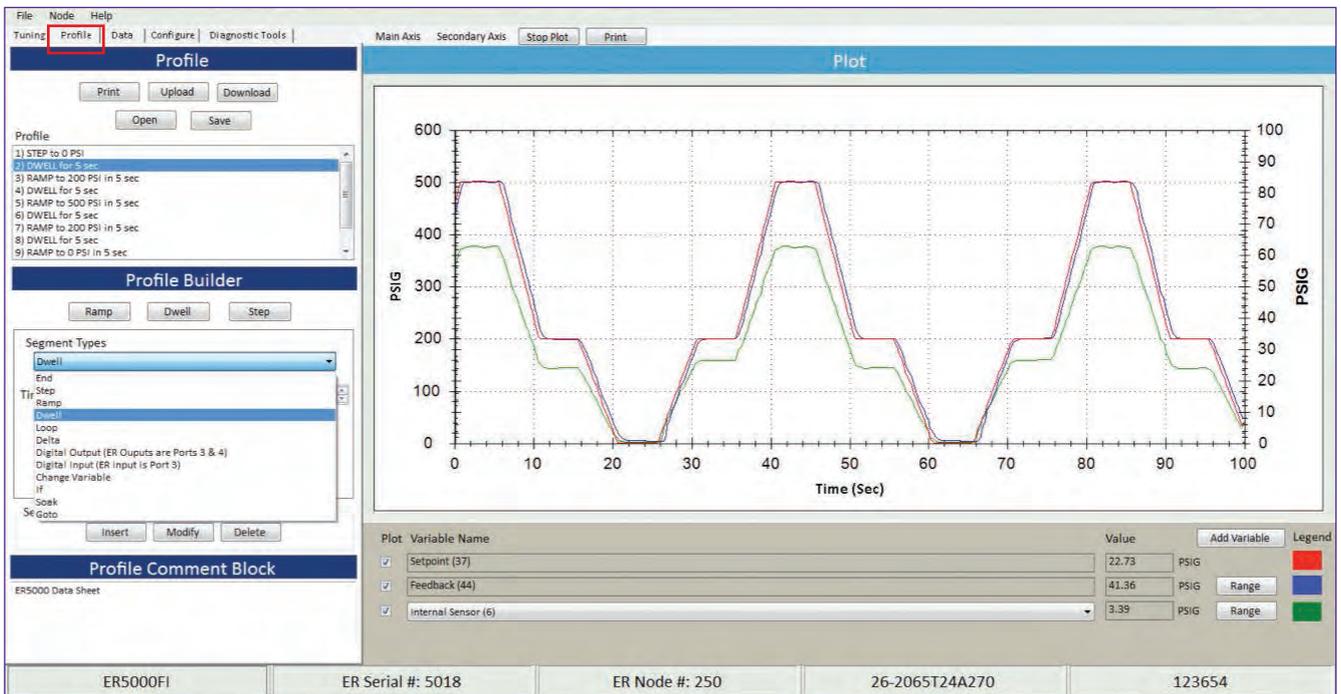
*LabVIEW™ and LabWindows/CVI™ are trademarks of National Instruments.*

# ERTune™ Software Screens

## Tuning Screen



## Profile Screen



# ERTune™ Software Screens

## Data Acquisition Screen

**Acquisition**  
 Sample Rate: 0.1 Seconds/Sample  
 Collection Time: 60 sec

**Output**  
 Output File: datafile  
 Delimiter: Space  
 DAQ Comment Block: ERS5000 Data Sheet

**Triggers**  
 Trigger Events:  
 Internal Pressure  
 Pressure (FB)  
 Error (SP-FB)  
 Digital Input

**Plot**  
 Variable Name | Value | Legend  
 Setpoint (37) | 479.55 PSIG | Range  
 Feedback (44) | 442.27 PSIG | Range  
 Internal Sensor (6) | 58.15 PSIG | Range

ERS5000FI | ER Serial #: 5018 | ER Node #: 250 | 26-2065T24A270 | 123654

## Configure Screen

**Mechanical Regulator**  
 Mechanical Regulator Series: 26-2000  
 Part Number: 26-1700  
 Serial Number: 26-2000

**Control Mode**: External Feedback

**ER Node**  
 Address: 250 | Serial #: 5018 | Version #: 133

**Calibration**  
 Zero %: 0.00 | Span %: 100.00

**Control Limits**  
 Condition: Inlet Closed / Exhaust Open

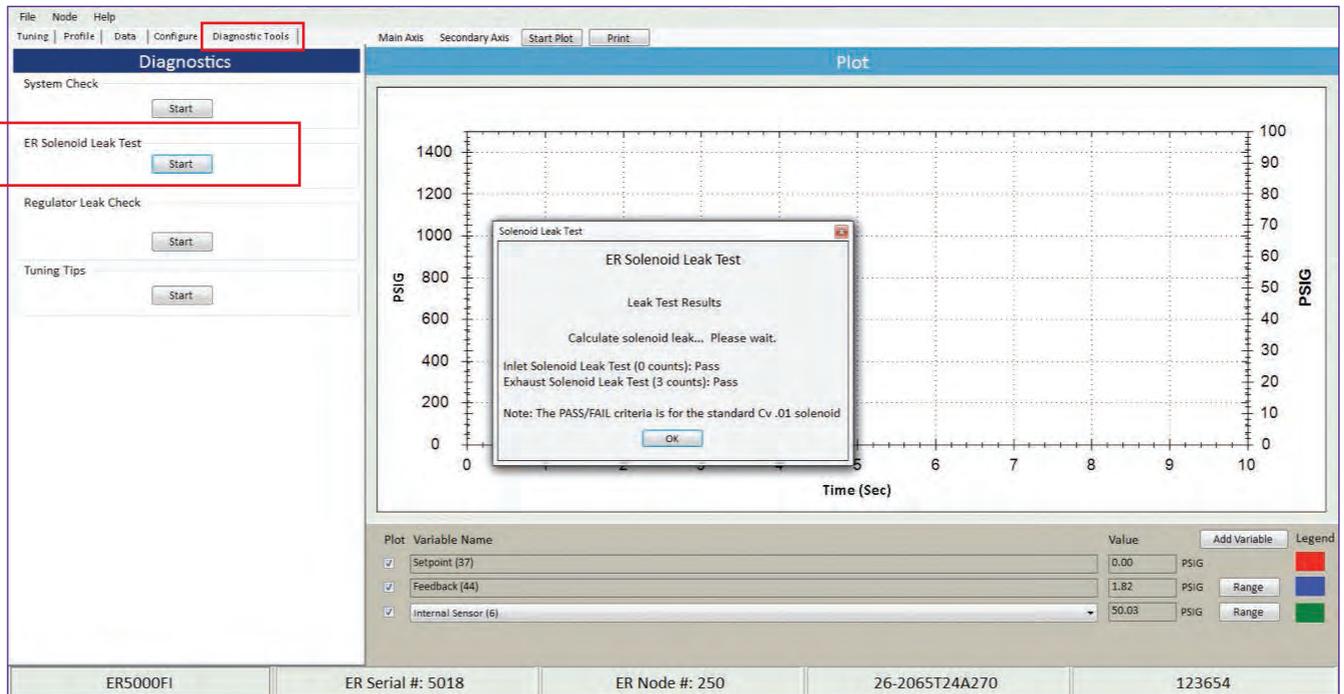
**Diaphragm Protection**  
 Disabled  
 Enabled

**Plot**  
 Variable Name | Value | Legend  
 Setpoint (37) | 0.00 PSIG | Range  
 Feedback (44) | 4.05 PSIG | Range  
 Internal Sensor (6) | 0.24 PSIG | Range

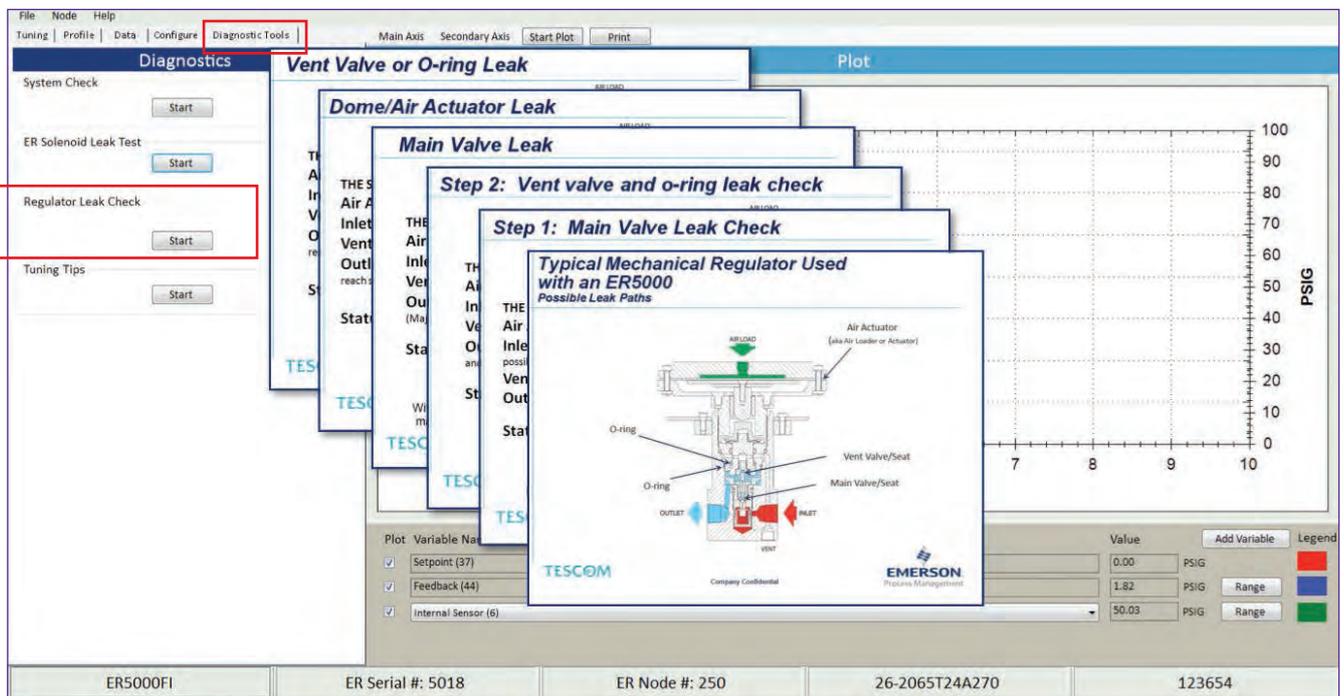
ERS5000FI | ER Serial #: 5018 | ER Node #: 250 | 26-2065T24A270 | 123654

# ERTune™ Software Screens

## Diagnostics Screen - Solenoid Valve Leak Test "Pass"



## Diagnostics Tools - Regulator Leak Check



## ER5000 Electropneumatic Controller Part Number Selector

*Repair Kits, Accessories & Modifications may be available for this product. Please contact TESCOM for more information.*

Example for selecting a part number:

| ER5          | 00  | 0   | S                         | I                                     | - | 1                                   |
|--------------|---|---|---------------------------|---------------------------------------|---|-------------------------------------|
| BASIC SERIES | BASE/ENCLOSURE STYLE  | INTERNAL SENSOR                             | FEATURES                  | SIGNAL TYPE                           |   | C <sub>v</sub> CONFIGURATION        |
| ER5          | 00 – Standard NEMA 4X<br>02 – Integrated Double piston<br>04 – OEM base<br>10 – Integrated 44-4000<br>11 – Integrated 44-5200 | 0 – 0-100 psig / 0-6.9 bar<br>0.1% accuracy | S – Basic<br>F – Enhanced | I – 4-20 mA / 1-5 VDC<br>V – 0-10 VDC |   | 1 – Standard, C <sub>v</sub> = 0.01 |

## ER5000 Accessories

| PART NUMBER | DESCRIPTION  |
|-------------|--|
| 85145       | Filter Kit   |
| 85061       | RS232 to RS485 Converter Kit (plugs into standard PC serial port). Includes: 2.75" x 4.8" x 1.2" converter and 6 foot, 9 pin cable |
| 82948       | USB to RS485 converter   |
| 82919       | Potentiometer with digital display   |
| 82575-25    | Power Supply for ER5000 (Output: 24 VDC at 250 mA / Input: 120 VAC, 60 HZ)   |
| ERAA03409   | USB Cable (one included)   |
| ERAA05146   | MTA Connector Replacement Kit  |

## Regulator Selection for use with the ER5000\*

| SPECIFICATION REQUIRED | EXPLANATION   |
|------------------------|---|
| <b>Pressure</b>        | Selected regulator must be capable of handling the system pressures. For best resolution, the control pressure range of the regulator should be nearest (yet above) the maximum application control pressure requirement. |
| <b>Flow Rate</b>       | Regulator must be capable of handling the required flow rate of the application.  |
| <b>Media</b>           | Regulator materials of construction must be compatible with the process media used for the application.   |

\*Contact your TESCOM Representative for assistance in selecting a suitable pressure regulator

## Compatible TESCOM Pressure Regulators

| REGULATOR SERIES                        | MAXIMUM INLET PRESSURE         | OUTLET PRESSURE RANGES       | FLOW CAPACITY<br>C <sub>v</sub> |
|---|--------------------------------|------------------------------|---------------------------------|
| <b>Pressure Reducing Regulators</b>     |                                |                              |                                 |
| <b>C<sub>v</sub> = .06 - .30</b>        |                                |                              |                                 |
| 26-2000A                                | Up to 20,000 psig / 1379 bar   | Up to 20,000 psig / 1379 bar | 0.02, 0.06, 0.12, 0.30          |
| 44-1500A                                | 6000 psig / 414 bar            | 600 psig / 41.4 bar          | 0.30                            |
| 44-1500D (Dome Load)                    | 6000 psig / 414 bar            | 90 psig / 6.2 bar *          | 0.30                            |
| 44-5200 (VA027)                         | 3500 psig / 241 bar            | 500 psig / 34.5 bar          | 0.06, 0.15                      |
| 50-2000A                                | Up to 30,000 psig / 2068 bar   | Up to 22,500 psig / 1551 bar | 0.06, 0.12, 0.30                |
| 54-2000A                                | Up to 20,000 psig / 1379 bar   | Up to 20,000 psig / 1379 bar | 0.06                            |
| <b>C<sub>v</sub> = greater than .30</b> |                                |                              |                                 |
| 269-529                                 | 300 psig / 21.0 bar            | 90, 300 psig / 6.2, 21.0 bar | 1.5 to 10.0                     |
| 44-1300A                                | 6000 psig / 414 bar            | Up to 2500 psig / 172.4 bar  | 0.8, 2.0                        |
| 44-4000A                                | 6000 psig / 414 bar            | Up to 6000 psig / 414 bar    | 0.70, 2.0                       |
| 54-2200A                                | Up to 10,000 psig / 689 bar    | Up to 10,000 psig / 689 bar  | 2.0                             |
| 54-2800A                                | 5000 psig / 345 bar            | Up to 5000 psig / 345 bar    | 8.0                             |
| DG (Air Load)                           | 600 psig / 41.4 bar            | 500 psig / 34.5 bar          | 10.0                            |
| DG (Dome Load)                          | 300 psig / 21.0 bar            | 90 psig / 6.2 bar *          | 10.0                            |
| DH (Air Load)                           | 500, 600 psig / 34.5, 41.4 bar | Up to 500 psig / 34.5 bar    | 5.0                             |
| DH (Dome Load)                          | 500 psig / 34.5 bar            | 90 psig / 6.2 bar *          | 5.0                             |
| DK (Air Load)                           | 1000 psig / 69.0 bar           | 600 psig / 41.4 bar          | 0.35                            |
| DK (Dome Load)                          | 1000 psig / 69.0 bar           | 90 psig / 6.2 bar *          | 0.35                            |
| PH16 (Dome Load)                        | 300 psig / 21.0 bar            | 90 psig / 6.2 bar *          | 5.0                             |
| PH18 (Dome Load)                        | 300 psig / 21.0 bar            | 90 psig / 6.2 bar *          | 10.0                            |
| <b>Backpressure Regulators</b>          |                                |                              |                                 |
| 26-1700A                                | Up to 20,000 psig / 1379 bar   | N/A                          | 0.02, 0.10, 0.14, 0.60          |
| 26-2300 (Dome Load)                     | 90 psig / 6.2 bar              | N/A                          | 0.06, 0.12, 0.60, 1.0           |
| 26-2300 (Air Load)                      | 500 psig / 34.5 bar            | N/A                          | 0.06, 0.12, 0.60, 1.0           |
| 54-2100A                                | Up to 30,000 psig / 2068 bar   | N/A                          | 0.08, 0.60                      |
| 54-2700A                                | 500 psig / 34.5 bar            | N/A                          | 5.0                             |
| 54-2900A                                | 10,000 psig / 689 bar          | N/A                          | 4.3                             |

\*Assuming 110 psig / 7.5 bar available to the ER5000



**WARNING!** Do not attempt to select, install, use or maintain this product until you have read and fully understood the *TESCOM Safety, Installation and Operation Precautions*.

DER502060X012 © 2013 Emerson Process Management Regulator Technologies, Inc. All rights reserved. 06/2013.  
Tescom, Emerson Process Management, and the Emerson Process Management design are marks of one of the Emerson Process Management group of companies. All other marks are the property of their respective owners.

