TESCOM™ Electropneumatic Controller/Motors

Description

The ER5000 Series (the latest generation of TESCOM 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 TESCOM 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. The ER5050 is designed for Hazardous Location use.

Applications

- Test equipment
- Calibration stands
- Proof & burst testing
- Production equipment
- Metal or plastic forming/molding
- Hydraulic Power Units
- Chemical Injection Units

Features and Benefits

ER5000SI-1 – Standard ER5000

- Precise accuracy
- 16 Bit for Data Acquisition
- Compatible with extensive dome loaded and air actuated TESCOM pressure regulators available from vacuum to 30,000 psig / 2068 bar, with flow capacities from C_V 0.02 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”
- TESCOM's ERTune™ software provided for data acquisition, PID tuning (real time graphic display of setpoint and feedback), creating and downloading profiles
- TESCOM 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 (Not included with ER5050)
- NEMA 4X IP66 enclosure (water tight, corrosion resistant)
- 1/2" SAE x 1/8" NPTF fitting included (mates to most TESCOM 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 0-10 VDC 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

ER5050 for Hazardous Locations

- Includes SI, SV, FI, FV options
- Approvals: CSA, IECEx, ATEX

TR000060ENUS-01_05-20

ER5000 SERIES

ER5000 Electropneumatic Controller

Specifications

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:
ER5000: 120 psig / 8.2 bar
ER5050: 110 psig / 7.5 bar
Nominal: 110 psig / 7.5 bar

Temperature
ER5000: -4°F to 167°F / -20°C to 75°C
ER5050: -4°F to 140°F / -20°C to 60°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_V = 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
ER5000: 3.1 lbs / 49 oz / 1.4 kg
ER5050: 2.6 lbs / 42.2 oz / 1.2 kg

Housing
Standard: NEMA 4X IP66 (aluminum and epoxy polyester paint)
Optional: Stainless steel

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
ER5000: -4°F to 167°F / -20°C to 75°C
ER5050: -4°F to 140°F / -20°C to 60°C

Relative Humidity
To 100% R.H. (non-condensing at
ER5000: 32°F to 167°F / 0°C to 75°C
ER5050: 32°F to 140°F / 0°C to 60°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

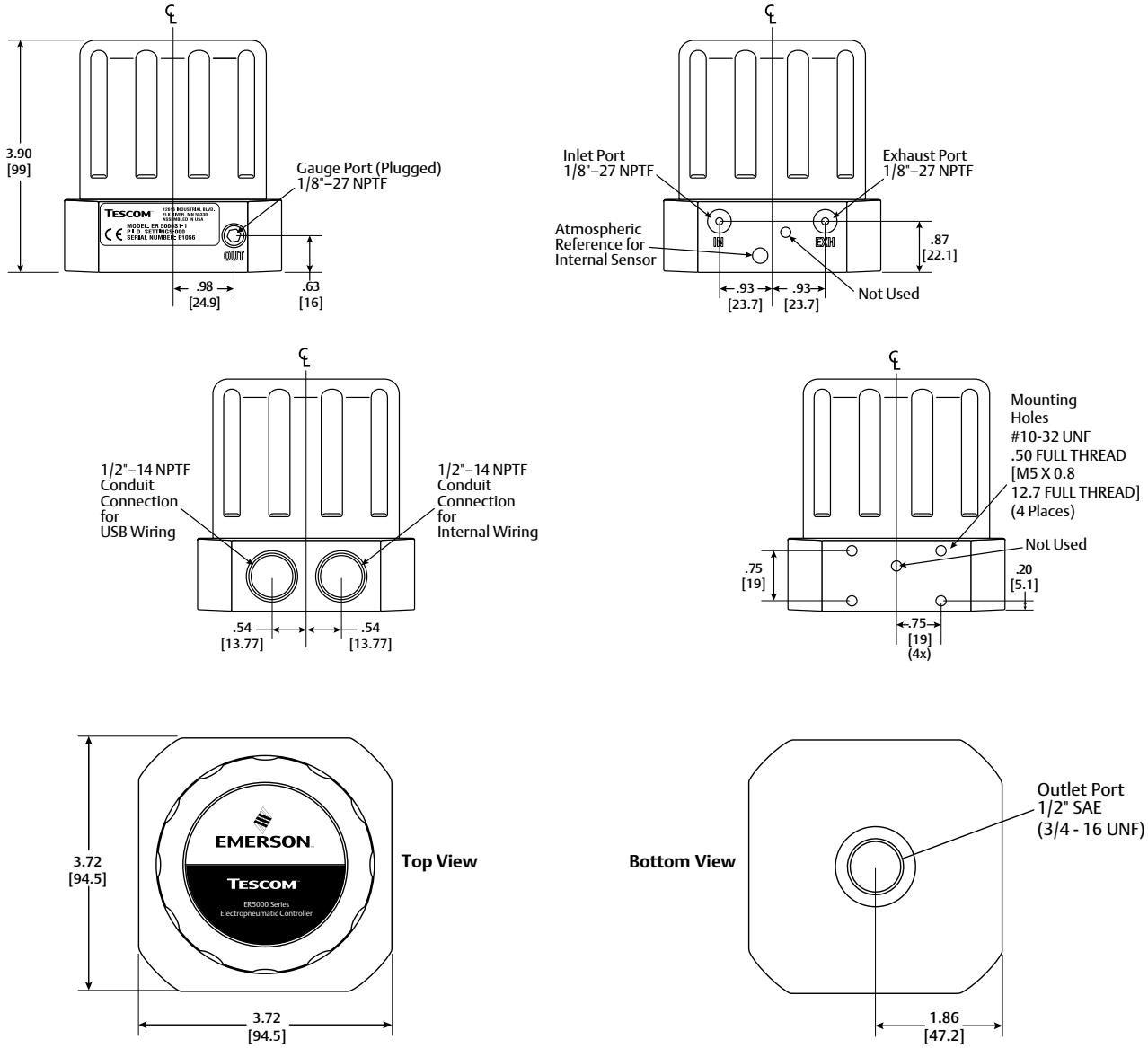
CERTIFICATIONS

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

Hazardous Location Approvals
CSA, IECEx, ATEX

ER5000 Electropneumatic Controller Installation Drawing

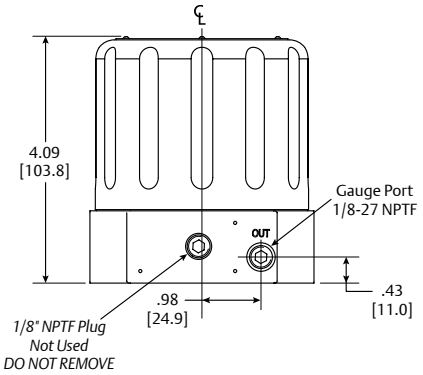
INSTALLATION DIMENSIONS

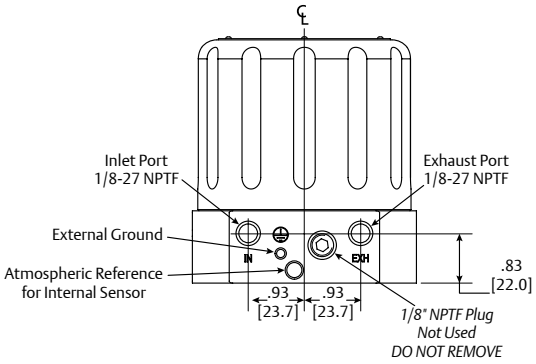


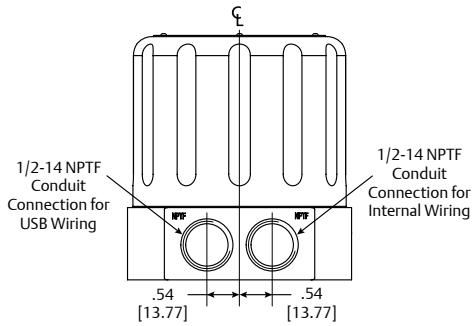
All dimensions are reference & nominal
Metric [millimeter] equivalents are in brackets

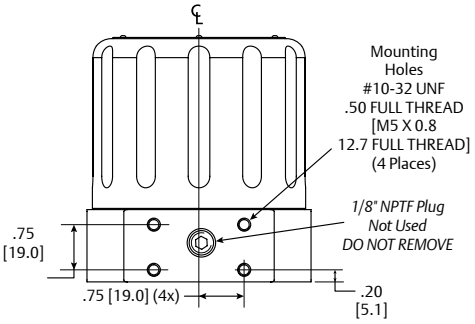
ER5000 SERIES

ER5050 Hazardous Location Model Dimensions



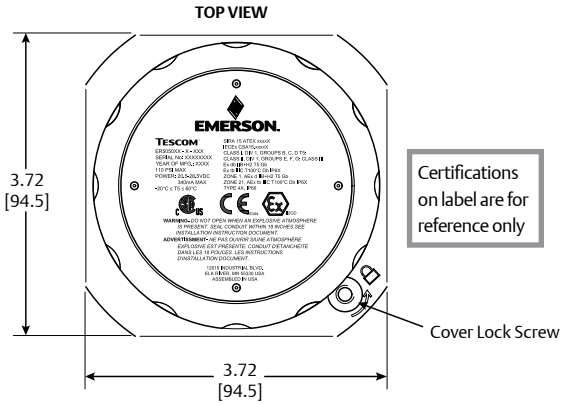


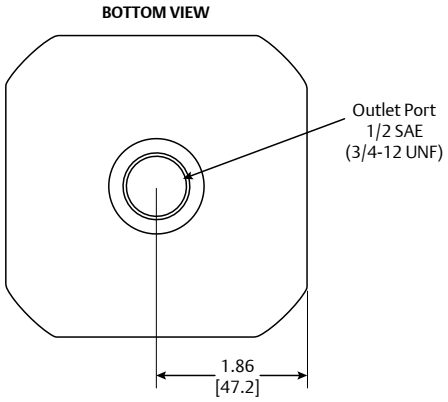




⚠ CAUTION

Removal of ANY of the 1/8" NPTF plugs called out on this page, other than the Gauge Port plug, will invalidate the Hazardous Location certification for the ER5050.





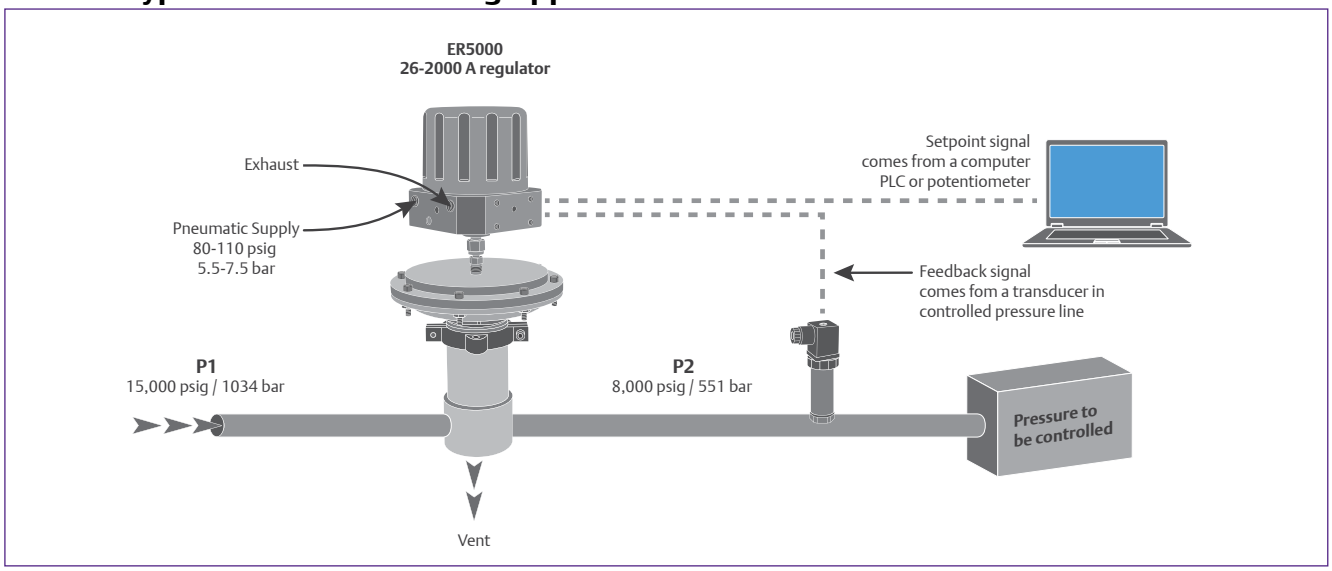
All dimensions are reference & nominal
Metric [millimeter] equivalents are in brackets

ER5000 Typical Applications

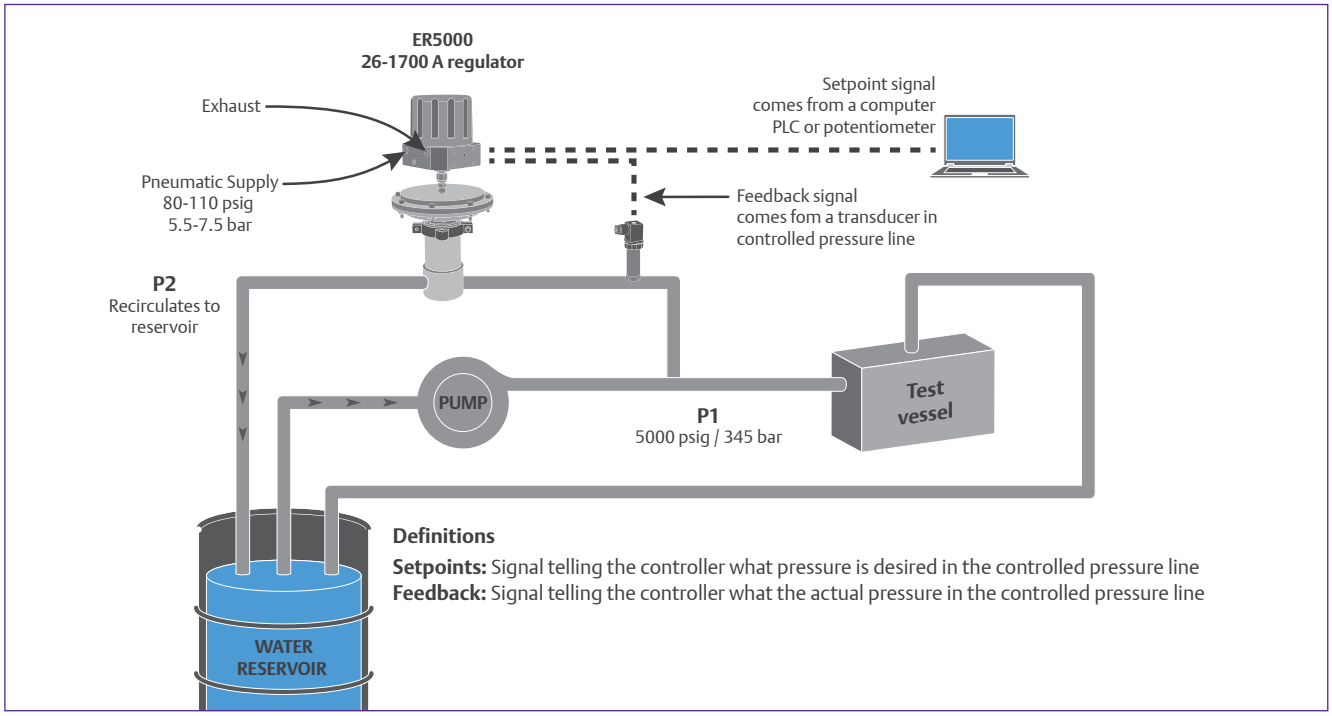
The variety of applications is limitless. Any process variable that can be manipulated using the pneumatic output of the ER5000 can be controlled. Some possibilities include controlling pressure, flow, temperature, position, speed, force, consistency, torque, and acceleration. The ER5000 improves both 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

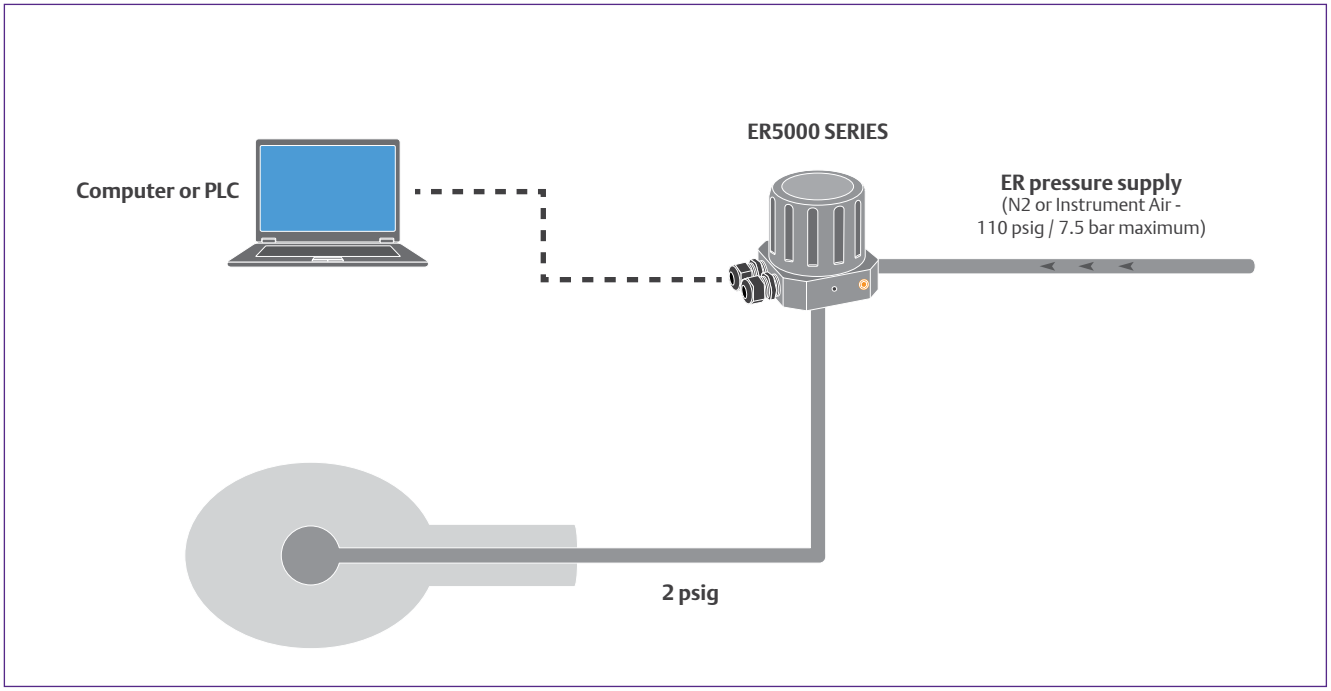


ER5000 Typical Back Pressure Application

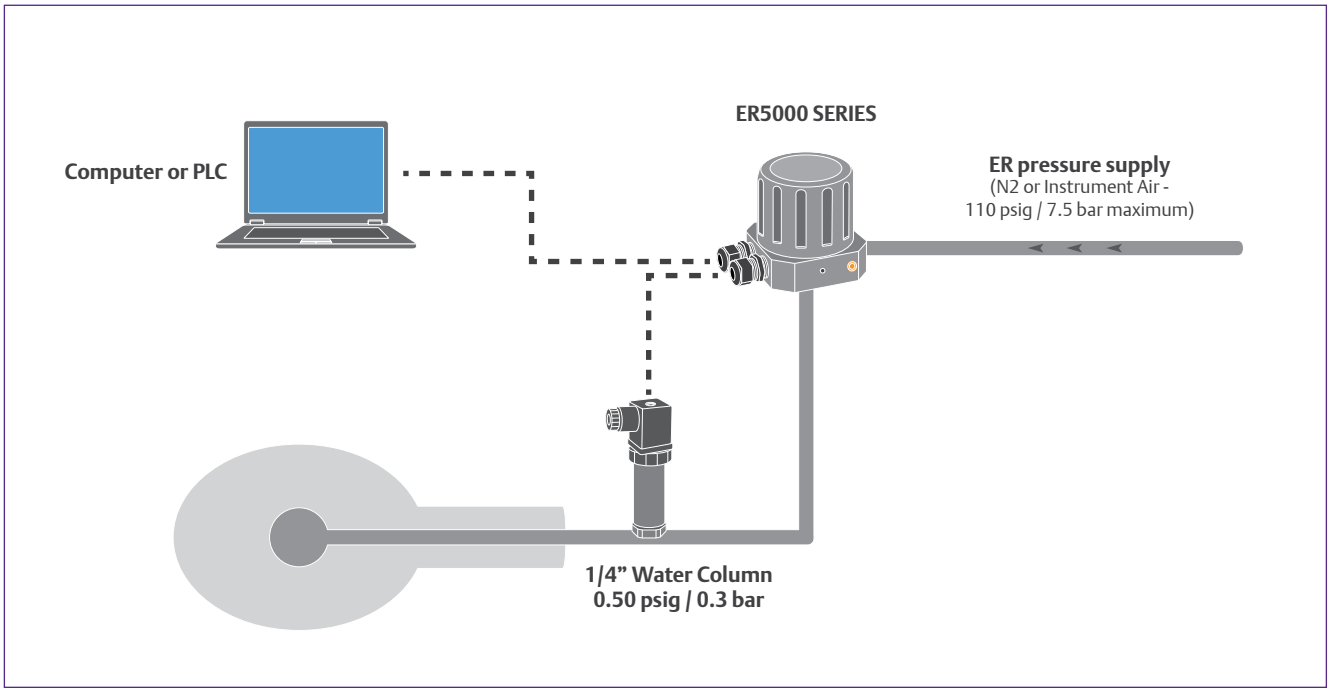


ER5000 SERIES

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: ER5000: Up to 120 psig / 8.2 bar maximum clean, dry inert gas
  ER5050: Up to 110 psig / 7.5 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 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. RS485 is recommended for ER5050 communication.

ERTune™ Software Features

The TESCOM 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 online manual along with the source code for the ER5000 DLL for Windows.

The 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

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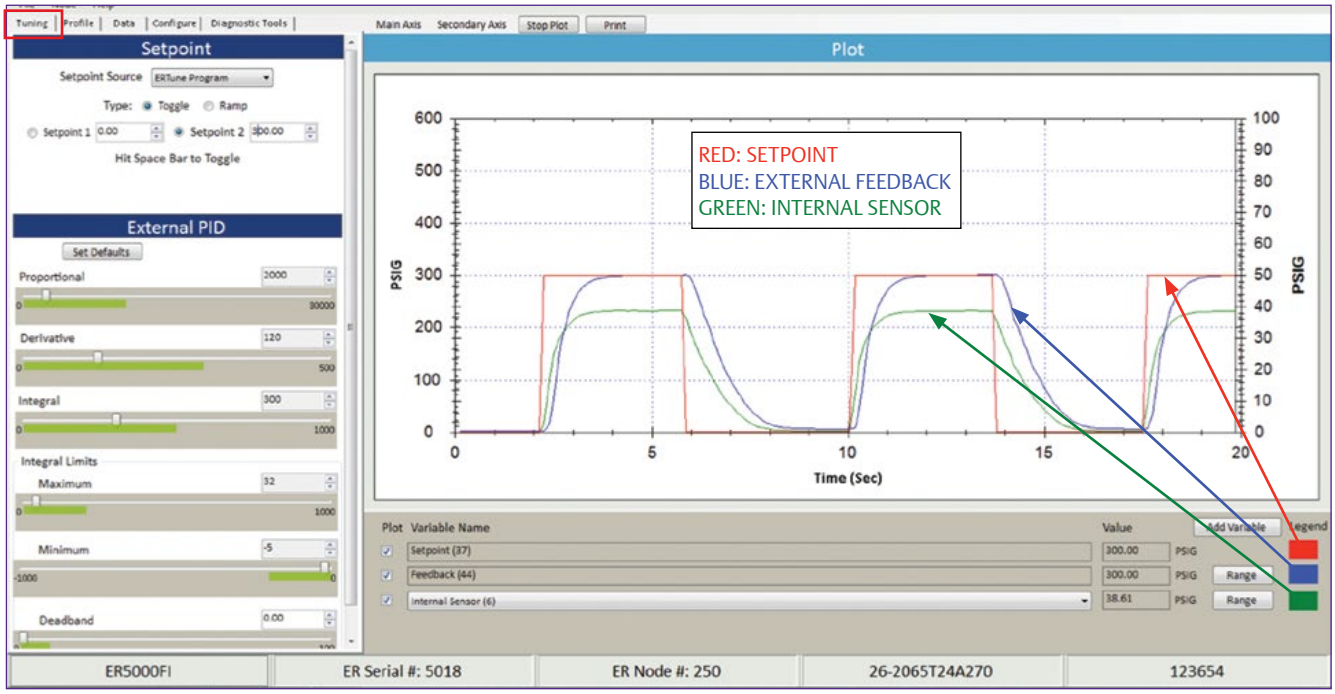
LabVIEW™ and LabWindows/CVI™ are trademarks of National Instruments.

ER5000 SERIES

ERTune™ Software Screens

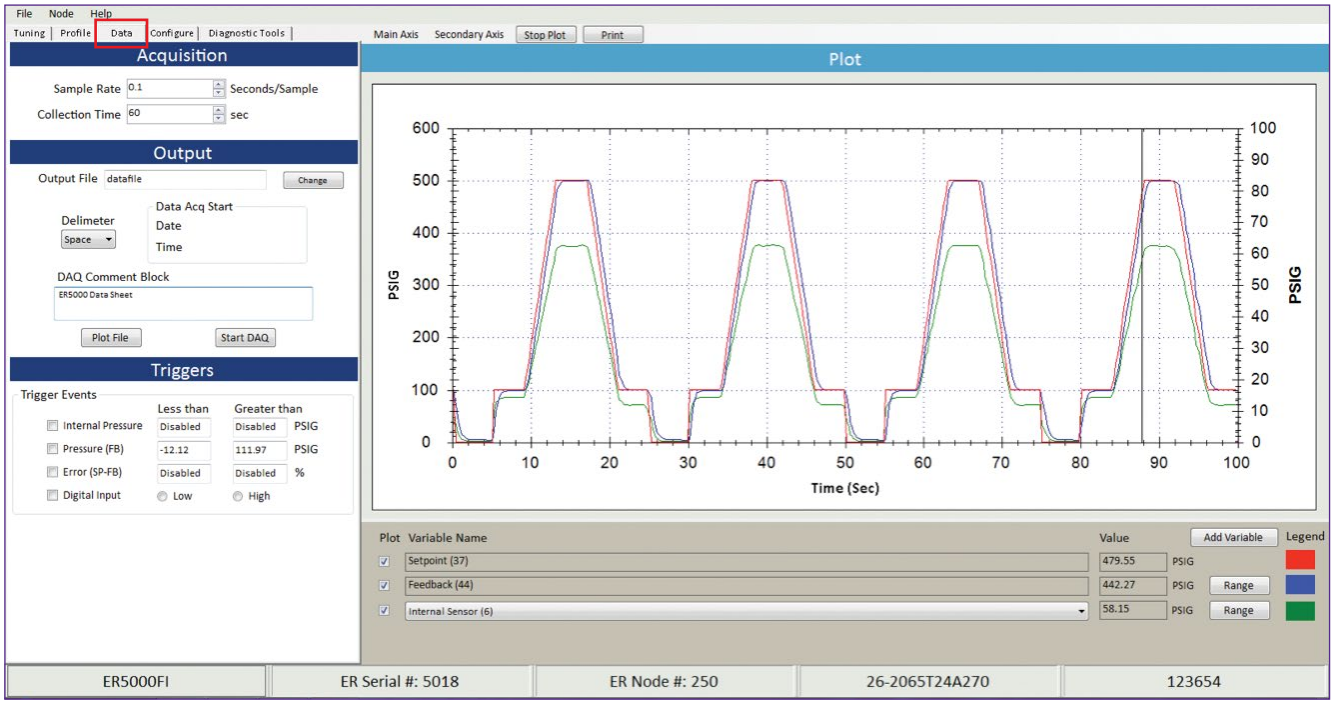
Tuning Screen



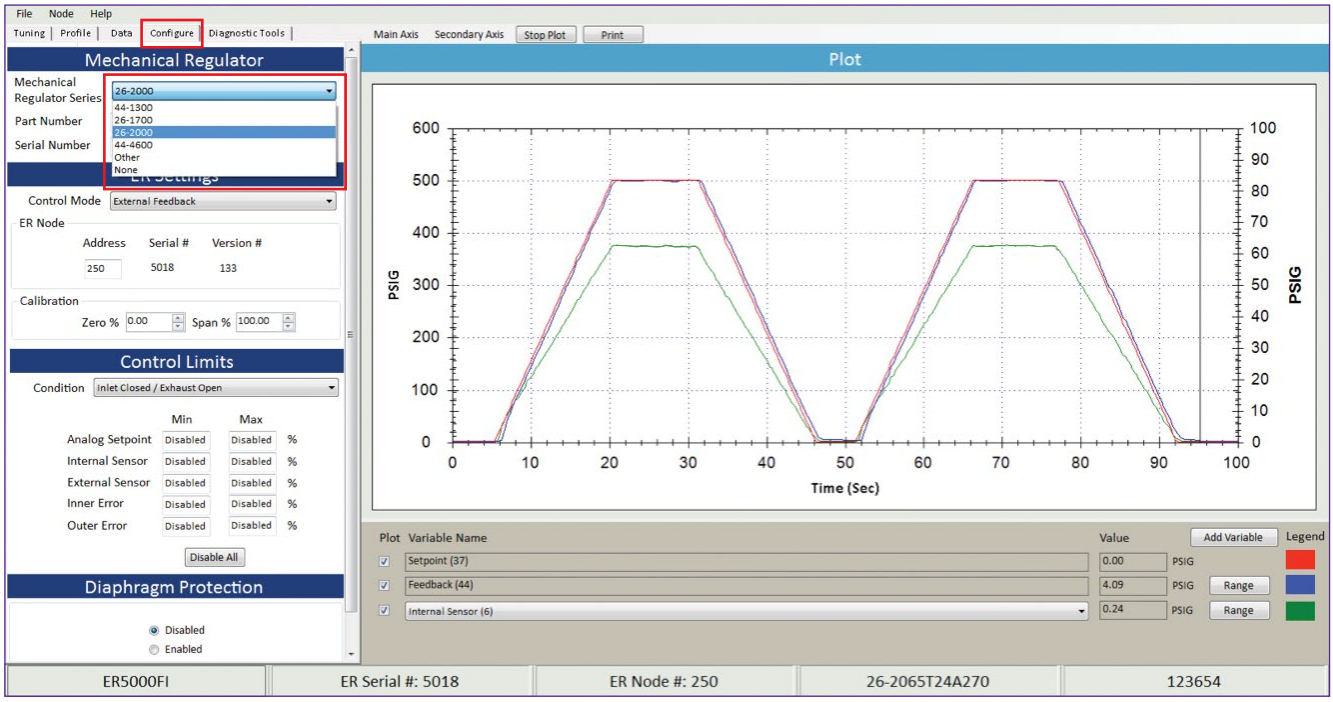
Profile Screen

ERTune™ Software Screens

Data Acquisition Screen



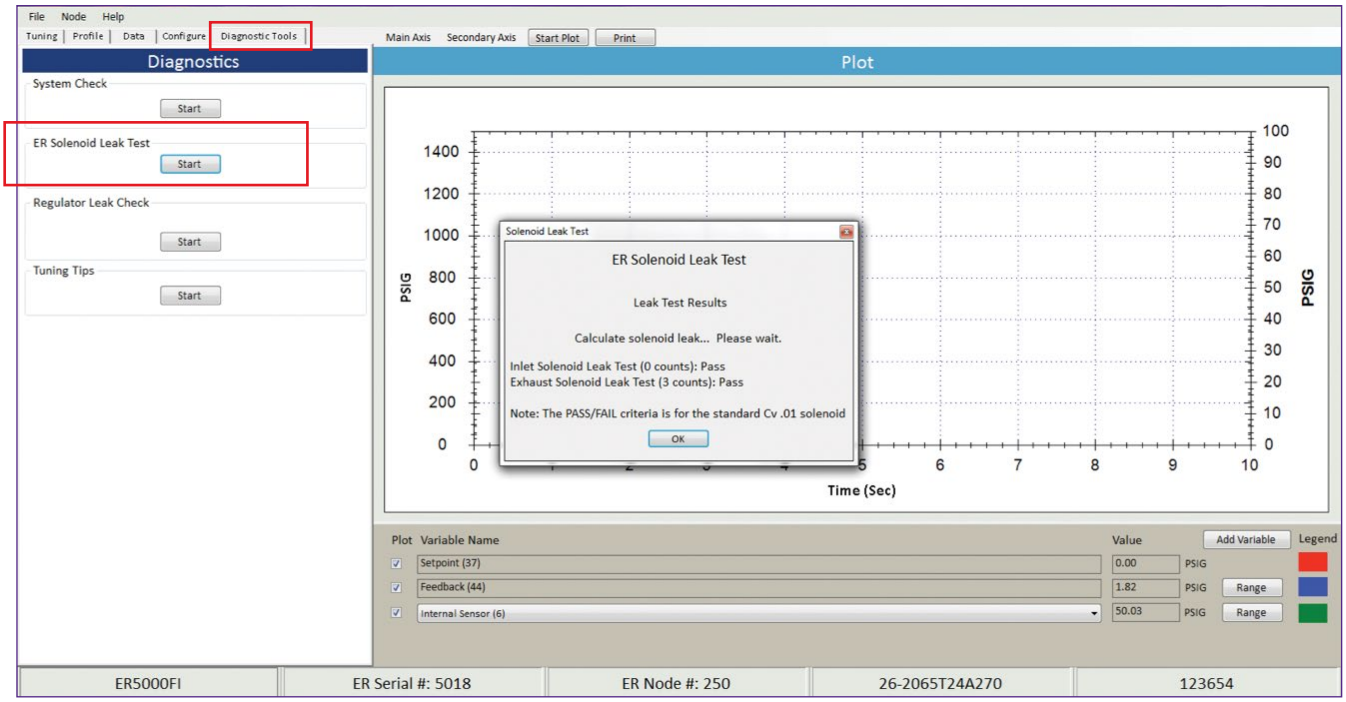
Configure Screen



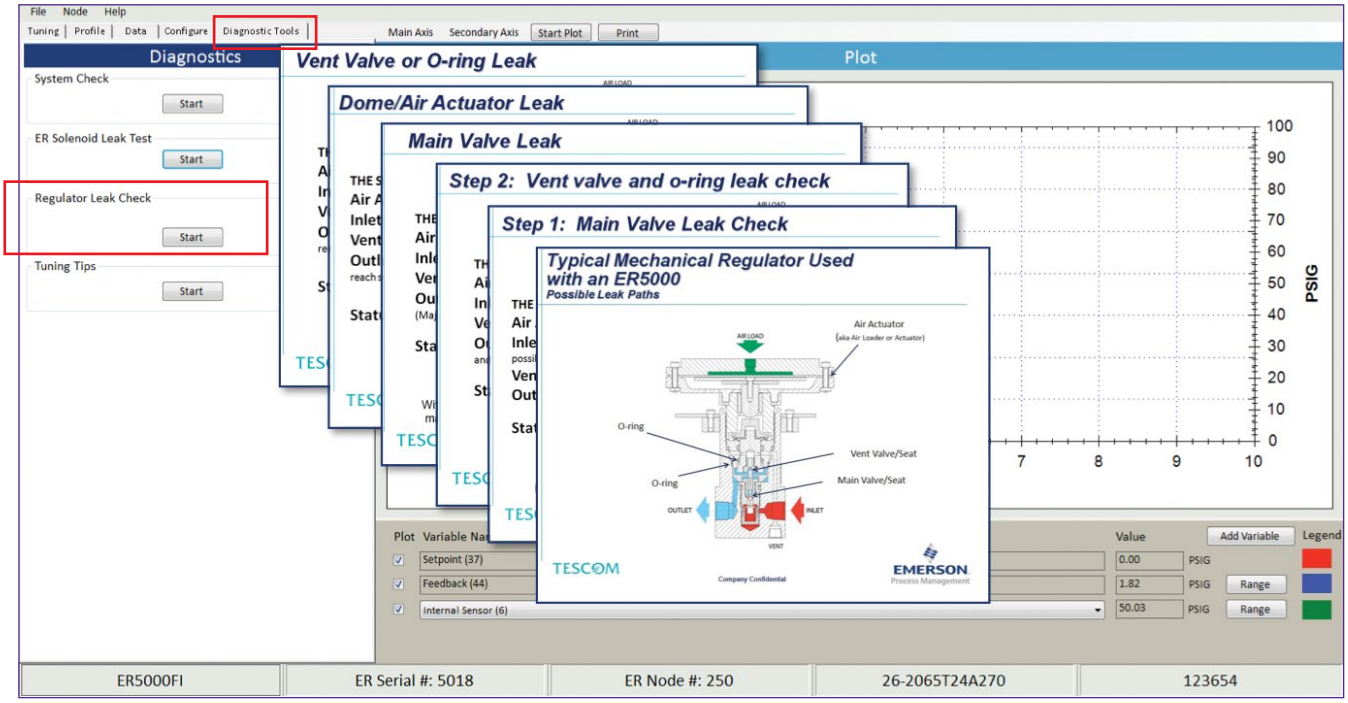
ER5000 SERIES

ERTune™ Software Screens

Diagnostics Screen - Solenoid Valve Leak Test "Pass"



Diagnostics Tools - Regulator Leak Check



ER5000 Electropneumatic Controller Part Number Selector

Learn more about common options.
For modifications, repair kits and accessories, contact factory.

Example for selecting a part number:

ER5	00	0	S	I	-	1

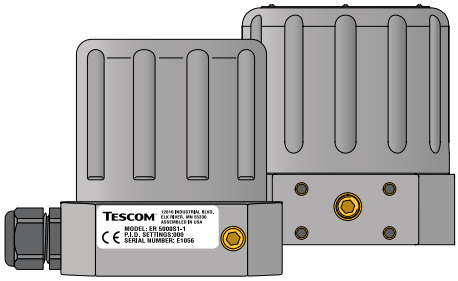
BASIC SERIES	BASE/ENCLOSURE STYLE [1]	INTERNAL SENSOR	FEATURES	SIGNAL TYPE	C_V CONFIGURATION
ER5	**00** – Standard NEMA 4X **02** – Integrated Double piston **04** – OEM base **05** – Aluminum HAZLOC **10** – Integrated 44-4000 **11** – Integrated 44-5200	**0** – 0-100 psig / 0-6.9 bar 0.1% accuracy	**S** – Basic **F** – Enhanced	**I** – 4-20 mAmp / 1-5 VDC **V** – 0-10 VDC	**1** – Standard, C_V = 0.01

1. For Stainless steel option, please contact Emerson.

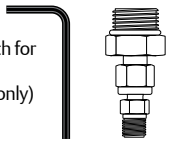
ER5000 Accessories

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) (Not included with the ER5050)
ERAA05146	MTA Connector Replacement Kit

What's in the box

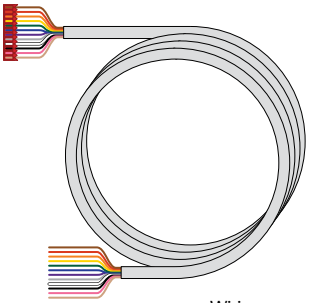


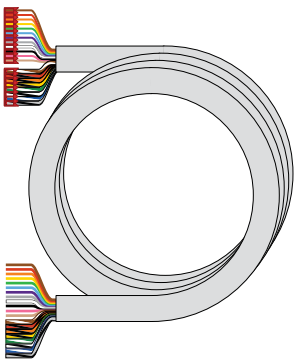
ER5000 or ER5050 Hazardous Location Electronic Pressure Controller



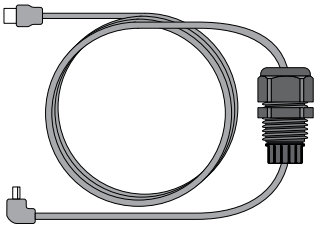
3 mm hex wrench for cover lock screw (ER5050 model only)

1/2" SAE x 1/8" NPTF adapter





Wiring connectors, pre-installed with strain relief



USB cable with integrated strain relief (Not included with the ER5050)

ER5000 SERIES

Regulator Selection for use with the ER5000*

SPECIFICATION REQUIRED	EXPLANATION
Pressure	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.
Flow Rate	Regulator must be capable of handling the required flow rate of the application.
Media	Regulator materials of construction must be compatible with the process media used for the application.

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

Compatible TESCOM Pressure Regulators

REGULATOR SERIES	MAXIMUM INLET PRESSURE	OUTLET PRESSURE RANGES	FLOW CAPACITY C_v
Pressure Reducing Regulators			
Cv = .06 - .30			
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
C_v = greater than .30			
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
Backpressure Regulators			
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*