ER3000 Series

Electropneumatic Controllers/Motors

DER301767X012

Description

TESCOM ER3000 Electropneumatic Controller, combined with a wide range of pressure regulators and an external transducer, provides true distributed control of gases or liquids from vacuum to 20,000 psig / 1379 bar. As a stand alone unit, the ER3000 can control the pressure of dry, clean inert gases from 0-100 psig / 0-6.9 bar. It will give your system closed loop feedback control with exceptional accuracy and response time.

Applications

- Test equipment
- Calibration stands
- Production equipment

Features and Benefits

ER3000SI - Standard ER3000

- Precise accuracy
- Compatible pressure regulators available from vacuum to 20,000 psig / 1379 bar with flow capacities of C_V = 0.02 to 45
- Control algorithms for I/P, external feedback, or cascade control modes
- Selectable setpoint signal source
  - External analog: 4-20 mA or 1-5 VDC
  - Digital RS485 (no A/D or D/A boards necessary)
  - Downloaded profile (runs independent of PC)
- Selectable feedback signal source
  - Internal 0-100 psig / 0-6.9 bar sensor
  - External analog: 4-20 mA or 1-5 VDC
- Selectable failsafe features
  - Programmable limits for analog setpoint, feedback, and error signals
  - Failsafe states: hold last pressure, vent, or full open
- Non-interacting zero and span
- Watertight, corrosion resistant NEMA 4X enclosure
- Software provided for data acquisition, PID tuning (real time graphic display of setpoint and feedback), debugging, and pressure profiles
- Protocol software provided for easy customization as a DLL in Windows®, 'C' library in MS-DOS®
- Software examples are provided for LabVIEW™, Visual Basic®, LabWindows/CVI™, and Visual C++®
- As many as 32 ER3000 Controllers can be networked at a distance up to 4000 feet away via a 2-wire RS485 link
- Vacuum may be controlled by only using the ER3000 and a subatmospheric transducer

**All ER3000 Series units have CE approval when wired per CE approved wiring instructions in the manual.*

ER3000SV - Standard ER3000

- All features of the ER3000SI except analog setpoint and feedback signals are 0-10 VDC

ER3000FI and ER3000FV - Enhanced ER3000

- All features of the ER3000SI and ER3000SV are included
- Two additional analog/digital inputs allow the user to:
  - Monitor an external signal in addition to feedback (e.g. flow, temperature)
  - Start/stop (or resume/stop) and pause pressure profiles
  - Alternate between two separate external feedback sources
  - Wait for an event to occur before proceeding to the next step in a downloaded profile (digital input)
  - Indicate that a step has occurred in a downloaded profile (digital output)
- Analog sensor output

ER3000EX and ER3000GX - FM Explosion Proof

- Explosion proof versions of ER3000SX and ER3000FX have Factory Mutual (FM) approval for use in Class I, Division I, Groups B, C, and D areas
- Approvals: FM, CSA, and CE*

ER3000MX and ER3000NX - ATEX Explosion Proof

- Explosion proof versions of ER3000SX and ER3000FX have approval for use in areas per ATEX marking: II 2 G EEx d IIB + H_2 T4
- Approvals: DEKRA/CENELEC and CE*

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ER3000 Series Electropneumatic Controller

Specifications

For other materials or modifications, please consult TESCOM.

ELECTRICAL

Power Requirement
20.5 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 shop air

Pressure
Minimum: Outlet pressure 1 psig / 0.07 bar
Maximum: 120 psig / 8.3 bar
Nominal: 110 psig / 7.6 bar

Temperature[1]
-20°F to 170°F / -29°C to 77°C (dry media required below 32°F)

Filter
In line 40 micron filter recommended

INPUT SIGNAL

Setpoint
4-20 mA, 1-5 VDC, or Digital RS 485 (0-10 VDC for ER3000XV)

Feedback (external)
4-20 mA or 1-5 VDC (0-10 VDC for ER3000XV)

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)
Temperature Effect
± **0.002%:** degrees F of FSO (-20°F to 170°F)
± **0.0036%:** degrees C of FSO (-30°C to 77°C)
Low Pressure Capability with External Transducer
± 0.25 inches water (0.635 g/sq. cm) into 2 liter volume

Response Time
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 LPM)

Solenoid Valve Rated Cycle Life: > 150 million cycles

1. All temperature conditions for Explosion Proof versions must satisfy: -4°F ≤ T ≤ 140°F / -20°C ≤ T ≤ 60°C.
2. Explosion proof versions only.

PHYSICAL

Size
Gas Port (Inlet, Exhaust and Gauge): 1/8 inch - 27 NPTF
Controlled Outlet Port: 1/4 inch - 18 NPTF
Internal Volume: 16.3 cubic inches / 267 cc
Length: 4.2 inches / 107 mm
Diameter: 3.72 inches / 95 mm
Conduit Openings: Two, 1/2 inch NPTF

Weight
34.8 oz / 1.0 kg

House Rating
Standard: NEMA 4X (cast aluminum and epoxy polyester paint)
Explosion Proof Version: CSA and FM approval for Class I, Division I, Groups B, C, and D locations
European Explosion Proof Version: Approved per ATEX (EEx d IIB + H_2 T4)

Flow Stream Materials
Solenoids: Nickel-plated Brass, FKM Seat and O-rings
Sensor: Glass, Ceramic, Silicon, RTV, Nickel
Manifold: Glass Filled PET[2]
Tubing: Polyurethane
Plug: Brass
O-Rings: Silicone, Buna-N, FKM

Mounting
Four 8-32 UNC holes

Mounting Orientation Effect
None

ENVIRONMENT

Temperature Range[1]
-20°F to 170°F / -29°C to 77°C

Relative Humidity
98% at 65°C (cover off-no effect)

Vibration
Resonance Sweep: 5-2000 Hz at 0.5 g constant acceleration
Resonance Dwell: 5 minutes at each resonance point (3 axis)
Sine Sweep: 0.5 octaves/minute, 5-2000 Hz (3 axis)
5-10 Hz at 10 mm constant displacement
10-2000 Hz at 2.0 g constant acceleration (No effect)

Storage Temperature
-58°F to 200°F / -50°C to 93°C

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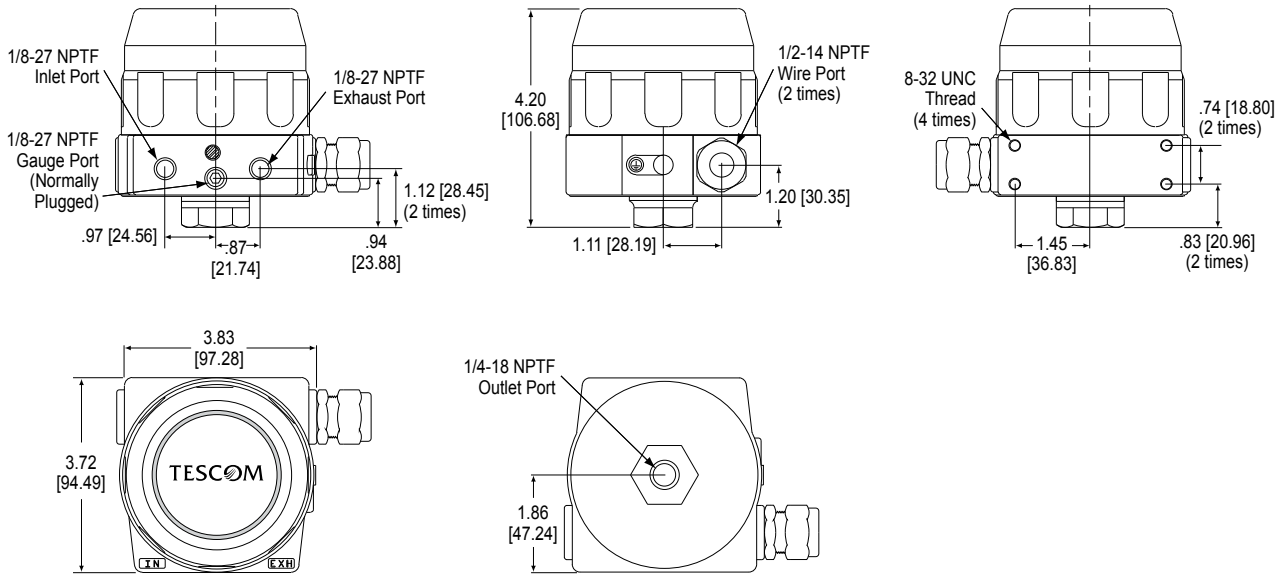
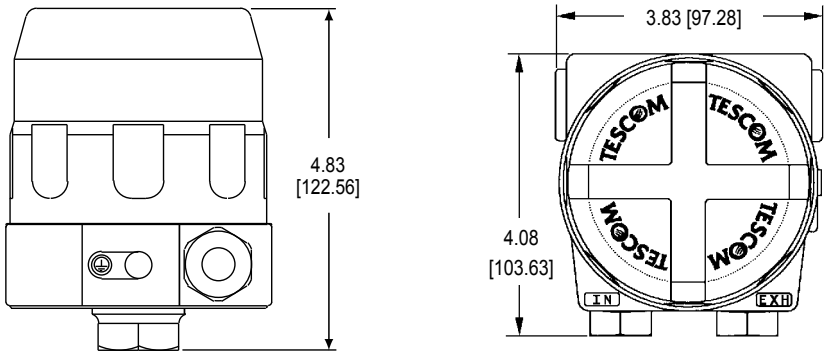
ER3000 Series Electropneumatic Controller Installation Drawing

INSTALLATION DIMENSIONS



MODEL ER3000EX, GX, MX, NX



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

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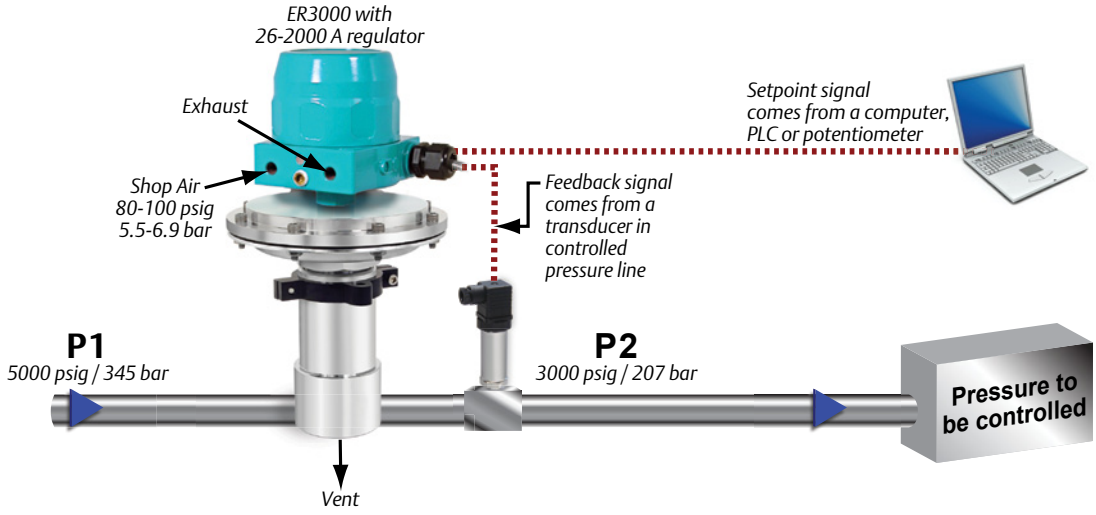
ER3000 Typical Applications

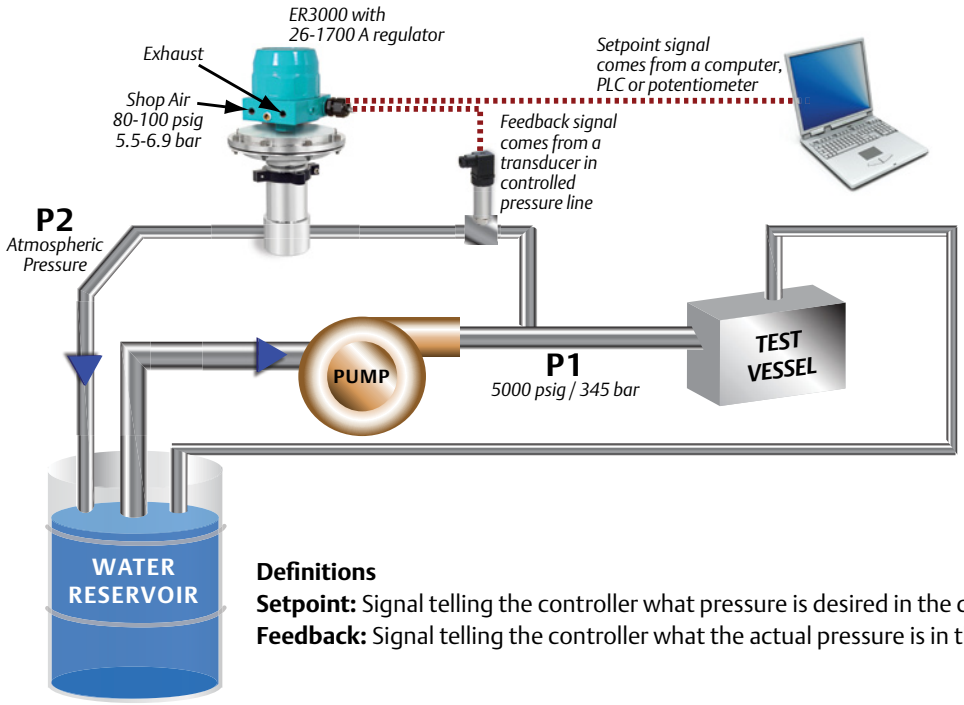
The variety of applications is limitless. Any process variable that can be manipulated using the pneumatic output of the ER3000 can be controlled. Some possibilities include controlling pressure, flow, temperature, position, speed, force, consistency, torque, and acceleration. The ER3000 improves both 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
- Pilot plants
- Replacement for valve positioners and I/Ps
- Spot welding pressure control

ER3000 Typical Pressure Reducing Application



ER3000 Typical Back Pressure Application



Definitions

Setpoint: Signal telling the controller what pressure is desired in the controlled pressure line

Feedback: Signal telling the controller what the actual pressure is in the controlled pressure line

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ER3000 Basics

ER3000 Basics

All ER3000 Controllers require 24 VDC with a minimum of 250 mAmps, up to 120 psig / 8.3 bar shop air supply and a setpoint signal. The ER3000 is shipped configured to accept an analog setpoint, either 1-5 volts or 4-20 mAmps (0-10 VDC for ER3000XV). This can be changed to accept a digital setpoint from a computer over the RS485 network using the provided software. This software also allows the user to tune and monitor the system and acquire data. If the ER3000 is used in External or Cascade mode, an analog 1-5 volt or 4-20 mAmp (0-10 VDC for ER3000XV) feedback signal is also required.

ER3000 Tuning

Since PID parameters need to change between static (dead-ended) and dynamic (flowing) pressure states, the ER3000 has the flexibility to be tuned for different system conditions. The Proportional, Integral, and Derivative (PID) variables are adjustable to:

- Achieve the quickest response to a setpoint change without overshoot or oscillation
- Achieve the best performance for a non-changing setpoint

TESCOM presets PID variables as standard, or customized for a specific TESCOM regulator. The user can then optimize the PID parameters after installation for best possible static and/or dynamic results to satisfy the user's system requirements using communication software provided in Windows® or MS-DOS®.

ER3000 Communication

The ER3000 communicates using a RS485 based protocol developed at TESCOM. The protocol is non-proprietary, allowing users to develop their own software to interface with a device, such as a PLC, that is not MS-DOS® or Windows® based.

ER3000 Software

The ER3000 protocol software is provided to assist in developing process control software that communicates with the ER3000. The protocol is available as a DLL for Windows® and a 'C' library for MS-DOS®. The protocol software uses six functions to communicate to the ER3000. The functions are: StartUp, ReadNetVar, WriteNetVar, ReadProfileSegment, WriteProfileSegment, and Shutdown.

MS-DOS® Programs Provided

TUNE, ERTALK, DEBUG, PROFILE, PROFILE2, AND DATA_LOG.

ER3000 Modifications

ER3020XX-1 Integrated Pressure Control Systems

The base of the ER3020XX-1 is designed to integrate with either a 26-102XXXXA-568 double piston regulator or 269-529-04IM and 269-529-06IM flow boosters. See Modification Table in the Part Number Selector section for details.

ER3000X-2 Low Flow Controller

Designed for use in slow response applications such as analyzers, temperature control or flow control. The ER3000X-2 is equipped with low flow solenoid valves that match the ER response to the system response.

ER3000X-4 High Flow Controller

Designed for use in high flow applications, this ER3000 may be used to deliver up to 5 SCFM / 142 SLPM (C_V = 0.09).

ER3000XX-XW Prewired Controller

The ER3000XX-XW is designed to provide a 'turnkey system' for the customer. The unit comes complete with the power supply and converter kit wired directly to the ER3000.

ER3100 Series High Pressure Controller

See ER3100 Series datasheet for information.

ER3P Series Kit I or Kit II for Pressure Reducing

Provides all the components needed for an ER controlled system. For more details, see ER3P Series datasheet.

ER3B Series Kit I or Kit II for Backpressure

Provides all the components needed for an ER controlled system. For more details, see ER3B Series datasheet.

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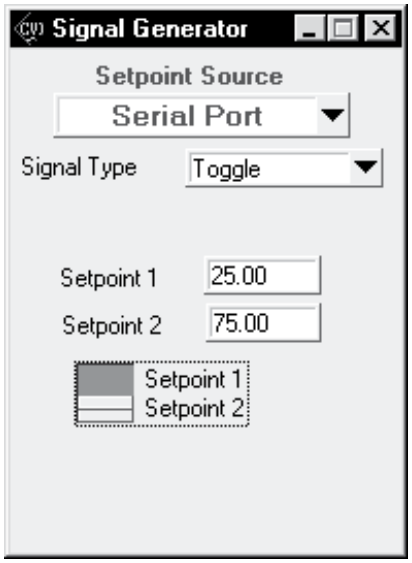
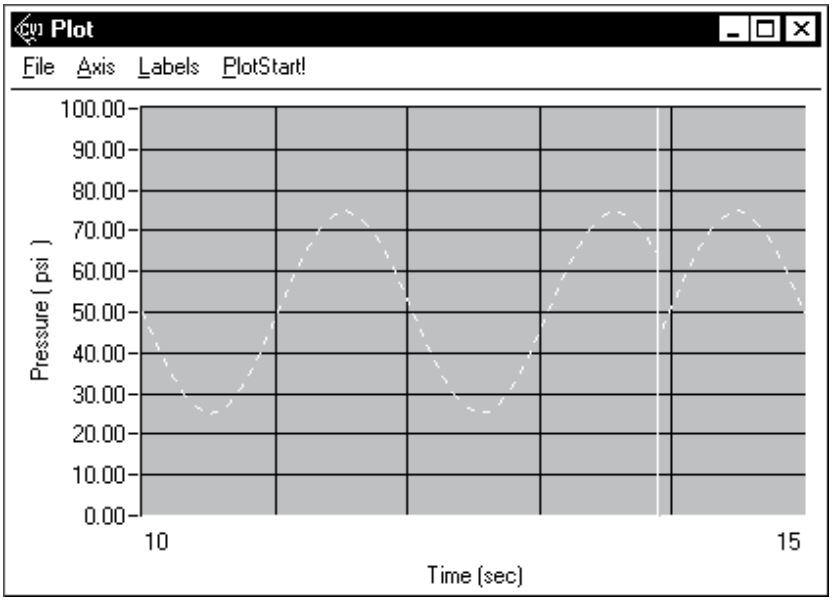
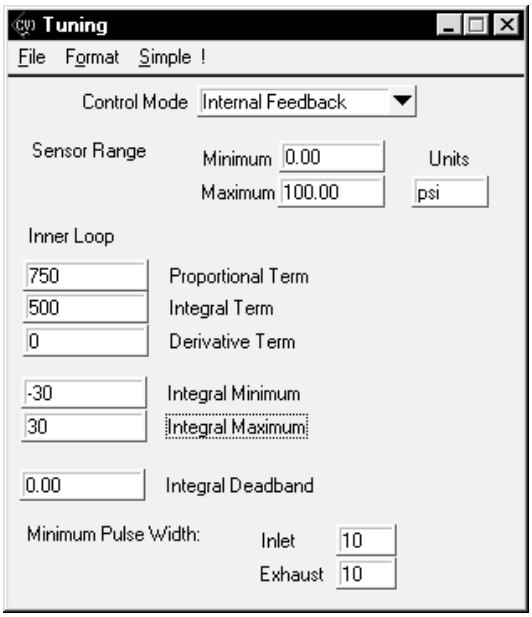
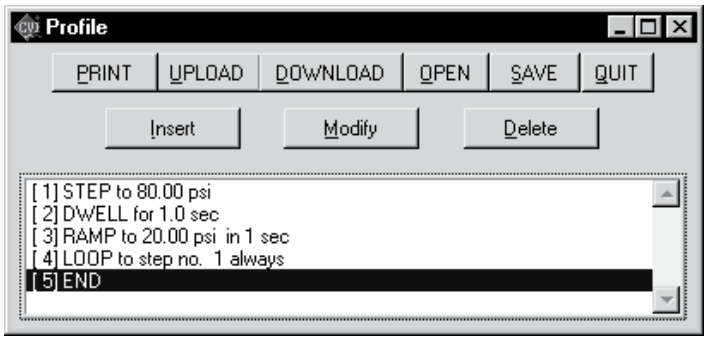
ER3000 TESCOM's Windows® Tune Software Features

TESCOM's Windows® Tune program is an all encompassing software package which allows the user to address any ER3000 Controller on the RS485 network and is typically used for simple tuning of ER3000s. Additionally, the Tune program allows you to monitor system operation, alter profiles, specify failsafe limits, enable password protection, read/write internal variables, acquire data and review previously acquired data. The basic screens available are: Signal Generator, Plot, Tuning, Profile, Pulse, Failsafe, Data Acquisition, Dacq View, Miscellaneous, Read/Write, and Password. See examples below.









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ER3000 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:

ER3 00 0 S I - 1 W

BASIC SERIES	BASE STYLE	INTERNAL SENSOR CONFIGURATION	BOARD CONFIGURATION	CURRENT/VOLTAGE	C_V CONFIGURATION	OPTIONAL
ER3	**00** – Standard **02**[1] – Integrated with 26-1000 and 269-529 **04** – OEM style (no cover) **10**[2] – Integrated with 44-4000 **11**[2] – Integrated with 44-5200	**0** – 0-100 psig 0-6.9 bar 0.1% accuracy **2** – 0-50 psia 0-2.4 bar abs. 0.1% accuracy **3** – 0-150 psia 0-9.3 bar abs. 0.1% accuracy **4** – 0-5 psig 0-0.35 bar 0.25% accuracy	**S** – Standard, setpoint/feedback **F** – 2 extra analog inputs/outputs **E** – Explosion proof **G** – Combines **F** and **E** **M** – ATEX explosion proof **N** – Combines **F** and **M**	**I** – 4-20 mA / 1-5 VDC **V** – 0-10 VDC	**1** – Standard, C_V = 0.01 **2** – Low flow, C_V = 0.001 **4** – High flow, C_V = 0.1	**4** – Prewired[3]

Note: *When combining the ER3000 with a TESCOM regulator or other control device, please indicate the device part number on the order to ensure the ER3000 is programmed with the optimal PID parameters for that combination.*

1. **For Model ER3020XX-1 (Integrated Regulator), order one of the below:**
   - *Regulator 269-529-04IM (Outlet: 0-300 psig / 0-20.7 bar)*
   - *Regulator 269-529-06IM (Outlet: 0-300 psig / 0-20.7 bar)*
   - *Regulator 26-1021D24A-568 (Outlet: 15-10,000 psig / 1.0-690 bar)*
   - *Regulator 26-1022D24A-568 (Outlet: 10-6000 psig / 0.69-414 bar)*
   - *Regulator 26-1024D24A-568 (Outlet: 5-2500 psig / 0.35-172 bar)*
   - *Regulator 26-1025D24A-568 (Outlet: 3-1500 psig / 0.21-103 bar)*
2. *Please see ER3100 Series catalog page for ordering information on that series.*
3. *Optional prewired ER3000 includes power supply and RS485 converter.*

ER3000 Accessories

PART NUMBER	DESCRIPTION
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 ER3000SX (Output: 24 VDC at 250 mA / Input: 120 VAC, 60 HZ)

Regulator Selection for the ER3000

SPECIFICATION REQUIRED	EXPLANATION
Inlet and Outlet Pressure	For best resolution, select the regulator with an outlet range nearest (yet above) the maximum application pressure. Regulator inlet pressure must be acceptable.
Flow Rate	The regulator should be capable of the correct calculated C_V value for the application.
Media	Media should be compatible with the regulator's materials of construction.

Compatible TESCOM Pressure Regulators

REGULATOR SERIES	MAXIMUM INLET PRESSURE	MAXIMUM OUTLET PRESSURE[1]	FLOW CAPACITY	VENT WITH ER
Pressure Reducing Regulators				
44-40XXXXX-XXX	6000, 3500 psig / 414, 241 bar	3500, 1500, 600 psig 241, 103, 41.4 bar	C_V = 0.7, 2.0	YES
26-10XX-XX-XXXA	15,000, 10,000, 6000 psig / 1034, 690, 414 bar	10,000, 6000, 2500, 1500, 200 psig 690, 414, 172, 103, 13.8 bar	C_V = 0.02, 0.06, 0.12	NO
44-13XX-XXXX-AXXX	4500, 3750 psig / 310, 259 bar	1500, 1000, 600, 400, 300, 200 psig 103, 69.0, 41.4, 27.6, 20.7, 13.8 bar	C_V = 0.8, 2.0	NO
44-11XX-XX-XXXA	10,000, 6000 psig / 690, 414 bar	6000, 2500, 1500 psig 414, 172, 103 bar	C_V = 0.02, 0.05, 0.12	NO
26-20XX-XXXAXXX[2]	15,000, 10,000, 6000 psig / 1034, 690, 414 bar	10,000, 6000, 2500, 1500 psig 690, 414, 172, 103 bar	C_V = 0.02, 0.06, 0.12	YES
44-52XX-XXX[2]	3500 psig / 241 bar	500 psig / 34.5 bar	C_V = 0.06, 0.15	YES
DHDXXXXXXXXXX	300 psig / 20.7 bar	100 psig / 6.9 bar	C_V = 5.0	YES
DKXXXXXXXXXX[2]	1000 psig / 69.0 bar	100, 700 psig / 6.9, 48.3 bar	C_V = 0.35	YES
Backpressure Regulators				
26-23XXXXXXA	500, 100, 60 / 34.5, 6.9, 4.1 bar	N/A	C_V = 0.06, 0.6, 1.0	N/A
44-47XX-XX-XXX	60 psig / 4.1 bar	N/A	C_V = 0.04, 0.30	N/A
26-17XX-XX-XXXA[2]	ten pressures up to 10,000 psig / 690 bar	N/A	C_V = 0.02, 0.1, 0.14, 0.6	N/A
269-350-XXX	100 psig / 6.9 bar	N/A	C_V = 0.6	N/A
269-465-XXX	500 psig / 34.5 bar	N/A	C_V = 0.6	N/A
54-27XXXXXXA	500 psig / 34.5 bar	N/A	C_V = 2.0, 5.0	N/A
Hydraulic Regulators				
54-20XXXXXA	15,000, 10,000 psig / 1034, 690 bar	15,000, 10,000, 6000, 2500, 1500 psig 1034, 690, 414, 172, 103 bar	C_V = 0.06, 0.2	YES
54-21XXXXXA (Backpressure)[2]	15,000, 10,000, 6000, 2500, 1500, 100 psig 1034, 690, 414, 172, 103, 6.9 bar	N/A	C_V = 0.08	N/A
54-22XXXXXA	8000 psig / 552 bar	8000, 5000, 2500, 100 psig 552, 345, 172, 6.9 bar	C_V = 2.0	YES
54-23XXXXXA (Backpressure)	10,000, 5000, 2500, 1150, 200 psig 690, 345, 172, 79.3, 13.8 bar	N/A	C_V = 1.7	N/A
54-28XXXXXA	5000 psig / 345 bar	5000, 3500, 1500, 600, 100 psig 345, 241, 103, 41.4, 6.9 bar	C_V = 8.0	YES
Specialty				
269-529-XX[2]	300 psig / 20.7 bar	90 psig / 6.2 bar	C_V = 1.5-45.0	YES
269-545-XXXXX	10,000, 6000 psig / 690, 414 bar	500 psig / 34.5 bar	C_V = 0.02, 0.06, 0.12	YES

1. Maximum outlet pressures are for regulators used with an ER3000 input pressure of 110 psig / 7.6 bar.
2. Available as a Kit with all the components needed for an ER controlled system. For more details, see datasheet for ER3P Series for Pressure Reducing or ER3B for Backpressure applications.

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.*

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