ER3000 Explosion Proof Manual

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ER3000 EXPLOSION PROOF MANUAL

This manual provides basic installation information and safety precautions for the following Tescom ER3000 Pressure Controllers:

MODEL NO.	DESCRIPTION
ER3000EI-1	4-20 mAmp/1-5 VDC analog setpoint and feedback **FM Explosion Proof Packaging (Class I, Division I, Groups B, C, & D)** **CSA Explosion Proof Packaging (Class I, Groups B, C & D, Type 4X)**
ER3000EV-1	0 - 10 VDC analog setpoint and feedback **FM Explosion Proof Packaging (Class I, Division I, Groups B, C, & D)** **CSA Explosion Proof Packaging (Class I, Groups B, C & D, Type 4X)**
ER3000MI-1	4-20 mAmp/1-5 VDC analog setpoint and feedback **KEMA ATEX Explosion Proof Packaging (Eex d IIB + H_2 T4 Hazardous Locations, Category II 2 G)**
ER3000MV-1	0 - 10 VDC analog setpoint and feedback **KEMA ATEX Explosion Proof Packaging (Eex d IIB + H_2 T4 Hazardous Locations, Category II 2 G)**
ER3000GI-1	Same as ER3000EI-1 with the addition of 2 analog/digital inputs, 2 digital outputs and 1 analog sensor output
ER3000GV-1	Same as ER3000EV-1 with the addition of 2 analog/digital inputs, 2 digital outputs and 1 analog sensor output
ER3000NI-1	Same as ER3000MI-1 with the addition of 2 analog/digital inputs, 2 digital outputs and 1 analog sensor output
ER3000NV-1	Same as ER3000MV-1 with the addition of 2 analog/digital inputs, 2 digital outputs and 1 analog sensor output
ER3000P	Same as ER3000MI-1 with screw terminal strip style and 2 additional analog inputs
ER3000H	Same as ER3000EI-1 with screw terminal strip style and 2 additional analog inputs

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INTRODUCTION

The ER3000 Series (Electronic Regulator) is a versatile 0 to 100 PSIG pressure controller. It can be used in conjunction with any pneumatically actuated regulator or valve to control pressure.

Setpoints can be provided via an analog input (4-20mA, 1-5V, or 0-10V), the digital RS485 interface, or a downloaded profile.

The controller can be wired through a standard serial communication port using an RS232 to RS485 adapter. This communication channel also provides for the programming of a number of internal parameters, including PID tuning variables, zero and span, mode of operation, limits, etc.

Feedback can be derived either from the ER3000's internal temperature compensated sensor or an external transducer (4-20mA, 1-5V, or 0-10V).

Four modes of operation are available:

1. Internal feedback mode makes the controller an I/P when analog setpoints are used and uses the internal sensor as the source of feedback.
2. External feedback mode uses an external sensor as the feedback.
3. Cascade mode creates a loop within a loop; the inner loop uses the internal sensor for feedback and the outer loop uses the external transducer for feedback.
4. Manual mode allows for direct control of the solenoid valves (used for troubleshooting the system only).

HAZARDOUS LOCATIONS CERTIFICATIONS

Factory Mutual (FM) Approval:

Explosion Proof
Identification No. 2Z0A0.AE
Class I, Division I, Groups B, C, and D
Enclosure type 4X

SPECIAL CONDITIONS FOR SAFE USE

- $-20°C \leq T_{amb} \leq 60°C$
- Do not remove cover while circuits are live
- Installation to be in accordance with the latest edition of National Electrical Code
- Unused conduit entry must be closed with suitable blanking element
- Seal conduit within 18 inches

Canadian Standards Association (CSA)

Explosion proof
Certification No. LR 85614-4
Class I, Groups B, C, and D
Enclosure Type 4X

SPECIAL CONDITIONS FOR SAFE USE

- $-20°C \leq T_{amb} \leq 60°C$
- Do not remove cover while circuits are live
- Installation to be in accordance with the latest edition of Canadian Electrical Code
- Rated 24 VDC, 350 mAmps
- Maximum working pressure: 110 PSIG

KEMA/Cenelec

Flameproof Certification
Certificate No. KEMA 03ATEX2365
ATEX Marking: EEx d IIB + H_2T4
Category: II 2 G
Enclosure type IP65

SPECIAL CONDITIONS FOR SAFE USE

- $-20°C \leq T_{amb} \leq 60°C$
- Do not remove cover while circuits are live
- Installation to be in accordance with the applicable local requirements
- The cable and conduit entry devices shall be of certified flameproof types, suitable for the conditions of use and correctly installed
- Unused apertures shall be closed with certified flameproof blanking elements

SPECIFICATIONS

Enclosure

NEMA 4X / IP65.

To prevent any interference from electromagnetic radiation, use rigid metal conduit to enclose the wiring entering the ER3000. Two 1/2" NPT wire ports have been provided for this purpose. If unused, properly seal with a metal plug.

Media

The preferred media is clean, dry instrument grade air or nitrogen. Use of an in-line 40-micron filter is highly recommended to prevent damage to the solenoid valves.

Inlet Pressure

Minimum:	Outlet pressure + 1 PSIG
Maximum:	120 PSIG
Typical:	110 PSIG

Note: Response time is affected by inlet pressure.

Environment

Temperature:	-20°C to 60°C (dry nitrogen supply gas) 5°C to 60°C (shop air)
Pressure:	28 - 32 inches Hg
Humidity:	To 100% R.H. (non-condensing) @ 0°C to 60°C

Flow Rate

Cv: 0.01

Note: The flow rate can be increased through the use of a booster regulator.

Power Requirement

Voltage:	24 VDC (22 VDC to 28 VDC)
Current:	340mA maximum, 180mA nominal

RS485 Communication Interface

Networking:	Up to 32 controllers on one network
Cable length:	4000 ft. maximum
Baud rate:	9600

Accuracy

Room temp:	0.1% of span maximum
Temperature effects:	0.002%/°F of span maximum

Note: Accuracy is based on the user-provided external transducer when used in external feedback mode.

Response Time

Rise Time: 257ms. - 10 PSIG to 90 PSIG
Fall Time: 552ms. - 90 PSIG to 10 PSIG

Note: Step response into dead-end system (1 cubic inch volume).

Ports

Conduit: 1/2" NPT
Pneumatic: 1/8" NPT - Inlet, exhaust and gauge ports
1/4" NPT - Controlled outlet port

Weight

40.6 oz. (1.15 kg)

External Analog Input Impedance

4-20mA: 250Ω
1-5V: 220KΩ - Single input pin to ground
1.7MΩ - Differential input
0-10V: 100KΩ

Digital Outputs

Current: 50 mA Continuous, 100 mA Instantaneous
Voltage: 5V - 28V
Type: Open collector, grounded emitter

Digital Inputs

Voltage Range/Input Impedance:

4-20 mA: 250Ω
1-5V: 220KΩ - Single input pin to ground
1.7MΩ - Differential input
0-10V: 100KΩ
Type: Level sensitive

Analog Output

4-20mA: 0.5% Accuracy

Sensor Update Rate

25ms: Rate of sensor reading and processing task

ER3000 INSTALLATION FLOW CHART

Step 1: Select Voltage/Current

Jumper J5 (top board – *see below right for* **Figure 1**) – Select Jumper position* for:

1: Analog Setpoint
2: External Feedback
3: Auxiliary input #1
4: Auxiliary input #2

For all the above jumper positions:

- Jumper not installed: configured for 1-5V.
- Jumper installed: configured for 4-20mA.

*Not on 0-10V models

Step 2: Plumb the external regulator and transducer

Use safety information on pages 4-6 & 8-10 prior to pressurization and operation of all equipment.

Step 3: Mount the ER3000

Four 8-32 UNC screw holes are provided.

Step 4: Electrical wiring

Connect ER3000 to a power supply, transducer, and computer (if needed), using the tables on this page.
Note: All electrical wiring must be in accordance with applicable local standards (see pages 4-6 & 8-10).

Step 5: Tune program (if using a computer)

Download the Tune program onto your computer.

Step 6: Read and follow the safety sections on page 4-6 & 8-10 carefully prior to pressurization and operation of the system.

ER3000 WIRING DIAGRAM

The following tables give the complete wiring layout of the ER3000 wiring assemblies, which are connected to the J3 and J4 terminal blocks. Refer to the tables to ensure proper wiring of external devices.

Note: The (+) and the (-) refer to the differential inputs. Both must be connected for the system to work properly.

Table 1: Main Cable Assembly*

J3 Pins	Description	Color
1	+Setpoint Input	Brown
2	-Setpoint Input	Red
3	+Feedback Input	Orange
4	-Feedback Input	Yellow*
5	-RS485 Network connection	Green
6	+RS485 Network connection	Blue
7	+ 24 Volt DC Power	Violet
8	24 Volt Return, (Power Ground)	Gray
9	+5 Volt output (5mA max.)	White
10	Analog Signal Ground	Black
11	Analog Signal Output	Pink
12	Analog Signal Ground	Tan*

**The tan wire should be connected to the yellow wire in systems with 4-20mA feedback.*

Table 2: Auxiliary Cable Assembly (ER3000F/ER3000G)

J4 Pins	Description	Color
1	+Auxiliary Input #1	Brown
2	-Auxiliary Input #1	Red
3	+Auxiliary Input #2	Orange
4	-Auxiliary Input #2	Yellow
5	Analog Signal Ground	Green
6	Analog Output Ground	Black
7	Digital Output #1	Blue
8	Digital Output #2	White

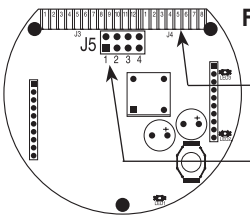

Figure 1: Top Board

SAFETY, INSTALLATION, & OPERATION PRECAUTIONS

DO NOT ATTEMPT TO SELECT, INSTALL, USE, OR MAINTAIN THIS CONTROLLER, OR ACCESSORY UNTIL YOU HAVE READ AND FULLY UNDERSTOOD THESE INSTRUCTIONS.

BE SURE THIS INFORMATION REACHES THE OPERATOR AND STAYS WITH THE PRODUCT AFTER INSTALLATION.

DO NOT PERMIT UNTRAINED PERSONS TO INSTALL, USE, OR MAINTAIN THIS CONTROLLER, OR ACCESSORY.

IMPROPER SELECTION, IMPROPER INSTALLATION, IMPROPER MAINTENANCE, MISUSE, OR ABUSE OF THIS CONTROLLER, OR RELATED ACCESSORIES CAN CAUSE DEATH, SERIOUS INJURY, AND/OR PROPERTY DAMAGE.

Possible consequences include but are not limited to:

- High velocity fluid (gas or liquid) discharge
- Electrocution
- Parts ejected at high speed
- Contact with fluids that may be hot, cold, toxic, or otherwise injurious
- Explosion or burning of the fluid
- Lines/hoses whipping dangerously
- Damage or destruction to other components or equipment in the system

Safety Precautions

1. Read and understand the user's manual before operating the controller.
2. Inspect the controller, and accessories before each use.
3. Operate the unit only under specified environmental conditions.
4. Follow instructions in the manuals for proper wiring.
5. Never connect the controller, or accessories to a supply source having a voltage greater than the maximum rated voltage of this controller, or accessory.
6. Never connect the controller, or accessories to a supply source having a pressure greater than the maximum rated pressure of this controller, or accessory.
7. Never use anything but clean dry inert gases or air into the electropneumatic controller.
8. Start up sequence for electropneumatic controllers is:
   a. Feedback loop must be installed and operational.
   b. Electrical power should be applied and system setpoint reduced to its lowest pressure output before turning on the pneumatic supply to the controller.

9. Refer to product label (modification specific) for maximum inlet pressures. If this rated pressure cannot be found, contact your local Tescom representative for the rated pressure prior to installation and use. Verify the designed pressure rating of all equipment (e.g., supply lines, fittings, connections, filters, valves, gauges, etc.) in your system. All must be capable of handling the supply and operating pressure.
10. Clearly establish flow direction of the fluid before installation of controllers, regulators, valves, and accessories. It is the responsibility of the user to install the equipment in the correct direction.
11. Do not tighten fittings, gauges, or components in pressurized systems.
12. Never turn controller, regulator or valve body. Instead, hold the controller body and turn fitting nut.
13. If a controller, regulator or valve leaks or malfunctions, take it out of service immediately.
14. Do not modify equipment or add attachments not approved by the manufacturer.
15. Apply pressure to the system gradually, avoiding a sudden surge of fluid or pressure shock to the equipment in the system.
16. Regulators are not shut-off valves. Install a pressure relief device downstream of the regulator to protect the process equipment from operating pressure increases. Shut off the supply pressure when the regulator is not in use.
17. Periodic inspection and scheduled maintenance of your equipment is required for continued safe operation.
18. The frequency of servicing is the responsibility of the user based on the application. Never allow problems or lack of maintenance to go unreported.
19. Read and follow precautions on compressed gas cylinder labels.
20. It is important that you analyze all aspects of your application and review all available information concerning the product or system. Obtain, read, and understand the Material Safety Data Sheet (MSDS) for each fluid used in your system.
21. Oxygen service requires special expertise and knowledge of system design and material compatibility in order to minimize the potential for death, serious injury, and/or property damage.
22. Never use materials for controllers, regulators, valves, or accessories that are not compatible with the fluids being used.
23. Users must test under normal operating conditions to determine suitability of materials in an application.
24. Vent fluids to a safe environment, and in an area away from employees. Be sure that venting and disposal methods are in accordance with Federal, State, and Local requirements. Locate and construct vent lines to prevent condensation or gas accumulation. Make sure the vent outlet is not obstructed by rain, snow, ice, vegetation, insects, birds, etc. Do not interconnect vent lines; use separate lines if more than one vent is needed.

25. Do not locate controllers, regulators, valves, or accessories using flammable fluids near open flames or any other source of ignition. Use of Explosion Proof controllers may be necessary to be in accordance with local electric codes.
26. Some fluids, when burning, do not exhibit a visible flame. Use extreme caution when inspecting and/or servicing systems using flammable fluids to avoid death or serious injury to employees. Provide a device to warn employees of these dangerous conditions.
27. Many gases can cause suffocation. Make certain the area is well ventilated. Provide a device to warn employees of lack of oxygen.
28. Never use oil or grease on these controllers, regulators, valves, or accessories. Oil and grease are easily ignited and may combine violently with some fluids under pressure.
29. Have emergency equipment in the area if toxic or flammable fluids are used.
30. Upstream filters are recommended for use with all fluids and gases.
31. Do not bleed system by loosening fittings.
32. Prevent icing of the equipment by removing excess moisture from the gas.
33. Always use proper thread lubricants and sealants on tapered pipe threads.

Installations

Inspect the controller, and accessories for physical damage and contamination. Do not connect the controller, or accessory if you detect oil, grease, or damaged parts. If the controller, or accessory is damaged, contact your local Tescom representative to have the controller cleaned or repaired.

Make sure that the components and materials used in the fluid handling system are compatible with the fluid and have the proper pressure rating.
Make sure that the components used in the electronic system are compatible with and have the proper voltage rating.

Repair Service

If a controller leaks or malfunctions, take it out of service immediately. You must have instructions before doing any maintenance. Do not make any repairs you do not understand. Have qualified personnel make repairs. Return any equipment in need of service to your equipment supplier for evaluation and prompt service. Equipment is restored to the original factory performance specifications, if repairable. There are flat fee repair charges for each standard model. The original equipment warranty applies after a complete overhaul.

Safe Component Selection

1. Consider the total system design when selecting a component to ensure safe, trouble-free performance.
2. The user is responsible for assuring all safety and warning requirements of the application are met through his/her own analysis and testing.
3. Tescom may suggest material for use with specific media upon request. Suggestions are based on technical compatibility resources through associations and manufacturers. Tescom does NOT guarantee materials to be compatible with specific media — THIS IS THE RESPONSIBILITY OF THE USER!
4. Component function, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system user.
5. The user is responsible to be in accordance with all the necessary mechanical and electrical codes required for installation and operation of the system. These requirements include but not limited to all explosion proof controllers.
6. The user is responsible for the selection of the proper model number of the controller that would meet the application's possible hazardous environment or conditions.

Do not modify equipment or add attachments not approved by the manufacturer.

ASSEMBLY/INSTALLATION/WIRING DRAWINGS & BILLS OF MATERIALS

Drawings and parts lists for your product may be obtained by calling the number below. Tescom will provide these by fax or mail. Your local Tescom representative can provide additional assistance.

Call (800) 447-1250 or email to systems@tescom.com for assembly/ installation/wiring drawings & bills of materials. Be sure to have your complete model number ready.

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Form No. 1960 Rev. 4/06 Printed 4/06 150 Printed in U.S.A.