

# TESCOM™

## Safety, Installation, Operations & Service Manual



A circular icon with a blue background and white border, depicting a stylized white figure of a person sitting and reading a document.	<p><b>Do not attempt to select, install, use or maintain this product until you have read and fully understood this manual.</b></p>
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# Section 1: Symbols

## 1.1 Symbols

### CAUTION

Paragraphs highlighted by the **CAUTION** icon contain information that must be followed to maintain a safe and successful operating environment.

### WARNING

Paragraphs highlighted by the **WARNING** icon contain information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

## Section 2: Safety and Installation Precautions

### 2.1 Regulators and Valves

#### **WARNING**

Do not attempt to select, install, use, or maintain this regulator, valve, 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.

The appliance may only be used for its intended purpose as described in these instructions for use (see Section “Intended Purpose”).

Do not permit untrained persons to install, use, or maintain this regulator, valve or accessory.

Improper selection, improper installation, improper maintenance, misuse, or abuse of regulators, valves, or related accessories can cause death, serious injury, and property damage.

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.

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Possible consequences include but are not limited to:

- High velocity fluid (gas or liquid) discharge
- 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

#### **CAUTION**

Safety Precautions

- Inspect the regulator, valve, and accessories before each use.
- Never connect regulators, valves, or accessories to a supply source having a pressure greater than the maximum rated pressure of the regulator, valve, or accessory.

- Refer to product label (model specific) for maximum inlet pressures. If this rated pressure cannot be found, contact your local TESCO M 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.
- Clearly establish flow direction of the fluid before installation of regulators, valves, and accessories. It is the responsibility of the user to install the equipment in the correct direction.
- Remove pressure from the system before tightening fittings, gauges or components.
- Never turn regulator or valve body. Instead hold regulator or valve body and turn fitting nut.
- If a regulator or valve leaks or malfunctions, take it out of service immediately.
- Do not modify equipment or add attachments not approved by the manufacturer.
- Apply pressure to the system gradually, avoiding a sudden surge of fluid or pressure shock to the equipment in the system.
- Regulators are not shut-off devices. Install a pressure relief device downstream of the regulator to protect the process equipment from overpressure conditions. Shut off the supply pressure when the regulator is not in use.
- Periodic inspection and scheduled maintenance of your equipment is required for continued safe operation.
- The frequency of servicing is the responsibility of the user based on the application.
- Positive seal/tied diaphragm regulators require the downstream pressure vented before turning the hand knob counterclockwise to reduce the outlet pressure. Damage may occur to the regulator if this procedure is not followed.
- Never allow problems or lack of maintenance to go unreported.
- Read and follow precautions on compressed gas cylinder labels.
- 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 Safety Data Sheet (SDS) for each fluid used in your system.
- Never use materials for regulators, valves, or accessories that are not compatible with the fluids being used.
- Users must test components for material compatibility with the system operating conditions prior to use in the system.
- Vent fluids to a safe environment, and in an area away from personnel. 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.
- Vent lines must not be pressurized. Installation of vented regulators must be oriented and plumbed such that vented media cannot accumulate in the vent line in order to prevent the vent line from being pressurized by the vented media or external sources.
- Do not locate regulators, valves, or accessories controlling flammable fluids near open flames or any other source of ignition.
- Avoid subjecting the regulator/valve to sudden impact, jolts, falls, and vibrations.

- Unit should be stored in a dry, environmental controlled location before installation and use.
- 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 personnel. Provide a device to warn personnel of these dangerous conditions.
- Many gases can cause suffocation. Make certain the area is well ventilated. Provide a device to warn personnel of lack of Oxygen.
- Never use oil or grease on these regulators, valves, or accessories unless recommended as specified in Operations and Service procedures. Oil and grease are easily ignited and may combine violently with some fluids under pressure.
- Have emergency equipment in the area if toxic or flammable fluids are used.
- Upstream filters are recommended for use with all fluids.
- Do not bleed system by loosening fittings.
- Prevent icing of the equipment by removing excess moisture from the gas.
- Always use proper thread lubricants and sealants on tapered pipe threads.

## 2.1.1 Intended Use

Regulators: Pressure regulators are intended to be used to regulate the pressure at which fluids are administered in an application. Additional regulations that supplement or limit the intended use may apply depending on the regulator and media or industry-specific standards. Regulators are not intended for use as a pressure or safety relief valve.

Valves: TESCOM Valves are intended to be used to control gas flow in piped systems. They are not intended for use as a pressure reducer.

## 2.1.2 Installation

### CAUTION

Do not open packaging until ready for installation or in a clean environment. Product is cleaned in accordance with CGA 4.1 and ASTM G93, Verification Type 1, Test 1 and Test 2. With periodic verification of cleaning process to MIL-STD-1330D.

### WARNING

Make sure that the components and materials used in the fluid handling system are compatible with the fluid and have the proper pressure rating. Failure to do so can result in death, serious injury, and/or property damage.

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

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## 2.1.3 Repair Service

If a regulator or valve 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.

### CAUTION

Proper component selection:

- Consider the total system design when selecting a component for use in a system.
- The user is responsible for assuring all safety and warning requirements of the application are met through his/her own analysis and testing.
- TESCO M may suggest material for use with specific media upon request.

TESCOM does **NOT** guarantee materials to be compatible with specific media -- **This is the responsibility of the user!**

- Component function, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system user.

### WARNING

Do not modify equipment or add attachments not approved by the manufacturer. Failure to do so can result in death, serious injury, and/or property damage.

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## Section 3: Operations and Service

Assembly/Installation Drawings & Bills Of Material drawings and parts lists for your product may be obtained by contacting TESCO. Tescom will provide these by email, fax or mail. Your local Tescom representative can provide additional assistance. Be sure to have your complete model number ready. See page 12 for contact information for the TESCO location closest to you.

Stem seal leakage usually results from seal wear, and can usually be corrected by tightening the bonnet bushing or packing nut. Overtightening can cause high stem friction, accelerated wear and shortened stem seal life.

### **WARNING**

Information detailed here is generic and applies to a select subset of TESCO regulators and valves. Some TESCO products have detailed, product-specific Installation, Operations and Service manuals. Please look up the corresponding manual for your product series on Emerson.com to ensure you are using the appropriate installation & operations instructions.

## 3.1 Pressure Reducing Regulators - Diaphragm - Sensed

### 3.1.1 General

TESCO's diaphragm sensed pressure reducing regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where high system pressures (up to 6000 psi) must be reduced to levels suitable for actuating low pressure (28 vac to 500 psi) instruments and related equipment.

### 3.1.2 Pressure Activation Methods

TESCO uses three basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the outlet pressure of a regulator.

**Control Knob:** Delivery pressure is increased by turning the control knob. The control knob applies a load through a spring to the diaphragm.

**Dome Load:** Delivery pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

**Combination Spring and Dome:** Delivery pressure is increased by applying a spring force as well as the introduction of pressurized gas or liquid.

### 3.1.3 Operation (Control Knob Adjustment)

Controlled outlet pressure settings are obtained using TESCO pressure reducing regulators by adjusting the control knob. Rotating the knob clockwise raises the outlet pressure while a counterclockwise rotation coupled with venting of the downstream side of the regulator plumbing lowers the outlet pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate set point.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter designed to stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

#### **WARNING**

A regulator is not intended to be used as a shutoff device. When the regulator is not in use, the inlet supply should be turned off. As a safety precaution, a pressure relief device should be installed downstream of the regulator to do so can result in death, serious injury, and/or property damage.

### 3.1.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCO (see last page for TESCO contact information).

The following steps outline the disassembly of pressure reducing regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the diaphragm.

**NOTE:** (Dome loaded regulators) All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the mounting bracket to be removed first. Remove upper portion of regulator (bonnet and/or dome). Some models require the mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring back-up plate, and diaphragm, etc. Review correct drawing to ensure that all parts have been disassembled.

4. The valve parts can now be removed from the regulator body by turning the seat retainer and/or back cap counterclockwise until it is free of the regulator body.

### CAUTION

When removing valve parts from a regulator that has a back cap, care must be taken to insure the main valve stem remains vertical. If the main valve stem is not removed correctly, parts may remain in the regulator.

5. To disassemble main valve assembly and/or valve, clamp valve in smoothed jaw vise or hold with pliers. Clamping should be done on flats.

### CAUTION

Care must be used to not damage valve.

### WARNING

Several TESCOM regulators are supplied with internal filters. They will be located either in the inlet port or in the main valve area of the regulator. In each case, they should be removed and replaced before reassembly.

## 3.1.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications:

1. Inspect all parts and replace those worn or damaged with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: Indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

### WARNING

Do not apply any type of grease to threaded internal parts of regulators that come standard with metal to metal diaphragm seals. Regulators with metal to metal diaphragm seals have Metal listed as the diaphragm material on their installation drawing.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seat must be installed with the chamfered side towards the main valve.
5. Standard Regulator with Control Knob - The body and bonnet are best joined by holding the bonnet assembly open end up and dropping all required items into place one at a time. The last item to be placed in the bonnet will be the diaphragm. It can be centered on the seating surface of the bonnet before the body assembly is inverted and screwed into the bonnet firmly - hand tight. Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.
6. Dome/Combination Spring and Dome Loaded Regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.
7. Self-Venting Regulator - If your regulator has an adjustable relief valve mechanism, it is set on final assembly at the factory and usually will not require further adjustment. If adjustment becomes necessary, use the following procedure after regulator has been installed.
  - Step 1.** Remove hole plug in control knob.
  - Step 2.** Using control knob, apply 10 to 15 psi on downstream side.
  - Step 3.** Turn clockwise vent adjusting screw (located under hole plug) until media can be heard escaping through vent valve.
  - Step 4.** Turn screw counterclockwise until media flow stops, plus 1/2 turn. Replace hole plug.
8. Reinstalling wire mesh inlet filter: Insert filter into primary inlet port. It then must be expanded to fit correctly. This can be accomplished by inserting a metal tool the same size as the port and then lightly tapping it with a hammer.

### **WARNING**

After regulator has been reassembled, it **MUST** be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

## 3.2 Pressure Reducing Regulators - Piston - Sensed

### 3.2.1 General

TESCOM piston sensed pressure reducing regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where high system pressures (up to 20,000 psi) must be reduced to levels suitable for actuating low pressure (0 to 20,000 psi) instruments and related equipment.

## 3.2.2 Pressure Activation Methods

TESCOM uses four basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the outlet pressure of a regulator.

**Control Knob:** Delivery pressure is increased by turning the control knob. The control knob applies a load through a spring to the piston.

**Dome Load:** Delivery pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

**Combination Spring and Dome:** Delivery pressure is increased by applying a spring force as

well as the introduction of pressurized gas or liquid.

**Air Actuated (Multiplier):** Delivery pressure is controlled by applying 0-100 psig pilot pressure to the air actuator, resulting in full outlet pressure range control.

## 3.2.3 Operation (Control Knob Adjustment)

Controlled outlet pressure settings are obtained using TESCO pressure reducing regulators by adjusting the control knob. Rotating the knob clockwise raises the outlet pressure while a counterclockwise rotation, coupled with venting of the downstream side of the regulator plumbing, lowers the outlet pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate set point.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter that only are designed to stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

### **WARNING**

A regulator is not intended to be used as a shutoff device. When the regulator is not in use, the inlet supply should be turned off. As a safety precaution, a pressure relief device should be installed downstream of the regulator.

## 3.2.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCO (see last page for TESCO contact information).

The following steps outline the disassembly of pressure reducing regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the piston.

NOTE: (Dome loaded regulators): All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the hand knob and/or mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring back-up plate, and piston sensor, etc. Review correct drawing to ensure that all parts have been disassembled.

NOTE: Two-stage regulators have portions on both ends of the regulator body that must be removed. It is TESCOm's recommendation that two-stage regulators be returned to the factory for repair.

4. The valve parts can now be removed from the regulator body by turning the seat retainer and/or back cap counterclockwise until it is free of the regulator body.

### CAUTION

Some TESCOm models have valve parts that are held in place by the use of left-handed threads.

When removing valve parts from a regulator that has a back cap, care must be taken to insure the main valve stem remains vertical. If the main valve stem is not removed correctly, parts may remain in the regulator.

5. To disassemble main valve assembly and/or valve, clamp valve in smoothed jaw vise. Clamping should be done on flats.

### CAUTION

Care must be used to not damage valve. Special service tools may be available to aid in the disassembly of the main valve assembly in certain models. Please contact your local TESCOm representative to learn more.

NOTE: Several TESCOm regulators are supplied with internal filters. They will be located either in the inlet port or in the main valve area of the regulator. In each case, they should be removed and replaced before reassembly.

## 3.2.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications:

1. Inspect all parts and replace those worn or damaged with TESCO M replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seats must be installed with the chamfered side towards the main valve.
5. Standard Regulator with Control Knobs - The body and bonnet are best joined by holding the bonnet assembly open end up and dropping all required items into place one at a time. The last item to be placed in the body of most all of TESCO M regulators is the piston sensor. Place all O-rings and back-up rings that are external to the piston sensor in the body before placing the sensor in place. O-rings should always be installed before back-up rings. The bonnet and body may now be attached. This is best done by holding the body in one hand and the bonnet in the other. Tilt the body at a 45° angle and then attach the bonnet by screwing it into the body firmly, hand tight.

Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.

6. Dome/Spring Combination and Dome Loaded Regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.
7. Self-Venting Regulator - If your regulator has an adjustable vent valve mechanism, it is set on final assembly at the factory and usually will not require further adjustment. If adjustment becomes necessary, use the following procedure after regulator has been installed:

**Step 1.** Remove hole plug located in control knob.

**Step 2.** Using control knob, apply 100 to 150 psi on downstream side.

**Step 3.** Turn vent adjusting screw clockwise (located under hole plug) until media can be heard escaping through vent valve.

**Step 4.** Turn Turn screw counter-clockwise until media flow stops, plus 1/2 turn. Replace hole plug.

8. Reinstalling wire mesh inlet filter - Insert filter into primary inlet port. It must then be expanded to fit correctly. This can be accomplished by inserting a metal tool the same size as the port and then lightly tapping it with a hammer.

### **WARNING**

After regulator has been reassembled, it should be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

## **3.3 Back Pressure Regulators - Diaphragm - Sensed**

### **3.3.1 General**

TESCOM's diaphragm sensed back pressure regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where the system or process requires the pressure to be limited to a maximum pressure. The control pressure range can be up to a maximum of 500 psig.

### **3.3.2 Pressure Activation Methods**

TESCOM uses three basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the back pressure of a regulator.

**Control Knob:** Back pressure is increased by turning the control knob. The control knob applies a load through a spring to the diaphragm.

**Dome Load:** Back pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

**Combination Spring and Dome:** Back pressure is increased by applying a spring force as well as the introduction of pressurized gas or liquid.

### **3.3.3 Operation (Control Knob Adjustment)**

Controlled back pressure settings are obtained using TESCOM back pressure regulators by adjusting the control knob. Rotating the knob clockwise raises the back pressure while a counterclockwise rotation will lower the back pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate back pressure set pressure.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter designed to stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

### **WARNING**

A back pressure regulator is not intended to be used as a system safety relief device. When the regulator is not in use, the inlet pressure should be turned off.

## 3.3.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see last page for TESCOM contact information).

The following steps outline the disassembly of back pressure regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the diaphragm.

NOTE: (Dome loaded regulators) All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring back-up plate, and diaphragm, etc. Review correct drawing to ensure that all parts have been disassembled.

4. The valve parts can now be removed from the regulator body by turning the seat retainer and/or back cap counterclockwise until it is free of the regulator body.
5. To disassemble diaphragm valve assembly and/or valve, clamp valve in smoothed jaw vise. Clamping should be done on flats.

### **CAUTION**

Care must be used to not damage valve.

### 3.3.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCOM replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.
3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: Indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

#### **WARNING**

Do not apply any type of grease to threaded internal parts of regulators that come standard with metal to metal diaphragm seals. Regulators with metal to metal diaphragm seals have Metal listed as the diaphragm material on their installation drawing.

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NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seat must be installed with the chamfered side towards the valve.
5. Standard Regulator with Control Knob - The body and bonnet are best joined by holding the bonnet assembly open end up and lowering all required items into place one at a time. The last item to be placed in the bonnet will be the diaphragm. It can be centered on the seating surface of the bonnet before the body assembly is inverted and screwed into the bonnet firmly – hand tight. The 44-2300 is an exception. In this case stack the diaphragm, diaphragm back up plate, load spring and spring button on top of the body. Lower the bonnet and screw the bonnet onto the body firmly-hand tight. Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.
6. Dome/Combination Spring and Dome Loaded Regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.

#### **WARNING**

After regulator has been reassembled, it MUST be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

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## 3.4 Back Pressure Regulators - Piston - Sensed

### 3.4.1 General

TESCOM piston sensed back pressure regulators are specifically engineered for applications requiring dependable pressure regulation. These regulators are especially appropriate for installations where the system or process requires the pressure to be limited to a maximum pressure. The control pressure range can be up to a maximum of 20,000 psi.

### 3.4.2 Pressure Activation Methods

TESCOM uses four basic types of activation methods. The activation method provides the means by which the operator can set the force that determines the outlet pressure of a regulator.

**Control Knob:** Delivery pressure is increased by turning the control knob. The control knob applies a load through a spring to the piston.

**Dome Load:** Delivery pressure is increased by applying pressurized gas or liquid to the dome of a regulator at a pressure equal to the outlet pressure desired. This dome pressure is normally provided by a second regulator called the pilot regulator.

**Combination Spring and Dome:** Delivery pressure is increased by applying a spring force as well as the introduction of pressurized gas or liquid.

**Air Actuated (Multiplier):** Delivery pressure is controlled by applying 0-100 psig pilot pressure to the air actuator, resulting in full outlet pressure range control.

### 3.4.3 Operation (Control Knob Adjustment)

Controlled back pressure settings are obtained using TESCOM back pressure regulators by adjusting the control knob. Rotating the knob clockwise raises the inlet pressure while a counterclockwise rotation will lower the inlet pressure. Final adjustments should be made in the direction of increasing pressure to obtain the most accurate back pressure set pressure.

TESCOM regulators will operate with any liquid or gaseous media compatible with the wetted materials. Some series/modifications come with an internal filter that only are designed to stop random contamination resulting from the installation of the regulator. An auxiliary upstream filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the regulator at high flow rates.

#### **WARNING**

A back pressure regulator is not intended to be used as a system safety relief device. When the regulator is not in use, the inlet pressure should be turned off.

## 3.4.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the regulator removed from the line. However, in some cases repair may be accomplished without removal of the regulator body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the regulator will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCO (see last page for TESCO contact information).

The following steps outline the disassembly of back pressure regulators for maintenance and repair:

1. Clamp the regulator in a vise by the flats on the bottom and/or side of the regulator body.
2. Turn control knob and/or spring adjustment mechanism counterclockwise to insure removal of all spring force on the piston.

NOTE: (Dome loaded regulators): All pressurized gas or liquid must be vented from dome before disassembly.

3. Remove upper portion of regulator (bonnet and/or dome). Some models require the hand knob and/or mounting bracket to be removed first.

NOTE: Upper portion of regulator may also include spring button, load spring, back-up plate, and piston sensor, etc. Review correct drawing to ensure that all parts have been disassembled.

4. The seat parts can now be removed from the regulator body by turning the seat retainer counter clockwise until it is free of the regulator body.
5. To disassemble sensor and valve assembly and/or valve, clamp the spring plate in a smoothed jaw vise or hold with pliers. Clamping should be done on flats.

### CAUTION

Care must be used to not damage valve surfaces.

## 3.4.5 Reassembly

The regulator is reassembled in the reverse order of disassembly, observing the following precautions. Please reference the Bill of Material and Assembly Drawing for the correct location of replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCO replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system they will be used in. All parts in the flow stream must be free of particles which could prevent proper seating of the main valve.

3. Apply a thin uniform coating of fluorocarbon grease to any or all of the following parts: Indentation of spring button, threaded portion of adjusting screw, entire threaded area of the bonnet, all O-rings, all threaded parts internal to regulator.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Valve seats must be installed with the chamfered side towards the main valve.
5. Standard regulator with control knobs - The body and bonnet are best joined by holding the bonnet assembly open end up and lowering all required items into place one at a time. The last item to be placed in the body of the majority of TESCO regulators, is the piston sensor. Place all O-rings and back-up rings that are external to the piston sensor in the body before placing the sensor in place. O-rings should always be installed before back-up rings. The bonnet and body may now be attached. This is best done by holding the body in one hand and the bonnet in the other. Tilt the body at a 45° angle and then attach the bonnet by screwing it into the body firmly, hand tight. Regulator should then be placed in vise and bonnet re-torqued to correct specifications. See Assembly Drawing.
6. Dome/Spring combination and Dome Loaded regulators are more easily reassembled by holding regulator firmly in vise and reinstalling dome.
7. Reinstalling wire mesh inlet filter - Insert filter into primary inlet port. It must then be expanded to fit correctly. This can be accomplished by inserting a metal tool the same size as the port and then lightly tapping it with a hammer.

### **WARNING**

After regulator has been reassembled, it must be connected to a pressure source with media compatible with the use of the regulator and pressurized to check for internal and external leakage and operating characteristics.

## 3.5 Valves - TESCO Multi-Turn and Metering Valves

### 3.5.1 General

TESCO Multi-Turn and Metering Valves are specifically engineered for applications requiring dependable controls. These valves are especially appropriate for installations where high system pressures (up to 10,000 psi) are used.

### 3.5.2 Actuation Type

These are hand knob, manual control. The valve is closed by turning the hand knob clockwise.

### 3.5.3 Operation (Control Knob Adjustment)

The valve is closed by turning the hand knob clockwise and opened by turning the hand knob counterclockwise. The hand knob rotation changes the position of the valve stem in relation to the seat.

TESCOM valves will operate with any liquid or gaseous media compatible with the wetted materials. A filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the valve at high flow rates.

### 3.5.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the valve removed from the line. However, in some cases repair may be accomplished without removal of the valve body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

An Assembly Drawing and Bill of Material for the valve will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCOM (see last page for TESCOM contact information).

The following steps outline the disassembly of the Multi-Turn and Metering Valves for maintenance and repair:

1. Clamp the valve body in a vise.
2. Turn the hand knob counterclockwise several turns to ensure the valve stem is not contacting the seat.
3. Remove the hand knob to expose the flats on the upper portion of the stem retainer.

NOTE: Upper portion of the valve may also include stem, seal, o-rings seat retainer. Review correct drawing to ensure that all parts have been disassembled.

4. The 30-1100 series seat is accessed from the bottom of the valve body. Please check your assembly drawing to verify.

#### CAUTION

Care must be used to not damage sealing components.

### 3.5.5 Reassembly

The valve is reassembled in the reverse order of disassembly, observing the following precautions.

Please reference Bill of Materials and Assembly Drawing for the correct location of the replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCO M replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system the valve will be used in. All parts in the flow stream must be free of particles which could prevent proper seating on the valve stem.
3. Apply a thin uniform coating of fluorocarbon grease to the following parts: threaded portion of the adjusting screw, the lower part of the threaded area of the stem retainer, all the o-rings.

NOTE: Do NOT apply any type of grease to the inlet and outlet connections.

4. Valve seat must be installed with the chamfered side towards the valve stem.
5. Thread the stem retainer into body hand-tight. Valve should be placed into a vise and the stem retainer re-torqued to specifications. See Assembly Drawing.

### **WARNING**

After valve has been reassembled, it must be connected to a pressure source with a media compatible with the use the valve and pressurized to check for internal and external leakage and operation characteristics.

## 3.6 Valves - TESCO M On-Off and Diverting Vaves

### 3.6.1 General

TESCOM On-Off and Diverting Valves are specifically engineered for application requiring dependable controls. These valves are especially appropriate for installations where high system pressures (up to 10,000 psig) are used.

### 3.6.2 Actuation Type

The valve is closed or opened by applying low air pressure to the actuation port.

### 3.6.3 Operation (Control Knob Adjustment)

The normally closed (spring closed) VA and VG valves require a minimum pressure of 60 psi applied to the actuation port to open. The normally open (spring open) VA and VG valves require a minimum pressure of 60 psi applied to actuation port to close. Most other valves, including the VL, VM, VT, and VU valves require a minimum pressure of 80 psi for actuation pressure. Please check your drawings for the maximum actuation pressure.

TESCOM valves will operate with any liquid or gaseous media compatible with the wetted materials. A filter is recommended for use in all but the cleanest media. Gaseous media should be free of excessive moisture to prevent icing of the valve at high flow rates.

## 3.6.4 Maintenance

The following procedures are provided to enable the customer to perform all normal maintenance and repair operations. These operations are more easily performed with the valve removed from the line. However, in some cases repair may be accomplished without removal of the valve body as long as the supply has been shut off and the inlet and outlet pressures have been vented.

The following steps outline the disassembly of the On-Off and Diverting Valves for maintenance and repair. For field repairs and maintenance, it is recommended to use the valve modules for repair. Module numbers are located on the datasheets or call TESCO M for the module number.

An Assembly Drawing and Bill of Material for the valve will be needed to complete maintenance procedures. The Assembly Drawing and Bill of Material are separate from this manual and available by contacting TESCO M (see last page for TESCO M contact information).

Special repair tools are available for field servicing valve modules (P/N 64084 for VA module and JT103871 for VG module):

1. Clamp the valve body in a vise.
2. Remove the upper portion of the valve bonnet. The actuation side.
3. For the VT and VU valves, also remove the lower bonnet.

NOTE: Upper portion of the valve may also include stem, seals and o-rings. Review correct drawing to ensure that all parts have been disassembled.

### CAUTION

Care must be used to not damage sealing components.

## 3.6.5 Reassembly

The valve is reassembled in the reverse order of disassembly, observing the following precautions. Please reference Bill of Materials and Assembly Drawings for the correct location of the replacement parts and correct torque specifications.

1. Inspect all parts and replace those worn or damaged with TESCO M replacement parts.
2. All parts should be cleaned to the cleanliness level required for safe operation with the media and system the valve will be used in. All parts in the flow stream must be free of particles which could prevent proper seating on the valve stem.
3. Apply a thin uniform coating of fluorocarbon grease to the following parts: The bonnet threads and all o-rings.

NOTE: Do NOT apply any type of grease to the inlet or outlet connections.

4. Place the valve body into a vise and re-torque the bonnet to specifications. See Assembly Drawing.

## WARNING

After valve has been reassembled, it must be connected to a pressure source with a media compatible with the use of the valve and pressurized to check for internal and external leakage and operation characteristics.

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## Section 4: Limited Warranty

TESCOM™ Corporation (“Seller”) warrants that the licensed firmware embodied in the goods will execute the programming instructions provided by Seller, and that the goods manufactured or services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first.

Consumables and services are warranted for a period of 90 days from the date of shipment or completion of the services. Products purchased by Seller from a third party for resale to Buyer (“Resale Products”) shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products.

If buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, correct any errors that are found by Seller in the firmware of services or repair or replace F.O.B. point of manufacture that portion of the goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the goods/services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources or environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at buyer's expense.

Seller shall not be obligated to pay any costs or charges incurred by buyer or any other party except as may be agreed upon in writing in advance by Seller. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel and representatives for site travel and diagnosis under this warranty clause shall be borne by buyer unless accepted in writing by Seller.

Goods repaired and parts replaced by Seller during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer.

This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by Seller.

**The warranties and remedies set forth above are exclusive. There are no representations or warranties of any kind, expressed or implied, as to merchantability, fitness for particular purpose or any other matter with respect to any of the good or services.**

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