

Equilibar, LLC  
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11<sup>th</sup> May 2017  
Revision Level: 3

## **Letter of findings for Equilibar Back Pressure Regulator**

**Element Project:** TRA-031269-00

**Objective:** To clarify correct application of ATEX Directive to Equilibar Back Pressure Regulators

**Scope:** Manufacturer: Equilibar, LLC (address as detailed above)  
Description: Back Pressure Regulator  
Part Numbers: Research Series (Excluding ZF), GS/GS(D) Series, NL/NLB Series, HV Series, FDO Series, FDT Series.

### **Evaluation Process:**

The back pressure regulators detailed above have been assessed against the requirements of the ATEX Directive 2014/34/EU for suitability for use when a Zone 0 hazardous atmosphere is present externally. The internal parts do not fall within the scope of the ATEX Directive, as they may be above or below atmospheric pressure (0.8-1.1 Bara) when in operation. It was also considered that the range of back pressure regulators fall within the definition of simple equipment.

### **Product Construction:**

Equilibar Back Pressure Regulators have a construction that consists of a single frictionless flexible diaphragm fitted between two pressure constraining metal halves (the body and the cap). Models within the range may also incorporate a second lower frictionless diaphragm. Throughout the range, model variance may be due to size or the sealing mechanism between the two metallic components. Some models rely on the diaphragm to provide the sealing mechanism, other model variant rely on two recessed O-rings present between the diaphragm and each metal retaining part. The Equilibar back pressure regulator may be comprised of any combination of the materials present within the appendix of this report. An example part number breakdown is included within the Appendix of this report. Other varying factors include: Port Size, Port Threads, Recess, Bolts, Pressure Rating, Temperature Rating, Diaphragm Thickness, and O-ring Material.

**Sources of Ignition:**

Element has determined that the equipment is not capable of creating a potential ignition source under normal operation, expected malfunction or rare malfunction. The inability to create an ignition is a consequence of the materials used in construction:

- i. The equipment body is manufactured entirely from suitable metallic components not contain by mass more than:
  - 10% in total of aluminium, magnesium, titanium and zirconium.
  - 7.5% in total magnesium, titanium and zirconium.
- ii. The frictionless flexible diaphragm is manufactured from metallic foils or antistatic materials only as detailed within this report.
- iii. The O-rings, which may be fitted, are not relied upon for explosion protection and serve a functional purpose only. The O-rings present are not exposed to efficient charging mechanisms during operation.

Further assessment and information detailing the potential ignition sources present within this equipment and the related mitigation present is attached in the Appendix of this letter. The equipment was assessed against the relevant clauses of EN13463-1 and a formal ignition hazard assessment was then conducted.

**Conclusion:**

Element Materials Technology therefore conclude that the Equilibar Back Pressure Regulators detailed above fall under the definition of “simple equipment” as stated in the ATEX Directive Guidelines. For this reason the equipment is not Ex or CE marked according to the requirements of the ATEX Directive 2014/34/EU.

However the end user should be aware of the precautions/conditions of safe use required during manufacture, installation and operation detailed within Annex B of this letter.

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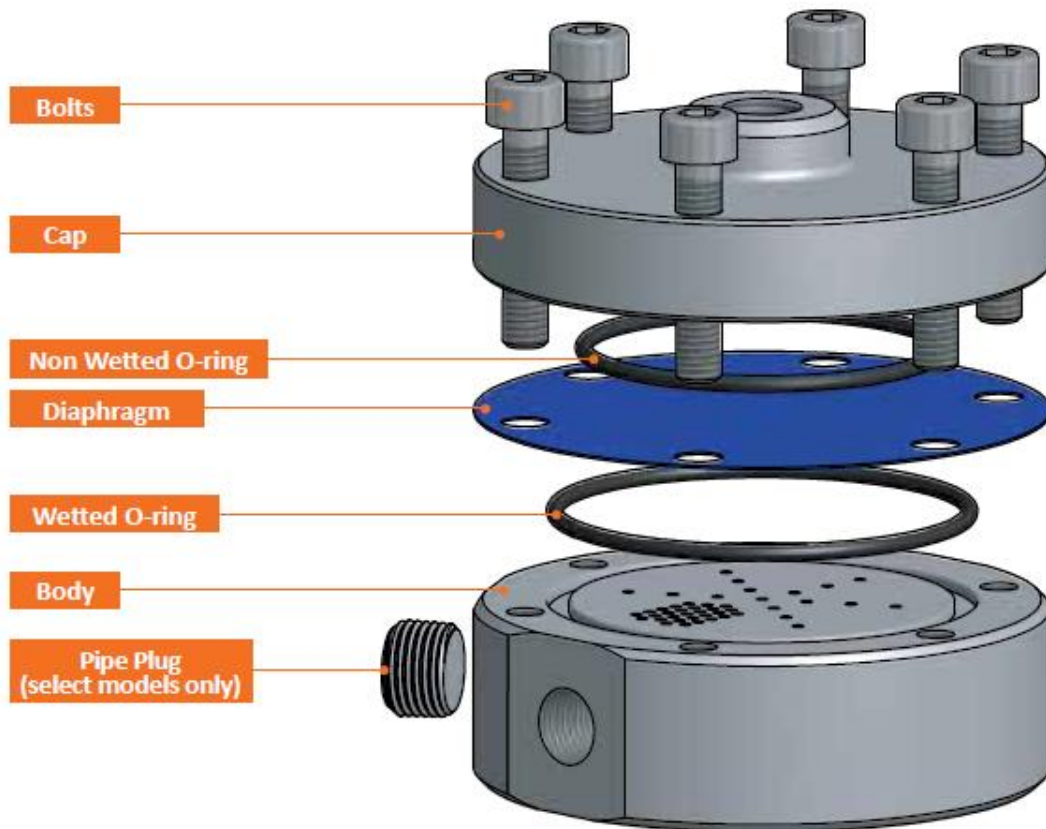
## Appendix A: Formal Ignition Hazard Assessment

Ignition hazard		Assessment of the frequency of occurrence without application of an additional measure				Measures applied to prevent the ignition source becoming effective			Frequency of occurrence including measures applied						
Potential ignition source	Description / basic cause	Normal operation	Foreseeable	Rare malfunction	Not relevant	Reasons for assessment	Description of the measure applied	Basis	Technical Documentation	Normal operation	Foreseeable	Rare malfunction	Not relevant	Resulting equipment category in respect of this ignition hazard	Necessary restrictions
Mechanical Sparks	Mechanically generated sparks due to impact.	x				Risk of impact during operation from external sources.	External metallic components utilised by the equipment do not contain by mass more than: i) 10% in total of aluminium, magnesium, titanium and zirconium. and not more than; ii) 7.5% in total magnesium, titanium and zirconium.	EN13463-1 Cl 6.4	Manufacturer's documentation: <i>ATEX Materials Memorandum May 2 2016</i>				x	1G	Metallic Composition.
Electrostatic charging	Electrostatic charges on non-metallic components.	x				Airflow passing through the back pressure regulator over non-metallic diaphragm part.	Only metallic foil diaphragms or diaphragms manufactured from materials whose surface resistivity is <1GΩ may be used as listed in this report. Surface resistivity has been determined by material data sheet or surface resistivity testing I.A.W 60079-0.	EN13463-1 Cl 6.7.3	Material Data Sheets Test Records: TRA-031269-00				x	1G	<1GΩ
Electrostatic charging	Electrostatic charges on isolated metallic parts.	x				Isolated conductive parts can become charged by electrostatic induction to a hazardous static.	Conditions of Safe Use and Manufacture state that: 'All metallic parts must be suitably bonded to earth through the process connections, via a low impedance connection. Continuity is to be confirmed upon installation.'	EN13463-1 Cl 6.7.2	Conditions of Safe Use and Manufacture				x	1G	-
Hot surfaces	Not applicable for this equipment.				x	N/A	N/A	N/A	N/A				x	N/A	N/A
Electrical sparks	Not applicable for this equipment.				x	N/A	N/A	N/A	N/A				x	N/A	N/A
Lightning	This ignition source is not significant for the manufacturer of the equipment and is an end user responsibility.				x	N/A	N/A	N/A	N/A				x	N/A	N/A

Ignition hazard		Assessment of the frequency of occurrence without application of an additional measure				Measures applied to prevent the ignition source becoming effective				Frequency of occurrence including measures applied				
Potential ignition source	Description / basic cause	Normal operation Foreseeable	Rare malfunction	Not relevant	Reasons for assessment	Description of the measure applied	Basis	Technical Documentation	Normal operation Foreseeable	Rare malfunction	Not relevant	Resulting equipment category in respect of this ignition hazard	Necessary restrictions	
Radio frequency (RF) electromagnetic waves from 10 <sup>4</sup> Hz to 3 x 10 <sup>12</sup> Hz	Not applicable for this equipment.			x	N/A	N/A	N/A	N/A			x	N/A	N/A	
Electromagnetic waves from 3 x 10 <sup>11</sup> Hz to 3 x 10 <sup>15</sup> Hz	Not applicable for this equipment.			x	N/A	N/A	N/A	N/A			x	N/A	N/A	
Ionizing radiation	Not applicable for this equipment.			x	N/A	N/A	N/A	N/A			x	N/A	N/A	
Ultrasonics	Not applicable for this equipment.			x	N/A	N/A	N/A	N/A			x	N/A	N/A	
Adiabatic compression and shock waves	Not applicable for this equipment.			x	N/A	N/A	N/A	N/A			x	N/A	N/A	
Exothermic reactions, including self-ignition of dusts	Not applicable for this equipment.			x	N/A	N/A	N/A	N/A			x	N/A	N/A	

## Appendix B: Further Information

### General Equipment Arrangement



**Figure 1:** General Construction Arrangement Equilibar Back Pressure Regulator.

## Permitted Materials

The evaluation has been conducted with the following materials included in the product construction.

Body Material	Diaphragm Material
Stainless Steel 300 Series	Metal Foils (see approved metals listed under Body Material)
Stainless Steel 400 Series	25% Carbon filled PTFE
Hastelloy	EPDM
Monel	Polyethylene - Anti-static
Bronze 500 Series	1% Carbon Filled Polyethylene UHMW
Brass 360 (Optional Nickel Plated)	PTFE - Static Dissipative

The polymer materials have been tested and only those listed in the table can be used. Any change of polymer material will necessitate further test and assessment.

## Reference Documents

Document Title	Revision Date
ATEX Materials Memorandum	2016-07-08
DuPont Teflon PTFE Specifications	-
Test Record TRA-031269-03	2017-03-01

## Details of Variations

This letter of findings is Revision 3 and includes the following amendment(s):

- Revision 3: Non-technical typographical changes
- Revision 2:
  - Inclusion of 4 additional diaphragm materials:
    - EPDM
    - Anti-static polyethylene
    - 1% Carbon filled polyethylene
    - Static dissipative polyethylene
  - Inclusion of 2 additional body materials:
    - Bronze 500 series
    - Brass 360 (Optional Nickel Plated)

## Conditions of Safe Use and Manufacture

1. All metallic parts must be suitably bonded to earth through the process connections, via a low impedance connection. Continuity is to be confirmed upon installation.

## Example Part Number Breakdown

Example																		
BD	12	S	N	G	X	-	N	S	X	P	100	T	100	V	X	VVV	V	B
					X	-			X	P		T			X			
1	2	3	4	5	6	-	7	8	9		10		11	12	13	14	15	16

1. Model
2. Port Size
3. Body Materials
4. Port Threads
5. Recess
6. Mod #
7. Reference Port Threads
8. Cap Material
9. Bolts
10. Pressure Rating
11. Temperature Rating
12. Diaphragm Material
13. Diaphragm Thickness
14. O-Ring (Wetted)
15. O-Ring (Non-Wetted)
16. Special Options