Global Aerosol Can Strength/Performance Requirements

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Ball Aerosol Packaging

Metals that keep products precious.
There is nothing more precious than home. We believe what you bring into your home should be sustainable, convenient and reliable. From aerosol cans for paint, deodorant, cooking sprays and cleaners, Ball packages products for everyday life.
Global Aerosol Locations

NORTH AMERICA

SOUTH AMERICA

EUROPE

MAP LEGEND
- Metal Food & Household Products Packaging
- Aluminum Slugs
- Headquarters
- Technology Center
Global Aerosol Can Strength/Performance Requirements

Aerosol Pressure Ratings & Markings

• Can Size Limitations
• Pressure Regulations and Limitations
• Test Temperature
• Thickness Regulations
• Component Chemistry Restrictions
• Markings
• Labeling Requirements are not addressed

Disclaimer – Regulations are dynamic. These regulations summarized in the following slides are accurate to the best of our knowledge. To ensure compliance with the target country or state, the shipper/marketer must confirm compliance with the country’s or state’s appropriate regulatory agency.
North America (USA, Canada & Mexico)

U.S. DOT Regulations (49 CFR) and Canadian Regulations (Transport Canada) are similar

- Maximum container size is 1 liter
- 3 standard types of aerosol containers
  - Non-specification (N2P)
  - DOT-2P, TC-2P
  - DOT-2Q, TC-2Q
North America (USA, Canada & Mexico)

Pressure Testing Temperature is $130^{\circ}F \ (54.4^{\circ}C)$

- Non-specification (N2P)
  - 140 psig or less at $130^{\circ}F$
  - Minimum buckle/distortion pressure is 140 psig
  - Minimum burst pressure is 210 psig
- No minimum thickness requirement
- No marking requirement
North America (USA, Canada & Mexico)

• DOT-2P (TC-2P)
  • Pressure greater than 140 psig up to 160 psig at 130°F
  • Minimum buckle/distortion pressure is 160 psig
  • Minimum burst pressure is 240 psig
  • 0.007” minimum thickness requirement
  • Container must be marked (visibly) with DOT-2P and the can manufacturer’s registration number
  • Ball transitioning to a combined marking: DOT/TC-2P M5702
North America (USA, Canada & Mexico)

- DOT-2Q (TC-2Q)
  - Pressure greater than 160 psig up to 180 psig at 130°F
  - Minimum buckle/distortion pressure is 180 psig
  - Minimum burst pressure is 270 psig
  - 0.008” minimum thickness requirement
  - Container must be marked (visibly) with DOT-2Q and the can manufacturer’s registration number
  - Ball transitioning to a combined marking: DOT/TC-2Q M5702
Europe


• Maximum container size is 1 liter
• 3 standard types of aerosol containers
  • 12 bar
  • 15 bar
  • 18 bar
• Russia and eastern Europe also appear to be utilizing the same standard
Europe (EU Member States)

Pressure Testing Temperature is 50ºC (122ºF)

- 12 bar
  - 8 bar (116 psig) or less at 50ºC
  - Minimum buckle/distortion pressure is 12 bar (174 psig)
  - Minimum burst pressure is 14.4 bar (209) psig
- No minimum thickness requirement
- Containers to be marked with “3” (reverse epsilon) to show compliance to the directive
Europe (EU Member States)

Pressure Testing Temperature is 50°C (122°F)

- 15 bar
  - 10 bar (145 psig) or less at 50°C
  - Minimum buckle/distortion pressure is 15 bar (218 psig)
  - Minimum burst pressure is 18 bar (261) psig
- No minimum thickness requirement
- Containers to be marked with “3” (reverse epsilon) to show compliance to the directive
Europe (EU Member States)

Pressure Testing Temperature is 50°C (122°F)

- 18 bar
  - 12 bar (174 psig) or less at 50°C
  - Minimum buckle/distortion pressure is 18 bar (261 psig)
  - Minimum burst pressure is 21.6 bar (313 psig)
- No minimum thickness requirement
- Containers to be marked with “3” (reverse epsilon) to show compliance to the directive
China & India

No documentation of regulations available
“Free Market” mentality
Check with local agents/regulatory agencies as regulations are subject to change
More acceptance of EU regulations
Australia

Very similar to the EU directive

• Maximum container size is 1 liter
• 3 standard types of aerosol containers
  • 12 bar
  • 15 bar
  • 18 bar
Australia

Also have the option of using a non-standard can suited for your product’s pressure

• Example
  – Product/Propellant equilibrium pressure is 8.7 bar (126 psig)
  – Can use a 13 bar can with a minimum buckle/distortion of 13 bar (189 psig) and a minimum burst of 15.6 bar (226 psig)
Japan

Unique standard

- Single rating
- Exempted from Gas Safety Law if 1 liter or less
- Maximum allowable pressure is 7.86 bar (114 psig) at 37°C (98°F)
- Buckle pressure is 1.5X equilibrium pressure at 50°C
- Burst pressure is 1.8X equilibrium pressure at 50°C
- No minimum thickness
Japan

To ensure compliance, most cans are made to the maximum allowable pressure

• Buckle/distortion of 12.8 bar (185 psig)
• Burst strength of 14.7 bar (231 psig)

No marking requirement, but certification may be needed
Japan

Certification

- Container specifications and drawing
- Chemical composition of base metal
- Distortion and Burst Performance Data
Korea

Similar to Japan

- Single rating
- Maximum allowable pressure is unknown
- Buckle pressure is 12.8 bar (185 psig)
- Burst pressure is 14.7 bar (213 psig)
- Minimum thickness of 0.22 mm (0.0085”)
Korea

Shipments subject to inspection

- Often require container certification
  - Container specifications and drawing
  - Chemical composition of base metal
  - Distortion and Burst Performance Data
  - Body wall thickness
Korea

Sample Certification

Customer Container Specification
Dimensional Quality Performance
211 Diameter Die Necked-in Aerosol Container - (207.5 tops, 210 btms)

*****SPECIAL FOR EXPORT TO KOREA*****

Nominal Can Height  Overall Height
in.  mm    +/- 0.005 in.  +/- 0.000 mm
413  122    5.580   141.73
604  182    7.017   178.23
612  187    7.157   190.93
713  198    8.579   217.91

ALL COMPONENTS ELECTROLYTIC TINPLATED STEEL
CHEMICAL REQUIREMENTS FOR TINPLATE PER ASTM A62 - TYPE MR
(CASE COMPOSITION mass%)
CARBON   0.11
MANGANESE 0.66
PHOSPHORUS 0.020
SULFUR     0.05
SILICON    0.020
COPPER     0.26
NICKEL     0.41
CHROMIUM   0.10
MOLYBDENUM 0.06
OTHER ELEMENTS, EA. 0.02

211 DIA. SPECIFICATIONS FOR EXPORT TO KOREA
BODY:  808 DR 0.0000 +/-0.024mm
RM:  1789 T5 0.0044 +/-0.058 mm
TOP:  1284 TJ 0.0041 +/-0.038 mm

<table>
<thead>
<tr>
<th>ITEM</th>
<th>KOREAN (KG SA) REQUIREMENT</th>
<th>TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Thickness, minimum</td>
<td>0.216 mm (0.0082&quot;) min.</td>
<td>0.224 mm (0.0088&quot;)</td>
</tr>
<tr>
<td>Distortion Pressure, minimum</td>
<td>12.76 bars (185 psi) min.</td>
<td>14.5 - 15 bars (206 - 213 psi)</td>
</tr>
<tr>
<td>Bursting Pressure, minimum</td>
<td>14.69 bars (214 psi) min.</td>
<td>21 - 22 bars (299 - 313 psi)</td>
</tr>
</tbody>
</table>

Ball Aerosol & Specialty Packaging
1125 Gasket Drive
Elgin, IL 60120 USA

Signature:  [Signature]

This information is furnished with the understanding that it is to be used only for the purpose for which it was requested, and is not to be divulged to other persons or companies without the written consent of Ball Aerosol & Specialty Packaging. It is to be returned to Ball Aerosol & Specialty Packaging after it has served its purpose.
South America

Similar to North American Regulations

- 3 standard types of aerosol containers
  - Non-specification/standard
  - 2P
  - 2Q
- Some use of EU regulations as well
South America

Standard Cans
- 10 bar (145 psig) buckle
- 15 bar (219 psig) burst

2P Cans
- 11.4 bar (163 psig) buckle
- 17.2 bar (245 psig) burst

2Q Cans
- 12.8 bar (185 psig) buckle
- 19.4 bar (281 psig) burst

Differences between North American regulations and South may just be “rounding”
# Global Aerosol Can Regulations

## Aerosol Container Pressure Requirements

<table>
<thead>
<tr>
<th>Country</th>
<th>Rating</th>
<th>Product Max Press @ Temp °C/F</th>
<th>Can Min Performance</th>
<th>Burst Press psig</th>
<th>Min. Plate Thickness mm/inches</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA &amp; CANADA</td>
<td>Non</td>
<td>54.4/130</td>
<td>9.66/140</td>
<td>14.48/210</td>
<td>NR</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>DOT 2P</td>
<td></td>
<td>11.03/160</td>
<td>16.55/240</td>
<td>0.18/0.007</td>
<td>DOT-2P + MFG^2</td>
</tr>
<tr>
<td></td>
<td>DOT 2Q</td>
<td></td>
<td>12.41/180</td>
<td>18.62/270</td>
<td>0.20/0.008</td>
<td>DOT-2Q + MFG^2</td>
</tr>
<tr>
<td></td>
<td>Max Press</td>
<td></td>
<td>12.41/180</td>
<td></td>
<td></td>
<td>Exemption Cans Available</td>
</tr>
<tr>
<td>Europe</td>
<td>Min Can</td>
<td>50/122</td>
<td>6.7/97</td>
<td>12.0/174</td>
<td>NR</td>
<td>Epsilon to be required in new legislation – some countries already mandate (e.g. France)</td>
</tr>
<tr>
<td></td>
<td>“12 Bar”</td>
<td></td>
<td>8.0/116</td>
<td>14.4/209</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“15 Bar”</td>
<td></td>
<td>10.0/145</td>
<td>18.0/261</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“18 Bar”</td>
<td></td>
<td>12.0/174</td>
<td>21.6/313</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max Press</td>
<td></td>
<td>12.0/174</td>
<td>See “18 bar”</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>Min Can</td>
<td>50/122</td>
<td>6.7/97</td>
<td>12.0/174</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>Other (12/15/18 bar)</td>
<td></td>
<td>P= pressure 1.5xP</td>
<td>1.8xP</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max Press</td>
<td></td>
<td>12.0/174</td>
<td>See “18 bar”</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>None</td>
<td>37/98</td>
<td>7.86/114</td>
<td>14.7/213</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>50/122</td>
<td></td>
<td>P= pressure 1.5xP</td>
<td>1.8xP</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>Standard</td>
<td>Unknown</td>
<td>10/145</td>
<td>15/219</td>
<td>NR</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>2P</td>
<td></td>
<td>11.4/163</td>
<td>17.2/245</td>
<td>NR</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>2Q</td>
<td></td>
<td>12.8/185</td>
<td>19.4/281</td>
<td>NR</td>
<td>Unknown</td>
</tr>
<tr>
<td>Korea</td>
<td>None</td>
<td>Unknown</td>
<td>12.8/185</td>
<td>14.7/213</td>
<td>0.22/0.0085</td>
<td>NR</td>
</tr>
</tbody>
</table>

### Notes:

1. Europe ratings are convention, not law. Their law is based on pressure at 50/122 and the can minimum buckle is 1.5 times this pressure and minimum burst is 1.8 times this pressure.
2. Japan pressure listed is maximum allowable. For can performance can use the second line but product pressure cannot exceed 7.86/114 at 37/98.
3. No one seems to know if there is a Korean product pressure or temperature.
4. Australia also has an additional “non-flammable compressed gas” regulation which also 50°C maximum product pressure of 15 bar requiring a 22.5 bar can. Their comment probably will never be used. Australia is adopting the European 12/15/18 bar grouping but confirm that you can make and use a 13 bar can for a “13 bar product” (product with equilibrium pressure of 8.7 bar).
5. Manufacturer’s symbol or number must be registered with the U.S. DOT. Ball Aerosol’s registration number is M5702.

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