



Global Aerosol Can Strength/Performance Requirements

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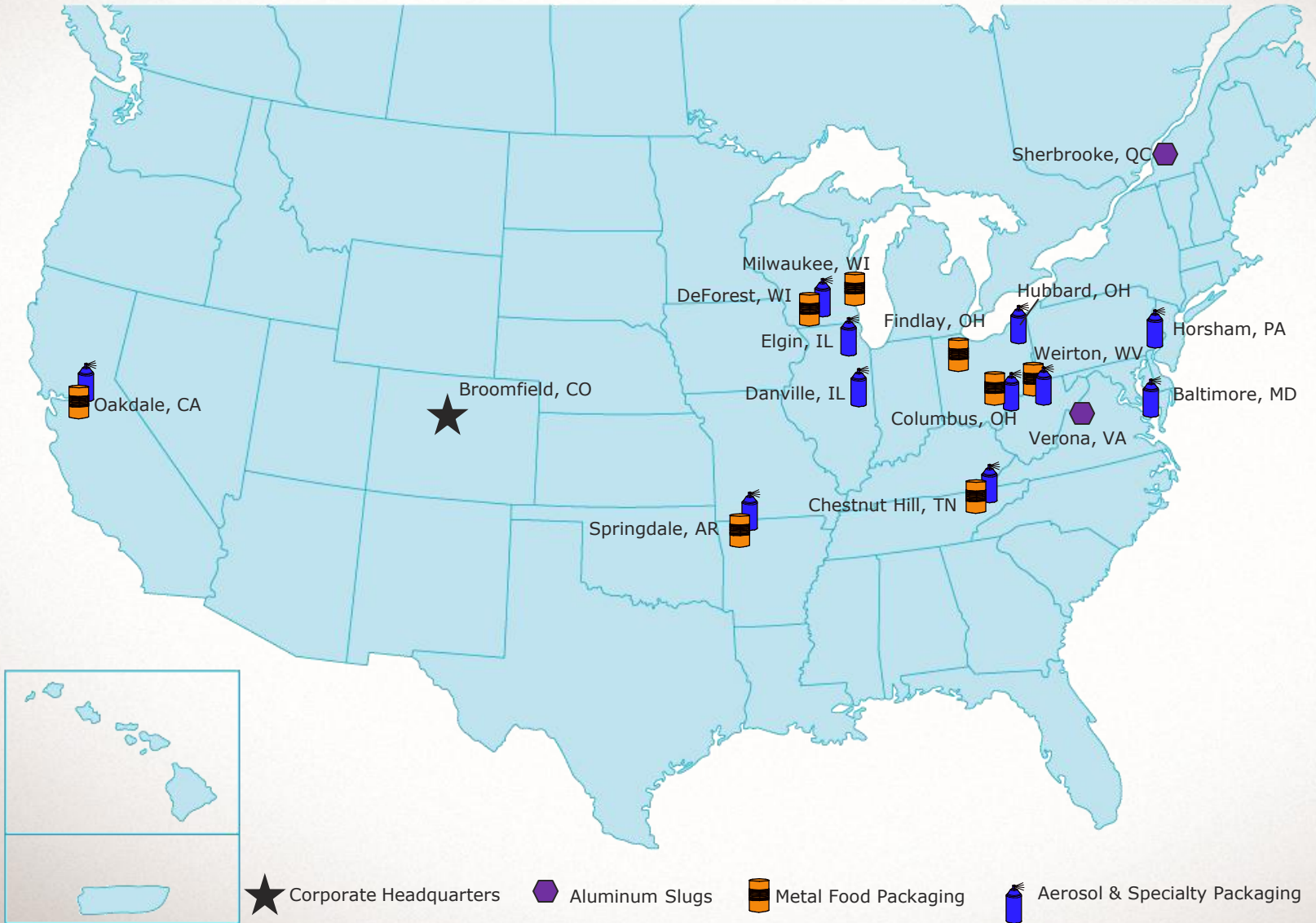
Ball Aerosol Packaging

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.

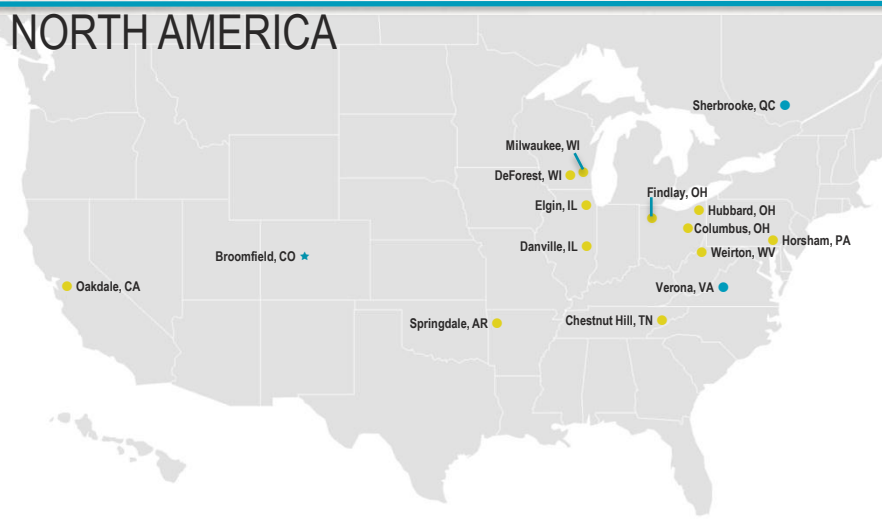


Ball Metal Food & Household Products Packaging Division, Americas



Global Aerosol Locations

NORTH AMERICA



EUROPE



SOUTH AMERICA



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°F (54.4°C)

- Non-specification (N2P)
 - 140 psig or less at 130°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

Council Directive of 20 May 1975

- 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 50°C (122°F)

- 12 bar
 - 8 bar (116 psig) or less at 50°C
 - 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

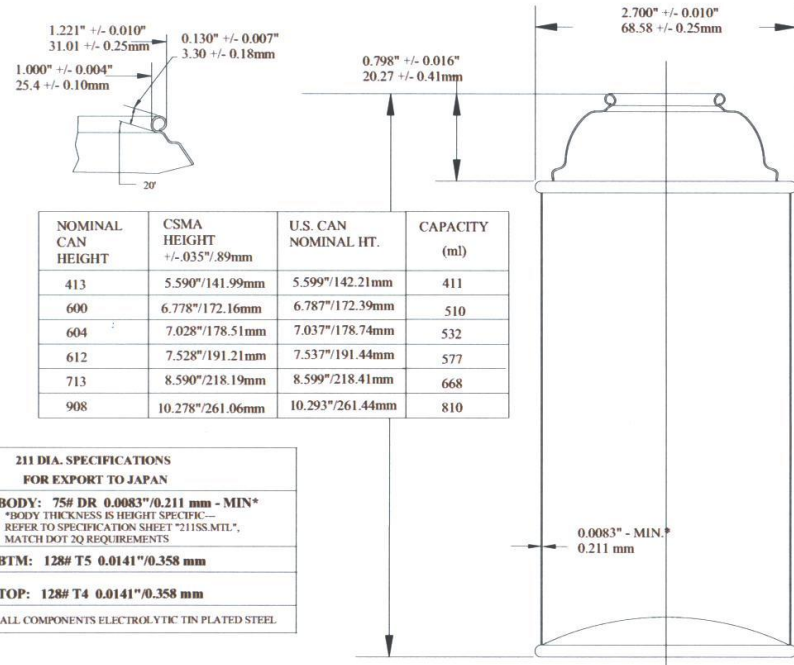
Certification

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



Does not reflect any changes made after 6/12/2006

CUSTOMER CONTAINER SPECIFICATION DIMENSIONAL QUALITY PERFORMANCE 211 DIAMETER STRAIGHT-SIDED AEROSOL CONTAINER ***SPECIAL FOR EXPORT TO JAPAN***



ITEM	JAPAN REQUIREMENT	TEST RESULTS
WALL THICKNESS	NONE	0.211 mm - MIN.
DISTORTION PRESSURE	13 KG/CM ²	13.0 KG/CM ² - MIN.
BURSTING PRESSURE	15 KG/CM ²	15.0 KG/CM ² - MIN.

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

Signature : _____
 Anatol Bilyk, Materials Scientist

DRWG#	REV.	DATE
211JAPAN	1	12/2/98

THIS INFORMATION IS FURNISHED WITH THE UNDERSTANDING THAT IT IS USED ONLY FOR THE PURPOSE FOR WHICH IT WAS REQUESTED, AND IS BE ISSUED TO OTHER PERSONS OR COMPANIES WITHOUT THE WRITTEN OF BALL AEROSOL & SPECIALTY PACKAGING. IT IS TO BE RETURNED TO BALL AEROSOL & SPECIALTY PACKAGING AFTER IT HAS SERVED ITS PURPOSE.

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



Sample Certification

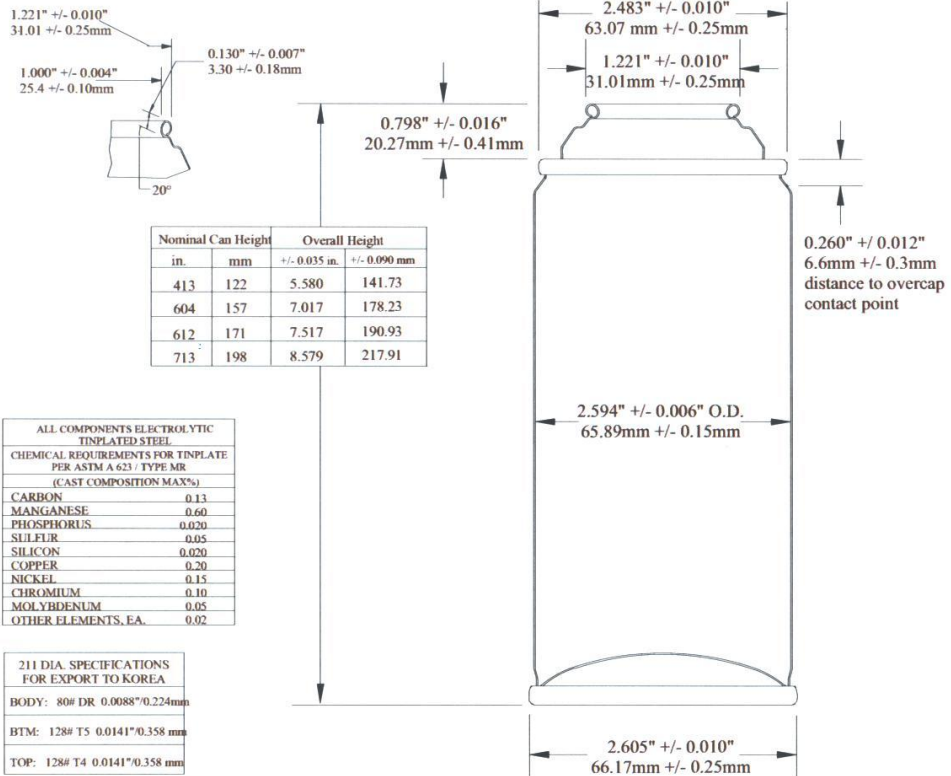


Customer Container Specification Dimensional Quality Performance

Does not reflect any
changes made after
6/12/2006

211 Diameter Die Necked-in Aerosol Container - (207.5 tops, 210 btms)

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



ALL COMPONENTS ELECTROLYTIC TINPLATED STEEL	
CHEMICAL REQUIREMENTS FOR TINPLATE PER ASTM A 623 - TYPE MR (CAST COMPOSITION MAX%)	
CARBON	0.13
MANGANESE	0.60
PHOSPHORUS	0.020
SULFUR	0.05
SILICON	0.020
COPPER	0.20
NICKEL	0.15
CHROMIUM	0.10
MOLYBDENUM	0.05
OTHER ELEMENTS, EA.	0.02

211 DIA. SPECIFICATIONS FOR EXPORT TO KOREA	
BODY:	80# DR 0.0088" 0.224mm
BTM:	128# T5 0.0141" 0.358 mm
TOP:	128# T4 0.0141" 0.358 mm

ITEM	KOREAN (KGS) REQUIREMENT	TEST RESULTS
Wall Thickness, minimum	0.216 mm (0.0085") min.	0.224 mm (0.0088")
Distortion Pressure, minimum	12.76 bars (185psi) min.	14.5 - 15 bars (206 - 213 psi)
Bursting Pressure, minimum	14.69 bars (214psi) min.	21 - 22 bars (299 - 313psi)

DRWG#	REV.	DATE
211NIKOREA	0	03/18/2004

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

Signature : _____
Anatol Bilyk, Materials Scientist

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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 PRODUCT/CAN BUCKLE /CAN BURST /THICKNESS

COUNTRY	RATING	PRODUCT MAX PRESS		CAN MIN PERFORMANCE		MIN. PLATE THICKNESS mm/inches	MARKING
		@ TEMP °C/F	PRESS. bar/psig	BUCKLE bar/psig	BURST bar/psig		
USA & CANADA	Non	54.4/130	9.66/140	9.66/140	14.48/210	NR	None
	DOT 2P		11.03/160	11.03/160	16.55/240	0.18/0.007	DOT-2P + MFG ⁵
	DOT 2Q		12.41/180	12.41/180	18.62/270	0.20/0.008	DOT-2Q + MFG ⁵
	Max Press.		12.41/180				Exemption Cans Available
Europe	Min Can	50/122	6.7/97	10.0/145	12.0/174	NR	Epsilon to be required in new legislation - some countries already mandate (e.g. France)
	"12 Bar"		8.0/116	12.0/174	14.4/209	NR	
	"15 Bar"		10.0/145	15.0/218	18.0/261	NR	
	"18 Bar"		12.0/174	18.0/261	21.6/313	NR	
	Max Press		12.0/174	See "18 bar"	See "18 bar"	NR	
Australia	Min Can	50/122	6.7/97	10.0/145	12.0/174	NR	NR
	Other (12/15/18 bar)		P= pressure	1.5xP	1.8xP	NR	
	Max Press ⁴		12.0/174	See "18 bar"	See "18 bar"	NR	
Japan	None	37/98	7.86/114	12.8/185	14.7/213	NR	NR
		50/122	P= pressure	1.5xP	1.8xP	NR	NR
Argentina	Standard	Unknown		10/145	15/219	NR	Unknown
	2P			11.4/163	17.2/245	NR	Unknown
	2Q			12.8/185	19.4/281	NR	Unknown
Korea	None	Unknown		12.8/185	14.7/213	0.22/0.0085	NR

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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