

**Shot Peening Media, Ultrasonically Activated**

**RATIONALE**

This revision includes ceramic media and additional media sizes to address user requirements.

**1. SCOPE**

The complete requirements for procuring the product shall consist of this document and the latest Issue of the basic specification, AMS2431.

**1.1 Application**

Peening balls conforming to this specification are typically intended for use in ultrasonically activated shot peening of metal surfaces to impart compressive stresses to these surfaces thereby increasing resistance to fatigue and stress-corrosion cracking. These balls can also be used in the peen forming process.

**2. APPLICABLE DOCUMENTS**

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

**2.1 SAE Publications**

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

AMS2431 Peening Media, General Requirements

**2.2 ASTM Publications**

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM A 751 Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

ASTM E 384 Standard Test Method for Knoop and Vickers Hardness of Materials

ASTM E140 Standard Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Knoop Hardness, and Scleroscope Hardness

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### 2.3 ANSI Publications

Available from American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, [www.ansi.org](http://www.ansi.org).

ANSI/ABMA/ISO 3290 Rolling bearings - Balls - Dimensions and Tolerances

### 2.4 DIN Publications

Available from DIN Deutsches Institut für Normung e. V., Burggrafenstraße, 6, 10787, Berlin, Germany or [www.DIN.de](http://www.DIN.de).

DIN 5401 Rolling bearings - Balls for rolling bearings and general industrial use

### 2.5 BNAE Publications

Available from BNAE, Technopolis 54, 199, rue Jean Jacques ROUSSEAU, 92138 Issy les Moulineaux cedex, France or [www.BNAE.asso.fr](http://www.BNAE.asso.fr).

BNAE NFL 06-834 Metallic parts – Inducement Compressive Surface Stresses – Tungsten Carbide Spherical Beads

### 2.6 ISO Publications

Available from International Organization for Standardization, 1, rue de Varembe, Case postale 56, CH-1211 Geneva 20, Switzerland, Tel: +41-22-749-01-11, [www.iso.org](http://www.iso.org).

ISO 3290 Rolling Bearings - Balls - Dimensions and Tolerances

## 3. TECHNICAL REQUIREMENTS

3.1 Peening balls shall conform to AMS2431 and the requirements specified herein.

3.2 Composition and properties

3.2.1 Chemical composition of peening balls shall conform to Table 1 or an alternative composition approved by the cognizant engineering organization.

TABLE 1 – COMMON PEENING BALL MATERIALS

| Material             | Alloy                                                               | AFNOR / ISO / DIN equivalent | Hardness     |
|----------------------|---------------------------------------------------------------------|------------------------------|--------------|
| Steel                | 52100                                                               | 100C6                        | 60-67 HRC    |
|                      | M50                                                                 |                              | 60-66 HRC    |
|                      | 1010/1015                                                           | XC10/XC15                    | 60-66 HRC    |
|                      | 1055/1065/1085                                                      |                              | 60-66 HRC    |
| Stainless Steel      |                                                                     |                              |              |
|                      | 440C                                                                | Z100CD17                     | 58-65 HRC    |
|                      | 304                                                                 | Z7CN18-09                    | 25-39 HRC    |
|                      | 304L                                                                | Z2CN18-10                    | 25-39 HRC    |
|                      | 316                                                                 | Z6CND17-12                   | 25-39 HRC    |
|                      | 316L                                                                | Z2CND17-12                   | 25-39 HRC    |
| Tungsten Carbide     | n/a                                                                 | BNAE NFL 06-834              | 1400-1800 HV |
| Ceramic High Density | ZrO <sub>2</sub> + HfO <sub>2</sub> + Y <sub>2</sub> O <sub>3</sub> |                              | 1100-1300 HV |

- 3.2.2 The percentage variation by weight ranges of the main constituents of ceramic ball shall conform to requirements in Table 2:

TABLE 2 – CERAMIC BALLS COMPOSITION

| Constituent                        | min | max |
|------------------------------------|-----|-----|
| Zirconium Oxide +<br>Hafnium Oxide | 90  | 95  |
| Yttrium Oxide                      | 3   | 7   |
| Others                             |     | 3   |

Note: Approved alternative shall conform to an AISI, SAE, ASTM, DIN, or ISO standard.

- 3.2.3 The surface finish, the shape and tolerances for steel, stainless steel and tungsten carbide media shall conform to grade of ANSI/ABMA/ISO 3290 or ISO 3290 or DIN 5401 defined in Table 3.

TABLE 3 – REQUIRED GRADES OF PEENING BALLS

| Standard           | Grade           |
|--------------------|-----------------|
| AISI/ABMA/ISO 3290 | up to 200       |
| ISO 3290           | up to 200       |
| DIN 5401           | up to class III |

- 3.2.4 Ceramic media shall be predominantly spherical in shape. 90% of media shall have sphericity higher than 0.8. Balls with sharp angle, twins, tear drop or with satellite are classified as defective media.

- 3.2.5 Hardness of peening balls shall conform to Table 1, unless otherwise agreed upon by user and manufacturer.

- 3.2.6 Density of ceramic media shall be not less than 5.90 g/cc.

- 3.2.7 Contamination

- 3.2.7.1 Balls shall be clean and free of dust, grit, oil and grease.

- 3.2.7.2 Surface Discolorations shall be determined microscopically using magnification per 4.1.5. Not more than 5% of ceramic media shall show foreign discolorations. A particle shall be considered objectionable for foreign discoloration when more than 25% of its surface area is discolored.

- 3.3 Size

- For metal alloy or carbide media, peening balls shall conform to the size requirements in Table 4. Ceramic media shall conform to the size requirements of Table 5.

TABLE 4 - USABLE SIZES. MOST COMMONLY USED ARE SHOWN IN GREY.

| Nominal diameter (mm) | Nominal diameter (inch) | Nominal diameter (mm) | Nominal diameter (inch) | Nominal diameter (mm) | Nominal diameter (inch) |
|-----------------------|-------------------------|-----------------------|-------------------------|-----------------------|-------------------------|
| <b>0.3</b>            | 0.01181                 | 1.98438               | <b>5/64</b>             | <b>4.5</b>            | 0.17717                 |
| 0.39688               | <b>1/64</b>             | 2.1                   | 0.08268                 | 5.15938               | <b>13/64</b>            |
| <b>0.4</b>            | 0.01575                 | 2.2                   | 0.08661                 | <b>5.5</b>            | 0.21654                 |
| <b>0.5</b>            | 0.01969                 | 2.3                   | 0.09055                 | 5.55625               | <b>7/32</b>             |
| 0.508                 | <b>0.02</b>             | 2.38125               | <b>3/32</b>             | 5.95312               | <b>15/64</b>            |
| <b>0.6</b>            | 0.02362                 | 2.4                   | 0.09448                 | <b>6</b>              | 0.23622                 |
| 0.635                 | <b>0.025</b>            | <b>2.5</b>            | 0.09843                 | 6.35                  | <b>1/4</b>              |
| <b>0.68</b>           | 0.02677                 | 2.6                   | 0.10236                 | <b>6.5</b>            | 0.25591                 |
| <b>0.7</b>            | 0.02756                 | 2.7                   | 0.10629                 | 6.74688               | <b>17/64</b>            |
| 0.79375               | <b>1/32</b>             | 2.77812               | <b>7/64</b>             | <b>7</b>              | 0.27559                 |
| <b>0.8</b>            | 0.03150                 | 2.8                   | 0.11023                 | 7.14375               | <b>9/32</b>             |
| <b>0.9</b>            | 0.03543                 | 2.9                   | 0.11417                 | <b>7.5</b>            | 0.29528                 |
| <b>1</b>              | 0.03937                 | <b>3</b>              | 0.11811                 | 7.54062               | <b>19/64</b>            |
| <b>1.1</b>            | 0.04330                 | 3.1                   | 0.12204                 | 7.9375                | <b>5/16</b>             |
| 1.19062               | <b>3/64</b>             | 3.175                 | <b>1/8</b>              | <b>8</b>              | 0.31496                 |
| <b>1.2</b>            | 0.04724                 | 3.2                   | 0.12598                 | 8.33438               | <b>21/64</b>            |
| <b>1.3</b>            | 0.05118                 | 3.3                   | 0.12992                 | <b>8.5</b>            | 0.33465                 |
| <b>1.4</b>            | 0.05511                 | 3.4                   | 0.13385                 | 8.73125               | <b>11/32</b>            |
| <b>1.5</b>            | 0.05906                 | 3.5                   | 0.13780                 | <b>9</b>              | 0.35433                 |
| 1.5875                | <b>1/16</b>             | 3.57188               | <b>9/64</b>             | 9.12812               | <b>23/64</b>            |
| 1.6                   | 0.06299                 | 3.96875               | <b>5/32</b>             | <b>9.5</b>            | 0.37402                 |
| 1.7                   | 0.06692                 | <b>4</b>              | 0.15748                 | 9.525                 | <b>3/8</b>              |
| 1.8                   | 0.07086                 | 4.36562               | <b>11/64</b>            | 9.92188               | <b>25/64</b>            |
| 1.9                   | 0.07480                 |                       |                         |                       |                         |

TABLE 5 - CERAMIC MEDIA FOR SHOT PEENING – SIZES AND SPHERICITY

| Designation | Nominal Sizes, Millimeters | Nominal Sizes, Inch | Sieve Size, Millimeters Maximum 0.5% Retained | Sieve Size, Millimeters Maximum 5% Retained | Sieve Size, Millimeters Maximum 5% Passing | Sieve Size, Millimeters Maximum 0.5% Passing |
|-------------|----------------------------|---------------------|-----------------------------------------------|---------------------------------------------|--------------------------------------------|----------------------------------------------|
| CB 1.1      | 1.0/1.2                    | 0.039/0.047         | 1.40                                          | 1.18                                        | 1.00                                       | 0.9                                          |
| CB 1.5      | 1.4/1.6                    | 0.055/0.062         | 1.70                                          | 1.60                                        | 1.40                                       | 1.18                                         |
| CB 1.9      | 1.8/2.0                    | 0.070/0.078         | 2.24                                          | 2.00                                        | 1.80                                       | 1.70                                         |
| CB 2.2      | 2.0/2.5                    | 0.078/0.098         | 2.80                                          | 2.50                                        | 2.00                                       | 1.80                                         |
| CB 3.0      | 2.6/3.3                    | 0.102/0.129         | 3.55                                          | 3.35                                        | 2.80                                       | 2.36                                         |

#### 4. QUALITY ASSURANCE PROVISIONS

In accordance with AMS2431 and the following:

##### 4.1 Sampling

One sample of not less than 100 balls shall be randomly selected from the batch and shall be suitably split to perform controls. The batches shall be packed in containers not exceeding 50 pounds (~22 kg) and issued of the same production.