**PRECISION MARSHALL STEEL COMPANY**
**One Northpoint Court, Bolingbrook IL 60440**
**Toll Free: 1-800-258-2558 - www.pmsteel.com**

# CERTIFICATION OF DRILL ROD

## PRODUCT INFORMATION

| Grade | Thickness | Heat # | Country of Origin | Purchase Order |
|---|---|---|---|---|
| W1 | 1.2500 | PM20173 | Brazil | P1504003 |

## CHEMICAL COMPOSITION

C: 0.9300 Mn: 0.3900 P: 0.0050 S: 0.0110 Si: 0.2400 Cr: 0.0600 Mo: 0.0200 Ni: 0.0500 Cu: 0.1100 V: 0.0010

## STANDARD INFORMATION

**STANDARD CHEMICAL COMPOSITION**

| AISI | Carbon | Manganese | Silicon | Sulfur | Chromium | Vanadium | Tungsten | Molybdenum | Phosphorous | Nickel |
|---|---|---|---|---|---|---|---|---|---|---|
| W1 | .90/1.05 | .30/.40 | .10/.25 | .025 Max | .30 Max | .10 Max | .15 Max | .10 Max | .025 Max | - |
| O1 | .85/1.00 | 1.00/1.40 | .10/.50 | 0.030 Max | .40/.70 | .30 Max | .40/.60 | -- | .030 Max | - |
| A2 | .95/1.05 | .40/1.00 | .50 Max | 0.030 Max | 4.75/5.50 | .15/.50 | -- | .90/1.40 | .030 Max | - |
| S7 | .45/.55 | .20/.90 | .20/1.00 | 0.030 Max | 3.00/3.50 | .35 Max | -- | .10 Max | .030 Max | - |
| D2 | 1.40/1.60 | .10/.60 | .10/.60 | 0.030 Max | 11.00/13.00 | .50/1.10 | -- | .70/1.20 | .030 Max | - |
| M2 | .78/1.05 | .15/.40 | .03/.02 | .03 Max | 3.75/4.50 | 1.75/2.20 | 5.50/6.75 | 4.50/5.50 | .40 Max | - |
| H13 | .40 | -- | 1.00 | .100 | 5.25 | 1.00 | - | 1.35 | -- | - |
| 304L | .03 Max | 2 Max | 1 Max | .03 Max | 18/20 | -- | - | - | .045 Max | 8/12 |

**SPECIFICATIONS** / **MACHINEABILITY**

| AISI | SAE | ASTM | FEDERAL | UNS | Rating |
|---|---|---|---|---|---|
| W1 | J-437 | A686-92(2010) (1) | QQ-T-580 Rev.C | T72301 | 100 |
| O1 | J-437 | A681-08 (2) | QQ-T-570 Rev.C | T31501 | 90 |
| A2 | J-437 | A681-08 (2) | QQ-T-570 Rev.C | T30102 | 65 |
| S7 | J-437 | A681-08 (2) | QQ-T-570 Rev.C | T41907 | 95 |
| D2 | J-437 | A681-08 (2) | QQ-T-570 Rev.C | T30402 | 50 |
| M2 | J438-B | A600-92a(2016) | QQT-570 Rev. C | T11302 | 65 |
| H13 | J-437 | A681-08 (2) | QQ-T-570 Rev.C | -- | 75 |
| 304L | S30403 | A276 | QQ-S-766 | S30403 | 70 |

**SURFACE / STRUCTURE**

| Size | Finish (Max) | Quality (Max Defect) |
|---|---|---|
| .000-.1250 | 10 RMS | 0.000 |
| .1251-.2500 | 15 RMS | 0.000 |
| .2501-.8750 | 20 RMS | 0.000 |
| .8751-2.000 | 30 RMS | 0.000 |
| All CD Flats | 50 RMS | .008/side |

*1 Certain heats may not meet the ASTM specification for Manganese*
*2 Certain sizes may not meet the ASTM specification for hardness.*

** Grain Size: 5-8 (McQuade-Ehn)*
** Microstructure: 85% min. spheroidization*

**HARDNESS**

| Size | W1 | O1 | A2 | S7 | D2 | H13 | M2 | 304L |
|---|---|---|---|---|---|---|---|---|
| .0000-.1250 | 166,000 psi | 116,000 psi | 128,000 psi | 123,000 psi | 131,000 psi | 40-48 HRC | 248 HB | 215 HB |
| .1251-.2500 | 28 HRC | 100 HRB | 27 HRC | 25 HRC | 28 HRC | 40-48 HRC | 248 HB | 215 HB |
| .2501-.5000 | 23 HRC | 100 HRB | 27 HRC | 25 HRC | 28 HRC | 40-48 HRC | 248 HB | 215 HB |
| .5001-2.000 | 96 HRB | 100 HRB | 27 HRC | 25 HRC | 28 HRC | 40-48 HRC | 248 HB | 215 HB |

** For sizes under 5/32" diameter, a tensile strength is obtained.*

| SIZE | | LENGTH | |
|---|---|---|---|
| Diameter | Tolerance | Length | Tolerance |
| .0000-.1249 | +/-.0003 | 3' | 36" +1/8,-0 |
| .1250-.499 | +/-.0005 | 6' | 72" +1,-0 |
| .500-3.00 | +/-.001 | 12' | 144" +2,-0 |

Precision Marshall Steel Company hereby attests that drill rod items as supplied have been tested and certified to meet all of the standards and limitations as set forth above.

Material is RoHs, REACH, and Conflict Mineral compliant. The letter confirming compliance can be found on our website or distributor portal.

Certified: Adam Helphenstine
Manager of Materials

Date: 2/23/2024

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Certified: Adam Helphenstine
Manager of Materials

Date: 2/23/2024