# 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 |
|---|---|---|---|---|
| O1 | 1.6250 | PM20079 | Brazil | P1446914 |

## CHEMICAL COMPOSITION

C: 0.9500 Mn: 1.1100 P: 0.0060 S: 0.0018 Si: 0.2500 Cr: 0.4200 Mo: 0.1000 Ni: 0.1000 Cu: 0.0700 V: 0.1800 W: 0.4500

## STANDARD INFORMATION

**STANDARD CHEMICAL COMPOSITION**

| AISI / SAE | UNS | Carbon | Manganese | Silicon | Phosphorous | Sulfur | Chromium | Vanadium | Tungsten | Molybdenum |
|---|---|---|---|---|---|---|---|---|---|---|
| W1 | T72301 | .90/1.05 | .30/.40 | .10/.25 | .025 Max | .025 Max | .30 Max | .10 Max | .15 Max | .10 Max |
| O1 | T31501 | .85/1.00 | 1.00/1.40 | .10/.50 | .030 Max | 0.030 Max | .40/.70 | .30 Max | .40/.60 | -- |
| A2 | T30102 | .95/1.05 | .40/1.00 | .50 Max | .030 Max | 0.030 Max | 4.75/5.50 | .15/.50 | -- | .90/1.40 |
| S7 | T41907 | .45/.55 | .20/.90 | .20/1.00 | .030 Max | 0.030 Max | 3.00/3.50 | .35 Max | -- | .10 Max |
| D2 | T30402 | 1.40/1.60 | .10/.60 | .10/.60 | .030 Max | 0.030 Max | 11.00/13.00 | .50/1.10 | -- | .70/1.20 |
| M2 | T11302 | .78 / 1.05 | .15 / .40 | .03 / .20 | .40 Max | .03 Max | 3.75 / 4.50 | 1.75 / 2.20 | 5.50 / 6.75 | 4.50 / 5.50 |
| H13 | -- | .40 | -- | 1.00 | -- | .100 | 5.25 | 1.00 | - | 1.35 |

**SPECIFICATIONS**

| AISI | SAE | ASTM | FEDERAL |
|---|---|---|---|
| W1 | J-437 | A686-92(2010) (1) | QQ-T-580 Rev.C |
| O1 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| A2 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| S7 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| D2 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| M2 | J438-B | A600-92a(2016) | QQT-570 Rev. C |
| H13 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |

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

**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 |

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

**MACHINABILITY**

| Grade | Rating |
|---|---|
| W1 | 100 |
| O1 | 90 |
| A2 | 65 |
| S7 | 95 |
| D2 | 50 |
| M2 | 65 |

### HARDNESS

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

** 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 |

***All material RoHS Compliant***

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 for drill rod as set forth above.

Certified: *PM Support Services*
Support Services

Date: 3/17/2022

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# CERTIFICATION OF DRILL ROD

## PRODUCT INFORMATION

| Grade | Thickness | Heat # | Country of Origin | Purchase Order |
|---|---|---|---|---|
| W1 | 0.3125 | PM20086 | United States | P1446914 |

## CHEMICAL COMPOSITION

C: 0.9100 Mn: 0.3900 P: 0.0080 S: 0.0080 Si: 0.1900 Cr: 0.0800 Mo: 0.0200 Ni: 0.0600 Cu: 0.1100 V: 0.0010

## STANDARD INFORMATION

**STANDARD CHEMICAL COMPOSITION**

| AISI / SAE | UNS | Carbon | Manganese | Silicon | Phosphorous | Sulfur | Chromium | Vanadium | Tungsten | Molybdenum |
|---|---|---|---|---|---|---|---|---|---|---|
| W1 | T72301 | .90/1.05 | .30/.40 | .10/.25 | .025 Max | .025 Max | .30 Max | .10 Max | .15 Max | .10 Max |
| O1 | T31501 | .85/1.00 | 1.00/1.40 | .10/.50 | .030 Max | 0.030 Max | .40/.70 | .30 Max | .40/.60 | -- |
| A2 | T30102 | .95/1.05 | .40/1.00 | .50 Max | .030 Max | 0.030 Max | 4.75/5.50 | .15/.50 | -- | .90/1.40 |
| S7 | T41907 | .45/.55 | .20/.90 | .20/1.00 | .030 Max | 0.030 Max | 3.00/3.50 | .35 Max | -- | .10 Max |
| D2 | T30402 | 1.40/1.60 | .10/.60 | .10/.60 | .030 Max | 0.030 Max | 11.00/13.00 | .50/1.10 | -- | .70/1.20 |
| M2 | T11302 | .78 / 1.05 | .15 / .40 | .03 / .20 | .40 Max | .03 Max | 3.75 / 4.50 | 1.75 / 2.20 | 5.50 / 6.75 | 4.50 / 5.50 |
| H13 | -- | .40 | -- | 1.00 | -- | .100 | 5.25 | 1.00 | - | 1.35 |

**SPECIFICATIONS**

| AISI | SAE | ASTM | FEDERAL |
|---|---|---|---|
| W1 | J-437 | A686-92(2010) (1) | QQ-T-580 Rev.C |
| O1 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
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| M2 | J438-B | A600-92a(2016) | QQT-570 Rev. C |
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*1 Certain heats may not meet the ASTM specification for Manganese*
*2 Certain sizes may not meet the ASTM specification for hardness.*

**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 |

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

**MACHINABILITY**

| Grade | Rating |
|---|---|
| W1 | 100 |
| O1 | 90 |
| A2 | 65 |
| S7 | 95 |
| D2 | 50 |
| M2 | 65 |

### HARDNESS

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

***All material RoHS Compliant***

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| W1 | 0.4375 | PM20086 | United States | P1446914 |

## CHEMICAL COMPOSITION

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## STANDARD INFORMATION

**STANDARD CHEMICAL COMPOSITION**

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| D2 | T30402 | 1.40/1.60 | .10/.60 | .10/.60 | .030 Max | 0.030 Max | 11.00/13.00 | .50/1.10 | -- | .70/1.20 |
| M2 | T11302 | .78 / 1.05 | .15 / .40 | .03 / .20 | .40 Max | .03 Max | 3.75 / 4.50 | 1.75 / 2.20 | 5.50 / 6.75 | 4.50 / 5.50 |
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**SPECIFICATIONS**

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** Microstructure: 85% min. spheroidization*

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Certified: *PM Support Services*
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