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	0.5000	PM20172	Netherlands	P1514249

CHEMICAL COMPOSITION

C: 0.9100 Mn: 0.3500 P: 0.0050 S: 0.0080 Si: 0.1900 Cr: 0.0500 Mo: 0.0100 Ni: 0.0400 Cu: 0.0900 V: 0.0020

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(2016) (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(2024)	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: 6/24/2024

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CERTIFICATION OF DRILL ROD

PRODUCT INFORMATION

Grade	Thickness	Heat #	Country of Origin	Purchase Order
W1	0.4375	PM20172	Netherlands	P1514249

CHEMICAL COMPOSITION

C: 0.9100 Mn: 0.3500 P: 0.0050 S: 0.0080 Si: 0.1900 Cr: 0.0500 Mo: 0.0100 Ni: 0.0400 Cu: 0.0900 V: 0.0020

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(2016) (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(2024)	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

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** Microstructure: 85% min. spheroidization*

HARDNESS

Size	W1	O1	A2	S7	D2	H13	M2	304L
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.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.*

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Diameter	Tolerance	Length	Tolerance
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W1	1.0000	PM20173	Brazil	P1514249

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	-
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