Steel Certificate of Test

1835 Dueber Ave. S.W.
Canton, Ohio 44706

ID #0499748-1

TIMKENSTEEL

6/06/2019

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Customer Order: --
Mill Order: 24829-A (2184751)

Customer Part Number:
Heat Number(s): W6268

Description of Material

DIAMETER: 13.000 in (330.200 mm)
Shape: RD
Prod Type: BAR
Sales Type: 1517VCbCa2
Int Quality: VACUUM DEGAS
Condition: FORGED ROLLED - NORMALIZE - PEELED

- ASME SA-350/SA-350M Rev. 2017 EDITION EXCEPT AS NOTED - GRADE LF-2 CLASS 1 FOR CHEMISTRY AND PROPERTIES ONLY
- ASTM A 105 / A 105M Rev. 18 09/01/2018 FOR CHEMISTRY & MECHANICAL PROPERTIES ONLY - EXCEPT AS NOTED
- ASME SA-105/SA-105M Rev. 2017 EDITION FOR CHEMISTRY & MECHANICAL PROPERTIES ONLY - EXCEPT AS NOTED
- ASTM A 675 / A 675M Rev. 14 05/01/2014 EXCEPT AS NOTED - GRADE 70 FOR CHEMISTRY AND PROPERTIES ONLY
- ASME SA-675/SA-675M Rev. 2017 EDITION EXCEPT AS NOTED - GRADE 70 FOR CHEMISTRY AND PROPERTIES ONLY
- ASTM A 696 Rev. 17 11/01/2017 GRADE C FOR CHEMISTRY & MECHANICAL PROPERTIES ONLY
- ASME SA-696 Rev. 2017 EDITION GRADE C FOR CHEMISTRY & MECHANICAL PROPERTIES ONLY
- CAMERON MR-005 Rev. D1 01/03/1989 EXCEPT AS NOTED
- EUROPEAN STANDARD EN 10204 12/17/2004 TYPE 3.1 INSPECTION CERTIFICATE
- ASTM A 29 / A 29M Rev. 16 02/02/2017 EXCEPT AS NOTED
- ASTM A 370 Rev. 17a 11/15/2017
- NACE NACE MR0175/ISO 15156 PARTS 1-3 Rev. 2015 11/23/2015
- NACE MR0103 / ISO 17495 Rev. 2015 11/23/2015
- ASTM A 961 / A 961M Rev. 16a 12/01/2016 AS APPLICABLE TO RAW MATERIAL - EXCEPT AS NOTED
- ASTM A 350 / A 350M Rev. 18 05/01/2018 EXCEPT AS NOTED - GRADE LF-2 CLASS 1 FOR CHEMISTRY AND PROPERTIES ONLY

Chemistry Information

	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo	%Cu	%Al	%V	%Cb	%N
SPEC Ladle Min:	.15	.90			.15						.020	.010	.0150
SPEC Ladle Max:	.19	1.23	.030	.010	.30	.15	.15	.05	.25	.060	.030	.020	.0200
W6268 Ladle:	.18	1.20	.005	.008	.27	.06	.08	.02	.13	.030	.026	.013	.0178

Testing of elements performed at TimkenSteel Chemistry Labs except where noted.

Metallurgy Information

SPEC: Chemistry CR+MO 0.319 Max CR+NI+MO+CU+V 0.999 Max
Heat W6268 CR+MO: 0.080 CR+NI+MO+CU+V: 0.316

SPEC: Chemistry CE ASTM C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15 0.45 Max
Heat W6268 CE ASTM C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15: 0.42

When shipping document is attached it becomes part of this certification.

We certify the above materials have been inspected and tested in accordance with the methods prescribed in the governing specifications and consistent with our Standard Commercial Terms and Conditions for Sale, Manufacture, and Shipping, which are incorporated into and made part of this certification. The results of such inspections and tests conform with the applicable requirements including the purchase order, specification(s) and exception(s). This certificate or report shall not be reproduced except in full, without the written approval of TimkenSteel Corporation.

Notarized: _____ by _____
NOTARY PUBLIC

Lisa Bucklew, METALLOGRAPHER

TimkenSteel Corporation

INS

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Metallurgy Information

SPEC: Grain Size SIZE 5/FINER
5/FINER

SPEC: Hardness ASTM E10 UOM BRINELL HARDNESS 180 Max LOCATION MID

Heat	Piece#		1	UOM
W6268	3231370	HARDNESS	142	BRINELL
	3231370	LOCATION	MID	BRINELL
	3231371	HARDNESS	146	BRINELL
	3231371	LOCATION	MID	BRINELL

SPEC: Impacts DIRECTION LONGITUDINAL ENERGY AVERAGE 25 Min ENERGY INDIVIDUAL 15 Min ENERGY UOM FT-LBS EXPANSION UOM IN LOCATION MID TEMPERATURE -50 TEMPERATURE SCALE F TYPE CHARPY SPECIMEN SIZE FULL

			FT-LBS				Shear %			Lateral Expansion IN						
Heat	Piece#	Temp	1	2	3	Avg.	1	2	3	1	2	3	Direction	Location	Type	Specimen Size
W6268	3231372	-50 F	75	50	55	60	50	40	40	.060	.042	.046	LONG.	MID	CHARPY	FULL

8MM RADIUS STRIKER USED FOR IMPACT TESTING

SPEC: Tensile ASTM E8 TENSILE 70,000 Min 85,000 Max STRENGTH UOM PSI YIELD .2 40,000 Min MIN ELONGATION 22.0 Min GAUGE LENGTH 2 IN MIN REDUCTION IN AREA 30.0 Min SPECIMEN SIZE .505" SHAPE ROUND DIRECTION LONGITUDINAL TEMPERATURE ROOM LOCATION MID

Heat	Piece#	Tensile Strength	UOM	.2% Yld Strength	Elong%	Gauge Length	%Red	Specimen	Direction	Temp	Location
W6268	3231372	71,665	PSI	48,244	30.1	2 IN	58.3	.505" RD	LONG.	RT	MID

All Hardness and Tensile testing performed at TimkenSteel Metallurgical Lab except where noted.

Heat Treatment

Heat: W6268 Lot: 1
NORMALIZED - 1625 F - 7.0 hour(s)

Heat W6268 Melt Source: USA
Manufacturing: USA
Bottom Pour Ingot Cast Process
REDUCTION RATIO - 5.1:1

Material melted and produced in the USA

TimkenSteel certifies that there is no mercury or radio-active material used in the melting or processing.

No welding of this material has occurred.

MATERIAL WAS ELECTRIC FURNACE MELTED, VACUUM DEGASSED AND LADLE REFINED

In reference to Section 1502 ("Conflict Minerals") of the Dodd-Frank Wall Street Reform and Consumer Protection Act, no tantalum, tin, tungsten or gold was intentionally added to this material.