

Steel Certificate of Test

1835 Dueber Ave. S.W.
Canton, Ohio 44706
ID #0570371-1



2/22/2023

S US Alloys Inc.
O T BOX 262405
L O HOUSTON, TX 77207 USA
D

S US ALLOYS INC
H T 6301 EPPES ST,
I O HOUSTON, TX 77087 USA
P

Customer Order: 20943 line 5 Customer Part Number:
Mill Order: 15615-G (2292101) Heat Number(s): 31119

Description of Material

DIAMETER: 6.750 in (171.450 mm)
Shape: RD
Prod Type: BAR
Sales Type: 1517VCbCa2
Int Quality: VACUUM DEGAS
Condition: HOT ROLL - NORMALIZE - STRAIGHTEN

Specification

- US ALLOYS US ALLOYS LF2-HN Rev. 4 09/04/2018 EXCEPT AS NOTED
- ASME SA-350/SA-350M Rev. 2021 EDITION EXCEPT AS NOTED - GRADE LF-2 CLASS 1 FOR CHEMISTRY AND PROPERTIES ONLY
- ASTM A105 / A105M Rev. 21 01/01/2021 EXCEPT AS NOTED - FOR CHEMISTRY & MECHANICAL PROPERTIES ONLY
- ASTM A675 / A675M Rev. 14 (REAPPROVED 2019) 09/01/2019 EXCEPT AS NOTED - GRADE 70 FOR CHEMISTRY AND PROPERTIES ONLY
- ASME SA-675/SA-675M Rev. 2019 EDITION EXCEPT AS NOTED - GRADE 70 FOR CHEMISTRY AND PROPERTIES ONLY
- ASTM A696 Rev. 17 11/01/2017 GRADE C FOR CHEMISTRY AND PROPERTIES ONLY
- ASME SA-696 Rev. 2021 EDITION GRADE C FOR CHEMISTRY AND 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
- NACE NACE MRO175/ISO 15156 PARTS 1-3 Rev. 2015 11/23/2015
- NACE MRO103 / ISO 17495 Rev. 2015 11/23/2015
- ASTM A350 / A350M Rev. 18 05/01/2018 EXCEPT AS NOTED - GRADE LF-2 CLASS 1 FOR CHEMISTRY AND PROPERTIES ONLY
- ASTM A370 Rev. 20 09/01/2020
- ASTM A961 / A961M Rev. 20 07/01/2020 AS APPLICABLE TO RAW MATERIAL - EXCEPT AS NOTED
- ASTM A29 / A29M Rev. 20 07/01/2020 EXCEPT AS NOTED
- ASME SA-105/SA-105M Rev. 2021 EDITION EXCEPT AS NOTED - FOR CHEMISTRY & MECHANICAL PROPERTIES ONLY

Chemistry Information

	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo	%Cu	%Al	%V	%As	%B	%Ca	%Cb
SPEC Ladle Min:	.15	.90			.15						.020				.010
SPEC Ladle Max:	.19	1.23	.030	.010	.30	.15	.15	.05	.25	.060	.030				.020
31119 Ladle:	.19	1.21	.008	.001	.27	.07	.07	.03	.13	.024	.025	.004	.0002	.0013	.013
	%Co	%N	%Pb	%Sb	%Sn	%Ti	%W	%Zn	%Zr						
SPEC Ladle Min:		.0150													
SPEC Ladle Max:		.0200													
31119 Ladle:		.007	.0190	.0012	.001	.007	.001	.001	.0010	.001					

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

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: _____ NOTARY PUBLIC

by *Lisa Bucklew*
Lisa Bucklew, METALLOGRAPHER

TimkenSteel Corporation

Steel Certificate of Test

1835 Dueber Ave. S.W.
Canton, Ohio 44706
ID #0570371-1



2/22/2023

Customer Order: 20943 line 5
Mill Order: 15615-G (2292101)

Customer Part Number:
Heat Number(s): 31119

Metallurgy Information

SPEC: Chemistry CR+MO 0.319 Max CR+NI+MO+CU+V 0.999 Max

Heat 31119 CR+MO: 0.100 CR+NI+MO+CU+V: 0.325

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

Heat 31119 CE ASTM C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15: 0.43

SPEC: Grain Size ASTM E112 SIZE 5/FINER

Heat 31119 SIZE: 7

SPEC: Hardness ASTM E10 UOM BRINELL HARDNESS 187 Max LOCATION MID FREQUENCY PER CUST SAMPLE PLAN

Heat Piece# 1 UOM

31119 3616393 HARDNESS 182 BRINELL

3616393 LOCATION MID BRINELL

3616395 HARDNESS 164 BRINELL

3616395 LOCATION MID BRINELL

SPEC: Impacts ASTM E23 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

Heat	Piece#	Temp	FT-LBS			Shear %			Lateral Expansion IN			Direction	Location	Type	Specimen Size	
			1	2	3	Avg.	1	2	3	1	2					3
31119	3616394	-50 F	52	76	70	66	50	70	70	.040	.050	.049	LONG.	MID	CHARPY	FULL
	3616396	-50 F	52	61	55	56	70	70	70	.040	.043	.039	LONG.	MID	CHARPY	FULL

BMM 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 FREQUENCY PER CUST SAMPLE
PLAN

Heat	Piece#	Tensile		UOM	.2% Yld		Gauge Length	%Red	Specimen	Direction	Temp	Location
		Strength	Strength		Strength	Elong%						
31119	3616394	80,351	57,059	PSI	33.2	2 IN	69.0	.505"	RD	LONG.	RT	MID
	3616396	79,870	55,865	PSI	32.6	2 IN	68.2	.505"	RD	LONG.	RT	MID

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

Heat Treatment

Heat: 31119 Lot: 1
NORMALIZED - 1625 F - 2.0 hour(s)

Heat 31119 Melt Source: USA
Manufacturing: USA
Heat 31119 - Bottom Pour Ingot Cast Process
REDUCTION RATIO - 21.9:1

HEAT WAS MELTED AT ELLWOOD QUALITY STEELS COMPANY, NEW CASTLE, PA

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

MATERIAL WAS ELECTRIC FURNACE MELTED, VACUUM DEGASSED AND LADLE REFINED

No welding of this material has occurred.

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.

TEST REPORT FURNISHED

BY U.S. ALLOYS, INC.

ITEM

HT. CODE WIS CLR CODE GREEN

DATE 2/22/2023 APP. BY

TimkenSteel Corporation

LF2 6-3/4"
JGL