

ABNAHMEPRÜFZEUGNIS  
INSPECTION CERTIFICATE  
EN 10204-3.1

Cert. No.: 227100 / 2017.11.28

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ISO 9001:2015 certification  
EN 9100:2016 certification  
EN ISO 14001:2015 certification



MARIAZELLERSTRASSE 25  
8605 KAPFENBERG/AUSTRIA

Besteller/Purchaser/Acheteur:

BOHLER Pacific Pte. Ltd.  
25, Pioneer Crescent  
SG-628554 Singapore  
Singapore

Bestell-Nr./Purchaser order No./No. de commande:

8080000916 / 2017.05.15

Werksauftrags-Nr./Works order-No./No. de la commande de l'usine:

2114723 / 2017.05.15

Prüfgegenstand/Object of test/Object d'examen:

BÖHLER LHX, 2.4665  
bar, rolled, solution annealed  
IBO ECOMAX, ISO 286/2 ITk12  
Application: Aviation/Space Ind.

Empfänger/Consignee/Destinaire:

BOHLER Pacific Pte. Ltd.  
25, Pioneer Crescent  
SG-628554 Singapore  
Singapore

Empfängerref.-Nr./Receiver reference-No./Référence destinaire:

-

Lieferschein-Nr./Delivery note-No./Avisd'expédition du client:

51471361 / 2017.11.17

Anforderungen/Requirements/Exigence:

AMS 5754M  
ASTM B572 Issue 06  
UNS N06002

GE S400 Issue 03-Jun-16  
GE S1000 Issue 23-May-17

**Volume of delivery**

Pos./Los	Dimensions	Length	No. of Pieces	Weight kgs	Mat.-ID	Test No.	Heat No.
10/1	RD 63,5 MM	3.000 - 4.000 MM	15	1510,0	T4T3	1631098-1	C48028

Ingot size = rd. 424 mm (16,7 inch)  
Reduction ratio = 41 : 1

Quality heat treatment

	Temperature	Soak time	Cooling
Solution annealed	1170°C	0:45 h M	Water
Pyrometry acc.to AMS 2750E			

M...holding time at nominal temperature after center of material has reached the tolerance limit.

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## Chemical Composition (%)

Chemical Composition  
Steelmaking Process: VIM+ESR

Heat No.

C	Si	Mn	P	S	Cr	Mo	Ni	V	W	
0,061	0,09	0,02	<0,005	0,0004	21,58	8,36	50,8	0,03	0,50	C48028
Cu	Co	Ti	Al	B	Fe	Zr				
<0,02	0,83	0,02	0,16	<0,001	17,53	0,010				C48028

Si, Mn, P, Cr, Mo, Ni, Cu, Co, Ti, Al, Nb, Fe, Ta, Zr	XRF
C, S	CS Combustion analysis
B	Spark optical emission spectrometer

Country of origin and melt: AUSTRIA

Name of melt source: Böhler Edelstahl GmbH & Co KG

## Metallographic examination

### Macro etch examination

Testing standard = ASTM A 604/A 604M - 07

Etch media = 1/3 H2O2 (35%) + 2/3 HCl (25-38%)

Class 1 Severity A

Class 2 Severity A

Class 3 Severity A

Class 4 Severity A

### Non metallic inclusions

Non metallic inclusions acc.to ASTM E45-13 method A

	A		B		C		D	
Test no.	thin	heavy	thin	heavy	thin	heavy	thin	heavy
S	-	-	-	-	-	-	1	-
SM	-	-	-	-	-	-	1	-
B	-	-	-	-	-	-	1	-

## Grain Size Evaluation

Testing standard = ASTM E112-13, ASTM E960-99

Etch media = H2O 100ml, HCl 300ml, H2O2 15ml

Magnification = 50:1, 100:1, 500:1

Structure type	Direction	Rim	Midradius	Center
Duplex ALA	longitudinal	ASTM No. 2.5 ALA ASTM No. >00	ASTM No. 3 ALA ASTM No. 0	ASTM No. 2 ALA ASTM No. >00

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## Mechanical Properties

The orientation of the tensile test specimen is longitudinal and transverse.  
L2 = longitudinal, 1/2 Radius (1/4T), Q = transverse

### Tensile test in delivery condition

					Yield Strength	Ultimate Tensile Strength	Elongation	Reduction of Area
					YS0.2	UTS	A4	RoA
					MPa	MPa	%	%
1631098-1	6B	ASTM E 8/E8M-16a 01.09.2016	L2	23	<b>&gt;=240</b> 273	<b>&gt;=660</b> 701	<b>&gt;=35</b> 62	<b>info.</b> 58
1631098-1	6B	ASTM E 8/E8M-16a 01.09.2016	QZ	23	<b>&gt;=240</b> 299	<b>&gt;=660</b> 720	<b>&gt;=35</b> 58	<b>info.</b> 57

### Hardness test in delivery condition

Test no.	Piece no.	Testing standard	Location	HBW 5/750
1631098-1	-	ASTM E10-15a Type A	Stäbe / bars	<b>&lt;=241</b> 152-153

The orientation of the stress rupture test specimen is longitudinal.  
L2 = longitudinal, 1/2 Radius (1/4T)

### Stress rupture test in delivery condition

					Load	Test duration	Reduction of area after rupture	Elongation after rupture
						T	Z	A4
					MPa	h	%	%
1631098-1	6B	ASTM E 139-11 01.08.2011	L2	816	<b>103</b> 103	<b>&gt;=24</b> 33,9	<b>info.</b> 59	<b>&gt;=10</b> 64

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**Nondestructive examination**

Material identification test (Spectrographic analysis) acc.to internal bohler standard: Positive material identification

100% Ultrasonic test acc. to AMS STD 2154 Rev. A 2012-10 Type I using Phased Array  
The material fulfils quality class A.

100% Surface Inspection acc.to DIN EN 10277-1:2008  
An Eddy Current test was performed.  
The material fulfils quality class 4.

**Statements**

The material is free of mercury, free of mercury compounds and or radium contamination at time of shipment, material produced without ozone depleting substances.

No weld repair has been performed on this material.

**Radioaktivitätskontrolle/Radioactivity inspection: Co-60<0,1Bq/g;**

hiermit kleiner als Grenzwert in der anzuwendenden Spezifikation IAEA RS-G-1.7 für unbedenkliche Stoffe.  
therefore smaller than upper limit required according to specification IAEA RS-G-1.7 for inoffensive material.

Das Material wurde hergestellt, erprobt, überprüft und geprüft in Übereinstimmung mit der Kundenbestellung und den referenzierten Spezifikationen und erfüllt die Anforderungen, sofern nicht anders in diesem Abnahmezeugnis angegeben. Ohne schriftliche Genehmigung der Böhler Edelstahl GmbH & Co KG darf dieses Zeugnis, außer im Ganzen, nicht vervielfältigt werden. Die Aufzeichnung von falschen, fingierten oder betrügerischen Erklärungen oder Eintragungen auf diesem Dokument, kann gemäß österreichischem Recht (Strafgesetzbuch §223ff) bestraft werden.

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**Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellvorschriften entsprechen.**

We hereby certify that the above mentioned products are consistent with the order prescriptions.

Nous certifions que les produits enumeres ci-dessus sont conformes aux prescriptions de la commande.

**Zeichen des Lieferwerks:**

Brand of Manufacturer:

Marques de l'usine:



**Besichtigung und Nachmessung: Keine Beanstandung**

Inspection and Checking of Dimensions: Satisfactory

Inspection of Control des dimensions: Satisfaisant

**Zeichen des Prüfers:**

Symbol of Inspector:

Symbole de l'inspecteur:



**BOHLER Edelstahl GmbH & Co KG**

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**AUSSTELLER/**

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DER ABNAHMEBEAUFTRAGTE/  
INSPECTOR REPRESENTATIVE/  
DU CONTROLEUR