



CERTIFICATE

No. A/20-871230 Rev 00  
Date 2020-01-29 Page 1/5

A02/z03  
INSPECTION CERTIFICATE acc to  
EN 10204 3.1

A06  
SANDVIK MATERIALS TECHNOLOGY  
P O BOX 1220  
18501 SCRANTON, P A  
USA

INSPECTION STAMP  
SVQ

<b>Customer References</b> <span style="float:right">A07</span> Customer order 2019-09-27  450-00991 LANGLEY ALLOY	<b>Sandvik References</b> <span style="float:right">A08</span> Order No. Sub No. ABSMT Dispatch note 100288 23283/53 ABSMT No. C.Code 284-89339 03
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<b>Material description</b> <span style="float:right">B01/B04</span> HOT WORKED STAINLESS BAR STEEL FORGED ANNEALED & STRAIGHTENED PEEL TURNED  Metallurgical process Origin <span style="float:right">C70</span> E+AOD+LRF Sweden	<b>Steel/material Designations</b> <span style="float:right">B02</span> Sandvik UNS SAF2205 S31803/S32205 EN no 1.4462
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**Technical requirements** B03  
SPEC PS 22V 2205 REV7 AND SANDVIK DDR  
EN10222-5:-2017\*, PED 2014/68/EU, EN10060:2003, EN 10221:1996  
NACE MR0175/ISO 15156-3:-2015, NACE MR0103/ISO 17945-1:-2015  
ASTM A-276-17, ASME SA-276-ED-19 SECT II PART A, EN10272:-2016\*,  
ASTM A-479-19, ASME SA-479-ED-19 SECT II PART A, EN 10088-3:-2014,  
ASTM A-484-18, ASTM A-182-19\*, ASTM A-1049-18\*, ASTM A-314-19\*,  
NORSOK M-630 ED-6, NORSOK MDS D47 REV. 5\*  
\*For detailed information, please see the appendix

<b>EXTENT OF DELIVERY</b> <span style="float:right">B07-B13</span>						
It	Product designation	Heat	Lot	Pieces	Kg	Lbs
	07 MBR-SANMAC2205-13"	558106	92501	1	3733.0	8230.00
				Total	1	3733.0 8230.00
<b>Recycled material</b>						
Heat	%					
558106	85.1					
<b>TEST RESULTS</b>						
Reduction ratio (times)						
Lot						
92501	4.0					
<b>Chemical composition (weight%)</b>						
Heat	PRE					
558106	35.3					



**Quality assurance - Erik Jansson/QA-manager Primary Products** A05/202  
MTC Service / Certificates



ANS



Heat	C	Si	Mn	P	S	Cr	Ni	Mo
558106	0.015	0.65	0.84	0.022	0.011	22.32	5.37	3.08
	Cu	N						
558106	0.15	0.173						
Tensile test at room temperature acc. to ASTM A370/ISO 6892-1								
Longitudinal								
Location half radius								
	Yield strength		Tensile strength		Elongation			
	Mpa	MPa	Mpa		%	%		
Lot	Rp0.2	Rp1.0	Rm		A	2"		
92501	514	582	719		41	41		
	Red.of Area							
	%							
	Z							
	68							
Transversal								
Location half radius								
	Yield strength		Tensile strength		Elongation			
	MPa	MPa	MPa		%	%		
Lot	Rp0.2	Rp1.0	Rm		A	2"		
92501	519	588	737		33	33		
	Red.of Area							
	%							
	Z							
	68							
Hardness test acc. to ASTM E-10								
Location half radius								
	Min	Max						
Lot	HBW	HBW						
92501	216	218						
- Near Surface								
	Min	Max						
Lot	HBW	HBW						
92501	218	221						
Impact test, J, Longitudinal acc. to ASTM A-370/ISO 148-1								
Location half radius								
	Single values			Avg.	Temperature			
Lot	Joule			Joule	°C			
92501	49	43	47	46	-50			
Lateral expansion								
				Temperature				
Lot	mm			°C				
92501	0.47	0.42	0.46	-50				
Impact test, J, Transversal acc. to ASTM A-370/ISO 148-1								
Location half radius								
	Single values			Avg.	Temperature			
Lot	Joule			Joule	°C			
92501	22	28	28	26	-50			





## Lateral expansion

Lot	mm			Temperature °C
92501	0.18	0.23	0.26	-50

Corrosion test according to ASTM G-48A, 25°C for 24 hours.

In delivery condition. No pitting corrosion found at 20x enlargement.

Test location acc to Norsok MDS D47

## Specimen weight loss

Lot	g/m <sup>2</sup>
92501	0.00

Ferrite acc to ASTM E-562

Location half radius

20 Points and 25 Fields

Lot	%
92501	48.5

- Near Surface

Lot	%
92501	49.5

Following controls/tests have been satisfactorily performed:

- Material Identification.
- Ultrasonic testing (\*)
- Visual inspection and dimensional control.
- Austenite Spacing acc. to DNV-RP-F112 Section 7 = 17.00 μm

## HEAT TREATMENT:

20 - 70 mm: Material soaking 1060°C, min. 30 minutes. Quenched in water. Water temp pre-quench max 40°C, after quench max 50°C

75 - 350mm: Continuous heat treatment furnace. Material soaking at 1060°C, 30 minutes minimum. Sandvik is using a continuous water spray quenching process. Water temp pre-quench 40°C max, after quench 50°C max.

355-370mm: Material soaking 1070°C, min. 60 minutes. Quenched in water. Water temp pre-quench max 40°C, after quench max 50°C

375-450mm: Material soaking 1070°C, min. 120 minutes. Quenched in water. Water temp prequench max 40°C, after quench max 50°C.

The raw material is free from radioactive contamination.

Microscopic Examination X 500 acc. to ASTM A 923 Method A/NORSOK M630  
Free from grain boundary carbides and intermetallic phases.

Material free from mercury contamination.

No welding or weld repair.

NORSOK M-650 ED-4 QTR NO: 22 Cr Duplex SS

Certified acc. Pressure Equipment Directive (2014/68/EU Annex 1 para 4.3) TUEV CERT-Certification body for pressure equipment of the TUEV NORD GRUPPE; notified body, reg.-no. 0045.





The delivered products comply with the specifications and requirements of the order.

The material is manufactured according to a Quality system, approved and registered to ISO 9001:2015.

No unauthorized alterations. The contents of this Inspection Certificate may not be modified or revised in any way without the prior written approval of AB Sandvik Materials Technology. Unauthorized alterations to the Inspection Certificate, including introduction of false, fictitious or fraudulent statements or entries, may be punishable by fines, imprisonment, or both. This Inspection Certificate may be copied only in the manner and for the purposes specified in Section 6 of EN 10204:2004. Contravention of this notice will be prosecuted to the fullest extent of applicable law.

The certificate is produced with EDP and valid without signature.





## APPENDIX

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Lab accreditation

Our lab is accredited under SWEDAC Accreditation number 1636 for testing as per ISO/IEC 17025.

## Applicable only to specific dimensions

20mm - 160mm: EN 10088-5 EN (Only valid for CE marked products together with Sandvik Declaration of Performance certificate).

20mm - 160mm: PED 2014/68/EU, \*EN 10272 (Stainless steel bars for pressure purposes).

20mm - 260mm: NORSOK M-630 Ed. 6 - NORSOK MDS D47 Rev.5\*

181mm - 450mm: PED 2014/68/EU, \*EN 10222-5

Suitable for manufacturing of components in acc. with \*ASTM A-182, ASTM A-1049, ASTM A-314.

## Test location

Mechanical, ferrite testing:

Bar dim  $\leq$  50 mm - Longitudinal test pieces in center of the bar

Bar dim > 50 mm - 450 mm - Longitudinal test pieces, 1/4 T and minimum 100 mm from any second surface.

Bar dim > 100mm - 450 mm - Transversal test pieces, 1/4 T and \_\_\_ minimum 100 mm from any second surface.

One set of test samples per heat treatment lot.

Maximum lot size 15 ton.

Micro: To ensure a sound, and unaffected structure all through the material three samples are taken, one close to surface, half radius, and in the center of the bar.

## Ultrasonic test

Dim 29 - 74 mm: EN 10308 quality class 3

Dim 75 mm - : Ultrasonic test acc to EN 10228-4, Scan coverage 1, Quality Class 3, Tab 4 and ASTM A-388, API 6A PSL3/3G.

Furnace calibration every third month according to API 6A

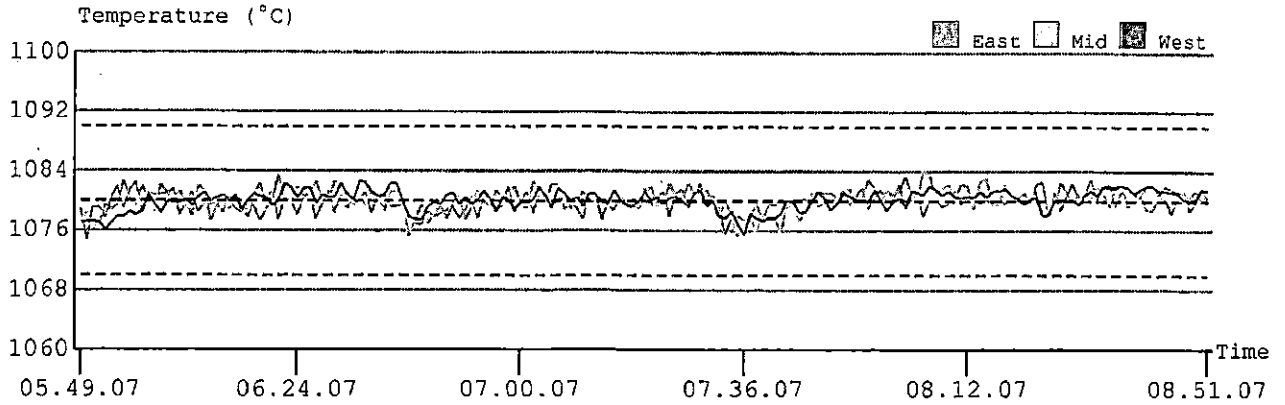
Thermocouples of S-type (+/- 5°C tolerance) are used to monitor the furnace temperature.



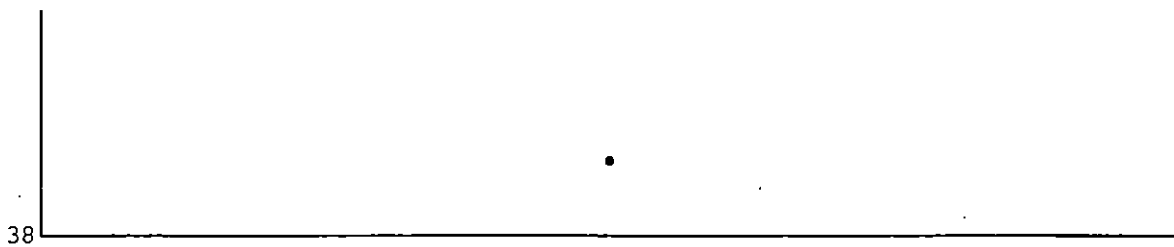


Work order	Num. of pieces	Dim (mm)	Weight (kg)	Steel Grade	Heat Number	Setpoints					
						Strategy	Zone 3 (°C)	Mtrl. temp. out furn. (°C)	Total time (mm)	Cooling time 1 (mm:ss)	Cooling time 2 (mm:ss)
92501	1	345	4929	3X32RD 69	558106	30	1080	1065	183	38:20	16:40

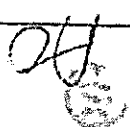
Heating Temperature (°C) - Zone 3 - Soaking



Temperature after cooling (°C)





Date	2020-01-12
SANDVIK Order No	
Grade	3X32RD89
Procedure No.	72-4031
Testpiece No.	K095
Specification	EN 10228-4, ASTM A388, API 6A PSL 3/3G
Level 1 Operator	
Performed by	4588-Sulje
Approved by	8703 - OLEN 
Level 2 Technician	

EQUIPMENTS

Apparatus	Sorting	Marking	Alarm	X	Recording
Apparatus	Sorting	Marking	Alarm		Recording
Apparatus	Sorting	Marking	Alarm		Recording
Transducer	Type	Size	Beam width	Focal length	Freq
Transducer	A604S	25,4 MM			2,25
Transducer	Type	Size	Beam width	Focal length	Freq
Transducer					MHz

EQUIPMENTS

<input checked="" type="checkbox"/> Contact	Rotational Speed of	<input checked="" type="checkbox"/> Tubular	<input type="checkbox"/> Transducer	RPM	Pitch	mm/Ray	Testspeed	m/min
Scanning	Sensitivity/calibration							
Axial	Longitudinal Defects, Two Way Search							
Axial	Sensitivity/calibration							
Axial	Transverse Defects, Two Way Search							
Axial Straight Beam	Sensitivity/calibration							
<input checked="" type="checkbox"/> Circumferential Straight Beam	Sensitivity/calibration							
	FBH $\phi$ 5 mm							
	Surface condition							
	Peel							
Note								
15% OVERLAP								

RESULT OF TESTING

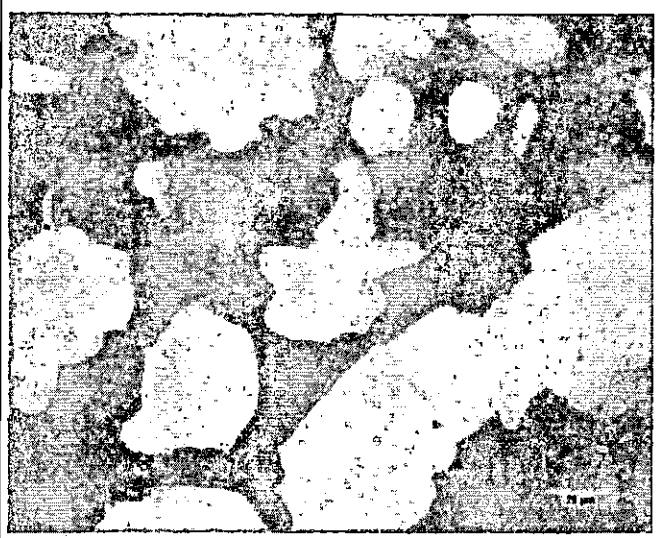
Dim in mm	Lot No	Heat No	Number of tested tubes/bars	Accepted without report	Accepted with report	Not Accepted
$\phi$ 330,20	92501	558108	1	1		

# Microstructure Examination Report

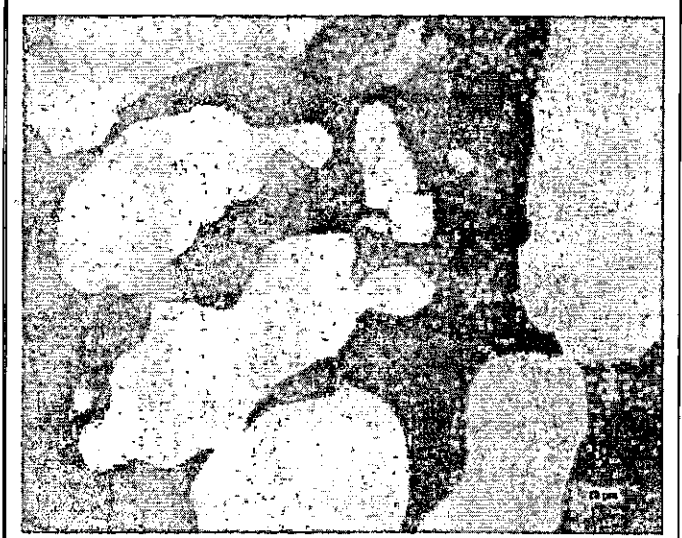
Material Information	
Grade	SANMAC2205
Heat	558106
Lot	92501
Dim	330,20X

Technical Information	
Certificate No.	A/20-871230
Test Date	2020-01-15
Etchant	MURAKAMI
Test Result	OK

Test No: 786      Magnification: 500x



Test No: 787      Magnification: 500x



Test No: 788      Magnification: 500x

