

Type of inspection document : Inspection certificate acc. to EN 10204 / 3.1	A02	Internal order No.: 10062609 - 80	A08
Purchaser : ALLEIMA BENELUX B.V. . AMUNDSENWEG 4 5928 LT VENLO THE NETHERLANDS	A06	Purchase order No. : 800777 Purchaser's reference : 800777 Project Id. : 4003435	A07
Product : Seamless cold finished tube Dimension (OD x WT) : 19,05 x 2,11AW mm	B01/B04 B09/B10	Steel designation : 3R60 / 3R60 Melting process : AOD	B02 C70
Technical requirements : ASME SA-213/SA213M - 2021 ASTM A213/A213M - 2022 ASTM A269/A269M-2015a(Reap.2019) EN 10216-5 TC1 2021 EN 10305-1 (Only Tolerances-Table 5) AD 2000 W2 Einbaurohre - 2022 AD 2000 W10 - 2019 NACE MR0175-2021/ISO 15156-3:2020, NACE MR0103/ISO 17945-1:2015 Alleima Spec. S-08921 PED 2014/68/EU			B03
Supplementary information : Manufacturing of stainless steel tubes in grade 3R60 / TP316L / UNS S31603 / 1.4435 from steel origin: Alleima Tube AB, Sweden. The qualified pre-material supplier is mentioned in the section "Extent of material delivery". Tube lenght 6000 mm (-0/+5 mm)			B14
The products, covered by this certificate, comply with specification and requirements of the order.			Z01
Originator of the document : QA - AC	A05/Z02	Inspector's stamp:	Z03

Chemical composition (Heat analysis)

Heat	C [%]	Si [%]	Mn [%]	P [%]	S [%]
	max 0.030	max 1.000	max 2.000	max 0.040	max 0.015
568274	0,021	0,400	1,770	0,029	0,007
568323	0,019	0,380	1,680	0,031	0,008

Heat	Cr [%]	Ni [%]	Mo [%]	N [%]
	17.000-18.000	12.500-14.000	2.500-3.000	max 0.100
568274	17,400	13,110	2,630	0,043
568323	17,360	13,160	2,620	0,035

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Product check analysis

Heat	Lot	C [%]	Si [%]	Mn [%]	P [%]	S [%]
		max 0.030	max 1.000	max 2.000	max 0.040	max 0.015
568274	2101509-11	0,021	0,410	1,780	0,031	0,007
568323	2101508-11	0,019	0,380	1,720	0,030	0,007

Heat	Lot	Cr [%]	Ni [%]	Mo [%]	N [%]
		17.000-18.000	12.500-14.000	2.500-3.000	max 0.100
568274	2101509-11	17,290	12,880	2,570	0,043
568323	2101508-11	17,380	12,970	2,600	0,040

Extent of material delivery

Heat	Lot	Hollow supp.	No. of HTcycles ¹⁾	Pieces	Total length [m]	Total weight [kg] ²⁾
568274	2101509-11	ALLEIMA SE	1	63	378.000	336.798
568323	2101508-11	ALLEIMA SE	1	244	1 464.000	1 304.424

Note : ¹⁾ Number of heat treatment cycles performed on the tubes.

²⁾ Weight quantity is theoretically calculated, it might differ compared to shipping documents.

Chomutov, date : 14.8.2023

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Flaring test in acc. with ASTM A 1016

Heat	Lot	ST	Test result [pass/fail]
			pass
568274	2101509-11	WnF	pass
568274	2101509-11	EnF	pass
568323	2101508-11	EnF	pass
568323	2101508-11	WnF	pass

ST (sample type): WnF-West end, tube did not not used for flattening test,Enf-East end, tube did not not used for flattening test;

Flaring test in acc. with EN 10216-5

Heat	Lot	Test result [pass/fail]
		pass
568274	2101509-11	pass
568323	2101508-11	pass

Flattening test in acc. with ASTM A 1016

Heat	Lot	ST	Test result [pass/fail]
			pass
568274	2101509-11	W	pass
568274	2101509-11	E	pass
568323	2101508-11	E	pass
568323	2101508-11	W	pass

ST (sample type): E-East end of tube; W-West end of tube;

Hardness test (HRB/HRC) in acc. with E18/S-08921/NACE

Heat	Lot	Hardness [HRB]	Hardness ≤ 22 HRC [yes/no]
		max 80,000	yes
568274	2101509-11	76,000	yes
568274	2101509-11	75,000	yes
568323	2101508-11	76,000	yes
568323	2101508-11	76,000	yes

Intergranular corrosion testing in acc. with ASTM A262E

Heat	Lot	Test result [pass/fail]
		pass
568274	2101509-11	pass
568323	2101508-11	pass

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Intergranular corrosion testing in acc. with EN ISO 3651-2/A

Heat	Lot	Test result [pass/fail]
		pass
568274	2101509-11	pass
568323	2101508-11	pass

Longitudinal tensile test in acc. with A370 / EN ISO 6892-1

Heat	Lot	Rp0,2 [MPa]	Rm [MPa]	A2" [%]	Amb.temper. [°C]	A5 [%]
		min 220.000	515.000-690.000	min 35.000	10.000-35.000	min 40.000
568274	2101509-11	261,000	580,300	52,000	24,000	50,200
568274	2101509-11	252,300	575,100	52,600	24,000	49,300
568323	2101508-11	286,700	590,500	51,000	24,000	48,800
568323	2101508-11	282,200	587,900	52,200	24,000	50,000

Heat	Lot	Rp1,0 [MPa]
		min 250.000
568274	2101509-11	293,700
568274	2101509-11	285,600
568323	2101508-11	318,600
568323	2101508-11	312,900

Microstructure evaluation and Grain size WI-3815/ASTM E112

The structure is free from grain boundary chromium carbide precipitations.

Heat	Lot	G.B.Cr.Carbides [No/Yes]	Grain size [(G)]
		No	5.000-14.000
568274	2101509-11	No	7,000
568323	2101508-11	No	7,000

Dimensional check

Test results comply with specified criteria.

HT - Final heat treatment of straight tubes

All tubes have been be solution annealed followed by accelerated cooling.

Solution annealing temperature 1090°C, soaking time min. 2 minutes.

Quench medium - protective gas.

Inside cleanliness check

Test results comply with specified criteria.

NDT - Eddy current flaw detection in acc. ASTM E426

Test results comply with specified criteria.

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NDT - Visual inspection

Test results comply with specified criteria.

PMI - 100% positive material identification

Test results comply with specified criteria.

Statement

The raw material is free from radioactive contamination.

Statement

Material free from mercury and asbestos contamination.

Statement

The material have been manufactured within the scope of certified Quality Management System maintained in accordance with EN ISO 9001:2015.

Straightness check

Test results comply with specified criteria.