Termoplam Ltd.
Testing laboratory

Republic of Bulgaria, Sofia,
http://www.termoplam.eu, e-mail: termoplam2011@abv.bg, GSM 0885 449 216

Test Report

№ 252
08.09.2022

I. NAME AND SIGNATURE OF THE TESTED SAMPLE:

Production model: MEGAL-M20

II. NAME AND DESCRIPTION OF THE TESTED SAMPLE:

Wood heating boiler with a rated thermal output of 20 kW, one unit per test.

III. LEGAL DOCUMENT: EN 303-5:2021, EN 304:2017, EN 45001 and EN ISO/IEC 17025:2018.

Picture of the sample

IV. QUANTITY OF THE TESTED SAMPLES: One test sample;

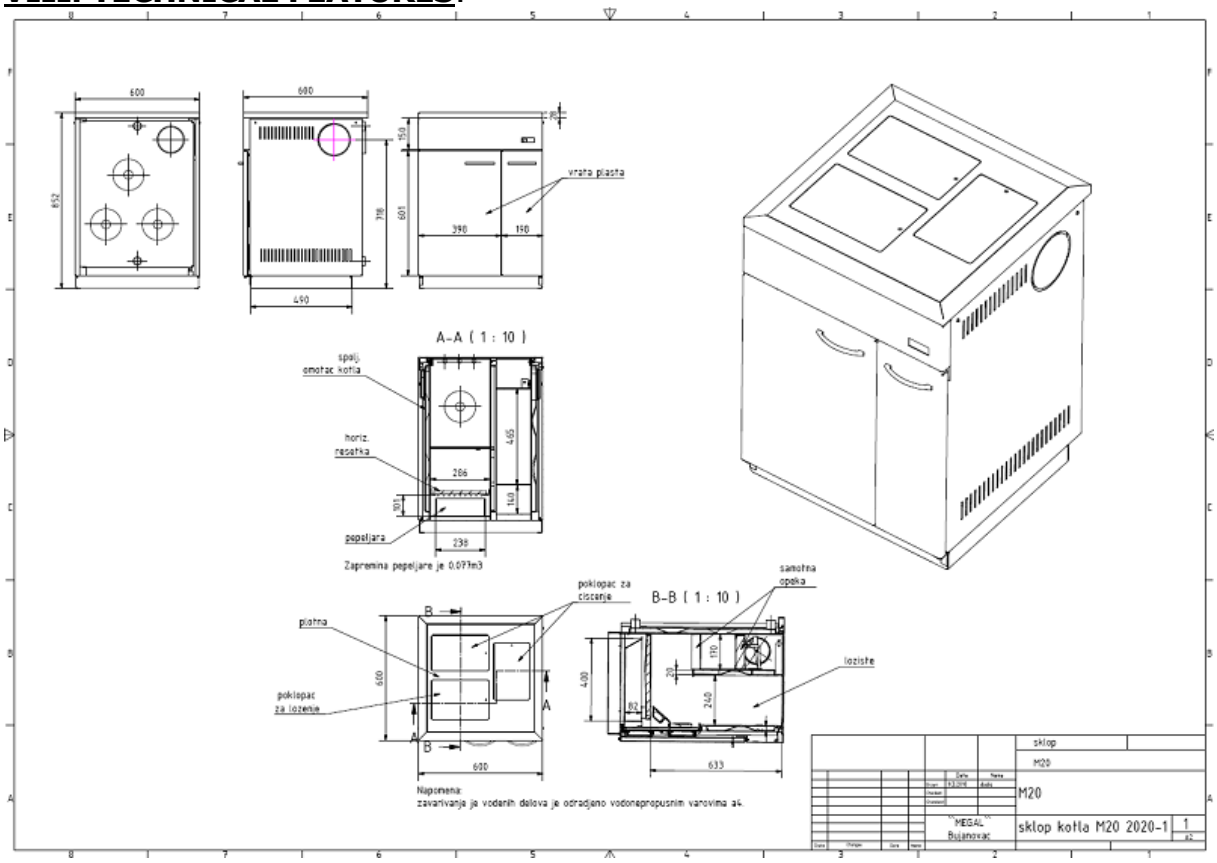
V. MANUFACTURER: "MEGAL" A.D, 17520 Bujanovac, Lopardinski put b.b, Serbia.

VI TEST APPLICANT: "MEGAL" A.D, 17520 Bujanovac, Lopardinski put b.b, Serbia.

VII. PURPOSE AND OBJECT OF THE TEST:

Heating boiler thermal test for defining of:
7.1. Nominal heat output;
7.2. Test for determining heating boiler efficiency.
7.3. Determining emissions from the heating boiler.
7.4. Pressure test of the boiler plumbing parts.
7.5. Calculation of the seasonal space heating emissions.
7.6. Calculation of the seasonal space heating energy efficiency.
7.7. Calculation of the energy efficiency index (EEI).

VIII. TECHNICAL FEATURES:



Scheme (drawing of the boiler)

8.1. Heat input $Q_в$ - according to section 3.13 from EN 303-5:2021;

8.2. Thermal capacity P - according to section 3.6 from EN 303-5:2021;

8.3. Efficiency $\eta_к = P/Q_в$ - according to section 4.4.2 and 5.9.3 from EN 303-5:2021.

8.4. Boiler weight – without water/ volume of the water jacket:
8.4.1. MEGAL-M20 kW – 168 kg./ 38 l.;

IX. TEST CONDITIONS:

9.1. Executor: Termoplam Ltd. Sofia
9.2. Weather conditions: Ambient temperature t_L: ≤ 19/19°C (from 15°C to 30°C according to section 5.6.1 от EN 303-5:2021).
9.3. Starting Date: 06.09.2022 y. Date of completion: 08.09.2022 y.
9.4. Weight of the pilot fuel:
9.4.1. B_n =4.7 kg/h (wood at rated heating output for two semi periods of 2 hour with continuous combustion according according to 5.6.4.1 and 4.4.5 from EN 303-5:2021).
9.4.2. B_{red} = 1,6 kg/h (wood at reduced heating output for two semi periods of 2 hour with continuous combustion according according to 5.6.4.1 and 4.4.5 from EN 303-5:2021).
9.5. Draft (low pressure in the flue pipe) ≤ 0,15÷0,28 mbar (see section 4.4.4 from EN 303-5:2021).
9.6. Fuel type:
9.6.1. Wood with calorific value Hu = 18320±60 kJ/kg according to test report № 9298/30.05.2022 issued by the EUROTEST - Control SA (see section 5.3 and table 9 from EN 303-5:2021 and specified in the maintenance book).
9.7. Temperature of outgoing water 86.7/85.3°C °C (see section 5.7.2 from EN 303-5:2021).
9.8. Other conditions :
9.8.1. The test is made under the conditions quoted above and observing the following additional ones:
9.8.1.1. Complied with the safety measures according to EN 303-5:2021 and EN 304;

9.8.1.2. The tested sample meets the instruction for installation and operation according to EN 303-5:2021 and EN 304.
9.9. Used equipment - according to section 5.2 from EN 303-5:2021.
9.10. Recording devices:
9.10.1. Auxiliary devices: PC with software application package.

X. RESULTS FROM THE TEST:

10. Parametres**.**
10.1. Rated heating output of the boiler P_N according to section 3.7 from EN 303-5:2021.
10.2. Duration of the test rated heating output (two semi periods):
10.2.1. Wood duration of the test ≥ 2 h according to section 5.6.4.1 and 4.4.5 from EN 303-5:2021.
10.3. Maximum temperatures of the elements:
10.3.1 For heating boiler service:
10.3.1.1. Handle of the door ≤ 58.9 °C – according to 4.3.7 from EN 303-5:2021;
10.4. Real values of the thickness measurement, etc. with additional certificates enclosed.
10.5. After the test of the plumbing parts at pressure p_{outg}=2xPS=2x2.5=5 [bar] there are no leaks and visible deformations (elastic and plastic) in accordance with section 5.4.1 from EN 303-5:2021.
10.6. Temperature control and limiting devices according to section 4.3.9 from EN 303-5:2021:
The operating instructions on page 9 state that a safety valve (outside the boiler) must be installed.
On page 8 picture 1 of the installation and operating instructions there is a description of how to connect a boiler to the open system using a safety valve. A connection diagram and the necessary elements are shown.
In page 9 picture 2 of the installation and operating instructions, a description is provided on how to connect the boiler to the closed system using a safety valve. The scheme shown is for connection to these elements.
10.7. For calculation of the values of Q_B, P and η_K are used formulas from items 5.9.1, item 5.9.2 and item 5.9.3.2 from EN 303-5:2021.
* Values before the slash refer to the test at nominal power, and after it are for minimum power.

Table 1

Measurement	MEGAL-M20		Limit
Regime	nom	min	-
t_A °C	210	194	
t_L °C	≤19	≤19	15÷30
$t_{1\ upper\ surface}$ (average value)	≤54.6	≤50.6	≤60+t_L*= 83
$t_{2\ left\ wall}$ (average value)	≤55.2	≤49.9	≤60+t_L*= 83
$t_{3\ right\ wall}$ (average value)	≤59.1	≤49.2	≤60+t_L*= 83
$t_{floor\ max}$	≤37.4	≤35.8	≤ 80 *
$t_{\ upper\ handle}$	≤58.9	≤57.0	≤60+t_L*= 83
$t_{\ lower\ handle}$	-	-	≤60+t_L*= 83
$P_{outg.}$ =2xPS bar	5	5	= 5 bar
W_1 m³/h	950	318	-
t_V °C	86.7	85.3	-
t_R °C	68.5	66.9	70 ÷ 90
Bn kg/h	4.7	1.6	-
P kW	20.17	6.83	
Q_B kW	23.92	8.14	
η_K= P/Q_B [%]	84.52	83.95	class 4
CO mg/m³ ** at 10% O_2	677.5	548.7	≤700
CO_2 % vol. part.	6.77	7.54	-
OGC mg/m³ at 10% O_2***	27.4	24.9	≤ 30
Dust mg/m³ at 10% O_2*****	55.6	48.2	≤60
W % ****	≤30	≤30	-
O_2 % vol. part.	14.0	13.2	10
NOx mg/m³ at 10% O_2	199.4	148.3	
PN kW	20	-	-

* According to section 4.3.7 from EN 303-5:2021.

** Emission class 5 of the boiler at rated heating output ≤50 kW according to section 4.4.7 and table 7 from EN 303-5:2021.

*** Emission class 5 of the boiler at rated heating output ≤50 kW according to section 4.4.7 and table 7 from EN 303-5:2021.

**** Fuel – wood according to section 5.3, table 9 from EN 303-5:2021.

***** Emission class 5 of the boiler at rated heating output ≤50 kW according to section 4.4.7 and table 7 from EN 303-5:2021.

XI. Seasonal space heating emissions: acc. to table 8, Annex F from EN 303-5:2021, Annex II and Annex III of the REGULATION (EU) 2015/1189:

Table 2

Results	Model boiler	In accordance REGULATION (EU) 2015/1189.
	MEGAL-M20	[mg/Nm^3]
Dust [mg/Nm^3]	49	[PM] [1] ≤ 60
CO [mg/Nm^3]	568	[CO] [2] ≤ 700
OGC [mg/Nm^3]	25	[OGC] [3] ≤ 30
NO_x [mg/Nm^3]	156	[NO_x] [4] ≤ 200

Dust content of exhaust gases [PM] [1] ≤ 60 mg/Nm^3 for manual stoked boilers in accordance with point 1 (c), of Annex II of the REGULATION (EU) 2015/1189.

CO of exhaust gases [CO] [2] ≤ 700 mg/Nm^3 for manual stoked boilers in accordance with point 1 (e), of Annex II of the REGULATION (EU) 2015/1189.

OGC of exhaust gases [OGC] [3] ≤ 30 mg/Nm^3 for manual stoked boilers in accordance with point 1 (d), of Annex II of the REGULATION (EU) 2015/1189.

NO_x of exhaust gases [NO_x] [4] ≤ 200 mg/Nm^3 for biomass boilers in accordance with point 1 (f), of Annex II of the REGULATION (EU) 2015/1189.

XII. Seasonal space heating energy efficiency: acc. to Annex F from EN 303-5:2021, Annex II and Annex III of the REGULATION (EU) 2015/1189:

Table 3

Model boiler	Seasonal space heating energy efficiency η_s %	In accordance REGULATION (EU) 2015/1189 [η_s] [%]
MEGAL-M20	82	[η_s] [1] ≥ 75

Where:

- η_s % - the seasonal space heating energy efficiency:

[η_s] [1] ≥ 75 % for boilers with a rated heat output of 20 kW or less in accordance with point 1 (a), of Annex II of the REGULATION (EU) 2015/1189.

XII. Energy efficiency index (EEI): acc. to Annex F from EN 303-5:2021, Annex II and Annex VIII of the REGULATION (EU) 2015/1187:

Table 3

Model boiler	Energy efficiency index EEI	Energy efficiency class
MEGAL-M20	119	A+

The energy efficiency index is calculated according to:
12.1. The requirements and the formulas of ANNEX VIII of REGULATION (EU) 2015/1187;
12.2. The energy efficiency index is calculated on the database provided by manufacturer for boiler burning wood;
12.3. The energy efficiency index is set for preferred fuel: wood according section 5.6.4.1 and section 5.3 from EN 303-5:2021.
12.4. Energy efficiency class is determined based on the energy efficiency index EEI according to Table 1 of ANNEX II of REGULATION (EU) 2015/1187.

XIII. ENCLOSURES:

13.1. Prints of the results from page 5.
13.2. Instruction for installation and operation - Yes.
13.3. Assembly drawing of the sample - 1.
13.4. Certificates (annexs A, B, C, D, and E): 5.

"ТЕРМОПЛАМ" ЕООД
СОФИЯ

MANAGER: .....
(eng. Pl. Iliev)

NOTE:
The test results relate only to the tested samples.
Extracts from the test report can't be reproduced without written agreement of the testing laboratory.
This document is only informative.

Annex A

Certificate of steel sheet with a thickness of 5 mm

HBIS GROUP Serbia Iron & Steel Bc Belgrade, Bulevar Milutja Popina 6,
Belgrade-New Belgrade,
11000 Belgrade, Republic of Serbia

CE
13
0040-CPR-0701

INSPECTION CERTIFICATE: 3.1 EN 10204:2004 PAGE No: 1
-uverenje o ispitivanju- (strana br):

PURCHASER: ATENIC COMMERCE D.O.O.
(kupac) CACAK
BULEVAR OSLOBODILACA CACKA 91
TRADING CO: ATENIC COMMERCE D.O.O.
(izvoznik) CACAK
(primalac) BULEVAR OSLOBODILACA CACKA 91
PRODUCT: HOT ROLLED COILS
(proizvod)
DIMENSIONS: 5,000 X 1500 X
(dimenzije, mm) EN 10051/2010
QUALITY: S235JR+AR
(kvalitet) EN 10025-2/2019
Net weight(kg): 43260
DELIVERY CONDITIONS : AR
(STANJE ISPORUKE)

CERTIFICATE No 54137
(uverenje broj)
PURCHASE ORDER
ITEM:
CONTRACT No. ATEN1071RS
(ugovor broj)
T: HR+CE
DATE OF ISSUE 31/07/2021
(dat.izdavanja)
Transport: 347446685070

COIL No, PACK No, (kotur br. paket br)	Heat No Šarža	MECHANICAL PROPERTIES - MEH.TEH.OSOBINE										Bend test	Hardness (tvrdoca)	Melt furn nacin Proiz
		Re MPa	Rm MPa	Re/ Rm	A %	Elo ng.	Impact test (žilavost) Sr.Vr.	1	2	3	S			
								J	T°C	J	J	J	180°	HRB HV10	
1F18016	881486	312	446	,70	30									Y
1F18017	377157	322	452	,71	28									Y

CHEMICAL COMPOSITION OF HEAT - HEMIJSKI SASTAV SARZE (%)

	881486	377157
C	0,12	0,12
Mn	0,77	0,78
Si	0,016	0,016
P	0,010	0,016
S	0,009	0,012
Al	0,039	0,047
Cu	0,10	0,07
Cr	0,03	0,04
Ni	0,04	0,03
Mo	0,006	0,006
Ti	0,002	0,002
V	0,002	0,002
Nb	0,003	0,002
N	0,006	0,007
B	0,0001	0,0001
CEV	0,26	0,27

Measured values of alpha and beta/gamma surface contamination of the examined goods are for alpha emitters lower than 4 Bq/100cm2, as well as for beta/gamma emitters lower than 40 Bq/100cm2
We hereby declare that above mentioned products were manufactured in accordance with specifications and contract requirements.

QUALITY ASSURANCE
Document is valid without signature and stamp. OBEZBEDJENJE KVALITETA

HBIS GROUP Serbia Iron & Steel d.o.o. Beograd
Odeljenje za kvalitet
AD-04

Annex B

Steel composition certificate

ISD DUNAFERR

INSPECTION CERTIFICATE 3.1

ISO 9001

Page 1 (2)

A DOKUMENTUM ELEKTRONIKUSAN HITELESÍTETT — THIS DOCUMENT IS DIGITALLY SIGNED AND TIMESTAMPED — NETLOCK

A01 Producer's Plant:	A02 Type of statement:	B15 Validity:	A10 Delivery date:	A11 Date of issue:	A08.1 Order No./Item:	Modification 0 / A03 Statement No.: 0027477167/000014
ISD DUNAFERR ZRT.,2400 DUNAÚJVÁROS, VASMŰ TÉR 1-3,	3.1-EN 10204-2004	2030.03.09	2020.03.09	2020.03.09	0004222692/000002	B02 Quality marking: P265GH +N / Quality standard: EN 10028-2:2017
	A08.1 Name of customer: DAK COMERC DOO				A08.2 Contract No.: 0004222692/000014	
	Address of customer: Serbia,21000,NOVI SAD,TEMERINSKI PUT 21.				B01.1 Name of product: Hot rolled coil (Plain)	
A04 Metal stamp:	A08.2 Place of destination: DAK COMERC DOO,Serbia,21000,NOVI SAD,TEMERINSKI PUT 21.				B01.2 Dimension standard: EN 10051:2010	
	B05 Reference (heat)treatment of samples:				B01.3 Class: L	
					C05 Place of inspection:	
B09 Supplementary requirements: Surface according to EN 10163-2standard class B / sub- class 3.					B04 Delivery terms of the product: Normalised	

IDENTIFICATION OF THE PRODUCT

B07.1 Charge No.	C70 Steel prod. Procedure	C00 Sample No.	B07.2 Coil/bundle No.	B08 Pieces (pc):	B12 Theoretical mass (t):	B13 Actual mass (t):	D52 Coiling temp.		B09 Width (mm):	B10 Thickness (mm):	B11 Length (mm):	B14 Total mass (t):
683880	LD	90000772731	D49276000			22,670			1500/+20	5		45,490
683880	LD	90000772732	D49276000			22,820						

B06 Marking of the product: (Z04)

DVP 2020.03.09 12:34:41

ISD DUNAFERR

INSPECTION CERTIFICATE 3.1

ISO 9001

Page 2 (2)

Modification 0 / A03 Statement No.: 0027477157/000014

CHEMICAL INSPECTION		C71 C	C72 Mn	C73 Si	C74 S	C75 P	C76 N	C77 Al	C78 Cu	C79 Cr	C80 Ni	C81 V	C82 Nb	C83 Ti	C84 B	C85 Ca	C86 Mo	C87 O	C88 Zr	C89 As	C90 Sn	C91 W	C92 Co	C95 Cev	C94: Alt/N	C94: Cr+Cu+Ni+Mo			
Standard requirement min:	P265GH +N		0,60					0,020																	2,000	0,000			
Standard requirement max:	P265GH +N	0,20	1,40	0,400	0,010	0,025	0,012		0,300	0,300	0,300	0,020	0,030	0,030			0,080									0,700			
Contract requirement min:																									2,000	0,000			
Contract requirement max:				0,030																						0,700			
Charge chemistry	683880	0,13	1,10	0,024	0,005	0,010	0,006	0,069	0,040	0,003	0,041	0,001	0,001	0,001	0,0000	0,005	0,006	0,003		0,002	0,003			0,33	12,000	0,171			
Finished product chemistry																													

MECHANICAL INSPECTION	C10	TENSILE TEST C01	C02	C04	C11 Yield point	C12 Tens.	C13 Elongation		C14 Contr. %	C15 Ra/Rt m	BENDING TEST C01	C02	C04	C51 Bend. rad. (mm)	C56 Bend angle	C52 Result	IMPACT TEST C44 Temp. °C	C01	C02	C04	C40-41 Type	C42 Impact 1 J	C42 Impact 2 J	C42 Impact 3 J	C43 Average J
					tip N/mm²	N/mm²	tip %	tip %																	
Standard requirement min:	P265GH +N		4		REH	265	410	A5 22,0																	
Standard requirement max:	P265GH +N						530																		
Contract requirement min:					REH	265	410	A5 22,0																	
Contract requirement max:							530																		
SAMPLE (No.)	90000772731 20207013439	5	4	1	REH	372	487	A5 34,0		0,78															
	90000772731 20207013440										5	4	1	0A	180	otf									
	90000772732 20207013441	5	4	1	REH	397	497	A5 32,8		0,80															
	90000772732 20207013442										5	4	1	0A	180	otf									

Code according to EN 10168:2004
C10 Shape of sample: The sample is a quadratic cross-section taken from sheet in every case.
C01 Sample taken from: 5 = beginning of coil; 6 = end of coil; 7 = middle of coil; 8 = other
C02 Direction of samples: 3 = L = lengthwise; 4 = T = cross; 5 = Z = diagonal
C04 Status of samples: 1 = rolled; 2 = annealed; 9 = normalised

D01 Marking and identification, surface properties, shape and dimension properties:
Marking and identification, control of surface properties, form and measure properties are completed, the product complies with the contract requirements.

Z01 The product complies with the contract requirements.

D51 Supplementary information:
1. Radioactivity: We verify that the produced and delivered products don't increase the radioactivity in environment, the radioactivity is under the normal value of 100 Bq/kg.
2. 1N/mm2= 1MPa

Annex C

Safety valve certificate

IVR
Innovation Value Research

DECLARATION OF CONFORMITY

According to the Norms:
EN10204-2.1 & UNI EN ISO / IEC 17050-1

The undersigned **IVR S.p.A.**
Producer of Hydrothermal Systems,
based in Boca (NO) Via Brughiera III no.1, Località Piano Rosa (Italy)

DECLARES

Under its sole responsibility that the product

Safety valve F/F
350 - 351 - 355 - 356 series

Are built in accordance with the technical requirements and with the procedures established by the Company Quality Management System compliant with the UNI EN ISO 9001:2015 standard

Field of application:

- Maximum working pressure: 6 bar
- Calibration range:
  - ½" : 1,5 – 6,0 bar
  - ¾" : 1,5 – 6,0 bar
  - 1" : 1,5 – 6,0 bar
- Operating temperature: +5°C / +110°C
- Standard calibration performed by the manufacturer: 6 bar

IVR S.p.A.
Legal Representative
Piero Giacomini
Piero Giacomini

April 20, 2022

Sede Amministrativa: Via Brughiera III n.1 Località Piano Rosa – 28010 BOCA (NO)
Sede Legale: Via Francesco Melzi d'Eril n.7 – 20154 MILANO (MI)
Codice Fiscale e Partita IVA 06829530960 – Registro Imprese di Milano n. 06829530960 – R.E.A. Milano n. 1918135
Tel. 0322 888811 – Fax 0322 888892-93 website www.ivrvalvole.it e-mail vendite@ivrvalvole.it / sales@ivrvalvole.it

Annex D

Certificate of welding electrode

INSPECTION CERTIFICATE (3.1) - Chemical analysis
TEST REPORT (2.2) - Mechanical properties

Date: 2021-11-15 Certificate number: EC26619040 rev. 0

Our order:	0100368940	Your order:	13102021
Our reference:	Predrad Boricic (Serbia)	Your reference:	
Customer number:	HUE00050	Your fax number:	
Customer order date:	20211013	Your e-mail:	

Invoice address
STANISIC METAL DOO NIS
KUBANSKA, 31
18000 NIS
Serbia

Receiver of certificate

Delivery address
STANISIC METAL DOO NIS
KUBANSKA, 31
18000 NIS
Serbia

DELIVERY Lot number: SFV4510265 Quantity: 7524 KGM

PRODUCT

Brand: ESAB
Description: OK 43.33 4.0x450mm
Item number: **4333404400**

CLASSIFICATIONS

SFA/AWS A5.1: E6013
EN ISO 2560-A: E 42 0 RR 12

MECHANICAL PROPERTIES

Typical data: acc to EN 10204 - 2.2

Standard:
Auxiliary:
Condition:

CHEMICAL COMPOSITION

Actual results: acc to EN 10204 - 3.1

All weld metal

Auxiliary:

C		0.08%
Si		0.35%
Mn		0.5%
P		0.025%
S		0.009%
Cr	<	0.1%
Ni	<	0.1%
Mo	<	0.1%
Nb		0.01%
Cu	<	0.1%
V		0.02%

COMMENTS

Product supplied under a QA Programme fulfilling the EN ISO 9001 standard.
This certificate is produced electronically and is valid without signature.
Please refer any queries to:
ESAB Kft. 1083 Budapest, Bókay János u. 44-46., C6 épület, 7. emelet +36 1 382-12-00

Validation - Chemical Analysis		Validation - Others	
Pál Dranka	Quality Assurance Manager	J-P Ernoult	Product Manager

Annex E

Certificate of seal

УНИВЕРЗИТЕТ У НИШУ
МАШИНСКИ ФАКУЛТЕТ
ЗАВОД ЗА МАШИНСКО ИНЖЕЊЕРСТВО
ЛАБОРАТОРИЈА ЗА ИСПИТИВАЊЕ МАТЕРИЈАЛА И МАШИНА
18000 Ниш, ул. А. Медведева бр. 14, тел/факс 018/588-199
тел. 018/ 500-739, 500-696, 500-701 – руководилац Завода
e-mail: zavod@masfak.ni.ac.rs

ИЗВЕШТАЈ О ИСПИТИВАЊУ
бр. 612–22–**19**/14

ИСПИТИВАЊЕ СТАКЛЕНЕ ПЛЕТЕНИЦЕ

Наручилац: **«MILAN PEŠIĆ» D. O. O.**
Производња ужади, канапа, плетеница и мрежа
16203 Вучје, с. Брза

ПОДАЦИ О ПРОИЗВОДУ

Назив производа:	СТАКЛЕНА ПЛЕТЕНИЦА
Година производње:	2014.
Попречни пресек:	квадратни, правоугаони и огругли од 3 mm 90 mm.
Сировински састав:	стаклено предиво.

ТЕХНИЧКЕ КАРАКТЕРИСТИКЕ

Радна температура:	до 550 °C
Називни статички притисак:	100 daN/cm^2 (bar)

Резултати испитивања се односе само на испитане узорке.

Ниш, 27. 2. 2014. год.

Руководилац посла
Горан Раденковић, ван. проф.

Руководилац
Завода за машинско инжењерство
Проф. др Драган Милчић