

TESR REPORT

№ TR-398-01/15.01.2024

Sponsor:	TMC EKATERINOSLAVSKAYA DVERNAYA ARTEL LTD, Gagarina av. 97/44, Ukraine, 49010, Dnipro
Object:	Doors, shutter assemblies, openable windows and conveyor systems Fire resistance Single-leaf metal door named "Construction exper" (CE)
Test method:	BDS EN 1634-1:2014+A1:2018 Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware - Part 1: Fire resistance test for door and shutter assemblies and openable windows and BDS EN 1363-1:2020 Fire resistance tests.Part 1 General requirements
Contents of the test report:	10 pages 7 annexes (40 pages)

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1. Description of the test specimen

The single-leaf metal door set Construction Expert (CE) consists of a metal frame with a threshold and a metal leaf. The door has dimensions (WxHxD) of 1140 mm x 2200 mm x 100 mm and a leaf thickness of 60 mm.

According to the technical specification provided by the applicant /annex 7/, the **door leaf** is metal with a rebate and has dimensions (WxHxD) of 1050 mm x 2120 mm x 60 mm. It consists of a base and a cover. The base of the leaf is made of 1.0 mm thick DC01 grade steel sheet, measuring 1020 mm x 2090 mm. The corners of the cover and the base, as well as the four sides of the leaf, are fixed with a continuous weld. The reinforcing slabs for the hinges are mounted to them in the same way. Eight M5 (DIN 928-8) nuts are welded to the leaf, 2 pcs. passive spikes - anti-penetration, reinforcing ribs in the leaf and lock boxes. The distance between the welding points should not exceed 120 mm. All weld seams are performed by semi-automatic arc welding in shielded gas using welding wire Sv-08G2S (Cb-08G2C) GOST 2246-70.

The leaf is reinforced with three transverse beams of dimensions (40 x 115) mm, located at a distance of 600 mm from the lower edge of the leaf, the second at 550 mm from the first and the third at 450 mm from the second, measured from the lower edges of the beams. The inside of the leaf, between the reinforcing beams, is filled with gypsum boards Promat brand, PROMATECT type, manufactured by Promat (Belgium) and stone wool. Stone wool type LYTX-312, LUYANG brand, manufactured by LUYANG ENERGY-SAVING MATERIALS CO. LTD (China). It has dimensions (WxH) 1200 mm x 600 mm, thickness 50 mm and density 80 kg/m³. It is glued to the metal sheet with glue brand Kleiberit, type 501.8 PUR, manufactured by the company Kleiberit SE & Co. KG (Germany). On the inner longitudinal edges, on the painted metal surface of the door leaf, sealing strip SAP 325 is glued. Glue 501.8 PUR was used for gluing. The sealing strip measures (11x2) mm, manufactured by HANGZHOU ZOINEN SEALING TECHNOLOGY LIMITED (China).

On both sides of the leaf, using Kleiberit brand glue, manufactured by the company Kleiberit SE & Co. KG (Germany) and screws outside with dimensions 3.5 x 10 mm and inside with dimensions (3.5 x 8) mm, one layer of wooden MDF boards with a thickness of 16 mm, density 800 kg/m³ are installed. The manufacturer of MDF boards is the company REZULT Ukraine LLC (MDF production plant in Korosten, Ukraine). MDF boards have dimensions: external (2120x1050x16) mm and internal (2085x1015x16) mm. The screws are located at a distance of 8 mm from the lower and upper edges of the leaf and the distance between the screws is 60 mm.

The MDF panels and cladding are covered with a decorative PVC foil with a thickness of 0.2 mm, manufactured by ZHEJIANG BIAOLONG NEW MATERIAL CO. LTD, China. The foil is mounted by vacuum pressing on MEKOL 1953 glue, manufactured by Mitol d.o.o. Sezana, Slovenia.

The door frame is metal, with a threshold, and is made of cold-rolled steel brand DC01 with a thickness of 1.8 mm.

The frame consists of two vertical beams, one upper beam and a threshold. The vertical beams have dimensions 2235 mm x 70 mm x 100 mm, and the horizontal beam- 1140 mm x 70 mm x 100 mm. Threshold has dimensions 1054mm x 57mm x 100mm The frame has the dimensions of the clear opening 1030 mm x 2100 mm and the construction opening 1140 mm x 2235 mm. It is also a welded structure by electric arc welding in accordance with GOST 14771-76 and GOST 14776-76. The beams of

the frame are closed with a cover and a self-adhesive thermal insulation gasket with cross-sectional dimensions of 0.15 mm x 2 mm, manufactured by Xingtai Xinyuansitong Auto Parts Co Ltd (China). Covers are mounted by means of spot welding with at least three welding points on each side and a distance between welding points of not more than 120 mm. On the vertical beams, by means of spot welding, the mounting plates and the adversaries of the locks are mounted.

The two vertical beams, the upper horizontal beam, the door threshold and the hinge stops are welded with a continuous seam along the adjacent surfaces.

The inside of the frame is insulated with stone wool, with a bulk density of 80 kg/m³, manufactured by DISCOR OOD (Ukraine).

The frame is powder-coated with RAL9005 paint based on polyester resin in an amount of 0.8 kg and a layer thickness of 100 µm. The paint is produced by LLC Powder Coating Ukraine (Ukraine).

The frame is lined with MDF boards with a thickness of 16 mm and dimensions: side (79 x 2145) mm, top (79 x 1214) mm. Manufacturer of MDF boards is "REZULT Ukraine" LLC, Korosten, Ukraine. The MDF boards are mounted using 3.5 mm x 10 mm screws, without the use of glue.

Along the perimeter of the frame, in the places of contact with the leaf, are installed:

- rubber seal type SAP 325 made of PVC-foam, with cross-sectional dimensions 12 mm x 8 mm, manufactured by HANGZHOU ZOINEN SEALING TECHNOLOGY LIMITED (China);

- self-adhesive fireproof gasket SAP 376 with cross-sectional dimensions 0.15 mm x 2 mm manufactured by Xingtai Xinyuansitong Auto Parts Co Ltd (China).

There are perforated holes in the frame for the adversaries of the locks and the passive spikes.

The total weight of the door /leaf + frame/ is 150,5 kg.

The door is additionally equipped with:

Lock

A TM Kale type lock, model 257L, manufactured by the company Kale Kilit (Turkey) was used. The dimensions of the lock body are (210 x 110 x 28) mm. It is mounted using screws with a milled head (M5 x 12) mm, manufactured by the company Kale Kilit. The lock is installed at a height of 771.5 mm from the top edge of the door leaf, in a box with an area of 300 mm x 28 mm.

The door is also equipped with a main cylinder lock type TM Kale, model 252R, manufactured by the company Kale Kilit (Turkey). The dimensions of the lock body are (140x110x28) mm. It is installed in a box with an area of 220 mm x 28 mm using screws with a milled head of dimensions (M5 x 12) mm, manufactured by the company Kale Kilit. The main lock is installed at a height of 1190.5 mm from the top edge of the door leaf.

Handle

The lock is equipped with a handle with a metal core, type SAP 527, manufactured by WENZHOU YIWAN TRADE CO. LTD (China). The handle is located at a height of 949.5 mm from the lower edge of the leaf.

Hinges

The door leaf is mounted to the frame using 2 pcs. metal hinges model ASPECT, manufactured by the company IP Kostenevich V.I. The hinges are made of a round

metal rod with welded mounting plates (40x3) mm, manufactured by IP Kostenevich V.I. (Ukraine). They have overall dimensions Ø255 x 116 mm. The hinges are mounted by welding. The lower hinge is 315 mm from the lower edge of the door leaf and the upper hinge is 330 mm from the upper edge of the door leaf measured from the lower edges of the hinges.

Passive spikes

Passive spikes 2 pcs standard model, manufactured by Zhejiang Juli Industry & Trade Co. Ltd. were used. They are 16 mm long with the visible part being 14 mm long and the tail being 2 mm long. The passive spikes are spaced 165 mm from the lower edge of the leaf and 165 mm from the upper edge of the leaf measured from their centers.

Mounting the frame to supporting structure

The door frame is installed in a standard low-density massive structure with a thickness of 200 mm, built from aerated concrete blocks, with a density 600 kg/m³. 6 pcs anchor bolts are welded on the metal frame attached to metal plates. The metal mounting plates are made of cold-rolled sheet metal with a thickness of 1 mm and dimensions (60x97) mm. They are located along the vertical members on the lock side at a distance of 213.5 mm from the bottom edge of the frame, 675.5 mm from the bottom plate and 1973.5 mm from the second plate. On the hinge side, the plates are spaced 213.5 mm from the bottom edge of the frame, 1128.5 mm from the bottom plate and 1973.5 mm from the second plate. They serve to fasten the door to the wall using anchor bolts with dimensions (10x132) mm. The anchor elements of the horizontal beam are missing. The distance between the supporting structure and the door frame is 20 mm. The frame, on the opposite side of the hinges, is turned over with aerated concrete blocks with thickness 70 mm.

This report contains details of the design, the test conditions and the results obtained, when tested in accordance with BDS EN 1363-1. Each significant deviation from sizes, installation, loading, stresses, and conditions on the edges or ends, except for the variations in the appropriate test method for the field of direct application, is not covered by this report.

2. Producer

The manufacturer of the door is company TMC EKATERINOSLAVSKAYA DVERNAYA ARTEL" LTD, Gagarina av. 97/44, Ukraine, 49010, Dnipro.

3. Laboratory conducted the test

F PLUS OOD,

ul. Vitosha, Kostenets 2042, Sofiiska oblast, NB No. 2548.

4. Date of receive of the test specimen

Two doors were tested: specimen № 398-01 and № 398-02 received on 01.12.2023. Specimens are delivered and installed by the test applicant.

5. Date of test

13.12.2023

6. Test conditions

Two doors were tested with standard fire impact, as required by paragraph 10.2.1. of BDS EN 1634-1. The fire impact for specimen № 398-01 is on the side of the hinges, and for specimen № 398-02 it is on the opposite side of the hinges. The door was tested unlocked, without a key in the lock. The temperature in the furnace was measured with

7 pcs. thermocouples type "K" / T_{fur} / with construction described in BDS EN 1363-1, located uniformly over the area of the tested specimen.

During the test, in furnace space was maintained pressure of 12 Pa above atmospheric, height 1500 mm above the level of the neutral pressure, in accordance with paragraph 9.2 of BDS EN 1634-1+A1. The values for the maintained pressure were measured with a transducer with a time constant of 4 s. The data are presented graphically with a time step of 10 s. No additional processing of the measured pressure values was performed. Pressure values are rounded to 0.1 Pa.

The temperature on the surface of the unheated side of the construction was measured through thirty seven thermocouples /TC/ type K. Their location is shown in annex 1. The measurements of TC1÷TC5 and TC17÷TC21 served to calculate the average temperature of the the tested door leaves..The maximum temperature on the leaves of the specimens is determined from the indications of thermocouples TC1÷TC16 and TC17÷TC27. Thermocouples TC11÷TC15 и TC28÷TC32 are located according to the requirement of the additional procedure for determining the maximum temperature for I_1 . From the readings of thermocouples TC33÷TC37, the maximum temperature of the frame of specimen № 398-02 is determined.

The measurements of the clearances between the frame and the door leaf are made in accordance with the requirements of item 10.1.2., as the maximum distance between the measuring points is less than 700 mm. The measured values of the joints between the leaf and the door frame are without gasket installed and are given in annex 5.

Previously the door is subjected to 25 cycles of opening/closing for functionality (the leaf translates from fully closed to fully open position (30 ° with the door opening inwards) and allowed to close by means of the self-closing device). The measured maximum opening force of specimen № 398-01 was 34.23 N and that of specimen № 398-02 was 32.07 N.

The deformation during the test was measured as required by p. 9.3 of BDS EN 1364-1. The places of measurement and the measured values are given in annex 4.

The materials used in the installation, are conditioned in the test hall for no less than 12 days, at ambient temperature in the range (8÷24)°C and relative humidity (31.4÷52.2)%.

The initial temperature and humidity during the test were $t=10^{\circ}\text{C}$ and $R_h= 53.3\%$ respectively.

7. Test results

№	Performance criterion	Test results (value, uncertainty)	Reported performance criterion	Limit value of the performance criterion according
1.	Resistance to fire – specimen № 398-01			
1.1.	Integrity E			
	Time till : ignition of cotton pad; - penetration of gap gauge; - sustained flaming.	Up to 46 min Up to 46 min Up to 46 min	yes no yes	yes/no

1.2. Insulation I				
	<u>Main Procedure I₂</u> - Average temperature t_{av} .; -Maximum temperature t_{max}	At 46 min	t_{av} .: 42°C	$T_{ini}.$ +140°C ≤ 150,0°C
			t_{max} .: 118°C	$T_{ini}.$ +180°C ≤ 190,0°C
	<u>Additional procedure I₁</u> - Average temperature t_{av} .; - Maximum temperature t_{max} .	At 46 min	t_{av} .: 42°C	$T_{ini}.$ +140°C ≤ 150,0°C;
			t_{max} .: 184°C	$T_{ini}.$ +180°C ≤ 190,0°C
1.3. Radiation W				
	- Measured value - Value based on measured temperature	At 46 min	-	≤ 15 kW/m ²
			t_{max} .: 184°C	≤ 300°C
2. Resistance to fire - specimen № 398-02				
2.1. Integrity E				
	Time till: ignition of cotton pad; - penetration of gap gauge; - sustained flaming.	Up to 46 min Up to 46 min Up to 46 min	no no no	yes/no
2.2. Isolation I				
	<u>Main Procedure I₂</u> - Average temperature t_{av} .; - Maximum temperature t_{max} .; - Maximum temperature t_{frame}	At 46 min	t_{av} .: 32°C	$T_{ini}.$ +140°C ≤ 150,0°C
			t_{max} .: 172°C	$t_{ini}.$ +180°C ≤ 190,0°C
			t_{max} .: 126°C	$t_{ini}.$ +360°C ≤ 370,0°C
	<u>Additional procedure I₁</u> Average temperature t_{av} .; - Maximum temperature t_{max} .; - Maximum temperature t_{frame}	At 46 min	t_{av} .: 126°C	$t_{ini}.$ +140°C ≤ 150,0°C;
			t_{max} .: 132°C	$t_{ini}.$ +180°C ≤ 190,0°C
			t_{max} .: 126°C	$t_{ini}.$ +180°C ≤ 190,0°C
2.3. Radiation W				
	- Measured value - Value based on measured temperature	At 46 min	-	≤ 15 kW/m ²
			t_{max} .: 184°C	≤ 300°C

Notes:

1. Due to the nature of the tests of fire resistance and consequent difficulties in quantifying the budget in measuring the duration of resistance to fire, it is not possible to estimate the uncertainty of the results.
2. The test specimens are provided by the test applicant and the laboratory is not responsible for the test product or construction declared by the applicant, as well as for the information submitted by the applicant which cannot be identified by the laboratory before, during and after the test.
3. The test results apply only to the tested specimens.
4. Extracts from the test report may not be reproduced without written consent of Laboratory for Testing & Research "F PLUS".

8. Observed phenomena

2nd min- release of smoke in the area at the additional lock of the two specimens;
11th min- deformation of the upper edge of the frame from the wall of specimen № 398-02;
18th min- release of smoke between leaf/frame in the area of the upper edges of the doors;
23rd min- deformation of the lower end of the frame from the wall of specimen № 398-02;
46th min- Ignition of a cotton pad- specimen № 398-02. End of test due to passed integrity and insulation criteria.

From the beginning to the end of the test, periodic checks were made with a cotton pad.

9. Scope of direct application of the test results

The field of direct application defines the permissible changes to the test specimen, followed by the successful fire resistance test. These variations can be applied automatically without the need for the sponsor to seek additional evaluation, calculation or approval.

NOTE: When extended product size requirements are envisaged, the dimensions of certain components within the test specimen can be less than those intended to be used at full size in order to maximize the extrapolation of the test results by modelling the interaction between components at the same scale.

Unless otherwise stated in the following text, the materials and construction of the door set must be the same as those tested. The number of leaves and the mode of action (one leaf door, rotating on hinged) should be no different.

- Metal construction

The dimensions of the metal lining around the frames can be increased to accommodate the increased thickness of the supporting structure. The thickness of the metal can also be increased up to 25%.

The type of metal must not be different from the one tested.

The number of reinforcing details for non-insulated doors and the number and type of fastening elements of such details within the finished panel may be increased in proportion to the increase in size, but shall not be less.

- Decorative finishes:

= Where the paint finish is not expected to contribute to the fire resistance of the door, alternative paints are acceptable and may be added to door leaves or frames for which unfinished test specimens were tested;

= Decorative laminates and timber veneers up to 1.5 mm thick can be added to the front side (but not to the edges) of doors which satisfy the insulating criteria (by normal or additional procedure).

= Decorative laminates and wood veneers exceeding 1.5 mm thick must be tested as part of the test specimen. For door sets tested with 16mm decorative laminated sides, the only possible differences should be within the same material types and thicknesses (eg for colour, pattern, manufacturer).

- Fasteners

The number of fasteners per unit length used to attach doorsets to supporting constructions may be increased, but should not be reduced and the distance between the fasteners may be less, but should not be greater.

- Building hardware

The number of hinges and hinge bolts can be increased, but should not be reduced.

NOTE: The number of the movement restraints, such as locks and latches, is not covered by the direct application.

- Permissible dimensional changes

Based on the results obtained, the following changes in dimensions are permissible:

For classification EI₂₄₅ (EI₁₄₅) including, with two-sided fire impact, the structure can be classified in category "A". On this basis, it is allowed:

= reduction to 50% of the width and 75% of the height of the test specimen

For classifications $\leq$ EI₂₃₀ ($\leq$ EI₁₃₀), with two-sided fire impact, the structure is classified in category "B". On this basis, it is allowed:

= reduction to 50% of the width and 75% of the height of the test specimen;

= increase up to 15% in height, 15% in width and 20% in area.

- For door sets of **smaller sizes**, the relative placement of movement restraints (e.g. locks, hinges, etc.) shall remain the same as tested, or any change in clearances between them shall be limited to the same percentage reduction as reducing the dimensions of the test specimen.

- The following must also apply to **larger doorsets**:

a) the height of the latch above floor level shall be equal to or greater than than the tested height , and such increase in height shall be at least proportional to the increase in door height;

b) the distance of the top hinge from the upper end of door leaf shall be equal to or less than that tested;

c) the distance of the lowest hinge from the lower end of the door leaf shall be equal to or less than that tested.

The maximum size of the **main clearances (p)** is as follows:

- opening inwards: upper side- 5.2 mm; on the side of the hinges- 4.2 mm and on the side of the lock- 4.4 mm;

- opening outside: upper side - 5.4 mm; on the side of the hinges- 4.2 mm and on the side of the lock- 4.6 mm.

- Standard solid low-density supporting construction

The fire resistance of a doorset tested in a solid standard supporting construction with a low density, as defined in EN 1363-1, may be applied to a doorset mounted in the same way in a wall, provided that the density and thickness of the wall are equal to or greater than those in which the doorset has been tested.

The fire resistance of a door is only applicable to a door installed in a partition with a fire resistance equal to or greater than that of the partition in which it is tested. The fire resistance of the partition must be established separately in a preliminary test.

Head of test:

Director of BTR:

/Konstantin Uzunov/

/Assoc. Proff. Eng. Detelin Spassov, PhD/

This report was issued in Bulgarian and English languages.
By established distinction between both reports the Bulgarian one is valid.

Annex 1- Scheme of disposal of the thermocouples on the unexposed side of the tested doors

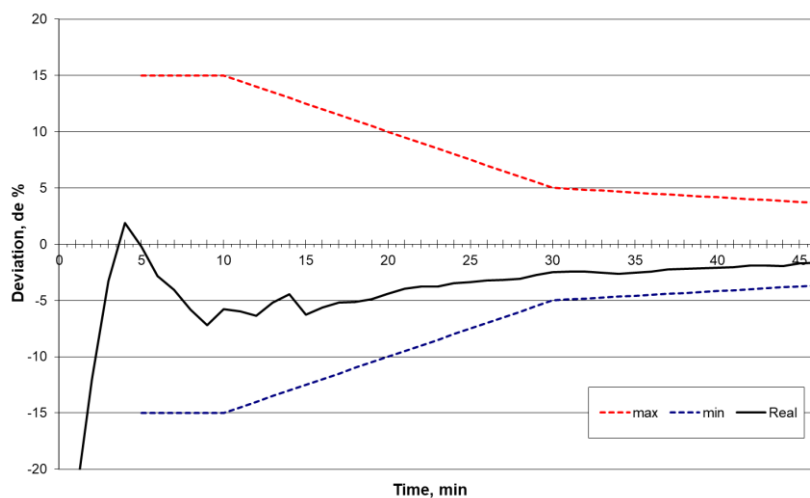


- Thermocouples for calculating the average temperature
- Thermocouples for measuring the maximum temperature
- Thermocouples for measuring the maximum temperature - additional procedure
- Thermocouples on the door frame

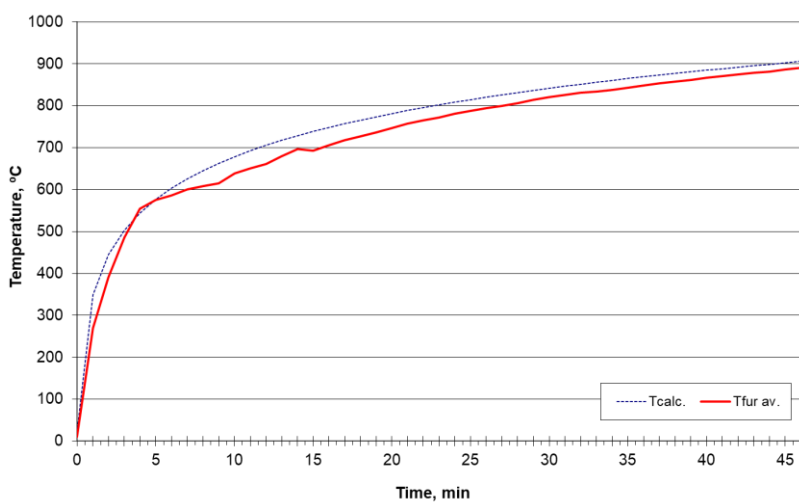
Annex 2 – Conditions in furnace space

Time	T _{fur 1}	T _{fur 2}	T _{fur 3}	T _{fur 4}	T _{fur 5}	T _{fur 6}	T _{fur 7}	T _{fur_av.}	d _e	d _{lim}
min	°C	°C	°C	°C	°C	°C	°C	°C	%	%
0	10	10	11	10	9	10	10	10	49,7	-
1	363	278	340	256	281	174	191	269	23,0	-
2	498	422	487	341	385	326	279	391	12,0	-
3	588	488	584	429	488	442	382	486	3,3	-
4	626	562	639	514	573	500	465	554	-1,9	-
5	653	585	622	528	596	533	507	575	0,2	15,0
6	668	603	627	528	602	553	520	586	2,8	15,0
7	679	615	646	548	607	567	538	600	4,1	15,0
8	683	592	654	580	582	589	575	608	5,8	15,0
9	690	592	678	583	582	598	584	615	7,2	15,0
10	706	624	663	619	623	625	615	639	5,8	15,0
11	722	628	675	625	632	654	621	651	6,0	14,5
12	736	634	687	629	638	672	628	661	6,4	14,0
13	751	654	700	657	668	682	649	680	5,2	13,5
14	767	676	698	680	700	688	662	696	4,4	13,0
15	777	659	707	672	692	689	650	692	6,3	12,5
16	788	663	728	688	719	697	659	706	5,6	12,0
17	794	672	738	701	736	714	670	718	5,2	11,5
18	801	680	746	711	747	720	680	726	5,1	11,0
19	809	692	750	724	755	729	693	736	4,9	10,5
20	815	705	763	740	763	735	709	747	4,4	10,0
21	822	715	774	752	774	744	720	757	4,0	9,5
22	828	723	783	760	784	752	729	766	3,8	9,0
23	833	731	791	767	792	753	736	772	3,8	8,5
24	842	738	800	774	800	764	745	781	3,5	8,0
25	851	744	808	780	806	770	751	787	3,4	7,5
26	855	751	815	786	813	779	759	794	3,2	7,0
27	861	756	821	792	819	785	766	800	3,2	6,5
28	863	759	830	796	826	791	776	806	3,1	6,0
29	871	764	840	805	835	798	784	814	2,7	5,5
30	876	770	849	812	843	803	790	821	2,5	5,0
31	880	781	854	815	848	806	796	826	2,5	4,9
32	883	785	860	820	853	812	801	831	2,4	4,8
33	886	790	865	821	858	816	802	834	2,6	4,8
34	892	794	869	826	860	817	805	838	2,6	4,7
35	893	802	873	831	865	825	811	843	2,5	4,6
36	900	809	876	833	871	828	818	848	2,4	4,5
37	903	818	878	840	875	833	826	853	2,3	4,4
38	906	824	883	841	883	835	831	858	2,2	4,3
39	910	830	891	844	888	837	833	862	2,1	4,3
40	914	834	894	841	895	843	842	866	2,1	4,2
41	917	839	897	845	897	847	850	870	2,0	4,1
42	920	845	901	850	903	850	856	875	1,9	4,0
43	922	848	903	853	905	854	863	878	1,9	3,9
44	925	850	909	856	909	851	869	881	2,0	3,8
45	929	857	913	859	914	860	876	887	1,7	3,8
46	931	861	917	862	919	863	882	891	1,6	3,7

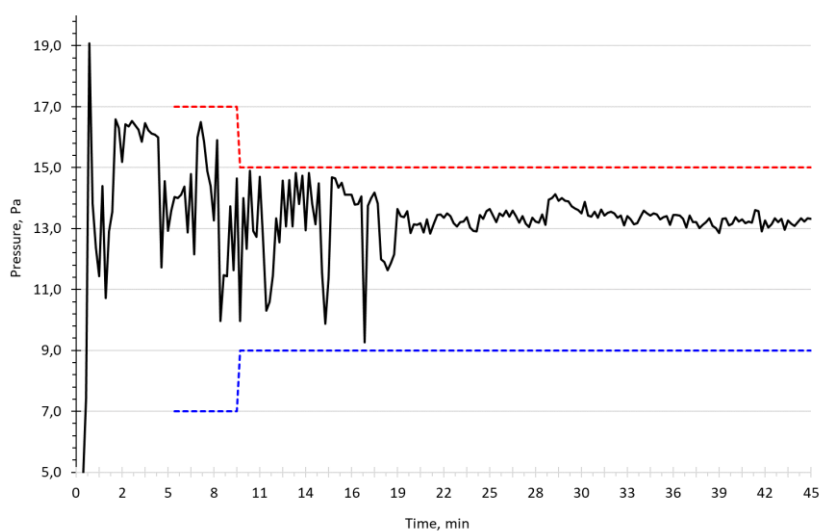
Continuation of annex 2



Deviation



Temperature in furnace space

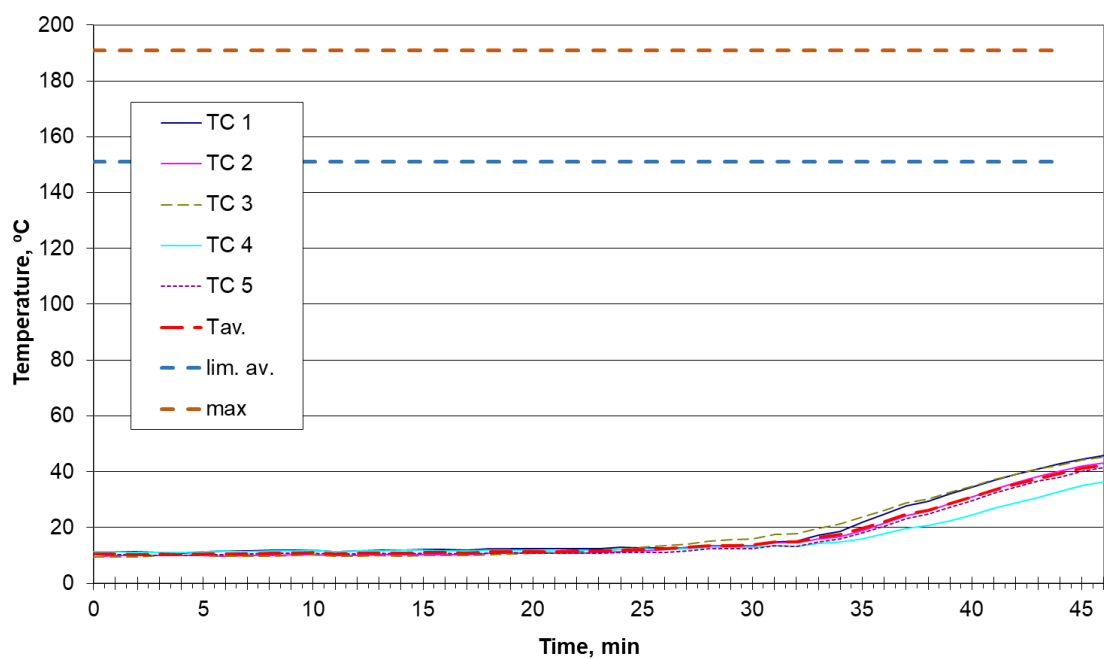


Pressure in furnace space

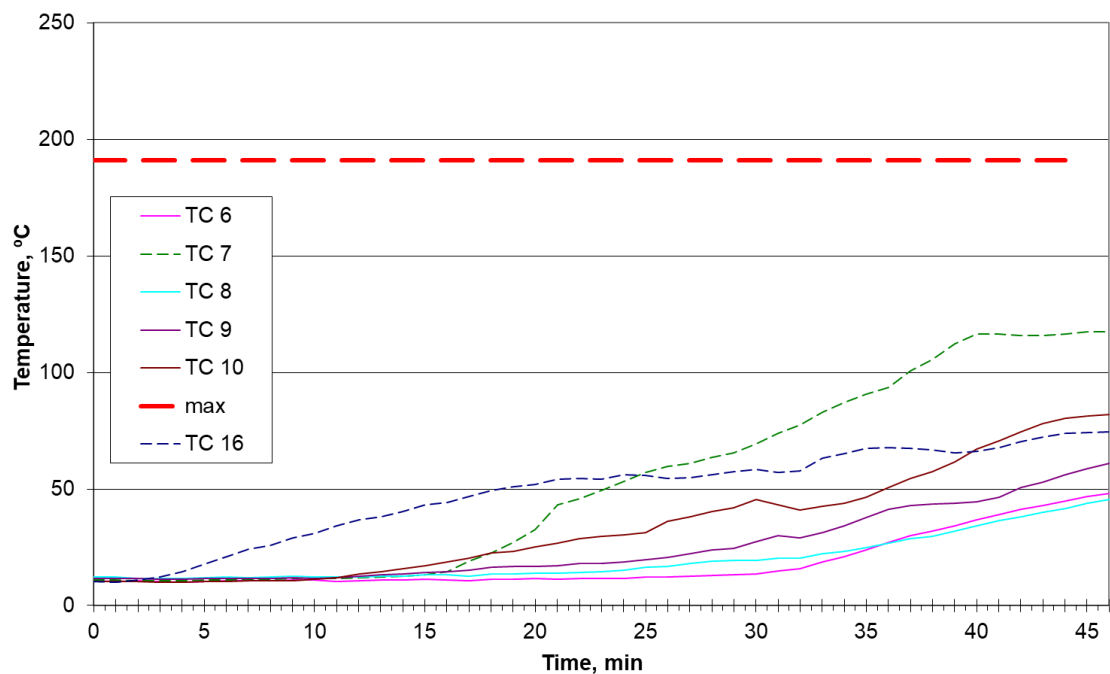
Annex 3- Temperatures of the unheated side of the specimens

Time	Door leaf - specimen № 398-01																
	Main Procedure											Additional procedure					
	TC ₁	TC ₂	TC ₃	TC ₄	TC ₅	T _{av.}	TC ₆	TC ₇	TC ₈	TC ₉	TC ₁₀	TC ₁₁	TC ₁₂	TC ₁₃	TC ₁₄	TC ₁₅	TC ₁₆
min	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
0	11	10	10	11	10	10	11	11	12	12	10	10	11	9	10	10	10
1	11	10	9	11	10	10	10	11	12	12	10	10	11	9	10	10	10
2	11	10	9	11	10	10	11	11	12	12	10	10	10	9	10	10	11
3	11	10	10	11	10	10	10	11	12	11	10	9	10	9	10	10	12
4	11	10	10	11	10	10	10	11	12	11	10	10	11	9	10	10	15
5	11	10	10	11	10	11	10	11	12	11	10	10	11	10	10	10	18
6	11	10	10	11	10	11	11	11	12	12	10	10	11	10	10	10	21
7	11	10	10	11	10	11	11	11	12	12	11	10	12	10	10	11	24
8	12	10	10	12	11	11	11	11	12	12	11	10	12	10	10	11	26
9	12	10	10	12	11	11	11	12	13	12	11	11	13	10	10	12	29
10	12	10	10	12	11	11	11	12	12	12	11	11	13	11	10	14	31
11	11	10	10	11	11	11	10	12	12	12	12	11	15	11	11	24	34
12	12	10	10	12	11	11	11	12	12	13	14	12	18	12	13	30	37
13	12	10	10	12	11	11	11	12	12	13	15	13	22	13	15	38	38
14	12	10	10	12	11	11	11	13	13	14	16	14	28	15	18	46	40
15	12	10	10	12	11	11	11	13	13	14	17	15	34	16	21	48	43
16	12	10	10	12	11	11	11	15	13	15	19	15	39	18	23	53	44
17	12	10	10	11	11	11	11	19	13	15	20	16	44	19	27	56	47
18	12	11	10	12	11	11	11	23	14	16	22	17	47	21	31	57	50
19	12	11	11	12	11	11	11	27	14	17	23	17	50	23	34	57	51
20	12	11	11	12	11	11	11	33	14	17	25	17	52	24	37	58	52
21	12	11	11	12	11	11	11	43	14	17	27	18	57	27	44	61	54
22	12	11	11	12	11	12	11	46	14	18	29	19	59	29	61	62	54
23	13	11	12	12	11	12	12	49	15	18	30	20	75	33	74	61	54
24	13	11	12	12	11	12	12	53	15	19	30	21	68	35	79	62	56
25	13	12	13	12	11	12	12	57	16	20	31	22	69	75	83	63	56
26	13	12	13	12	11	12	12	60	17	21	36	23	71	68	86	67	54
27	13	13	14	12	12	13	12	61	18	22	38	25	74	67	87	73	55
28	14	14	15	13	13	14	13	63	19	24	40	28	79	65	89	78	56
29	13	13	16	13	12	14	13	66	19	25	42	30	85	66	86	80	58
30	14	14	16	13	12	14	14	69	19	27	46	34	92	65	86	82	58
31	15	15	18	14	14	15	15	74	20	30	43	38	99	65	85	85	57
32	15	14	18	13	13	15	16	77	20	29	41	40	105	65	84	78	58
33	17	16	20	14	15	16	19	83	22	31	43	45	110	67	89	90	63
34	19	17	21	15	16	17	21	87	23	34	44	49	114	68	91	89	65
35	22	19	24	16	18	20	24	91	25	38	47	54	118	71	92	94	67
36	25	21	26	18	21	22	27	94	27	41	51	59	121	74	95	104	68
37	28	24	29	20	23	25	30	101	29	43	54	67	125	76	99	113	67
38	29	26	30	21	25	26	32	106	30	44	57	70	128	78	101	129	67
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40	35	31	35	25	30	31	37	116	34	45	67	86	137	89	105	152	66
41	37	34	37	27	32	33	39	116	36	47	71	94	142	98	109	159	68
42	39	36	39	29	35	36	41	116	38	51	74	99	149	105	113	165	71
43	41	38	41	31	37	37	43	116	40	53	78	103	154	110	116	169	72
44	43	40	42	33	38	39	45	117	42	56	80	106	159	114	120	173	74
45	44	42	44	35	40	41	47	117	44	59	81	108	164	115	126	179	74
46	46	43	45	36	41	42	48	118	46	61	82	109	168	114	131	184	74

Continuation of annex 3

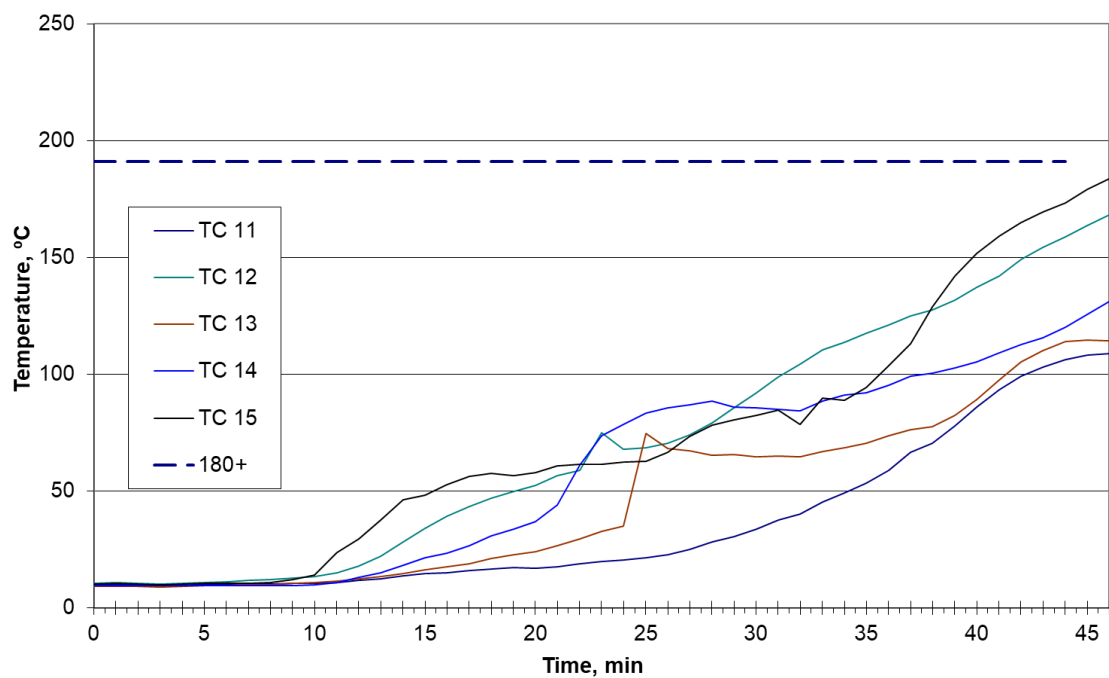


Average temperature of unheated door side, specimen № 398-01



Maximum temperature of the unheated side of the door, specimen № 398-01

Continuation of annex 3



Maximum temperature on the unheated side of the door (additional procedure I₁),
specimen №398-01

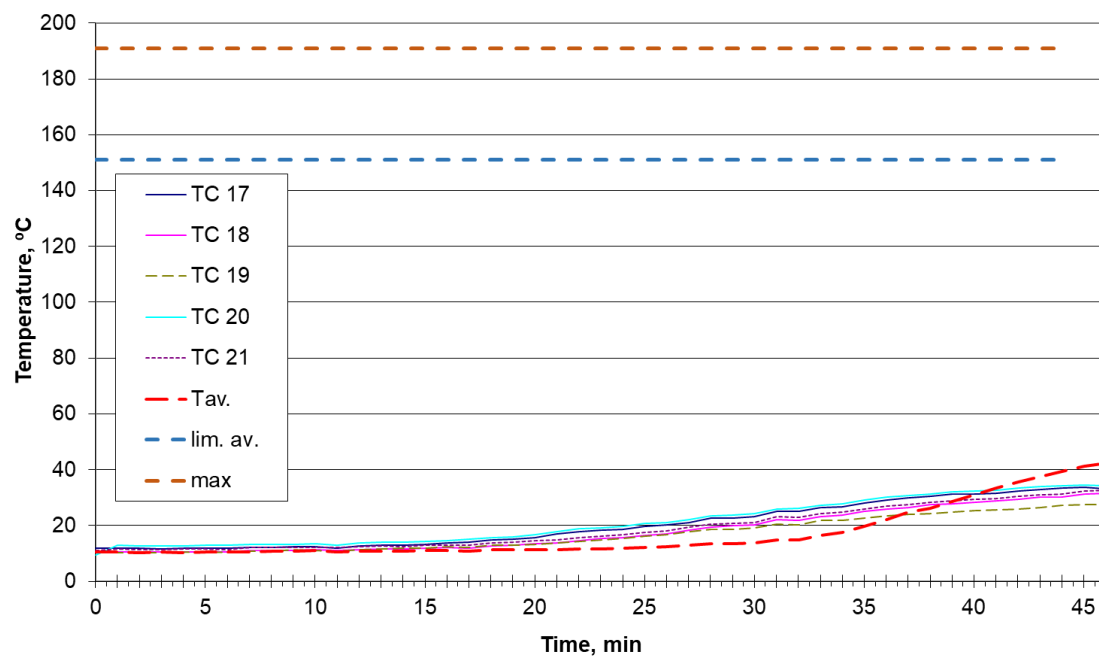
Continuation of annex 3

Time	Door leaf specimen № 398-02											
	Main Procedure											
	TC ₁₇	TC ₁₈	TC ₁₉	TC ₂₀	TC ₂₁	T _{av.}	TC ₂₂	TC ₂₃	TC ₂₄	TC ₂₅	TC ₂₆	TC ₂₇
min	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
0	12	11	10	10	11	11	11	12	11	11	10	11
1	12	11	10	13	12	11	11	15	11	13	12	12
2	12	10	10	13	11	11	11	14	12	13	12	12
3	12	10	10	13	11	11	11	14	13	13	12	12
4	12	10	10	13	11	11	11	15	13	14	12	12
5	12	10	10	13	11	11	11	15	14	14	12	12
6	12	10	11	13	11	11	12	15	14	14	12	13
7	12	11	11	13	12	12	12	16	14	14	13	13
8	12	11	11	13	12	12	12	16	14	14	13	13
9	12	11	11	13	12	12	12	17	14	14	13	13
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11	12	11	11	13	12	12	12	19	15	14	13	13
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13	13	12	12	14	13	13	13	26	17	15	14	14
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22	18	15	14	19	16	16	15	63	33	20	17	16
23	18	15	15	19	16	17	16	79	37	20	17	17
24	19	16	15	20	17	17	16	72	39	21	18	17
25	20	17	16	21	18	18	17	73	79	22	19	18
26	20	17	17	21	18	19	18	75	72	22	19	19
27	21	18	18	22	19	20	19	78	71	23	20	20
28	23	19	19	24	20	21	20	83	69	25	21	21
29	23	20	19	24	21	21	20	89	70	25	22	21
30	23	20	19	24	21	22	20	96	69	25	22	21
31	25	22	20	26	23	23	21	103	69	27	24	22
32	25	22	20	26	23	23	21	109	69	27	24	22
33	26	23	22	27	24	25	23	114	71	28	25	24
34	27	24	22	28	25	25	23	118	72	29	26	24
35	28	25	23	29	26	26	24	122	75	30	27	25
36	29	26	23	30	27	27	24	125	78	31	28	25
37	30	27	24	31	28	28	25	129	80	32	29	26
38	30	27	24	31	28	28	25	132	82	32	29	26
39	31	28	25	32	29	29	26	136	86	33	30	27
40	31	28	25	32	29	29	26	141	93	33	30	27
41	32	29	26	33	30	30	27	146	102	34	31	28
42	32	29	26	33	30	30	27	153	109	34	31	28
43	33	30	27	34	31	31	28	158	114	35	32	29
44	33	30	27	34	31	31	28	163	118	35	32	29
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46	33	32	28	34	33	32	29	172	118	35	34	30

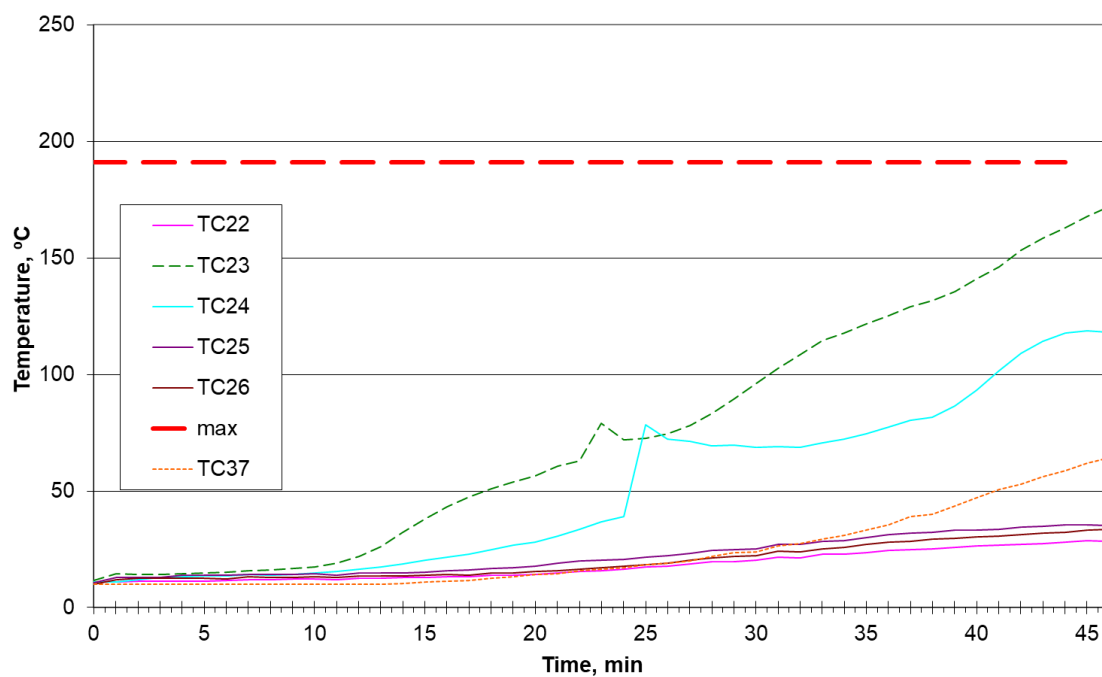
Continuation of annex 3

Time	Specimen № 398-02									
	Additional procedure					Frame				
	TC ₂₈	TC ₂₉	TC ₃₀	TC ₃₁	TC ₃₂	TC ₃₃	TC ₃₄	TC ₃₅	TC ₃₆	TC ₃₇
min	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
0	10	10	10	10	10	11	10	10	10	10
1	13	12	10	10	10	11	10	10	10	10
2	15	12	10	10	10	11	10	9	10	10
3	15	14	10	10	10	10	10	10	10	10
4	16	14	10	10	10	11	11	10	11	10
5	16	15	10	10	10	12	11	10	11	10
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9	18	15	10	10	11	12	11	11	11	10
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12	23	17	10	11	11	13	15	12	12	10
13	27	18	11	11	12	13	20	13	13	10
14	33	20	11	12	12	15	23	14	15	10
15	39	21	12	12	14	16	26	15	16	11
16	44	23	13	13	15	16	31	16	17	11
17	49	24	13	12	16	16	36	18	18	12
18	52	26	15	13	17	17	39	21	21	13
19	55	28	17	13	19	18	44	24	23	13
20	57	29	19	14	21	20	47	27	25	14
21	62	32	20	14	22	21	47	28	27	15
22	64	34	22	16	24	21	47	29	28	16
23	80	38	23	16	26	23	46	31	31	16
24	73	40	24	13	27	24	43	32	32	17
25	74	80	25	15	28	25	41	33	33	19
26	76	73	27	20	30	26	40	35	34	19
27	79	72	29	17	32	27	40	35	35	20
28	84	70	30	24	34	29	42	39	37	22
29	90	71	31	18	35	31	41	40	39	23
30	97	70	32	19	36	31	44	40	40	24
31	104	70	34	26	38	33	48	42	43	26
32	110	70	35	21	39	35	51	43	46	28
33	115	72	36	22	41	37	55	44	49	29
34	119	73	37	19	42	38	63	46	53	31
35	123	76	37	20	45	40	68	48	57	33
36	126	79	39	21	46	42	71	50	61	36
37	130	81	39	21	48	43	76	52	68	39
38	133	83	39	22	49	44	68	52	71	40
39	137	87	41	23	52	46	79	55	77	44
40	142	94	42	28	53	48	88	58	84	47
41	147	103	43	24	55	51	91	60	90	51
42	154	110	44	24	58	52	91	61	90	53
43	159	115	45	26	59	54	92	63	92	56
44	164	119	46	29	62	56	110	64	93	59
45	169	123	47	28	64	59	119	67	94	62
46	173	125	48	27	66	62	126	69	94	64

Continuation of annex 3

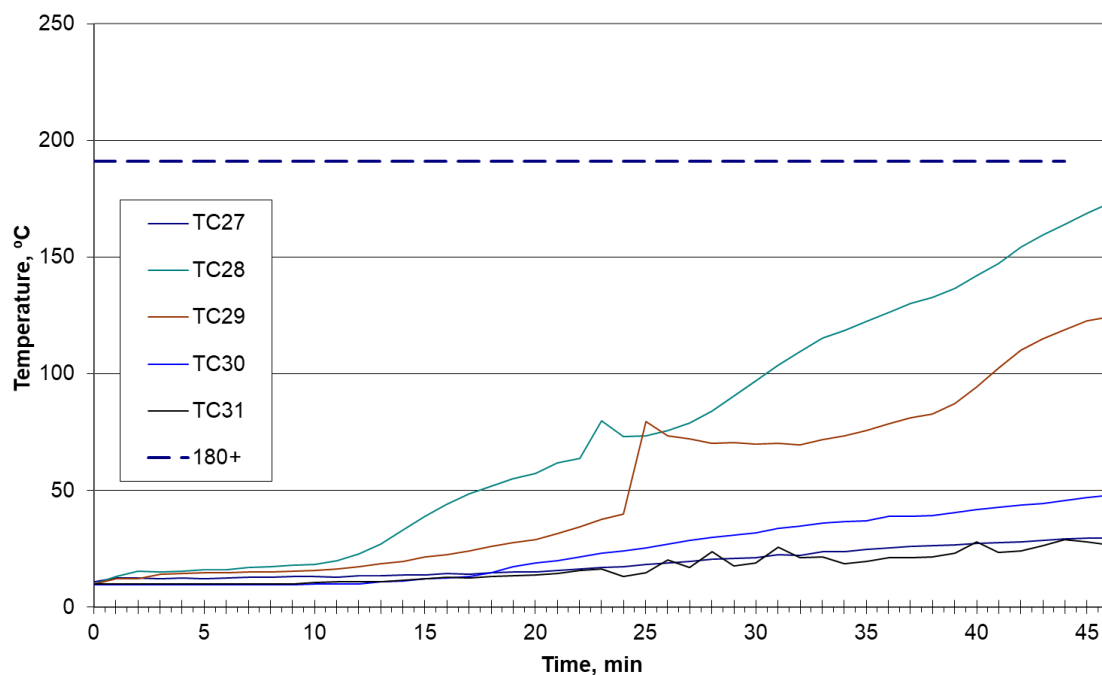


Average temperature of unheated door side, specimen №398-02

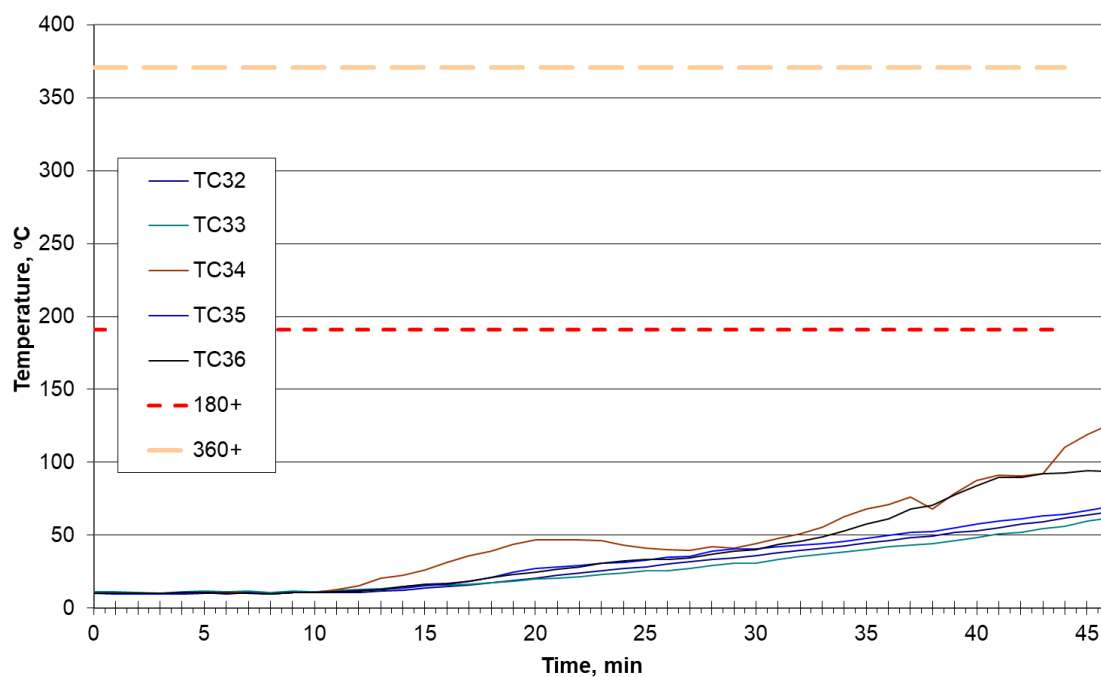


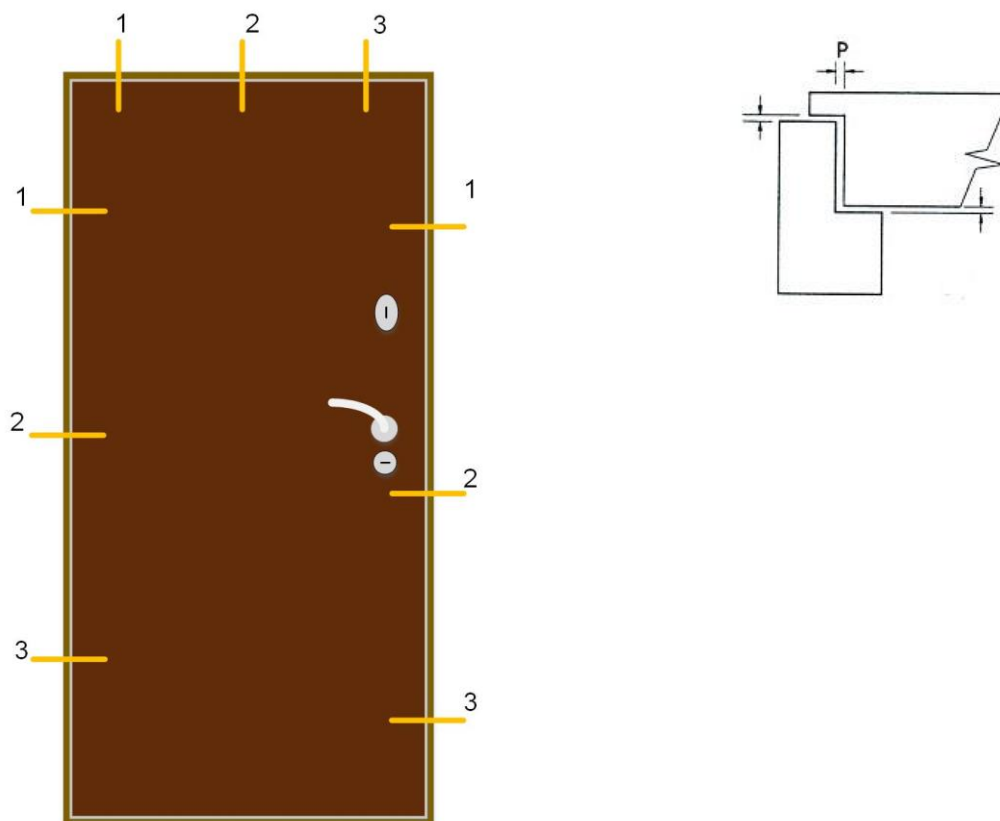
Maximum temperature on the unheated side of the door specimen № 398-02

Continuation of annex 3



Maximum temperature on the unheated side of the door, specimen № 398-02

Maximum frame temperature on unheated side (additional procedure I₁), specimen № 398-02

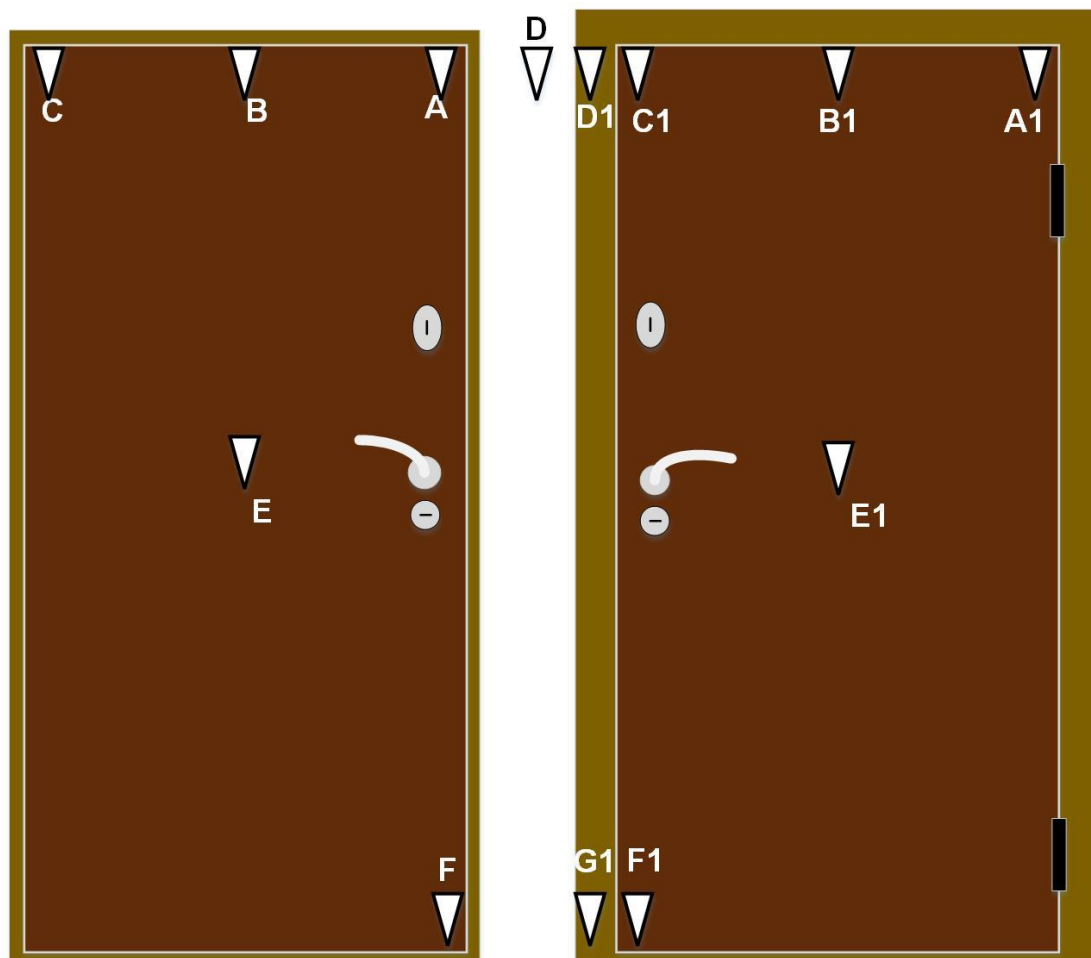
Anneix 4 – Locations and values of the measured clearances

Locations of measurement

Values of measured main clearances (p) without gasket

Place of measurement	1	2	3	Maximum measured value (a)	Measured average value (c)	Calculated maximum value (x)
Specimen № 398-01						
Threshold	-	-	-	-	-	-
Upper side	3,1	3,0	3,2	3,2	3,1	5,2
On the hinge side	2,1	2,2	2,3	2,3	2,2	4,2
On the lock side	2,2	2,3	2,4	2,4	2,3	4,4

Place of measurement	1	2	3	Maximum measured value (a)	Measured average value (c)	Calculated maximum value (x)
Образец № 398-02						
Threshold	-	-	-	-	-	-
Upper side	3,3	3,5	3,4	3,5	3,4	5,4
On the hinge side	1,4	2,0	2,5	2,5	2,0	4,2
On the lock side	2,2	2,6	2,7	2,7	2,5	4,6

Annex 5 – Places and values of the measured deformations


▽ Deformation measurement locations

Values of the measured deformations

Measurement points	Time, min			Measurement points	Time, min		
	15	30	45		15	30	45
A, mm	-6	-12	-15	A1, mm	0	18	55
B, mm	-5	-5	-12	B1, mm	0	10	30
C, mm	-6	-10	-10	C1, mm	8	20	34
D, mm	-2	-2	-2	D1, mm	6	9	13
E, mm	-7	-19	-33	E1, mm	-9	-9	-1
F, mm	-4	-24	-23	F1, mm	0	15	50
G, mm	-	-	-	G1, mm	-1	0	-1

"-" deformation towards the furnace space;

"+" deformation in direction opposite to the furnace space

Annex 6 - Pictures from the conducted test



Pictures 1 and 2. Preparation of the specimen



Pictures 3 and 4. Preparation of the specimen



Pictures 5 and 6. Preparation of the specimen

Continuation of annex 6



Pictures 7 and 8. During the test



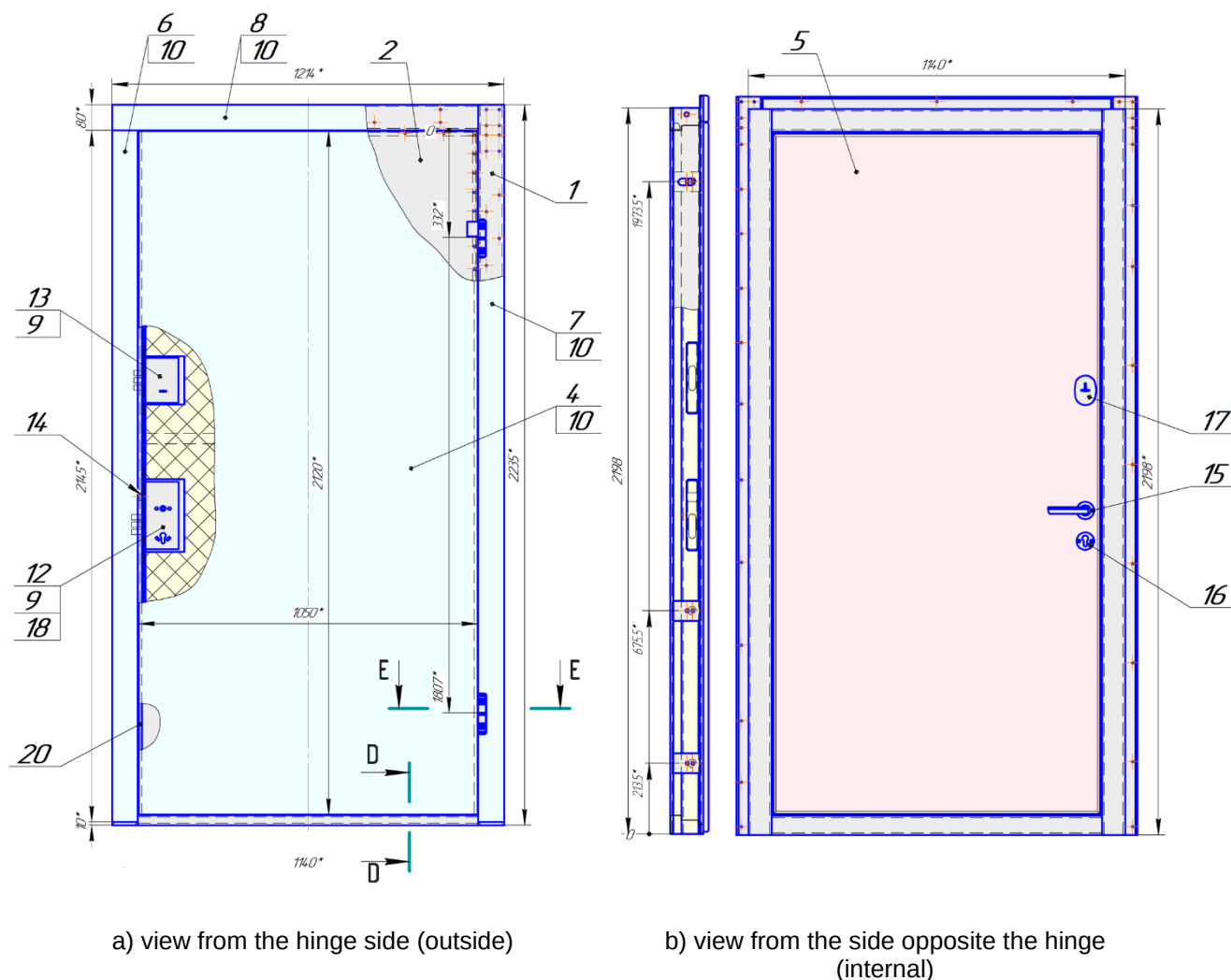
Pictures 9 and 10 During the test



Pictures 11 and 12. After the test

Annex 7 – Technical specification

Dimensions in mm



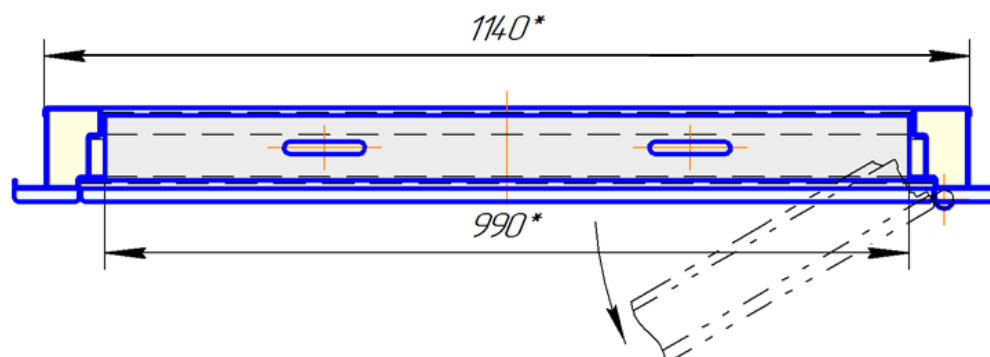
1. FRAME 1170×2200, S100, R
2. Leaf 1020×2090, S60, R
3. Lid
4. External MDF cladding of the door
5. Internal MDF cladding of the door
6. Vertical cladding on the side of the lock
7. Vertical cladding on the side of the hinges
8. Horizontal cladding upper part of the leaf
9. Screw M5×12 DIN 965
10. Self-tapping screw 3,5×10 DIN 9100
11. Nit 4.0×10 DIN 7337

12. Main lock model Calais, type 252
13. Auxiliary lock model Kale, type 257
14. Latch adjustment plate model EK-01
15. Type 526 handle set
16. Lock for main lock SAP 102/18
17. Lock for auxiliary lock SAP 203
18. Cylinder 50×50
19. Stone wool 80 kg/m³
20. Sealing strip SAP 325
21. Sealing strip SAP 376

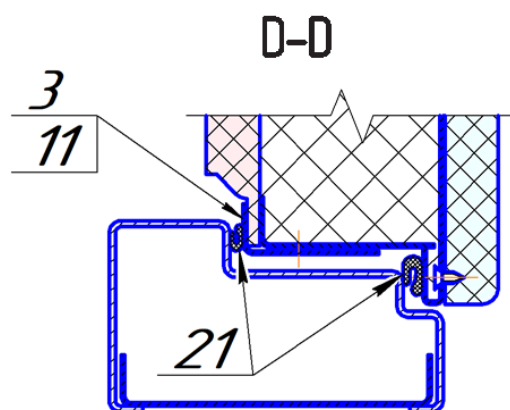
Fig. 1. Door, right turn. General installation drawing

Continuation of annex 7

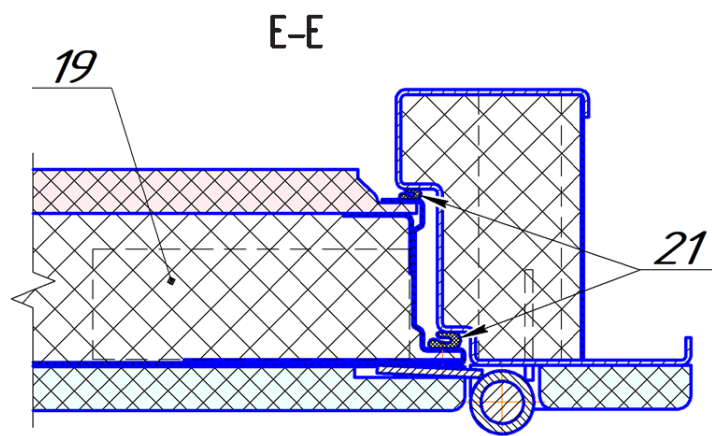
Dimensions in mm



c) top view of door set



d) detailed section D-D

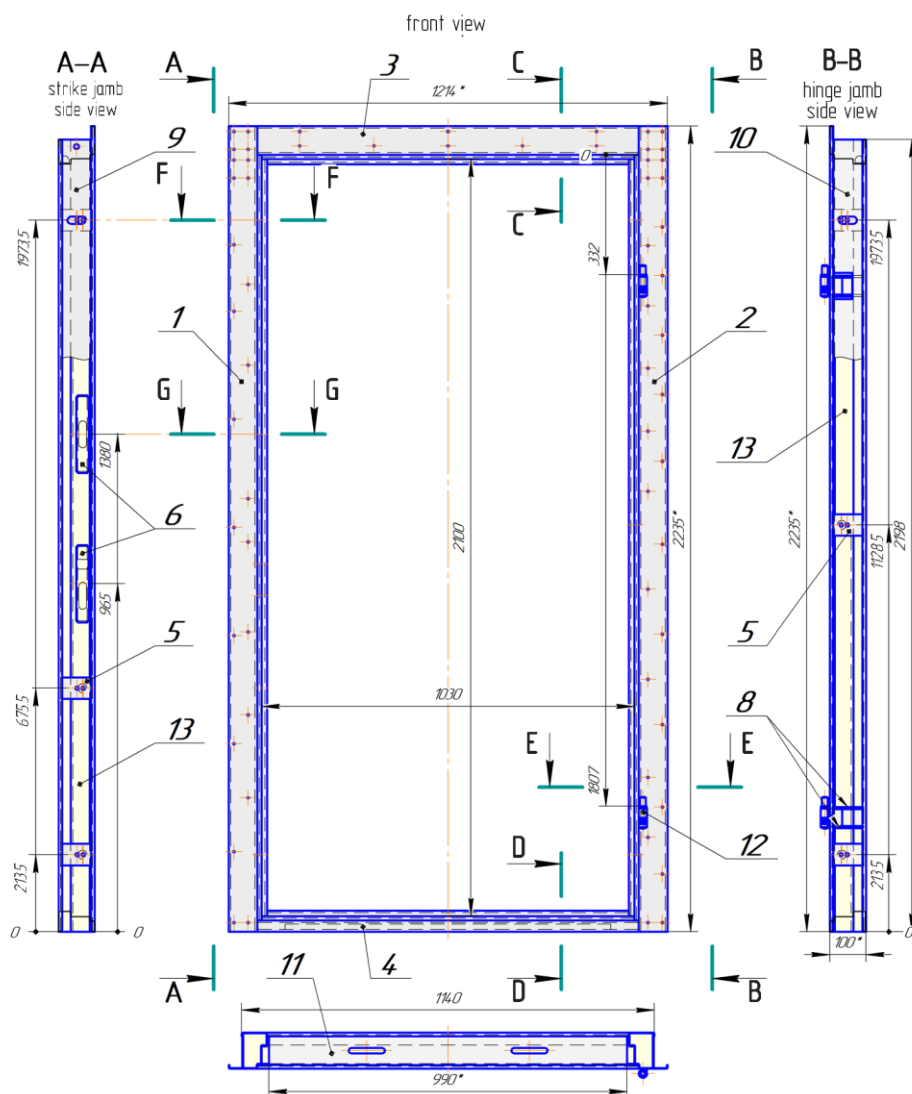


e) detailed section E-E

Fig. 2. Detail cuts of the door

Continuation of annex 7

Dimensions in mm



1. Vertical beam on the side of the lock - 1 pc.
2. Vertical beam on the side of the hinge-1 pc.
3. Horizontal beam of the frame -1 pc.
4. Door threshold-1 pc.
5. Mounting plate - 6 pcs.
6. Covering boxes for the openings of the locks - 2 pcs.
7. Threshold cover - 1 pc.
8. Hinge limiter - 4 pcs.
9. Thermal insulation molding on the side of the lock - 1 pc.
10. Heat-insulating covering molding on the side of the hinges-1 pc.
11. Heat-insulating covering molding on the upper beam of the frame - 1 pc.
12. Frame hinges with plastic cover - 2 pcs.
13. Stone wool 80 kg/m³

Fig. 3. Door frame, right turn. General installation drawing

Continuation of annex 7

Dimensions in mm

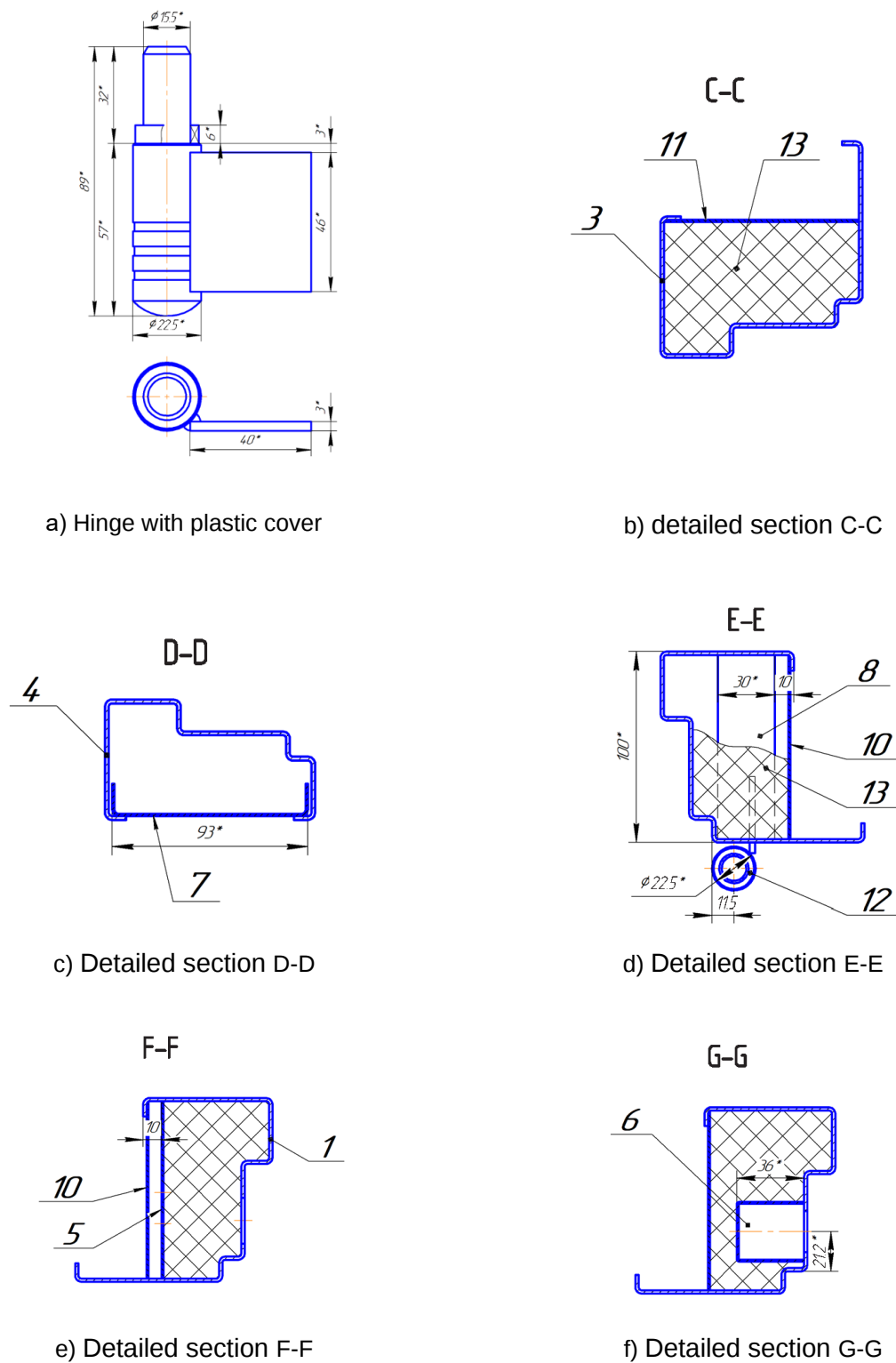
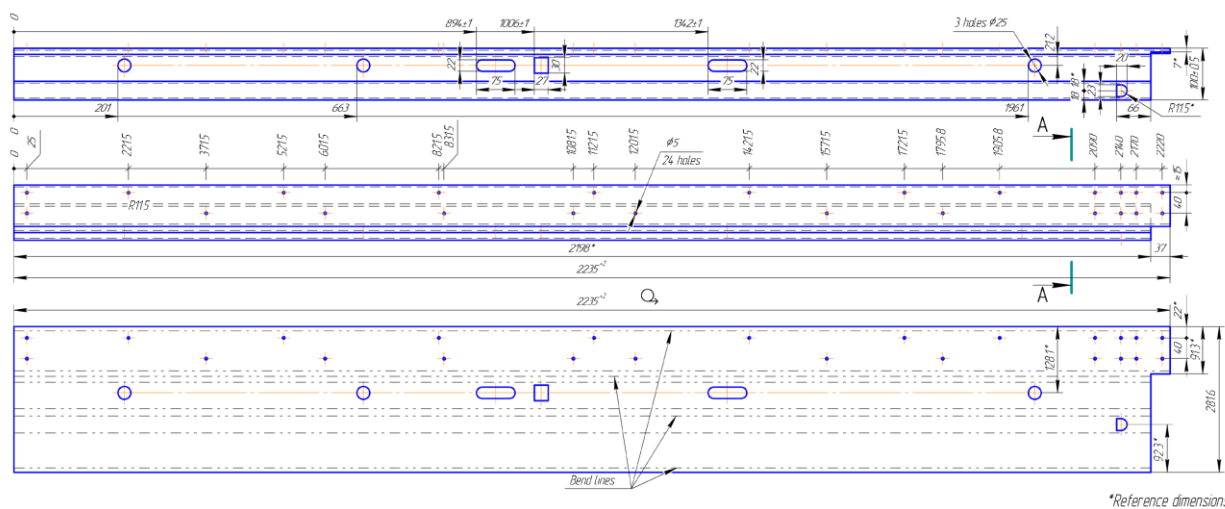


Fig. 4. Detailed sections of the case

Continuation of annex 7

Dimensions in mm



A-A

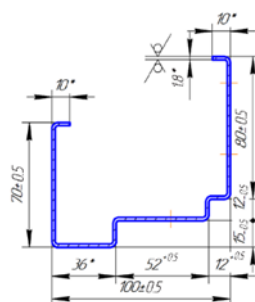


Fig. 5. Frame - view from the side of closure

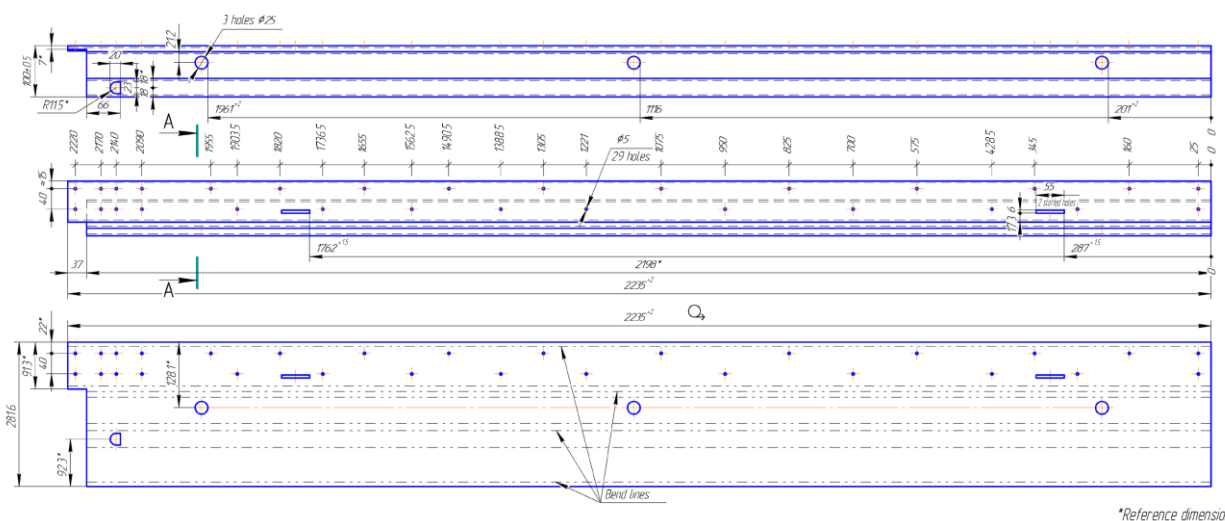
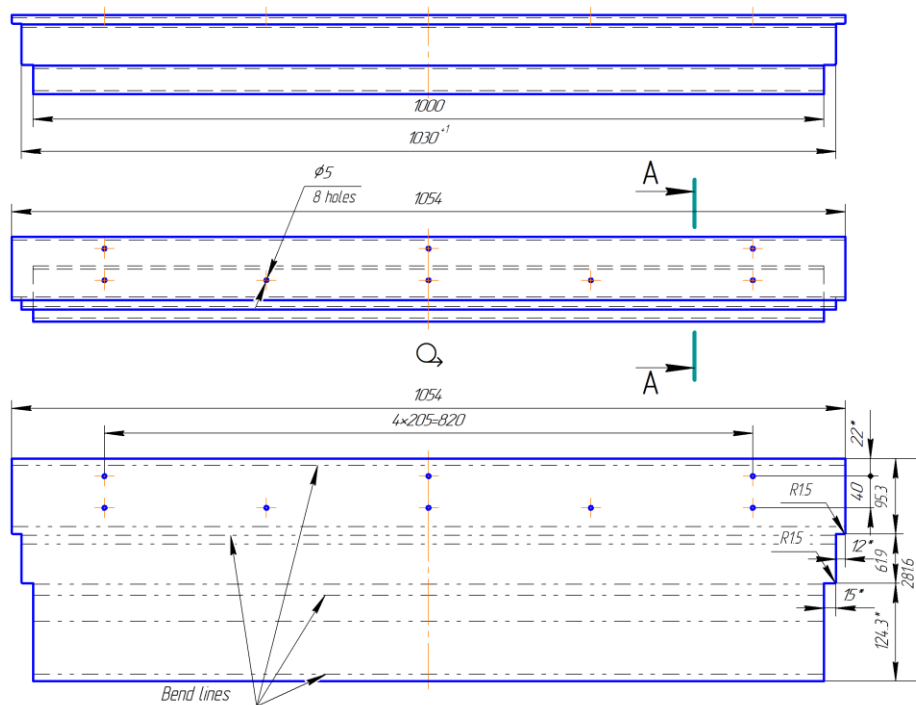


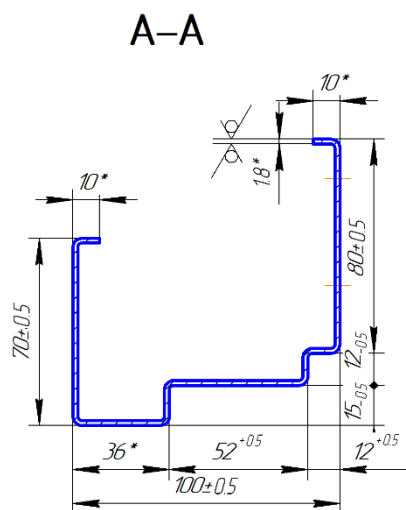
Fig. 6. Frame - view from the side of the hinges

Continuation of annex 7

Dimensions in mm



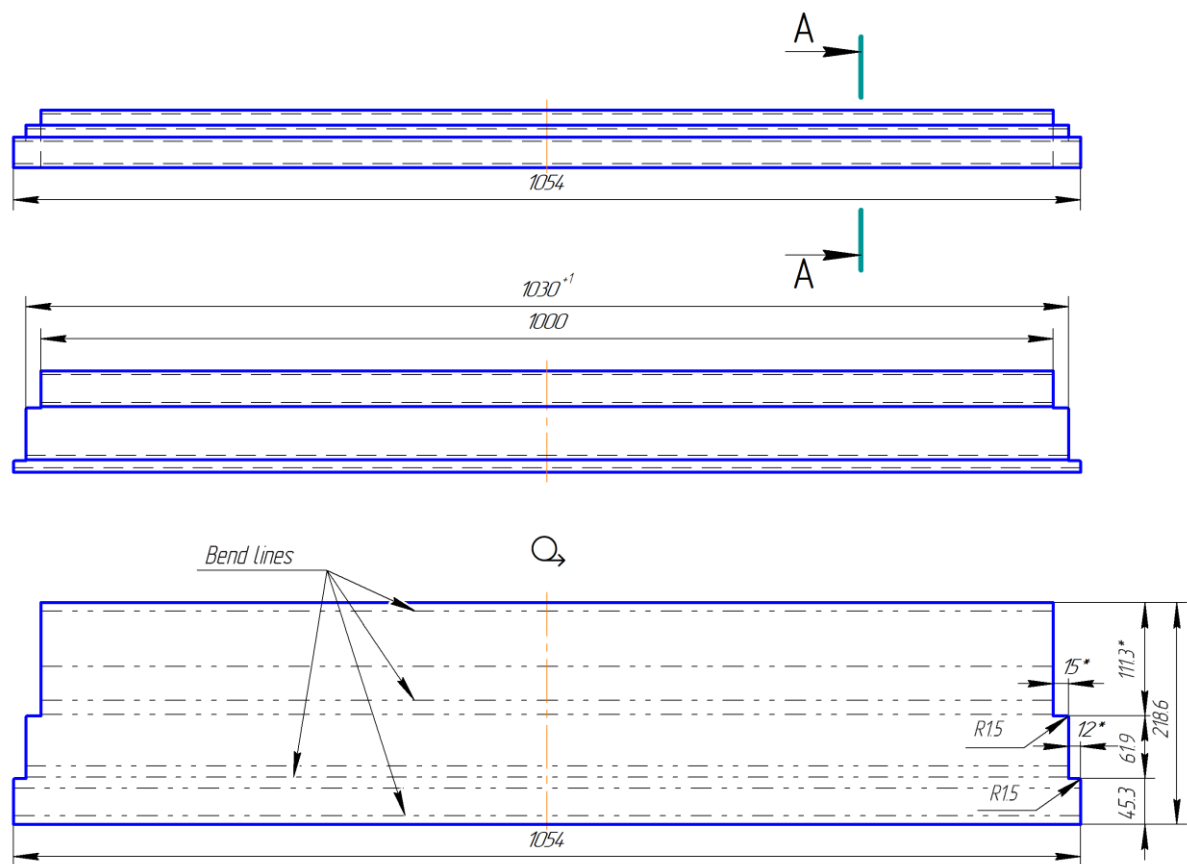
*Reference dimensions.



*Reference dimensions

Fig. 7. Case - top view

Dimensions in mm



A—A

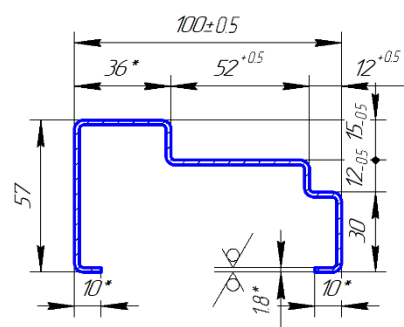


Fig. 8. Door threshold

Continuation of annex 7

Dimensions in mm

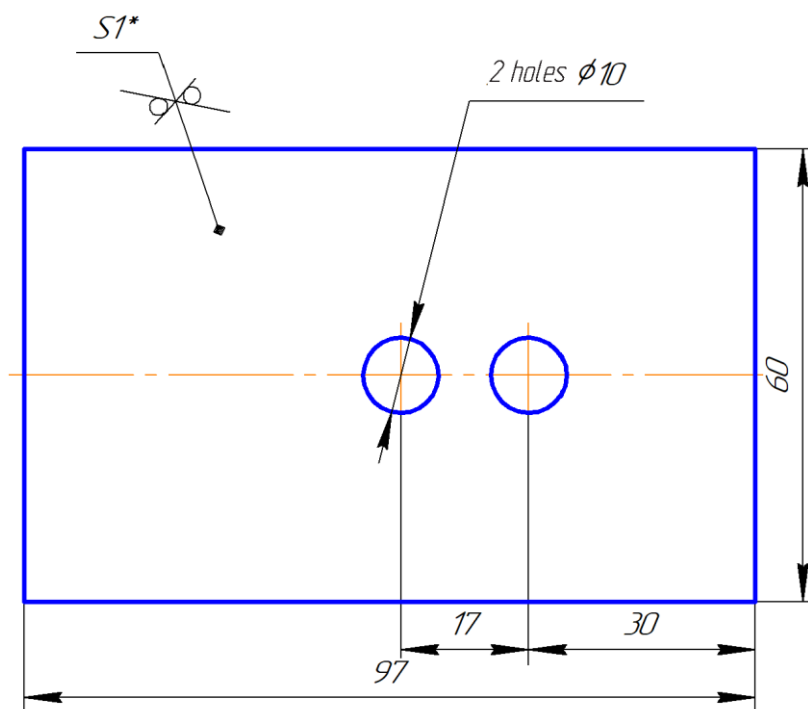


Fig. 9. Mounting plate

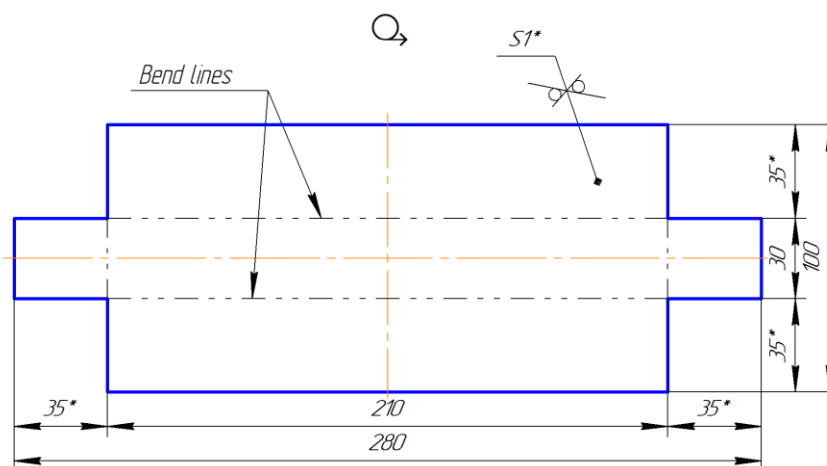
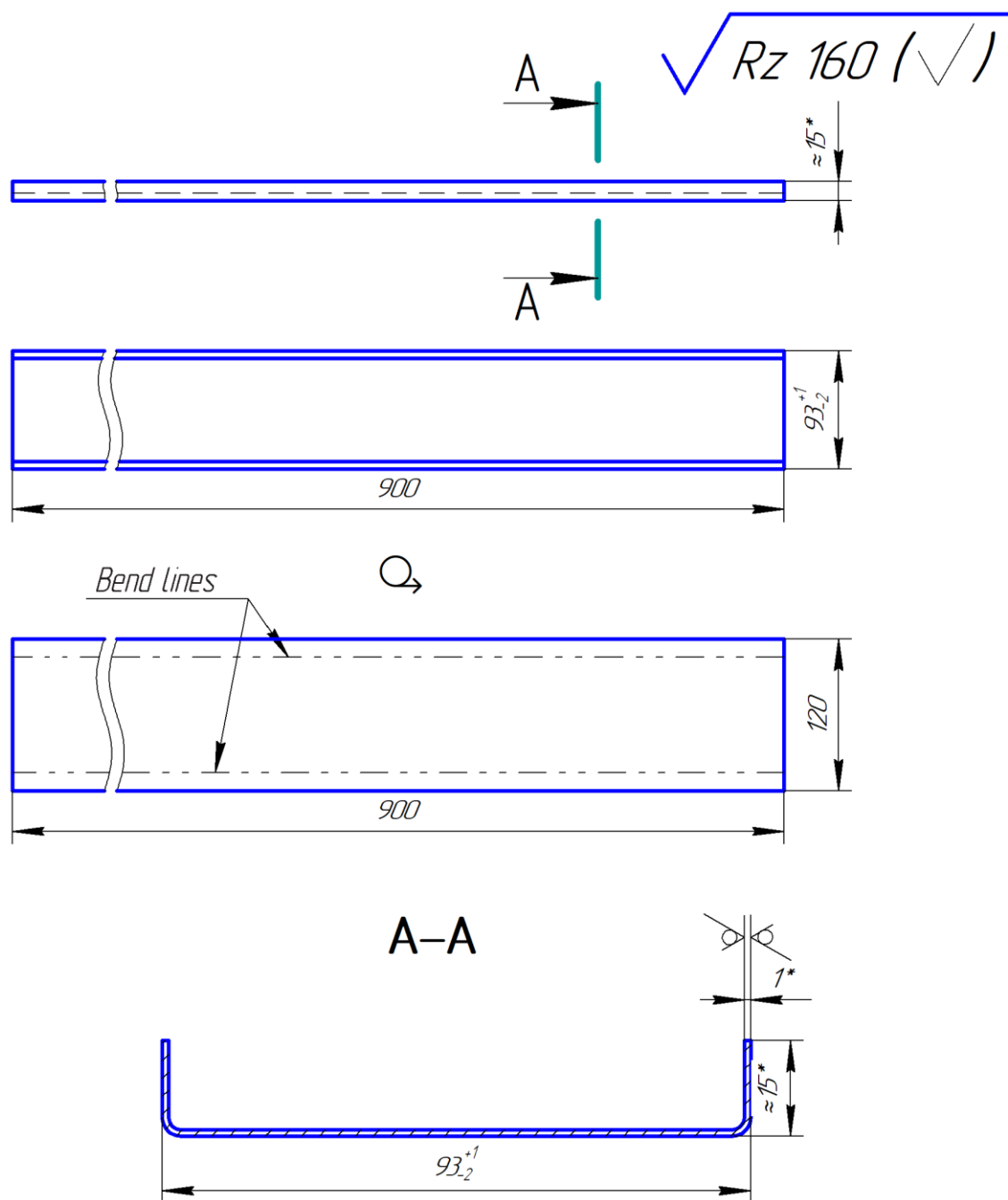


Fig. 10. Covering box for the openings of the passive spikes

Continuation of annex 7

Dimensions in mm



**Reference dimensions.*

Fig. 11. Lower cover of the door threshold

Continuation of annex 7

Dimensions in mm

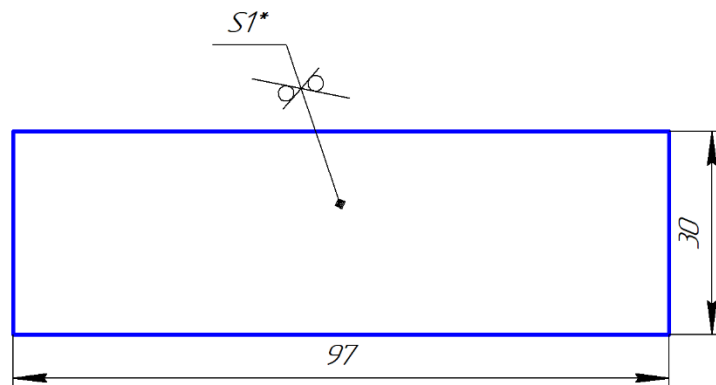


Fig. 12. Hinge limiter

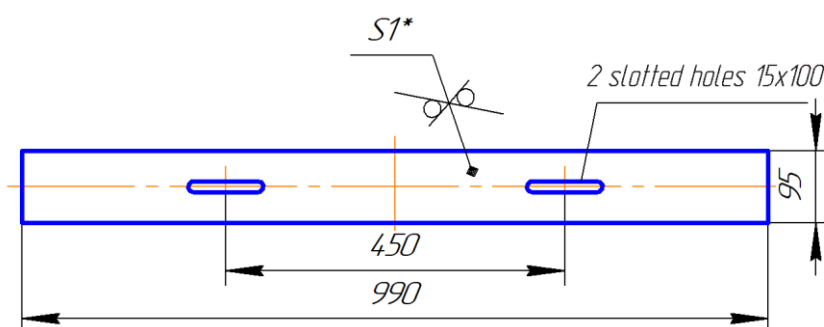


Fig. 13. Strip of the upper beam (for a closed heat-insulated design)

Continuation of annex 7

Dimensions in mm

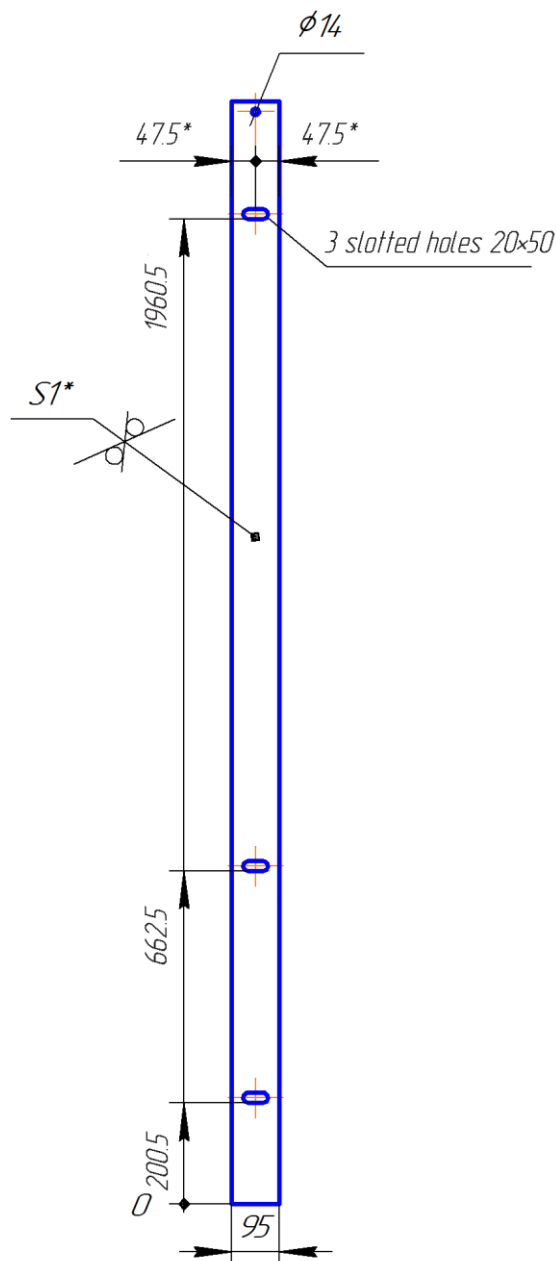


Fig. 14. A strip on the side of the locks (for a closed heat-insulated design)

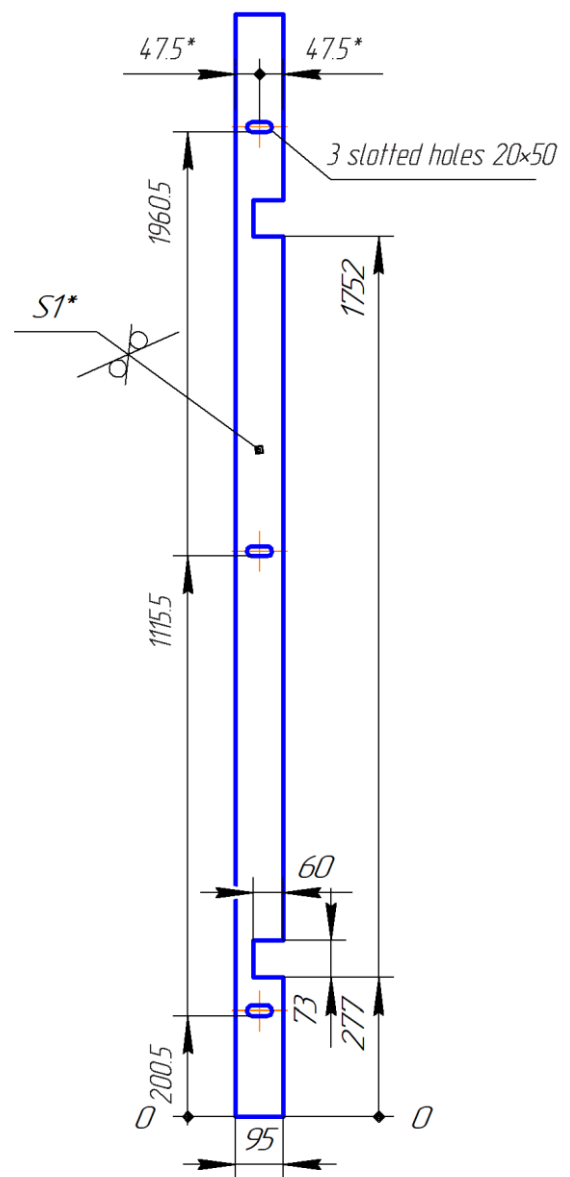
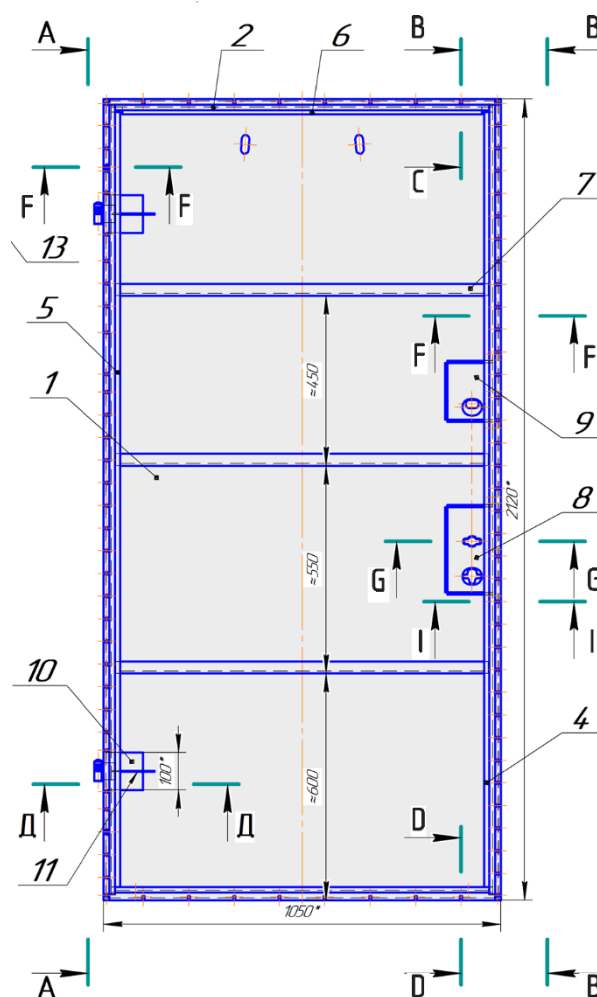


Fig. 15. A strip on the side of the hinges (for a closed heat-insulated design)

Continuation of annex 7

Dimensions in mm



- | | |
|--|--|
| 1. Base of the leaf - 1 pc. | 8. Box for the main lock 252 -1 pc. |
| 2. Cover of the leaf - 1 pc. | 9. Box for additional lock 257 -1 pc. |
| 3. Threshold profile - 1 pc. | 10. Reinforcement plate on the hinges - 2 pcs. |
| 4. Profile on the side of the lock - 1 pc. | 11. Rib for strengthening the hinge - 2 pcs. |
| 5. Profile on the side of the hinge - 1 pc. | 12. Weld nut M5 DIN 928 - 8 pcs. |
| 6. Profile on the upper side -1 pc. | 13. Passive spikes (anti-burglary)– 2 pcs. |
| 7. Reinforcing profiles in the leaf - 3 pcs. | 14. Hinges with plastic cover -2 pcs. |

Fig. 16. Door leaf, right opening. General mounting installation drawing

Continuation of annex 7

Dimensions in mm

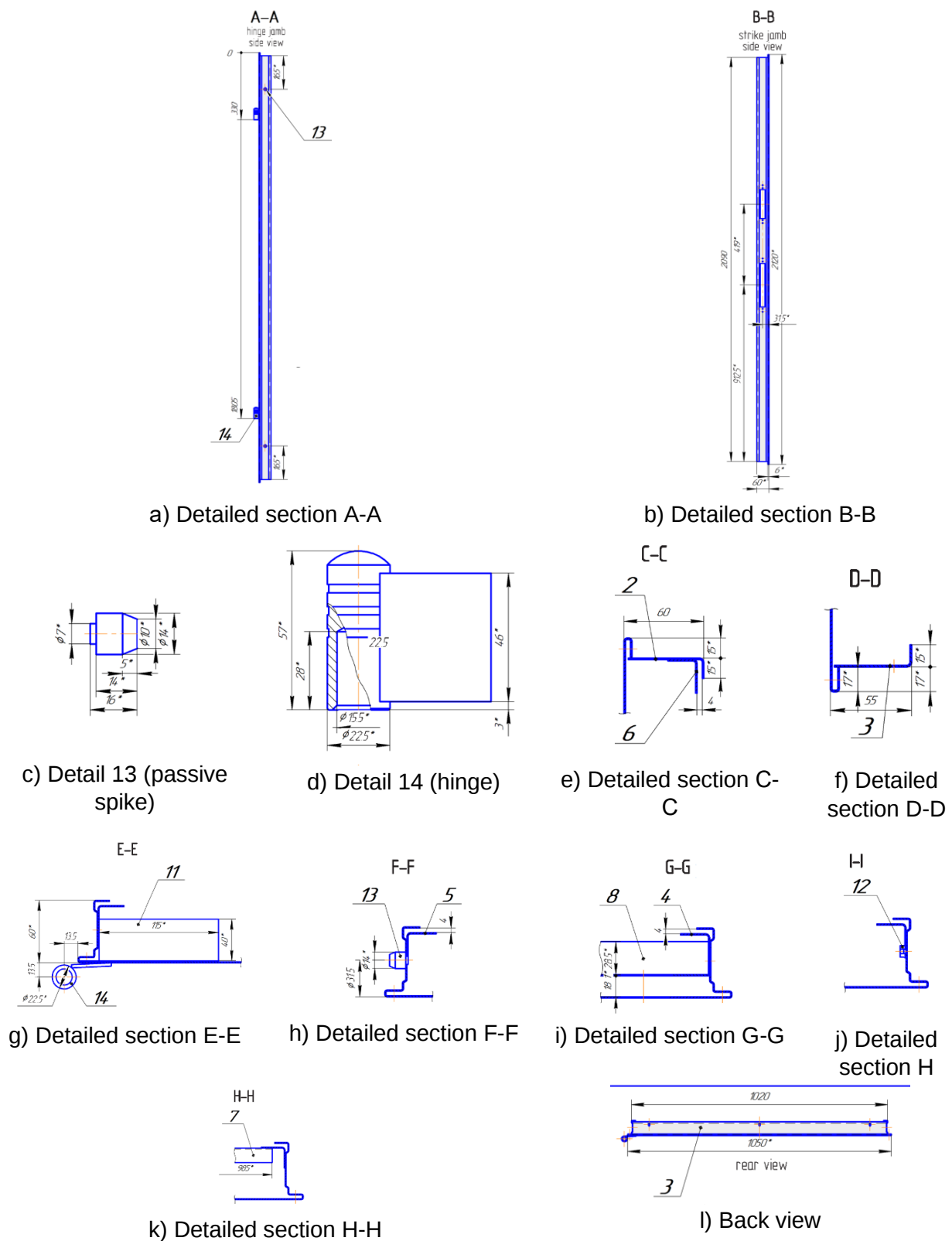


Fig. 17. Detail sections of the door leaf

Continuation of annex 7

Dimensions in mm

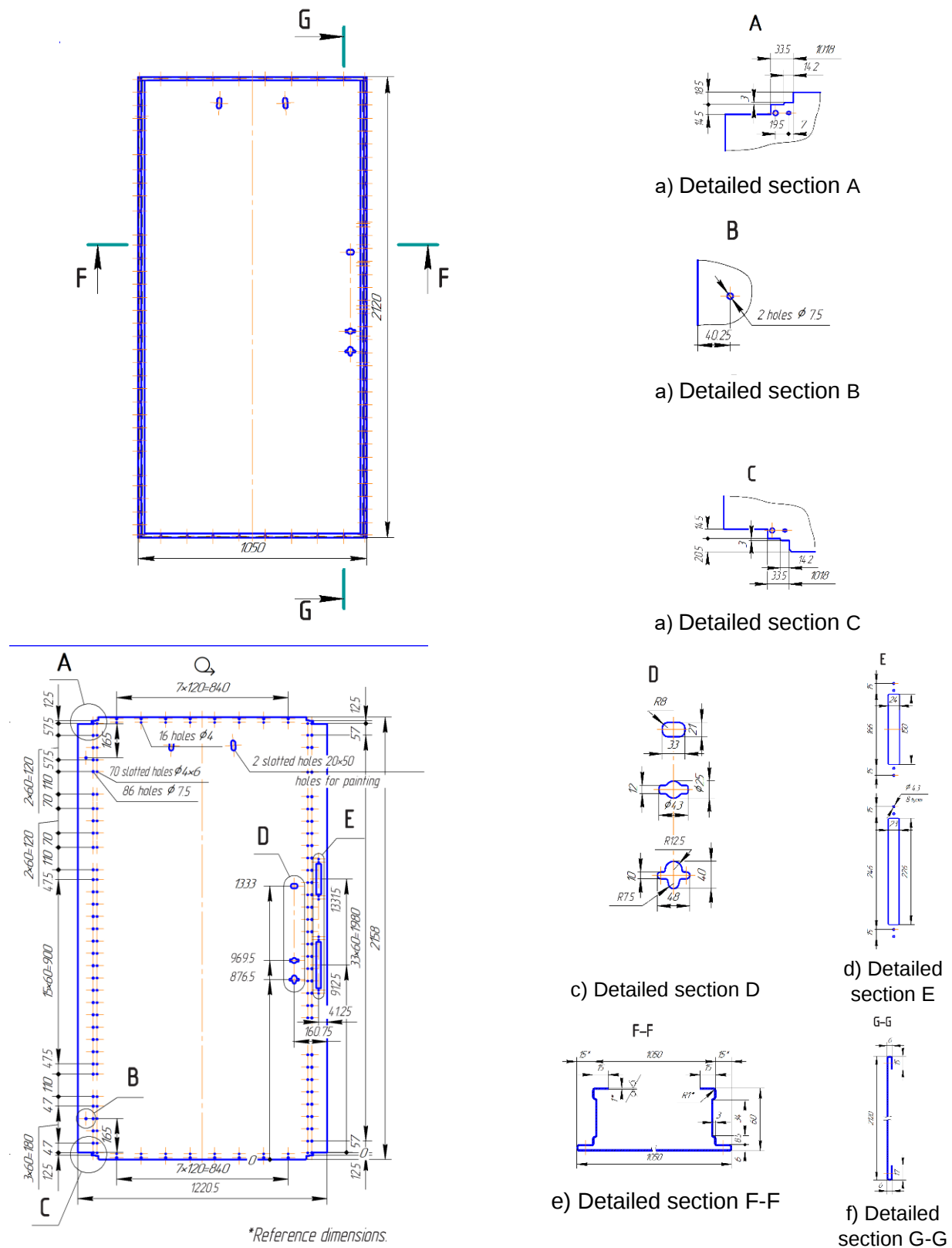


Fig. 18. Door leaf

Continuation of annex 7

Dimensions in mm

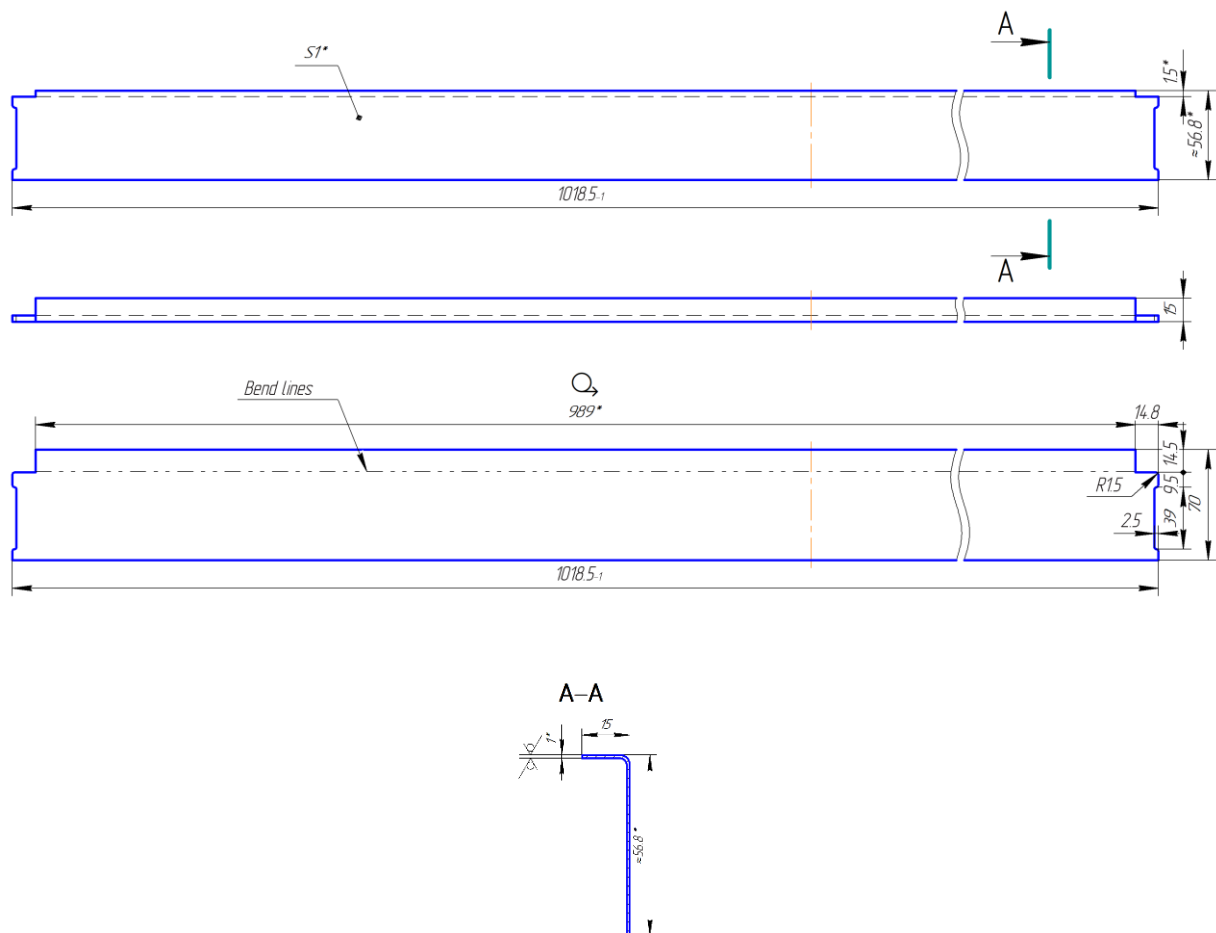


Fig. 19. Door leaf- top view

Continuation of annex 7

Dimensions in mm

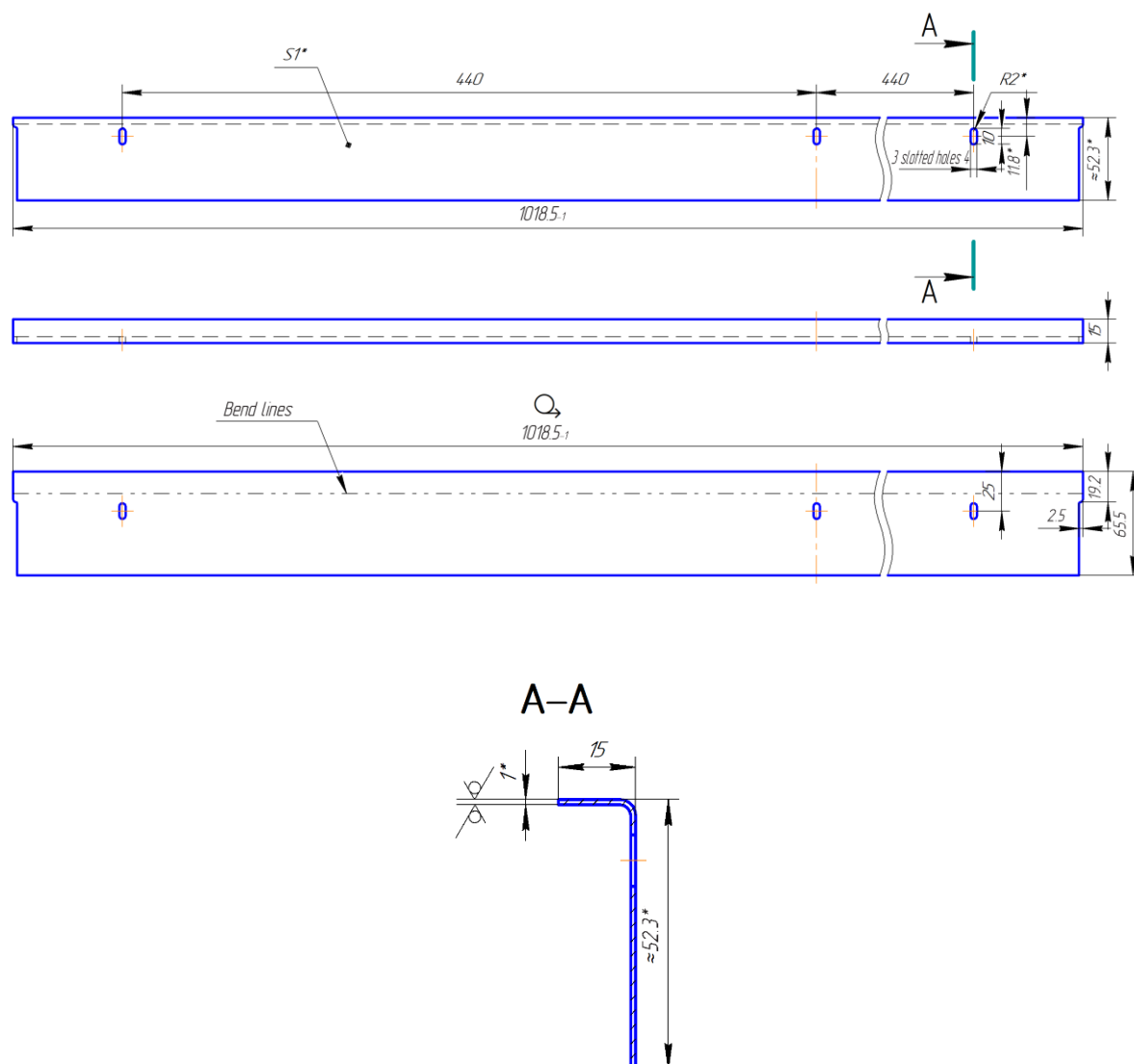


Fig. 20. Leaf - view from the door threshold

Continuation of annex 7

Dimensions in mm

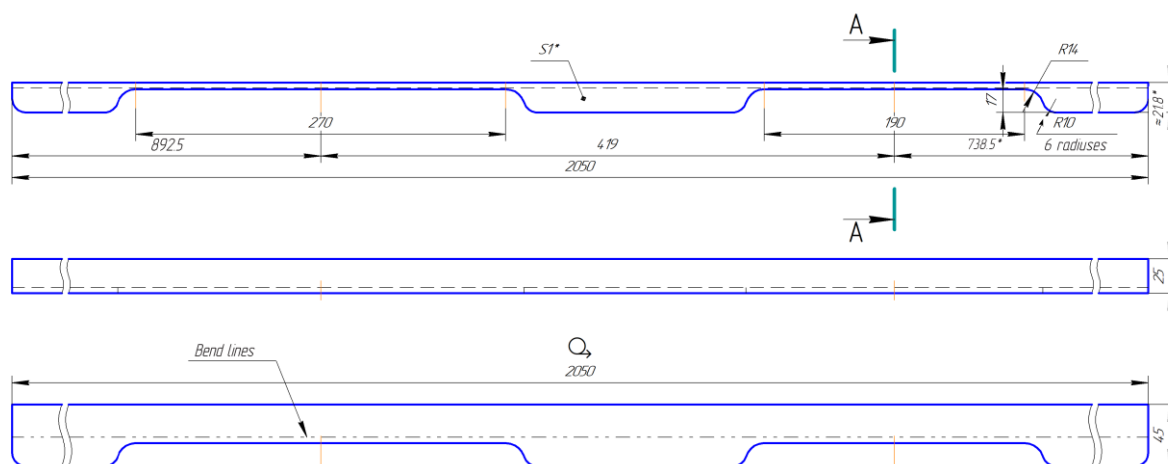
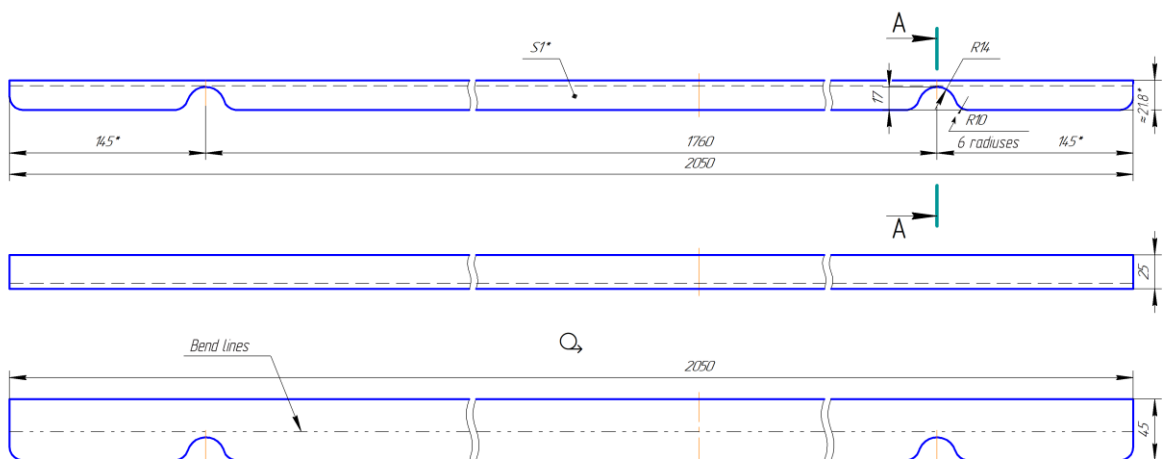


Fig. 21. Leaf- view from the closing side

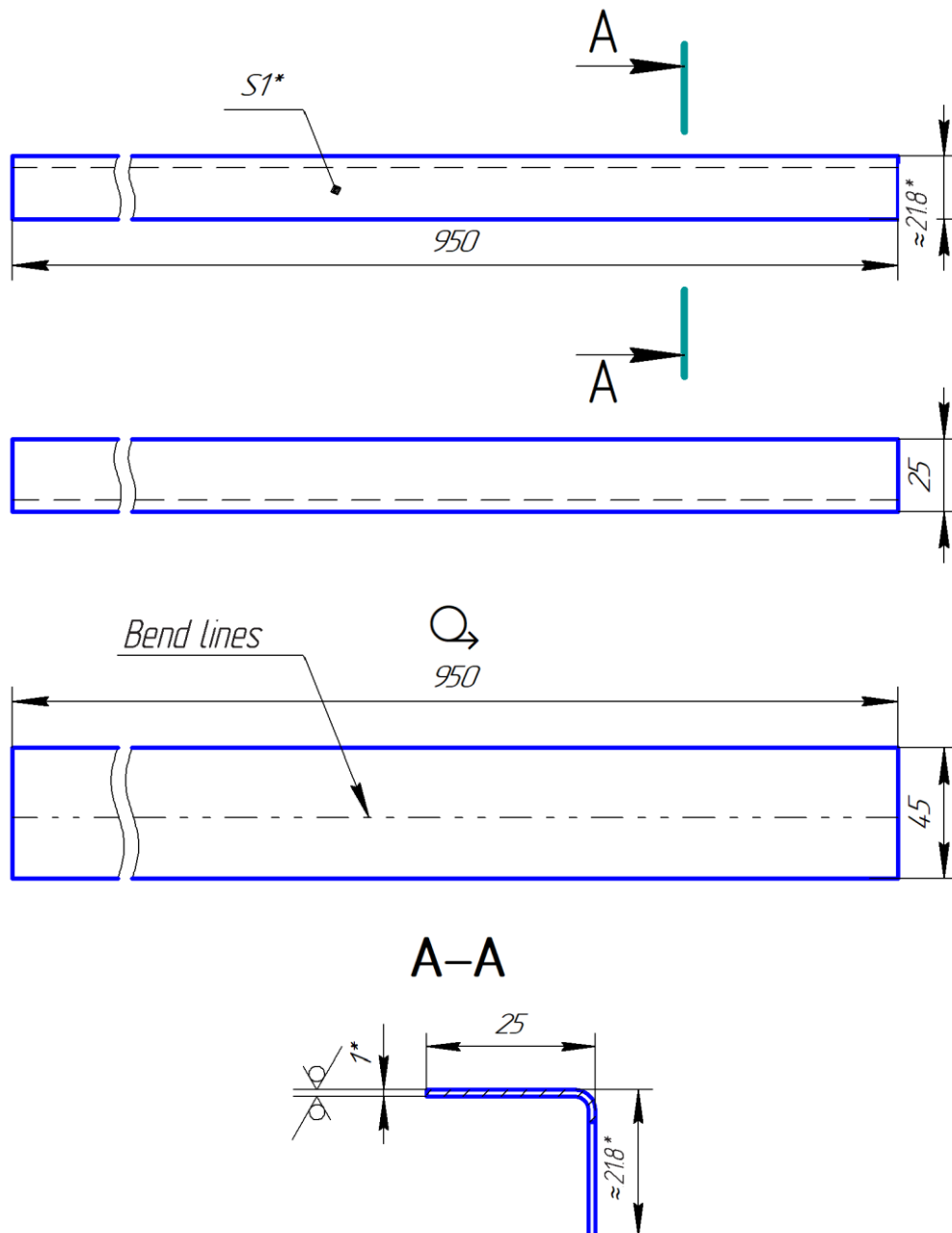


*Reference dimensions

Fig. 22. Leaf - view from the hinge side

Continuation of annex 7

Dimensions in mm



*Reference dimensions

Fig. 23. Angle of the front par

Continuation of annex 7

Dimensions in mm

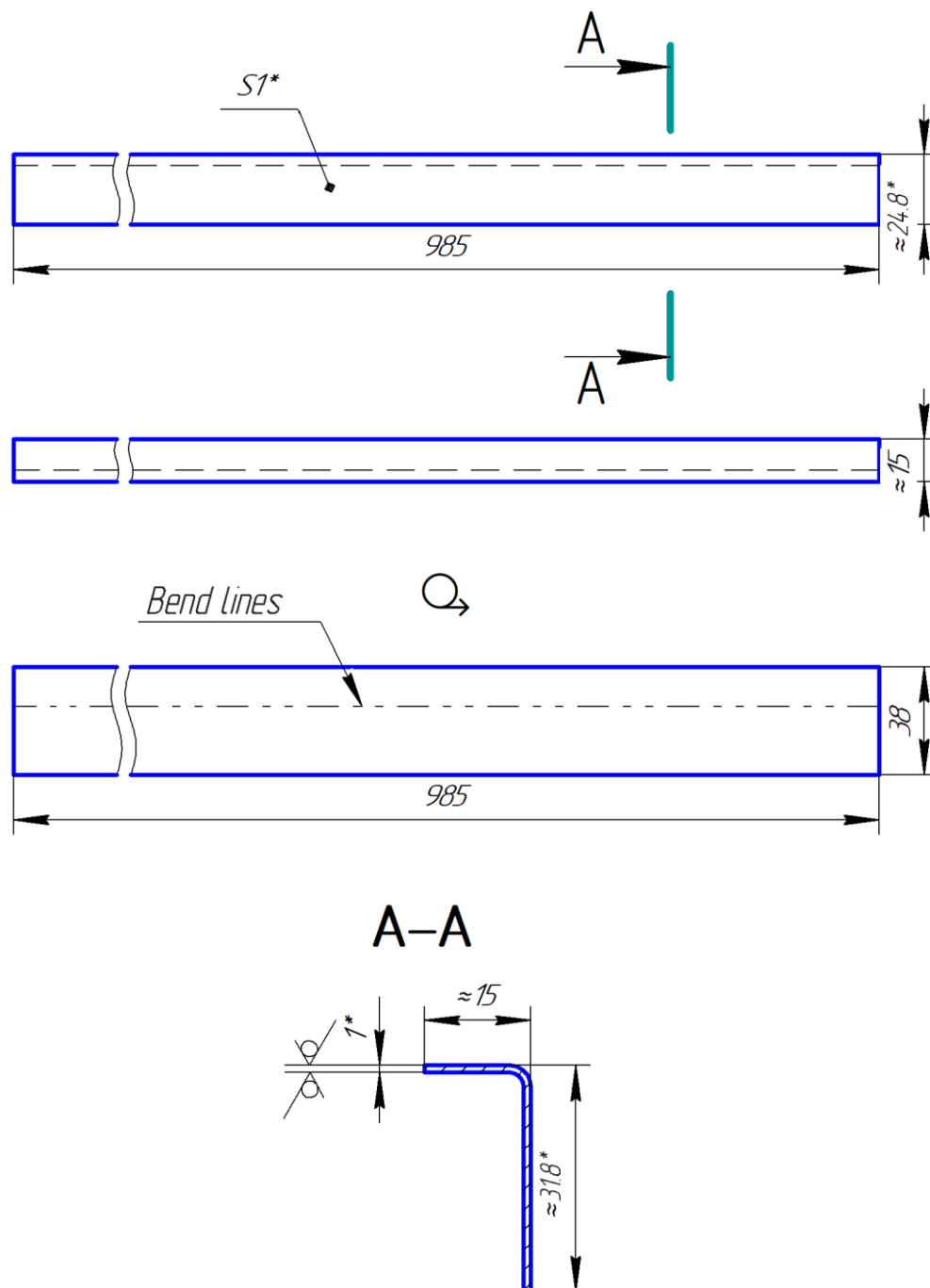
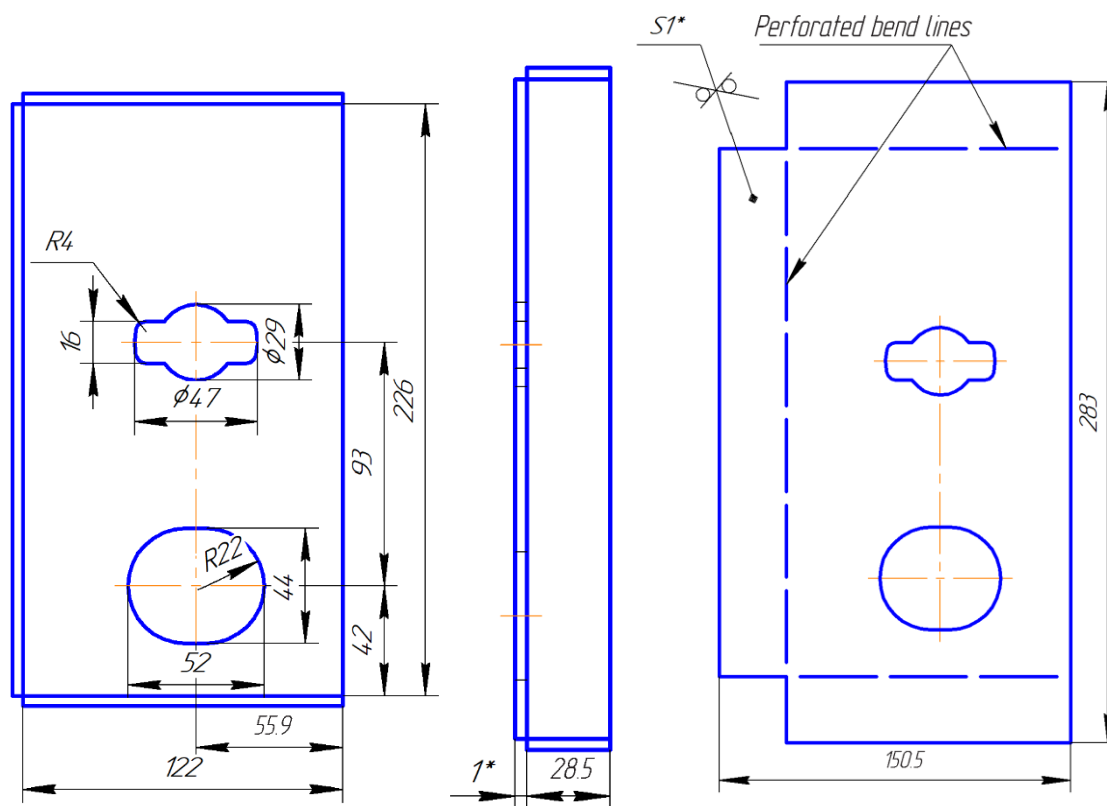


Fig. 24. Leaf connection angle

Continuation of annex 7

Dimensions in mm



*Reference dimensions

Fig. 25. Cover for main lock model 252

Continuation of annex 7

Dimensions in mm

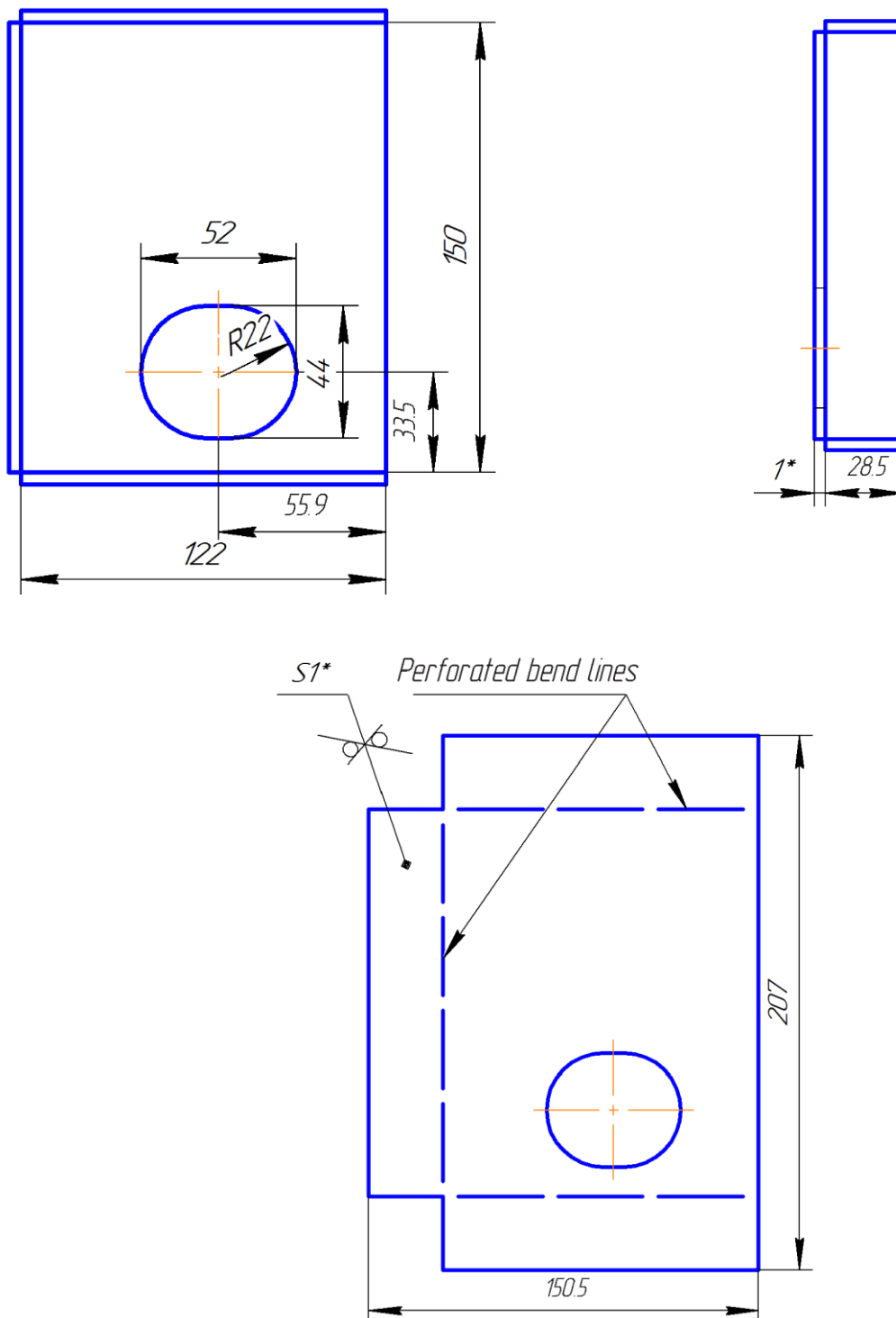


Fig. 26. Protective box for auxiliary lock model 257

Continuation of annex 7

Dimensions in mm

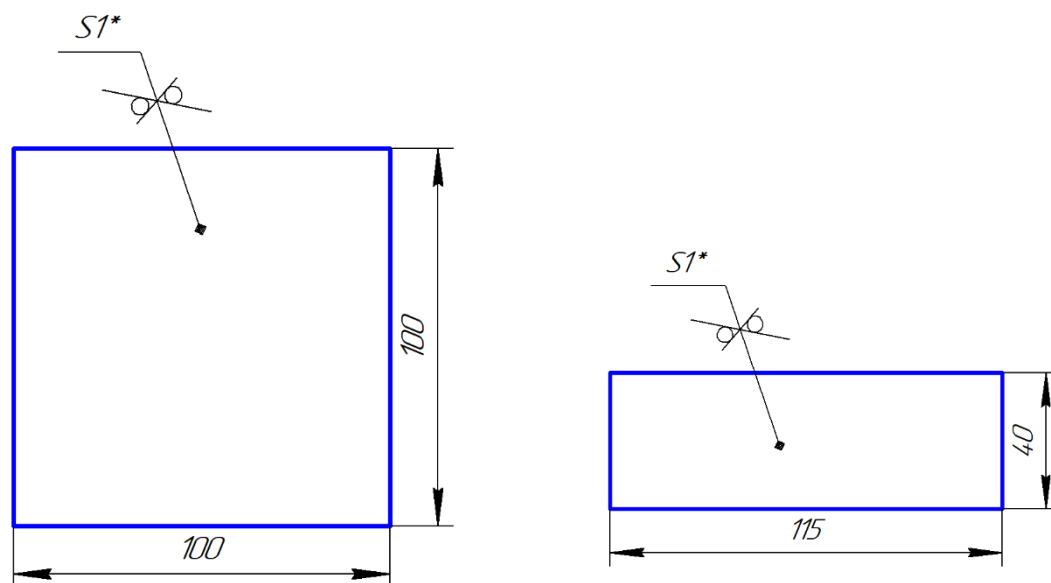


Fig. 27. Reinforcement plates of the hinges

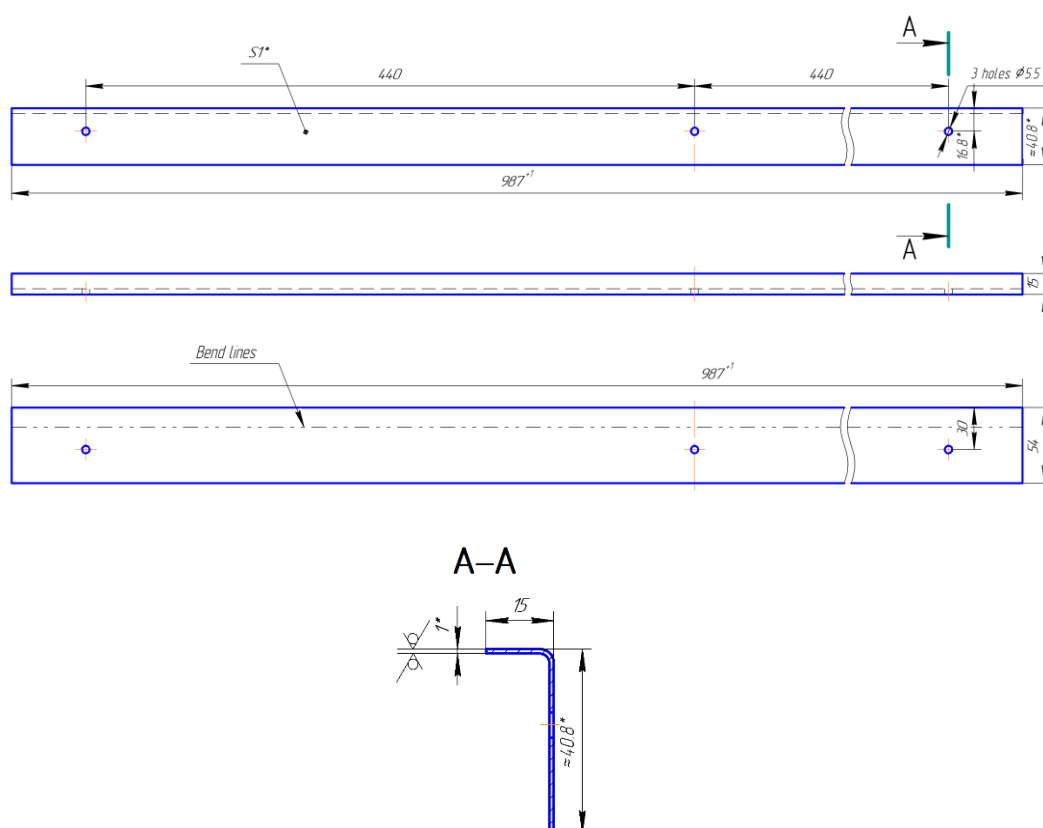
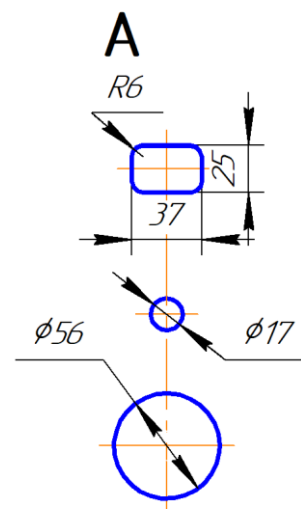
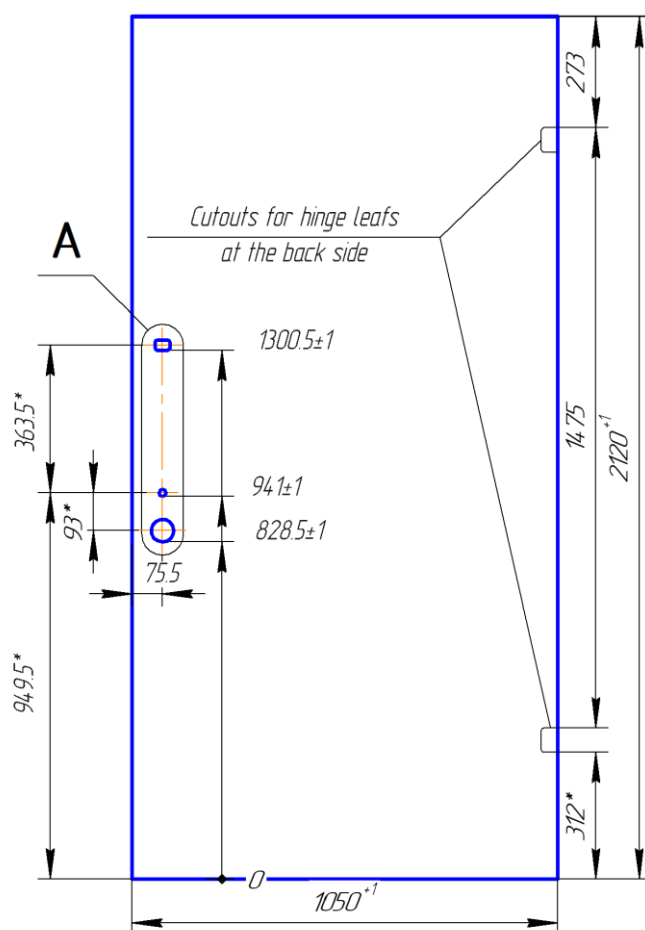


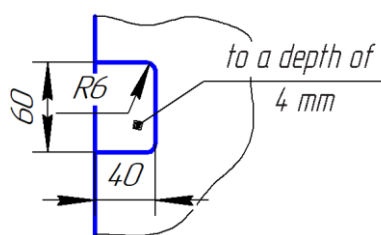
Fig. 28. Leaf -view and angle from the hinge side

Continuation of annex 7

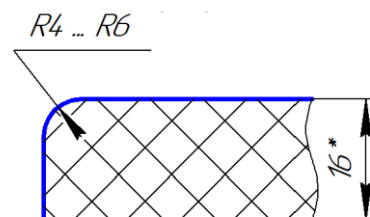
Dimensions in mm



a) Detailed section A-A



b) Opening in the leaf for the hinge

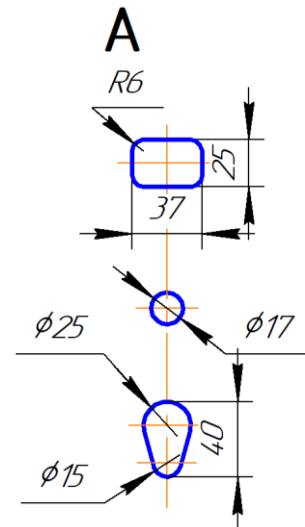
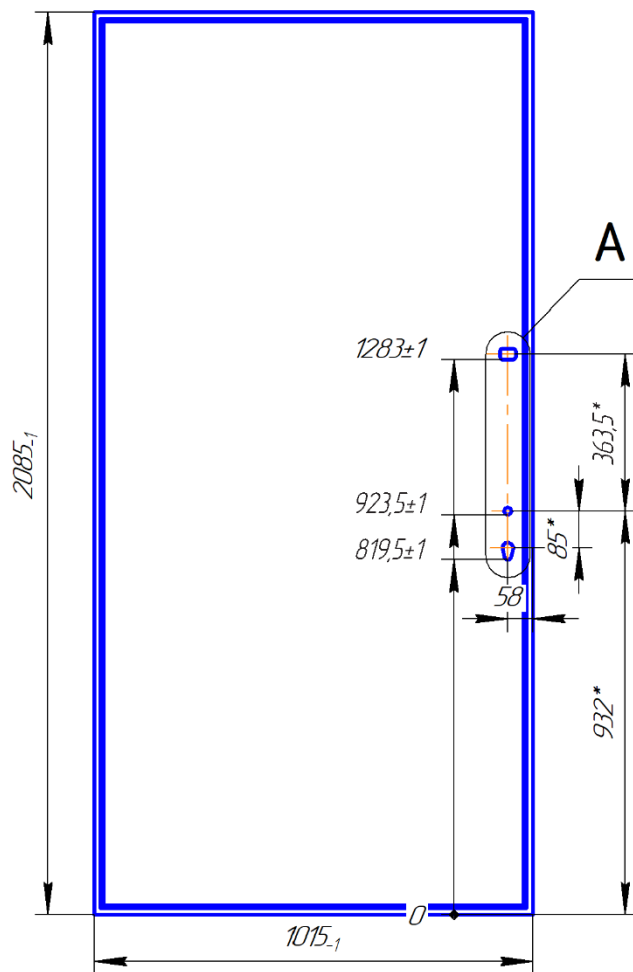


c) Bevel profile along the perimeter of the door lining on the front side

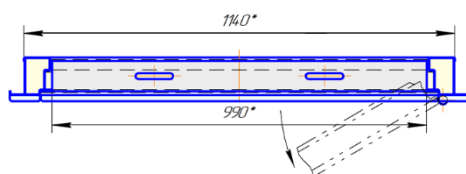
Fig. 29. External lining of the door from MDF

Continuation of annex 7

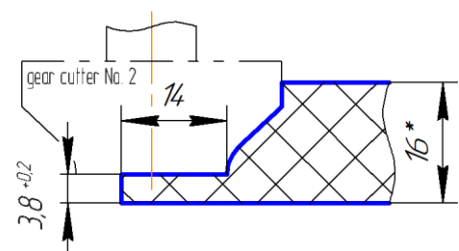
Dimensions in mm



a) Detailed section A-A



b) Door- top view



c) Bevel profile along the perimeter of the leaf lining on the front side

Fig. 30. Internal MDF door lining

Continuation of annex 7

Dimensions in mm

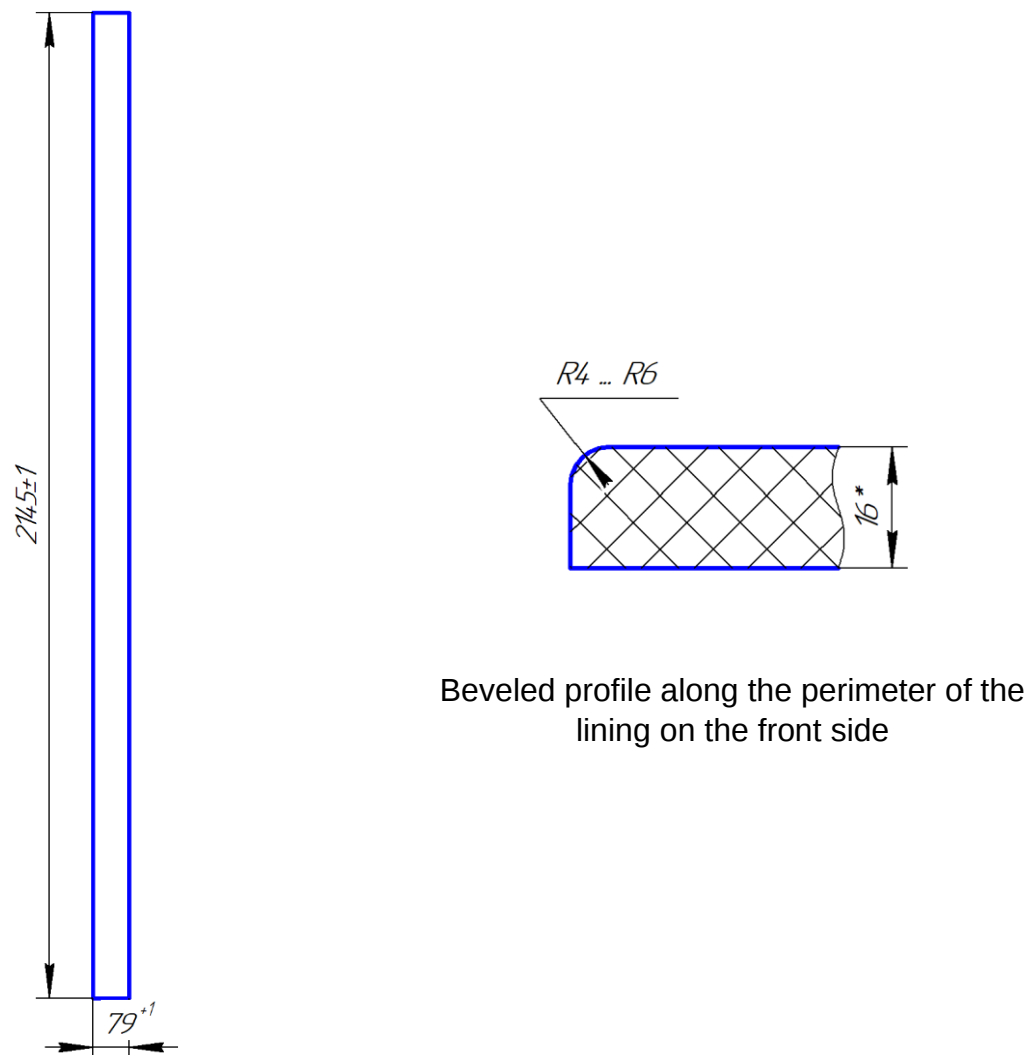


Fig. 31. Vertical MDF lining of the safety beam

Continuation of annex 7

Dimensions in mm

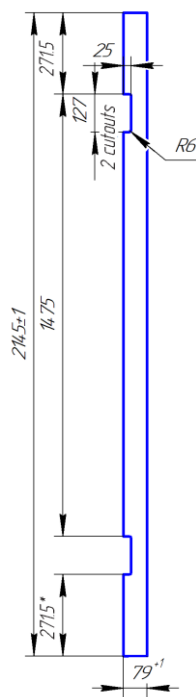
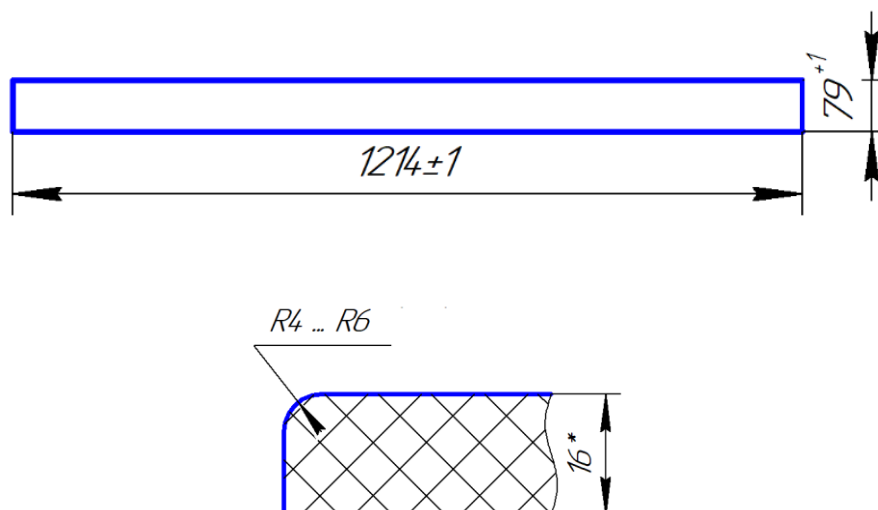


Fig. 32. Vertical MDF lining on the hinge (MDF-16 board)



Bevel profile along the perimeter of the lining on the front side

Fig. 33. Horizontal MDF lining