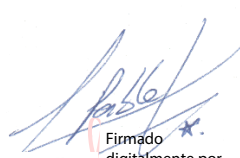


TEST REPORT

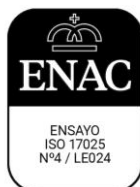
No. 125396

CLIENT	STACBOND® (ECO BIERZO COMPOSITE S.L.)
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PURPOSE	TEST REPORT ACCORDING TO NFPA 285-25 STANDARD EXTERNAL CLADDING SYSTEM
TESTED SPECIMEN (*)	REF. « STB-T-SZ-PRO WITH STACBOND FR PANELS »
DATE OF RECEIPT	2026.05.13
TEST DATE	2026.06.03
DATE OF ISSUE	2026.07.22

Technical manager Reaction to Fire Laboratory
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Pablo Garmendia



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INDEX

TEST SPECIMEN CHARACTERISTICS.....	3
REQUESTED TEST.....	9
TEST FACILITY AND TEST APPARATUS	10
BURNERS	12
TEST SPECIMEN	12
INSTRUMENTATION.....	14
RESULTS OBTAINED IN CALIBRATION	17
AMBIENT CONDITIONS AT THE START OF THE TEST	19
BURNER GAS FLOW DATA OBTAINED DURING THE TEST	19
OBSERVATIONS DURING THE TEST	21
CONDITIONS OF ACCEPTANCE AND TEST RESULTS.....	24
POST-TEST ANALYSIS	25
APPENDICE A. TIME – TEMPERATURE GRAPHS	26
APPENDICE B. REGISTERED DATA DURING TEST.....	32
APPENDICE C. DRAWINGS	57
APPENDICE D. PHOTOGRAPHS	74
APPENDICE E. DAMAGE SKETCHES	109
APPENDICE F. TECHNICAL DATA SHEETS. SUPPORTING WALL (LSF).....	116
APPENDICE F. TECHNICAL DATA SHEETS. CLADDING SYSTEM(*)	136



TEST SPECIMEN CHARACTERISTICS

The 13th of May of 2026, TECNALIA RESEARCH & INNOVATION received from STACBOND the different components that comprise the test specimen of an external cladding system.

The external cladding system being tested had the following commercial reference (*):

« STB-T-SZ-PRO WITH STACBOND FR PANELS »

The description of the external cladding system is the next one:

Ventilated façade system consisting of composite panels with core reinforced with fire-retardant materials, an aluminium substructure, and a vapor barrier, installed over a supporting gypsum board wall.

The test specimen « **STB-T-SZ-PRO WITH STACBOND FR PANELS** » comprised the following components (*):

SAMPLING SELECTION

On 17 and 19 February 2026, INTERTEK staff took random samples of STACBOND FR panels corresponding to production orders OF4I388 and OF4I406, identifying them under project code G01606765.

Technical drawing of a mechanical part showing front and top views with dimensions.

Front View Dimensions:

- Total width: 50.00
- Total height: 30.00
- Top flange width: 20.00
- Top flange height: 10.00
- Internal width: 20.00
- Internal height: 10.00
- Bottom flange width: 50.00
- Bottom flange height: 10.00
- Internal width (bottom): 20.00
- Internal height (bottom): 10.00

Top View Dimensions:

- Overall width: 55.0
- Overall height: 15.0
- Internal width: 50.0
- Internal height: 10.0
- Internal width (bottom): 50.0
- Internal height (bottom): 10.0

B) LIGHT STEEL FRAME SUPPORTING WALL SYSTEM

Nº	COMPONENT	USE IN THE CLADDING SYSTEM	COMMERCIAL REFERENCE	MATERIAL DESCRIPTION	PARAMETERS
101	Gypsum board. External and internal panel	External and internal gypsum panel of the supporting wall	KNAUF Cortafuego DF		2500 x 1200 Thickness = 15mm
102	Self drilling screw	Fastening of the external panel to the vertical studs	PM 3,5 x 25	Steel	3,25 x 25 mm
103	C section vertical stud	Vertical stud conforming the substructure of the supporting wall.		Steel	3000 x 90 mm
104	U section horizontal channel	Horizontal channel conforming the substructure of the supporting wall.		Steel	3000 x 90 mm
105	Metal-to-metal screw with drilling tip	Fastening between supporting wall substructure elements	Ref.:3,5 x 3,9 Manufacturer: SEMIN	Steel	3,5 x 3,9
106	Supporting wall internal fire stop	Supporting wall internal cavity fire stop. Mounted between the steel studs	ROCKWOOL VENTIROCK DUO Cara sup 100 kg/m3 Cara inf flex 40kg/m3	Stone wool	Maximum dimensions: 1350 x 600 mm Thickness = 120 mm
107	External gypsum plasteboard	Gypsum plaste board for the joints of the supporting wall	AQUAPANEL OUTDOOR Manufacturer: KNAUF	Gypsum plasteboard	
108	External paper joint tape	Joint treatment tape for supporting wall	Tarmaglass 160 R 131	Fiber glass	
109	Internal gypsum plasteboard	Gypsum plaste board for the joints of the supporting wall	CE 78 LENT Manufacturer: SEMIN	Gypsum plaste board	
110	External gypsum plasteboard	Joint treatment tape for supporting wall	Cinta de papel KANUF Manufacturer: KANUF	Paper tape	

All the components of the test specimen have been installed on-site at TECNALIA test facilities under revision of TECNALIA.

MOUNTING SEQUENCE

The following mounting sequence description refers to the components numbered in GENERAL DESCRIPTION tables above.

Light Steel Frame Supporting Wall

The substructure of the supporting wall consists of two metal frames which are bonded together by screws [105] fastened to the horizontal channels in contact (See LSF drawings appendix). The upper and lower horizontal channels [104] of the assembly are fixed to the upper and lower beams of the movable metal frame of the test apparatus with screws [102].

Vertical studs [103] are then installed using screws [105] to the metal frame channels. The studs are fixed to the horizontal L-shaped profiles of the metal frame using screws [102]. A strip of thermal mineral insulation [106] is installed inside the upper channel of the lower frame, between the studs, as a floor line cavity barrier.

A layer of gypsum board [101] is then installed to the outside face of the supporting wall using screws [102]. Horizontal and vertical joints are covered with mesh tape [108/110] and paste [107/109].

From the inner face of the supporting wall, a layer of gypsum plasterboard [101] has been fixed with screws [102]. Horizontal and vertical joints have been covered with paper tape [108/110] and paste [107/109].

The internal perimeter of the window opening has been finished with a layer of external gypsum board [101]. Joints around the opening have been covered with mesh tape [108/110] and paste [107/109].

External cladding system

The vapor barrier [7] has been installed sticking it to the external face of the gypsum board of the Light Steel Frame.

All the aluminium hanging brackets [5] have been fixed using screws [6] to the supporting wall. The brackets [5] are fixed to the vertical steel studs [103] within the LSF.

The cavity barriers [9] have been installed using some shimming elements [8] to achieve the necessary depth. These shimming elements [8] are fixed to the LSF using screws [6]. The Shimming elements are as follow:

- Perimeter of the window. Omega + 1 stud
- Floor levels. Each level has 2 rows
 - 1st row. Omega + 1 stud
 - 2nd row. Omega + 2 studs

The T section vertical studs [3] are fixed to hanging brackets [5]. The studs [3] are fixed using self-drilling screws [4]. After that, the composite panels [1] are fixed to the T section vertical studs [3], using as fixing elements the self-drilling screws [2]. In the first row, a

hanging base profile is installed [1]. This starter profile, which is included among the panel accessories [1], features a hook-shaped geometry that receives and supports the panels. At the top, the panels are provided with a hanging hood, which supports the next course of panels. This arrangement is repeated successively for each row. All panels are screwed to the studs with self-drilling screws [2].

The panels of the perimeter of the window opening, has already incorporated the flashing detail. So, the flashing elements are also made of composite panels [1]. The perimeter flashing elements around the window opening, in the area that overlaps with the LSF section, are screwed to its edge using screws [6].

CONSTRUCTIVE DETAILS

Description of window perimeter and components fastening details

The panels of the perimeter of the window opening, has already incorporated the flashing detail. So, the flashing elements are also made of composite panels [1]. See the drawing appendix for the details.

The test specimen consists of a 120 mm-thick supporting wall and a 120 mm-thick external cladding system, reaching a total thickness of 240 mm.

Details of the fastening of the test specimen to the test apparatus

Steel screws [6] have been used to fasten hanging brackets to the supporting wall. One screw per bracket has been used.

Sides and top sealing of the test specimen

The sides of the test specimen have been sealed using L shape steel profiles.

The top of the test specimen hasn't been sealed.

Descriptive drawings of the system

Drawings are included in the *Drawings* appendix of this report.

REQUESTED TEST

The requested test is the fire propagation test for exterior wall assemblies according to NFPA 285-25 *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components*.

This standard provides a test method for determining the fire propagation characteristics of exterior wall assemblies that are constructed using combustible materials or that incorporate combustible components.

The fire propagation characteristics are determined for post-flashover fires of interior origin.

The purpose of this standard is to provide a standardized fire test procedure for evaluating the suitability of exterior wall assemblies that are constructed using combustible materials or that incorporate combustible components for installation on buildings.

This standard shall be used to evaluate the fire propagation characteristics of exterior wall assemblies and panels used as components of curtain wall assemblies that are constructed

using combustible materials or that incorporate combustible components within the wall assemblies as specified in the following:

- (1) The ability of the wall assembly to resist flame propagation over the exterior face of the wall assembly.
- (2) The ability of the wall assembly to resist vertical flame propagation within the combustible components from one storey to the next.
- (3) The ability of the wall assembly to resist vertical flame propagation over the interior surface of the wall assembly from one storey to the next.
- (4) The ability of the wall assembly to resist lateral flame propagation from the compartment of fire origin to adjacent compartments or spaces.

TEST FACILITY AND TEST APPARATUS

The test apparatus consists of a steel and concrete structure installed inside a test facility, which is constructed to allow for the exhaust of the combustion by-products during the test while not inducing an airflow on the exterior face of the test specimen. The test facility protects the test apparatus and test specimen from exposure to wind and precipitation.

The test apparatus consists of a two-storey structure having a height of 15 ft 8 in. $\pm$ 1 in. (4.8 m $\pm$ 25 mm) with a test room on each storey, with a room on each storey, having the dimensions and additional specifications mentioned in paragraph 4.4. of the NFPA 285-25 standard.

In the front face of the test apparatus a movable vertical steel frame is installed, on which the specimen to be tested is mounted.

The test specimen minimum dimensions shall be 18 ft 6 in (plus overhang) x 13 ft 4 in ((5480 + overhang) x 4060 mm), with a central window opening of 78 in x 30 in (1981 x 762 mm), as shown in the following figure which has been taken from the test standard.

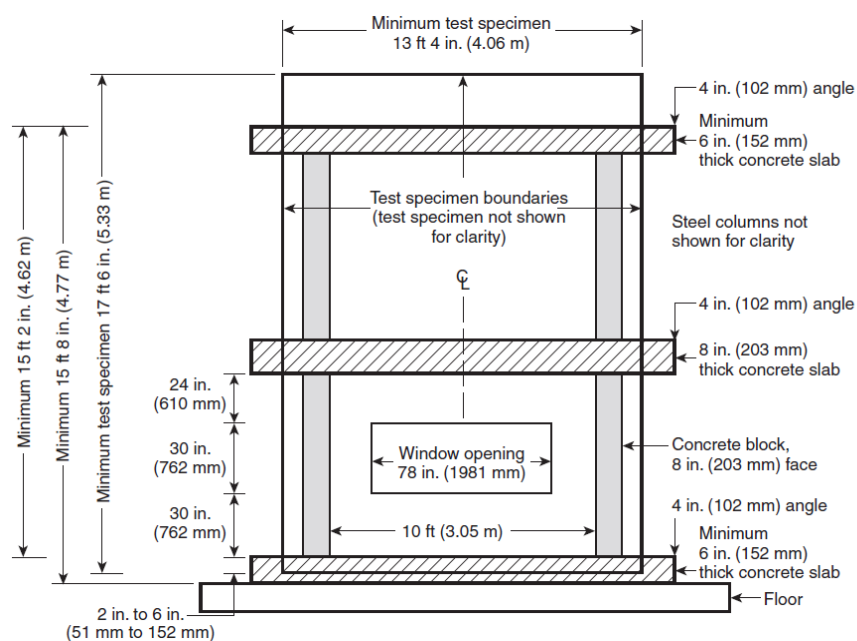


Fig. 1 Front view of test specimen superimposed over test apparatus (not to scale)

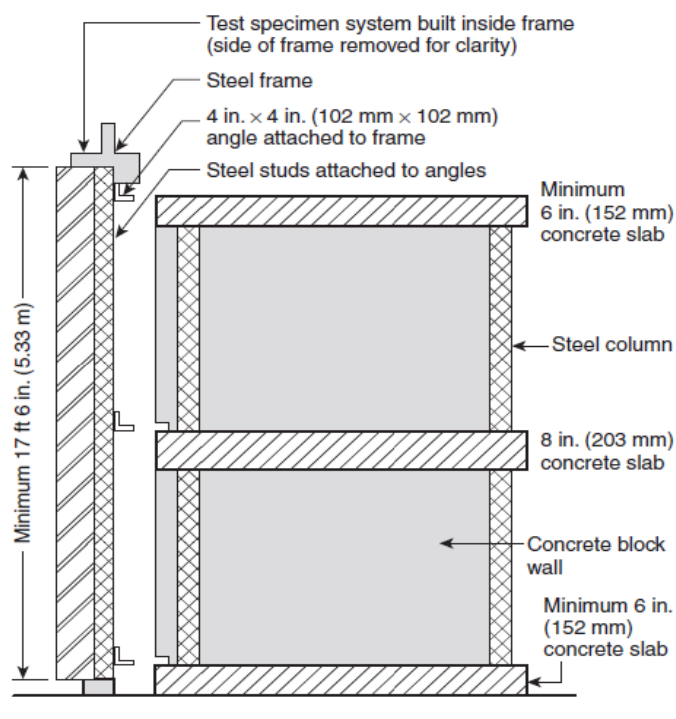


Fig. 2 Side view of test apparatus with test specimen in movable test frame (not to scale)

BURNERS

The burner arrangement consists of two gas-fired burners.

One burner (Room Burner) is placed inside the first-storey test room, with unfinished inside dimensions of 10 ft ± 0.5 in. wide × 10 ft ± 0.5 in. deep (3.05 m ± 13 mm × 3.05 m ± 13 mm) and an unfinished floor-to-ceiling height of 7 ft ± 0.5 in. (2.13 m ± 13 mm), complying with the requirements specified in paragraph 4.6 of NFPA 285-25.

The other burner (Window Burner) is placed near the top of the first-storey window opening of the test specimen, complying with the requirements specified in paragraph 4.6 and of NFPA 285-25.

The burners are supplied by propane gas and the gas flow rates should comply with the requirements specified by Chapter 7 of NFPA 285-25.

TEST SPECIMEN

The test specimen consists of a composite panels façade system mounted on a supporting wall, with a total thickness of the test specimen of 240 mm.

The supporting wall, with a thickness of 120 mm, consists of a light steel frame substructure with a layer of 15 mm-thick internal gypsum board, 90 mm-thick stud cavity and a layer of 15 mm-thick external gypsum board.

The ventilated façade system, with a thickness of 120 mm, consists of external composite panel of 4 mm thick cladding panels fixed to vertical T section aluminium studs that are fixed to aluminium brackets fixed to the supporting wall. Between the external cladding panels and the supporting wall, it is conformed an 116 mm air cavity.

Size and position relative to the bench

The test specimen dimensions are 5842 x 4522 mm and it is mounted on the movable frame placed in the front face of the apparatus.

Dimensions of the window opening

The window opening is 1982 mm wide x 762 mm high and it has been installed vertically centred in the specimen, with the upper face of the sill at a height of 762 mm from the test room slab.

Details of window opening are specified in the section *Test Specimen Characteristics -> Constructive Details* of this document.

Securing the specimen to the test apparatus

Steel screws [102] were used to fasten the channels [104] of the supporting wall to the horizontal beams of the movable frame. The studs [103] are also fastened to the horizontal L-shaped studs of the metal frame using steel screws [102].

Joints and sealants

The specimen has horizontal joints (4 Joints) specified in the attached *Drawings* appendix.

The specimen has vertical joints (1 Joint) specified in the attached *Drawings* appendix.

Cladding panels of the composite facade system have 8 mm-thick horizontal joints (See panel fixing clip drawing appendix), the first one being located 316 mm above the top of the window opening. These cladding panels also have 8 mm-thick continuous vertical joints, one of which is shifted 305mm to the left side of the test specimen from the centreline. The joints of the cladding panels are not covered.

Regarding the supporting wall, horizontal and vertical joints of the panels are covered with mesh tape [108/110] and paste [107/109].

Edges of test specimen details

Once the test specimen has been mounted by the client, TECNALIA has installed two 80 x 200 mm L-section and 1.5 mm-thick galvanized steel flashing along both side edges.

Window headers

The window flashing elements are made of the same composite panels as the cladding panels of the façade. See de drawings to check the geometry of these flashing elements.

INSTRUMENTATION

Throughout the test, temperatures are recorded from a series of thermocouples placed on the exterior and interior surface of the facade, as well as on the ceiling of the combustion chamber, as specified in section 6.1 of the NFPA 285-25 standard and in the corresponding figures.

The arrangement and quantity of thermocouples to be installed in the intermediate layers of the facade will depend on the façade system to be tested, according to section 6.1 (7) of the test standard. Figures Detail A to Detail I specify the location of the thermocouples for each type of constructive system.

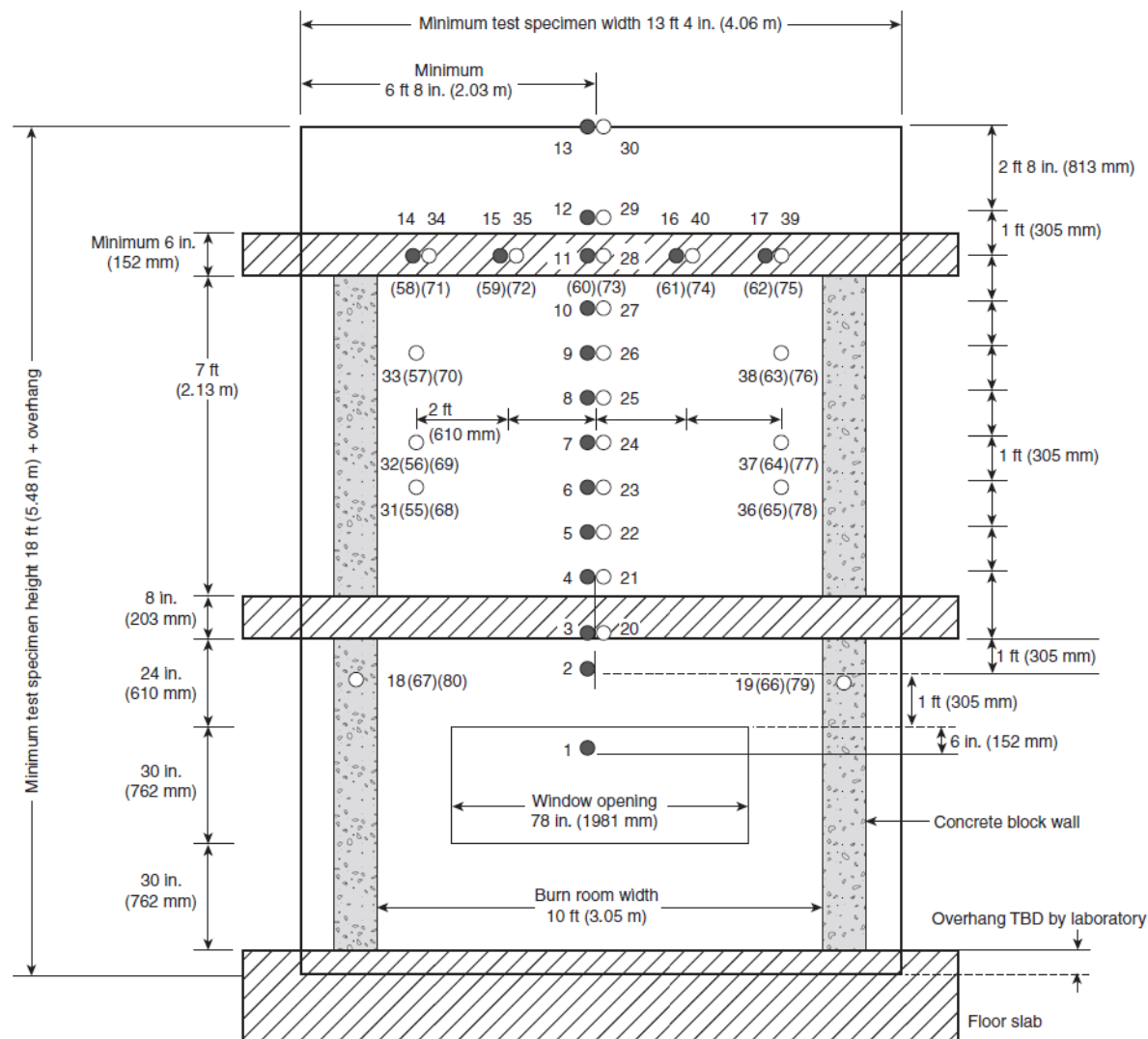
The specimen which has been tested corresponds to Detail G, according to NFPA 285-25. The location of the thermocouples throughout the depth of the specimen has been the following:

- External thermocouples have been installed 25 mm outwards from the external face of the test specimen cladding.
 - 1 to 17
- Internal thermocouples have been installed in the middle of the depth of the **air cavity**, i.e. 58 mm outwards from the external base of the supporting wall.
 - 18 to 40

Both the gas flow meters, and the thermocouples comply with the characteristics required in sections 6.2 and 6.3 of NFPA 285-25, respectively.

A data acquisition system connects these thermocouples and gas flow meters to a remote-control cabinet connected in turn to PC-SCADA acquisition and recording equipment.

INSTALLATION OF THERMOCOUPLES ON THE EXTERNAL FACE AND IN INTERIOR LAYERS OF THE FAÇADE SYSTEM, ACCORDING TO NFPA 285-25



● Thermocouples — 1 in. (25 mm) from exterior wall surface

○ Thermocouples — In the wall cavity air space or the insulation, or both, as shown in Figure 6.1(b) Details A through I.

() Thermocouples — Additional thermocouples in the insulation or the stud cavity, or both, where required for the test specimen construction being tested, as shown in Figure 6.1(b) Details C through I.

Figure not to scale

Fig. 3 Front view of test specimen superimposed over test apparatus thermocouple locations.

INSTALLATION OF THERMOCOUPLES ON THE INTERNAL FACE OF THE FAÇADE SYSTEM, ACCORDING TO NFPA 285-25

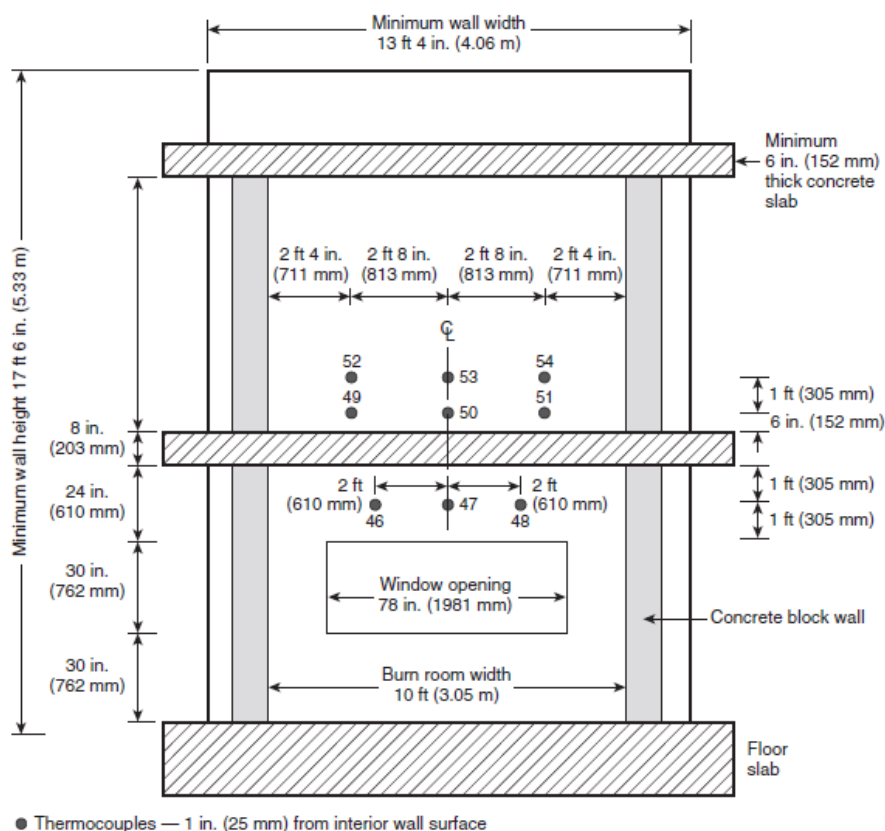


Fig. 4 Interior view of the test specimen. Instrumentation arrangement.

INSTALLATION OF THERMOCOUPLES UNDER COMBUSTION CHAMBER CEILING, ACCORDING TO NFPA 285-25

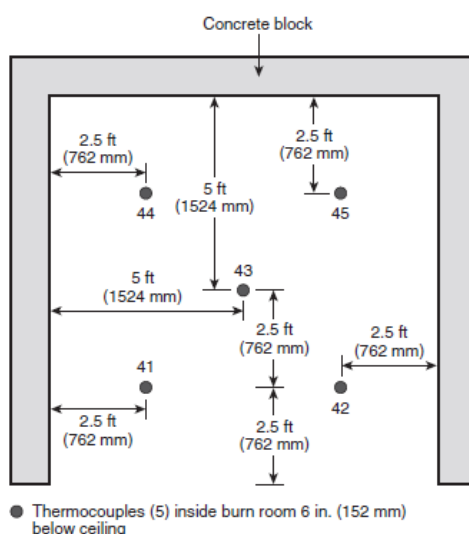


Fig. 5 Plan view – First storey test room. Instrumentation arrangement.

RESULTS OBTAINED IN CALIBRATION

The test apparatus is considered to be under calibration conditions when the average temperature and the average heat flux in each time interval obtained during the calibration meets the requirements of table 7.1.11 of NFPA 285-25 (See Note⁽¹⁾, three of the heat flux values are above of the required one).

The last calibration was performed with propane gas as combustion source for the two burners, and the horizontal and vertical centerline of the Window Burner (WB) were located at the following distances:

	NFPA 285-25 standard	Measured distances calibration (mm)
From WB centerline to bottom surface of window header	9 ± 0.5 in (230 ± 13 mm)	230 mm
From WB centerline to external surface of specimen	0 - 5 in (0 - 130 mm)	100 mm

Data obtained during calibration are shown below:

- Registered average gas flow rate for each burner, at each time interval
- Registered average temperature by thermocouple, at each time interval
- Registered average heat flux by radiometer, at each time Interval

Calibration gas flow rate

Average gas flow value (m ³ /h)	0-5 min	5-10 min	10-15 min	15-20 min	20-25 min	25-30 min
Room Burner (RB)	32,93	32,95	34,44	36,54	36,13	38,65
Window Burner (WB)	0,00	7,84	9,90	11,39	12,06	12,68

Temperatures in Celsius degrees (°C)

Thermocouples	Time (min)					
	0-5	5 - 10	10- 15	15-20	20-25	25-30
2	380	499	578	635	649	660
3	400	503	567	615	654	686
4	365	476	534	589	632	660
5	353	460	515	551	564	598
6	312	412	467	504	510	538
7	276	364	411	450	457	490
15-17	565	700	764	823	841	875
18-22	570	702	766	816	835	865

Heat flux values (W/cm²) at heat flux meter:

Time (min)	Heat flux meters (W/cm2)		
	C-2 ft	C-3 ft	C-4 ft
0 - 5	1,22 ⁽¹⁾	1,26 ⁽¹⁾	0,92
5 - 10	2,08	2,05	1,43
10 - 15	2,90	2,69	1,90
15 - 20	3,56 ⁽¹⁾	3,23	2,27
20 - 25	3,90	3,40	2,56
25 - 30	4,51	3,56	2,80

Note⁽¹⁾: This heat flux value is above of the stated in the standard NFPA 285-25

AMBIENT CONDITIONS AT THE START OF THE TEST

Temperature and humidity conditions and airflow velocity in the vicinity of the specimen at the start of the test are shown below.

TEST DATA	2026.06.03	TEST START TIME	14:30
------------------	------------	------------------------	-------

STANDARD	TEST	TEMPERATURE (°F)	HUMIDITY (%)	AIRFLOW VELOCITY (m/s)
NFPA 285-25	At the start of the test	68,0	47	0,05

Airflow measurements have been taken perpendicular to the external face of the façade system, at a distance of less than 1m.

BURNER GAS FLOW DATA OBTAINED DURING THE TEST

The tables below show the average gas flow rate values, for each time interval, registered during the fire test.

The type of gas used has been propane gas for both burners.

Average gas flow value (m ³ /h)	0-5 min	5-10 min	10-15 min	15-20 min	20-25 min	25-30 min
Room Burner (RB)	32,49	32,95	34,38	36,47	36,11	38,64
Window Burner (WB)	0,00	7,76	9,86	11,36	12,02	12,67

COMPARISON OF GAS FLOW RATE REGISTERED DURING TEST AND CALIBRATION

The tables below show the comparison between the average propane gas flow rate values, for each time interval, recorded during the last calibration and during the fire test.

In both the calibration and the test propane gas was used as fuel source and the Window Burner was placed at the following distances:

- Vertical: Burner centreline at 230 mm from the bottom surface of the window header.
- Horizontal: Burner centreline at 100 mm from the external surface of the specimen.

Calibration gas flow rate

Average gas flow value (m ³ /h)	0-5 min	5-10 min	10-15 min	15-20 min	20-25 min	25-30 min
Room Burner (RB)	32,93	32,95	34,44	36,54	36,13	38,65
Window Burner (WB)	0,00	7,84	9,9	11,39	12,06	12,68

Test gas flow rate

Average gas flow value (m ³ /h)	0-5 min	5-10 min	10-15 min	15-20 min	20-25 min	25-30 min
Room Burner (RB)	32,49	32,95	34,38	36,47	36,11	38,64
Window Burner (WB)	0,00	7,76	9,86	11,36	12,02	12,67

COMPARISON OF WINDOW BURNER POSITIONING DURING TEST AND CALIBRATION

The following table shows the comparison between the positioning of the Window Burner during the last calibration and during the test. The horizontal and vertical centreline of the Window Burner (WB) was located at the following relative distances to the specimen:

	NFPA 285-25 standard	Measured distances calibration (mm)	Measured distances test (mm)
From WB centreline to bottom surface of window header	9 ± 0.5 in (230 ± 13 mm)	230 mm	230 mm
From WB centreline to external surface of specimen	0 - 5 in (0 - 130 mm)	100 mm	100 mm

OBSERVATIONS DURING THE TEST

The observations which can be highlighted during a test according to NFPA 285-25 are the ones derived from the progress of the flames on the surface of the specimen, changes in the mechanical behaviour of components (i.e. deformations, delamination or detachments), any fire penetration phenomena through cavities or spread of flames over the specimen edges, and even observations in the second floor room due to fire penetration or smoke accumulation during the test.

5A		5B	
4A		4B	
3A		3B	
2A		2B	
1A'	1A	1B	1B'

Fig 6. External cladding panel numbering

OBSERVATIONS FROM THE FRONT OF TEST SPECIMEN

Test time	Observations (see panel location in "DAMAGE SKETCHES OF THE WALL ASSEMBLY" figure)
00:00	Ignition of Room Burner (test start time 14:30)
00:45	Smoke is continuously coming out from the window opening
02:07	Flames coming out from the window opening
02:21	The surface of the external panels is getting dirty due to the smoke.
03:28	The parts of the vapor barrier that extend to the interior around the perimeter of the window opening are burning.
05:00	Ignition of Window Burner
05:14	RB an WB flow rate adjusted
05:58	The paint of the surface of the panels 1A, 1B, 2A and 2B is burning. The burnt surface follows a triangular shape.
07:20	The lintel has been deformed. The paint of the surface of the panels 1B and 2B is burning.
08:30	A lot of smoke is coming out from the air cavity in the top of the test specimen
08:57	Melted material is falling.
09:57	Material falling, it is presumed to be the core of the panels.
10:00	Next gas-flow rate
10:14	RB an WB flow rate adjusted
10:20	The composite panel of the lintel has fallen
11:22	Superficial flame reaching the 3 rd level of panels
11:46	Melted material is dripping. It continues burning once has fallen
12:20	Continuous falling of melted material. Material continues falling in the panels 2B and 2C
12:59	The lintel is quite melted.
13:32	Continuous falling of material to the lower edge of the opening of the window. Once it falls, it continues burning.
14:40	1B panel is melted in the centre, generating a hole. The flames are reaching the air cavity.
15:00	Next gas-flow rate
15:14	RB an WB flow rate adjusted
15:48	The panel 2B is deformed outward. Is melted in the centre, generating a hole.
16:23	The cavity barrier placed in the middle height of the panels of the 2 nd row is activated. The hole generated in the panels of the 2 nd row ends in the activated cavity barrier.
18:01	The panels 1B and 2B in the right part are deformed outward.
18:40	The lower cavity barrier of the first level, has fallen in the central part of the test specimen.
20:00	Next gas-flow rate
20:05	RB an WB flow rate adjusted
20:45	It looks like the upper cavity barrier of the first row is still holding up.
21:40	The lintel on the right side has been deformed outward.

22:00	Superficial flames are reaching the panels of the 3 rd row. The paint is degrading but it is not burning.
23:34	The fallen material that is still burning is accumulating in the lower edge of the window opening.
25:00	Next gas-flow rate
25:10	RB an WB flow rate adjusted
26:00	It looks like the upper cavity barrier of the 1 st row has fallen.
26:30	The flames are in the interior of the air cavity in the panel 2B
28:51	The internal flames are still in the air cavity, but they are not propagating.
29:50	Material has fallen.
30:00	RB and WB shut off. End of the test.
30:30	There are flames in the air cavity in the 1 st horizontal joint
31:24	Internal flames in the 2 nd horizontal joint.
32:00	All the flames almost are extinguished.
35:16	Residual flames at the first horizontal joint on both sides of the vertical joint.
38:15	It looks like the residual flames are extinguished
39:10	Material has fallen from the joint area.
60:00	End of the test

OBSERVATIONS FROM THE SECOND FLOOR OF THE TEST APPARATUS

No remarkable phenomena occur on the first floor during the test. No smoke or flames are detected in this area.

CONDITIONS OF ACCEPTANCE AND TEST RESULTS

An evaluation is made to determine whether each of the test acceptance conditions is met for the overall performance of the tested façade system.

Conditions of acceptance	Test results
Flames did not reach 10 ft (3050 mm) above window opening header	Registered maximum flame height during the test has been 6 ft (1855 mm) above the opening header
Flames did not reach a lateral distance of 5 ft (1525 mm) from the vertical centerline	Registered maximum flame width during the test has been 4 ft (1150 mm) from the vertical centerline
Flames did not propagate beyond the limits of the 1 st storey test room	Flames did not propagate beyond the limits of the 1 st storey test room
No visible flaming in the 2 nd storey test room	No visible flaming in the 2 nd storey test room
11 and 14-17 thermocouples registered temperatures do not exceed 1000 °F (538°C) limit	Registered maximum temperature 712,4 °F. Bellow the limit of 1000°F
18-19, 28 and 31-40 thermocouples registered temperatures do not exceed 1000 °F (538°C) limit	Registered maximum temperature 462,2 °F. Bellow the limit of 1000°F
49-54 thermocouples registered temperatures do not exceed 500 °F (260°C) above ambient temperature limit	Registered maximum temperature 114,8 °F. Bellow the limit of 500°F

The façade system tested the commercial reference « **STB-T-SZ-PRO WITH STACBOND FR PANELS** » (*) **MEETS** all the acceptance criteria according to NFPA 285-25 standard.

POST-TEST ANALYSIS

Once the test is performed and the specimen has cooled down, a post-test analysis is performed according to section 9 of the NFPA 285-25 standard.

The specimen was dismantled and dissected in order to determine the extent and depth of damage to the different components that make up the facade and to study the post-test condition of the external panels of the specimen.

A summary table with the damage analysis of the sample after testing is presented below:

Parameter	Specimen zone	Affected components	Observations
Spalling	-	It has not been registered	-
Melting	Along the sample at a maximum 0,85 m from vertical centerline, on both sides (h) Maximum height 0,80 m from header (v)	External face of the cladding panels	-
	Along the sample at a maximum 0,85 m from vertical centerline, on both sides (h) Maximum height 0,80 m from header (v)	Internal face of the cladding panels	-
Distortion / Deformation	1,85 m from header (v) 1,15 m from vertical centerline, on both sides (h)	Cladding panels (external and internal face)	-
Detachment	-	It has not been registered	-
Degradation	1,85 m from header (v) 1,15 m from vertical centerline, on both sides (h)	External face of the base wall	-

Parameter	Value (m)	Specimen zone	Affected components	Observations
Spread of the flames over the cladding system surface	1,85 m (v) 1,15m on both sides (h)	Central area of external surface of cladding panels	Cladding panels	
Estimation of flame spread or any indication of damage in the air cavity	1,20 m (v) 1,15m on both sides (h)	Central area of air cavity	Internal face of the cladding panels External face of the base wall	Melting of the internal face of the cladding panels
Spread of the flames in intermediate layers	1,20 m (v) 1.15 m on both sides (h)	Central area of waterproof barrier	External face of the base wall	Degradation of the external face of the supporting wall
Fall of components of the facade system	0,85 m (v) 0,80 m on both sides (h)	Central area of cladding panels	Cladding panels	Fall of fragments from cladding panels

The appendix *Photographs* show the situation in which the layers of the facade system have been found after the test and the dismantling of the components that make up the specimen.

Both the external and internal layers of the tested specimen have been analysed: cladding panel and substructure elements, as well as the components of the supporting wall.



APPENDICE A. TIME – TEMPERATURE GRAPHS

TIME - TEMPERATURE GRAPHS

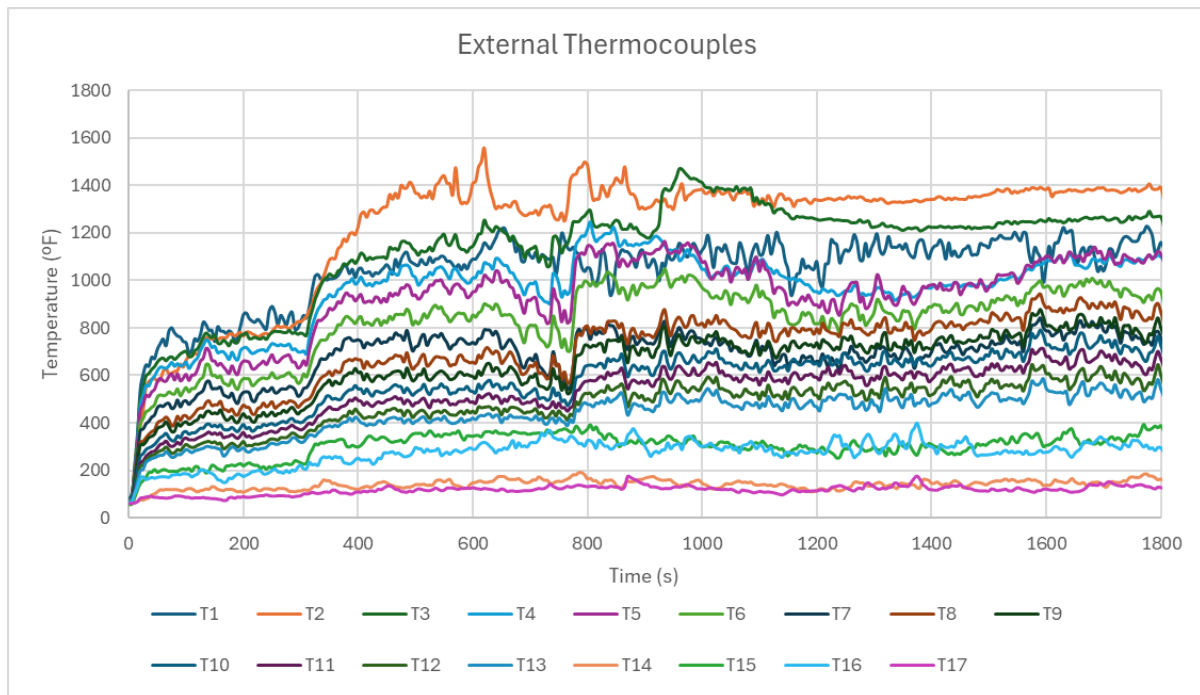


Fig 7. External thermocouples time vs. temperature graph

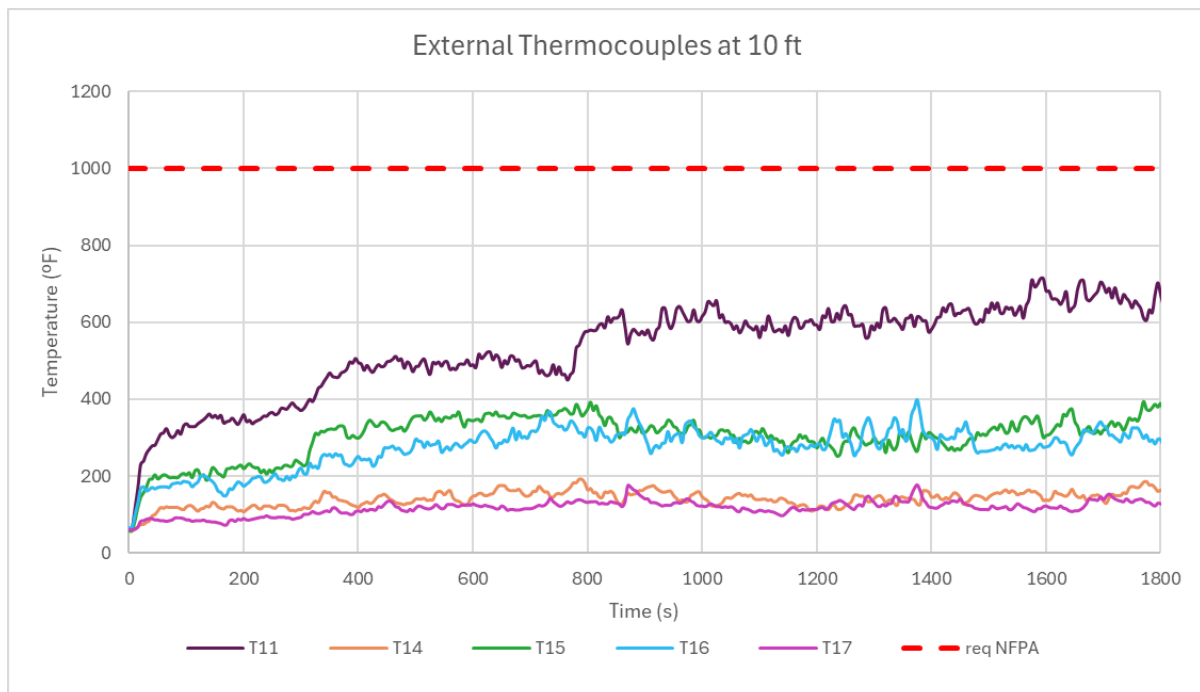


Fig 8. External thermocouples at 10 ft time vs. temperature graph

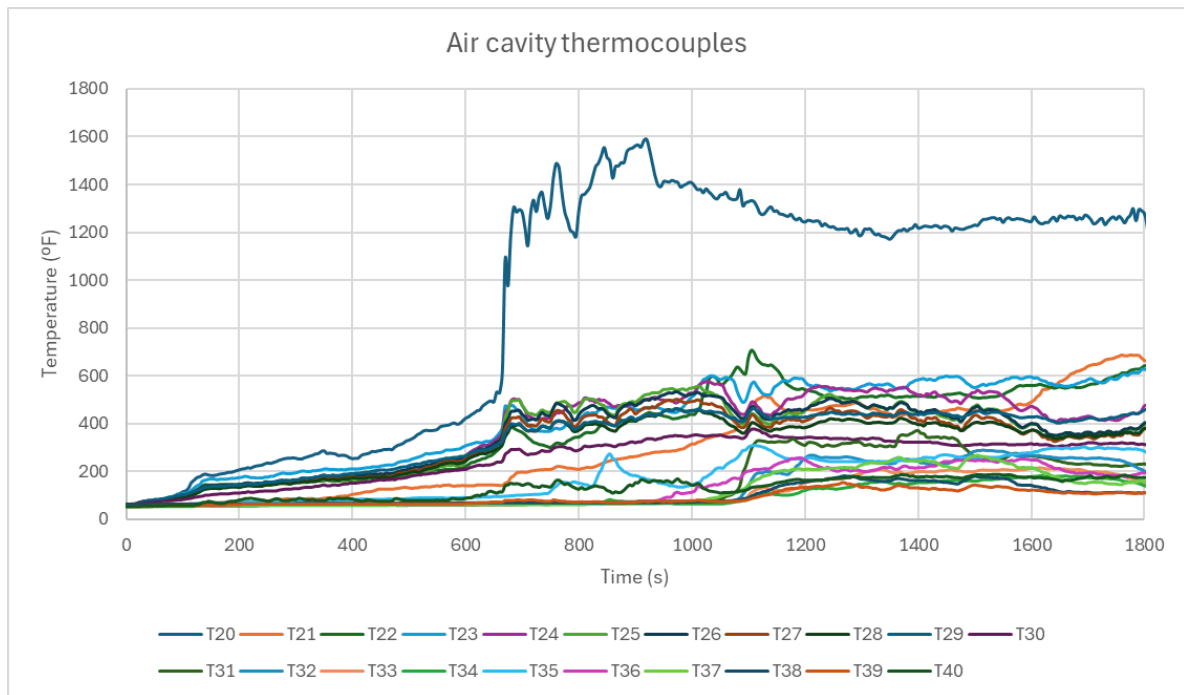


Fig 9. Air cavity centerline thermocouples time vs. temperature graph

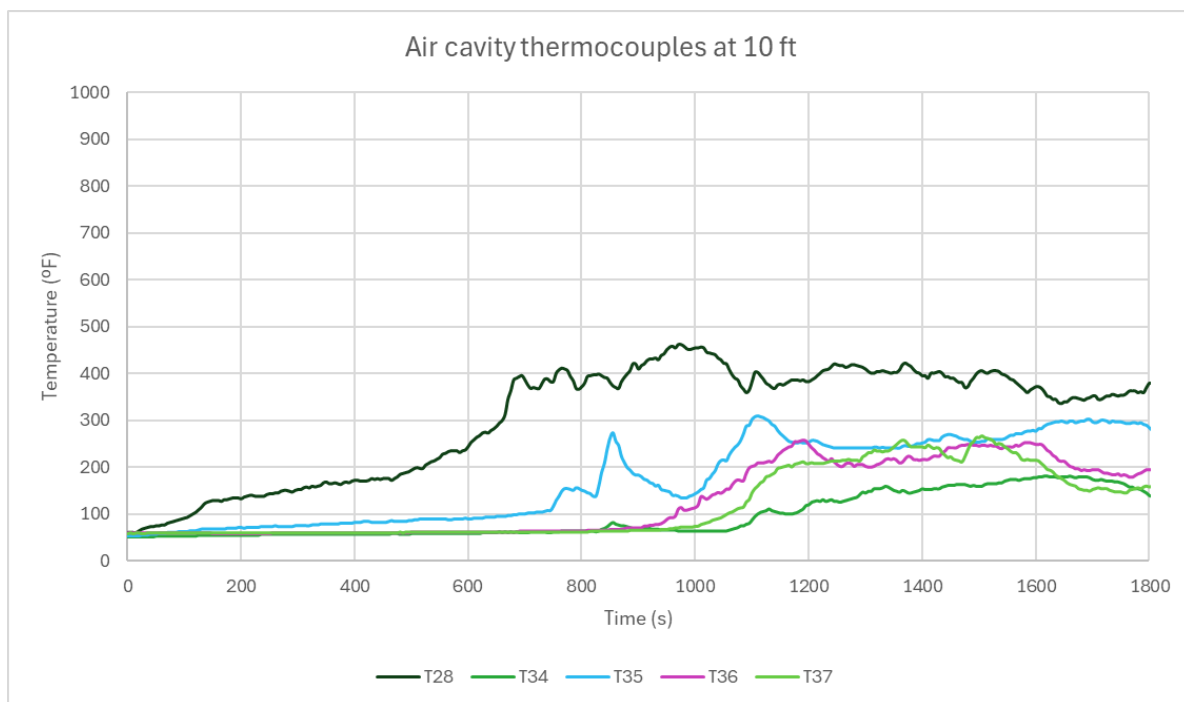


Fig 10. Air cavity thermocouples at 10 ft time vs. temperature graph

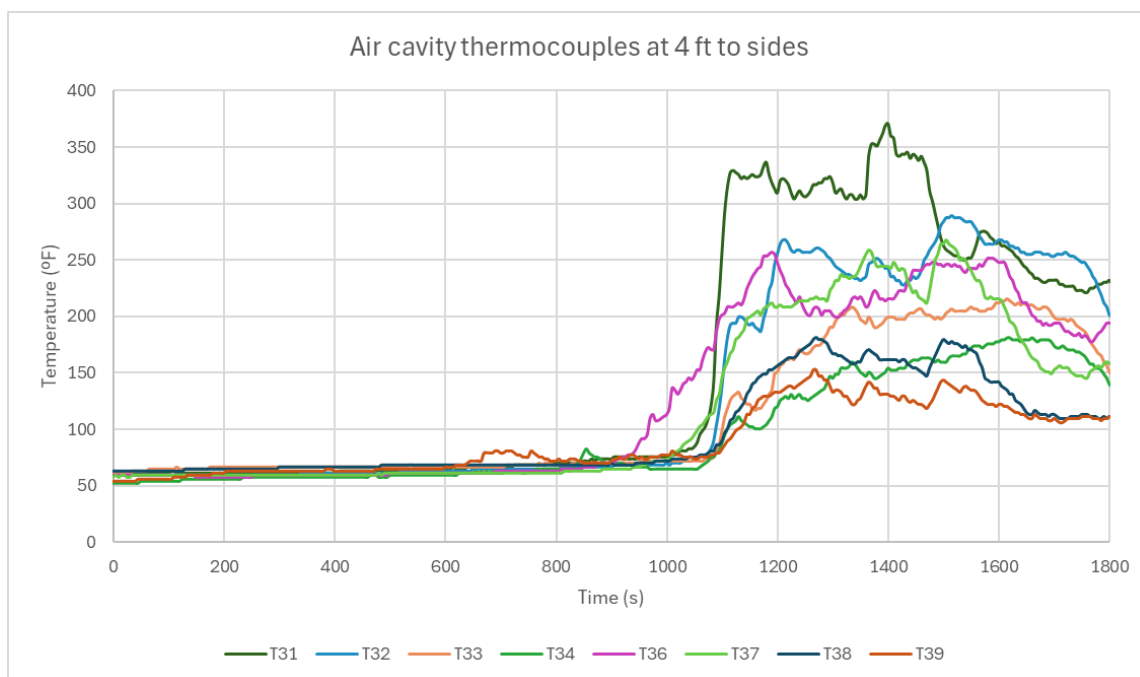


Fig 11. Air cavity thermocouples at 4 ft to sides time vs. temperature graph

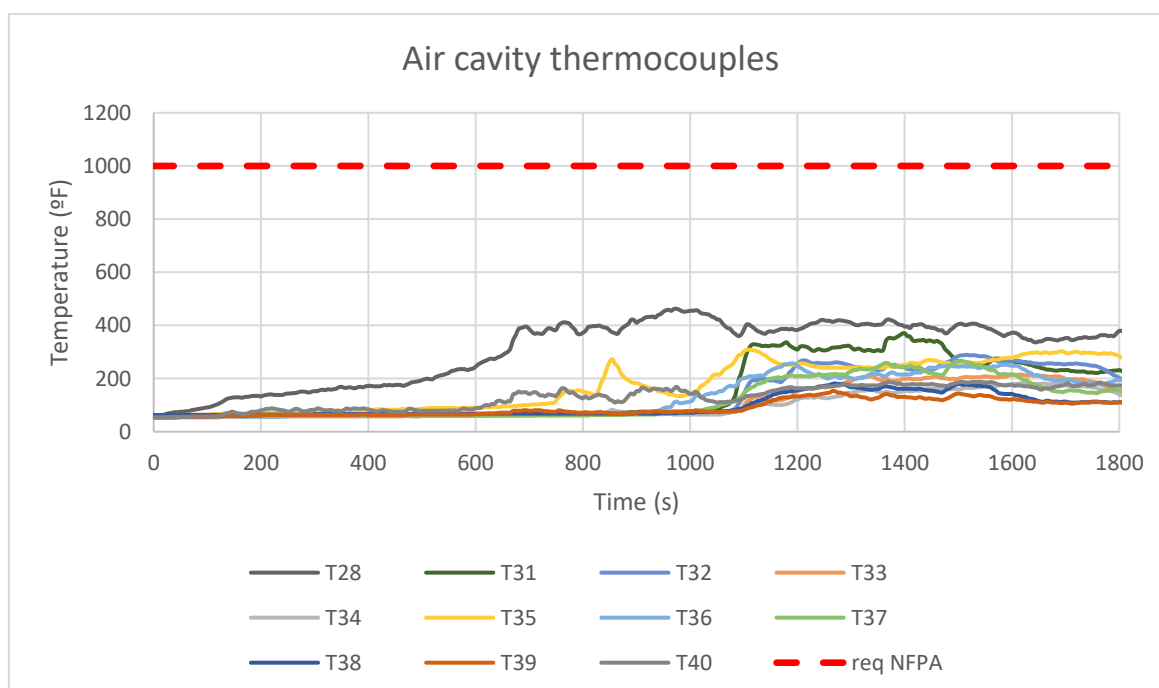


Fig 12. Air cavity thermocouples time vs. temperature graph

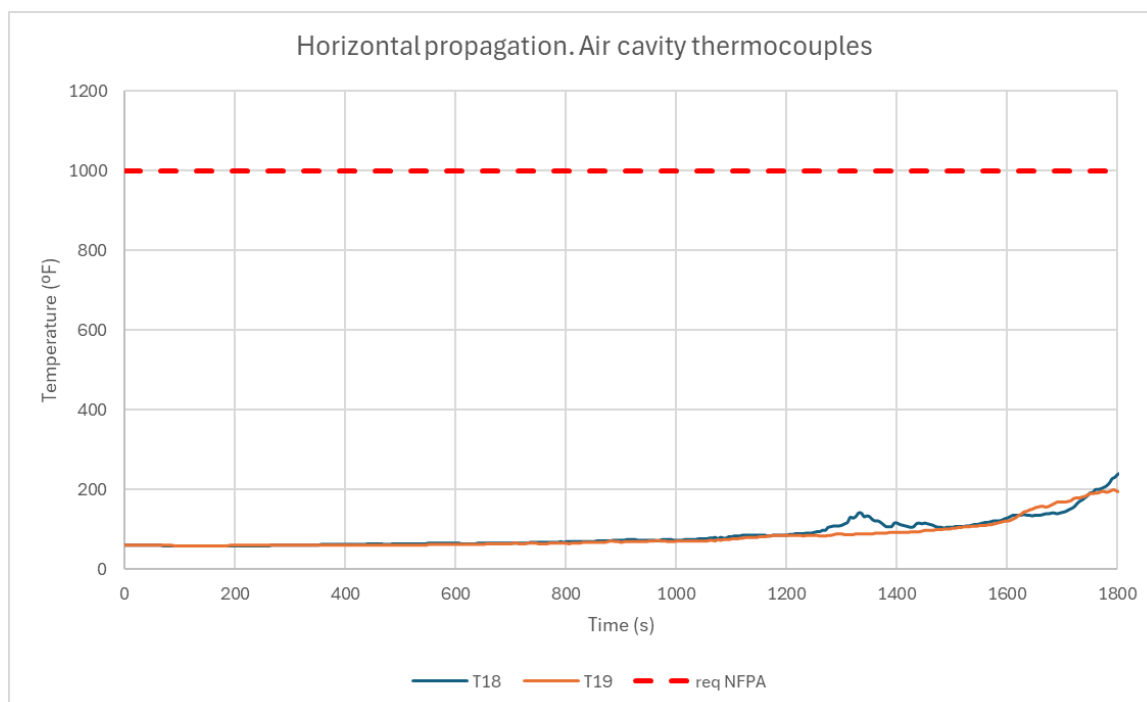


Fig 13. Horizontal propagation. Air cavity thermocouples time vs. temperature graph

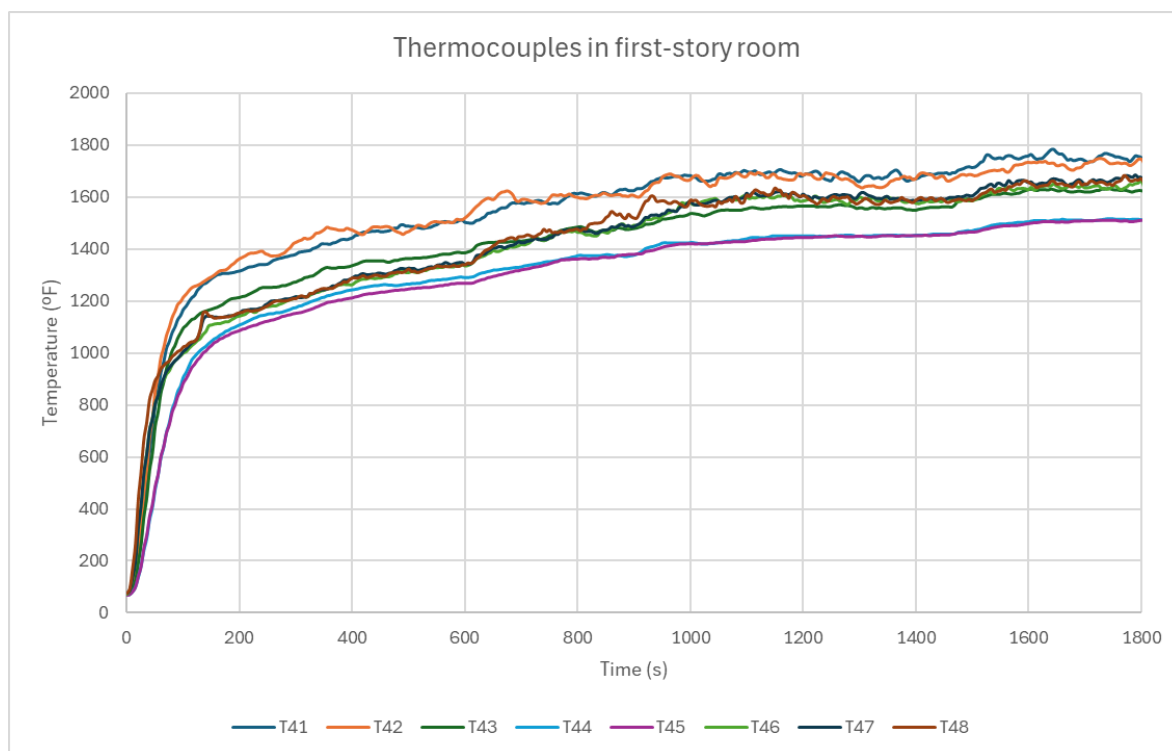


Fig 14. First-storey room thermocouples time vs propagation graph

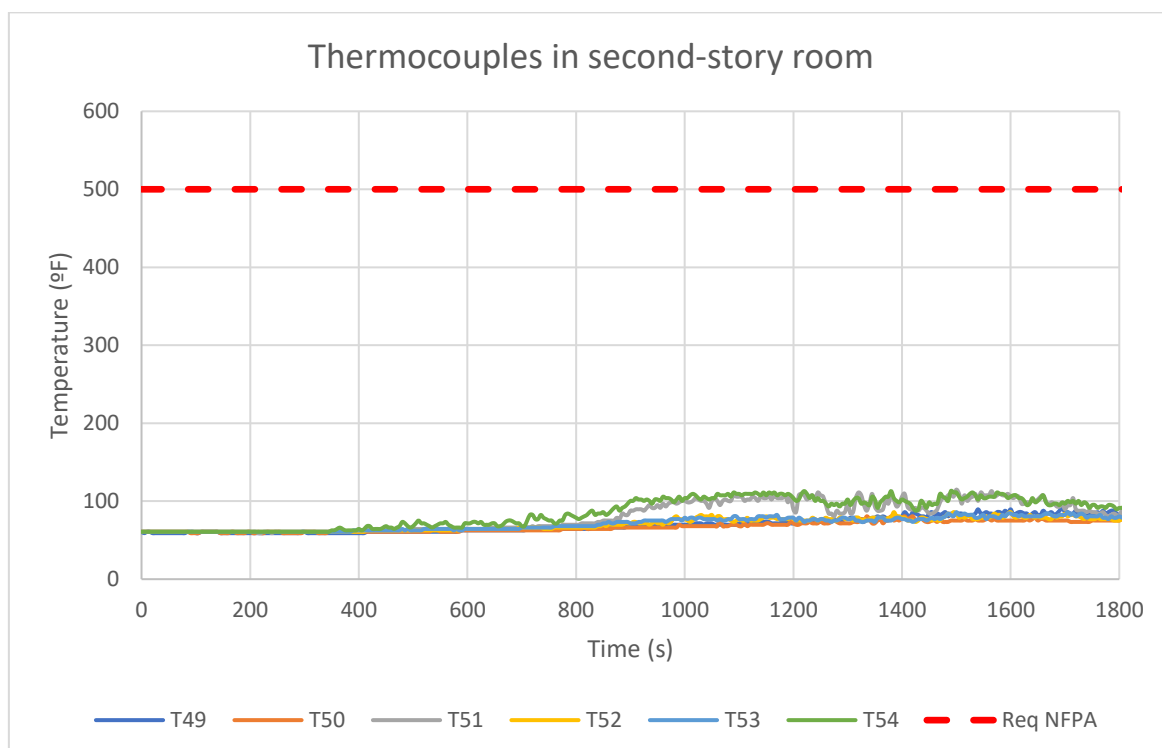
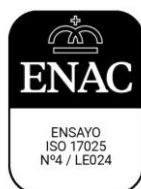


Fig 15. Second storey internal thermocouples time vs. temperature graph



APPENDICE B. REGISTERED DATA DURING TEST



REGISTERED DATA DURING TEST

Table 1. T1 – T15 thermocouples temperatures in Fahrenheit degrees (1)

time (s)	temperature (°F)															
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	pass/fail	T11	T12	T13	pass/fail	pass/fail
0	77	63	75	75	73	72	68	61	64	64	64	64	61	61	59	57
5	99	64	75	77	73	72	68	61	64	64	64	64	61	61	59	57
10	185	199	207	174	180	160	151	135	136	122	115	99	93	63	82	82
15	324	306	347	322	306	271	261	232	228	196	167	158	149	68	117	117
20	538	385	495	469	450	397	367	318	307	259	230	217	198	75	144	144
25	603	451	550	516	480	417	374	322	307	270	239	223	205	75	156	156
30	644	549	597	558	516	446	396	338	320	288	259	244	234	81	171	171
35	639	574	608	556	511	453	406	352	338	295	270	255	243	84	190	190
40	676	583	626	583	531	466	424	363	343	300	279	264	250	97	192	192
45	671	586	637	597	541	477	433	370	352	309	280	266	253	100	203	203
50	711	577	657	621	574	509	464	399	376	324	295	277	259	109	192	192
55	734	583	669	635	588	518	473	408	383	338	309	282	264	118	198	198
60	754	617	673	633	577	514	469	414	388	345	313	288	264	117	203	203
65	725	628	662	630	576	518	480	424	405	356	324	298	279	120	201	201
70	786	606	675	640	595	531	482	412	385	338	307	286	268	118	196	196
75	801	610	678	655	606	523	460	387	363	325	300	271	255	118	196	196
80	779	617	667	639	581	522	468	397	365	325	306	275	257	118	196	196
85	766	621	678	649	606	543	496	428	397	345	318	288	268	118	196	196
90	761	648	691	640	577	514	468	410	387	338	309	284	266	115	203	203
95	743	635	698	644	588	532	489	430	399	360	331	298	277	113	207	207
100	738	664	702	657	604	549	493	430	405	363	336	309	288	120	203	203
105	694	680	680	630	579	531	478	417	394	352	329	302	282	124	208	208
110	707	680	682	646	601	545	491	426	397	358	329	297	275	122	196	196
115	754	693	703	662	603	545	502	441	408	358	329	298	282	115	214	214
120	745	691	712	675	626	567	520	457	414	367	336	306	286	109	216	216
125	772	711	736	705	660	585	527	462	432	378	342	311	289	115	199	199
130	824	741	763	727	673	595	538	464	424	378	347	316	293	117	203	203
135	813	759	779	750	714	646	570	486	446	392	354	320	300	122	189	189
140	790	756	768	741	703	642	576	493	450	396	361	322	300	120	199	199
145	790	754	759	718	664	601	545	473	439	385	352	316	297	131	221	221
150	743	757	770	723	660	601	545	477	442	390	358	320	297	129	217	217
155	804	748	738	696	642	590	545	477	439	383	351	311	291	120	207	207
160	788	759	734	700	651	597	550	491	455	392	358	315	288	117	203	203
165	786	759	748	700	637	570	520	460	430	374	338	291	261	115	198	198
170	777	759	739	685	622	563	513	455	412	370	342	297	268	120	217	217
175	788	774	725	667	608	558	507	448	415	372	343	307	288	120	219	219
180	777	775	748	698	640	583	525	459	426	381	351	315	298	120	223	223
185	745	766	738	675	615	554	495	437	406	370	342	307	295	115	219	219
190	763	775	739	666	604	541	482	433	401	363	334	298	282	109	225	225
195	810	781	766	705	644	572	514	459	423	379	347	309	288	111	228	228
200	856	766	772	716	660	586	529	475	439	394	360	322	295	108	219	219
205	864	783	779	718	660	586	531	466	423	376	342	304	280	113	226	226
210	840	783	756	705	655	585	527	464	424	381	345	306	277	118	232	232
215	829	775	756	693	630	558	495	439	406	365	336	304	286	124	225	225
220	824	770	761	696	628	563	491	437	405	370	342	311	291	124	221	221
225	837	763	756	703	640	577	518	460	430	383	345	309	288	117	221	221
230	824	768	754	707	649	586	529	466	428	381	349	313	291	115	208	208
235	806	775	761	709	660	590	545	484	444	394	356	316	293	122	216	216
240	795	777	752	702	646	586	532	468	428	388	356	318	297	122	205	205
245	871	772	770	720	667	592	536	477	435	394	363	329	309	122	216	216
250	891	786	781	734	687	612	549	489	446	397	365	333	315	118	208	208
255	865	801	786	730	660	592	527	462	430	390	360	331	311	117	219	219
260	815	810	784	725	655	588	529	471	439	396	363	327	309	124	221	221
265	853	802	784	730	667	595	541	480	441	403	376	338	316	124	219	219
270	835	806	781	725	678	597	543	489	453	406	376	338	318	124	226	226
275	813	804	781	727	684	606	543	482	444	401	374	338	316	120	228	228
280	853	795	790	732	685	612	554	493	457	414	383	347	322	111	225	225
285	865	810	777	709	658	595	550	491	466	419	390	358	336	111	226	226
290	793	815	781	712	655	590	540	484	451	406	381	354	338	109	241	241
295	799	828	774	700	631	567	513	466	437	405	376	343	325	113	237	237

Table 1. T1 – T15 thermocouples temperatures in Fahrenheit degrees (2)

time (s)	temperature (°F)														
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	pass/fail	T11	T12	T13	pass/fail
300	828	826	779	698	639	576	520	477	450	401	370	340	318	113	232
305	853	837	774	703	662	606	545	489	455	406	376	340	320	118	226
310	842	849	768	691	644	594	549	496	466	419	388	356	334	117	232
315	891	874	833	761	707	630	567	502	473	426	399	369	349	117	266
320	963	901	874	810	759	673	592	520	484	428	394	369	349	127	288
325	1018	945	919	847	799	707	621	549	504	444	408	369	343	135	311
330	1026	972	950	878	831	729	640	570	529	473	428	387	358	131	307
335	1006	988	981	896	831	748	669	588	543	478	433	390	367	145	316
340	1015	1018	1002	918	842	748	667	597	559	491	446	406	381	160	315
345	1002	1054	1011	923	855	752	671	604	568	513	457	408	383	156	320
350	1008	1087	1027	941	883	774	691	617	581	513	468	414	388	156	322
355	1008	1094	1020	932	876	774	687	599	558	500	459	410	383	145	322
360	1011	1092	1018	936	887	786	711	621	576	504	457	414	390	145	322
365	1020	1134	1040	961	910	813	711	613	567	498	457	408	385	138	329
370	1040	1144	1047	966	905	813	707	617	567	500	468	419	396	136	331
375	1062	1175	1071	982	932	837	747	653	594	518	471	430	403	135	327
380	1058	1164	1065	991	948	849	756	660	601	531	478	428	405	133	302
385	1029	1195	1078	993	936	842	759	667	612	540	496	450	421	127	298
390	1047	1202	1087	1008	934	831	747	662	610	541	493	439	408	124	306
395	1013	1193	1072	984	914	819	747	671	630	558	505	459	424	122	300
400	1045	1227	1090	995	928	838	750	666	612	543	495	444	415	118	298
405	1053	1279	1116	1015	941	847	743	664	613	543	491	432	401	126	306
410	1033	1288	1107	991	909	815	716	630	581	523	475	419	397	129	318
415	1033	1267	1085	979	910	824	738	658	606	543	487	423	388	133	336
420	1036	1294	1098	988	914	819	732	642	586	525	477	426	396	129	345
425	1018	1297	1090	977	909	811	729	635	574	513	469	423	392	131	338
430	1033	1285	1096	991	930	831	743	646	590	532	480	428	394	140	329
435	1029	1285	1098	990	927	837	754	660	599	532	489	444	408	147	331
440	1042	1301	1098	991	907	811	736	651	595	527	484	441	408	149	340
445	1054	1310	1099	1002	925	831	741	649	585	527	486	437	397	153	340
450	1067	1312	1094	999	910	822	741	658	597	536	496	453	414	147	333
455	1051	1362	1139	1036	946	849	757	671	603	541	498	453	419	140	322
460	1027	1342	1132	1035	934	835	754	673	613	554	504	460	423	136	318
465	1089	1368	1135	1027	946	856	779	685	617	561	511	460	423	131	322
470	1056	1348	1128	1024	939	856	770	682	619	554	500	450	415	129	324
475	1089	1400	1161	1058	968	858	766	680	613	552	504	453	419	127	327
480	1112	1389	1166	1063	968	856	748	657	590	527	480	430	399	126	316
485	1119	1391	1159	1065	982	880	790	696	631	547	496	451	412	129	325
490	1085	1414	1155	1054	973	862	747	655	603	532	489	446	414	129	342
495	1074	1400	1135	1022	937	813	703	626	577	516	471	423	397	133	352
500	1067	1369	1125	1013	939	829	720	639	585	527	484	435	406	140	356
505	1063	1366	1107	981	921	817	727	651	604	536	486	446	412	140	356
510	1089	1348	1125	995	930	835	761	678	603	543	498	453	423	140	356
515	1072	1357	1121	1013	954	860	772	687	628	563	504	450	424	142	345
520	1069	1350	1125	1015	954	842	727	640	590	534	480	433	406	136	352
525	1098	1377	1141	1035	981	864	750	648	579	520	464	419	401	138	367
530	1076	1344	1125	1024	981	885	766	664	588	543	495	441	412	138	356
535	1090	1398	1153	1047	999	896	770	678	603	545	491	446	415	154	343
540	1092	1411	1173	1054	999	882	761	678	613	549	496	450	419	160	351
545	1103	1432	1184	1058	1002	889	777	675	619	565	486	442	412	158	342
550	1099	1441	1195	1045	977	862	756	675	612	550	496	453	428	151	352
555	1081	1411	1157	1024	964	849	738	666	599	549	496	446	412	158	352
560	1081	1407	1148	1008	943	826	711	640	583	522	477	435	401	162	351
565	1067	1360	1170	1044	972	838	727	646	585	527	480	433	397	144	358
570	1051	1476	1193	1051	984	855	732	648	594	527	477	432	399	136	356
575	1067	1362	1146	1033	984	864	752	680	612	541	489	442	406	135	367
580	1045	1324	1132	1013	968	860	756	685	613	541	491	450	419	129	343
585	1067	1330	1130	1002	959	860	747	666	601	541	491	437	403	126	327
590	1049	1326	1119	990	928	835	734	660	604	554	502	453	412	124	345
595	1076	1355	1137	991	934	829	732	653	599	536	487	442	412	140	345

Table 1. T1 – T15 thermocouples temperatures in Fahrenheit degrees (3)

time (s)	temperature (°F)										pass/fail			pass/fail		
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	
600	1090	1409	1144	1011	952	855	739	657	595	532	489	450	421	147	343	
605	1090	1418	1166	1013	955	846	732	651	588	527	482	441	414	149	347	
610	1108	1477	1195	1038	981	864	754	685	619	563	516	468	426	154	347	
615	1126	1501	1200	1033	977	873	757	673	601	543	505	464	432	154	342	
620	1159	1558	1254	1074	1022	901	792	703	628	561	513	466	430	149	360	
625	1148	1450	1229	1071	1013	896	792	718	649	574	522	468	437	149	363	
630	1134	1386	1216	1065	1002	891	790	705	648	579	522	468	437	153	363	
635	1155	1342	1206	1049	995	878	770	691	617	552	502	455	423	154	358	
640	1179	1303	1227	1092	1040	901	786	703	633	563	514	464	433	165	367	
645	1207	1314	1220	1090	1035	887	763	694	626	561	507	457	428	174	356	
650	1216	1306	1213	1074	993	853	714	651	597	540	482	433	401	174	356	
655	1222	1319	1202	1063	997	856	720	664	608	550	500	459	421	174	356	
660	1193	1317	1193	1062	1000	855	739	682	615	545	491	448	417	165	351	
665	1171	1310	1166	1035	975	856	752	700	637	567	511	464	433	162	352	
670	1180	1330	1188	1031	966	844	734	684	628	565	511	466	424	162	363	
675	1121	1332	1164	1008	928	817	712	653	613	543	498	464	423	162	361	
680	1144	1297	1146	991	937	808	684	639	588	536	502	459	423	165	358	
685	1083	1283	1143	966	896	766	642	606	561	513	482	450	424	156	356	
690	1080	1274	1096	939	862	738	631	606	567	505	482	441	421	149	358	
695	1125	1276	1119	972	916	793	662	619	572	520	487	446	421	147	352	
700	1105	1285	1132	988	916	811	673	642	595	527	486	446	414	151	352	
705	1094	1283	1137	986	927	810	662	637	592	538	495	451	415	160	356	
710	1119	1296	1143	993	927	810	689	655	606	543	498	460	430	160	356	
715	1078	1276	1085	939	865	765	644	610	559	504	468	437	412	172	358	
720	1108	1303	1101	927	853	748	630	612	554	505	475	444	419	165	356	
725	1103	1314	1099	912	847	738	613	601	549	505	464	423	397	158	354	
730	1092	1310	1058	909	819	720	595	585	541	495	460	423	396	158	370	
735	1090	1317	1065	903	831	741	613	601	559	504	468	437	415	145	356	
740	1098	1279	1180	1029	963	849	700	684	628	547	489	450	419	145	358	
745	1026	1258	1188	1022	925	810	651	640	586	514	464	428	399	153	360	
750	1098	1258	1159	988	903	783	642	646	594	527	484	451	421	154	369	
755	1198	1285	1116	930	826	718	570	583	538	491	464	435	408	153	370	
760	1171	1251	1146	957	874	754	603	615	567	496	464	428	401	158	376	
765	1139	1306	1155	941	820	703	543	568	523	473	450	412	388	163	370	
770	1128	1422	1189	963	835	705	550	576	531	489	464	437	414	171	361	
775	1141	1445	1247	1074	964	811	639	639	581	516	473	432	403	181	363	
780	1121	1449	1247	1150	1085	943	765	750	678	588	532	487	455	181	387	
785	1107	1474	1249	1170	1107	975	795	777	685	595	540	477	450	190	374	
790	1056	1479	1263	1188	1117	973	775	768	694	603	559	507	473	190	356	
795	1038	1499	1272	1188	1110	997	801	801	727	635	574	523	486	181	363	
800	1054	1486	1288	1215	1144	993	792	808	727	642	576	523	478	163	374	
805	1047	1402	1296	1247	1146	977	752	775	718	644	579	525	477	167	392	
810	991	1339	1238	1193	1130	995	792	804	727	642	577	509	468	156	370	
815	986	1344	1225	1164	1099	975	772	793	723	637	579	520	484	156	383	
820	1027	1344	1229	1177	1121	990	786	801	734	649	592	529	482	145	360	
825	1130	1400	1236	1184	1121	991	777	799	732	649	595	536	493	144	351	
830	1112	1377	1234	1197	1143	1015	781	781	698	631	585	529	482	158	331	
835	1024	1353	1234	1198	1155	1035	815	826	748	671	613	558	505	156	351	
840	937	1393	1224	1200	1150	1027	810	828	747	658	599	540	487	160	352	
845	968	1405	1243	1225	1157	1017	808	829	748	669	610	540	496	154	338	
850	1071	1432	1254	1197	1121	993	784	826	748	662	610	549	504	138	333	
855	1105	1420	1247	1146	1058	945	745	801	743	666	615	554	518	127	300	
860	1130	1413	1218	1152	1089	970	770	819	763	691	631	565	527	127	309	
865	1123	1479	1216	1170	1080	957	748	770	700	642	590	531	487	142	313	
870	1121	1400	1218	1150	1060	918	709	732	653	594	543	468	433	154	315	
875	1107	1366	1238	1152	1078	950	752	784	711	624	568	498	455	151	325	
880	1083	1364	1218	1146	1092	981	765	799	725	644	581	525	480	153	318	
885	1056	1342	1224	1155	1081	939	730	772	700	633	574	520	478	154	315	
890	1112	1303	1202	1150	1096	963	741	757	685	621	567	505	471	162	331	
895	1130	1310	1193	1155	1116	988	757	784	716	639	576	516	473	162	313	

Table 1. T1 – T15 thermocouples temperatures in Fahrenheit degrees (4)

time (s)	temperature (°F)															
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	pass/fail	T11	T12	T13	pass/fail	pass/fail
900	1103	1301	1186	1161	1117	977	745	768	705	628	567	495	457	167	313	
905	1056	1306	1179	1157	1114	970	734	772	714	635	579	502	459	171	320	
910	1069	1310	1184	1166	1112	973	736	768	684	604	559	495	453	172	331	
915	1090	1323	1206	1180	1117	973	732	759	676	601	554	489	448	174	327	
920	1060	1341	1215	1188	1130	988	752	781	709	630	579	523	471	167	313	
925	999	1332	1240	1179	1132	1015	784	806	729	648	588	529	473	162	316	
930	1072	1332	1360	1164	1148	1024	808	856	797	694	635	583	527	158	325	
935	1058	1344	1387	1148	1164	1049	828	876	804	702	635	574	527	158	331	
940	1110	1312	1380	1130	1121	1011	772	810	729	651	599	540	496	160	345	
945	1089	1314	1382	1128	1114	972	721	766	684	626	583	523	486	160	342	
950	1090	1301	1407	1126	1121	990	759	806	723	646	599	549	496	149	329	
955	1119	1351	1434	1130	1125	1006	779	835	756	685	633	576	520	142	325	
960	1157	1378	1470	1085	1116	1006	802	846	772	696	640	574	522	135	313	
965	1141	1407	1468	1092	1146	1018	779	826	745	682	628	550	505	138	311	
970	1110	1341	1454	1116	1148	993	750	802	729	658	613	545	496	133	313	
975	1099	1357	1441	1130	1159	1020	774	811	729	649	601	529	484	135	329	
980	1132	1364	1429	1107	1143	1022	788	847	759	664	604	543	493	149	334	
985	1157	1377	1431	1107	1143	1017	784	851	763	685	631	552	491	153	345	
990	1137	1380	1427	1090	1125	1004	761	817	741	666	604	541	498	158	320	
995	1112	1382	1418	1071	1101	988	757	813	738	655	601	536	491	158	320	
1000	1128	1384	1413	1047	1076	970	750	820	750	671	615	558	511	145	300	
1005	1148	1368	1395	1047	1080	959	732	804	743	676	626	576	531	140	300	
1010	1191	1369	1391	1022	1044	952	739	833	770	700	653	594	545	135	302	
1015	1126	1378	1389	1009	1008	930	725	817	765	696	648	583	529	124	298	
1020	1054	1357	1373	1020	1011	927	750	831	770	694	642	568	516	122	304	
1025	1135	1377	1393	1029	1033	936	761	853	784	712	655	592	538	124	306	
1030	1137	1377	1387	1031	1033	925	729	819	747	673	612	545	505	126	318	
1035	1123	1364	1387	1040	1020	927	736	833	756	671	619	545	486	131	320	
1040	1152	1369	1382	1060	1051	957	745	831	752	653	599	538	491	142	316	
1045	1116	1378	1386	1058	1042	943	738	815	730	653	601	534	482	144	318	
1050	1080	1357	1384	1027	993	898	703	801	745	651	595	525	477	142	306	
1055	1072	1339	1378	1020	1029	943	720	795	720	639	581	507	468	147	306	
1060	1074	1364	1396	1027	1056	945	718	788	720	644	590	518	471	153	286	
1065	1157	1369	1375	1038	1047	937	700	772	714	630	572	509	466	154	298	
1070	1134	1369	1387	1033	1031	921	698	763	696	626	583	520	457	149	289	
1075	1080	1378	1389	1033	1049	927	700	768	703	653	603	543	484	151	291	
1080	1033	1364	1380	1018	1004	907	682	759	691	637	590	531	486	147	286	
1085	1096	1368	1389	1035	1044	927	685	761	691	631	585	523	477	151	291	
1090	1135	1314	1335	1065	1081	954	723	802	718	631	579	520	473	142	313	
1095	1153	1333	1350	1083	1098	981	748	822	738	651	588	527	486	138	316	
1100	1110	1319	1324	1080	1038	930	700	761	685	613	559	498	462	138	309	
1105	1108	1346	1335	1090	1085	955	723	788	707	635	588	531	482	140	324	
1110	1150	1328	1319	1074	1049	930	705	779	711	642	579	514	471	140	311	
1115	1189	1359	1324	1054	1040	923	727	820	745	664	615	559	511	136	298	
1120	1112	1337	1315	1049	1006	909	707	799	721	648	595	531	487	138	306	
1125	1153	1310	1285	1029	946	844	642	748	687	621	576	509	469	133	297	
1130	1204	1344	1297	1044	968	871	657	743	673	621	577	518	477	135	297	
1135	1164	1364	1301	1026	972	867	662	772	700	633	581	514	464	142	288	
1140	1146	1362	1301	1018	964	880	687	784	718	633	574	500	451	142	291	
1145	1081	1341	1285	1013	946	867	685	797	725	642	590	532	486	138	271	
1150	1044	1346	1279	1008	896	824	639	766	702	619	565	500	464	131	261	
1155	939	1337	1263	1004	907	815	658	799	738	657	595	541	496	131	280	
1160	968	1312	1260	1011	909	813	658	801	745	669	612	550	502	127	289	
1165	1026	1335	1270	997	898	819	657	790	725	655	608	536	478	120	293	
1170	1033	1337	1267	1004	916	831	653	783	716	644	585	518	460	124	307	
1175	1090	1341	1269	993	932	865	684	799	729	648	586	516	464	126	298	
1180	1053	1344	1265	982	914	853	673	790	736	660	601	532	477	124	304	
1185	1062	1332	1263	982	939	865	676	793	727	660	601	540	486	115	291	
1190	1051	1324	1265	968	918	855	680	793	730	658	606	547	495	109	289	
1195	1047	1341	1261	954	898	820	653	774	720	648	594	520	473	111	288	

Table 1. T1 – T15 thermocouples temperatures in Fahrenheit degrees (5)

time (s)	temperature (°F)														
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	pass/fail	T12	T13	pass/fail	pass/fail
1200	1080	1341	1258	954	898	819	660	797	738	653	592	516	468	115	273
1205	999	1337	1254	946	887	820	658	777	714	640	581	502	451	122	288
1210	973	1339	1256	964	914	849	691	820	750	675	615	549	495	122	298
1215	1069	1342	1258	959	876	810	662	795	741	673	612	543	493	118	282
1220	1072	1346	1260	952	865	790	637	786	734	682	635	568	509	113	282
1225	1171	1344	1260	959	914	838	675	779	720	646	603	547	507	122	275
1230	1159	1339	1254	952	919	829	657	777	707	648	601	538	496	126	266
1235	1150	1342	1256	937	874	808	644	774	720	667	622	561	511	115	252
1240	1074	1348	1254	939	855	781	624	765	711	653	606	563	522	113	255
1245	1108	1342	1252	948	910	853	689	819	759	689	635	570	518	117	282
1250	1130	1346	1252	957	948	869	694	817	757	693	642	576	518	124	291
1255	1123	1355	1251	955	968	880	691	813	748	673	619	559	502	127	291
1260	1143	1348	1243	957	990	901	723	835	766	676	619	556	507	133	316
1265	1193	1351	1243	979	991	894	702	801	730	648	590	516	462	149	325
1270	1164	1348	1245	973	991	889	694	797	720	651	590	516	462	151	307
1275	1089	1353	1256	939	910	833	671	799	732	657	590	523	473	147	298
1280	1085	1350	1245	946	930	855	673	786	716	642	594	534	487	147	289
1285	1157	1339	1247	937	883	811	655	777	698	621	559	496	455	140	280
1290	1101	1337	1251	941	889	826	666	770	696	621	561	502	462	133	284
1295	1135	1333	1225	941	916	844	680	783	723	648	590	540	498	135	288
1300	1164	1342	1225	952	957	867	678	784	716	640	579	522	477	142	300
1305	1197	1337	1227	970	1024	919	725	819	734	653	597	523	471	147	288
1310	1130	1344	1233	968	1000	907	712	802	721	646	586	505	448	149	286
1315	1110	1342	1242	957	945	878	721	831	770	696	631	565	505	142	289
1320	1135	1330	1229	948	921	867	711	842	779	700	637	592	545	131	261
1325	1186	1324	1227	950	936	862	687	783	712	653	603	543	498	136	293
1330	1143	1330	1231	943	918	860	680	779	707	649	603	540	495	138	277
1335	1141	1332	1224	918	898	846	691	802	738	669	610	547	504	129	268
1340	1141	1330	1224	921	898	829	669	792	721	658	601	543	507	124	280
1345	1150	1332	1216	932	930	837	673	790	720	648	592	523	478	144	316
1350	1132	1328	1211	941	975	873	702	793	714	637	581	509	464	145	302
1355	1155	1332	1216	943	955	869	718	824	752	669	608	545	500	142	298
1360	1119	1332	1222	950	945	869	702	799	727	655	610	545	500	142	315
1365	1101	1333	1218	932	912	838	678	802	747	676	617	568	520	140	293
1370	1098	1339	1222	930	900	795	630	748	696	642	588	529	473	138	273
1375	1152	1337	1222	939	921	831	664	775	730	669	613	549	484	127	264
1380	1171	1332	1209	952	945	853	676	788	739	671	612	549	484	126	293
1385	1168	1335	1213	970	975	874	673	770	709	649	603	550	500	160	315
1390	1121	1341	1220	970	968	865	685	779	718	653	603	547	498	162	297
1395	1092	1341	1227	968	979	889	680	783	714	640	574	516	471	158	313
1400	1126	1342	1224	970	981	889	698	795	712	640	581	518	480	145	309
1405	1144	1342	1224	979	982	900	729	817	729	653	594	525	484	145	302
1410	1150	1351	1224	973	964	896	729	826	750	673	612	545	489	151	298
1415	1171	1353	1229	986	990	894	734	828	759	667	613	554	507	142	293
1420	1144	1346	1225	981	961	865	709	819	761	682	637	581	525	138	284
1425	1090	1341	1224	977	964	873	696	801	739	676	626	568	516	144	275
1430	1159	1348	1227	981	959	865	702	815	757	693	644	583	531	140	268
1435	1105	1341	1222	981	964	876	720	826	768	696	646	595	541	149	275
1440	1125	1348	1225	991	991	892	716	808	738	667	617	559	513	156	266
1445	1101	1344	1225	988	988	903	732	811	743	673	622	563	509	153	271
1450	1103	1342	1227	973	941	860	709	811	741	669	622	552	496	144	268
1455	1128	1342	1225	981	959	856	687	793	736	666	630	576	516	127	279
1460	1135	1342	1220	984	979	882	707	810	739	673	631	570	516	131	282
1465	1146	1353	1227	981	988	892	712	817	750	678	635	581	531	135	295
1470	1108	1350	1218	977	988	892	720	822	745	666	615	547	500	144	298
1475	1110	1355	1224	981	977	885	707	817	745	655	597	529	482	149	293
1480	1110	1353	1220	981	972	873	702	824	750	657	595	509	466	149	313
1485	1155	1353	1220	990	1004	905	729	837	770	671	606	532	475	147	306
1490	1150	1359	1224	982	984	900	725	829	757	667	601	536	491	144	309
1495	1146	1360	1224	973	955	876	716	828	761	687	633	563	507	138	306

Table 1. T1 – T15 thermocouples temperatures in Fahrenheit degrees (6)

time (s)	temperature (°F)															
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	pass/fail	T11	T12	T13	pass/fail	pass/fail
1500	1139	1362	1225	975	970	882	720	824	759	682	624	567	514	145	316	
1505	1175	1368	1222	973	990	918	747	864	793	712	649	585	527	151	324	
1510	1171	1373	1225	984	991	907	730	856	786	694	633	568	523	154	327	
1515	1177	1384	1242	999	1024	925	734	847	783	702	649	577	522	156	320	
1520	1191	1378	1243	1006	1022	919	734	831	747	671	624	547	491	154	334	
1525	1180	1375	1240	1002	1022	919	741	844	772	680	622	554	498	160	325	
1530	1177	1386	1249	1004	1024	936	770	864	792	711	639	561	496	163	311	
1535	1177	1384	1247	1011	1026	930	748	853	775	698	633	556	505	156	316	
1540	1180	1368	1238	1017	1033	918	736	831	759	698	637	563	502	162	342	
1545	1204	1377	1249	1017	1022	928	743	837	766	676	617	550	498	158	325	
1550	1184	1369	1240	1006	988	894	729	844	774	691	628	550	495	151	316	
1555	1168	1377	1247	1013	1002	916	743	838	777	696	640	559	504	154	340	
1560	1202	1377	1249	1029	1027	905	700	790	721	658	610	534	480	154	352	
1565	1198	1387	1247	1044	1062	945	759	860	779	693	642	568	500	160	354	
1570	1114	1382	1247	1049	1063	946	768	871	804	716	658	590	525	163	347	
1575	1076	1391	1247	1044	1056	968	810	921	860	775	709	646	576	158	336	
1580	1139	1389	1243	1060	1078	977	813	921	853	757	691	622	565	160	347	
1585	1117	1386	1249	1067	1078	990	826	934	858	768	698	624	559	154	356	
1590	1092	1393	1256	1067	1092	999	842	943	878	792	712	633	568	149	329	
1595	991	1386	1251	1071	1090	972	802	905	847	770	712	642	586	136	300	
1600	1063	1384	1249	1085	1103	975	788	885	810	730	680	608	547	138	306	
1605	1144	1389	1261	1083	1101	975	786	889	811	730	680	608	534	136	307	
1610	1096	1353	1251	1083	1089	955	766	873	804	714	660	588	532	144	315	
1615	1157	1369	1254	1080	1076	948	774	873	793	718	660	586	529	160	325	
1620	1159	1371	1249	1090	1096	972	783	869	788	711	657	586	527	154	334	
1625	1191	1375	1251	1098	1105	973	790	883	808	709	646	576	529	153	331	
1630	1224	1373	1243	1083	1074	934	748	864	802	709	658	583	525	149	360	
1635	1200	1377	1249	1089	1092	950	772	883	824	734	678	595	532	147	356	
1640	1207	1384	1260	1107	1121	977	779	873	790	689	628	541	478	154	370	
1645	1209	1378	1251	1103	1110	982	784	878	797	703	635	552	495	165	374	
1650	1114	1382	1256	1067	1096	972	775	878	806	711	644	568	516	153	342	
1655	1074	1377	1251	1065	1103	984	813	916	849	754	685	604	527	145	329	
1660	1121	1375	1258	1062	1101	997	831	928	858	779	707	622	559	144	306	
1665	1139	1375	1263	1054	1080	977	804	914	851	774	707	628	572	149	313	
1670	1105	1384	1267	1051	1112	1006	819	905	822	734	662	581	518	136	322	
1675	1139	1384	1261	1063	1108	993	804	882	806	714	655	579	516	142	329	
1680	1139	1380	1260	1089	1130	1009	828	903	813	720	662	599	547	149	313	
1685	1094	1384	1265	1090	1141	997	810	892	813	732	671	606	543	149	311	
1690	1038	1391	1263	1081	1116	986	801	883	815	743	680	619	556	151	318	
1695	1060	1389	1267	1089	1123	1000	820	909	844	768	703	639	568	145	309	
1700	1040	1391	1267	1072	1090	977	790	896	824	741	694	622	561	135	320	
1705	1074	1380	1256	1081	1096	975	783	885	820	741	676	592	541	129	322	
1710	1132	1380	1254	1107	1123	997	811	903	829	748	687	601	536	144	334	
1715	1130	1382	1258	1092	1099	972	801	889	802	718	662	581	527	153	342	
1720	1098	1380	1263	1074	1069	959	808	910	844	748	689	619	561	149	329	
1725	1123	1377	1260	1065	1074	961	775	874	799	714	662	586	529	149	338	
1730	1159	1369	1245	1060	1074	930	736	835	759	691	648	568	507	149	331	
1735	1180	1373	1247	1083	1108	964	784	887	808	725	671	608	536	156	318	
1740	1186	1378	1256	1089	1103	964	781	883	810	723	662	601	540	154	333	
1745	1179	1387	1270	1083	1094	955	775	878	810	718	653	583	520	169	351	
1750	1166	1378	1256	1076	1090	939	750	842	774	700	637	563	500	172	345	
1755	1164	1386	1269	1074	1080	937	768	869	799	718	655	579	516	171	349	
1760	1170	1375	1265	1092	1089	932	757	869	788	711	646	588	525	169	343	
1765	1198	1378	1261	1089	1078	925	756	851	772	693	635	574	529	174	365	
1770	1204	1386	1267	1085	1074	907	730	833	747	667	610	536	489	183	394	
1775	1229	1393	1272	1096	1096	930	741	831	738	660	604	549	500	185	374	
1780	1216	1407	1292	1107	1108	937	743	844	775	694	631	570	509	176	370	
1785	1189	1387	1270	1096	1090	918	729	838	772	700	624	563	504	176	378	
1790	1119	1384	1269	1098	1105	955	781	892	813	727	671	604	549	169	387	
1795	1130	1386	1270	1107	1123	966	786	903	842	766	702	646	583	160	387	

Table 2. T16 – T30 thermocouples temperatures in Fahrenheit degrees (1)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail									pass/fail		
	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30
0	66	61	59	59	59	54	54	59	55	57	63	64	61	63	63
5	66	61	59	59	59	54	55	59	55	57	63	63	61	63	63
10	99	63	59	59	59	54	55	59	55	57	63	64	61	63	63
15	129	68	59	59	59	55	55	61	57	57	63	64	61	63	63
20	167	82	59	59	63	55	57	66	63	63	68	68	64	66	64
25	172	84	59	59	64	55	61	70	64	64	72	72	68	70	66
30	162	88	59	59	68	55	64	73	66	66	75	73	70	73	66
35	165	90	59	59	68	55	66	75	68	68	77	75	72	75	68
40	171	90	59	59	68	55	68	75	70	70	79	77	73	79	70
45	167	86	59	59	68	55	68	77	70	72	79	77	73	79	70
50	171	86	59	59	70	55	70	77	70	72	81	79	75	82	72
55	172	84	59	59	70	55	72	79	72	72	81	79	75	82	72
60	172	84	59	59	72	55	73	81	73	73	82	81	77	84	73
65	172	82	59	59	77	55	75	82	73	73	82	81	77	86	73
70	171	84	57	59	82	57	77	88	75	75	86	84	81	88	75
75	180	86	57	59	88	57	79	91	77	79	90	86	82	91	77
80	181	91	57	59	93	57	82	93	81	81	91	88	84	93	77
85	183	91	57	59	97	57	82	95	81	81	93	90	86	97	79
90	181	91	57	57	104	59	88	100	84	84	95	91	88	99	81
95	187	90	57	57	108	59	90	104	86	84	99	93	90	100	81
100	185	86	57	57	115	59	93	108	88	88	102	95	91	102	82
105	183	86	57	57	118	59	95	108	90	90	102	97	93	104	84
110	172	82	57	57	129	61	100	111	90	91	104	99	97	108	86
115	180	84	57	57	153	63	108	120	97	97	111	104	100	113	88
120	185	84	57	57	163	64	115	131	102	100	117	109	104	117	91
125	201	84	57	57	174	64	124	140	113	109	122	117	109	120	93
130	201	86	57	57	178	66	131	145	118	115	127	120	115	124	95
135	198	82	57	57	185	68	140	160	129	126	135	129	122	129	97
140	192	82	57	57	189	70	145	163	135	129	138	133	126	135	100
145	187	81	57	57	185	68	144	167	136	133	140	133	127	135	100
150	178	81	57	57	183	68	144	169	138	133	140	135	129	136	102
155	162	79	57	57	183	68	144	169	138	133	142	135	129	136	104
160	158	77	57	57	185	68	144	165	136	133	142	135	129	136	104
165	149	73	57	57	189	70	145	167	135	129	140	135	127	138	106
170	151	73	57	57	190	70	145	167	136	133	142	136	131	138	106
175	167	84	57	57	192	70	145	167	138	135	142	136	131	138	106
180	165	86	57	57	196	70	145	169	140	136	144	138	133	140	106
185	176	82	57	57	196	70	144	171	140	136	145	140	135	142	108
190	185	88	57	59	199	70	142	171	140	136	145	140	135	142	109
195	181	86	57	59	203	70	145	172	140	136	144	138	135	142	109
200	174	90	57	59	207	70	147	174	140	136	144	138	133	142	109
205	180	86	57	59	210	70	145	176	142	136	147	142	136	144	111
210	185	86	57	59	212	70	149	180	144	138	151	144	138	145	111
215	194	88	57	59	216	72	149	178	147	142	153	145	140	149	115
220	196	90	57	59	214	72	147	174	144	140	151	144	140	147	113
225	199	91	57	59	219	72	145	174	144	140	149	142	138	145	113
230	198	93	57	59	223	73	144	172	145	140	151	144	138	147	115
235	185	93	57	59	225	73	147	172	144	140	151	142	138	149	117
240	185	97	57	59	226	73	149	172	144	140	151	144	138	151	117
245	190	93	57	59	232	75	153	176	147	145	156	147	142	153	118
250	199	91	57	59	235	77	153	176	145	144	156	149	144	154	118
255	207	91	57	59	234	79	154	180	145	142	154	149	144	154	118
260	194	93	57	59	237	81	154	180	149	145	156	149	145	154	118
265	192	93	59	59	241	81	156	185	153	149	158	153	145	156	118
270	189	93	59	59	246	82	158	189	153	151	162	156	149	160	122
275	199	91	59	59	250	82	158	192	154	149	163	156	151	162	124
280	190	91	59	59	253	84	158	192	153	149	162	156	151	162	126
285	201	88	59	59	255	86	156	190	154	149	162	154	149	162	126
290	198	90	59	59	255	84	154	190	154	147	160	153	147	162	126
295	214	91	59	59	257	84	154	192	158	153	165	156	151	163	127

Table 2. T16 – T30 thermocouples temperatures in Fahrenheit degrees (2)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail										pass/fail	
	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30
300	221	93	59	59	255	84	156	194	158	153	163	154	153	165	127
305	207	100	59	59	252	82	154	198	162	156	165	158	153	165	127
310	207	100	59	59	252	82	154	201	167	160	172	163	156	169	131
315	234	102	59	59	257	84	154	201	165	158	171	163	158	172	133
320	223	108	59	59	261	86	154	199	165	160	171	163	156	171	133
325	226	104	59	59	264	86	156	199	165	160	172	165	160	172	133
330	221	102	59	59	268	86	158	203	165	160	171	163	158	174	135
335	248	104	59	59	273	84	158	203	163	160	176	165	160	178	138
340	257	108	59	59	275	84	160	205	167	162	178	167	162	178	138
345	253	109	59	59	284	86	160	207	169	163	181	172	167	183	142
350	257	108	59	59	286	88	162	210	171	165	183	174	169	185	144
355	250	117	61	59	275	90	163	210	172	167	180	172	165	181	140
360	259	117	61	59	277	90	162	208	171	165	181	172	165	181	140
365	253	109	61	59	275	90	160	208	169	162	181	172	167	185	144
370	255	104	61	59	273	91	160	208	169	162	178	169	165	183	144
375	234	104	61	59	266	95	160	207	169	162	178	167	163	183	142
380	230	104	61	59	268	97	162	208	171	163	181	171	167	185	145
385	226	100	61	59	268	97	162	207	169	162	181	172	169	189	147
390	232	100	61	59	264	97	162	208	171	163	181	171	167	189	147
395	244	108	61	59	257	100	163	210	172	167	185	176	171	190	151
400	252	109	61	59	253	104	165	210	172	167	183	178	172	190	151
405	243	108	61	59	255	106	167	210	172	165	183	176	172	192	151
410	244	113	61	59	255	108	169	210	171	163	183	172	171	192	153
415	243	109	61	59	266	109	172	212	169	163	183	172	171	194	154
420	244	113	61	59	271	113	172	214	171	165	185	172	171	196	154
425	226	113	61	59	273	115	172	216	178	167	187	176	172	198	156
430	232	111	61	59	277	115	172	216	178	171	190	180	176	198	156
435	252	120	61	59	284	117	176	219	176	167	189	178	174	201	160
440	250	118	63	59	282	120	178	219	174	167	190	178	176	203	162
445	273	126	63	59	286	126	181	219	174	165	189	176	174	205	163
450	273	133	63	59	288	126	180	223	176	169	190	180	176	207	165
455	275	135	63	59	291	126	180	225	174	167	189	178	176	207	163
460	279	129	63	59	291	126	180	226	178	171	192	180	176	205	165
465	270	120	63	59	293	126	181	226	176	167	190	178	172	207	165
470	273	118	61	59	291	126	183	226	176	169	192	181	176	208	167
475	266	111	61	59	302	127	183	230	183	172	194	183	180	210	165
480	257	109	61	59	309	129	185	237	189	178	199	190	185	214	171
485	259	108	63	59	313	131	189	241	192	181	203	192	187	217	171
490	262	113	63	59	318	133	189	243	194	183	205	194	189	219	172
495	275	109	63	59	327	133	190	244	198	185	207	194	190	219	174
500	297	117	63	59	331	131	192	246	201	187	212	198	194	225	178
505	291	122	63	59	336	129	194	252	205	192	214	203	198	228	181
510	289	120	63	59	343	131	196	255	207	196	217	207	199	230	183
515	275	117	63	59	354	131	199	259	205	192	217	201	198	232	185
520	289	115	63	59	360	135	199	262	210	196	219	205	198	232	185
525	280	115	63	59	369	135	201	268	214	198	223	210	205	237	189
530	282	118	63	59	372	136	203	275	216	201	226	216	208	239	189
535	284	126	63	59	370	135	203	273	219	203	228	219	212	243	190
540	291	120	63	59	370	136	205	275	219	205	230	219	214	243	192
545	262	115	63	59	372	138	207	277	226	212	235	225	217	244	192
550	270	117	64	61	376	140	208	279	228	216	237	228	221	246	194
555	277	126	64	61	387	138	205	279	232	221	244	235	228	250	198
560	268	126	64	61	390	142	207	282	230	219	241	235	230	252	199
565	279	126	64	61	392	142	208	289	241	225	246	243	234	255	201
570	286	122	64	61	394	144	208	289	239	225	246	241	235	255	201
575	280	120	64	61	399	140	208	289	241	225	248	243	235	257	203
580	275	124	64	61	403	138	208	291	244	226	250	243	235	259	205
585	282	124	64	61	397	140	212	293	243	223	250	239	232	259	205
590	288	126	64	61	401	140	212	295	248	226	253	243	235	262	207
595	295	124	64	61	412	142	216	302	252	230	255	243	237	262	208

Table 2. T16 – T30 thermocouples temperatures in Fahrenheit degrees (3)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail										pass/fail	
	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30
600	289	127	64	61	423	140	221	307	262	241	262	253	244	266	208
605	289	124	64	61	428	140	228	311	275	253	271	262	253	271	214
610	304	122	63	61	437	140	237	315	284	264	279	270	259	279	217
615	315	120	63	61	444	140	239	318	291	271	282	275	264	282	221
620	318	124	63	61	453	144	244	322	297	280	288	279	268	286	225
625	313	122	63	61	457	144	248	320	304	286	295	284	273	289	226
630	300	120	63	61	473	144	253	320	309	288	295	288	275	289	225
635	289	118	63	61	482	144	255	325	309	288	295	284	273	289	226
640	273	115	64	61	491	144	262	325	311	293	302	291	279	293	226
645	286	115	64	61	495	144	266	327	318	300	306	293	282	297	228
650	286	122	64	61	491	144	275	334	325	311	315	302	288	304	232
655	295	118	64	63	532	142	286	347	334	320	324	309	295	309	239
660	289	111	64	63	529	142	297	361	345	331	331	316	300	315	239
665	307	113	64	63	615	142	315	383	363	352	351	333	313	325	243
670	325	113	64	63	1087	151	415	473	446	424	399	378	345	363	271
675	295	111	64	63	977	156	408	468	460	455	421	396	363	376	280
680	316	111	64	63	1195	174	392	477	495	491	450	421	387	397	291
685	300	113	64	63	1305	181	381	473	504	496	451	424	390	397	291
690	304	115	64	63	1285	194	374	459	500	496	455	424	394	396	291
695	298	115	64	63	1296	196	369	451	500	498	455	428	396	401	293
700	315	115	64	63	1285	198	363	433	477	477	439	412	387	388	284
705	318	117	64	64	1220	196	354	415	457	460	430	403	376	378	275
710	316	120	64	64	1144	198	342	396	433	444	415	390	369	370	270
715	329	124	64	63	1281	201	333	385	428	442	417	394	370	372	273
720	356	122	64	63	1335	203	322	376	421	439	419	392	369	372	273
725	345	124	64	63	1287	205	318	372	417	435	415	390	369	370	275
730	363	131	64	64	1350	207	313	369	419	446	432	405	379	379	280
735	367	142	66	64	1368	207	311	369	421	457	446	419	388	390	288
740	342	133	66	64	1306	208	307	367	423	451	437	412	388	387	284
745	334	127	66	64	1258	208	304	367	423	448	433	408	383	383	284
750	329	122	66	63	1310	208	300	369	424	448	435	408	383	381	286
755	331	122	66	63	1425	212	309	376	432	464	464	439	401	399	297
760	320	127	66	63	1488	219	318	381	444	486	484	453	408	410	302
765	325	133	66	63	1472	221	318	378	444	487	482	455	412	412	304
770	343	129	66	64	1371	219	315	379	450	491	477	448	410	408	304
775	340	131	66	64	1288	217	316	388	457	493	469	439	406	406	302
780	327	136	66	64	1251	214	327	405	473	484	453	421	394	397	297
785	313	138	66	64	1209	214	333	408	473	473	441	410	385	394	297
790	313	136	68	64	1200	212	340	412	473	450	417	390	369	378	289
795	302	133	66	64	1182	210	343	417	478	448	415	388	367	378	286
800	325	131	68	64	1288	208	343	423	487	468	437	403	372	385	289
805	325	133	68	63	1353	212	351	428	489	484	451	419	379	392	295
810	315	133	68	64	1359	214	360	439	507	502	460	430	394	405	306
815	293	133	68	64	1373	217	363	446	505	504	466	433	396	403	304
820	327	127	68	64	1391	216	361	442	496	504	473	435	397	406	304
825	315	129	68	64	1434	217	363	446	496	502	477	435	397	408	306
830	302	127	68	66	1476	221	369	444	489	498	471	437	399	410	307
835	302	127	68	66	1490	226	383	455	502	486	462	428	396	406	309
840	289	133	68	66	1522	232	396	460	496	478	464	428	392	405	307
845	293	131	68	66	1555	237	412	466	498	475	457	421	390	405	311
850	307	129	68	66	1513	241	424	469	489	453	442	408	381	399	311
855	309	127	70	66	1499	244	432	468	482	441	433	399	374	396	309
860	313	120	70	66	1427	248	432	464	471	437	428	394	370	392	306
865	309	131	70	66	1476	250	428	464	471	435	426	394	369	390	304
870	347	174	70	66	1477	252	419	469	477	466	451	421	383	401	311
875	360	171	70	68	1492	253	415	471	475	477	464	435	392	408	313
880	376	163	70	70	1492	255	410	475	473	484	475	442	399	414	313
885	356	160	72	70	1537	257	410	473	475	484	478	450	406	417	316
890	338	151	72	68	1549	261	410	468	478	489	486	460	421	426	322
895	325	145	72	68	1553	261	410	466	482	493	482	457	421	426	324

Table 2. T16 – T30 thermocouples temperatures in Fahrenheit degrees (4)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail									pass/fail		
	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30
900	302	140	72	66	1562	262	414	459	487	489	475	441	410	415	320
905	282	140	72	68	1566	264	421	457	487	498	482	450	417	423	324
910	259	131	73	68	1557	268	428	459	493	507	487	457	421	424	324
915	273	131	73	68	1584	271	435	462	496	518	500	466	428	433	331
920	280	129	73	68	1589	273	442	468	502	522	500	466	432	435	336
925	273	126	73	68	1546	275	446	468	504	523	498	464	432	437	336
930	286	122	72	68	1490	279	442	466	507	529	507	471	433	437	336
935	288	124	72	68	1436	280	441	469	511	529	502	466	430	433	333
940	316	124	72	68	1398	280	437	468	505	529	509	478	439	441	336
945	291	124	72	68	1391	282	435	462	500	534	516	484	442	442	338
950	304	129	72	70	1413	284	432	459	498	543	520	491	451	451	343
955	309	131	72	70	1413	284	430	455	496	543	525	496	457	455	345
960	311	129	72	70	1411	284	426	450	496	545	529	498	459	457	347
965	288	131	70	72	1418	286	421	448	496	547	527	495	455	455	347
970	333	138	72	70	1413	286	421	446	487	541	532	500	462	460	351
975	342	140	73	70	1409	289	423	450	489	540	532	502	462	460	349
980	343	135	73	70	1389	293	426	460	500	543	525	495	459	457	349
985	329	131	73	68	1396	295	430	471	509	545	520	489	453	451	347
990	322	124	73	68	1402	302	430	486	514	540	516	487	451	448	345
995	306	122	72	68	1409	309	437	500	527	547	522	491	453	451	347
1000	300	122	72	70	1407	315	439	513	527	549	523	493	455	451	351
1005	302	120	72	70	1393	315	439	522	532	552	527	495	455	455	352
1010	307	124	72	70	1378	322	455	549	554	556	531	500	457	460	352
1015	315	127	73	70	1380	325	471	561	567	554	525	495	455	459	351
1020	302	124	73	70	1366	331	523	583	572	540	516	484	446	451	349
1025	293	120	73	70	1382	338	531	588	576	536	516	484	444	450	347
1030	289	120	73	70	1369	340	585	597	576	532	518	480	442	451	349
1035	284	118	73	70	1359	343	597	601	570	529	516	484	441	451	351
1040	300	120	75	70	1344	347	595	597	565	522	514	477	433	448	351
1045	297	118	75	70	1341	349	585	590	567	518	513	471	430	448	351
1050	302	120	75	70	1357	352	565	585	563	509	511	469	423	446	352
1055	288	117	75	70	1359	354	565	588	558	498	505	462	421	442	349
1060	298	109	77	72	1368	358	577	594	529	473	487	442	408	433	345
1065	273	108	77	72	1346	361	588	590	511	457	478	430	397	428	343
1070	302	117	79	70	1339	367	601	586	489	437	464	421	390	423	343
1075	307	115	75	73	1337	370	621	572	477	424	451	410	387	424	345
1080	311	113	79	72	1342	385	637	534	455	414	439	399	374	414	343
1085	322	109	77	73	1378	401	628	507	442	405	426	387	367	410	340
1090	307	106	77	73	1312	419	613	489	439	397	421	383	360	408	338
1095	291	108	81	73	1324	432	608	496	442	403	426	390	365	417	345
1100	306	111	81	75	1328	448	676	531	464	421	450	414	383	444	365
1105	302	109	82	75	1333	466	707	565	489	441	469	435	403	459	376
1110	280	108	82	75	1328	484	696	574	489	439	469	433	403	464	378
1115	286	109	82	77	1308	500	671	556	473	428	451	415	396	455	374
1120	297	108	84	77	1281	505	657	540	462	421	441	406	388	451	370
1125	266	106	84	79	1274	513	648	525	442	408	426	392	379	439	361
1130	270	102	84	79	1283	514	646	522	439	403	419	387	376	433	360
1135	261	99	84	79	1299	509	642	520	437	399	417	387	370	426	351
1140	255	97	84	79	1306	507	646	525	435	399	417	385	369	419	345
1145	273	102	84	79	1288	491	637	550	448	412	433	401	376	423	349
1150	277	109	84	81	1290	480	626	559	453	419	441	406	378	423	349
1155	271	117	84	81	1278	471	612	568	464	421	439	401	376	423	345
1160	273	118	84	81	1276	462	592	577	477	428	446	410	379	424	343
1165	264	113	82	82	1270	455	572	581	495	435	451	414	383	426	342
1170	280	109	82	82	1267	451	561	576	504	444	459	419	387	426	342
1175	280	113	84	84	1276	451	554	583	502	442	455	415	387	426	342
1180	273	111	84	84	1260	450	547	590	504	441	457	417	387	428	342
1185	273	111	84	84	1252	450	543	590	509	439	457	414	385	426	340
1190	282	113	84	84	1260	451	543	588	511	444	460	415	387	426	340
1195	277	113	84	84	1247	455	547	588	514	444	455	408	383	426	340

Table 2. T16 – T30 thermocouples temperatures in Fahrenheit degrees (5)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail										pass/fail	
	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30
1200	282	113	84	84	1243	457	541	576	527	455	460	412	383	428	342
1205	284	117	86	84	1251	459	540	563	538	464	464	415	387	428	343
1210	270	118	86	84	1249	457	536	559	547	477	475	421	390	433	343
1215	271	113	88	84	1245	457	534	556	550	487	477	428	396	435	342
1220	295	117	88	84	1249	459	531	561	552	493	480	437	401	437	340
1225	322	127	88	84	1245	460	523	556	558	504	487	442	406	439	340
1230	349	131	88	82	1227	462	520	552	554	509	489	446	408	439	340
1235	342	133	90	84	1236	466	511	547	556	516	495	448	410	441	342
1240	345	136	90	84	1227	469	511	543	554	522	502	460	415	442	340
1245	302	133	90	84	1222	473	507	536	549	522	505	466	421	448	336
1250	311	127	91	84	1224	475	509	541	550	516	504	459	419	446	338
1255	298	122	93	84	1215	477	509	543	545	509	496	453	417	442	338
1260	282	117	93	82	1213	475	509	545	547	502	495	453	417	442	338
1265	253	113	97	82	1215	475	509	549	543	491	486	444	414	439	338
1270	264	122	97	82	1213	475	505	545	540	491	487	448	415	439	336
1275	275	126	104	84	1216	478	504	547	540	491	489	451	419	442	338
1280	318	122	106	84	1198	480	505	545	540	493	491	453	419	442	334
1285	340	142	108	86	1202	486	502	541	538	500	495	453	417	439	333
1290	352	147	108	88	1213	487	505	545	538	496	489	451	415	439	334
1295	333	138	108	88	1188	487	509	550	540	487	484	446	414	441	336
1300	300	131	109	88	1189	480	513	556	538	477	477	439	410	441	338
1305	277	122	113	86	1213	473	513	559	534	469	471	430	405	437	336
1310	271	120	117	86	1213	468	513	565	532	464	466	423	401	435	334
1315	293	126	129	86	1215	460	514	567	541	469	471	428	401	439	338
1320	298	122	127	86	1200	464	514	561	547	477	478	435	405	444	340
1325	322	127	131	88	1189	460	511	559	549	477	477	433	405	442	338
1330	329	129	140	88	1193	455	514	563	545	469	473	433	406	442	338
1335	352	145	140	88	1184	448	518	561	543	468	469	430	405	439	334
1340	343	145	131	88	1182	448	516	563	538	464	466	428	403	437	327
1345	309	135	133	88	1177	444	520	567	534	459	460	428	401	435	327
1350	322	133	131	88	1171	441	518	563	541	466	468	432	403	437	327
1355	291	133	124	88	1182	433	513	556	540	468	464	426	403	433	325
1360	306	133	120	90	1197	430	509	547	543	480	475	437	408	433	325
1365	360	151	120	90	1207	433	511	547	549	489	484	453	419	442	325
1370	378	167	117	90	1207	435	511	547	550	493	489	459	423	446	325
1375	399	176	111	90	1215	437	513	549	552	489	484	451	419	444	322
1380	363	162	106	90	1206	441	514	554	549	478	480	446	415	446	322
1385	320	140	106	91	1215	439	513	568	536	460	462	430	408	441	322
1390	307	131	106	91	1218	439	514	574	531	455	457	423	403	437	322
1395	302	120	115	91	1233	439	514	581	525	451	457	423	401	441	322
1400	300	118	115	91	1218	441	514	583	520	444	448	412	396	437	322
1405	291	117	111	91	1220	442	514	586	520	444	450	414	396	441	322
1410	270	117	109	91	1225	441	516	588	514	439	444	406	390	437	322
1415	307	122	108	91	1225	448	513	583	525	446	453	423	401	442	322
1420	302	126	106	91	1224	448	513	586	522	444	455	423	401	444	324
1425	297	131	104	93	1224	448	511	583	529	448	457	421	403	444	320
1430	297	129	106	93	1229	448	511	581	532	450	459	426	405	446	320
1435	302	135	113	93	1225	451	516	590	520	437	450	415	401	446	320
1440	298	135	115	93	1218	450	516	594	514	432	441	406	394	444	316
1445	324	133	113	95	1225	453	520	595	513	428	437	406	394	441	315
1450	316	140	115	97	1225	453	522	599	505	424	433	401	390	441	313
1455	325	131	113	97	1220	457	522	595	495	423	433	403	390	439	311
1460	342	126	111	97	1206	459	523	595	491	415	423	394	385	433	309
1465	315	124	109	97	1218	459	525	597	495	415	423	388	381	433	309
1470	306	122	106	99	1216	466	527	597	493	417	423	388	381	433	309
1475	273	117	104	99	1213	462	527	592	484	406	408	372	370	426	307
1480	261	115	104	99	1213	460	522	583	496	419	421	381	372	428	307
1485	264	113	102	100	1218	457	520	570	509	435	439	401	383	435	309
1490	264	113	104	100	1222	457	518	563	518	446	448	412	390	437	309
1495	264	113	104	100	1225	455	511	554	529	466	462	426	399	444	311

Table 2. T16 – T30 thermocouples temperatures in Fahrenheit degrees (6)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail									pass/fail		
	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30
1500	266	113	104	102	1231	455	509	550	531	473	468	435	405	450	313
1505	268	122	106	102	1229	455	507	554	540	478	473	433	406	451	313
1510	270	118	106	104	1243	453	507	559	532	466	462	424	403	451	315
1515	275	115	106	104	1254	451	509	565	527	455	453	421	401	444	311
1520	270	117	106	106	1254	457	509	559	531	460	455	426	405	442	311
1525	280	118	108	106	1258	457	511	565	534	462	459	426	406	444	313
1530	284	120	108	106	1261	457	513	567	534	460	459	424	406	448	315
1535	275	113	109	108	1261	453	513	567	532	460	455	421	405	448	315
1540	280	113	111	108	1254	457	514	572	531	457	453	414	399	448	315
1545	273	120	111	108	1258	453	518	577	523	448	446	412	397	446	315
1550	279	127	113	109	1242	453	522	579	514	439	437	403	394	442	315
1555	277	124	115	109	1256	457	529	586	504	430	432	396	388	441	315
1560	268	118	117	109	1261	459	534	586	496	423	426	394	387	437	311
1565	282	117	117	111	1254	464	540	594	484	410	415	387	381	435	311
1570	268	113	118	111	1254	469	547	594	473	403	410	379	376	432	311
1575	268	109	120	113	1258	478	556	594	462	392	397	370	370	428	313
1580	270	108	120	115	1256	482	559	588	455	383	388	361	365	424	313
1585	279	115	120	117	1254	478	558	588	455	381	383	356	360	424	313
1590	284	115	122	118	1249	478	559	594	460	385	390	360	365	426	313
1595	275	120	126	120	1247	484	559	595	468	394	396	367	369	428	315
1600	277	122	127	120	1245	491	559	595	473	399	401	372	372	428	316
1605	279	118	131	122	1265	498	559	590	468	396	399	372	372	428	313
1610	288	117	135	126	1249	513	561	592	462	396	397	367	369	430	315
1615	300	117	135	129	1238	522	565	585	450	381	383	356	361	426	311
1620	298	117	135	135	1236	541	561	579	437	372	372	343	352	423	311
1625	288	122	135	138	1242	543	558	577	435	369	370	343	351	423	313
1630	289	117	136	144	1242	545	554	568	419	354	356	334	345	415	311
1635	284	115	135	145	1256	554	552	568	414	351	354	334	345	412	307
1640	264	109	135	149	1263	559	549	563	412	351	351	325	338	408	304
1645	255	108	133	151	1247	565	550	558	408	347	351	327	336	403	304
1650	271	109	135	154	1269	576	554	561	417	351	354	333	340	403	306
1655	282	109	135	156	1263	579	550	558	417	352	356	334	340	406	307
1660	293	113	135	158	1260	586	549	556	417	358	361	343	345	406	306
1665	320	118	136	158	1269	595	550	556	414	356	361	347	349	410	307
1670	318	127	138	156	1265	608	554	559	419	356	361	345	349	412	313
1675	316	140	138	158	1267	612	554	561	421	354	356	342	347	410	313
1680	313	138	140	162	1252	619	550	567	419	351	356	340	345	412	311
1685	320	138	140	165	1261	621	550	570	423	351	356	338	343	414	313
1690	333	136	138	169	1256	626	552	576	426	351	356	340	347	415	315
1695	342	145	140	169	1272	631	556	577	428	354	363	345	349	419	316
1700	331	138	142	169	1267	640	561	585	432	358	365	345	352	423	320
1705	327	147	144	169	1254	644	565	588	430	356	363	342	352	424	320
1710	307	153	147	171	1236	648	567	583	424	349	356	336	345	423	320
1715	307	145	151	172	1240	648	567	576	419	351	358	340	345	419	318
1720	300	140	154	178	1252	651	572	574	415	354	365	347	349	415	315
1725	295	136	162	180	1258	657	574	570	415	352	363	349	352	417	315
1730	289	135	169	180	1233	666	583	572	414	352	361	347	352	419	316
1735	311	133	172	181	1245	669	588	581	417	356	369	352	356	421	316
1740	306	140	178	183	1258	671	592	590	417	356	367	349	354	426	318
1745	300	135	183	187	1265	673	595	586	415	352	361	343	352	424	316
1750	325	131	190	190	1254	678	601	585	414	354	365	351	354	426	316
1755	325	136	192	190	1267	682	603	592	415	356	363	351	354	430	318
1760	325	138	199	192	1256	687	612	603	423	361	370	351	358	435	320
1765	313	140	199	192	1240	684	612	606	430	369	378	361	363	437	318
1770	298	136	201	196	1260	684	613	601	433	369	378	360	363	437	316
1775	307	131	205	196	1272	687	622	610	439	374	383	361	363	442	318
1780	291	131	208	194	1299	685	626	613	444	376	379	354	360	444	318
1785	295	126	216	196	1249	685	628	612	442	374	378	352	361	441	315
1790	284	122	226	199	1296	685	628	613	442	378	381	352	360	444	313
1795	297	129	230	199	1290	675	633	626	455	385	392	367	370	450	315

Table 3. T31 – T45 thermocouples temperatures in Fahrenheit degrees (1)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail					
	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45
0	61	59	61	52	54	59	57	63	54	54	68	73	77	66	66
5	59	59	61	52	54	59	59	63	54	54	73	79	81	70	70
10	59	59	61	52	54	59	57	63	54	54	93	108	99	81	81
15	59	59	61	52	54	59	59	63	54	54	127	147	127	99	99
20	59	59	61	52	54	59	59	63	54	54	207	253	196	136	140
25	59	59	61	52	55	59	57	63	54	54	277	334	266	180	178
30	59	59	61	52	55	59	57	63	54	55	401	464	370	241	250
35	59	59	63	52	55	59	59	63	54	55	489	549	442	286	297
40	61	59	63	52	57	59	59	63	54	55	613	673	547	356	369
45	61	59	63	52	57	59	59	63	55	55	702	748	613	405	415
50	61	59	63	54	57	59	59	63	55	55	799	855	718	475	486
55	61	59	63	54	59	59	59	63	55	55	855	912	772	529	531
60	61	59	63	54	59	59	59	63	55	55	925	982	846	595	601
65	61	59	64	54	59	59	59	63	55	55	964	1020	887	637	639
70	61	59	64	54	61	59	59	63	55	57	1018	1069	939	694	693
75	61	59	64	54	61	59	59	63	55	57	1044	1099	972	730	723
80	61	59	64	54	61	59	59	63	55	57	1078	1137	1008	783	772
85	61	59	64	54	61	59	59	63	55	57	1099	1161	1027	811	799
90	61	59	64	54	63	59	59	63	55	57	1128	1188	1056	851	833
95	61	59	64	54	63	59	59	63	55	57	1144	1198	1076	873	855
100	61	59	64	54	63	59	59	63	55	57	1168	1216	1096	907	885
105	63	59	64	54	63	59	59	63	55	57	1180	1227	1105	925	901
110	63	59	64	54	64	59	59	63	57	57	1198	1242	1117	950	923
115	61	59	66	54	64	59	59	63	57	57	1213	1252	1128	973	945
120	61	59	64	54	64	59	59	63	57	59	1222	1258	1132	986	957
125	61	59	64	55	66	59	59	63	57	61	1242	1261	1143	999	973
130	61	59	64	55	68	59	59	64	57	63	1252	1267	1152	1009	984
135	61	59	64	55	68	59	59	64	59	70	1265	1274	1157	1018	1000
140	61	59	64	55	68	59	59	64	59	70	1269	1281	1161	1026	1008
145	61	59	64	55	68	59	59	64	59	75	1278	1288	1164	1036	1020
150	61	59	64	55	68	57	59	64	59	73	1287	1294	1168	1045	1029
155	61	59	64	55	68	57	59	64	59	70	1294	1301	1171	1054	1040
160	61	59	64	55	68	57	59	64	59	68	1301	1310	1175	1060	1045
165	61	59	64	55	68	57	59	64	59	66	1303	1317	1180	1069	1054
170	61	59	64	55	68	57	59	64	59	66	1306	1319	1186	1074	1058
175	61	59	66	55	70	57	59	64	59	68	1306	1321	1195	1083	1065
180	61	59	66	55	70	57	59	64	61	73	1306	1328	1202	1087	1069
185	61	59	66	55	70	57	59	64	61	75	1308	1339	1207	1094	1076
190	61	59	66	55	70	57	59	64	61	75	1310	1346	1209	1098	1080
195	61	59	66	55	72	57	59	64	61	77	1314	1357	1211	1103	1083
200	61	59	66	55	72	57	59	64	61	81	1315	1364	1213	1108	1087
205	61	59	66	55	70	57	59	64	63	82	1319	1369	1216	1112	1092
210	61	59	66	55	72	57	59	64	63	86	1324	1375	1218	1117	1094
215	61	59	66	55	72	57	59	64	63	86	1330	1382	1224	1123	1099
220	61	59	66	55	72	57	59	64	63	88	1332	1386	1229	1128	1103
225	61	59	66	55	72	57	59	64	63	86	1333	1386	1234	1134	1107
230	61	59	66	55	72	57	59	64	63	84	1337	1387	1240	1137	1108
235	61	59	66	57	73	57	59	64	63	82	1341	1391	1247	1143	1114
240	61	59	66	57	73	57	59	64	63	81	1341	1393	1251	1144	1117
245	61	59	66	57	73	57	59	64	63	79	1341	1384	1251	1146	1121
250	61	59	66	57	73	57	59	64	63	75	1342	1380	1251	1150	1123
255	61	59	66	57	73	59	59	64	63	77	1350	1375	1251	1152	1126
260	61	59	66	57	75	59	59	64	63	82	1357	1375	1252	1152	1128
265	61	59	66	57	73	59	59	64	63	86	1360	1375	1252	1155	1132
270	61	59	66	57	73	59	59	64	63	84	1364	1377	1254	1155	1135
275	61	59	66	57	73	59	59	64	63	79	1366	1382	1258	1157	1141
280	61	59	66	57	73	59	59	64	63	77	1369	1387	1258	1161	1143
285	61	59	66	57	73	59	59	64	63	77	1371	1398	1261	1164	1146
290	61	59	66	57	73	59	59	64	63	81	1375	1407	1265	1168	1148
295	61	59	66	57	75	59	59	64	63	82	1377	1422	1270	1173	1152

Table 3. T31 – T45 thermocouples temperatures in Fahrenheit degrees (2)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail					
	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45
300	61	59	66	57	75	59	59	66	63	82	1380	1427	1272	1175	1153
305	61	59	66	57	75	59	59	66	63	88	1387	1432	1278	1180	1155
310	61	59	66	57	75	59	59	66	63	86	1389	1436	1281	1182	1157
315	61	59	66	57	75	59	59	66	63	82	1391	1443	1288	1188	1161
320	61	59	66	57	75	59	59	66	63	81	1393	1440	1290	1191	1164
325	61	59	66	57	77	59	59	66	63	81	1395	1441	1294	1197	1168
330	61	59	66	57	77	59	59	66	63	82	1402	1449	1296	1200	1171
335	61	59	66	57	77	59	59	66	63	79	1405	1461	1303	1204	1177
340	61	61	66	57	79	59	59	66	63	79	1411	1463	1310	1207	1180
345	61	61	66	57	79	59	59	66	63	79	1420	1468	1319	1213	1186
350	61	61	66	57	79	59	59	66	63	77	1420	1476	1324	1215	1189
355	61	61	66	57	79	59	59	66	63	82	1420	1485	1328	1220	1195
360	61	61	66	57	79	59	59	66	63	88	1418	1481	1326	1222	1197
365	61	61	66	57	79	59	59	66	63	84	1423	1479	1324	1225	1198
370	61	61	66	57	79	59	59	66	63	86	1425	1477	1324	1229	1200
375	61	61	66	57	81	59	59	66	63	88	1431	1474	1328	1231	1204
380	61	61	66	57	81	59	59	66	63	86	1436	1474	1328	1233	1204
385	61	61	66	57	81	59	59	66	64	86	1438	1474	1328	1236	1207
390	61	61	66	57	81	59	59	66	64	88	1436	1481	1330	1240	1209
395	61	61	66	57	81	59	59	66	64	86	1440	1477	1332	1242	1211
400	61	61	66	57	82	59	59	66	63	84	1443	1474	1335	1243	1213
405	63	61	66	57	82	59	59	66	63	81	1452	1468	1339	1245	1216
410	63	61	66	57	82	59	59	66	63	79	1454	1463	1342	1247	1218
415	63	61	66	57	84	59	59	66	63	75	1461	1458	1348	1251	1222
420	63	61	66	57	84	59	59	66	63	77	1465	1458	1351	1252	1225
425	63	61	66	57	84	59	59	66	63	81	1465	1468	1353	1254	1227
430	63	61	66	57	82	59	59	66	63	81	1467	1476	1353	1256	1229
435	63	61	66	57	82	59	59	66	63	79	1468	1485	1353	1258	1229
440	63	61	66	57	82	59	59	66	63	77	1468	1486	1353	1260	1231
445	63	61	66	57	82	59	59	66	63	75	1470	1486	1353	1260	1233
450	63	61	66	57	82	59	59	66	63	75	1467	1485	1353	1261	1234
455	63	61	66	57	82	59	59	66	63	75	1467	1486	1353	1263	1234
460	63	61	66	57	84	59	59	66	63	75	1468	1488	1350	1263	1236
465	63	61	66	59	86	59	59	66	63	75	1470	1486	1348	1261	1238
470	63	61	66	59	84	59	59	66	63	77	1476	1481	1351	1261	1240
475	63	61	66	59	84	59	59	66	64	86	1481	1472	1355	1260	1242
480	63	61	66	57	84	59	61	66	64	86	1481	1467	1355	1260	1242
485	63	61	66	57	84	59	59	68	64	82	1492	1463	1359	1261	1243
490	63	61	66	57	84	59	61	68	64	81	1494	1458	1360	1263	1243
495	63	61	66	57	86	59	61	68	64	79	1488	1465	1362	1265	1245
500	63	61	66	59	86	61	61	68	64	79	1488	1468	1362	1265	1247
505	63	61	66	59	88	61	61	68	64	79	1486	1476	1362	1267	1249
510	63	61	66	59	88	61	61	68	64	79	1486	1481	1364	1267	1249
515	63	61	66	59	90	61	61	68	64	79	1483	1492	1364	1269	1251
520	63	63	66	59	90	61	61	68	64	79	1481	1492	1364	1269	1251
525	64	63	66	59	90	61	61	68	64	79	1479	1488	1366	1272	1252
530	64	63	66	59	90	61	61	68	64	79	1481	1486	1366	1274	1252
535	64	63	68	59	90	61	61	68	64	79	1483	1495	1368	1278	1252
540	64	63	68	59	90	61	61	68	64	79	1485	1503	1369	1279	1254
545	64	63	66	59	90	61	61	68	64	79	1490	1506	1371	1279	1256
550	64	63	66	59	90	61	61	68	64	81	1494	1506	1373	1281	1258
555	64	63	66	59	90	61	61	68	64	79	1501	1504	1377	1281	1260
560	64	63	66	59	90	61	61	68	64	81	1504	1504	1378	1283	1260
565	64	63	66	59	88	61	61	68	64	79	1506	1503	1378	1283	1263
570	64	63	66	59	88	61	61	68	64	81	1504	1506	1378	1285	1263
575	64	63	66	59	90	61	61	68	64	86	1503	1503	1380	1287	1267
580	64	63	66	59	90	61	61	68	64	86	1503	1504	1384	1288	1267
585	64	63	66	59	90	61	61	68	64	84	1504	1515	1386	1290	1269
590	64	63	66	59	90	61	61	68	64	84	1510	1513	1386	1292	1269
595	64	63	66	59	91	61	61	68	64	84	1512	1513	1384	1292	1269

Table 3. T31 – T45 thermocouples temperatures in Fahrenheit degrees (3)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail					
	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45
600	64	63	66	59	90	61	61	68	66	88	1503	1521	1384	1290	1269
605	64	63	66	59	90	61	61	68	66	90	1501	1530	1387	1290	1269
610	64	63	66	59	91	61	61	68	66	90	1499	1540	1391	1292	1269
615	66	63	66	59	91	61	61	68	66	97	1501	1553	1398	1294	1270
620	64	63	66	59	91	61	61	68	68	100	1510	1564	1411	1299	1276
625	64	63	66	61	91	61	61	68	68	99	1512	1573	1416	1305	1279
630	64	63	66	61	93	61	61	68	68	104	1519	1584	1420	1308	1283
635	64	63	66	61	93	61	61	68	68	104	1524	1591	1422	1310	1285
640	66	63	66	61	93	61	61	68	70	115	1537	1596	1423	1314	1290
645	66	63	66	61	93	61	61	68	72	117	1539	1594	1423	1315	1292
650	66	64	66	61	95	61	61	68	72	113	1544	1591	1423	1319	1296
655	66	64	66	63	95	61	61	68	72	109	1544	1600	1425	1319	1297
660	66	64	66	61	95	61	61	68	72	115	1553	1612	1425	1321	1301
665	66	64	66	63	95	61	61	68	72	115	1558	1620	1425	1323	1303
670	66	64	66	61	97	61	61	68	79	140	1558	1621	1425	1324	1306
675	66	64	66	63	97	61	61	68	79	144	1562	1625	1425	1324	1308
680	66	64	66	61	99	61	61	68	79	151	1573	1620	1427	1326	1312
685	66	64	66	63	99	61	61	68	79	147	1578	1609	1427	1328	1314
690	66	64	66	61	100	63	61	68	81	149	1576	1589	1429	1330	1317
695	66	64	66	61	100	63	61	68	81	147	1578	1584	1431	1330	1317
700	66	64	66	61	100	63	61	68	79	142	1576	1591	1429	1332	1321
705	66	64	66	61	102	63	61	68	79	145	1575	1593	1431	1335	1323
710	66	64	68	63	102	63	61	68	81	149	1578	1591	1432	1337	1324
715	66	64	68	63	102	63	61	68	81	145	1578	1587	1434	1339	1326
720	66	64	68	63	104	63	61	68	81	136	1580	1584	1438	1341	1330
725	68	64	68	63	104	63	61	68	79	136	1585	1584	1440	1342	1332
730	68	64	68	63	104	63	61	68	77	133	1587	1580	1436	1344	1333
735	68	64	68	63	106	63	61	68	77	140	1585	1576	1436	1346	1335
740	68	64	68	61	108	63	61	68	75	138	1580	1578	1440	1350	1339
745	68	64	68	61	108	63	61	68	75	136	1578	1584	1443	1351	1341
750	68	64	68	63	117	63	61	68	75	135	1573	1596	1450	1351	1344
755	68	64	68	63	129	63	61	68	81	147	1576	1609	1452	1353	1348
760	68	64	68	63	138	63	61	68	79	162	1576	1609	1458	1355	1351
765	68	64	68	64	149	63	61	68	77	163	1575	1607	1465	1357	1353
770	68	64	70	64	154	63	61	68	75	154	1584	1611	1470	1360	1359
775	68	64	68	64	154	63	61	68	75	145	1591	1605	1472	1362	1359
780	68	64	70	64	153	63	61	68	73	149	1600	1607	1476	1364	1360
785	70	64	70	64	151	63	61	68	73	142	1605	1612	1477	1366	1360
790	70	64	70	64	156	63	61	68	72	135	1612	1607	1479	1369	1362
795	70	64	68	64	154	63	61	68	72	129	1614	1602	1481	1371	1362
800	70	64	68	64	151	63	61	68	72	126	1612	1600	1483	1375	1362
805	70	64	68	64	149	63	61	68	73	133	1616	1596	1485	1377	1364
810	70	66	68	64	145	64	61	68	72	126	1614	1596	1481	1375	1364
815	70	66	68	64	144	64	63	68	72	127	1611	1594	1477	1375	1364
820	70	66	68	64	138	64	63	68	72	133	1609	1598	1472	1375	1362
825	70	66	68	63	138	64	63	68	73	136	1605	1603	1468	1375	1364
830	70	66	70	64	160	64	63	68	73	140	1603	1607	1463	1375	1364
835	70	66	70	68	189	64	63	68	73	136	1605	1607	1463	1375	1364
840	70	66	70	70	208	64	63	68	72	135	1612	1609	1468	1375	1368
845	70	66	70	73	239	64	63	68	72	131	1618	1616	1470	1377	1369
850	72	66	70	79	262	66	63	68	70	120	1616	1614	1470	1378	1369
855	72	66	70	82	273	66	63	68	70	117	1611	1609	1470	1378	1368
860	72	66	70	79	255	66	63	68	70	109	1607	1607	1470	1377	1369
865	73	66	70	77	246	66	63	68	70	115	1614	1609	1472	1375	1369
870	72	66	70	75	223	66	63	68	70	111	1623	1611	1479	1377	1375
875	73	66	70	75	210	68	63	68	70	113	1629	1611	1479	1375	1377
880	73	66	70	73	199	70	63	68	70	122	1629	1605	1477	1373	1378
885	73	66	70	72	194	70	64	68	70	135	1630	1605	1474	1371	1378
890	73	66	70	70	187	70	64	68	70	144	1625	1603	1474	1373	1380
895	73	66	70	70	183	70	64	68	70	140	1625	1609	1476	1375	1380

Table 3. T31 – T45 thermocouples temperatures in Fahrenheit degrees (4)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail					
	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45
900	73	66	70	70	183	70	64	70	72	153	1625	1607	1477	1377	1380
905	75	68	70	70	180	70	64	68	73	153	1632	1602	1479	1380	1382
910	75	68	70	70	174	73	64	68	73	165	1632	1602	1483	1386	1382
915	75	68	70	70	172	73	64	68	75	163	1634	1612	1486	1393	1384
920	75	68	70	70	167	75	64	68	73	158	1641	1623	1494	1402	1391
925	75	68	70	68	165	75	64	68	73	154	1648	1629	1494	1405	1393
930	73	68	70	68	160	77	64	68	75	162	1659	1645	1495	1409	1395
935	73	68	70	68	162	77	64	68	77	162	1661	1654	1497	1411	1396
940	73	68	70	66	153	79	66	68	77	160	1668	1657	1503	1414	1400
945	73	68	70	66	151	82	66	70	75	160	1672	1659	1506	1418	1404
950	75	68	70	66	149	88	66	70	73	156	1675	1677	1513	1423	1407
955	75	68	72	66	147	91	68	70	75	162	1674	1684	1513	1425	1411
960	75	68	72	66	140	91	68	70	73	158	1674	1688	1515	1423	1413
965	75	68	72	66	140	95	70	70	73	153	1675	1690	1517	1423	1414
970	75	68	72	64	138	109	70	70	75	162	1679	1684	1519	1423	1416
975	75	68	72	64	135	113	72	70	75	169	1679	1681	1522	1423	1418
980	75	68	72	64	135	108	72	72	75	158	1679	1679	1524	1423	1420
985	75	68	72	64	135	108	72	72	75	153	1681	1672	1524	1423	1420
990	75	68	72	64	138	109	72	72	77	154	1684	1666	1526	1423	1420
995	75	68	72	64	140	111	72	72	77	149	1683	1665	1530	1423	1422
1000	75	70	72	64	144	113	73	72	77	142	1683	1668	1535	1425	1422
1005	75	68	72	64	147	118	73	72	77	144	1677	1679	1535	1425	1422
1010	77	70	72	64	153	136	77	73	81	149	1675	1684	1533	1423	1420
1015	77	70	72	64	156	135	79	73	79	144	1665	1681	1531	1422	1422
1020	79	70	72	64	172	131	81	73	77	129	1661	1668	1528	1420	1422
1025	81	70	72	64	176	135	82	73	77	126	1661	1661	1526	1420	1422
1030	81	72	72	64	185	140	86	73	75	118	1661	1650	1530	1420	1422
1035	81	72	72	64	192	142	88	73	75	117	1663	1641	1533	1422	1423
1040	82	72	72	64	207	145	90	75	75	115	1668	1647	1539	1422	1423
1045	82	72	72	64	214	144	91	75	75	113	1672	1648	1542	1423	1425
1050	84	73	72	64	216	147	95	75	73	109	1688	1672	1546	1425	1425
1055	88	73	72	64	214	153	99	75	73	111	1688	1675	1548	1427	1425
1060	95	75	72	66	226	153	102	77	75	111	1683	1674	1548	1429	1427
1065	99	77	72	68	235	162	104	77	75	111	1690	1674	1549	1431	1427
1070	102	77	73	70	243	169	108	77	75	113	1692	1677	1548	1431	1427
1075	109	79	73	72	248	172	111	79	75	113	1688	1683	1548	1432	1429
1080	120	82	73	75	257	171	113	81	77	115	1695	1692	1548	1432	1429
1085	142	90	75	75	271	171	115	81	77	118	1692	1693	1548	1432	1429
1090	192	104	81	79	288	187	126	86	79	118	1695	1684	1548	1436	1429
1095	219	118	86	81	289	198	131	86	79	122	1702	1679	1551	1438	1429
1100	257	138	99	88	302	201	145	90	82	126	1699	1681	1553	1440	1431
1105	293	163	111	95	307	203	154	97	86	133	1695	1693	1557	1443	1432
1110	315	181	118	100	309	208	160	100	90	135	1697	1692	1558	1445	1434
1115	327	192	126	104	307	208	167	108	91	136	1701	1688	1557	1445	1434
1120	329	194	129	106	306	208	171	109	95	136	1692	1695	1555	1445	1436
1125	327	194	131	108	302	210	180	115	99	138	1686	1692	1553	1443	1438
1130	325	199	133	111	298	212	181	117	100	140	1690	1686	1553	1443	1438
1135	322	199	127	108	291	210	185	120	102	142	1693	1675	1555	1445	1440
1140	324	198	126	106	288	216	189	124	106	144	1697	1677	1555	1447	1440
1145	322	194	122	104	279	225	198	131	113	149	1692	1688	1558	1450	1440
1150	324	192	122	102	271	230	199	135	113	153	1693	1688	1558	1450	1440
1155	325	194	118	102	266	235	201	140	118	154	1702	1675	1560	1450	1441
1160	324	190	117	100	261	239	203	142	120	156	1706	1674	1560	1450	1441
1165	324	189	118	100	255	243	205	145	126	158	1701	1670	1562	1450	1443
1170	325	187	118	100	253	244	201	147	127	162	1697	1668	1562	1450	1443
1175	333	198	122	102	252	253	207	149	129	163	1693	1666	1560	1450	1443
1180	336	207	126	104	252	253	208	149	129	165	1692	1666	1560	1450	1443
1185	325	223	131	108	253	255	210	153	129	167	1693	1670	1562	1450	1445
1190	318	230	135	111	252	257	212	153	131	167	1690	1686	1564	1450	1445
1195	313	246	149	118	252	255	208	154	133	163	1681	1692	1564	1450	1445

Table 3. T31 – T45 thermocouples temperatures in Fahrenheit degrees (5)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail					
	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45
1200	309	255	151	120	253	248	208	156	133	163	1683	1686	1564	1450	1445
1205	320	264	156	126	257	241	210	158	133	163	1690	1690	1564	1450	1445
1210	322	268	158	127	257	235	208	160	135	163	1690	1688	1564	1450	1445
1215	320	268	162	129	255	228	208	162	136	163	1693	1686	1564	1450	1445
1220	316	264	162	127	252	225	208	163	138	163	1699	1675	1564	1450	1447
1225	309	259	163	131	248	219	208	163	138	163	1699	1670	1560	1449	1447
1230	304	257	162	127	246	216	210	163	136	163	1690	1670	1562	1450	1447
1235	307	259	167	129	244	212	212	165	138	165	1675	1679	1562	1449	1449
1240	311	259	171	131	243	217	214	169	140	165	1668	1693	1562	1449	1449
1245	307	257	169	127	241	210	214	171	142	169	1665	1692	1560	1447	1450
1250	306	257	167	127	241	205	214	172	144	169	1663	1690	1562	1449	1450
1255	307	257	167	126	241	201	214	174	145	171	1677	1686	1566	1449	1452
1260	311	257	169	127	241	201	216	176	147	171	1683	1679	1567	1450	1452
1265	316	259	172	129	241	207	216	180	153	171	1693	1672	1569	1452	1450
1270	316	261	174	131	241	208	217	181	153	172	1697	1668	1567	1452	1450
1275	318	261	174	133	241	207	216	180	147	174	1692	1672	1566	1454	1449
1280	318	259	176	135	241	201	216	180	147	174	1688	1670	1566	1454	1449
1285	322	257	181	136	241	205	216	178	144	180	1679	1663	1564	1454	1449
1290	322	253	185	142	241	205	214	176	144	178	1675	1657	1560	1452	1449
1295	324	252	190	147	241	205	223	171	138	178	1665	1647	1555	1449	1450
1300	318	248	190	145	241	201	226	167	133	174	1659	1641	1557	1449	1450
1305	309	244	196	149	241	199	232	167	135	174	1670	1636	1557	1450	1450
1310	311	243	199	149	241	199	232	165	135	174	1681	1641	1553	1450	1449
1315	313	241	203	154	243	201	237	165	133	174	1683	1643	1553	1450	1447
1320	307	239	201	154	243	205	235	163	129	176	1681	1643	1557	1450	1447
1325	304	237	205	154	241	207	235	162	129	174	1672	1645	1558	1452	1449
1330	307	237	207	156	243	210	234	160	126	174	1674	1639	1555	1452	1449
1335	307	235	208	160	241	216	235	158	122	174	1675	1638	1557	1452	1450
1340	304	234	207	158	241	217	235	158	122	174	1670	1638	1555	1452	1452
1345	304	234	203	154	241	216	239	160	126	174	1675	1641	1553	1452	1452
1350	307	232	198	151	241	217	244	160	127	174	1679	1648	1555	1454	1452
1355	304	234	196	149	241	214	250	165	133	178	1692	1661	1555	1454	1452
1360	307	235	194	147	241	208	255	169	138	181	1699	1665	1557	1454	1452
1365	342	246	199	151	244	210	259	171	142	183	1704	1670	1557	1454	1450
1370	352	248	196	149	246	217	257	169	140	187	1697	1670	1557	1452	1450
1375	352	250	190	145	244	223	250	167	136	185	1681	1677	1557	1452	1452
1380	351	252	190	145	244	221	244	165	136	185	1668	1681	1553	1452	1452
1385	356	250	192	147	246	216	244	162	131	180	1661	1675	1549	1450	1452
1390	361	246	194	149	250	216	244	162	131	181	1665	1677	1549	1450	1452
1395	369	243	198	151	250	214	244	162	131	178	1668	1668	1548	1452	1452
1400	370	243	199	154	252	216	244	162	131	176	1670	1672	1548	1454	1452
1405	360	235	199	153	253	216	243	162	129	178	1674	1686	1551	1454	1452
1410	358	235	199	153	259	216	248	162	129	178	1681	1693	1553	1454	1452
1415	343	232	198	153	259	219	244	162	127	180	1683	1693	1555	1454	1454
1420	342	232	198	154	257	223	241	160	126	178	1686	1690	1557	1454	1454
1425	343	228	198	154	257	223	243	162	129	178	1690	1688	1558	1456	1452
1430	343	228	198	154	257	223	241	162	129	180	1686	1684	1558	1458	1454
1435	345	232	201	158	264	230	232	158	126	178	1688	1674	1558	1458	1454
1440	340	232	203	160	268	234	226	156	124	178	1692	1675	1558	1458	1454
1445	343	235	203	162	270	241	221	154	126	178	1692	1681	1560	1458	1456
1450	342	234	205	162	270	241	223	154	124	180	1692	1679	1560	1458	1456
1455	338	235	207	162	268	241	217	153	122	178	1693	1665	1560	1458	1456
1460	342	241	207	163	266	241	216	151	122	176	1688	1663	1560	1458	1456
1465	336	250	203	163	262	244	214	149	120	174	1693	1668	1560	1458	1458
1470	329	253	201	163	261	246	212	147	118	174	1693	1674	1569	1459	1459
1475	311	259	201	163	259	246	223	154	122	172	1702	1679	1582	1465	1463
1480	302	262	199	162	259	248	237	160	126	172	1706	1686	1585	1467	1463
1485	291	266	198	160	255	248	250	165	131	178	1710	1688	1589	1468	1465
1490	280	271	199	162	253	246	255	171	136	180	1715	1684	1591	1470	1465
1495	270	280	198	160	253	246	264	176	142	183	1717	1688	1591	1470	1467

Table 3. T31 – T45 thermocouples temperatures in Fahrenheit degrees (6)

time (s)	temperature (°F)														
	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail					
	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45
1500	262	284	199	160	253	244	264	180	144	185	1713	1686	1589	1470	1467
1505	259	288	203	160	255	246	268	178	142	187	1715	1683	1589	1474	1467
1510	257	288	205	163	255	246	264	176	140	187	1722	1684	1591	1476	1468
1515	255	289	207	165	261	244	262	178	138	185	1733	1690	1593	1477	1472
1520	253	288	205	165	259	246	261	176	136	185	1738	1693	1598	1481	1476
1525	253	288	205	165	259	244	257	176	135	187	1760	1697	1602	1485	1477
1530	252	288	205	165	259	244	250	174	133	187	1762	1701	1605	1488	1479
1535	250	286	205	167	259	241	252	172	136	187	1753	1702	1609	1492	1483
1540	250	284	205	167	259	239	250	174	138	187	1747	1704	1609	1494	1485
1545	252	284	207	171	261	243	244	171	136	187	1749	1702	1609	1495	1486
1550	252	284	208	172	264	243	241	171	135	185	1751	1704	1609	1497	1488
1555	257	280	207	174	268	243	235	169	135	185	1747	1708	1612	1497	1490
1560	264	277	207	174	268	243	232	167	133	187	1756	1699	1612	1497	1490
1565	273	271	205	174	271	246	232	160	129	185	1760	1697	1611	1499	1490
1570	275	268	205	172	271	244	226	154	126	181	1758	1708	1609	1499	1492
1575	275	264	205	174	271	248	217	145	124	178	1751	1722	1611	1501	1492
1580	273	264	207	176	275	252	216	144	122	176	1747	1724	1612	1503	1492
1585	270	264	207	176	277	252	217	142	122	174	1747	1726	1614	1503	1494
1590	268	264	208	176	277	252	216	142	122	174	1753	1728	1620	1503	1495
1595	264	266	212	178	279	250	216	142	120	176	1756	1733	1623	1504	1497
1600	266	268	212	178	277	248	216	142	122	176	1758	1735	1627	1504	1499
1605	262	268	214	180	282	248	214	138	122	172	1764	1733	1629	1508	1501
1610	262	266	214	180	282	248	208	136	120	174	1753	1735	1627	1510	1503
1615	261	266	216	181	288	243	203	135	120	174	1746	1733	1623	1510	1503
1620	259	262	214	181	291	235	196	131	118	172	1747	1737	1627	1510	1504
1625	257	262	212	180	293	232	194	131	117	171	1749	1735	1627	1510	1506
1630	253	261	210	180	295	225	190	126	115	171	1760	1738	1627	1510	1506
1635	252	261	212	180	297	221	183	124	115	169	1771	1731	1625	1508	1506
1640	248	257	210	178	297	214	180	122	113	167	1782	1731	1629	1510	1506
1645	244	257	212	180	298	212	176	118	113	165	1783	1731	1627	1512	1506
1650	243	255	210	180	297	212	172	115	111	162	1773	1722	1623	1512	1504
1655	239	255	210	180	295	207	167	113	109	158	1765	1722	1621	1512	1504
1660	237	255	210	181	298	201	163	113	109	163	1765	1726	1625	1515	1506
1665	234	257	208	180	298	199	162	117	113	163	1755	1722	1625	1513	1504
1670	234	257	207	178	295	196	160	115	111	163	1742	1711	1620	1512	1504
1675	232	257	207	180	297	196	154	113	109	165	1746	1706	1618	1512	1506
1680	230	255	208	180	298	192	153	113	109	169	1740	1704	1618	1512	1508
1685	230	255	208	180	298	194	151	113	109	171	1742	1711	1620	1512	1508
1690	232	255	207	180	302	192	151	111	108	172	1746	1713	1621	1512	1508
1695	232	253	203	178	302	192	149	113	108	174	1746	1717	1620	1512	1510
1700	232	253	199	174	297	194	153	113	109	180	1740	1729	1618	1510	1510
1705	232	255	198	172	295	194	154	111	108	181	1735	1731	1618	1510	1510
1710	228	255	198	172	297	194	156	109	106	174	1737	1737	1618	1510	1510
1715	228	255	198	174	300	190	154	109	106	171	1737	1738	1620	1510	1510
1720	226	257	198	172	300	187	154	109	108	172	1746	1746	1623	1510	1512
1725	226	255	196	171	298	187	154	109	109	174	1756	1749	1623	1512	1512
1730	226	253	198	171	295	185	151	111	109	178	1760	1749	1629	1513	1512
1735	226	253	196	171	298	183	149	111	109	180	1767	1746	1629	1515	1512
1740	223	252	192	169	297	183	147	111	109	176	1767	1737	1630	1517	1512
1745	223	250	190	169	297	185	147	111	109	174	1764	1729	1630	1517	1512
1750	223	248	189	167	297	181	147	113	111	176	1760	1729	1627	1517	1512
1755	221	248	187	165	295	183	145	113	111	178	1755	1731	1625	1515	1512
1760	221	244	183	162	293	181	145	113	111	183	1755	1733	1625	1515	1510
1765	225	241	178	158	293	178	151	111	111	185	1751	1729	1623	1515	1508
1770	225	235	174	158	295	178	153	111	109	181	1747	1731	1625	1515	1510
1775	226	232	171	154	295	181	154	111	109	180	1746	1729	1623	1513	1510
1780	228	225	167	154	293	185	156	109	109	176	1737	1722	1620	1513	1506
1785	228	219	165	153	295	187	154	109	108	174	1746	1726	1618	1515	1506
1790	230	212	160	149	291	190	158	111	109	174	1758	1735	1621	1515	1508
1795	230	208	156	145	289	194	160	109	109	174	1756	1746	1623	1515	1510

Table 4. T46 – T54 thermocouples temperatures in Fahrenheit degrees (1)

time (s)	temperature °F								
	T46	T47	T48	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail
0	73	77	77	61	61	61	61	61	61
5	88	88	95	59	61	61	61	61	61
10	140	140	174	61	61	61	61	61	61
15	201	201	268	61	61	61	61	61	61
20	331	329	439	59	61	61	61	61	61
25	417	417	545	59	61	61	61	61	61
30	534	540	669	59	61	61	61	61	61
35	615	612	734	59	61	61	61	61	61
40	702	703	820	59	61	61	61	61	61
45	748	747	858	59	61	61	61	61	61
50	806	806	894	59	61	61	61	61	61
55	837	837	912	59	61	61	61	61	61
60	876	876	939	59	61	61	61	61	61
65	894	905	952	59	61	61	61	61	61
70	919	930	963	59	61	61	61	61	61
75	932	945	970	59	61	61	61	61	61
80	955	959	986	59	61	61	61	61	61
85	970	972	995	61	61	61	61	61	61
90	981	981	1006	61	59	61	61	61	61
95	990	993	1011	61	59	61	61	61	61
100	1000	1008	1024	59	59	61	61	61	61
105	1006	1017	1027	59	59	61	61	61	61
110	1018	1029	1038	61	61	61	61	61	61
115	1029	1040	1044	61	61	61	61	61	61
120	1038	1047	1045	61	61	61	61	61	61
125	1049	1058	1058	61	61	61	61	61	61
130	1056	1087	1092	61	61	61	61	61	61
135	1072	1128	1153	61	61	61	61	61	61
140	1083	1143	1159	61	61	61	61	61	61
145	1105	1143	1144	59	59	61	61	61	61
150	1108	1143	1141	59	59	61	61	61	61
155	1112	1139	1134	59	59	61	61	61	61
160	1114	1139	1135	59	59	61	61	61	61
165	1114	1137	1137	59	61	61	61	61	61
170	1117	1139	1137	59	61	61	61	61	61
175	1121	1141	1139	59	59	61	61	61	61
180	1121	1144	1139	59	59	61	61	61	61
185	1128	1144	1143	59	59	61	61	61	61
190	1134	1146	1146	59	59	61	61	61	61
195	1141	1152	1152	59	61	61	61	61	61
200	1143	1155	1155	59	61	61	61	61	61
205	1146	1164	1157	59	59	61	61	61	61
210	1150	1166	1162	59	59	61	61	61	61
215	1159	1168	1164	59	61	59	61	61	61
220	1162	1170	1161	59	59	59	61	61	61
225	1157	1170	1162	59	59	61	61	61	61
230	1159	1170	1164	59	61	61	61	61	61
235	1170	1173	1166	59	61	61	61	61	61
240	1173	1175	1171	59	61	59	61	61	61
245	1179	1186	1177	59	61	61	61	61	61
250	1179	1191	1182	59	61	61	61	61	61
255	1180	1200	1189	59	61	61	61	61	61
260	1182	1202	1197	59	59	61	61	61	61
265	1182	1202	1200	59	59	61	61	61	61
270	1188	1204	1200	59	59	61	61	61	61
275	1191	1206	1200	59	59	61	61	61	61
280	1197	1209	1200	59	59	61	61	61	61
285	1202	1209	1202	59	59	61	61	61	61
290	1206	1211	1206	59	59	61	61	61	61
295	1209	1215	1209	61	59	61	61	61	61

Table 4. T46 – T54 thermocouples temperatures in Fahrenheit degrees (2)

time (s)	temperature °F									
	T46	T47	T48	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail
300	1215	1218	1209	61	61	61	61	61	61	61
305	1216	1215	1216	59	61	61	61	61	61	61
310	1216	1215	1220	59	61	61	61	61	61	61
315	1218	1216	1216	59	61	61	61	61	61	61
320	1216	1218	1216	59	61	61	61	61	61	61
325	1224	1231	1229	59	59	61	61	61	61	61
330	1229	1229	1229	59	59	61	61	61	61	61
335	1233	1236	1238	59	59	61	61	61	61	61
340	1234	1242	1242	59	59	61	61	61	61	61
345	1240	1243	1247	59	61	61	61	61	61	61
350	1242	1245	1249	59	61	61	61	61	61	63
355	1247	1247	1247	59	61	61	61	61	61	63
360	1249	1252	1249	59	61	63	61	61	61	64
365	1258	1260	1249	59	61	63	61	61	61	66
370	1256	1260	1256	59	61	63	61	61	61	64
375	1261	1267	1263	59	61	61	61	61	61	63
380	1263	1272	1265	59	61	61	61	61	61	63
385	1265	1281	1274	59	61	61	61	61	61	63
390	1263	1281	1272	59	61	61	61	61	63	63
395	1263	1285	1281	59	61	61	61	61	63	63
400	1263	1290	1288	59	61	63	61	61	63	64
405	1272	1297	1288	59	61	61	61	61	63	63
410	1278	1297	1288	59	61	63	61	61	63	64
415	1283	1305	1294	61	61	63	63	63	63	68
420	1285	1306	1297	61	61	63	63	63	63	68
425	1285	1303	1290	61	61	63	63	63	63	64
430	1288	1303	1292	61	61	63	63	63	63	64
435	1288	1305	1296	61	61	63	63	63	63	64
440	1287	1305	1299	61	61	63	63	63	63	64
445	1288	1308	1299	61	61	63	63	63	63	66
450	1288	1308	1296	61	61	63	63	63	63	68
455	1292	1306	1296	61	61	63	63	63	63	66
460	1294	1305	1296	61	61	63	63	63	63	66
465	1294	1308	1305	61	61	63	63	63	63	64
470	1297	1310	1308	61	61	63	63	63	63	66
475	1305	1317	1308	61	61	63	63	63	63	68
480	1306	1321	1312	61	61	63	63	63	64	73
485	1315	1326	1310	61	61	63	63	63	63	72
490	1317	1326	1310	61	61	63	63	63	64	68
495	1310	1324	1315	61	61	63	63	63	63	66
500	1310	1328	1323	61	61	64	63	63	63	68
505	1314	1326	1314	61	61	64	63	63	63	72
510	1312	1326	1315	61	61	64	63	63	63	75
515	1310	1319	1310	61	61	64	63	63	63	72
520	1314	1321	1312	61	61	64	63	63	64	72
525	1319	1324	1315	61	61	64	63	63	64	70
530	1317	1326	1321	61	61	64	63	63	64	68
535	1323	1332	1324	61	63	64	63	63	64	66
540	1326	1333	1326	61	63	64	63	63	64	68
545	1328	1332	1328	61	63	64	63	63	64	70
550	1328	1339	1335	61	61	64	63	63	64	72
555	1330	1341	1333	61	61	64	63	63	64	72
560	1330	1342	1332	61	61	64	63	63	64	73
565	1333	1350	1333	61	61	64	63	63	64	70
570	1333	1346	1332	61	61	64	63	63	64	68
575	1332	1341	1333	61	61	64	63	63	63	66
580	1332	1344	1337	61	61	64	63	63	64	66
585	1339	1348	1333	63	61	64	63	63	63	66
590	1341	1350	1333	63	63	64	64	63	63	66
595	1341	1350	1339	63	63	64	64	64	64	72

Table 4. T46 – T54 thermocouples temperatures in Fahrenheit degrees (3)

time (s)	temperature °C									
	T46	T47	T48	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail
600	1335	1342	1339	63	63	64	64	64	64	72
605	1337	1344	1346	63	63	64	64	64	64	72
610	1342	1344	1344	63	63	64	64	64	64	73
615	1350	1355	1350	63	63	64	64	64	64	73
620	1362	1375	1362	63	63	64	64	64	64	72
625	1368	1378	1369	63	63	64	64	64	64	73
630	1371	1380	1382	63	63	64	64	64	64	70
635	1375	1382	1393	63	63	66	64	64	64	70
640	1382	1391	1398	63	63	66	64	64	64	70
645	1386	1398	1404	63	63	66	64	64	64	72
650	1395	1405	1413	63	63	66	64	64	64	72
655	1391	1405	1418	63	63	66	64	64	64	68
660	1391	1411	1429	63	63	66	64	64	64	68
665	1396	1411	1431	63	63	66	64	64	64	70
670	1402	1405	1432	63	63	66	64	64	64	73
675	1402	1411	1440	63	63	66	64	64	64	75
680	1409	1414	1443	63	63	66	64	64	64	75
685	1407	1416	1443	63	63	66	64	64	64	73
690	1409	1422	1438	63	63	66	64	64	64	72
695	1413	1429	1447	63	63	66	66	64	64	72
700	1418	1425	1447	63	63	66	66	66	66	68
705	1416	1425	1449	63	63	66	66	66	66	68
710	1420	1431	1454	64	63	66	66	66	66	75
715	1425	1432	1452	64	63	66	66	66	66	82
720	1436	1436	1447	64	63	68	66	66	66	82
725	1443	1443	1449	64	63	66	66	66	66	77
730	1441	1438	1456	64	63	68	66	66	66	77
735	1434	1438	1461	64	63	68	66	66	66	82
740	1432	1438	1476	64	63	68	64	64	66	79
745	1436	1438	1467	64	63	68	64	66	66	77
750	1441	1445	1474	64	63	68	64	66	66	75
755	1445	1447	1463	64	63	68	64	66	66	75
760	1456	1458	1465	64	63	68	66	66	68	72
765	1459	1458	1463	64	63	68	66	66	68	72
770	1463	1467	1468	64	63	68	66	66	68	75
775	1467	1474	1463	64	64	70	66	66	68	75
780	1467	1474	1467	64	64	70	66	66	68	82
785	1468	1474	1472	64	64	70	66	66	68	84
790	1467	1476	1472	64	64	70	66	66	68	82
795	1470	1477	1476	64	64	70	66	66	68	81
800	1465	1481	1476	64	64	70	66	66	68	79
805	1465	1479	1470	64	64	70	66	66	68	77
810	1461	1472	1477	64	64	72	66	66	68	79
815	1454	1468	1477	64	66	72	66	66	68	81
820	1456	1470	1494	64	64	72	66	66	68	82
825	1452	1468	1497	64	64	72	66	66	68	86
830	1450	1463	1499	66	64	72	66	66	68	88
835	1452	1461	1499	66	64	72	66	66	68	82
840	1465	1468	1501	66	64	73	68	68	70	84
845	1467	1474	1506	66	64	73	68	70	70	84
850	1463	1474	1521	66	64	75	70	72	72	86
855	1463	1477	1528	66	64	75	68	72	72	82
860	1477	1486	1544	66	64	75	70	73	73	84
865	1477	1485	1537	66	64	75	70	72	72	88
870	1488	1486	1530	66	66	75	70	72	72	91
875	1494	1495	1535	66	66	79	70	73	73	93
880	1497	1495	1522	66	66	77	70	73	73	88
885	1488	1488	1517	66	66	84	70	73	73	91
890	1483	1492	1533	66	66	82	72	73	73	93
895	1486	1486	1524	68	66	82	72	73	73	97

Table 4. T46 – T54 thermocouples temperatures in Fahrenheit degrees (4)

time (s)	temperature °F									
	T46	T47	T48	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail
900	1492	1488	1519		68	66	88	72	72	100
905	1490	1494	1519	68	66	88	73	72	72	100
910	1492	1499	1539	68	66	90	73	72	72	104
915	1497	1510	1562	68	66	90	72	73	73	102
920	1513	1522	1582	68	66	90	72	73	73	102
925	1513	1522	1587	68	66	88	72	75	75	100
930	1513	1531	1603	70	66	91	72	75	75	102
935	1519	1531	1602	68	66	95	70	75	75	100
940	1521	1533	1584	68	66	91	72	75	75	97
945	1517	1530	1584	68	66	91	73	75	75	102
950	1528	1537	1585	68	66	95	72	75	75	102
955	1533	1539	1584	68	66	91	72	75	75	100
960	1539	1551	1576	68	66	97	70	75	75	106
965	1542	1549	1575	68	66	93	73	73	73	104
970	1548	1548	1582	68	66	97	72	75	75	104
975	1546	1546	1582	68	66	99	73	77	77	102
980	1564	1558	1575	70	66	99	79	77	77	99
985	1578	1566	1569	70	66	97	81	77	77	102
990	1575	1564	1562	70	70	99	77	77	77	106
995	1578	1578	1566	70	68	100	77	75	75	100
1000	1578	1585	1587	70	68	100	77	79	79	104
1005	1571	1575	1585	70	68	99	75	77	77	104
1010	1571	1571	1587	70	68	99	73	79	79	108
1015	1576	1571	1576	70	68	100	75	79	79	109
1020	1582	1575	1569	72	68	104	79	77	77	108
1025	1585	1575	1566	72	68	102	81	79	79	104
1030	1587	1578	1564	72	68	100	82	79	79	102
1035	1591	1582	1566	70	68	100	81	77	77	106
1040	1593	1587	1567	72	68	97	81	77	77	104
1045	1594	1589	1562	72	68	91	81	77	77	102
1050	1585	1585	1582	72	68	100	82	77	77	104
1055	1578	1582	1575	70	68	104	77	77	77	104
1060	1584	1587	1582	70	68	100	81	75	75	109
1065	1585	1594	1584	70	77	95	81	77	77	108
1070	1596	1600	1591	70	68	100	77	75	75	108
1075	1598	1600	1582	70	68	102	77	75	75	108
1080	1589	1603	1602	70	68	100	77	77	77	109
1085	1591	1594	1593	70	70	100	75	77	77	106
1090	1598	1596	1576	70	70	108	73	81	81	111
1095	1605	1600	1580	70	70	106	75	81	81	109
1100	1600	1616	1607	72	68	106	77	77	77	109
1105	1594	1605	1602	72	68	106	75	77	77	108
1110	1598	1618	1614	70	72	100	75	77	77	109
1115	1596	1616	1627	72	68	102	79	75	75	109
1120	1600	1609	1623	72	70	102	75	77	77	109
1125	1602	1605	1616	72	70	106	75	77	77	109
1130	1598	1607	1616	72	70	104	75	77	77	111
1135	1605	1607	1609	73	70	100	75	81	81	109
1140	1600	1609	1607	73	70	106	77	81	81	108
1145	1596	1612	1614	73	70	104	79	81	81	111
1150	1598	1620	1634	73	72	104	81	79	79	108
1155	1603	1621	1627	73	72	106	79	81	81	111
1160	1603	1621	1625	72	70	102	79	81	81	109
1165	1611	1614	1605	72	70	108	79	81	81	111
1170	1603	1612	1611	72	70	104	77	82	82	108
1175	1605	1611	1594	72	70	104	77	77	77	109
1180	1600	1616	1616	73	70	104	77	77	77	109
1185	1587	1614	1616	73	70	108	77	77	77	108
1190	1589	1609	1607	73	70	99	77	79	79	109
1195	1584	1602	1602	72	73	106	79	79	79	108

Table 4. T46 – T54 thermocouples temperatures in Fahrenheit degrees (5)

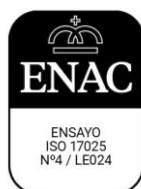
time (s)	temperature °F									
	T46	T47	T48	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail
1200	1585	1612	1605		72	72	90	77	79	104
1205	1587	1605	1602	73	70		86	75	75	100
1210	1591	1603	1593	73	70	108	75	79		102
1215	1589	1594	1585	73	72	109	75	77		109
1220	1603	1603	1580	73	72	108	75	73		113
1225	1602	1600	1573	73	72	102	75	75		109
1230	1591	1598	1580	73	73	106	75	75		104
1235	1580	1598	1593	73	72	108	79	77		108
1240	1580	1594	1589	73	72	102	77	77		100
1245	1585	1602	1584	73	72	111	75	75		104
1250	1585	1607	1596	73	75	108	77	77		100
1255	1589	1611	1602	73	72	106	77	77		100
1260	1591	1611	1596	75	72	95	79	75		97
1265	1585	1607	1594	75	72	84	77	75		93
1270	1582	1611	1598	75	73	84	77	73		97
1275	1575	1611	1598	77	75	81	75	75		95
1280	1571	1609	1600	75	73	88	75	75		97
1285	1584	1605	1585	75	72	84	79	77		93
1290	1587	1596	1580	75	72	84	79	79		97
1295	1589	1598	1573	77	72	86	77	79		97
1300	1600	1612	1578	77	72	97	77	77		102
1305	1596	1620	1585	79	72	84	77	77		95
1310	1593	1616	1594	79	73	86	75	79		100
1315	1594	1609	1591	79	73	104	79	75		104
1320	1593	1605	1584	77	73	111	79	75		104
1325	1598	1602	1576	77	77	108	75	73		97
1330	1587	1596	1571	77	73	95	77	73		99
1335	1585	1596	1571	77	81	88	75	75		97
1340	1584	1594	1576	77	77	97	77	75		95
1345	1591	1602	1587	79	72	109	79	75		106
1350	1600	1603	1584	79	72	93	79	73		102
1355	1596	1593	1578	81	75	88	79	79		91
1360	1593	1596	1580	79	77	88	79	79		99
1365	1594	1594	1584	81	72	90	79	79		102
1370	1594	1596	1587	79	75	102	77	75		106
1375	1585	1593	1598	77	75	97	79	75		106
1380	1580	1591	1591	79	81	109	79	75		113
1385	1580	1589	1587	77	75	102	86	77		104
1390	1584	1587	1582	81	77	93	81	79		100
1395	1584	1589	1578	79	75	97	81	79		99
1400	1576	1587	1587	81	79	106	79	77		102
1405	1575	1589	1594	86	81	109	79	77		100
1410	1578	1591	1598	82	77	93	75	75		99
1415	1580	1593	1591	81	79	90	75	75		97
1420	1585	1593	1589	86	81	90	75	73		91
1425	1582	1596	1596	84	75	91	73	75		88
1430	1582	1594	1596	82	77	88	75	77		90
1435	1584	1593	1585	81	79	91	79	77		100
1440	1585	1593	1591	81	75	91	79	77		97
1445	1582	1596	1594	79	73	88	77	75		91
1450	1585	1593	1589	84	73	84	77	77		99
1455	1593	1594	1580	86	75	84	75	79		95
1460	1593	1600	1580	82	75	86	77	77		97
1465	1591	1600	1585	84	73	90	75	79		97
1470	1585	1600	1587	82	77	99	75	77		109
1475	1582	1603	1591	84	73	104	79	79		106
1480	1584	1602	1591	86	73	104	81	81		104
1485	1591	1603	1587	81	73	108	84	84		100
1490	1589	1609	1585	84	75	109	82	82		113
1495	1585	1607	1591	82	75	106	86	81		111

Table 4. T46 – T54 thermocouples temperatures in Fahrenheit degrees (6)

time (s)	temperature °F									
	T46	T47	T48	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail	pass/fail
1500	1585	1605	1585	84	75	115	84	86	111	
1505	1589	1612	1593	84	75	109	79	82	106	
1510	1596	1621	1598	84	75	97	81	82	102	
1515	1605	1634	1609	82	77	108	79	84	104	
1520	1609	1636	1614	82	75	100	81	82	106	
1525	1616	1639	1618	82	75	104	81	82	109	
1530	1620	1648	1627	82	75	106	77	82	111	
1535	1618	1650	1630	84	77	109	77	79	108	
1540	1612	1641	1618	90	75	100	77	79	102	
1545	1630	1654	1621	84	75	111	79	81	108	
1550	1634	1654	1623	84	75	108	79	82	104	
1555	1627	1647	1630	86	77	108	81	77	104	
1560	1636	1648	1625	84	77	108	79	81	106	
1565	1636	1665	1639	84	75	113	81	81	106	
1570	1629	1656	1639	82	77	106	84	81	106	
1575	1625	1652	1645	86	75	108	82	79	111	
1580	1632	1663	1650	86	75	109	82	79	109	
1585	1632	1665	1648	84	75	108	79	82	109	
1590	1634	1666	1659	88	75	108	81	81	108	
1595	1632	1663	1663	84	75	109	84	84	104	
1600	1629	1657	1657	90	75	106	86	84	106	
1605	1638	1659	1650	82	75	104	81	82	108	
1610	1627	1650	1645	84	75	106	79	82	108	
1615	1632	1648	1636	86	75	106	81	81	104	
1620	1641	1654	1641	86	75	97	81	82	104	
1625	1641	1656	1643	84	75	97	79	81	100	
1630	1643	1654	1645	84	77	99	79	81	95	
1635	1643	1657	1647	81	75	99	82	81	97	
1640	1643	1668	1659	84	77	100	81	81	104	
1645	1650	1672	1661	86	79	100	79	81	99	
1650	1643	1670	1650	82	75	102	81	81	100	
1655	1638	1666	1650	82	77	106	79	81	104	
1660	1632	1665	1652	88	77	108	79	82	108	
1665	1636	1654	1645	84	75	100	79	84	99	
1670	1639	1647	1645	84	75	95	77	84	95	
1675	1650	1650	1639	86	75	99	77	82	95	
1680	1647	1654	1639	82	75	97	81	81	97	
1685	1641	1663	1652	84	75	93	79	81	97	
1690	1638	1668	1659	88	75	93	81	82	95	
1695	1643	1661	1647	91	75	97	81	82	99	
1700	1636	1650	1650	86	75	90	84	82	97	
1705	1636	1650	1650	86	75	95	81	86	100	
1710	1638	1661	1661	84	73	95	82	82	99	
1715	1641	1668	1659	84	73	104	82	84	100	
1720	1643	1663	1652	88	73	90	81	81	97	
1725	1643	1666	1656	84	73	88	81	82	100	
1730	1634	1666	1657	84	73	88	79	84	95	
1735	1634	1661	1654	84	73	88	77	82	99	
1740	1630	1657	1647	82	73	86	79	79	97	
1745	1634	1661	1650	82	73	88	77	81	91	
1750	1641	1666	1645	82	75	86	77	81	95	
1755	1643	1674	1656	84	75	86	77	81	95	
1760	1634	1674	1659	86	75	84	79	81	91	
1765	1629	1672	1665	84	75	84	77	82	93	
1770	1634	1681	1683	88	75	86	77	79	93	
1775	1639	1684	1675	84	75	82	77	79	91	
1780	1648	1681	1663	86	75	81	77	77	95	
1785	1647	1677	1661	88	75	82	77	81	95	
1790	1652	1686	1666	88	75	84	75	79	93	
1795	1654	1677	1665	84	75	82	75	79	90	



APPENDICE C. DRAWINGS



DRAWINGS

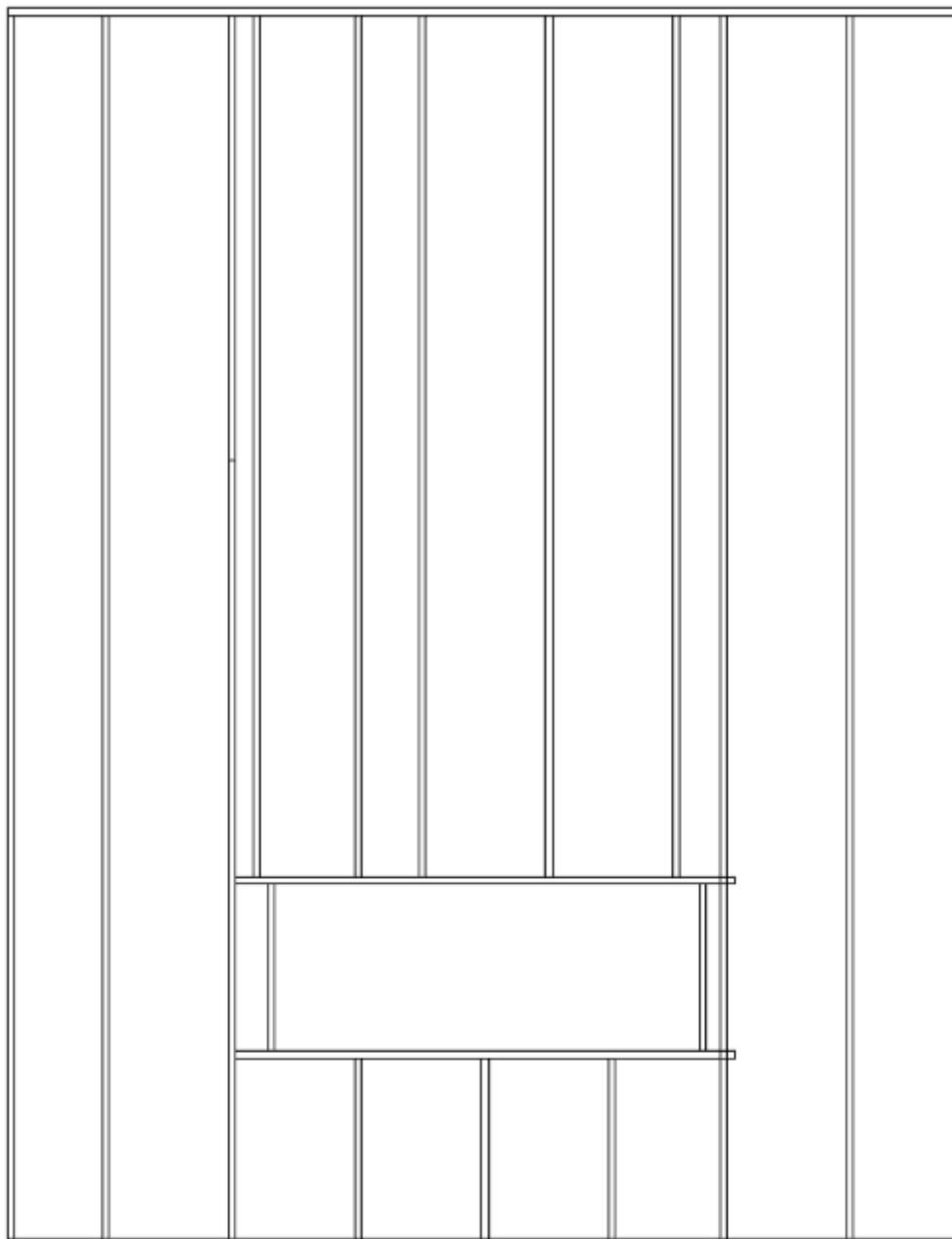
The following test specimen drawings supplied by the customer have been checked by TECNALIA and they are representative of the specimen tested according to this report.

The construction of the test specimen has been verified by TECNALIA following the drawings included in this report.

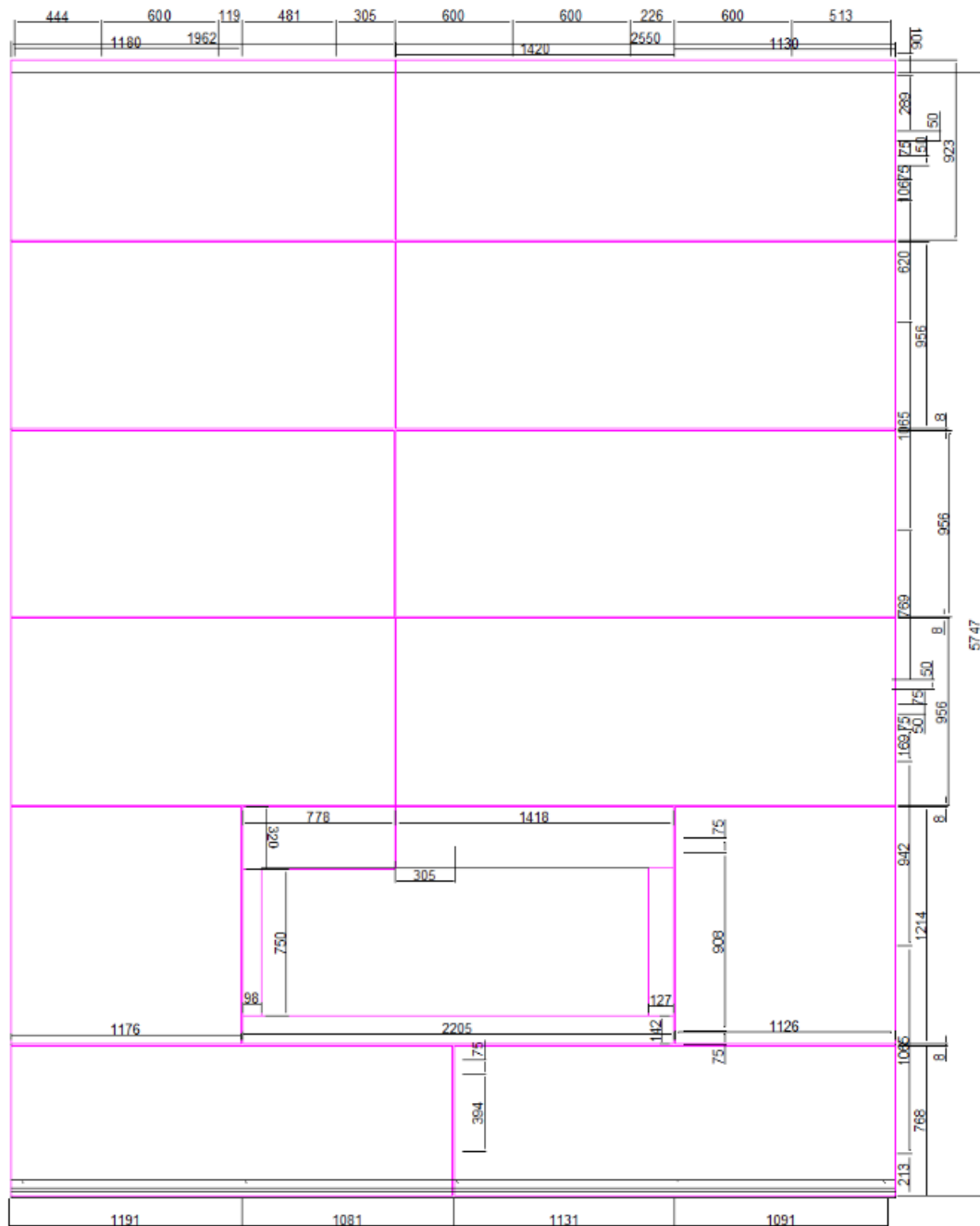
A list of the attached drawings is specified below:

- Elevation, principal cross section and plan of supporting wall.
- Elevation, principal cross section and plan of the ventilated façade system installed on the supporting wall, where the joints in the external cladding panels can be observed.
- Façade system details around the window opening.

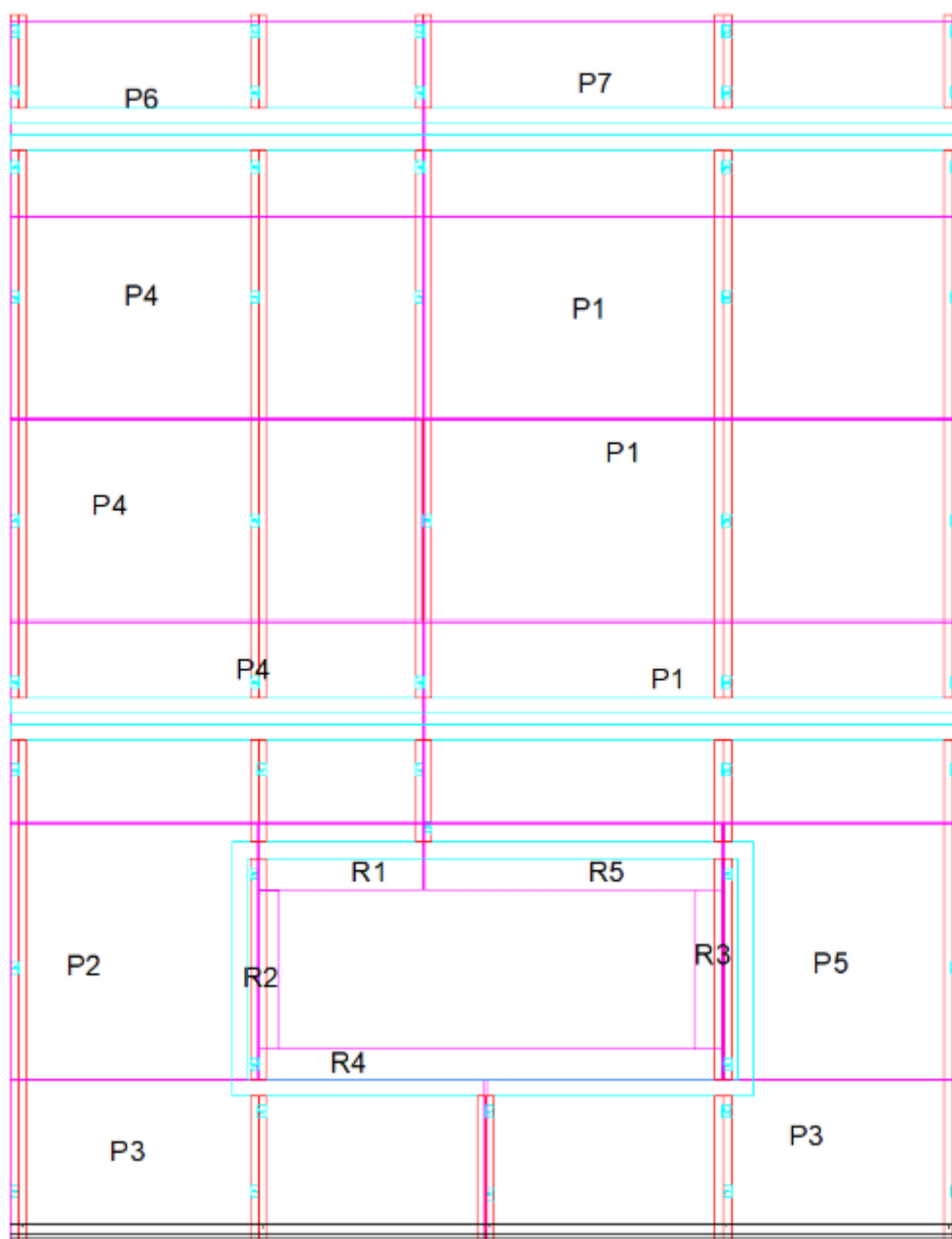
- Supporting wall drawings: Inner metal frame substructure (*)



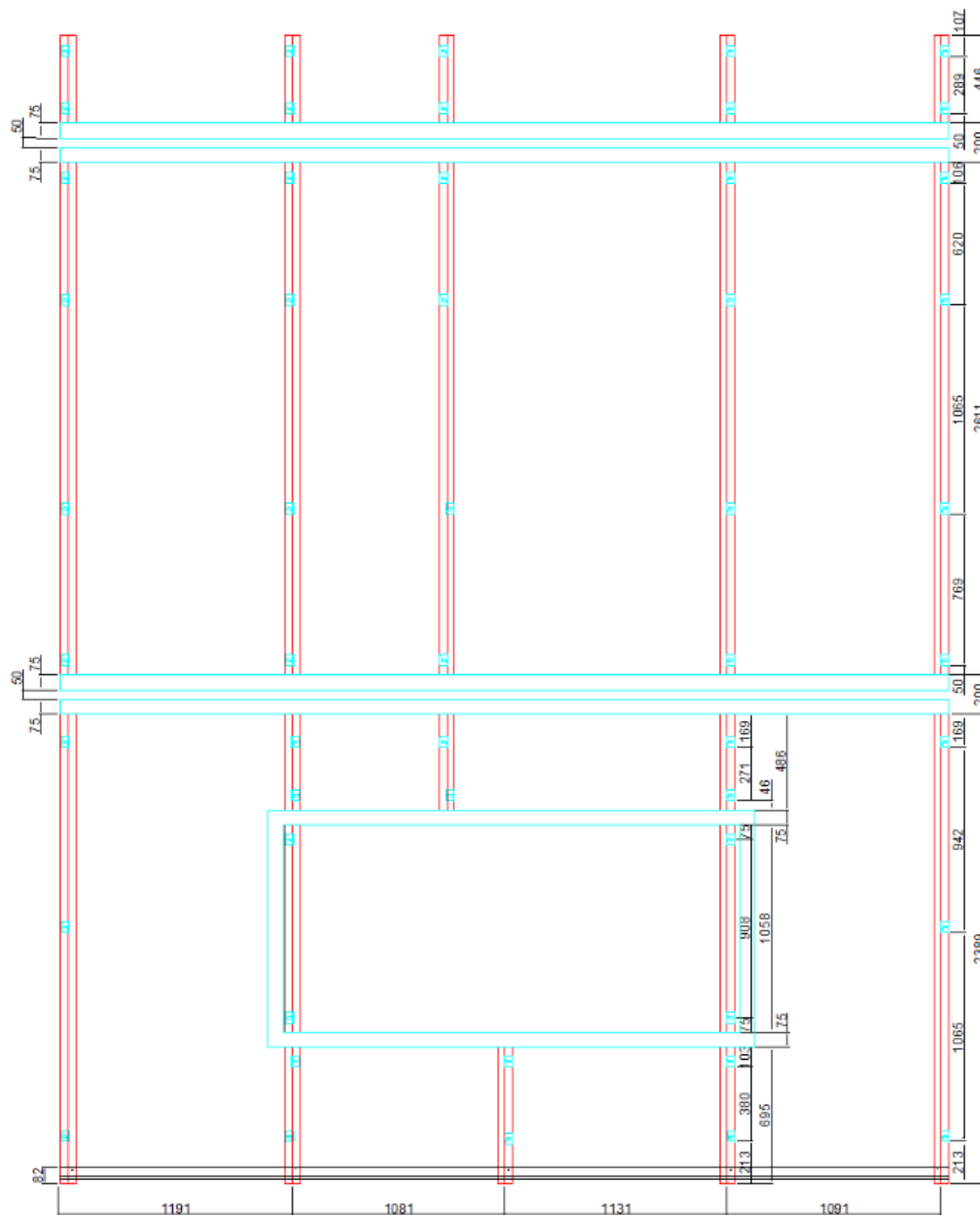
- Façade system drawings (*): Cladding panel layout



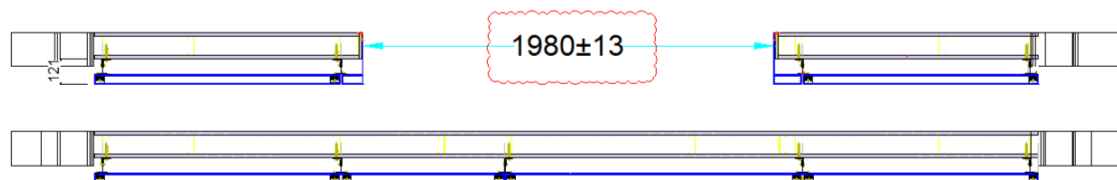
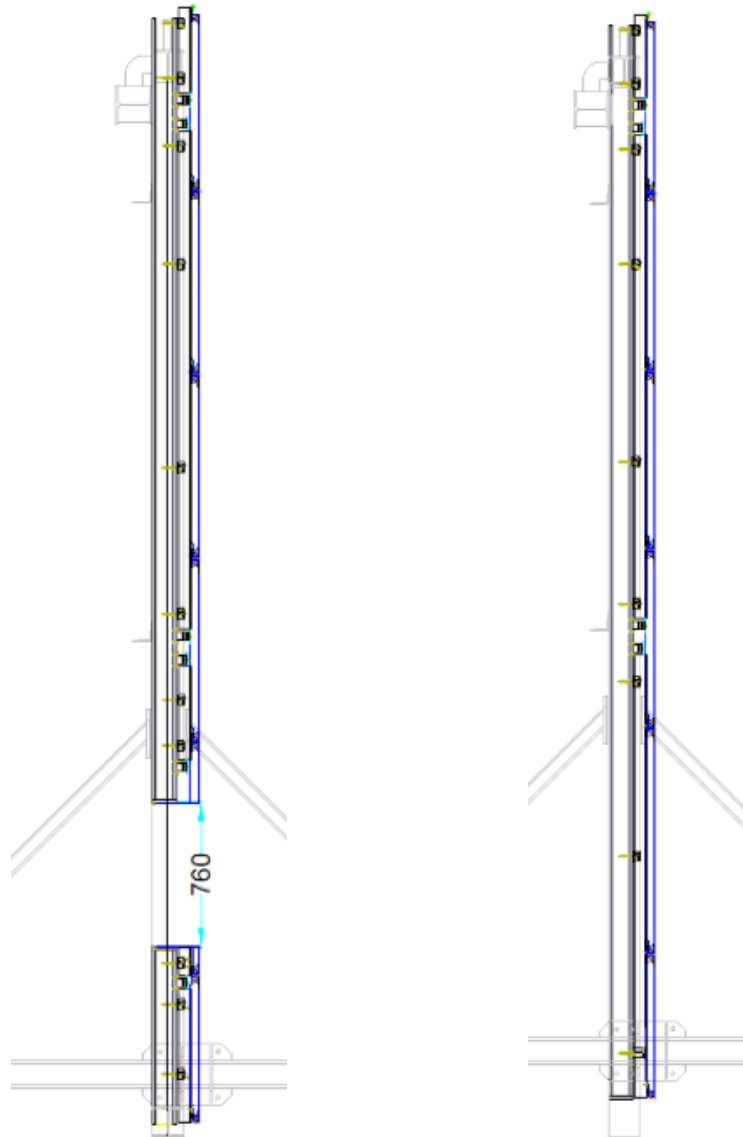
- Façade system drawings (*): Cladding panel + fire barriers + vertical studs + brackets



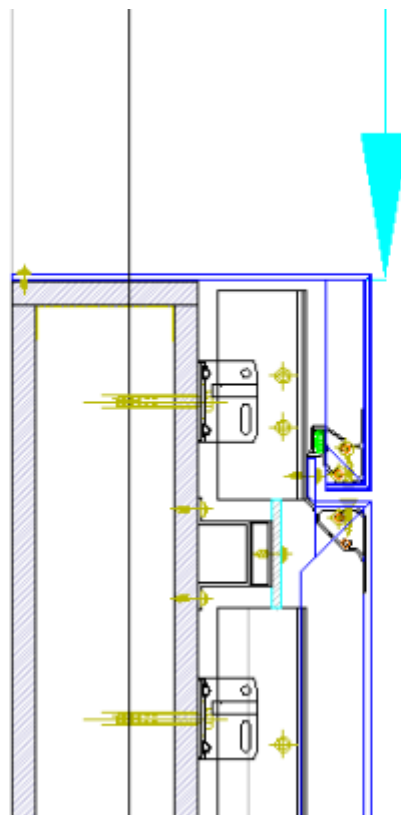
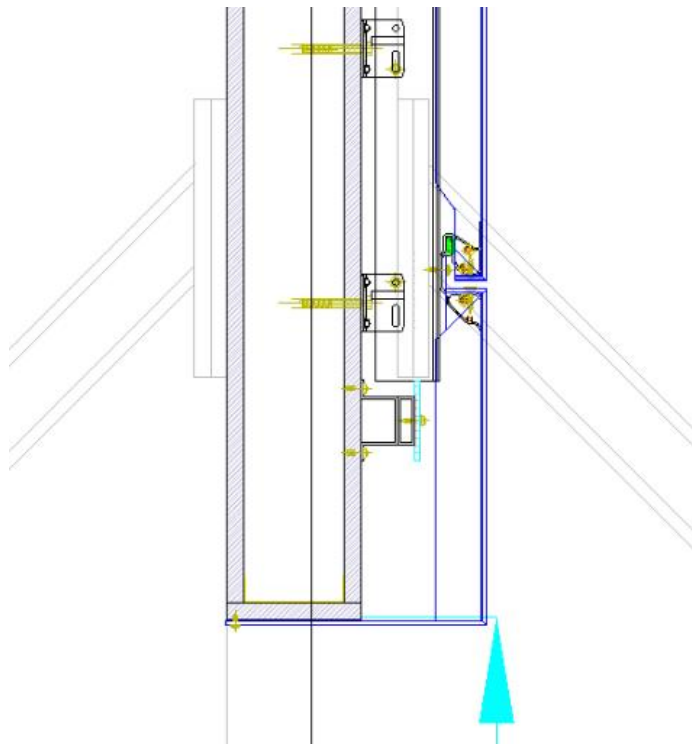
- Façade system drawings (*): Fire barriers + vertical studs + brackets



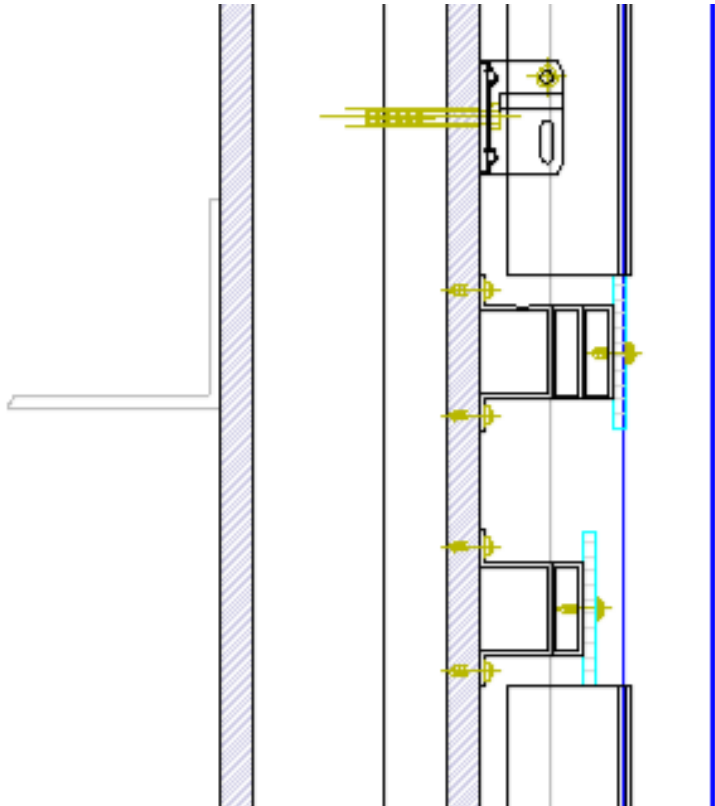
- Façade system drawings (*): Sections



- Façade system drawings (*): Window opening perimeter flashing detail

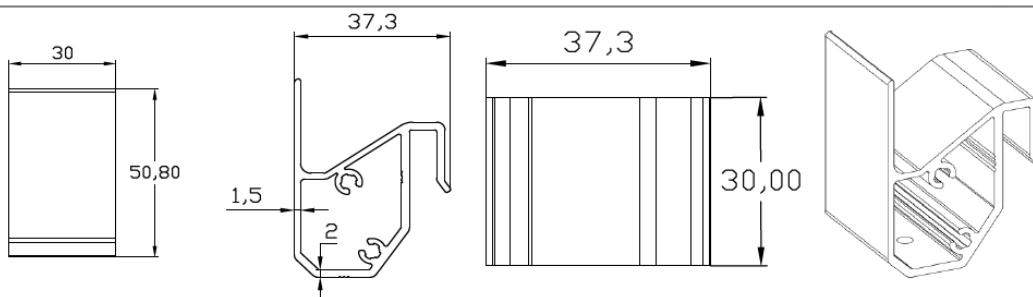


- Façade system drawings (*): Cavity barrier + shimming element detail

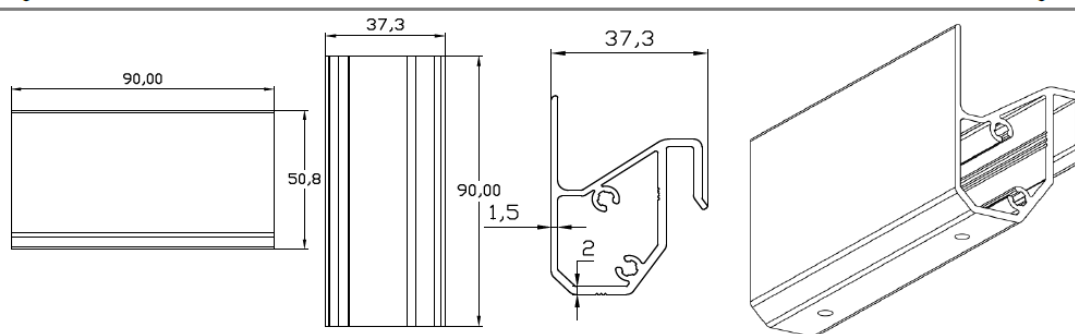


- Cladding panels accessories. (*)

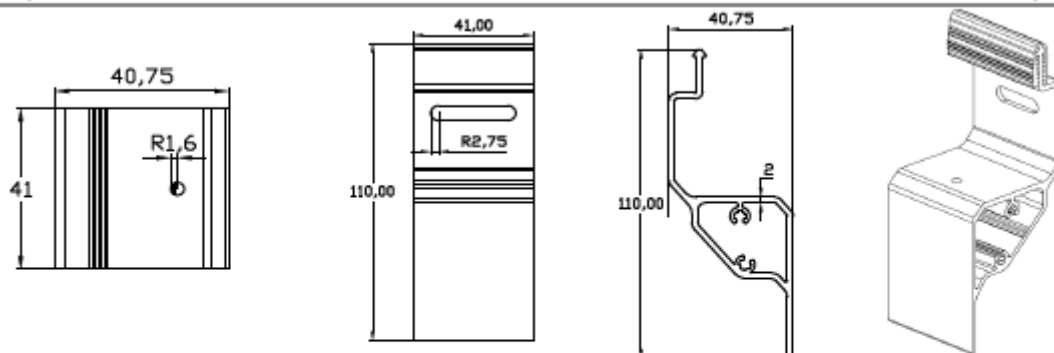
Short S Bracket 05.19.096	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.0219	kg



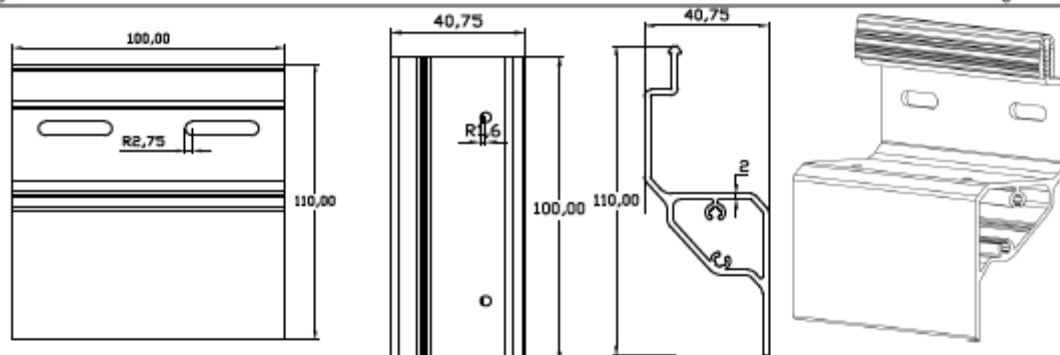
Long S Bracket 05.19.097	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.05119	kg



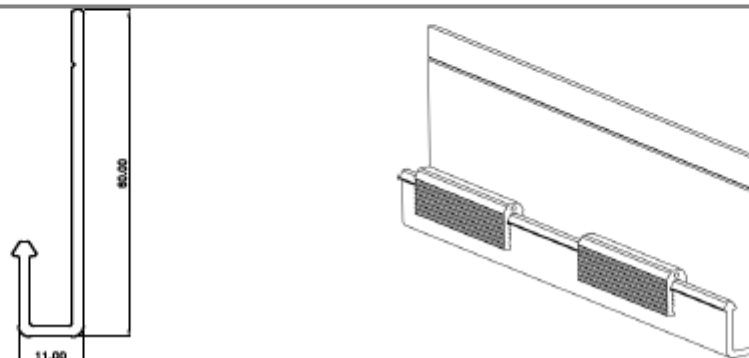
Short Z Bracket 05.19.094	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.03891	kg



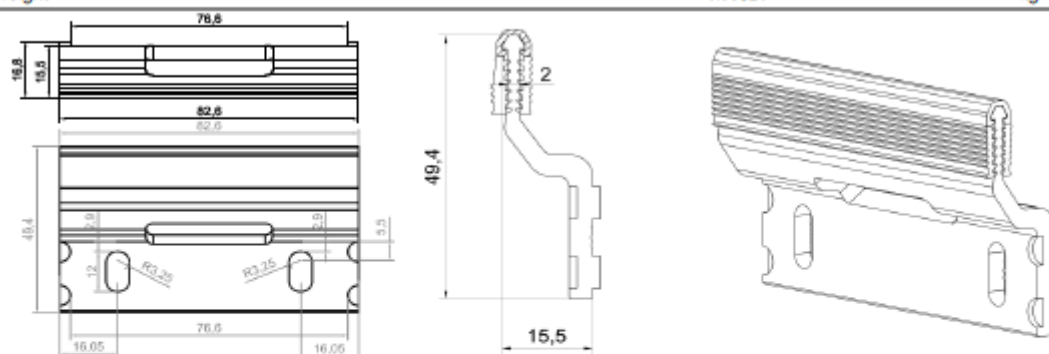
Long Z Bracket 05.19.095	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.07397	kg



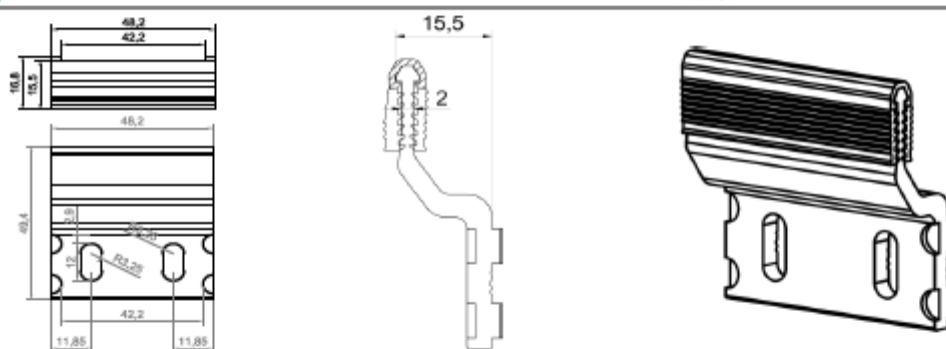
Starter profile SZ 05.19.099	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.457	kg



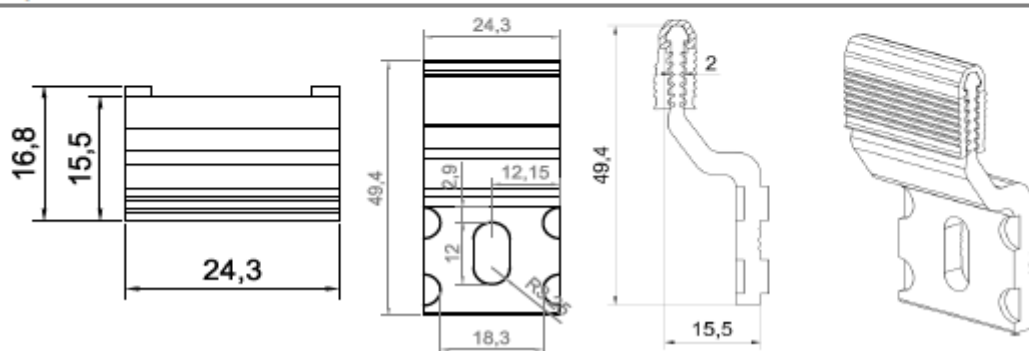
SZ horizontal stiffener long bracket 05.19.101	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.03829	kg



SZ horizontal stiffener short bracket 05.19.100	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.02589	kg

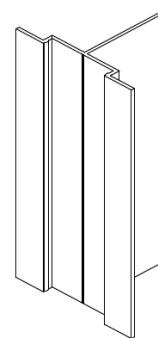
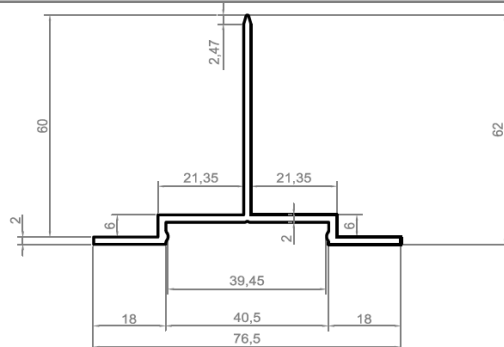


SZ horizontal stiffener mini bracket 05.19.110	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.01213	kg



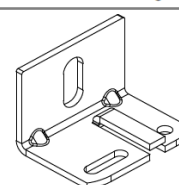
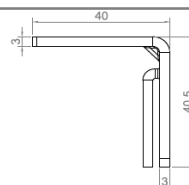
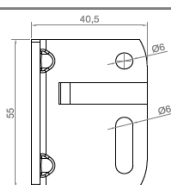
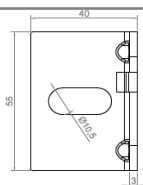
- Vertical studs. T profiles.(*)

T-Omega Profile 05.19.061	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.741	kg/m
Inertia	81257	mm ⁴
Thickness	2	mm



- Brackets detail.(*)

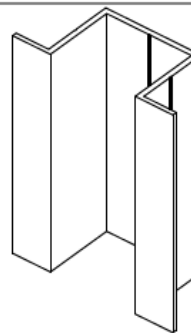
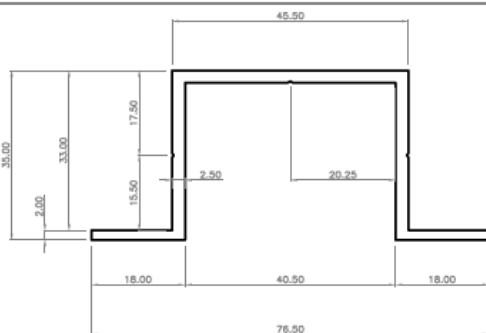
Separador L 41 05.19.089	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,03086	kg



Este perfil no está incluido ni en DIT ni en ETE

- Cavity barrier shimming elements. (*)

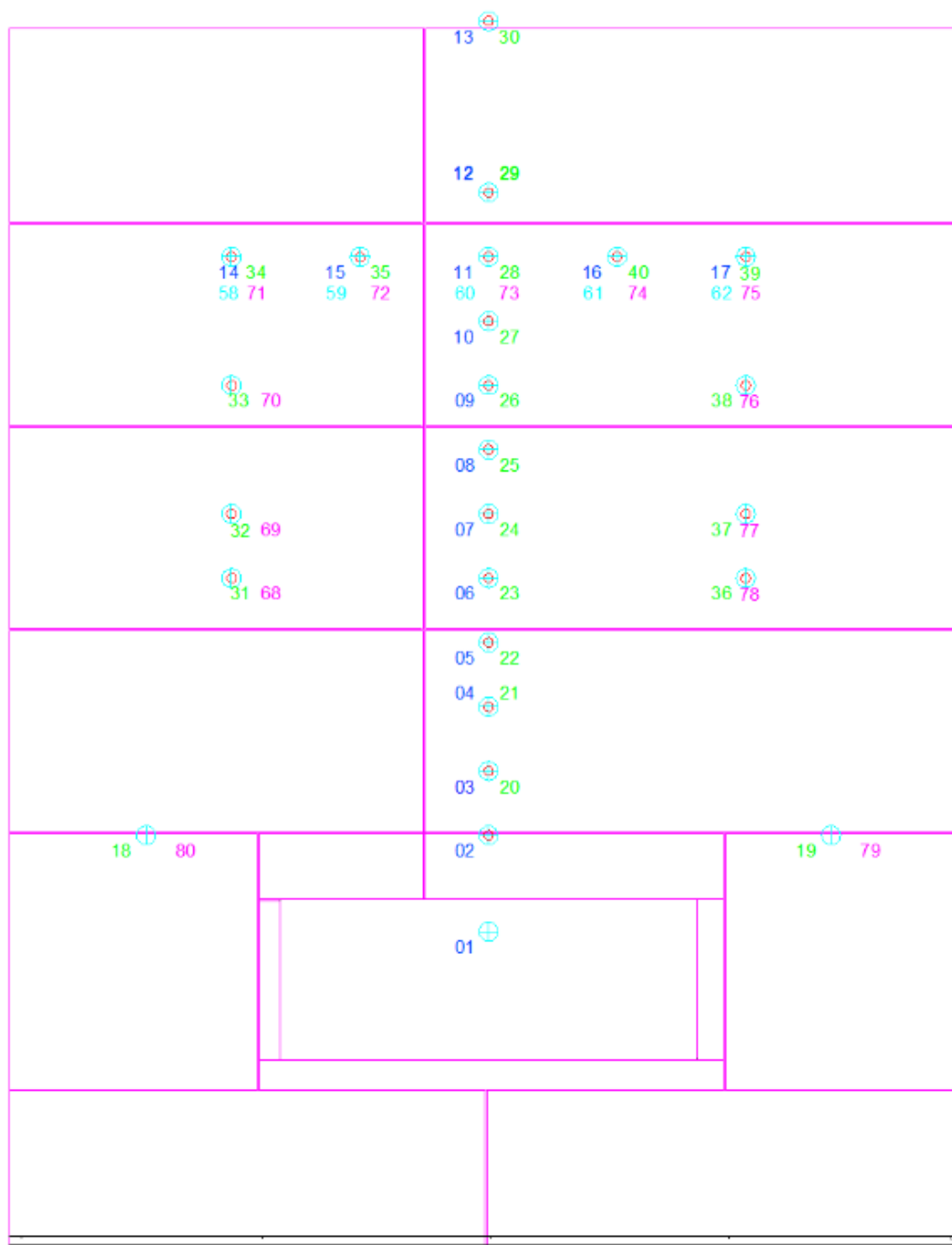
Perfil Omega 05.19.003	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,9126	kg/m
Inercia	60381,5	mm ⁴
Espesor	2	mm



Montante STB-PEG 19.022	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	1,12	kg/m

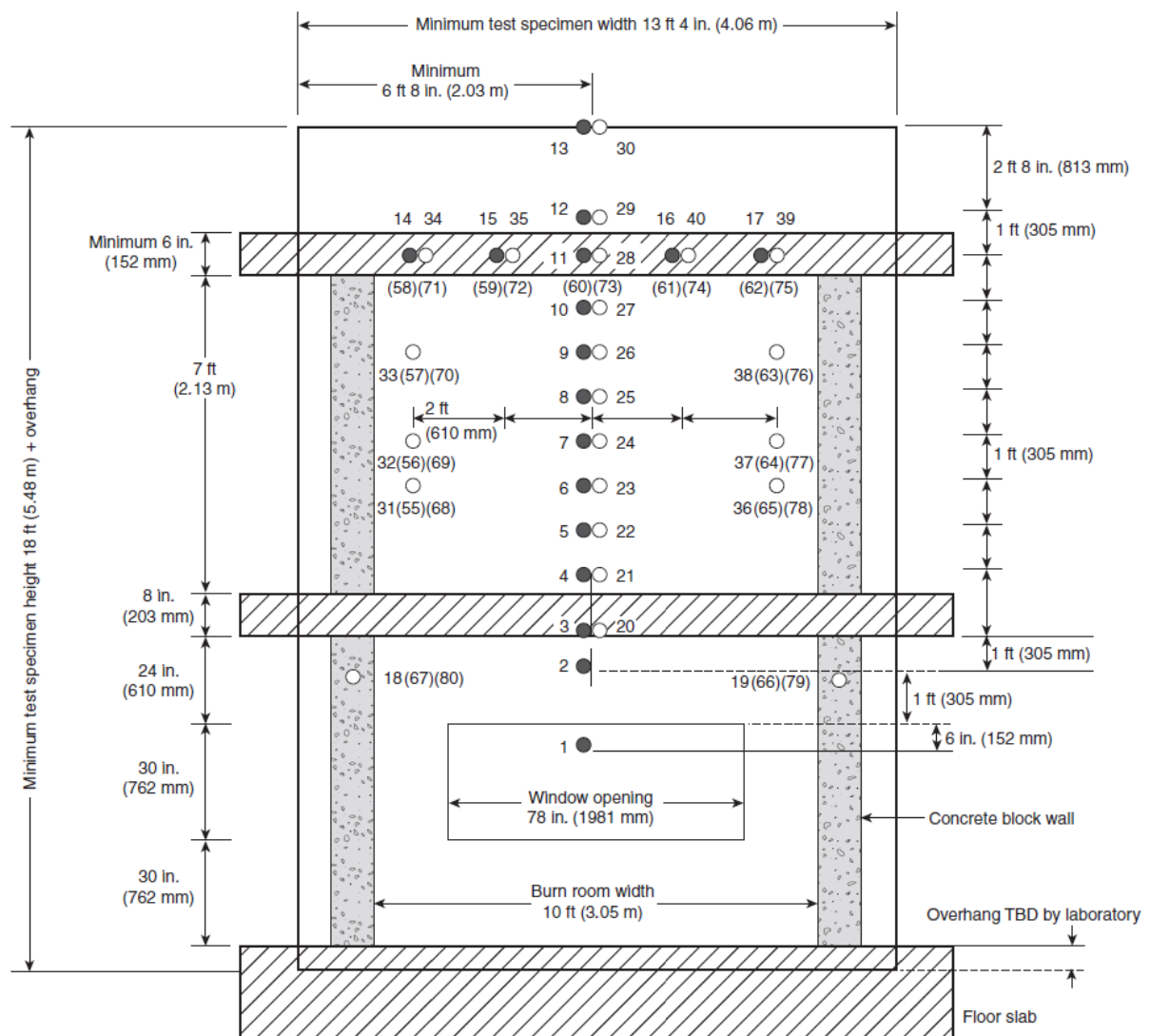


- Location of test instrumentation on the test specimen.



EXTERIOR THERMOCOUPLES
AIR CAVITY THERMOCOUPLES
EXTERIOR DUPLICATE THERMOCOUPLES
AIR CAVITY THERMOCOUPLES

Thermocouples superimposed on test specimen.



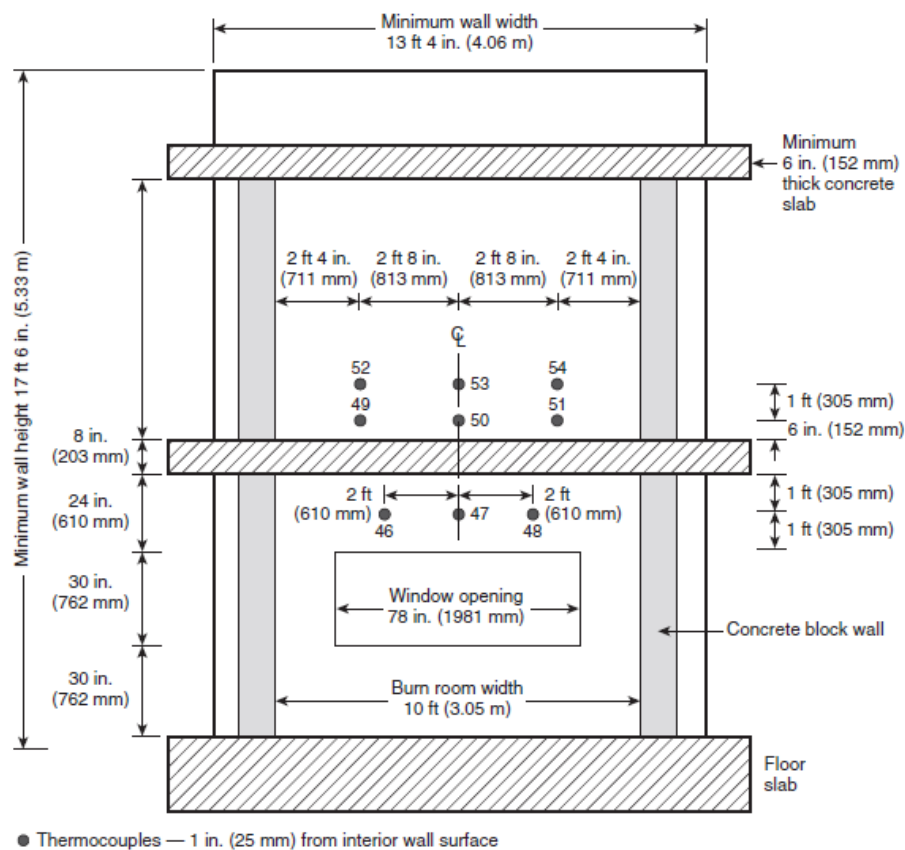
● Thermocouples — 1 in. (25 mm) from exterior wall surface

○ Thermocouples — In the wall cavity air space or the insulation, or both, as shown in Figure 6.1(b) Details A through I.

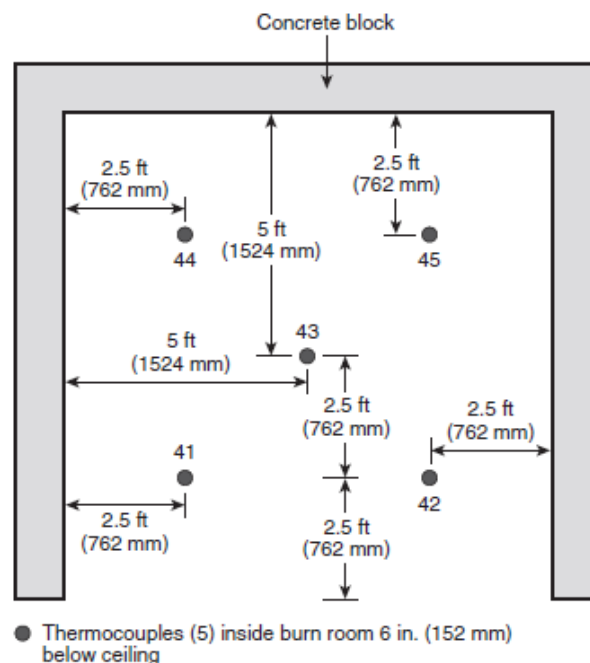
() Thermocouples — Additional thermocouples in the insulation or the stud cavity, or both, where required for the test specimen construction being tested, as shown in Figure 6.1(b) Details C through I.

Figure not to scale

Thermocouple locations dimensional front elevation.

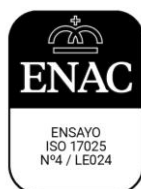


Thermocouple locations dimensional rear elevation.



Plan view – First storey test room. Instrumentation arrangement.

APPENDICE D. PHOTOGRAPHS



PHOTOGRAPHS

Light Steel Frame supporting wall system: Mounting sequence





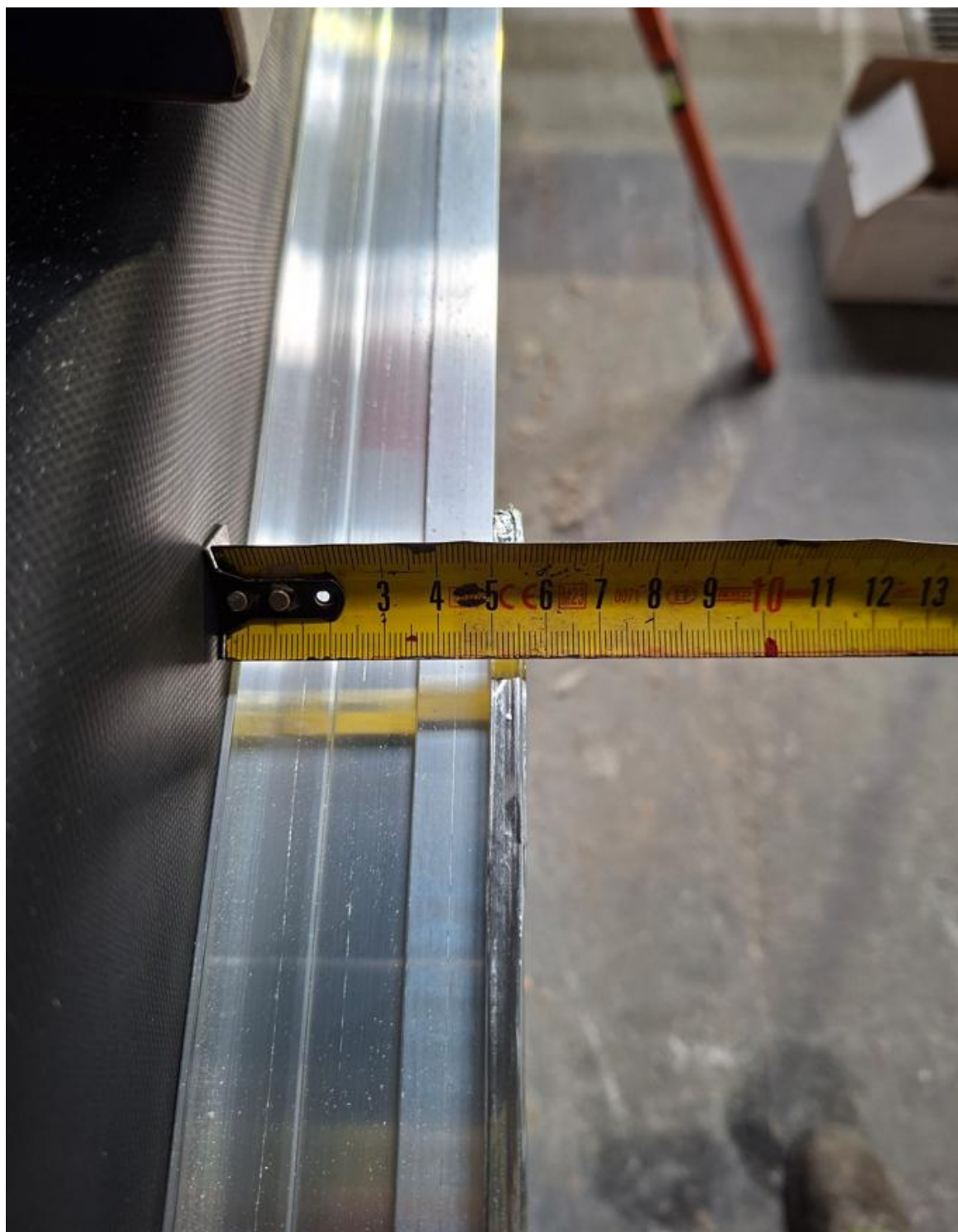




Façade system: Mounting sequence















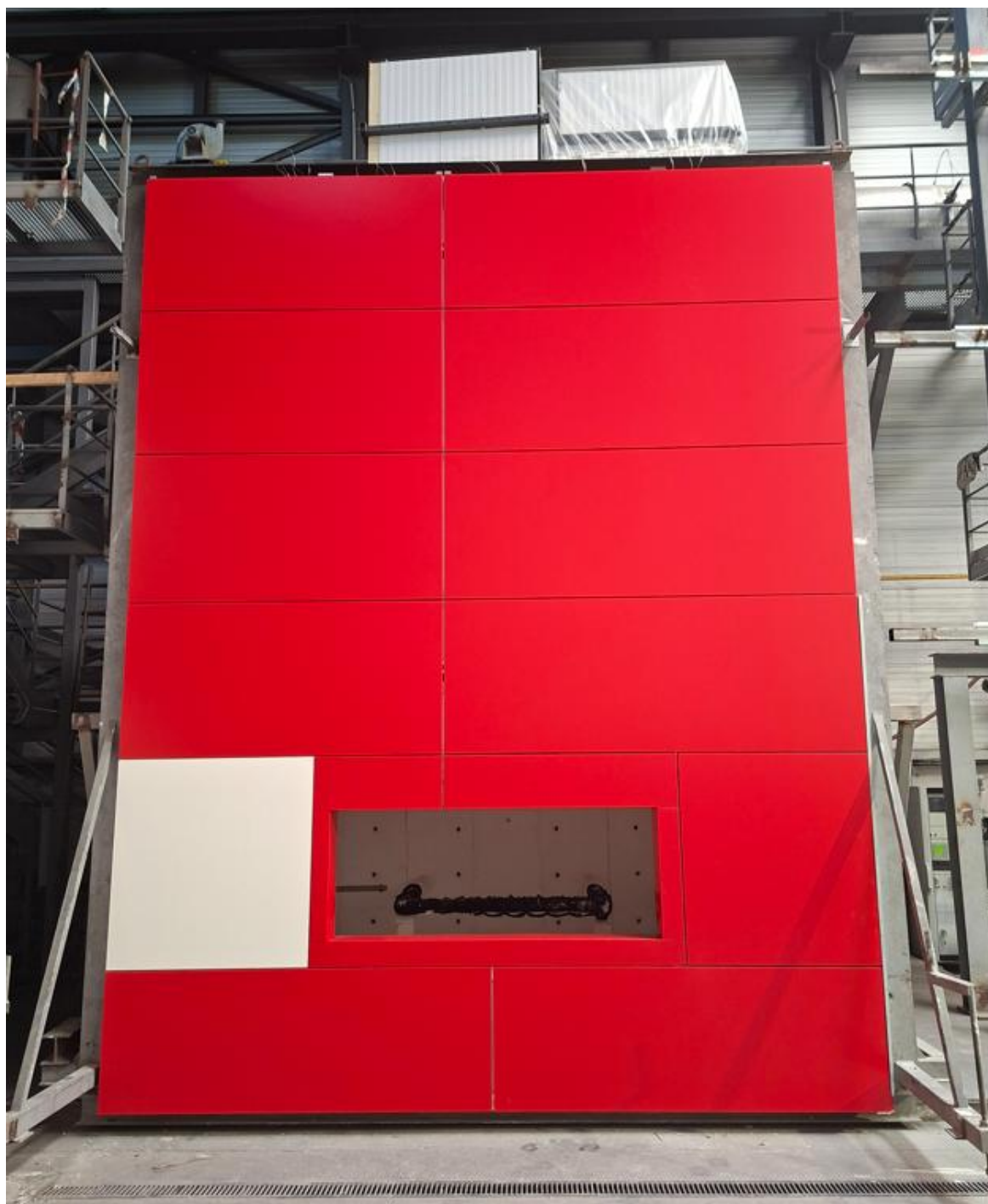












General view of façade system test specimen during testing





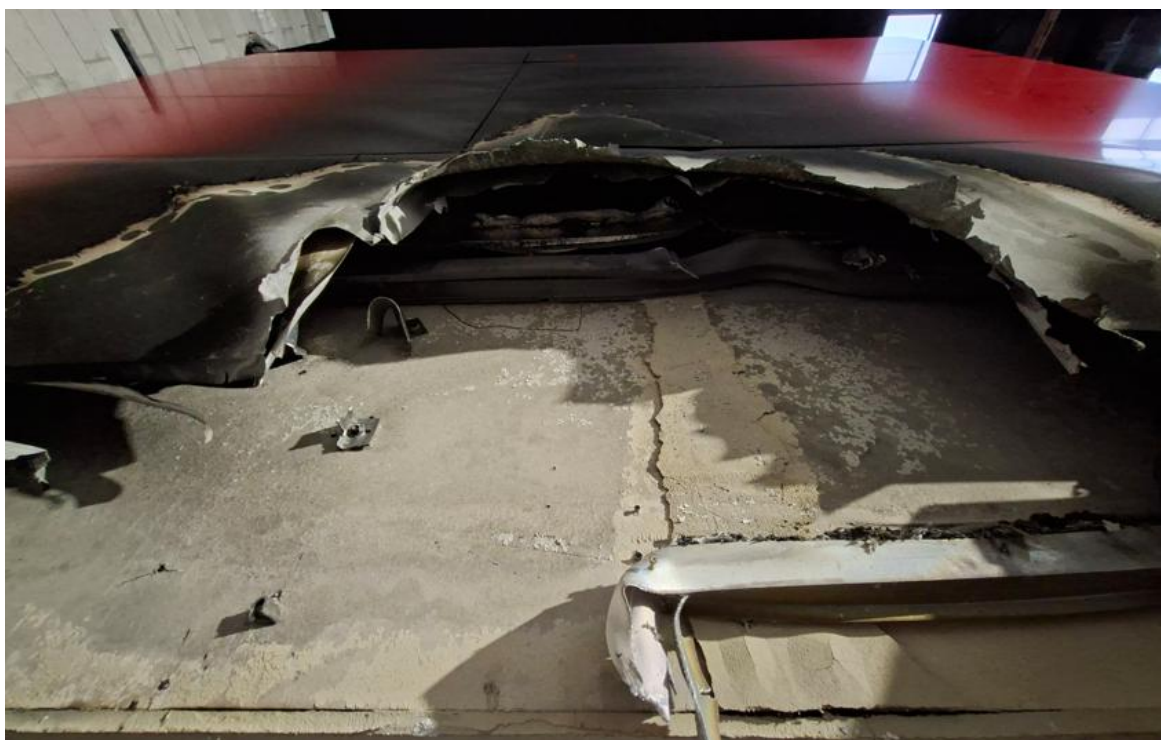






Post-test examination after testing



















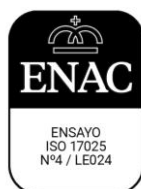




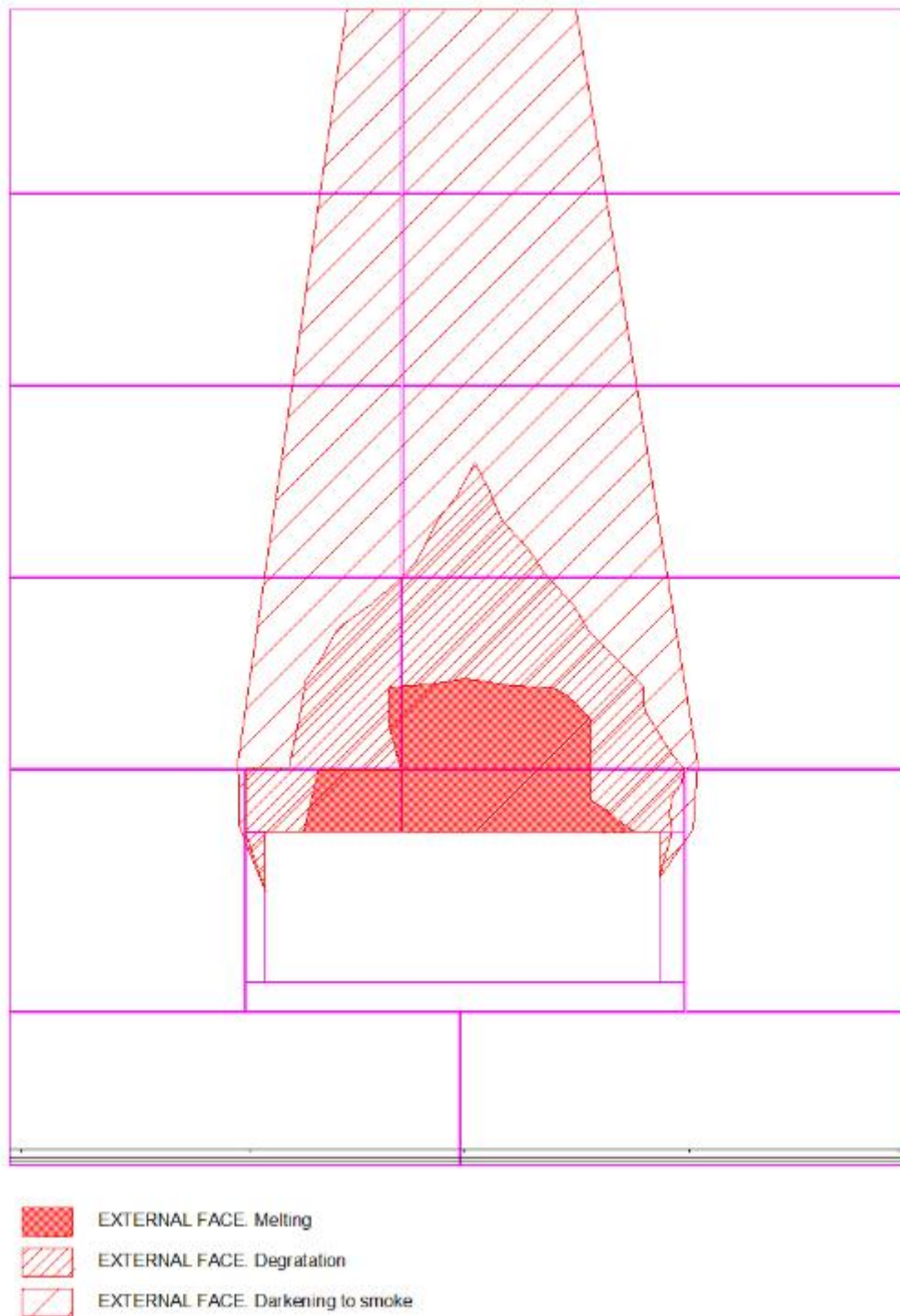


*Back part of the base wall
It is noticed that the flame didn't spread to the second storey room*

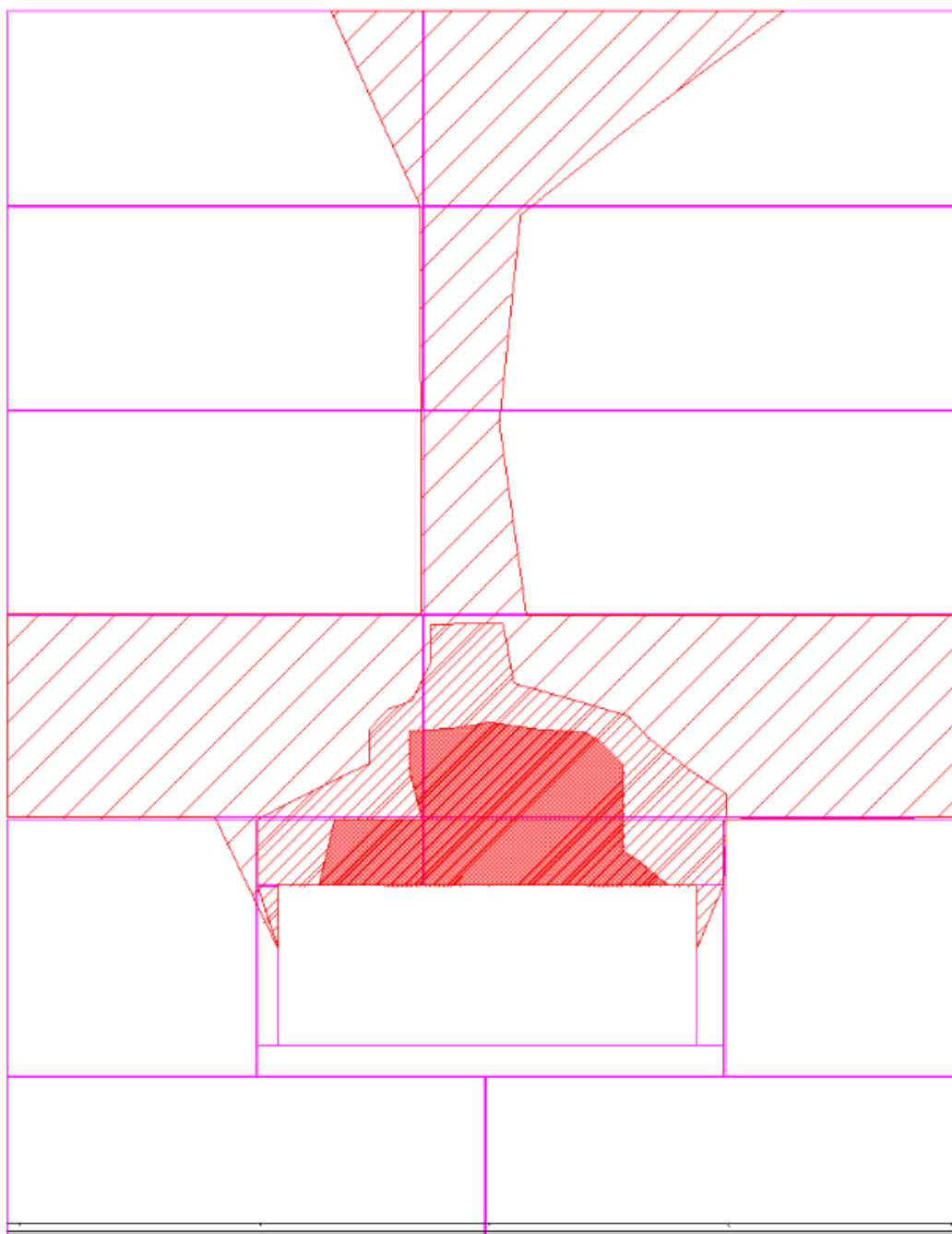
APPENDICE E. DAMAGE SKETCHES



DAMAGE SKETCHES OF THE WALL ASSEMBLY

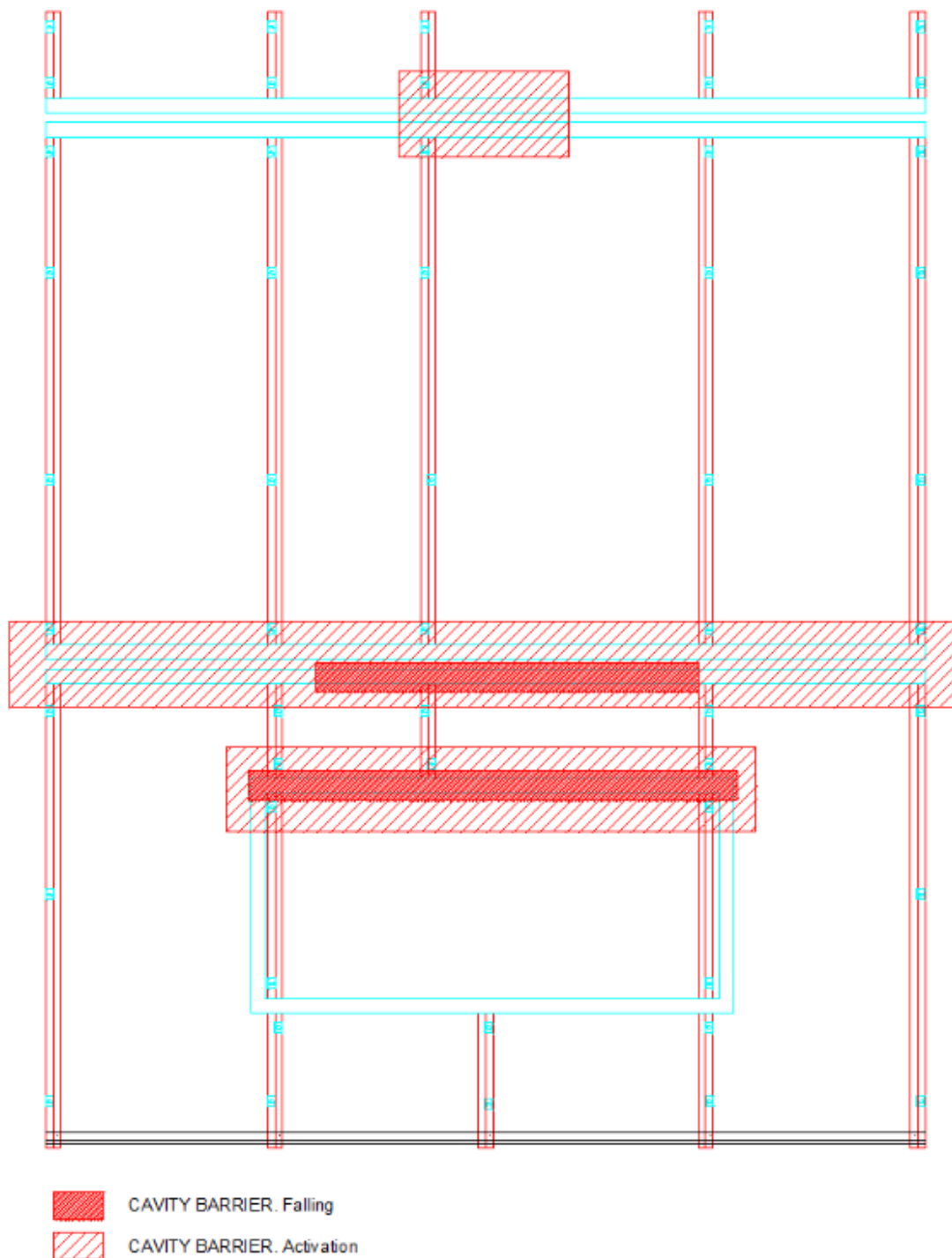


Damages of the external face of the cladding panels

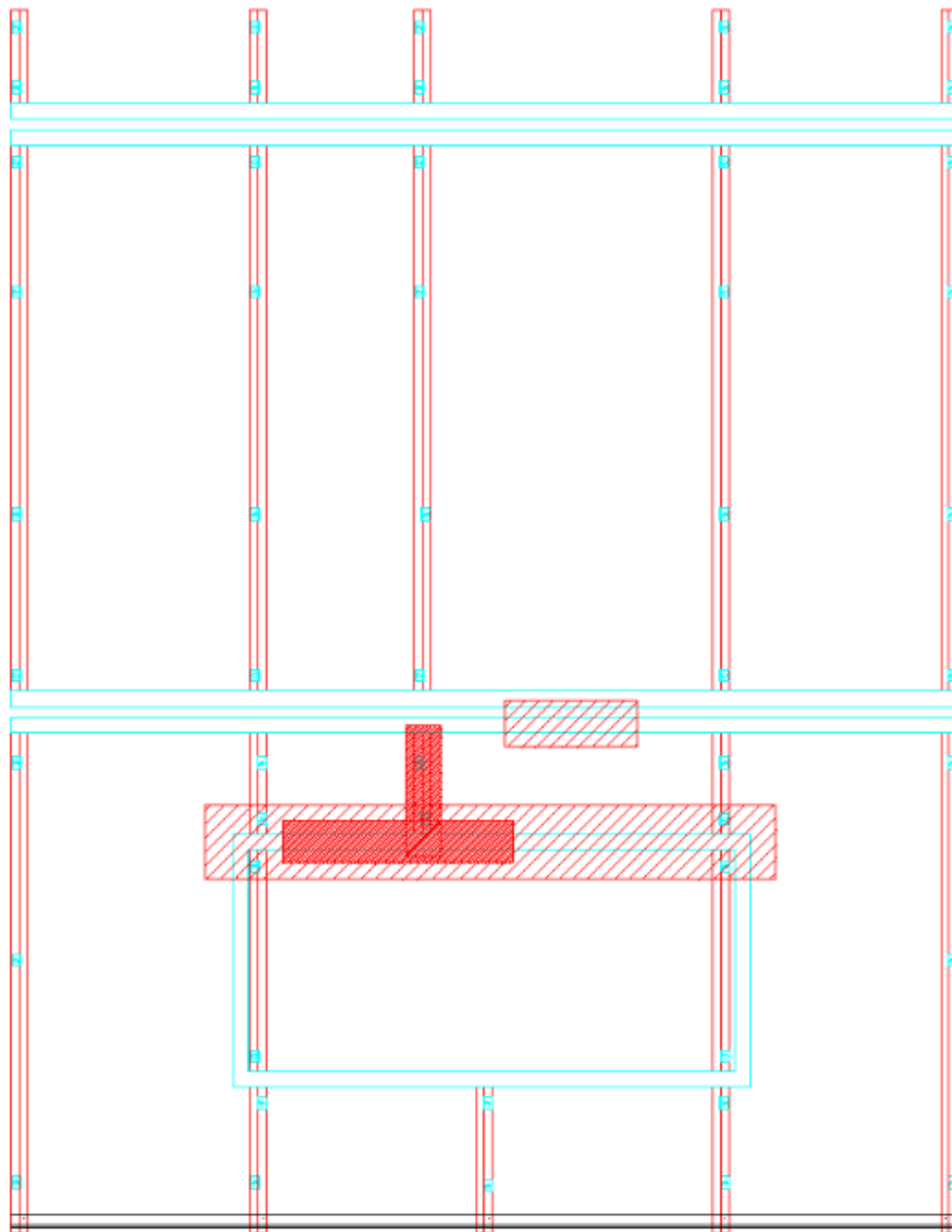


-  INTERNAL FACE. Melting
-  INTERNAL FACE. Degradation
-  INTERNAL FACE. Darkening to smoke

Damages of the internal face of the cladding panels

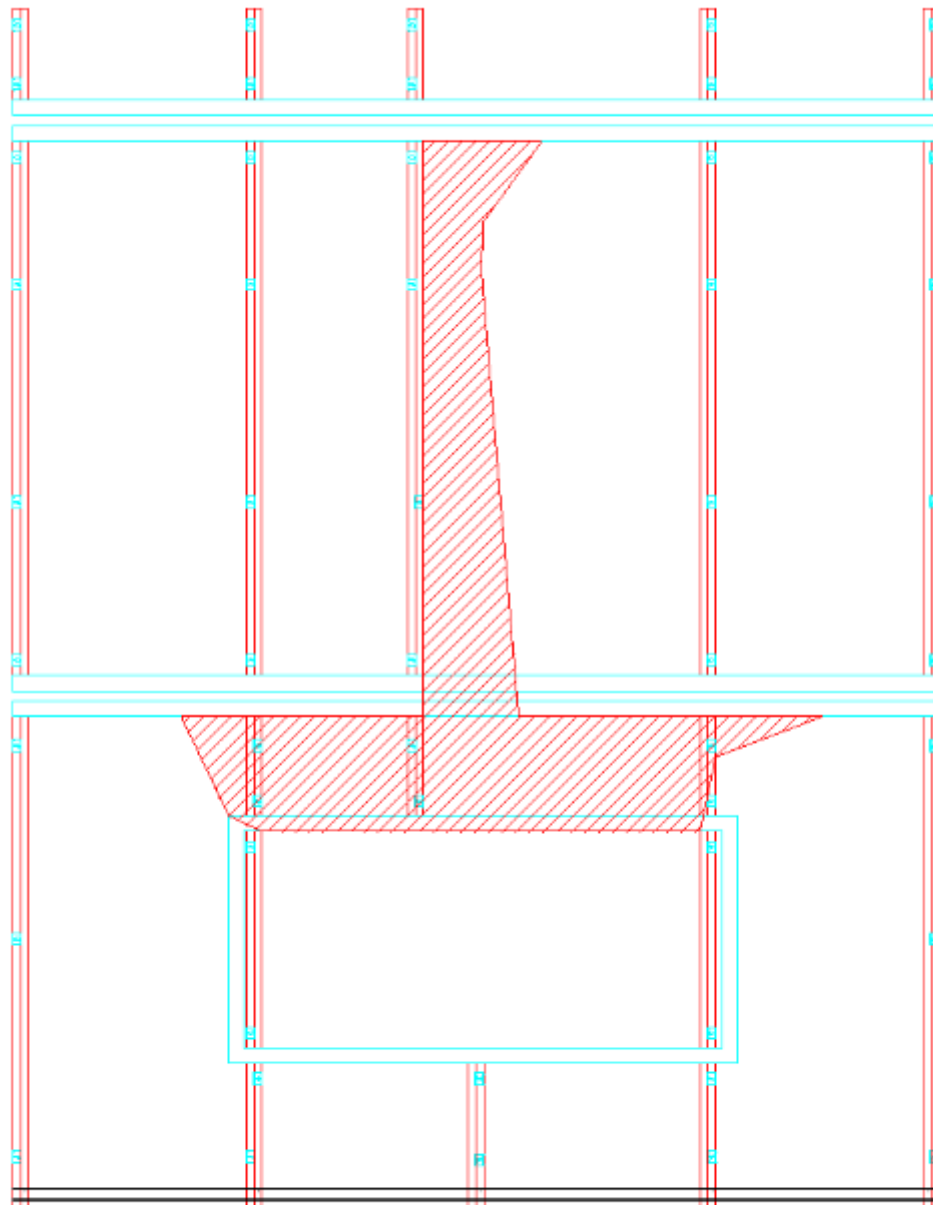


Damages of cavity barriers



-  VERTICAL STUD / SHIMMING ELEMENT. Melting
-  VERTICAL STUD / SHIMMING ELEMENT. Deformation

Damages of the vertical studs and shimming elements



 VAPOR BARRIER. Degradation

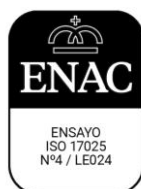
Damages of vapor barrier of the supporting wall

EXTENT OF RESIDUAL BURNING

Test specimen residual burning was observed to reach at approximately 6 ft. from the header after 1 minute from the end of the test (specimen self-extinguished at min 32'00").



APPENDICE F. TECHNICAL DATA SHEETS. SUPPORTING WALL (LSF)



GYPSUM BOARD

KNAUF



Knauf Cortafuego DF

Placa de yeso laminado para sistemas con mayor resistencia al fuego

Descripción del producto

Placa de yeso laminado con densidad controlada y cohesión del alma mejorada a altas temperaturas. Tiene un núcleo de yeso reforzado con fibra de vidrio y otros aditivos. La cara vista de color rosa permite identificar en obra los sistemas con requisitos elevados de resistencia al fuego.

- Tipo de placa:
UNE-EN 520
- Color del cartón (cara vista):
- Tinta del rotulo:

DF
rosa
roja

Almacenaje
En sitios secos, en palés.

Calidad
De acuerdo a la norma UNE-EN 520, el producto está sometido a ensayos de tipo inicial y al control de la producción en fábrica que le otorgan el marcado CE y la marca N de AENOR.

Campo de aplicación

Las placas Knauf Cortafuego DF pueden ser utilizadas en cualquier unidad de obra en interior como aplacado de sistemas de construcción en seco en los que se requiera alcanzar una elevada resistencia al fuego.

Sistemas:

- W11.es Tabiques con estructura metálica
- W12.es Tabiques con estructura de madera
- W62.es Trasdados autoportantes
- W63.es Sistemas Shaftwall
- D11.es Techos suspendidos
- D11-FC.es Franjas cortafuego para naves
- K250.es Protección al fuego de vigas y pilares metálicos
- WM.es Cerramientos de fachada Knauf Aquapanel
- WC111G.es Protección al fuego para muro cortina

Propiedades

- Buena cohesión del yeso a altas temperaturas
- Fácil de trabajar
- No combustible
- Se puede curvar (placa de 12,5 mm)
- Poca retracción e hinchazón con los cambios climáticos

No es apta para zonas de humedad permanente ni para tabiques que tengan conducciones de líquidos en su interior.

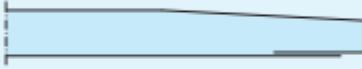
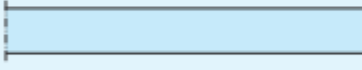


K711F.es Knauf Cortafuego DF

Placa de yeso laminado para sistemas con mayor resistencia al fuego



Datos técnicos

Descripción	Unidad	Valor	Norma
Tipo de placa	-	DF	UNE-EN 520
Reacción al fuego (UNE-EN 13501-1)	Clase	A2-s1,d0 (B)	UNE-EN 520
Borde longitudinal revestido con cartón	-	Borde afinado BA 	UNE-EN 520
Borde transversal sin cartón	-	Borde cortado BCO 	UNE-EN 520
Tolerancia de anchura	mm	+0 / -4	UNE-EN 520
Tolerancia de longitud	mm	+0 / -5	UNE-EN 520
Tolerancias de espesores: Placas de 12,5 y 15 mm Placa de 25 mm	mm	+0,5 / -0,5 +1,0 / -1,0	UNE-EN 520
Tolerancia de ortogonalidad	mm/m	≤ 2,5	UNE-EN 520
Factor de resistencia al vapor de agua μ: Seco Húmedo	-	10 4	UNE-EN ISO 10456
Conductividad térmica λ	W/(m·K)	≥ 0,23	UNE-EN ISO 10456
Hinchamiento y retracción por 1 % de variación de la humedad relativa	mm/m	0,005 - 0,008	-
Hinchamiento y retracción por 1 Kelvin de variación de temperatura	mm/m	0,013 - 0,020	-
Densidad	kg/m³	≥ 800	UNE-EN 520
Dureza superficial (huella)	mm Ø	≤ 20	UNE-EN 520
Permeabilidad al aire	m³/(m²·s·Pa)	1,4 x 10⁻⁴	-
Medidas: Espesores Anchura Longitudes	mm	12,5 / 15 / 25 1200 Varías	-
Peso aproximado: Placa de 12,5 mm Placa de 15 mm Placa de 25 mm	kg/m²	≥ 10,0 ≥ 12,0 ≥ 20,0	-
Temperatura máxima de uso	°C	≤ 50 (puntualmente hasta 60)	-
Carga de rotura a flexión: Placa tipo longitudinal transversal	N	12,5 mm 15 mm 25 mm ≥ 550 ≥ 650 ≥ 1450 ≥ 210 ≥ 250 ≥ 600	UNE-EN 520

Las placas de yeso laminado aumentan su peso cuando absorben agua. Con un aumento del 10% de su peso experimentan una pérdida del 70% de su resistencia. Esta placa no tiene tratamiento hidrófugo. En contacto con el agua, tarda aprox. 2 h en llegar a un aumento de su peso del 10%.



K711F.es Knauf Cortafuego DF

Placa de yeso laminado para sistemas con mayor resistencia al fuego

Medidas y embalaje

Descripción	Espesor mm	Anchura mm	Longitud mm	Unidad de embalaje	Código
Cortafuego DF 12,5 BA	12,5	1200	2500	36 unidades/palé 108 m ² /palé	84658
			2600	36 unidades/palé 112 m ² /palé	84659
			2800	36 unidades/palé 121 m ² /palé	84782
			3000	36 unidades/palé 130 m ² /palé	84783
Cortafuego DF 15 BA	15	1200	2000	42 unidades/palé 101 m ² /palé	679870
			2500	30 unidades/palé 90 m ² /palé	133072
			2600	30 unidades/palé 94 m ² /palé	133073
			2800	30 unidades/palé 101 m ² /palé	133074
			3000	30 unidades/palé 108 m ² /palé	133076
Cortafuego DF 25 BA	25	1200	2000	16 unidades/palé 38 m ² /palé	504303

Otras medidas: bajo pedido

K711F.es Knauf Cortafuego DF

Placa de yeso laminado para sistemas con mayor resistencia al fuego



Knauf Datos de contacto: Tel.: 900 106 114 knauf@knauf.es	Sistemas de Construcción en Seco Avenida de Burgos, 114 Planta 6ª, 28050 Madrid
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K711F.es/esp/09.21/ES	Las características constructivas, estáticas y físicas de los sistemas Knauf, solamente pueden ser conseguidas y garantizadas, utilizando materiales comercializados por Knauf y siguiendo las indicaciones de montaje de nuestras hojas técnicas.

VERTICAL STUD

1 | Ficha de Producto Pladur®

Perfilería Pladur® MONTANTES XL ZI

FP-Montante XL ZI M-04/10/2021

PLADUR®



DESCRIPCIÓN

Perfil metálico en forma de C, fabricado en acero galvanizado mediante proceso de laminación en frío.

Pladur® Montante M	Designación	Alma (mm)	Alas (mm)	Espesor (mm)	Recubrimiento
M 36/45 XL ZI	C44/35/46	34,5	44/46	0,62	Z140
M 48/45 XL ZI	C44/46/46	46,5	44/46	0,62	Z140
M 62/45 XL ZI	C44/61/46	60,5	44/46	0,62	Z140
M 70/45 XL ZI	C44/70/46	70,0	44/46	0,62	Z140
M 90/45 XL ZI	C44/89/46	88,5	44/46	0,62	Z140
M 100/45 XL ZI	C44/99/46	98,5	44/46	0,62	Z140
M 125/45 XL ZI	C44/124/46	123,5	44/46	0,62	Z140

GAMA

Este perfil pertenece a la Gama de perfiles Pladur® XL. La comparativa de características de la gama completa está disponible en el Manual Pladur®.

RECOMENDACIONES Y LIMITACIONES DE USO

Uso en interiores (consultar guía de sistemas PLADUR®).

SEGURIDAD Y SALUD

Para su transporte manual, no se recomienda la manipulación por un único individuo.

USO PREVISTO

Estructura portante de los tabiques en sistemas de placas de yeso laminado Pladur®.
Estructura portante de los trasdosados en sistemas de placas de yeso laminado Pladur®.
Estructura portante de los techos en sistemas de placas de yeso laminado Pladur®.

NORMATIVA Y CALIDAD

Perfilería metálica fabricada de acuerdo a la norma EN-14195



DATOS TÉCNICOS DEL PRODUCTO

Características	M 36/45 XL ZI	M 48/45 XL ZI	M 62/45 XL ZI	M 70/45 XL ZI	M 90/45 XL ZI	M 100/45 XL ZI	M 125/45 XL ZI	Uds.	Tolerancias
Tipo de acero	DX51D							-	-
Recubrimiento	CAPA DE ZINC (Z140)							-	-
Longitud	≤ 3000							mm	±3mm
	de 3001 a 5000							mm	±4mm
	> 5000							mm	±5mm
Espesor (e) (mm)	0,62							mm	±0,06mm
Rectitud	≤ L/400 mm (L= longitud nominal)							-	-
Torsión (h=espacio/W= ancho nominal)	≤0,1							-	-
Anchura inferior	34,5	46,5	60,5	70,0	88,5	98,5	123,5	mm	±0,5mm
Altura alas (a)(mm)	44/46	44/46	44/46	44/46	44/46	44/46	44/46	mm	±0,5mm
Ángulo pliegue (alma-ala)	90°	90°	90°	90°	90°	90°	90°	°	±2°
Momento de inercia	1,67	3,19	5,67	7,83	13,23	16,86	28,30	cm4	-
Peso aproximado	0,60	0,66	0,73	0,77	0,86	0,90	1,02	Kg/m	-
Nº Perforaciones	1ª perforación a 250mm. Separación entre perforaciones 500mm.							-	-
Diámetro de las perforaciones	21 x 21	52 x 26	52 x 26	33 (x 2)	33 (x 2)	33 (x 2)	33 (x 2)	-	-
Reacción al fuego	A1 (No contribuye al fuego)							Euroclase	-

2 | Ficha de Producto Pladur®

INSTALACIÓN

Se debe respetar en todo momento la normativa vigente aplicable en el territorio en el que se realice la instalación.

Atendemos a las consultas técnicas sobre instalación y ofrecemos soporte técnico a través de nuestro teléfono de atención al cliente y asistencia técnica +34 910 880 899 y en la dirección de correo electrónico consultas@pladur.com

ALMACENAJE Y MANIPULACIÓN

Almacenar al resguardo de la luz solar, la lluvia y fuentes de ignición.

Evite el contacto directo con disolventes, aceites y oxidantes.

Durante el montaje se recomienda manipularlos con cuidado para evitar golpear con ellos otros objetos o personas y provocar daños accidentalmente.

Para su transporte manual, no se recomienda la manipulación por un único individuo productos o conjunto de productos que superen individual o simultáneamente los 25kg.

En caso de superarlos se recomienda una manipulación colectiva o mediante la ayuda de elementos mecánicos.

Se recomienda manipular los perfiles mediante el uso de guantes de protección mecánica según normas UNE-EN-420 y UNE-EN 388.

DATOS TÉCNICOS DEL PRODUCTO

	M 36/45 XL Z1	M 48/45 XL Z1	M 62/45 XL Z1	M 70/45 XL Z1	M 90/45 XL Z1	M 100/45 XL Z1	M 125/45 XL Z1
Unidades / paquete	10	10	10	10	10	8	4
Unidades / pallet	360	360	280	240	200	160	120
Rotulación del perfil	-						
En una de las alas en su cara exterior se imprimen por chorro de tinta los datos							
Nombre empresa	Pladur Gypsum S.A.U						
Logo pladur®	Logo						
Nombre perfil (Designación)	MONTANTE M--/45 XL Z1						
Marcado NF	-	NF-CSTB	-	NF-CSTB	NF-CSTB	-	-
Código fábrica	-	OL	-	OL	OL	-	-
Marcado N	-						
Marcado CE	CE AÑO DCE5004						
Norma Año	EN 14195:2005						
Identificación	C44/-/46 0,62						
Longitud	-						
Galvanizado	Z140						
Reacción al fuego	A1						
Línea	Nº						
Lote de fabricación (fecha y hora)	00/00/2000 00:00						
Código de barras / EAN	-						
Gama	GAMA REFORZADA XL						

Oficinas Centrales y Fábrica de Valdemoro-Madrid
Placas de Yeso Laminado, Perfiles y Pastas.

El presente documento describe las características de los materiales Pladur® y sus recomendaciones de montaje, actualizadas a la fecha de edición. Estos datos pueden variar en función de los cambios de diseño de los productos y normativas vigentes. Estas características no deben ser transferidas a otros productos y sistemas fuera de la gama Pladur®. Este documento no tiene carácter contractual. Datos válidos salvo error tipográfico o de transcripción. Quedan reservados todos los derechos, incluida la incorporación de mejoras y modificaciones. Pladur® es una marca registrada de PLADUR GYPSUM S.A.U.

Servicio de Atención al Cliente

910 880 899

consultas@pladur.com

pladur.com
corporativo.pladur.com



HORIZONTAL CHANNEL



Ficha de Producto
Pladur®

Página
1

PLADUR® CANAL C

02a02001ES - Rev. 06/2020



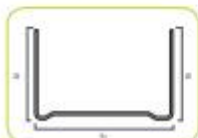
DESCRIPCIÓN

Perfil metálico en forma de U, fabricado en chapa de acero bajo en carbono y galvanizado en continuo por inmersión en caliente para su conformación en frío. La combinación de un acero de alta calidad, un alto nivel de recubrimiento y un proceso productivo que cuenta con los últimos avances tecnológicos en perfilado y estampación, proporcionan a los canales Pladur® C una perfecta protección contra la corrosión y gran resistencia mecánica.

CAMPO DE APLICACIÓN

Son indicados como elementos perimetrales horizontales que conforman, junto con los montantes, la estructura portante de los tabiques, trasdosados y algún tipo de techo en los sistemas de placa de yeso laminado Pladur®. En ellos encajan los montantes de dimensión equivalente, por una simple acción de giro, asegurando su conexión y alineación.

DISEÑO DEL PERFIL



DIMENSIONES

DIMENSIÓN (MM)	LONGITUD (MM)
35	3000
48	3000
48 / 65	3000
73	3000
73 / 65	3000
90	3000
125	4000
150	4000

DATOS TÉCNICOS

PROPIEDAD	VALORES
Tipo de acero	DX51D
Recubrimiento	CAPA DE ZINC (Z140)
Dimensión (mm)	35 48 48/65 73 73/65 90 125 150
Espesor (e) (mm)	0,55 0,55 0,55 0,55 0,55 0,6 0,6 0,6
Anchura (h) (mm)	35,3 45,8 46,1 71,1 71,1 91,2 126,2 151,2
Altura alas (a) (mm)	30 30 65 30 65 35 35 40
Ángulo pliegue (alma-ala)	90° 90° 90° 90° 90° 90° 90° 90°
Peso aproximado (kg/m)	0,41 0,46 0,75 0,57 0,87 0,75 0,91 1,07
Reacción al fuego	A1 (No contribuye al fuego)
Normativa aplicable	EN-14195
Sellos calidad	CE

TOLERANCIAS

PROPIEDAD	VALORES
Espesor	± 0,05 mm
Anchura	± 0,5 mm
Altura alas (a)	± 1 mm
Longitud	± 3 mm (L ≤ 3000 mm) ± 4 mm (3000 < L ≤ 5000 mm)
Dimensión angular (alma-ala)	± 2°
Rectitud	≤ L/400 mm (L = longitud nominal)
Torsión (h/W)	≤ 0,1 (h = espacio / W = ancho nominal)

INSTALACIÓN

- Se debe respetar en todo momento la normativa vigente aplicable en el territorio en el que se realice la instalación.
- Atendemos a las consultas sobre instalación y ofrecemos soporte técnico a través de nuestra dirección de correo electrónico consultas@pladur.com

PRESENTACIÓN

Rotulación perfil

En una de las alas, en su cara exterior se imprimen por chorro de tinta negra los siguientes datos: Logo Pladur®, nombre perfil, longitud, galvanizado, espesor, norma armonizada, reacción al fuego, marcado CE, código prov y lote fabricación (fecha y hora).

Pladur® Perfiles



PLADUR® CANAL C

Ficha de Producto
Pladur®



02a02001ES - Rev. 07/2015

Embalaje

Dimensión (mm)	34	48	48/65	73	73/65	90	125	150
Unidades / Paquete	12	12	12	12	12	8	8	4
Faquetes / Palet	40	49	28	28	16	36	20	42
Otros	Los perfiles se agrupan en paquetes con flejes de polipropileno blanco con el logo Pladur® senografiado en color verde. Los paquetes se agrupan en Palets. Cada Palet dispone de tacos en su parte inferior y tablas en su parte superior que aseguran su estabilidad. El número de tacos y tablas y sus dimensiones varían en función del tipo y dimensiones del perfil. Los Palets van como mínimo flejados en tres puntos "abrazados" a zunchos de madera. La tensión del fleje es suficiente para que no se separe del Palet cuando haya más de tres alturas de apilado sin que dañe los perfiles.							

PRECAUCIONES

- Únicamente mediante el uso combinado de los productos originales Pladur® (placa, perfiles, pastas, tornillos y accesorios) garantizamos el cumplimiento de los resultados obtenidos en nuestros ensayos o predicciones y que ofrecemos en nuestra documentación técnica.
- Para obtener información detallada sobre su seguridad, consulte la ficha de datos de seguridad del producto.

ALMACENAJE Y MANIPULACIÓN

- Almacenar en horizontal, sobre una superficie plana y seca, preferiblemente al resguardo de la luz solar, la lluvia y fuentes de ignición.
- Evitar el contacto directo con disolventes, aceites u oxidantes.
- Durante su montaje se recomienda manipularlos con cuidado para evitar golpear con ellos otros objetos o personas y provocar daños accidentalmente. Para su transporte manual, no se recomienda la manipulación por un único individuo de productos o conjunto de productos que superen individual o simultáneamente los 25 kg. En caso de superarlo se recomienda una manipulación colectiva o mediante la ayuda de elementos mecánicos.
- Se recomienda manipular los perfiles mediante el uso de guantes de protección mecánica según normas UNE-EN 420 y UNE-EN 388.

consultas@pladur.com
www.pladur.com



Oficina Central y Fábrica de Vallboya-Madrid
Placas de Yeso Laminado, Transformadas,
Perfiles y Pastas Adhesivas

El presente documento se describe según las características de los materiales PLADUR® y sus recomendaciones de montaje, actualizadas a la fecha de la edición, pudiendo por tanto estar según posibles cambios de diseño de los productos y normativas vigentes. Estas características no deben ser trasladadas a otros productos y sistemas fuera de la gama PLADUR®. Este documento no tiene carácter contractual. Publicado junio de 2020. Datos válidos salvo error tipográfico o de transcripción. Quedan reservados todos los derechos. Incluye la incorporación de mejoras y modificaciones. PLADUR® es una marca registrada de Pladur® Gypsum S.A.U.

Pladur®
Lo hace realidad

SELF-DRILLING SCREW FOR GYPSUM BOARDS



Ficha de Producto
Pladur®

página 1

PLADUR® TORNILLOS

04b01001ES - Rev. 10/2015



DESCRIPCIÓN

Tornillos autorroscantes o auto perforantes fabricados en acero de alta resistencia, con recubrimiento anticorrosivo incorporado, para su uso en los sistemas de placa de yeso laminado Pladur®.

PLADUR® TORNILLO PM	
Descripción	Tornillo autorroscante fabricado en acero de cementación con recubrimiento fosfatado que actúa como protector frente a la corrosión. Dispone de cabeza de trompeta plana con huella cruciforme Philips nº 2 y punta afilada.
Campo de aplicación	Fijación de las placas de yeso laminado Pladur® a los perfiles de acero laminado (hasta 0,75 mm de espesor) en los sistemas Pladur®. No es apto para el atornillado de chapas metálicas entre sí.
PROPIEDAD	VALORES
Diámetro vástago (mm)	3,5 3,9 4,2
Diámetro cabeza (mm)	8 8 8
Longitud (mm) (tolerancia)	25 (±1,50) 35 (±1,50) 45 (±1,50) 55 (±1,50) 70 (±1,50)
Carga admisible (kg)	Arrancamiento: 15 Cortante: 30
Reacción al fuego	A1
Normativa aplicable	EN-14566 CE
Designación	Tornillo para placa de yeso laminado / EN 14566 / clase 48 / THN.

PLADUR® TORNILLO MM	
Descripción	Tornillo auto perforante fabricado en acero de cementación con recubrimiento cianurado que actúa como protector frente a la corrosión. Dispone de cabeza "gota de saba" con huella cruciforme Philips nº 2 y punta de broca.
Campo de aplicación	Fijación de los perfiles metálicos entre sí (hasta 2,25 mm de espesor) en los sistemas de placa de yeso laminado Pladur®.
PROPIEDAD	VALORES
Diámetro vástago (mm)	3,5
Diámetro cabeza (mm)	7 7
Longitud (mm) (tolerancia)	9,5 (±0,75) 25 (±1,25)
Carga admisible (kg)	Arrancamiento: 15 Cortante: 30
Reacción al fuego	A1
Normativa aplicable	EN-14566 CE
Designación	Tornillo para placa de yeso laminado / EN 14566 / clase 24 / PSD.

PLADUR® TORNILLO PB	
Descripción	Tornillo auto perforante fabricado en acero de cementación con recubrimiento fosfatado que actúa como protector frente a la corrosión. Dispone de cabeza de trompeta plana con huella cruciforme Philips nº 2 y punta de broca.
Campo de aplicación	Fijación de las placas de yeso laminado Pladur® a los perfiles de acero laminado (espesores comprendidos entre 0,75 mm y 2,25 mm) en los sistemas Pladur®. No es apto para el atornillado de chapas metálicas entre sí.
PROPIEDAD	VALORES
Diámetro vástago (mm)	3,5
Diámetro cabeza (mm)	8 8
Longitud (mm) (tolerancia)	25 (±0,75) 35 (±1,25)
Carga admisible (kg)	Arrancamiento: 15 Cortante: 30
Reacción al fuego	A1
Normativa aplicable	EN-14566 CE
Designación	Tornillo para placa de yeso laminado / EN 14566 / clase 48 / TSD.

PLADUR® TORNILLO PMA	
Descripción	Tornillo autorroscante fabricado en acero de cementación con recubrimiento fosfatado que actúa como protector frente a la corrosión. Dispone de cabeza de trompeta plana con huella cruciforme Philips nº 2 y punta afilada.
Campo de aplicación	Fijación de las placas de yeso laminado Pladur® a estructuras de madera en los sistemas Pladur®.
PROPIEDAD	VALORES
Diámetro vástago (mm)	4,8
Diámetro cabeza (mm)	
Longitud (mm) (tolerancia)	35 (±0,75)
Carga admisible (kg)	Arrancamiento: 15 Cortante: 30
Reacción al fuego	A1
Normativa aplicable	EN-14566
Designación	Tornillo para placa de yeso laminado / EN 14566 / clase 48 / THN.

Pladur® Accesorios



PLADUR® TORNILLOS

Ficha de Producto
Pladur®

pág
2

04b01001ES - Rev. 10/2015

PRESENTACIÓN

Marcado de cabeza

- Todos los tornillos Pladur® incorporan una P grabada en su cabeza, para su fácil identificación.

Embalaje

	PM						PB			MM		PMA
Dimensión (mm)	3,5 x 25	3,5 x 35	3,5 x 45	3,9 x 25	3,9 x 35	3,9 x 55	4,2 x 70	3,5 x 25	3,5 x 35	3,5 x 9,5	3,5 x 25	4,8 x 35
Caja (uds)	1.000	1.000	500	1.000	1.000	500	250	500	500	1.000	500	500
Cajón (contiene cajas) (uds)	12.000	12.000	6.000	12.000	12.000	6.000	3.000	16.000	6.000	32.000	16.000	6.000
Otros formatos	Cubo 10.000 uds	Cubo 7.000 uds	-	Blister 100 uds / Cajón 5.000 uds	Blister 100 uds / Cajón 5.000 uds	-	-	-	-	Blister 100 uds / Cajón 5.000 uds	-	-

INSTALACIÓN

- Para el atornillado es necesario el uso de un atornillador eléctrico con potencia mínima de 350W y revoluciones comprendidas entre 2500 y 4000 rpm.
- Los tornillos se atornillan perpendicularmente a las placas de tal manera que penetren en ella lo necesario para que sin atravesar la celulosa superficial de la cara vista admitan su plastificado posterior.
- La longitud idónea del tornillo a elegir es aquella que, una vez atornillado a las placas y al perfil, su punta sobresalga de éste último al menos 10 mm.
- Se debe respetar en todo momento la normativa vigente aplicable en el territorio en el que se realice la instalación.
- Atendemos a las consultas sobre instalación y ofrecemos soporte técnico a través de nuestra dirección de correo electrónico consultas@pladur.com

ALMACENAJE Y MANIPULACIÓN

- Almacenar los tornillos en su embalaje original, al resguardo de la lluvia y fuentes de ignición en un lugar de no intemperie.
- No se recomienda la manipulación por un único individuo de productos o conjunto de productos que superen individual o simultáneamente los 25 kg. En caso de superarlo se recomienda una manipulación colectiva o mediante la ayuda de elementos mecánicos.
- Se recomienda el uso de guantes de protección mecánica según EN-420 y EN-388.

PRECAUCIONES

- Únicamente mediante el uso combinado de los productos originales Pladur® (placa, perfiles, pastas, tornillos y accesorios) garantizamos el cumplimiento de los resultados obtenidos en nuestros ensayos o predicciones y que ofrecemos en nuestra documentación técnica.

ACABADOS Y DECORACIÓN

- Las cabezas de los tornillos Pladur® colocados en las placas que forman la cara vista del tabique deben ser cubiertos con dos o tres capas de pasta para juntas de la gama Pladur® para obtener una superficie completamente plana y continua. No se debe pintar la superficie antes de realizar este tratamiento.
- Es necesario aplicar una imprimación y dejar secar antes de pintar, texturizar o empapelar, de forma que se iguale la capacidad de absorción de la placa y la pasta empleada. Se deben seguir cuidadosamente las instrucciones del fabricante para su aplicación.
- Una adecuada ventilación del recinto que favorezca la circulación de aire minimiza la aparición de problemas ocasionados por la humedad.
- En caso de altos niveles de humedad ambiental podría ser necesario el uso de deshumificadores.
- Se deben seguir cuidadosamente las instrucciones del fabricante del material que se emplee como decoración.

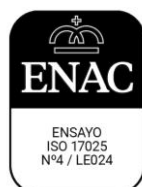
consultas@pladur.com
www.pladur.com



Oficinas Centrales y Fábrica de Valdemoro-Madrid
Placas de Yeso Laminado, Transformados,
Perfiles y Pastas Adhesivas

El presente documento se describe según las características de los materiales PLADUR® y sus recomendaciones de montaje, actualizadas a la fecha de la edición, pudiendo por tanto variar según posibles cambios de diseño de los productos y normativas vigentes. Estas características no deben ser transferidas a otros productos y sistemas fuera de la gama PLADUR®. Este documento no tiene carácter contractual. Publicado julio de 2015. Datos válidos salvo error tipográfico o de transcripción. Quedan reservados todos los derechos, incluida la incorporación de mejoras y modificaciones. PLADUR® es una marca registrada de Pladur® Gypsum S.A.U.

Pladur®
Lo hace realidad



METAL-TO-METAL SCREW

**FIJACIONES MECÁNICAS PARA SISTEMAS
N PLACAS DE YESO**
DeP n° 3585501002038



EN 14566

27/01/2017

DECLARACIÓN DE PRESTACIONES

n° 3585501002038

1. Código de identificación única del producto tipo :

Fijaciones mecánicas para sistemas en placas de yeso

VIS 3.5 * 25MM / 35MM / 45MM TTTC
VIS 4.2 * 55MM / 75MM / 85MM TTTC
VIS 4.8 * 90MM / 110MM / 130MM TTTC
VIS 3.5 * 9.5MM TRPF
VIS 3.5 * 13MM TRPF

2. Uso previsto :

Fijación de las placas de yeso, placas de yeso armada de fibras, productos obtenidos por transformación secundaria así como productos accesorios apropiados representados
A la figura 2 de la norma sobre esqueletos de madera de construcción y en metal, si llega el caso, en las obras de construcción

3. Fabricante :

SEMIN SAS
1A RUE DE LA GARE
57920 KEDANGE SUR CANNER - FRANCIA
Tel: 03 82 83 53 57
Fax: 03 82 83 53 33
mail@semin.com
www.semin.com

4. Representante autorizado :

No aplicable

5. Sistemas de evaluación de la constancia de las prestaciones :

Systema 4

6. En caso de declaración de prestaciones relativa a un producto de construcción :

6a. Norma armonizada : EN 14566 : 2008 + A1 2009

Organismo notificado : No aplicable

6b. Documento de evaluación europeo : No aplicable

Evaluación técnica europea : No aplicable

Organismo notificado : No aplicable

7. Prestaciones declaradas :

Nombre del producto	Características esenciales EN 14566 : 2008 + A1 2009	
	Resistencia a la tracción Resistencia a la flexión	Resistencia a la rotación
VIS 3.5 * 25MM / 35MM / 45MM TTTC	si	conforme
VIS 4.2 * 55MM / 75MM / 85MM TTTC	si	conforme
VIS 4.8 * 90MM / 110MM / 130MM TTTC	si	conforme
VIS 3.5 * 9.5MM TRPF	si	conforme
VIS 3.5 * 13MM TRPF	si	conforme

8. Documentación técnica apropiada y / o documentación técnica específica :

No aplicable

Las prestaciones del producto identificado en el punto 1 son conformes con las prestaciones declaradas en el punto 7.
La presente declaración de prestaciones se emite bajo la sola responsabilidad del fabricante identificado en el punto 3.

Firmado por y en nombre del fabricante por : PHILIPPE SEMIN (PDG)

Fecha y lugar de emisión : 27 01 2017 en KEDANGE SUR CANNER

Firma :

SEMIN
1A, Rue de la Gare - F 57920 KEDANGE SUR CANNER - Tel. 03.82.83.53.57 - Fax : 03.82.83.53.33
www.semin.com - E-mail : mail@semin.com

SUPPORTING WALL INTERNAL FIRE STOP



Ventirock Duo

Panel de lana de roca semirrígido no revestido de doble densidad

Aplicación

Aislamiento térmico y acústico de fachadas ventiladas



Características Técnicas

Propiedad	Descripción				Norma
Densidad nominal (kg/m ³)	100-40				EN 1602
Conductividad térmica W/(m·K)	0,034				EN 12667
Dimensiones (mm)	1350 x 600				
Reacción al fuego /Euroclase	A1				EN 13501.1
Resistencia térmica (m ² K/W)	Espesor (mm)	Resistencia térmica (m ² K/W)	Espesor (mm)	Resistencia térmica (m ² K/W)	
	50	1.45	100	2.90	
	60	1.75	120	3.50	
	80	2.35	140	4.10	
Tolerancia de espesor (mm)	T3				EN 823
Estabilidad dimensional a una temperatura y humedad específicas	DS (70,90)				EN 1604
Resistencia al flujo de aire	AF15	(> 15 KPa · s/m ²)			EN 29053
Resistencia al paso del vapor de agua	MU1	(μ = 1)			EN 12086
Absorción de agua a corto plazo (kg/m ²)	WS	(< 1,0 kg/m ²)			EN 1609
Absorción de agua a largo plazo por inmersión parcial (kg/m ²)	WL(P)	(< 3,0 kg/m ²)			EN 12086

Ventajas

- Resistencia al agua de lluvia.
- Resistencia a la acción del viento.
- Estabilidad dimensional garantizada.
- No es necesario el uso de mortero.
- Seguridad en caso de incendio.
- Excelente aislamiento térmico y acústico.
- Perfecta adaptación a los elementos estructurales gracias a la doble densidad.
- No hidrófilo ni higroscópico.
- Químicamente inerte.
- Declaración Ambiental de Producto
- Libre de CFC y HCFC, respetuoso con el medio ambiente.
- Certificado de bajas emisiones
- Informe Bureau Veritas: garantía de la integridad del producto y del sistema durante su puesta en obra y durante su ciclo de vida.



abr.-22

ROCKWOOL Peninsular S.A.U.
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31380 Caparrosa, Navarra, Spain
T (+34)902 430 430
www.rockwool.es

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EXTERNAL JOINT TREATMENT PASTE



Mortero de Juntas Aquapanel® Outdoor

Mortero de juntas en base de cemento para
Sistemas de fachada con Placas Aquapanel® Outdoor

Material

Composición

El Mortero de juntas Aquapanel® Outdoor es un mortero en polvo, de cemento Portland, cal, cargas minerales y resinas sintéticas, de color gris.

Almacenaje

Conservar el envase bien cerrado y al abrigo de la humedad.

Tiempo máximo de almacenaje: 12 meses
Utilizar inmediatamente los sacos abiertos.

Embalaje

Saco de 20 kg (palet 48) Código: 00131094

Campo de uso

El Mortero de juntas Aquapanel® Outdoor se utiliza para el tratamiento de juntas de las placas de Cemento Aquapanel® Outdoor. Permite sentar y fijar la Malla de juntas Aquapanel® Outdoor en las juntas de las placas.

Temperatura de trabajo

No aplicar a pleno sol ni a temperaturas del soporte inferiores a 5 °C.

No aplicar sobre soportes sometidos a humedad permanente.

Propiedades

- Color gris
- Mortero de juntas y enlucido
- Mortero de Cemento modificado con resinas sintéticas
- Granulometría compensada
- Reforzado con fibras
- Viscosidad estable
- Rápido secado
- Baja absorción de agua y permeable al vapor de agua
- Buena adhesión
- Aplicación manual
- Uso exterior - Interior

Mortero de Juntas Aquapanel® Outdoor

Forma de trabajo, datos técnicos, precauciones



Forma de trabajo

Preparación

- Las placas Aquapanel® deben estar instaladas y su superficie seca, sana, consistente, libre de polvo, grasas y ceras.
- Entre cada borde de placas sucesivas debe haber una separación de como mínimo 4 mm., con el fin de que el mortero penetre en ella.

Amasado

Mezclar el contenido de un saco 20 kg. con aprox. 6,8 l. de agua y amasar de forma mecánica (600 rpm) hasta obtener una pasta suave y consistente, de uso inmediato.

Aplicación

Realización de juntas:

- Rellenar la junta y sentar la Cinta de Juntas Aquapanel® Outdoor.
- Mortero de Juntas Aquapanel® Outdoor, puede ser utilizado con cualquiera de las dos Cintas de Juntas Aquapanel® Outdoor.
- Tapar las cabezas de tornillos.
- El tiempo de manejabilidad es de 75 min a 20°C y el de rectificación es de 20 min a 20°C.
- Limpiar las herramientas con agua inmediatamente después de usar.
- En caso necesario tratar la superficie con la Imprimación GRC.

Tiempo de secado

No remover una vez iniciado el fraguado. El tiempo de secado del mortero es variable, dependiendo de las condiciones climáticas y del espesor de la capa aplicada. La siguiente etapa de trabajo es posible después de 24 horas.

Precauciones

Xi Irritante

Para mayor información consultar la Ficha de Datos de Seguridad

Datos técnicos

Producto	
Densidad aparente polvo	1200 ± 50 kg/m³
Densidad pasta	1650 ± 50 kg/m³
Densidad mortero endurecido	1200 ± 50 kg/m³
Resistencia a la compresión EN 1015-11	6,5 ± 1 N/mm²
Absorción de agua por capilaridad EN 1015-18	< 0,2 kg/m², min 0,5)
Resistencia a la adhesión EN 1015-12	> 5 kg/cm²
Coefficiente de permeabilidad al vapor de agua	μ < 0,3
Aplicación	
Temperatura mínima de aplicación en el soporte	> 5° C
Agua de amasado	0,34 l de agua por 1 kg de polvo (6,8 l. de agua por saco de 20 kg)
Limpeza Herramienta	Con agua, inmediatamente después de usar
Espesor mínimo por capa en enlucido	4 mm (para reparar huecos)
Tiempo de rectificación	20 minutos a 20°C
Tiempo de trabajo o manejabilidad	75 min. a 20 ° C, variable en función de la temperatura y humedad
Tiempo de retoque	24 horas a 20°C, variable en función de la temperatura y humedad
Consumo teórico	0,7 Kg por m² para junta de 4 mm
Tiempo de secado	Variable, según espesor y condiciones climáticas.

La siguiente etapa de trabajo es posible después de 24 horas

Knauf
Atención al cliente:
• Tel.: 902 440 460
• Fax.: 902 440 461

Knauf GmbH España, Av. de Manoleras, 10 - edificio C - 28050 Madrid

El coste de la llamada es de 0,0633 €/min. durante el primer minuto y 0,0673 €/min. los restantes, llamando desde un teléfono fijo desde España. Las llamadas desde un móvil o internet, son las fijadas por el operador.



www.Knauf.es

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Los detalles constructivos, así como los datos físicos, estáticos y propiedades de nuestros sistemas, se pueden garantizar solamente utilizando productos comercializados o recomendados por Knauf GmbH.

MESH JOINT TAPE

Tramaglass 160 R131



Malla de fibra de vidrio indicada para el refuerzo de morteros en Sistema de Aislamiento Térmico Exterior (SATE - ETICS). Certificado conforme a la norma ETAG 004.

Ancho	110 cm.
Longitud	50 m.
Peso	160 gr./m ²
Luz malla	3,5 x 3,8 mm
Espesor	± 0,52 mm.
Tejido	Half-leno
Densidad lineal	Urdimbre: 25 x 2 tex Trama: 20,5 tex
Resistencia a la tensión	Urdimbre: ≥ 1900 N/5 cm. Trama: ≥ 1900 N/5 cm.
Resistencia a la tensión después de 28 días en una disolución al 5% de Hidróxido de Sodio	Urdimbre: ≥ 1000 N/5 cm. Trama: ≥ 1000 N/5 cm.
Elongación	Urdimbre: 3,8 % Trama: 3,8 %
Elongación después de 28 días en una disolución al 5% de Hidróxido de Sodio	Urdimbre: 3,5 % Trama: 3,5 %
Propiedades	Alta estabilidad dimensional Compatible con la mayoría de sistemas de fachadas Altamente resistente a los álcalis Alargamiento reducido

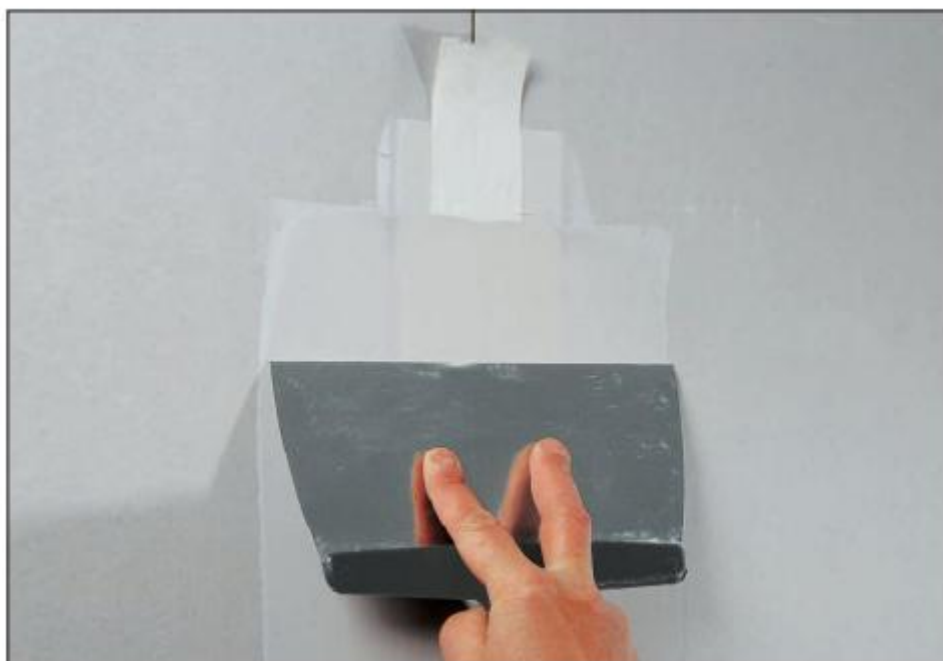
Las indicaciones y datos técnicos que aparecen en esta ficha están basados en nuestra experiencia y certificaciones vigentes, declinando toda responsabilidad por consecuencias derivadas de una utilización inadecuada. Por ello, nuestra garantía se limita exclusivamente a la calidad del producto suministrado. Esta ficha técnica podrá ser actualizada sin previo aviso.

regarsa

C/ Agustín Durán, 4 - 28028 Madrid - Tfno. 91 726 14 11 - Fax: 91 361 17 08

www.regarsa.com - regarsa@regarsa.com

INTERNAL JOINT TREATMENT PASTE



CE 78 LENT

PASTA DE JUNTAS PARA PLACAS DE YESO

DEFINICIÓN TÉCNICA.

El CE 78 LENT es un revoque en polvo formulado especialmente para el tratamiento de las juntas de placa de yeso de bordes rebajados, en combinación con una cinta de unión.

El tiempo de empleo de la masa es superior a 24 horas y puede aplicarse mecánicamente o a mano.

COMPOSICIÓN Y ASPECTO.

Revoque en polvo a base de carbonato cálcico, resina y varios aditivos.

La pasta deja un acabado de color blanco.

SOPORTES ADMITIDOS.

Todos los tipos de placa de yeso con o sin aislantes (lana de vidrio, lana mineral, poliestireno), de bordes rebajados y caras encartonadas.

REVESTIMIENTOS.

- Subcapa de imprimación para placas de yeso.
- Revoque de alisado a base de yeso.

DOCUMENTOS DE CONSULTA.

Ficha técnica nº 9/02-731 y DTU 25.41.

CARACTERÍSTICAS TÉCNICAS.

- Tiempo de fraguado: fragua por secado.
- Adherencia de la cinta: >1000 g.
- Fisuración: sin fisuras hasta un espesor de 5 mm.
- Densidad: 0,8.

ENVASADO.

Sacos de 5 y 25 kg sobre palet con funda.

ALMACENAMIENTO.

9 meses en envase original sin abrir y protegido contra la humedad.



12

PUESTA EN OBRA

PRECAUCIONES DE EMPLEO.

La temperatura durante la aplicación y el secado debe estar comprendida entre 5 y 30°C.

No aplicar sobre soporte húmedo.

No aplicar sobre soporte helado.

En invierno o con tiempo frío, utilizar preferentemente nuestros revocos CE 78 de fraguado rápido o muy rápido.

PREPARACIÓN DE LOS SOPORTES.

Las placas de yeso se fijan según el DTU 25.41.

Las placas recortadas deben biselarse y desempolvarse.

RELACIÓN DE MEZCLA.

De 10 a 11 l de agua por saco de 25 kg.

APLICACIÓN.

Antes de tratar las juntas propiamente dichas, debe procederse al relleno entre los paneles que puedan quedar mal unidos y volver a tapar (desconchados, deterioro del paramento...).

La aplicación se realiza a mano "untando" el rebaje con una espátula de 10 ó 15 cm y colocando la cinta. (La cara afilada contra el revoque). Dar enseguida una pasada de acabado, dejar secar y terminar tapando la cinta.

Tapar igualmente las cabezas de los tornillos.

Aplicar una cinta a ras de techo procurando que el hormigón esté libre de restos de aceite del desencofrado.

En caso de ángulos verticales salientes, usar una cinta armada (con la armadura del lado de la placa) o un perfil angular metálico.

CINTAS COMBINADAS.

Cintas MARCO PAPER o SOROPA.

RENDIMIENTO.

Unos 350 gr/m² de placas.

TIEMPO DE SECADO.

El recrecido puede efectuarse 8 horas después de la primera pasada.

PASTA JUNTA-COLA PARA JUNTAS

El CE 78 LENT es el cemento-cola por excelencia para la ejecución de juntas con cintas entre las placas de paramento de yeso.

Este producto de fácil aplicación proporciona un tiempo de empleo muy largo después del mezclado, mayor de 24 horas.

VENTAJAS

- Aplicación manual o mecánica.
- Se adapta bien a obras grandes.
- Tiempo de empleo muy largo.

CONSEJOS DE COLOCACIÓN

No solapar las cintas de junta en las intersecciones: cortar una de ellas para evitar sobreespesores.



13



PAPER JOINT TAPE



Knauf Cinta de papel

Cinta de juntas para placas de yeso laminado

Descripción del producto

Composición

Cinta de papel de 50 mm de ancho para realizar el tratamiento de juntas de forma conjunta con la gama de pastas Knauf, en sistemas con placa de yeso laminado. Compuesta de papel microperforado, lijado por ambas caras y un prepliegue mecánico central que facilita su colocación en ángulos entrantes.

Almacenaje

Almacenar el producto en un lugar seco no expuesto a la luz solar directa. Con temperatura constante entre -10 °C y +60°C.

Calidad

El producto está sujeto a ensayos de tipo inicial y al control de producción en fábrica de acuerdo a la Norma UNE-EN 13963.

Campo de aplicación

La cinta de papel se utiliza en el tratamiento de juntas en los sistemas de tabiques, trasdosados y techos suspendidos. Permite junto con la pasta de juntas una perfecta unión entre las placas de yeso laminado.

Temperatura de uso: entre 5 °C y 30°C.

Propiedades

- Alta Resistencia mecánica
- Fácil y rápida de aplicar
- Compatible con la amplia gama de pastas Knauf
- Mejora la adherencia de las juntas entre placas
- No se expande con la humedad
- Tratamiento anticorrosión
- Se puede aplicar el acabado de forma inmediata
- Para una mejor identificación incluye impresa la letra "K"

Embalaje

Rollo de 23 m
Rollo de 150 m

Código: 3695
Código: 69914

K442b.es Knauf Cinta de papel

Cinta de juntas para placas de yeso laminado



Tratamiento de juntas

Se puede aplicar en placas con bordes BA, BV, BB.

El tratamiento de juntas se realiza entre dos placas entre sí o entre una placa y otros elementos de obra.

Se ha de tener en cuenta la calidad requerida para cada tipo de obra.

Aplicar la pasta de juntas Knauf en los bordes de las placas, en una tira aproximada de 80 mm de ancho y 1 mm de espesor y sentar la cinta de papel con el rótulo en la cara vista.

Una vez sentada la cinta se plancha, pasando la espátula sobre ella y retirando el material sobrante.

Dependiendo del tipo de acabado requerido, hay que realizar el planchado de la cinta y aplicar las demás manos de pasta que irán sobre ella.

La cinta es adecuada tanto para las juntas longitudinales, como para las transversales.

Acabado

Una vez realizado el tratamiento de juntas se recomienda lijarse a fin de alcanzar una mayor planeidad y favorecer la aplicación del acabado.

Posteriormente aplicar una imprimación sobre todo el paramento para igualar la capacidad de absorción entre la superficie de la placa y la zona de la junta.

Finalmente proceder a la aplicación del acabado.

Datos Técnicos

Descripción	Unidad	Valor
Material	-	Papel Kraft
Color	-	Crema
Gramaje	gr/m ²	138 (+0/-3%)
Perforación eléctrica y mecánica	Ø	0,1 a 0,3 de 1 a 2 cm ²
Límite elástico	N/mm	5,23
Estabilidad dimensional	%	Longitud: 0,4 Anchura: 2,5
Reacción al fuego	Clase	E

Consumo de materiales

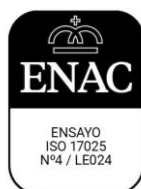
Ancho de placa	Junta	Techo (10 x 10 m)	Tabique (4 x 2,75 m)	Trasdado (4 x 2,75 m)
1200 mm	Longitudinal	0,75	1,5	0,75
	Transversal	0,45	sí/ necesidad en juntas horizontales	

Consumo en m/m² para el tratamiento de juntas

Knauf Teléfono de contacto: ▶ Tel.: 902 440 460 ▶ Fax: 91 766 13 35 ▶ www.knauf.es	Sistemas de Construcción en Seco Avenida de Burgos, 114 Planta 6ª, 28050 Madrid La documentación técnica está sujeta a constantes actualizaciones, es necesario consultar siempre la última versión desde nuestra página Web. www.knauf.es Todos los derechos reservados. Prohibida la reproducción total o parcial, sin la autorización de Knauf GmbH España. Garantizamos la calidad de nuestros productos. Los datos técnicos, físicos y demás propiedades consignados en esta hoja técnica, son resultado de nuestra experiencia utilizando sistemas Knauf y todos sus componentes que conforman un sistema integral. Los datos de consumo, cantidades y forma de trabajo, provienen de nuestra experiencia en el montaje, pero se encuentran sujetos a variaciones, que puedan provenir debido a diferentes técnicas de montaje, etc. Por la dificultad que entraña, no ha sido posible tener en cuenta todas las normas de la edificación, reglas, decretos y demás escritos que pudieran afectar al sistema. Cualquier cambio en las condiciones de montaje, utilización de otro tipo de material o variación con relación a las condiciones bajo las cuales ha sido ensayado el sistema, puede alterar su comportamiento y en este caso, Knauf no se hace responsable del resultado de las consecuencias del mismo.	
K442b.es/esp/11.19/ES	Las características constructivas, estáticas y físicas de los sistemas Knauf, solamente pueden ser conseguidas y garantizadas, utilizando materiales comercializados por Knauf y siguiendo las indicaciones de montaje de nuestras hojas técnicas.	



APPENDICE F. TECHNICAL DATA SHEETS. CLADDING SYSTEM(*)





TECHNICAL SPECIFICATIONS

STACBOND FR
fire retardant ACP

VER: 001 / 2026

PANEL PHYSICAL SPECIFICATIONS

Total panel thickness (mm)	Panel weight (kg/m ²)
	Thickness of lacquered face of 0.5 (mm)
4	7.3±8%

ALUMINIUM ALLOY

	VALUE	NORM
Visible face	5005	UNE-EN 573-3
Hidden face	3105/3005*	UNE-EN 573-3

SHEET DIMENSIONS

	UNITS	VALUE
Width (min./max.)	mm	800/2000**
Length (min./max.)	mm	2000/6000**
Thickness tolerance	mm	-0.15/+0.1
Width tolerance	mm	-0/+2
Length tolerance	mm	-0/+10
Squareness (diagonal tolerance)	mm	±3
Protective film width tolerance	mm	0;-5

TECH. SPECS. OF THE PANEL

	UNITS	VALUE	NORM
Peeling	N/mm	≥7,0	ASTM D903-98 (2004)
Rigidity (EI)	kNcm ² /m	2610	DIN 53293
Resistant module (W)	cm ³ /m	1.496	
Acoustic insulation Rw (C;Ctr)	dB	33 (-1;-4)	ISO 717-1:2013
Sound reduction Rw	dB	29.9±1.30	
Thermal resistance (R)	m ² K/W	0.014	
Thermal conductivity	W/m ² K	0.448	UNE-EN ISO 12567-1
Thermal transmittance (U)	W/m ² °C	5.67	
Thermal expansion (α)	mm/m (100°)	1.66	UNE-EN ISO 10545:2019
Operating temperature	°C	-50/+80	

CORE SPECIFICATIONS

	FR	UNITS	VALUE	NORM
Density		g/cm ³	1.50±0.15	
Fire reaction			B _s 1-d0	UNE-EN 13501-1:2018

ALUMINIUM TECH. SPECIFICATIONS

	UNITS	VALUE	NORM
Alloy		5005	3105/3005*
		H42/H44	H42/H44
Modulus of elasticity (E)	N/mm ²	70 000	70 000
Proof stress (Rp 0.2)	N/mm ²	≥ 80	≥ 110
Tensile strength (Rm)	N/mm ²	125≥ Rm≥ 205	130≥ Rm≥ 215
Elongation (A50)	%	≥ 3	≥ 4
Density (ρ)	kg/m ³	2,700	2,700
Thermal expansion (α)	mm/m (100°)	2.36	2.36

* Aluminium alloy 5005 available by customer request.

** Check with us for other dimensions.



TECHNICAL SPECIFICATIONS

SZ PRO ACCESORIES

STACBOND

VER: 001 / 2026

SZ PRO ACCESORIES

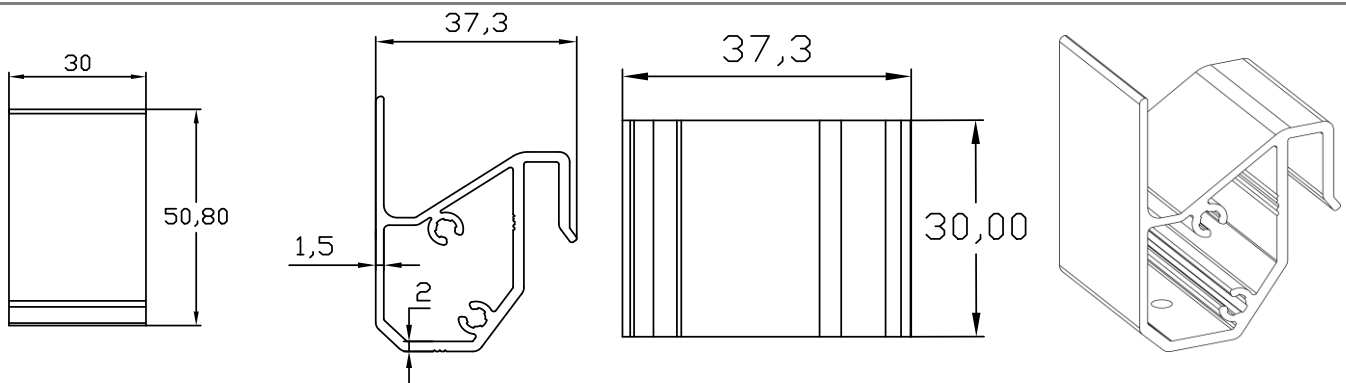
Reference	Description
05.19.096	Short S Bracket
05.19.097	Long S Bracket
05.19.094	Short Z Bracket
05.19.095	Long Z Bracket
05.19.099	Starter profile SZ
05.19.101	SZ horizontal stiffener long bracket
05.19.100	SZ horizontal stiffener short bracket
05.19.110	SZ horizontal stiffener mini bracket

Alloy	TYPE	NORM
SZ PRO ACCESORIES	EN AW 6063 T6	UNE-EN 573-3 and UNE-EN 755-2

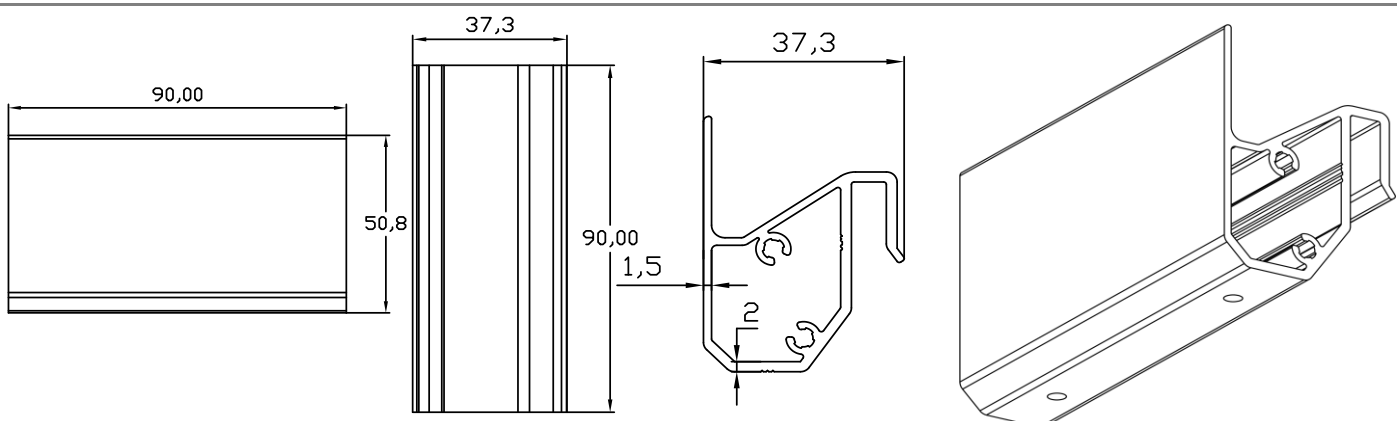
Alloy EN AW 6063 T6	TECHNICAL SPECIFICATIONS	VALUE	UNITS
Tensile strength (Rm)		≥215	MPa
Proof stress (Rp 0.2)		≥170	MPa
Elongation (A50)		≥8%	

CHEMICAL COMPOSITION									
Si	0.20-0.60	Fe	0.35	Cu	0.1	Mn	0.1	Mg	0.45-0.9
Cr	0.1	Zn	0.1	Ti	0.1	Others	0.05	Total	0.15

Short S Bracket 05.19.096	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.0219	kg



Long S Bracket 05.19.097	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.05119	kg





TECHNICAL SPECIFICATIONS

SZ PRO ACCESORIES

STACBOND

VER: 001 / 2026

Short Z Bracket 05.19.094

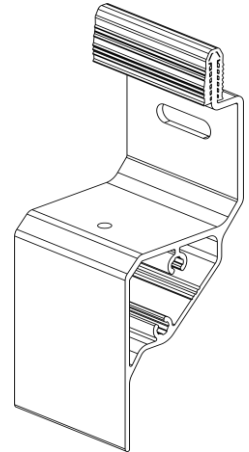
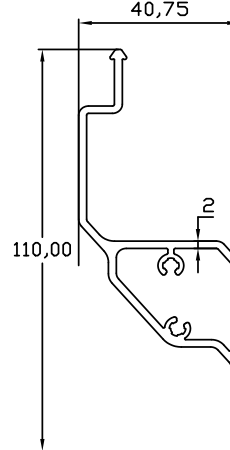
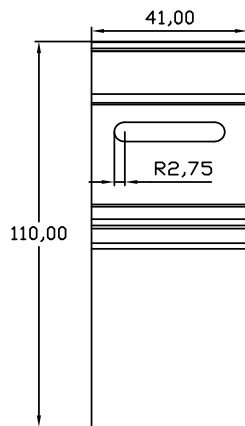
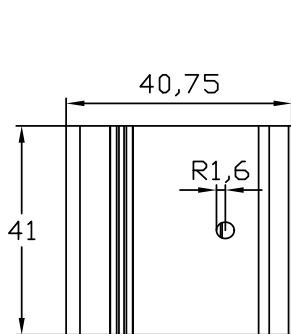
DIMENSIONAL SPECIFICATIONS

UNITS

Weight

0.03891

kg



Long Z Bracket 05.19.095

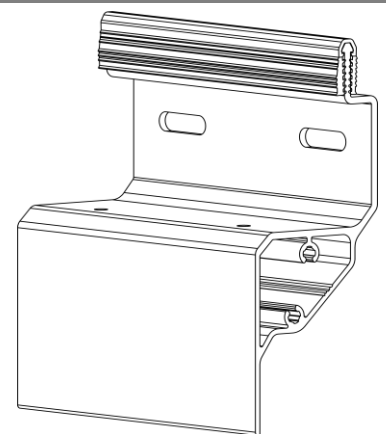
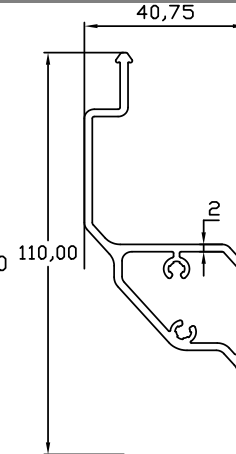
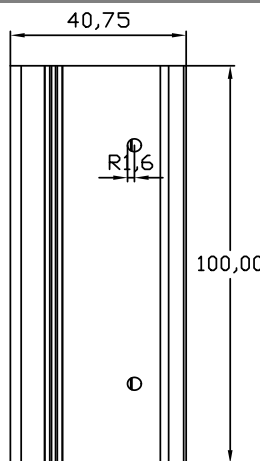
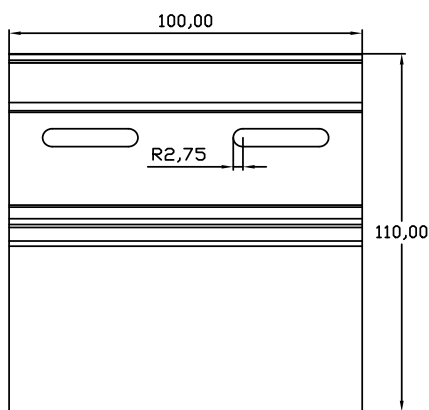
DIMENSIONAL SPECIFICATIONS

UNITS

Weight

0.07397

kg



Starter profile SZ 05.19.099

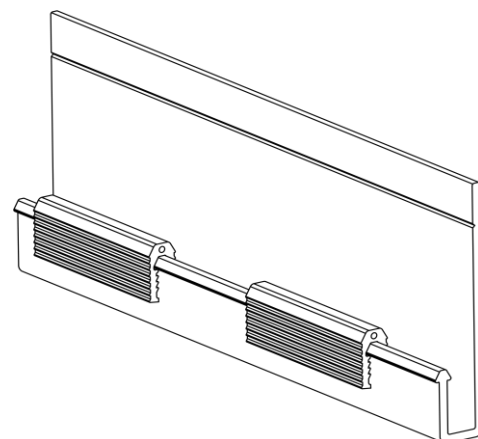
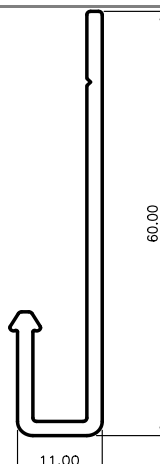
DIMENSIONAL SPECIFICATIONS

UNITS

Weight

0.457

kg





TECHNICAL SPECIFICATIONS

SZ PRO ACCESORIES

STACBOND

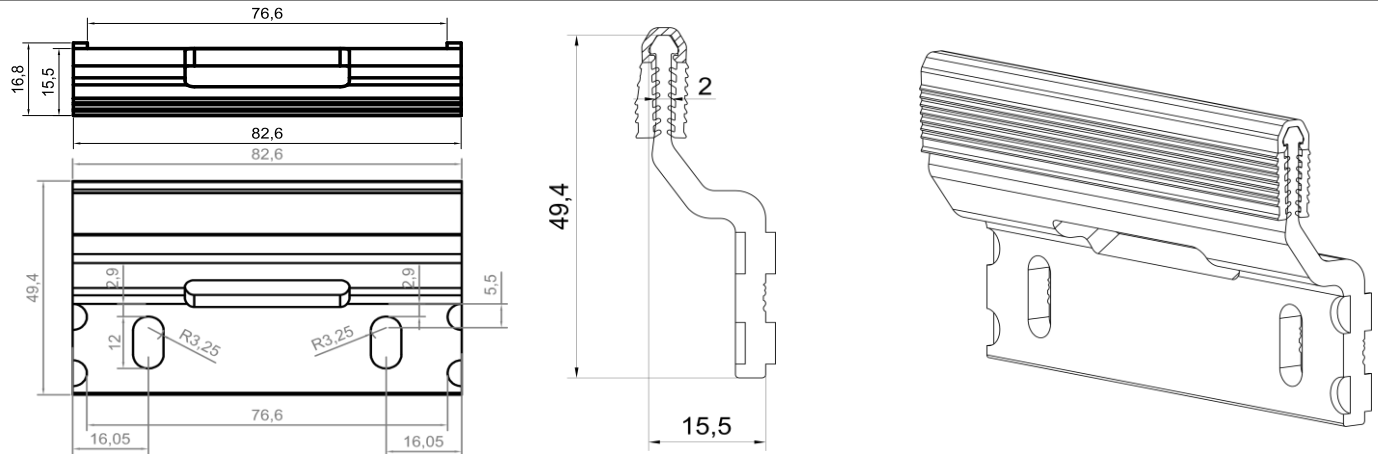
VER: 001 / 2026

SZ horizontal stiffener long bracket 05.19.101

DIMENSIONAL SPECIFICATIONS

UNITS

Weight 0.03829 kg

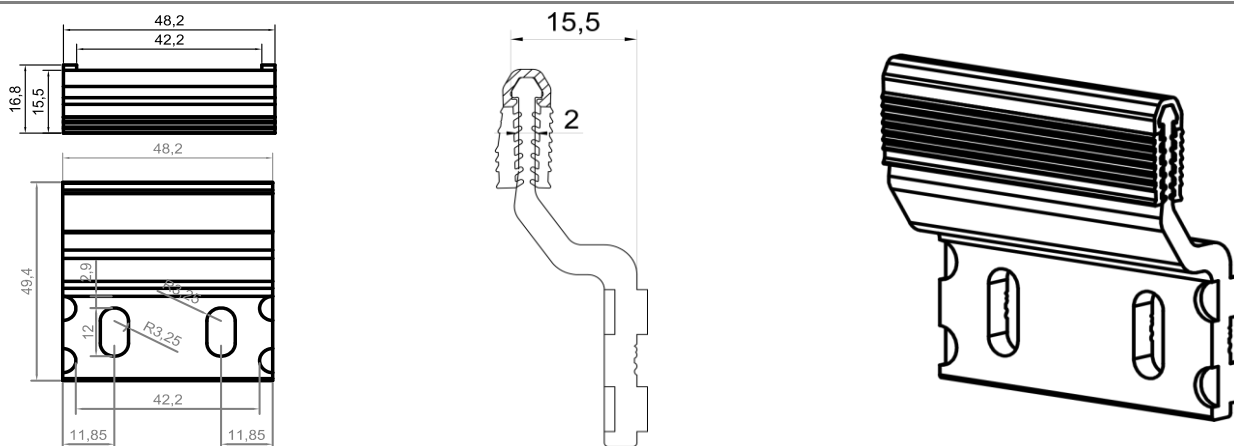


SZ horizontal stiffener short bracket 05.19.100

DIMENSIONAL SPECIFICATIONS

UNITS

Weight 0.02589 kg

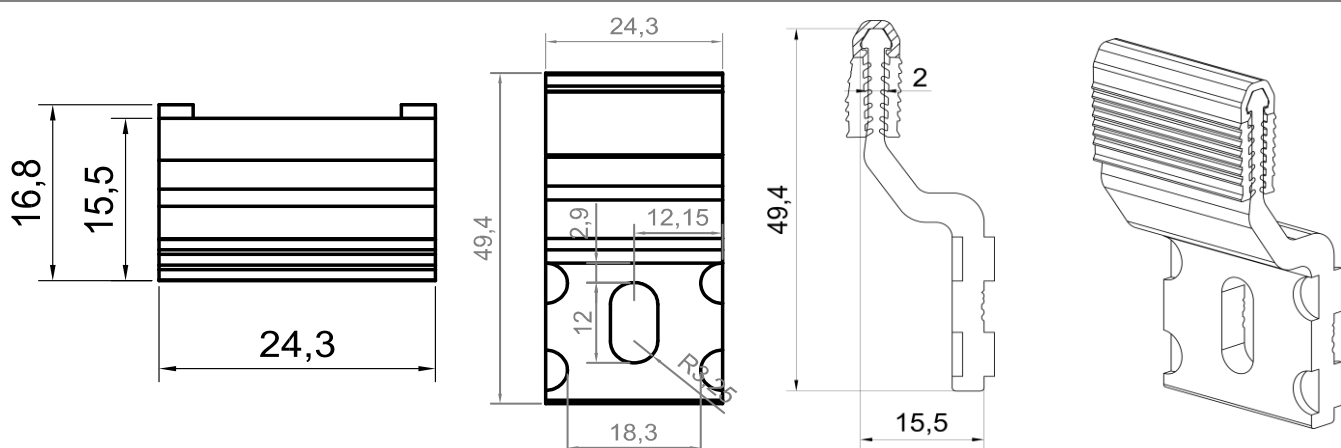


SZ horizontal stiffener mini bracket 05.19.110

DIMENSIONAL SPECIFICATIONS

UNITS

Weight 0.01213 kg





TECHNICAL SPECIFICATIONS

FLAT HEAD SCREW STB-T0700

STACBOND

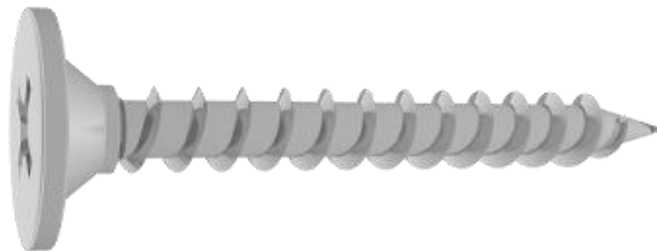
VER: 001 / 2026

SCREW

Reference	Description
STB-T0700	FLAT HEAD SCREW

Specifications	VALUE
USE	STB-SZ-PRO brackets and joining horizontal stiffener 05.19.107 to the side flanges of cassettes
TYPE OF MATERIAL	Stainless Steel A2
DIAMETER AND HEAD TYPE	9mm SR1
LENGTH	20mm
STEM DIAMETER	4.2mm
MIN. UNITS UNPAINTED	1000 UNITS
MIN. UNITS PHOSPHATED	1000 UNITS
MIN. UNITS LACQUERED RAL	1000 UNITS
UNITS PER BOX	1000 UNITS

FLAT HEAD SCREW STB-T0700





TECHNICAL SPECIFICATIONS

T AND L PROFILES

STACBOND

VER: 001 / 2026

T AND L PROFILES

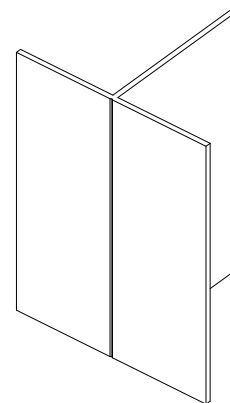
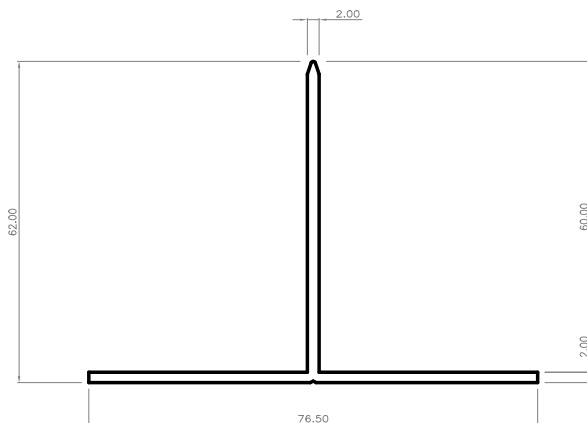
Reference	Description
05.19.043	T Profile
05.19.059	Intermediate L Profile
05.19.061	T-Omega Profile
05.19.092	T-CH-PRO Profile

Alloy	TYPE	NORM
T AND L PROFILES	EN AW 6063 T6	UNE-EN 573-3 and UNE-EN 755-2

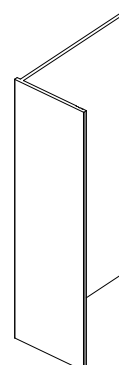
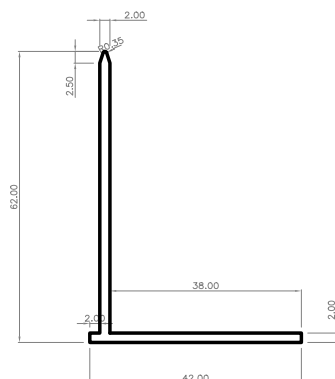
Alloy EN AW 6063 T6	TECHNICAL SPECIFICATIONS	VALUE	UNITS
Tensile strength (Rm)		≥215	MPa
Proof stress (Rp 0.2)		≥170	MPa
Elongation (A50)		≥8%	

CHEMICAL COMPOSITION									
Si	0.20-0.60	Fe	0.35	Cu	0.1	Mn	0.1	Mg	0.45-0.9
Cr	0.1	Zn	0.1	Ti	0.1	Others	0.05	Total	0.15

T Profile 05.19.043	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.7317	kg/m
Inertia	96614.2	mm ⁴
Thickness	2	mm



Intermediate L Profile 05.19.059	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.5451	kg/m
Inertia	80228	mm ⁴
Thickness	2	mm





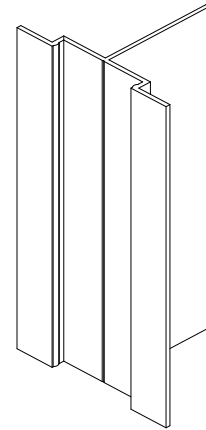
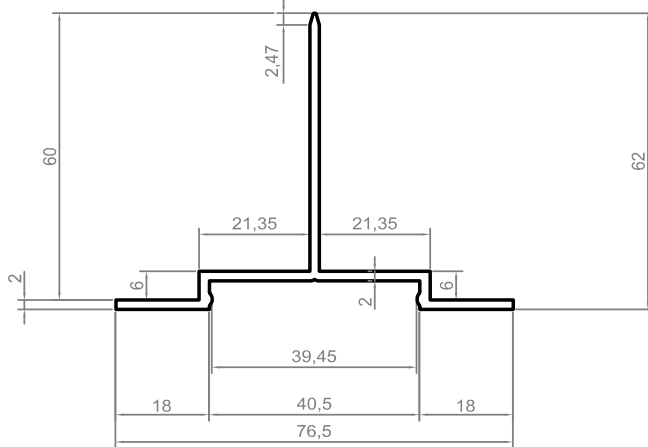
TECHNICAL SPECIFICATIONS

T AND L PROFILES

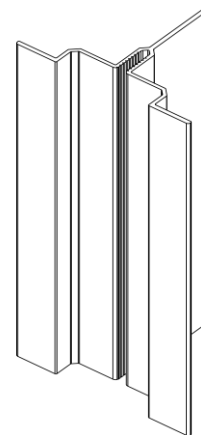
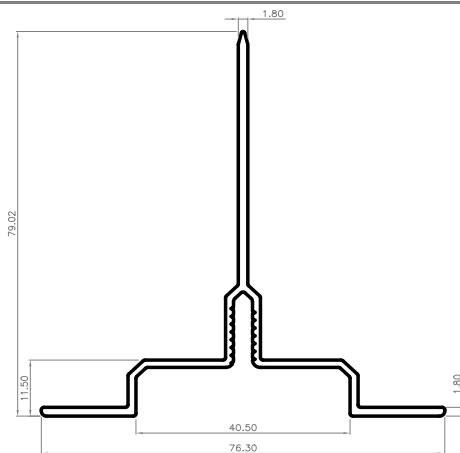
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VER: 001 / 2026

T-Omega Profile 05.19.061	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.741	kg/m
Inertia	81257	mm ⁴
Thickness	2	mm



T-CH-PRO Profile 05.19.092	DIMENSIONAL SPECIFICATIONS	UNITS
Weight	0.7577	kg/m
Inertia	151152	mm ⁴
Thickness	2	mm





ESPECIFICACIONES TÉCNICAS

MENSULAS L

STACBOND

VER: 002 / 2026

MÉNSULAS L

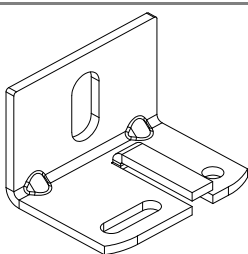
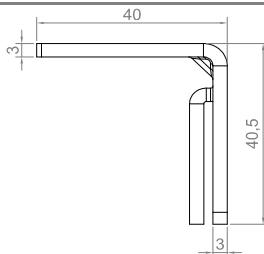
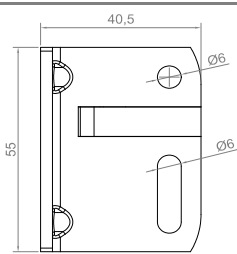
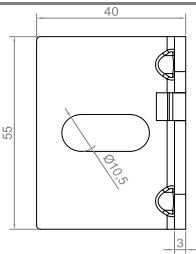
Referencia	Descripción
05.19.089	Separador L 41
05.19.041	Separador L 68
05.19.044	Separador L 92
05.19.051	Separador L 116
05.19.052	Separador L 140
05.19.053	Separador L 164
05.19.054	Separador L 188
05.19.055	Separador L 212
05.19.056	Separador L 236
05.19.042	Separador doble L 68
05.19.045	Separador doble L 92

Aleación	TIPO	NORMA
MÉNSULAS L	EN AW 5005 H24	UNE-EN 573-3 y UNE-EN 755-2

Aleación EN AW 5005 H24	ESPECIFICACIONES TÉCNICAS	VALOR	UNIDADES
Tensión a rotura (Rm)		≥100	MPa
Tensión a límite elástico (Rp 0.2)		≥40	MPa
Elongación (A50)		≥16%	

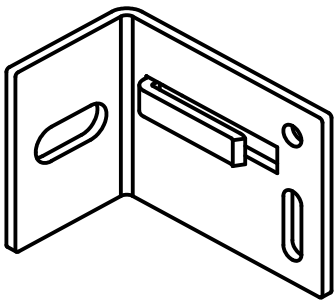
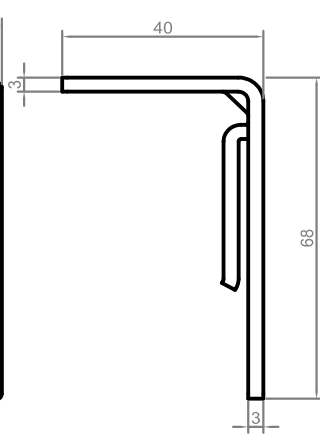
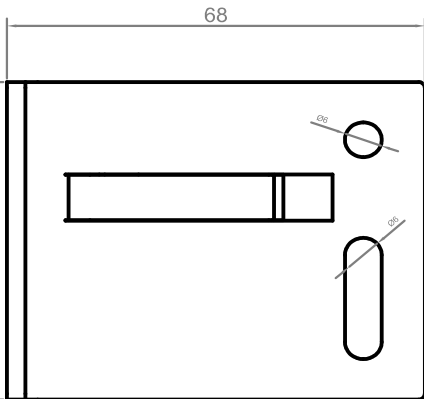
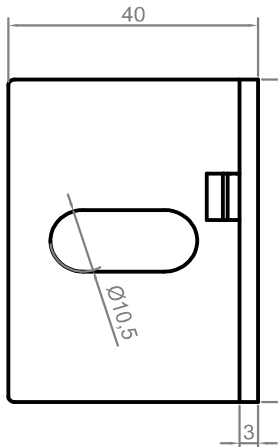
COMPOSICIÓN QUÍMICA									
Si	0,30	Fe	0,70	Cu	0,20	Mn	0,20	Mg	0,50-1,10
Cr	0,10	Zn	0,25	Ti	0	Otros	0,05	Total	0,15

Separador L 41 05.19.089	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,03086	kg



Este perfil no está incluido ni en DIT ni en ETE

Separador L 68 05.19.041	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,04325	kg





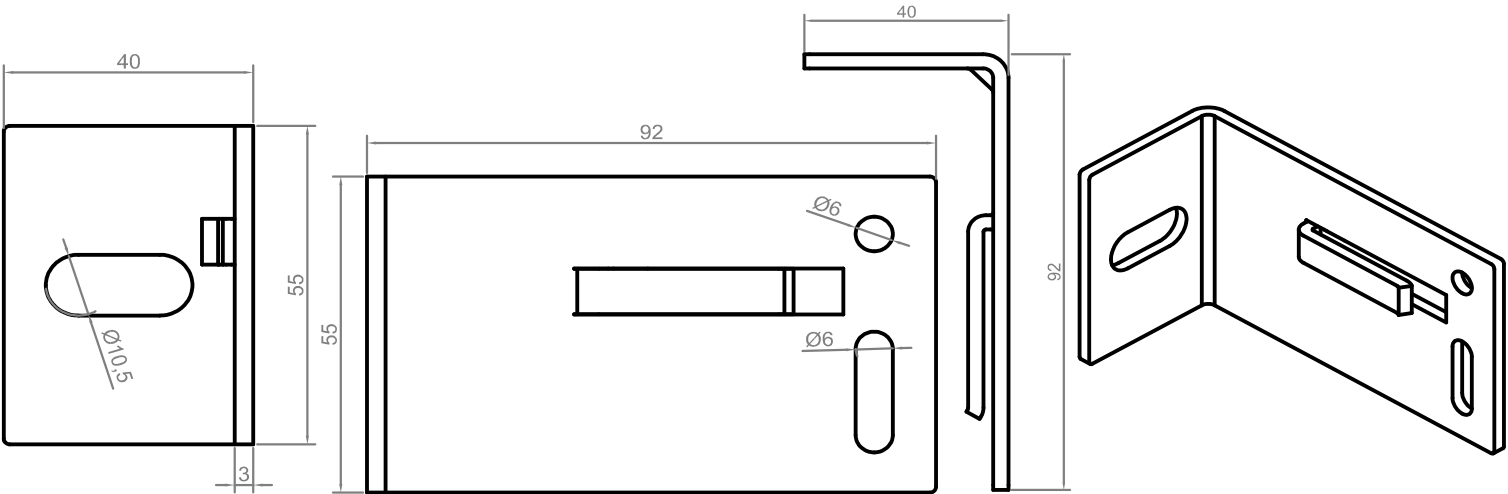
ESPECIFICACIONES TÉCNICAS

MÉNSULAS L

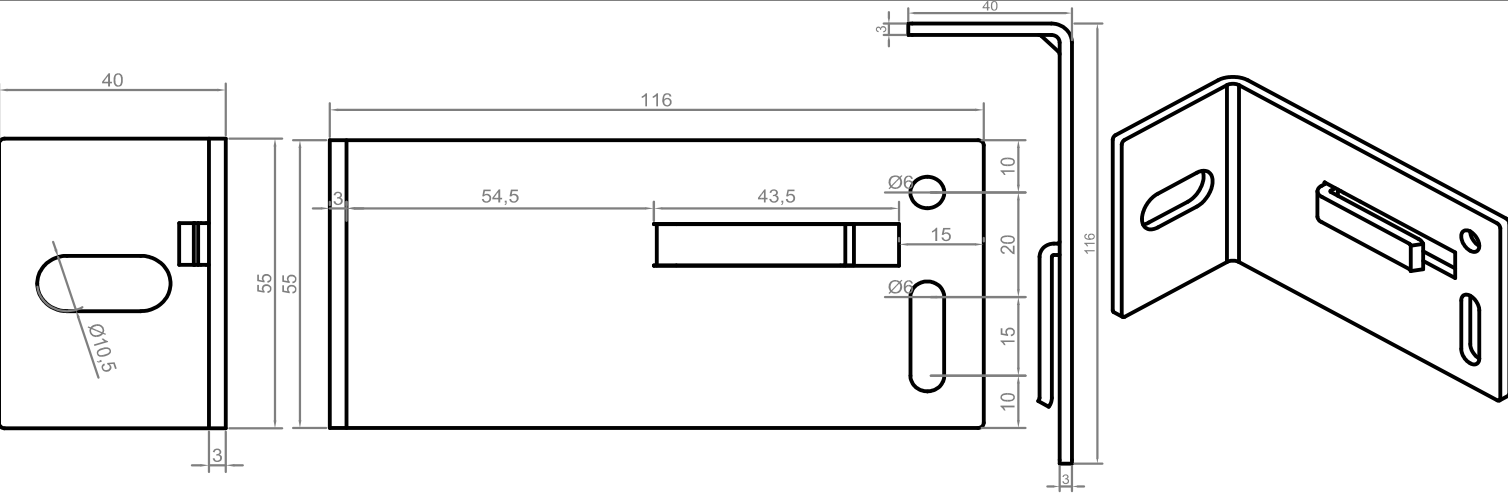
STACBOND

VER: 002 / 2026

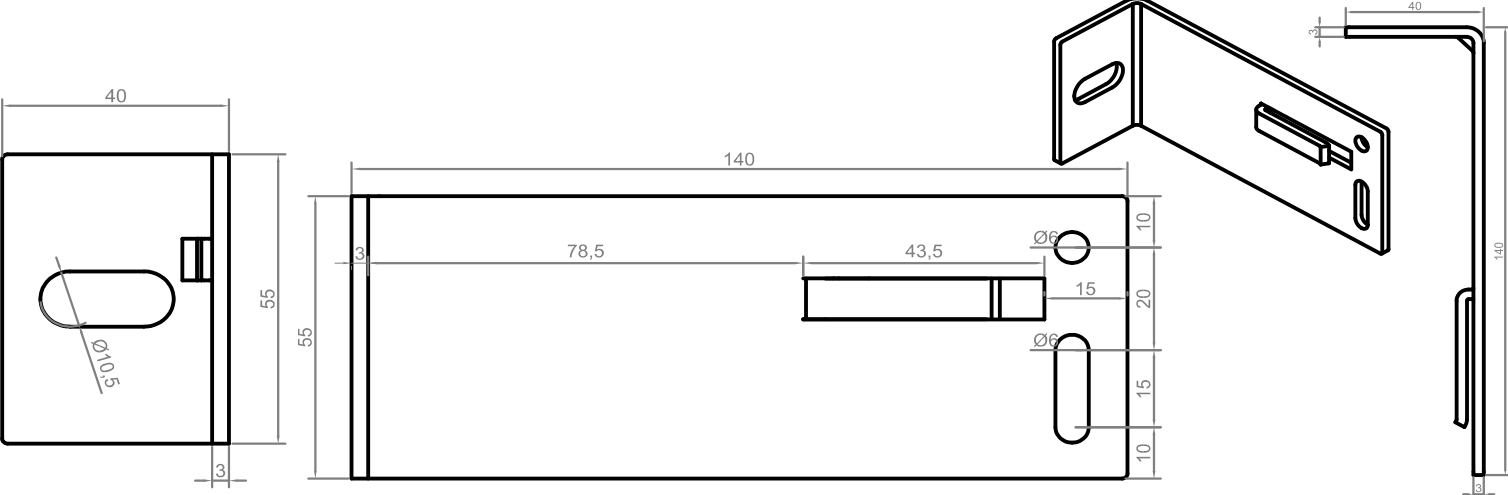
Separador L 92 05.19.044	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,05426	kg



Separador L 116 05.19.051	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,06746	kg



Separador L 140 05.19.052	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,07594	kg





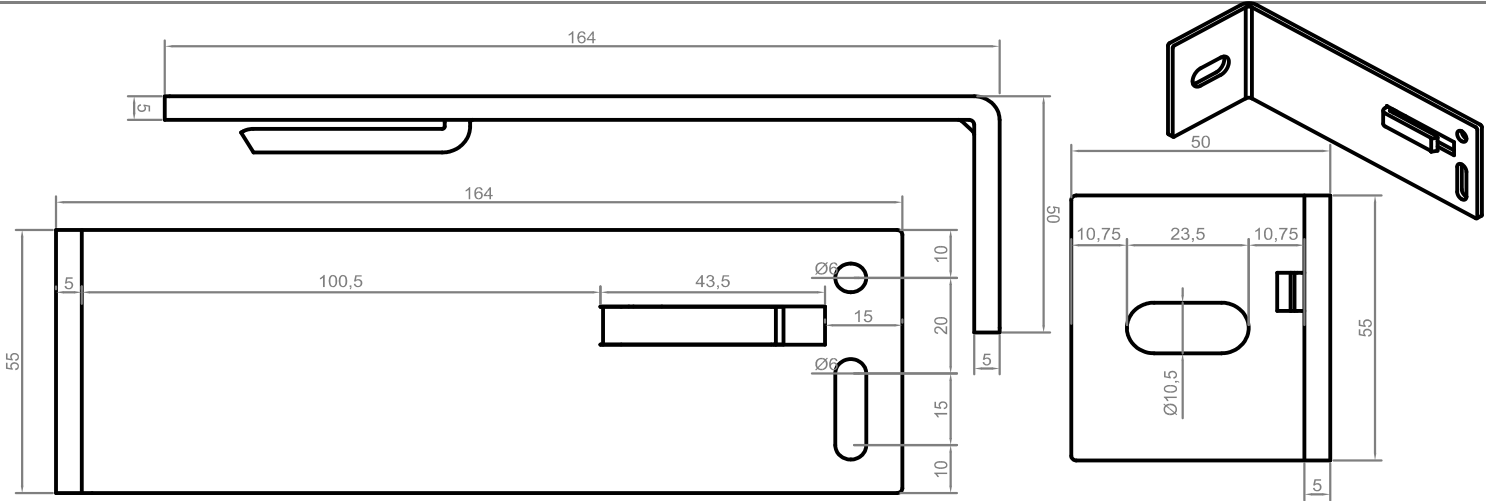
ESPECIFICACIONES TÉCNICAS

MÉNSULAS L

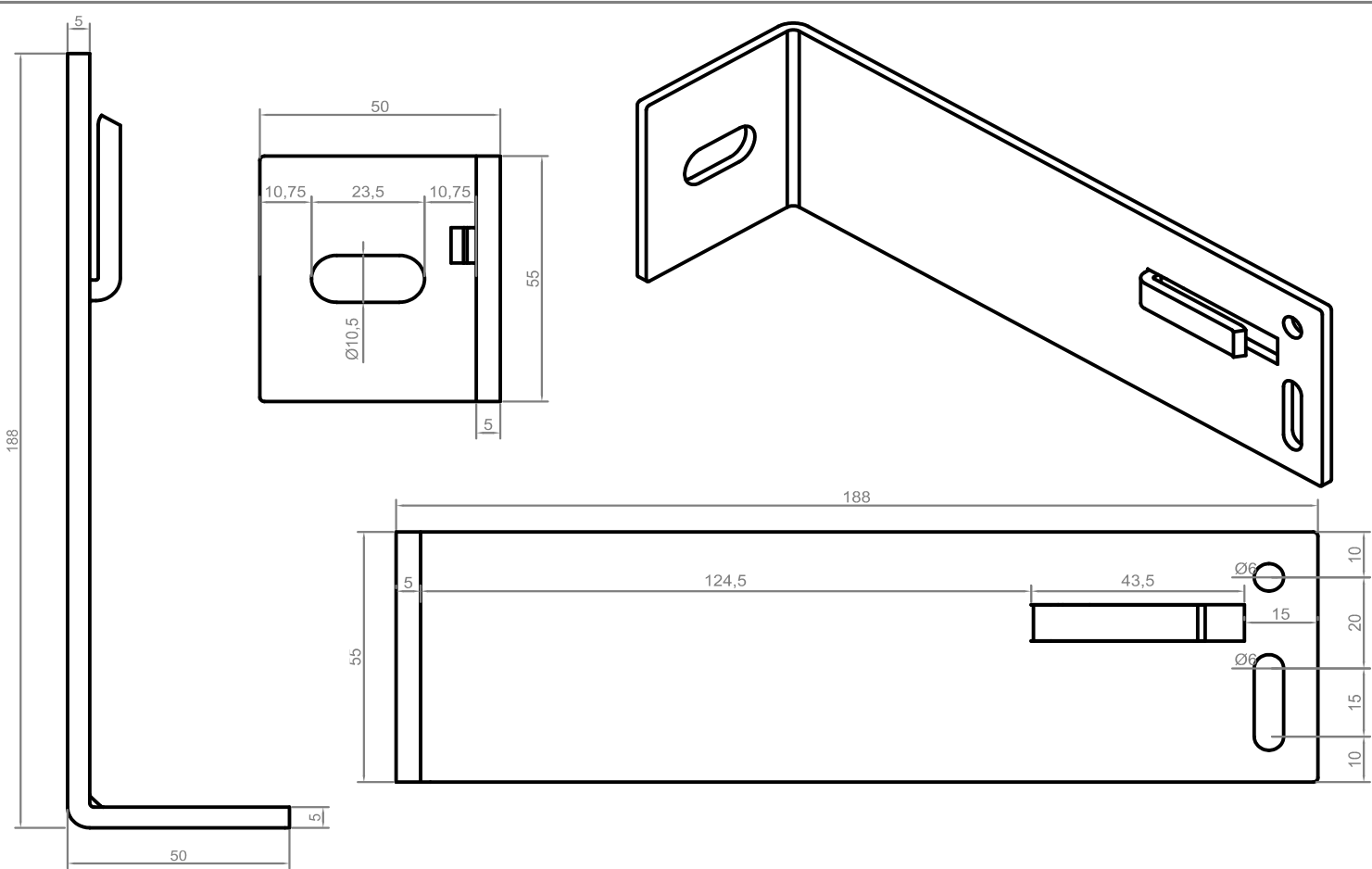
STACBOND

VER: 002 / 2026

Separador L 164 05.19.053	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,15143	kg



Separador L 188 05.19.054	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,16719	kg





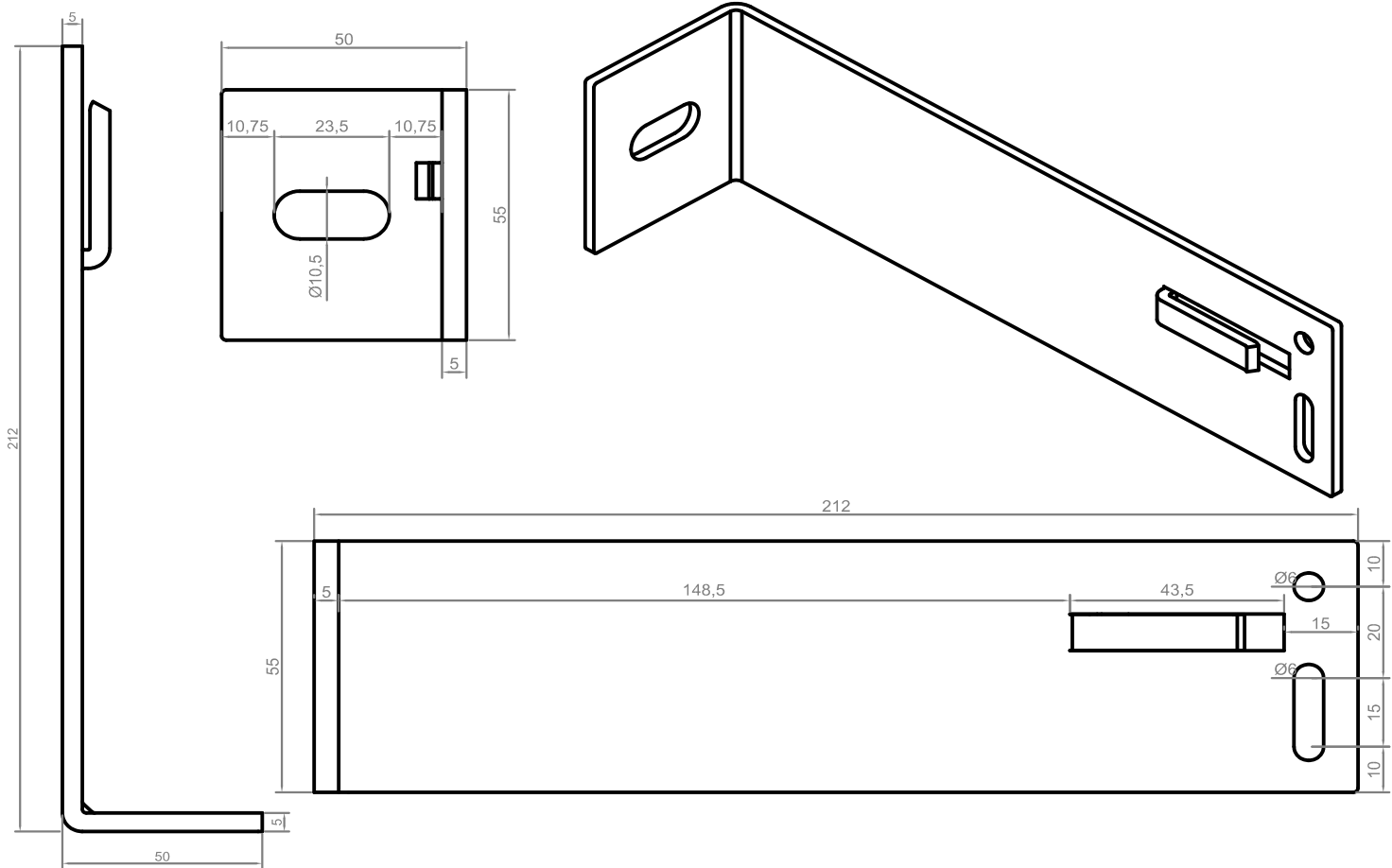
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MÉNSULAS L

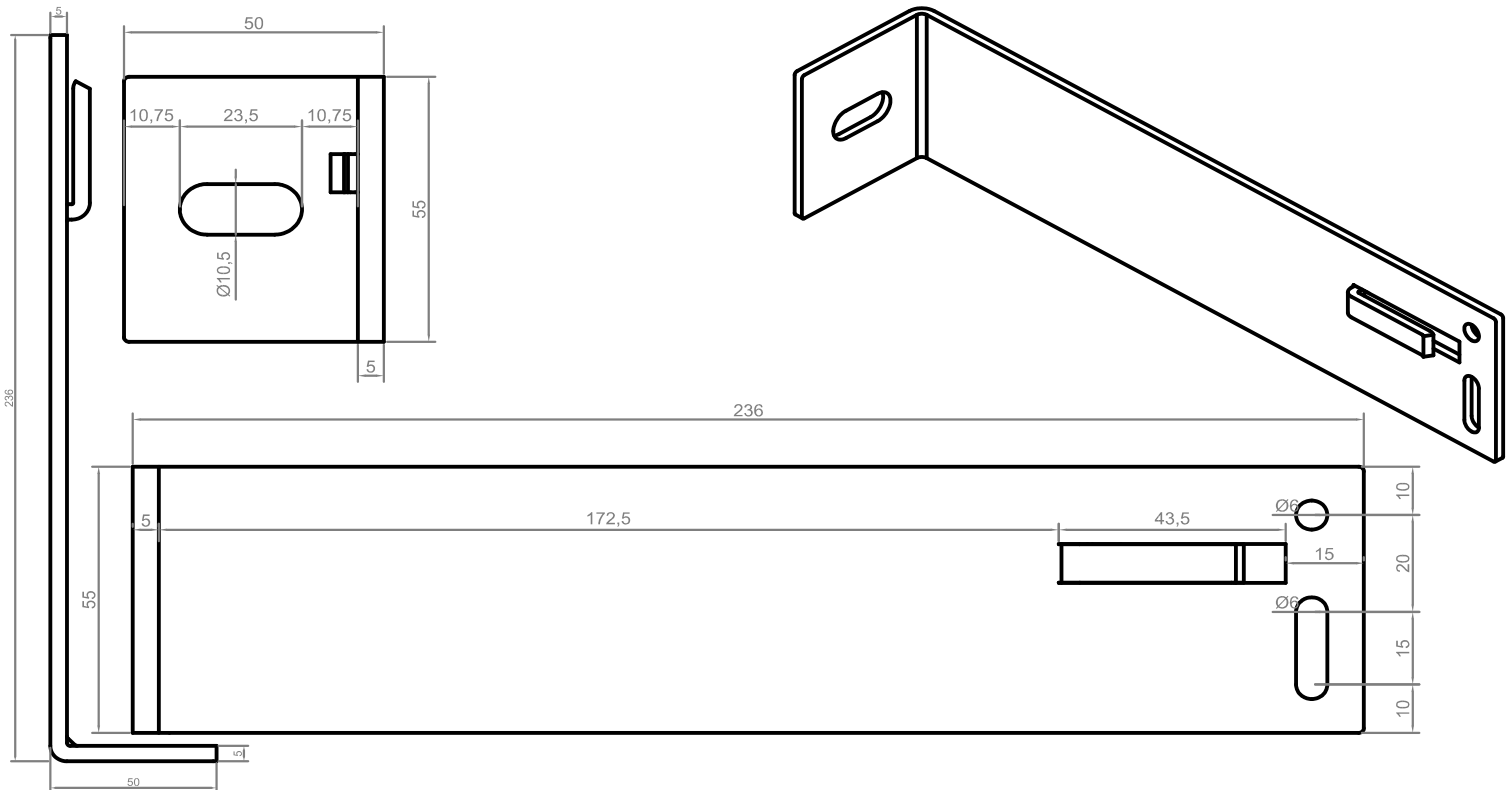
STACBOND

VER: 002 / 2026

Separador L 212 05.19.055	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,18533	kg



Separador L 236 05.19.056	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,19831	kg

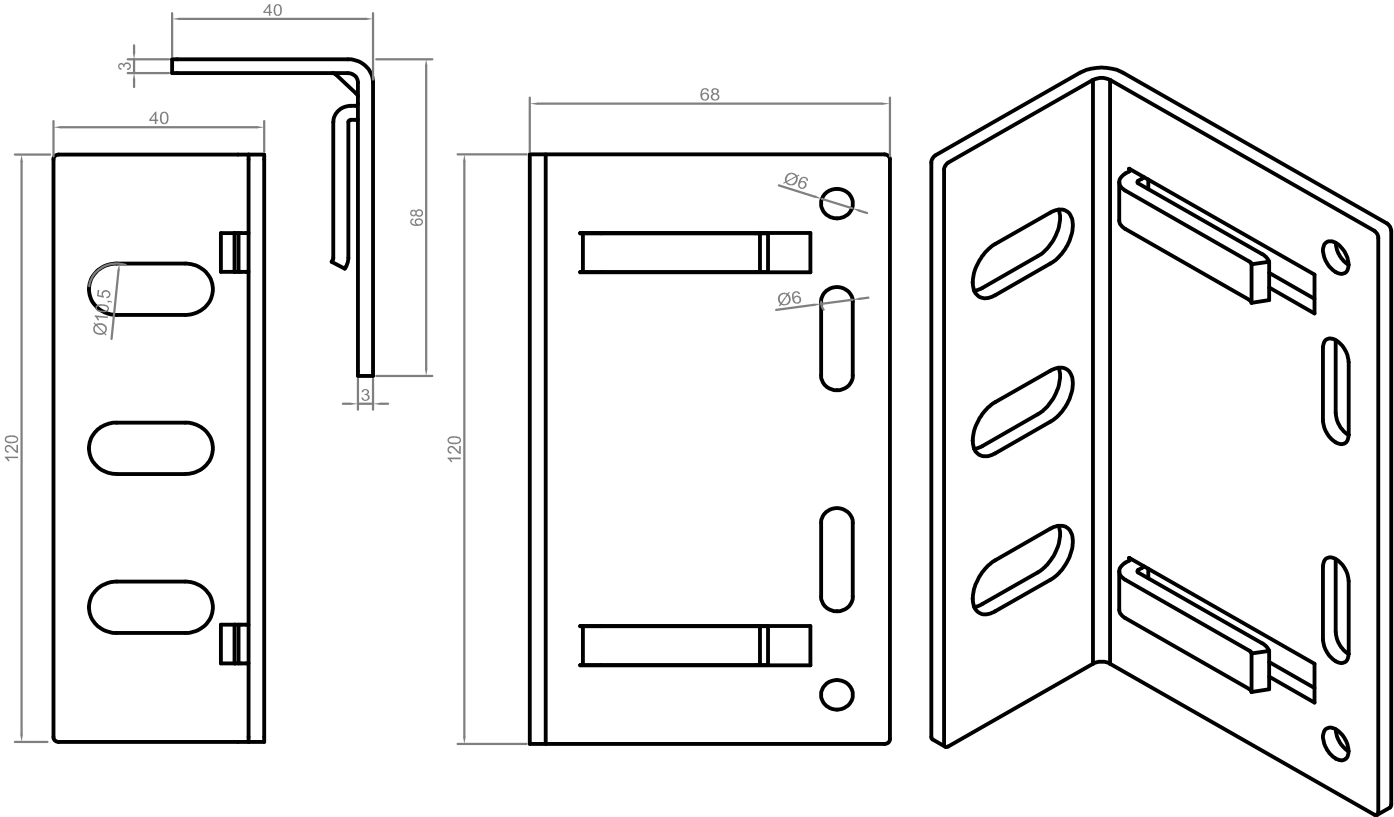




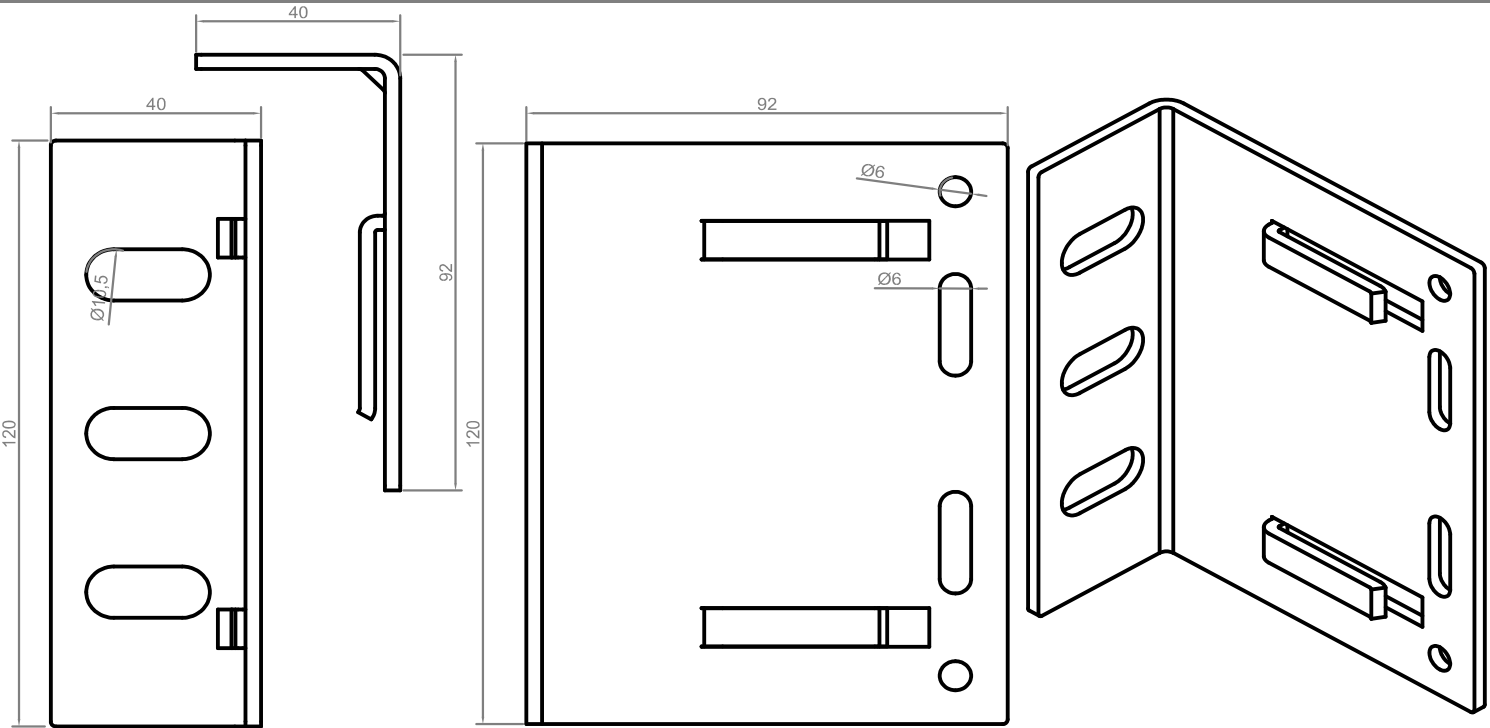
ESPECIFICACIONES TÉCNICAS

MÉNSULAS L

Separador doble L 68 05.19.042	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,09310	kg



Separador doble L 92 05.19.045	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,11686	kg





FF102/50

FF102/50 Ventilated Cavity Fire Barrier

Tenmat's FF102/50 Ventilated Cavity Fire Barriers are designed to reinstate fire resistance performance within external wall cavities that require permanent (open-state) ventilation in non-fire conditions.

Product Description

Tenmat's FF102/50, Ventilated Cavity Fire Barriers, are manufactured from a low smoke zero halogen high expansion intumescent material. They are designed to be installed horizontally or diagonally/inclined (max. 70° angle) to reinstate fire resisting performance to external wall cavities that are required to be ventilated (open-state) in non-fire conditions.

The FF102/50 is manufactured from a rigid intumescent material supplied in a strip format, it is also covered with a protective layer of aluminium foil for ease of handling.

In the event of a fire the FF102/50 intumescent material will expand to close the external wall cavity, providing effective fire resistance, for integrity and insulation for up to 120 minutes depending upon the construction of the external walls.

The FF102/50 is designed for use within cavities of up to 50mm and once installed will close the remaining free air gap in front of the 6mm cavity barrier of up to a maximum of 44mm (depending on construction type).

Product Details

- CCPI Verified
- An "open state" cavity fire barrier for use horizontally within uninsulated, ventilated and drained cavities
- Approved for use in inclined/diagonal applications (max. 70° angle) such as a gable end under a pitched roof
- Fire Rated for up to 120 minutes for both integrity and insulation when tested to the general principles of BS EN 1363-1 following ASFP TGD 19 guidance
- 3rd Party Certification - IFC Certification
- Tested for : Timber Frame, SIPS Panels, SFS, Concrete, Masonry, Render Systems & External Weatherboards
- Ventilated design – developed to allow maximum ventilation and drainage of cavities reducing the need for cavity trays or weepholes
- Suitable for "open-state" ventilated cavities up to 50mm wide
- Provided in strips of 1m long, 75mm wide and 6mm thick
- Lightweight - designed to be easily and quickly installed
- No maintenance required after installation

Approved Applications

FF102/50 “Open State” Cavity Fire Barrier

Tested to the principals of BS EN 1363-1 and in accordance with ASFP TGD19 guidance

Inner Leaf Substrate Type with Appropriate Fire Resistance	Outer Leaf Substrate Type With Appropriate Fire Resistance	Orientation	Insulation Type Within Cavity	Maximum Cavity Width (in mm)	Maximum Open State Air Gap (in mm)	Product Fire Resistance Rating	
						Integrity	Insulation
OSB on Timber Frame ^{2 8} or Non-combustible board including Versapanel on SFS ^{5 8} or Masonry or Concrete	Knauf Windliner A2 Rated board ⁷ or Other min. A2 rated boards or Masonry or Concrete	Horizontal / Inclined (max. 70° angle) ¹⁰	None	50	44	120 ²	120 ²
SIPS Panel ³	Knauf Windliner A2 Rated board ⁷ or Other min. A2 rated boards or Masonry or Concrete	Horizontal / Inclined (max. 70° angle) ¹⁰	None	50	44	120	120
OSB on Timber Frame ^{2 8} or Non-combustible board including Versapanel on SFS ^{5 8} or Masonry or Concrete	Hardie® Plank and alter- native lapped weather- boards ⁴	Horizontal / Inclined (max. 70° angle) ¹⁰	None	25 (+12mm) ¹	19 (+12mm) ¹	120	120
OSB on Timber Frame ^{2 8} or Non-combustible board including Versapanel on SFS ^{5 8} or Masonry or Concrete	Hardie® Plank and alter- native lapped weather- boards ⁴	Horizontal / Inclined (max. 70° angle) ¹⁰	None	38 (+12mm) ¹	32 (+12mm) ¹	120	120
OSB on Timber Frame ^{2 8} or Non-combustible board including Versapanel on SFS ^{5 8} or Masonry or Concrete	Hardie® VL Plank and alter- native flat weatherboards ⁴	Horizontal / Inclined (max. 70° angle) ¹⁰	None	38	32	120	120
OSB on Timber Frame ^{2 8} or Non-combustible board including Versapanel on SFS ^{5 8} or Masonry or Concrete	Hardie® VL Plank and alter- native flat weatherboards ⁴	Horizontal / Inclined (max. 70° angle) ¹⁰	None	50	44	120	120
OSB on Timber Frame ^{2 8} or Cement particle board or other non-combustible board including Versapanel on SFS ^{5 8 9} or Masonry or Concrete	Rock Mineral Fibre External Wall Slab	Horizontal / Inclined (max. 70° angle) ¹⁰	None - mineral fibre formed outer substrate	15	9	120	120
OSB on Timber Frame ^{2 8} or Cement particle board or other non-combustible board including Versapanel on SFS ^{5 8 9} or Masonry or Concrete	Rock Mineral Fibre External Wall Slab	Horizontal / Inclined (max. 70° angle) ¹⁰	None - mineral fibre formed outer substrate	25	19	120	120
OSB on Timber Frame ^{2 8} or Cement particle board or other non-combustible board including Versapanel on SFS ^{5 8 9} or Masonry or Concrete	Rock Mineral Fibre External Wall Dual Density (DD) Slab ⁶	Horizontal / Inclined (max. 70° angle) ¹⁰	None - mineral fibre formed outer substrate	40	34	120	120

3rd Party Certification

IFC Certification - Certificate No. IFC1753

Fire Test Evidence

Field of Application Report - PAR/22672/04 Revision B

International Fire Consultants Ltd (IFC) part of KIWA UK Group

Technical Assessment Report - 4790359356-1 Issue 2

UL International

Approved Applications

¹ Hardie® Plank, Hardie® VL Plank and other weatherboards are approved with an overlapping detail resulting in a varying cavity size of up to 12mm greater than the timber batten depth.

² Timber Fire Test Evidence:

The fire ratings for OSB on timber frame constructions are not a full specification; the Principal Designer/Project Fire Engineer must confirm suitability of the chosen product or assembly to achieve the desired level of fire resistance.

Testing on timber frame inner substrates was carried out using a minimum 9 mm OSB sheathing board with a minimum 35 mm timber stud positioned directly behind the sheathing and aligned with the cavity barrier.

For OSB outer substrates, the cavity barrier's performance depends on the OSB remaining intact, stable, and in place, without deflection or failure that alters cavity size or compromises the board at the barrier location. Refer to Field of Application Report PAR/22672/04 Revision B.

For SIPs (Structural Insulated Panels) constructions, refer to the tested specification noted in Note ³.

The FF102/50 barrier was also used in a large-scale test simulating a fully developed post-flashover fire in a timber-frame building with timber cladding. Installed between ground and first floor levels, it limited concealed fire spread within the cavity.

Test conclusion: "The intumescent horizontal cavity barrier at fire floor level prevented extensive fire spread within the structural frame and met the requirements for a short-duration fire resistance period," where short duration = 30 minutes.

³ SIPS Panel fire testing consisted of 145mm thick SIPS Panel with 12.5mm thick OSB boards either side of 120mm wide timber studs and filled with PU Foam, Protect TF200 combustible breather membrane, 45mm wide timber stud behind the cavity barrier location, 50mm cavity formed by vertical 25x50mm timber battens stopped and started above and below the cavity barrier, Knauf Windliner 12.5mm thick outer substrate. Test Report 538815A.

⁴ Approved Weatherboard parameters:

- Material type – Fibre cement board
- Thickness – 8 mm minimum
- Reaction to fire Class – A2, s1-d0 (or better)

See UL Assessment Report 4790359356-1 for full details.

⁵ Non-combustible board on steel framed system (SFS) with direct and applicable fire test evidence to demonstrate that it can provide the level of fire resistance, as applicable, when tested to EN 1364-1 or EN 1365-2 with the selected facing material.

⁶ SFS System build up – 118.5mm overall thickness comprising, 94mm wide steel stud profiles and 100mm Rockwool 45kg/m³ insulation, clad internally with 1 x 12.5mm British Gypsum Gyproc wallboard, clad externally with 1 x 12.5mm Versapanel cement bonded particle board with a 40mm cavity and an outer substrate of 80mm thick Rockwool Dual Density (DD) slab. Test Report 544507A.

⁷ Knauf Windliner Sheathing Board, A2 s1 d0 Reaction to Fire Rating at 12.5mm thick.

⁸ Tested breather membrane was Protect TF200, 0.3mm thick polypropylene sheet with Class 1 surface spread of flame tested to BS476-7 and Class E when tested to BS EN 11925-2. Other membranes of the same or better reaction to fire classification and thickness also approved.

⁹ Cement particle boards must be minimum Reaction to Fire Class B s1 d0.

¹⁰ Gable End Walls – Diagonal / Inclined Installation

Kiwa Fire Safety Compliance conclude that any of the above approved applications may be inclined at angles up to 70° from the horizontal without causing deterioration of the test results.

Fire test evidence, safety data sheets and previous versions of product information are all available upon request by contacting Tenmat, please [click here](#)

Technical Information

Colour	Silver
Finish	Foil
Storage	Dry, ambient (see Safety Data Sheet)
Weight	0.4kg
Fire Resistance	See Fire Test Evidence table.
Durability to EOTA TR024 (Intumescent/Reactive Seal)	Type X - intended for outdoor use or exposed to free weathering - rain, UV, high temperatures in summer, frost and frost-thaw in winter. ¹
European Product Declaration (EPD)	EPD in accordance with EN15804+A2 & ISO 14025 / ISO 21930 ²
Smoke Generation - BS EN 45545-2	Low Smoke Generation in intumescent material testing ³ Tenmat FF102 Results Ave. Ds(max)20 value =3 Max. limit 300 as per EN45545-2
Halogen Content	Halogen-free Tested Max. Values Fluorine = 0.0006% / 6ppm Bromine = 0.0001% / 1ppm Chlorine = 0.0007% / 7ppm Iodine = 0.0006% / 6ppm Max. limit 0.5% / 5000ppm ⁴
Working Life	60 years ⁵
Dimensions	Thickness = 6mm Width = 75mm Length = 1000mm

The product is not subject to any warning or ban under Section 26 of the NZ Building Act 2004.

¹ Type X testing to EOTA TR024 detailed in Report - (2300/522/18) - 2/2018 - Br/Mü dd. 2018/06/06.

² European Product Declaration (EPD) - Report HUB-2489.

³ Testing for Ds(max)20 records the greatest smoke density generated during twenty minutes, it is a logarithmic expression relating to how much light can be transmitted through the smoke. In the EN45545-2 standard, a maximum value of 300 must be demonstrated for the most demanding applications, typically underground passenger rail with autonomous vehicles. Tenmat's intumescent material can therefore be considered to be low-smoke. Test evidence in Doc. Ref. 396264.

⁴ According to the IEC 60754-1 standard, halogen-free equates to less than 0.5% / 5000ppm hydrogen halide gas release on combustion. This means materials must contain below these levels for fluorine, chlorine, bromine, or iodine. Doc. Ref. 3802815

⁵ Independent 3rd party review of test data confirmed the intumescent would be expected to be capable of performing its function for a period of at least 60 years in an environment which is protected from the elements for normal temperature range of -5C to +30C but can reasonably be expected to cope with intermittent extremes in the range of -20C to +50C. KIWA Technical Report TN/25082/01.



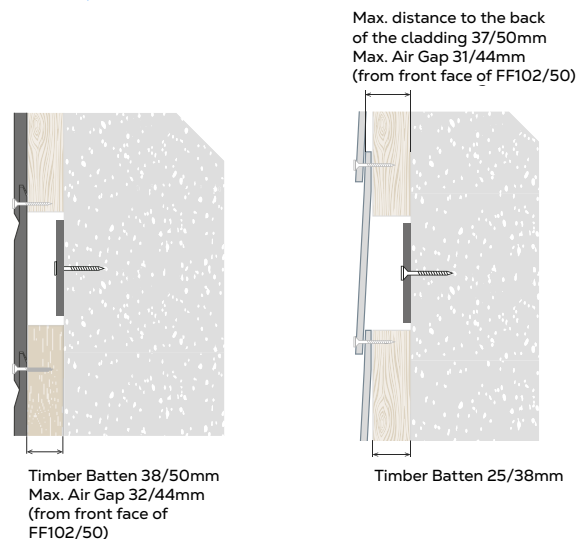
Technical Drawings

Typical Detail behind Hardie® VL Plank and other generic weatherboards



FF102/50 between battens (stop start)

Typical Detail behind Hardie® Plank and other generic weatherboards (continuous through battens)



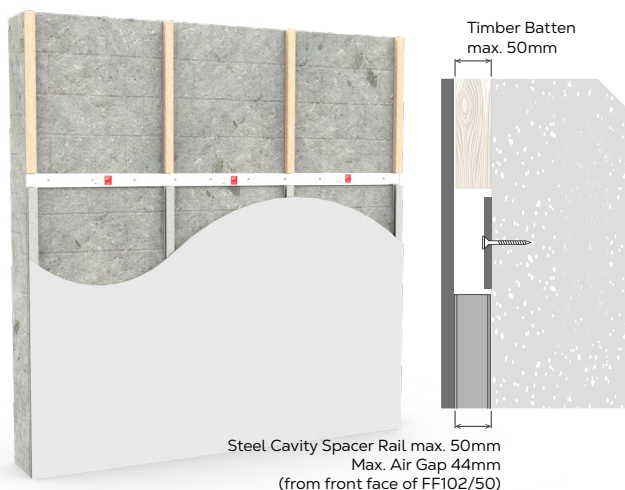
When stopping and starting vertical timber battens, ensure a gap of min. 10mm is left above and below the FF102/50

Recommended installation:



FF102/50 continuous through battens

Typical Detail behind non-combustible external wall substrates



When stopping and starting vertical timber battens, ensure a gap of min. 10mm is left above and below the FF102/50

Tested detail includes for various non-combustible outer substrates including mineral fibre external wall slab (full details can be provided upon request).

Recommended installation:



FF102/50 continuous through battens

It is recommended to ensure the cavity barrier is installed continuously without interruption wherever possible.

The use of timber battens to act as vertical cavity barriers is not approved by Tenmat and must be agreed by others.

If timber battens break the cavity barrier line, the ability of vertical timber battens to fully seal off all gaps against the outer substrate, in particular in the case of lapped cladding, must be considered.

The ultimate acceptance of vertical timber battens to be used as a vertical cavity barrier and sufficiently seal against the outer substrate is the responsibility of the principal designer or project fire engineer.

Tenmat recommends considering the use of the NVFB-WB non-ventilated cavity fire barrier as a fire tested vertical cavity barrier behind external flat or lapped weatherboard cladding.

Pre Installation

The principal designer must approve the use of any cavity barrier, in conjunction with the associated fire test evidence, taking full account of the whole construction of the external wall systems and components, including any requirements of National Building Regulations and or NHBC Standards.

The FF102/50 demonstrates functional compliance for various National Building Codes & Regulations including Approved Document B for England & Wales, Building (Scotland) Regulations 2004, Section 2.4 Cavities and NZ Building Code Clause C3: Fire affecting areas beyond the source.

Before a Tenmat FF102/50 cavity barrier is recommended by Tenmat, the following information is required to ensure that the suggested product is considered suitable for the intended application, by Tenmat, within the construction as indicated by the client.

- Project name, location and postcode.
- Building height and use (as per ADB V1/2 2020).
- Fire resistance period/rating required. Integrity and Insulation.
- Composition and construction of external walls, both inner and outer substrates.
- Total external wall cavity size. (Maximum distance from outer face of inner substrate to inner face of inner substrate including tolerances/profiles).
- Type and thickness of cavity insulation if present.
- What ventilation gap is required horizontally?
- Are non-vented cavity barriers required vertically?
- Quantity required to complete project?
- When will materials be required?
- Name and role of person completing form.

When the above information is obtained then this can be cross referenced with the full range of Tenmat cavity barriers to ensure that the product recommended, by Tenmat, is considered suitable for consideration by the principal designer.

General considerations

In most circumstances the cavity barrier should be installed uninterrupted in a continuous line. In certain situations, installation in between vertical battens has been tested (see technical detail drawings).

The principal designer must sanction any interruptions, which may include items such as brackets, rails or battens, that may affect the continuous line of the cavity barrier. The principal designer must consider the combustibility, melting points and the shape of any interruptions, that are likely to prevent the cavity barrier performing as tested or as expected in the projects design.

If there are interruptions/obstructions that prevent the cavity barrier being fitted in a continuous line, and with sanction from the principal designer, the product may be cut with a sharp knife and tightly butted up against any obstructions and then restarted on the opposite side of the obstruction. The obstruction must not create a void which the cavity barrier can not expand into.

Intumescent cavity barriers are tested and designed to expand outwards, from the face of the intumescent material only, additional design details will be required to account for external corners.

The cavity barrier should not be penetrated by anything other than the mechanical fixings which are used to fix the cavity barrier to the building.

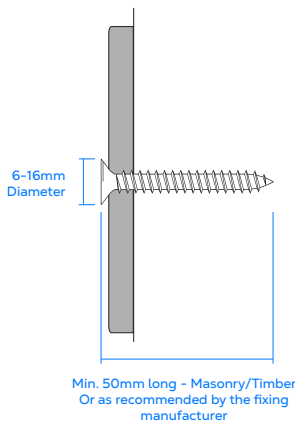
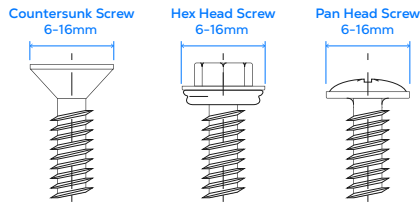
The cavity barrier should be installed onto a flat surface, with no gaps behind the cavity barrier, the maximum space in front of the cavity barrier should not be greater than 44mm (or less depending on construction, see cavity size and air gap details in fire test evidence table).

The Tenmat technical team should be consulted in any instance where the principal designer is uncertain as to any issues which may impede the ability of the cavity barrier to perform as expected.

Ensure the installation area is free from dust, oil and any corrosive material.

Check the mounting substrate is solid and free from cracks and degradation before beginning.

Installation Instructions



1. Check the Area

Make sure the cavity is clear of obstructions.
If any gap or penetration could allow fire to travel vertically, firestop it separately using an approved firestop product.

2. Fixings (Screws)

Use stainless steel screws.
Minimum head diameter: 6mm
Maximum head diameter: 16 mm
(countersunk, hex head, or integrated washer types acceptable, including rubber-sealed washers).

Minimum fixing depth:

50mm into masonry/timber
Unless the fixing manufacturer specifies otherwise.

3. Fastening the Product

Tighten fixings only until the head touches the product—do not overtighten to avoid damaging the strip.

Ensure the labelled side faces the cavity, so the label is visible after installation.

Fix along the centre line of the barrier.

4. Fixing Layout

For full-length sections (1 metre length):

First fixing: maximum 125 mm from one end.
Then fix at max 250 mm centres (4 fixings per metre).
Final fixing: maximum 125 mm from the other end.

For sections under 1 metre:

Place fixings maximum 125 mm from each end.
Add extra fixings in between at maximum 250 mm spacing.
For short cut pieces (≤ 250 mm):
At least one fixing is required, two fixings are recommended.

5. Joining Multiple Lengths

When adding lengths, make sure they are tightly butted together.
No gaps should be visible between sections.

Gable End Walls - Diagonal / Inclined Installation

For diagonal or inclined installations, the maximum angle permitted is 70° from the horizontal. Cavity barriers should be installed continuously and without interruption wherever possible.

Where timber battens interrupt the horizontal cavity barrier line, if agreed by others, it must be confirmed that they can fully seal all gaps against the outer substrate, especially with lapped cladding, where achieving a complete seal may be difficult.

Timber Frame:

When installing on a timber frame inner substrate, ensure the construction includes a minimum 9 mm OSB sheathing board with a minimum 35 mm timber stud positioned directly behind the sheathing board and aligned with the cavity barrier.

Limitations

To ensure compliance to the relevant test evidence detailed within this Data Sheet, the product must be installed as per the fitting instructions by competent installers. The product must only be used in a horizontal or diagonal/inclined (max. 70° angle) orientation.

Maintenance

- No active maintenance required.
 - Where alterations are made around the product it should be checked visually to ensure that the product is still installed as per the approved original design and fitting instructions at the time of original installation.
 - Where product(s) is damaged or tampered, new product should be installed in line with installation guidance.
-

Storage Conditions

- See Safety Data Sheet
-

Tools Required

- Sharp Knife
 - Measuring Tape
 - Appropriate drill
 - Stainless steel fixings
-

PPE Required

- Hand protection
 - Eye protection
 - Follow project site requirements
-

Disposal

- Outer packaging can be cleaned and recycled.
- Intumescent is non hazardous waste and is categorised as “waste accepted at landfill for non-hazardous waste” and local regulations should be followed.

Please see Safety Data Sheet for more information.

FF102/50

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Innovate today.
Protect tomorrow.
tenmat.com

Tenmat warrants the materials it produces will conform to Tenmat specifications and approved drawings where applicable. It is entirely the customer's responsibility to make the final product choice and satisfy themselves of the suitability of the product for the intended application, carrying out testing where required. For construction projects, all products which the customer is intending to use on a particular project must be approved in writing by the customer's building designer, system designer or design control professional, to ensure compliance with the latest regulations.

The information contained in Tenmat data sheets is presented in good faith. Tenmat Limited makes passive fire protection product suggestions based solely upon and limited to the information made available to Tenmat. Tenmat possesses knowledge of fire test data and offers manufacturers installation advice. Within reason, Tenmat is skilled at offering opinion concerning the installations in question, and can comment on interfaces with other construction materials, but this is not a recommendation or decision. Decisions on overall building fire strategy are not made by Tenmat. Tenmat products have been tested for a wide range of construction types, and they must be only used in accordance with Tenmat test evidence. Each specific Tenmat product must be installed into a construction that matches the corresponding test report. Tenmat product performance requires safe and proper handling and correct installation.

Doc Reference: TDS-14		
Revision: 4	Date: 25/03/26	
PB: CM	CB: CT	AB: DR



ESPECIFICACIONES TÉCNICAS

PERFILES OMEGA Y PEG

STACBOND

VER: 001 / 2026

PERFILES OMEGA Y PEG

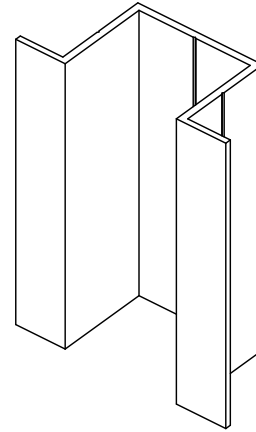
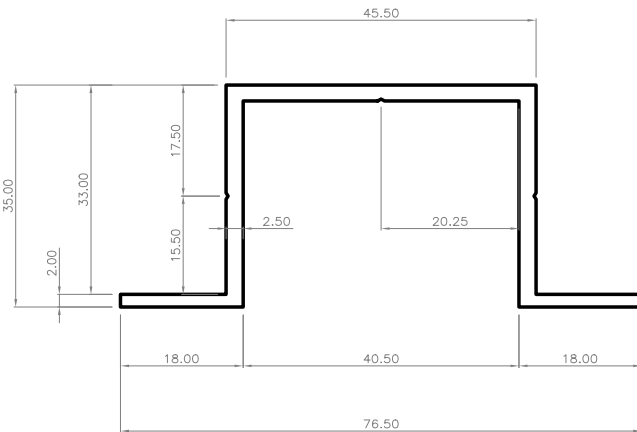
Referencia	Descripción
05.19.003	Perfil Omega
19.022	Montante STB-PEG

Aleación	TIPO	NORMA
PERFILES OMEGA Y PEG	EN AW 6063 T6	UNE-EN 573-3 y UNE-EN 755-2

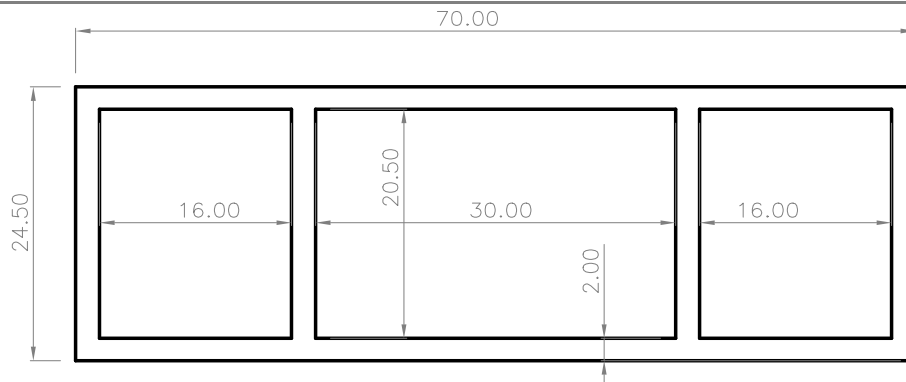
Aleación EN AW 6063 T6	ESPECIFICACIONES TÉCNICAS	VALOR	UNIDADES
Tensión a rotura (Rm)		≥215	MPa
Tensión a límite elástico (Rp 0.2)		≥170	MPa
Elongación (A50)		≥8%	

COMPOSICIÓN QUÍMICA									
Si	0,20-0,60	Fe	0,35	Cu	0,10	Mn	0,10	Mg	0,45-0,9
Cr	0,10	Zn	0,10	Ti	0,10	Otros	0,05	Total	0,15

Perfil Omega 05.19.003	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	0,9126	kg/m
Inercia	60381,5	mm ⁴
Espesor	2	mm

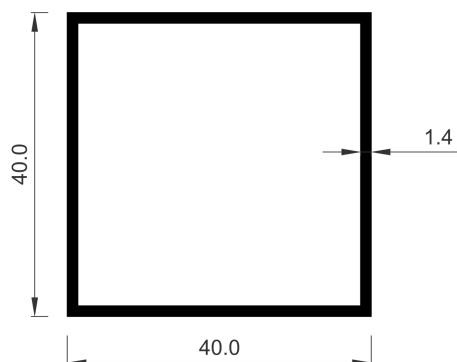


Montante STB-PEG 19.022	CARACTERÍSTICAS DIMENSIONALES	UNIDADES
Peso	1,12	kg/m



PERFILES NORMALIZADOS

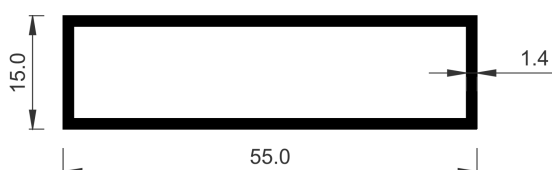
Perfiles a escala



804040	
Descripción	Tubo de 40x40x1.4 mm
Peso (g/m)	585,9
Superficie (dm ² /m)	30,98
I _x (cm ⁴)	5,37
I _y (cm ⁴)	5,37



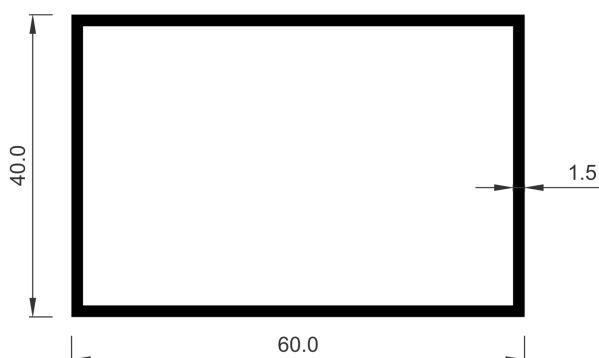
805020	
Descripción	Tubo de 50x20x1.5
Peso (g/m)	542,7
Superficie (dm ² /m)	26,8
I _x (cm ⁴)	1,41
I _y (cm ⁴)	6,13



805515	
Descripción	Tubo de 55x15x1.4
Peso (g/m)	510,3
Superficie (dm ² /m)	26,88
I _x (cm ⁴)	0,76
I _y (cm ⁴)	6,34



806020	
Descripción	Tubo de 60x20x1.5
Peso (g/m)	623,7
Superficie (dm ² /m)	30,8
I _x (cm ⁴)	1,67
I _y (cm ⁴)	9,76



806040	
Descripción	Tubo de 60x40x1,5 mm
Peso (g/m)	785,7
Superficie (dm ² /m)	38,8
I _x (cm ⁴)	7,94
I _y (cm ⁴)	14,9

RevealShield SA® Self-Adhered

Patent-pending, highly vapor permeable Water Resistive Barrier (WRB) and Air Barrier (AB) sheet membrane. Product No.: 13309090

RevealFlashing SA™ Self-Adhered

Product No.: 44305500

Product Description

The **patent-pending** RevealShield SA Self-Adhered WRB/Air Barrier membrane protects the building envelope by allowing vapor pass through (breathable) but not air or liquid water mitigating costly moisture damage and saving energy for the life of the building.

BASIC USE

RevealShield SA Self-Adhered is installed above grade behind **open joint** rainscreen wall cladding assemblies where permanent UV exposure is inherent.

CLADDING OPEN JOINTS

Cladding open joints can be up to 2" (5.1 cm) or up to 40% of the total elevation area.

MATERIALS

RevealShield SA Self-Adhered consists of multiple layers of spun-bond polyester fabric with a proprietary coating and a fully self-adhered pressure sensitive adhesive that allows for initial re-positioning prior to rolling.

BENEFITS

Uniquely suited for open joint cladding requiring advanced UV protection such as perforated panels, reclaimed wood and special facades.

Superior building envelope protection – high drying capacity (63 perms) allows building materials to dry out, reducing the risk of damage from moisture infiltration, mold, mildew and rot — for the life of the building.

Airtight barrier – stops air infiltration as per the ASTM 2357 Air Barrier assembly test, ABAA approved.

Consistent millage thickness – a factory-made rolled good ensures consistent properties and performance.

Fully tested building envelope system – rough opening flashing accessories eliminate the need for untested outside components.

Fully bonds without primer to most substrates.

No primers are used or required for product installation.

For OSB and other substrates contact VaproShield Technical.

Simple installation – requires only basic tools; no specialized mobilizations or protection gear are required.

RevealShield SA, when used as a WRB/AB, meets the **exemption for low combustibility** provided it is the only combustible component in the wall assembly, as referenced in the current International Building Code (IBC) Chapter 14.

Apply to clean and dry-to-the-touch "as new" substrates, no additional preparation is required.

Spans substrate joint gaps up to 7/8" (22.2 mm), eliminates need for tapes and fillers.

Phase construction ready, installs in below-freezing temperatures, non-directional installation, sustains up to 12 months UV and climate exposure prior to open joint cladding installation.

Emits zero VOCs ensuring crew safety and a healthy building.

Compatible Substrates

- Exterior Gypsum Sheathing
- Rigid Insulation
- Precast Concrete
- Concrete Block
- Cast-in-place Concrete
- Plywood
- Pre-painted Steel
- Galvanized Metal
- Aluminum (Painted/Mill Finish)
- Anodized Aluminum
- Vinyl Window and Door Frames
- Fiberglass Window and Door Frames

For OSB and other substrates contact VaproShield Technical.

Technical Data & Environmental

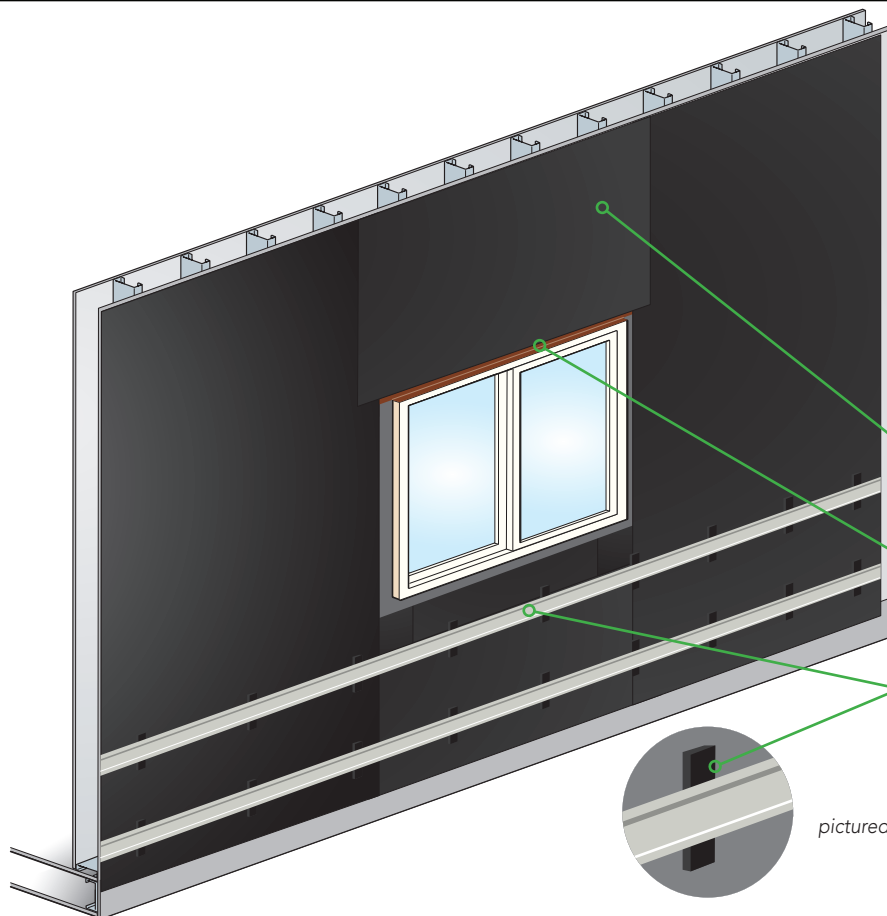
Environmental Product Declaration (EPD) third-party verified. ISO 21930 and ISO 14025 North American compliant

Tested to industry standards for Weather Resistive Barriers and approved by ABAA to meet requirements for Air Barriers.

PHYSICAL PROPERTIES	
PROPERTY	RESULT
Color	Black (top), Black (back)
Thickness	0.4798 mm (18.889 mil)
Membrane Weight	364.66 g/m ² (1.20 oz/ft ²)
Roll Weight	55 lbs (25 kg)
Roll Dimensions	59" x 102' (1.5m x 31.1 m)
Roll Coverage	500 sq. ft. (46.6 sq. m.) gross
Skid	25 Rolls
Primer	No Primer Required
VOCs	None
Exposure Before Permanent Cladding	12 months
Minimum Application Temp	20°F (-6.6°C)
Service Temperature	minus 40°F (-40°C) - 225°F (107°C)
Warranty	20 year material warranty

PRODUCT DATA SHEET

RevealShield SA® Self-Adhered Product No.: 13309090 / RevealFlashing SA Product No.: 44305500



Complete Building Envelope System

WRB/AIR BARRIER
RevealShield SA Self-Adhered

A ROUGH OPENING FLASHING OPTIONS

B RAINSCREEN COMPONENTS

pictured: VaproShims SA Self-Adhered

A ROUGH OPENING FLASHING OPTIONS

The following rough opening flashing can be used:

- VaproLiqui-Flash™
- BlockFlashing™ or RevealFlashing SA™
- VaproBond™

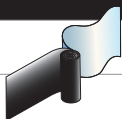
Reference individual data sheets for comprehensive information.

B RAINSCREEN COMPONENTS

RevealShield SA Self-Adhered membrane requires a ventilated and unimpeded vertical drainage cavity or rainscreen system to be incorporated into all WRB/AB installations. VaproShim SA Self-Adhered accomplishes this, and are available as a corresponding accessory. View corresponding Product Data Sheet for in-depth information.

Rough Opening Flashing Membranes

Product	Part No.	Roll Sizes
RevealFlashing SA Self-Adhered Roll	44305500	Roll Size: 11 3/4" x 102' (298mm x 31.1m) 100 S/F (9.3 S/M)



In conjunction with:

Window and Rough Openings Flashing	VaproLiqui-Flash	BlockFlashing	VaproBond
Application Temperature	35°F to 110°F (1.7°C to 43°C)	0°F to 180°F (-18°C to 82°C)	20°F to 120°F (-6.7°C to 49°C)
Drying Capacity	High	None	Low
Breathable Permeability			
Application Method	Sausage Gun / Putty Knife or Brush	Utility Knife / J-Roller	Sausage Gun / Putty Knife

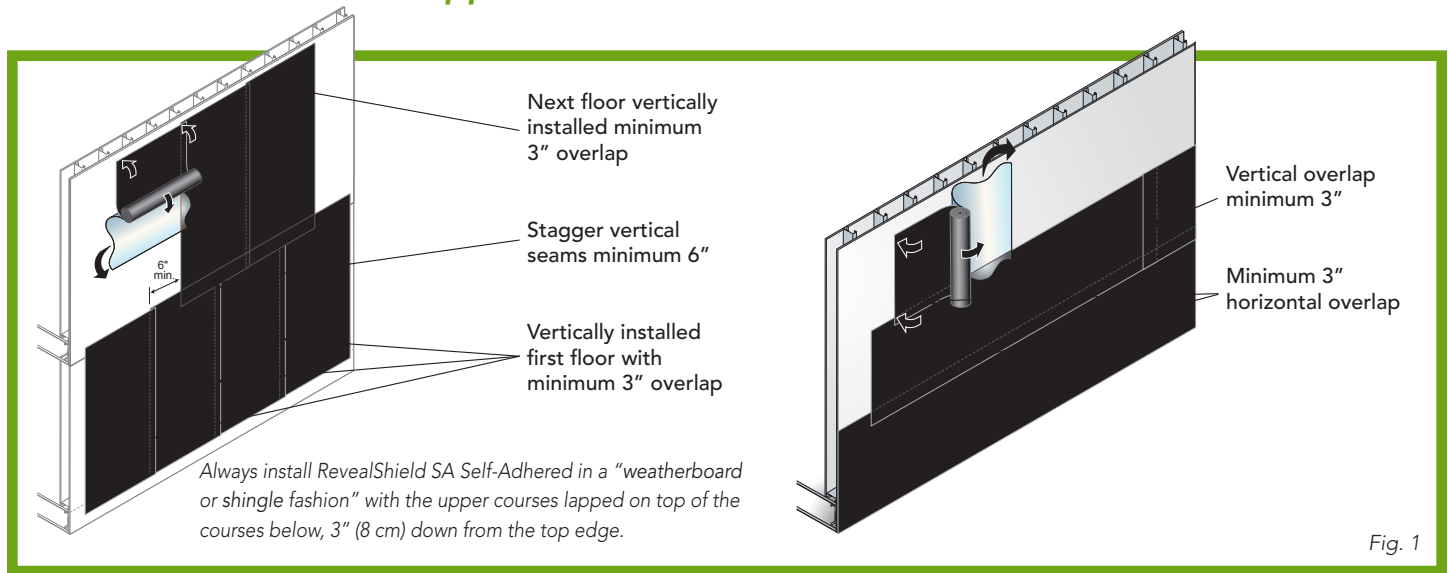


VaproShim SA™ Self-Adhered

Simple, cost effective neoprene accessory, creates a rain screen drainage plane and air/water tight seal for fastener penetrations, available in two thicknesses: 1/8" (3mm), 1/4" (6mm).

Visit VaproShield.com to review additional flashing options.

Vertical and Horizontal Application



RELATED LEED CREDITS

VaproShield membranes qualify for LEED credits. Visit VaproShield.com for the latest sustainability and LEED information.

Installation

STORAGE AND HANDLING

Store materials on end in original packaging at temperatures between 40°F and 120°F (4.4°C and 48.9°C). Protect materials from direct sunlight and inclement weather until ready for use.

SAFETY

Work crews are safe around VaproShield membranes. RevealShield SA Self-Adhered contains zero VOCs or toxins.

PREPARATION

All surfaces must be dry, sound, clean, "as new" condition, and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water resistive air barrier membrane and flashings. Fill voids and gaps in substrate greater than 7/8 inch (22.2 mm) in width to provide an even surface. Strike masonry joints full-flush.

BEST PRACTICE INSTALLATION

All overlaps must be a minimum of 3" (8 cm) on vertical and horizontal seams. Inside and outside vertical corner overlaps should be a minimum 6" (15 cm) in both directions, staggered a minimum of 24" (61 cm), and should not occur directly above or below windows or doors. See Fig. 1.

Visit www.VaproShield.com for complete installation instructions and instructional videos.

LIMITATIONS

RevealShield SA Self-Adhered should be covered within 12 months of installation with permanent cladding material.

Open joint spacing should not exceed 2" (5.1 cm) with maximum open area not to exceed 40% of total elevation area of open joint cladding.

Minimum recommended application temperature of 20°F (- 6°C) and rising.

Do not contaminate RevealShield SA Self-Adhered membrane with building site chemicals which make it more wettable (e.g., surfactants). This will adversely affect its water resistance and therefore its contribution to the water resistance of the overall wall system.

Flash fenestrations per window and door manufacturers' recommendations, local building code requirements, ASTM and AAMA guidelines.

If desired adhesion is not attained between membranes due to site conditions, VaproShield recommends applying a bead of VaproBond as an additional solution to pressure rolling.

Availability

VaproShield products are available throughout North America, Central and South America, and New Zealand.

Warranty

A 20-year material warranty is available.

PRODUCT DATA SHEET

RevealShield SA® Self-Adhered Product No.: 13309090 / RevealFlashing SA Product No.: 44305500

TESTING DATA		
PROPERTY	STANDARD	RESULT
Strength		
Dry Tensile Strength ≥ 20 lbf/in	ASTM D828 Standard Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus	6.6 N/mm (37.3 lb/in)
Dry Breaking Force (Grab method) MD ≥ 40 XMD ≥ 35	ASTM D5034 Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)	MD – 529 N (119 lb/in) XMD – 427 N (96 lb/in)
Cold Mandrel Bend Test	AC38 Section 3.3.4	Warp (Machine) Direction - No cracking Filling (Cross) Direction - No cracking
Weathering Tests	AC38 Section 4.1.2 UV Exposure AC38 Section 4.1.3 Accelerated Aging	UV - No visual change UV & Accelerated - visibly lighter, no visible deterioration
Water Vapor Transmittance		
Water Vapor Transmission Desiccant Method, Procedure A, 24.4°C (76.0°F) 50 %RH	ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials	28.058 Perm (grain/h•ft ² •inchHg) 1605 ng/Pa•s•m ²
Water Vapor Transmission Water Method, Procedure B, 24.4°C (76.0°F) 50 %RH	ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials	63.481 Perm (grain/h•ft ² •inchHg) 3632 ng/ 2Pa•s•m ²
Water Vapor Transmission Dynamic Relative Humidity Measurement (23°C 50 %RH)	ASTM E398 Standard Test Method for Water Vapor Transmission Rate of Sheet Materials Using Dynamic Relative Humidity Measurement	65.52 Perm (grain/h•ft ² •inchHg) 3748 ng/Pa•s•m ²
Adhesion Testing		
Adhesion to backing	ASTM D3330 method B	PASS
Peel Adhesion 90° Peel Adhesion, 24 hours	AAMA 711 Section 5.3	PASS
Accelerated Aging and UV Exposure 90° Peel Adhesion, 24 hours	AAMA 711 Section 5.4	PASS
Elevated Temperature 122° F (50 °C) for 7 days) 90° Peel Adhesion, 24 hours	AAMA 711 Section 5.5	PASS
Thermal Cycling 90° Peel Adhesion, 24 hours	AAMA 711 Section 5.6	PASS
Resistance to Peeling from Itself 90° Peel Adhesion 24 hours	AAMA 711 Section 5.9 & Annex 2	DensGlas Gold: No peeling, buckling or ripping Plywood: No peeling, buckling or ripping Concrete: No peeling, buckling or ripping CMU: No peeling, buckling or ripping
Air Resistance Testing		
Air Permeance	ASTM E2178 @75 Pa Standard Test Method for Air Permeance of Building Materials	0.0001 L/s•m ² @ 75 Pa (0.0000 cfm/ft ² @ 1.57 psf)
Air Barrier	ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies	<0.01 L/s•m ² @ 75 Pa (<0.002 cfm/ft ² @ 1.57 psf)
Air Barrier	ASTM E283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen	<0.01 L/s•m ² @ 75 Pa (<0.01 cfm/ft ² @ 1.57 psf)
Water Resistance Testing		
Nail Sealability	ASTM D1970/ section 7.9 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection	Pass - Review Fastener Penetrations Technical Bulletin at VaproShield.com
Water Resistance (Boat Test)	ASTM D779 Standard Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry Indicator Method (Withdrawn 2011)	Control - No leakage Weathered - No Leakage
Water Resistance (Control after Weathering)	AATCC 127 Hydrostatic pressure test (550 mm water column for 5 hours), American Association of Textile Chemists and Colorists	Control - No leakage Weathered - No Leakage

PRODUCT DATA SHEET

RevealShield SA® Self-Adhered Product No.: 13309090 / RevealFlashing SA Product No.: 44305500

TESTING DATA		
PROPERTY	STANDARD	RESULT
Fire Testing		
Flame Spread Smoke Developed	ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials	Flame Spread 0 Smoke Developed 75
NFPA 285 Compliant	Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components	View over 50 compliant assemblies with various manufacturers at VaproShield.com or Contact VaproShield Technical Team, 1-866-731-7663 opt. 5
Canadian Standards		
Multiple	CAN/CGSB 51.32 – Sheathing Membrane, Breather Type	PASS

Referencia	FT AUTOTA
Fecha	2016
Códigos	607370
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	607431
	609880
	6127005
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FICHA TÉCNICA

TORNILLERÍA AUTOTALADRANTE



DIN 7504-K



AUTA



DIN 7504-P



DIN 7504-N

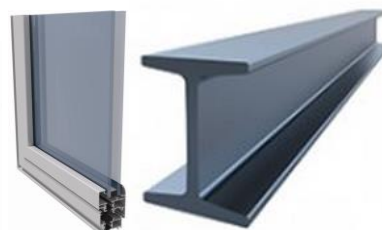
CARACTERÍSTICAS

- Punta broca: taladra directamente el material sin necesidad de taladro previo.
- Rosca autorroscante.
- Gran variedad de tipos de cabezas, diámetros y longitudes para distintas aplicaciones: flexibilidad en el montaje.
- Recubrimientos en cincado, cincado negro, cincado blanco y silver ruspert.
- Versiones en colores habituales de chapas lacadas comerciales (carta RAL).
- Disponibles tapones de colores para cabezas hexagonales.

APLICACIONES

- Para la unión de metal a madera, elementos metálicos entre sí, o plástico, madera y otros materiales sobre materiales metálicos.
- Versiones con arandela de acero galvanizado-AREPDM o acero inoxidable-AREPDM para uniones estancas en fachadas y cubiertas, en distintos diámetros.

MATERIALES BASE



EJEMPLOS DE APLICACIÓN



FICHA TÉCNICA
TORNILLERÍA AUTOTALADRANTE

Códigos 607370
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6127100
6127007

TABLA DE SELECCIÓN

Código	Norma	Cabeza	Mortaja	Ø arandela EPDM (1)	Material/Recubrimiento (2)	Material a taladrar
DIN 7504K	DIN 7504K	Hexagonal con arandela	---	14, 16, 18, 25	Acero / Cincado	Acero
DIN 7504K	DIN 7504K	Hexagonal con arandela	---	16	A2	Acero y acero inoxidable
AUTA	---	Hexagonal con arandela	---	16	Acero / Cincado	Acero
AUTA	---	Hexagonal con arandela	---	16	A2	Acero y acero inoxidable
DIN 7504N	DIN 7504N	Alomada	Phillips	---	Acero / Cincado	Acero
DIN 7504N	DIN 7504N	Alomada	Phillips	---	Acero inox	Aluminio
DIN 7504P	DIN 7504P	Avellanada	Phillips	---	Acero / Cincado	Acero
DIN 7504P	DIN 7504P	Avellanada	Phillips	---	Acero / Cincado negro	Acero

(1) Características arandela EPDM según Ficha Técnica ARVUL

(2) Recubrimientos: cincado $\geq 3 \mu\text{m}$ según ISO 4042 A1J
cincado negro $\geq 3 \mu\text{m}$ según ISO 4042 A1N

MATERIALES

Característica	Acero	Inox
Material	Acero especial para tratamiento térmico SAE J403 1022	Acero inox A2
Dureza superficial	$> 500 \text{ HV}$	---
Dureza núcleo	240 - 450 HV	---
Profundidad dureza	ST 2.5 - 3.5: 0.05 - 0.18 mm. ST 3.9 - 5.5: 0.10 - 0.23 mm. ST 6.3: 0.15 - 0.28 mm.	---

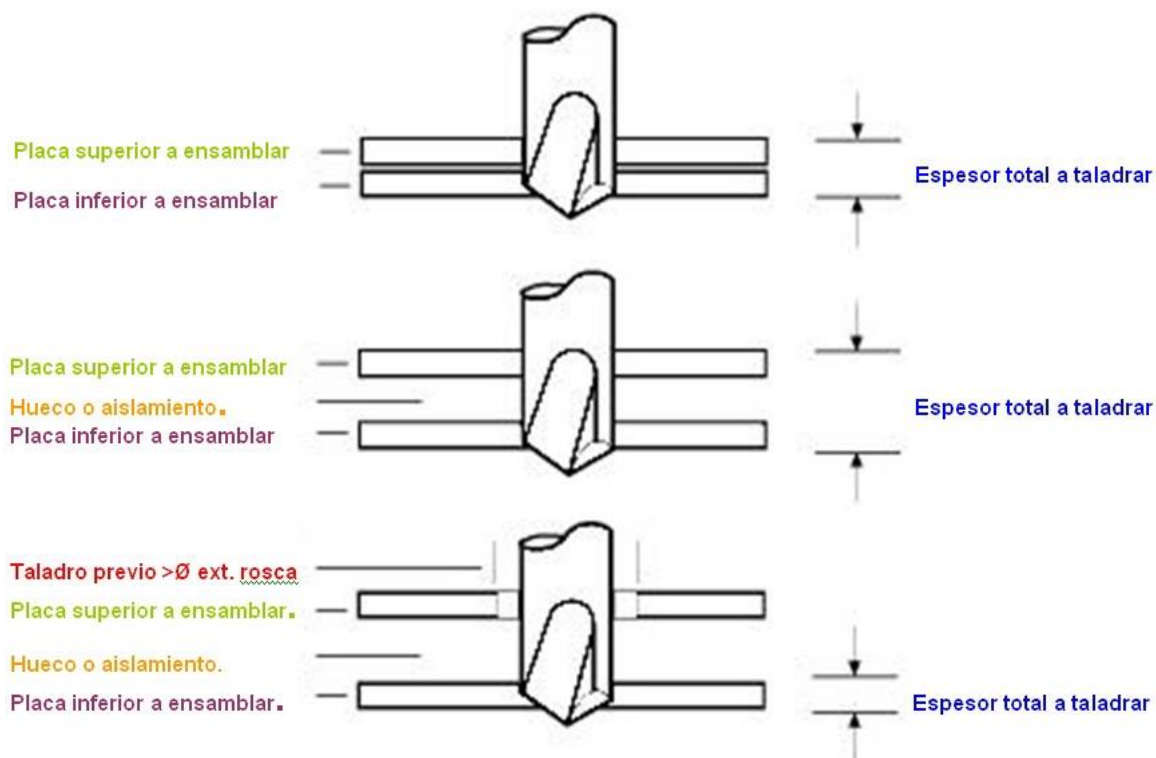
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Fecha	2016
	607370
	607411
	607431
Códigos	609880
	6127005
	6127100
	6127007

FICHA TÉCNICA

TORNILLERÍA AUTOTALADRANTE

SELECCIÓN PUNTAS

La elección de la punta del tornillo debe ser tal que el espesor total de los materiales metálicos a unir (incluyendo eventuales separaciones intermedias) sea menor que el filo de la punta broca; en caso contrario es posible que se produzca la rotura del tornillo durante su instalación.



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TORNILLERÍA AUTOTALADRANTE

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607411
607431
609880
6127005
6127100
6127007

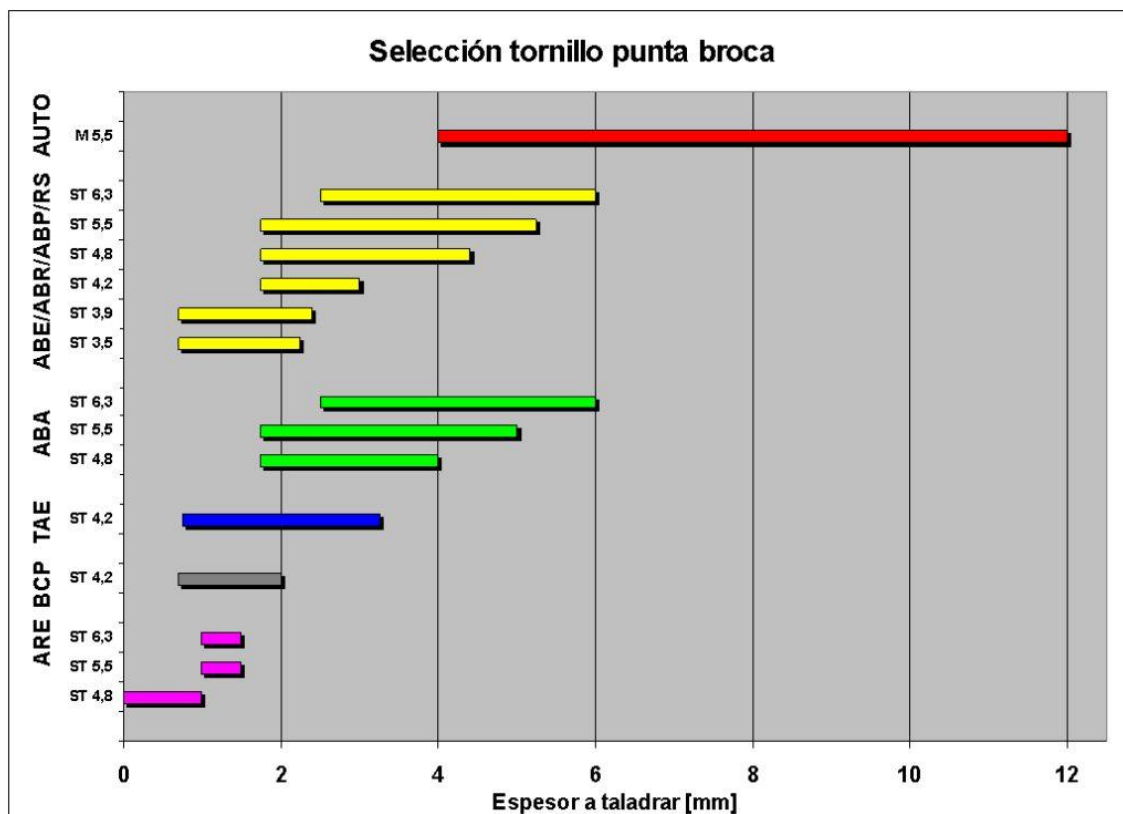
PARÁMETROS DE INSTALACIÓN

Parámetro		ST 3.5	ST 3.9	ST 4.2	ST 4.8	ST 5.5 M 5.5	ST 6.3
Fuerza máxima instalación	[N]	150	200	250	250	350	350
Velocidad taladrado	Acero	1800 - 2500				1000 - 1800	
	Acero inox.	1000 - 1500				600 - 1000	
Tiempo máximo	[sg]	4	4.5	5	7	11	13
Par máximo	[Nm]	2.8	3.8	4.7	6.9	10.4	16.9

10 N $\approx$ 1 Kg

10 Nm $\approx$ 1Kg m

A tiempos altos de taladrado o velocidad excesiva de taladrado hay riesgo de quemar la punta broca, no consiguiendo por tanto taladrar el material.



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TORNILLERÍA AUTOTALADRANTE

Códigos

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607431
609880
6127005
6127100
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ESPESOR MÁXIMO A FIJAR						
Longitud	ST 3,5	ST 3,9	ST 4,2	ST 4,8	ST 5,5	ST 6,3
9,5	2,85					
11	4,2					
13	6,2	5,8	4,3	3,7		
16	9,2	8,8	7,3	5,5		
19	12,1	11,7	10,3	8,7	8,7	7
22	15,1	14,7	13,3	11,7	11,7	10
25	18,1	17,7	16,3	14,7	14,7	13
32	25,1	24,5	23	21,5	21,5	20
38		30,5	29	27,5	27,5	26
45			36	34,5	34,5	33
50			41	39,5	39,5	38
60				49,5	49,5	48
63				52,5	52,5	51
73				62,5	62,5	61
75				64,5	64,5	63
80				69,5		68
90				79,5		78
100				89,5		88
110						98
120						108
130						118
140						128

RESISTENCIA CARACTERÍSTICA DEL TORNILLO

MEDIDA	TRACCION [KN]	CORTADURA [KN]
ST 2.9	2.62	1.31
ST 3.5	3.81	1.91
ST 3.9	4.64	2.32
ST 4.2	5.26	2.63
ST 4.8	7.11	3.56
ST 5.5	9.63	4.82
ST 6.3	13.36	6.68

1 KN ≈ 100 Kg

En las cargas a tracción se deberá tener en cuenta la propia resistencia de la chapas a unir, que habitualmente será inferior a la resistencia del tornillo en sí, ya que el tornillo probablemente rasgará las chapas.

FICHA TÉCNICA

TORNILLERÍA AUTOTALADRANTE

Códigos

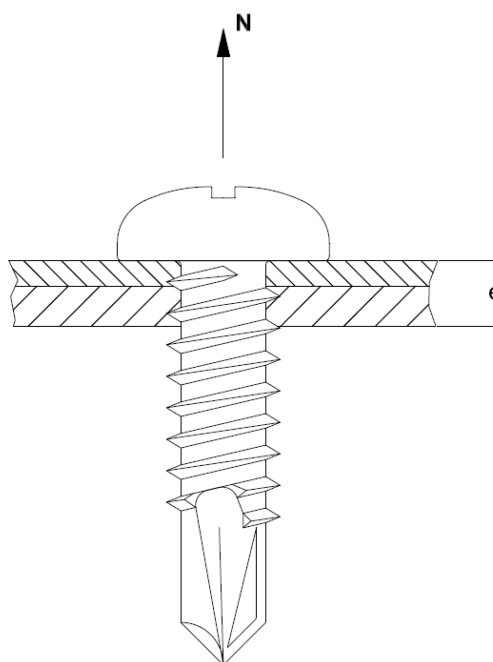
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CARGA RECOMENDADA A EXTRACCIÓN EN CHAPA DE ACERO

MEDIDA	CARGA RECOMENDADA					
	e[mm]	N[kN]	e[mm]	N[kN]	e[mm]	N[kN]
ST 3.5	0.8	0.55	1.5	0.89	2.0	1.13
ST 3.9	0.8	0.54	1.5	0.97	2.0	1.50
ST 4.2	2.0	1.63	2.5	1.51	3.0	2.62
ST 4.8	2.0	1.87	3.0	2.77	4.0	3.71
ST 5.5	2.0	1.77	3.5	2.86	5.0	3.43
ST 6.3	2.5	1.44	4.0	3.19	5.0	4.83

CARGA RECOMENDADA A EXTRACCIÓN EN CHAPA DE ALUMINIO

MEDIDA	CARGA RECOMENDADA					
	e[mm]	N[kN]	e[mm]	N[kN]	e[mm]	N[kN]
ST 4.8	2.0	0.95	3.0	1.52	4.0	2.10



FICHA TÉCNICA

TORNILLERÍA AUTOTALADRANTE

1. DIN 7504-K

Tornillo autotaladrante de cabeza hexagonal con arandela estampada



Material base



Ensamblaje chapa



Perfiles chapa

Propiedades



Recubrimiento
zincado



Acero

Propiedades



Hexagonal con
arandela
estampada



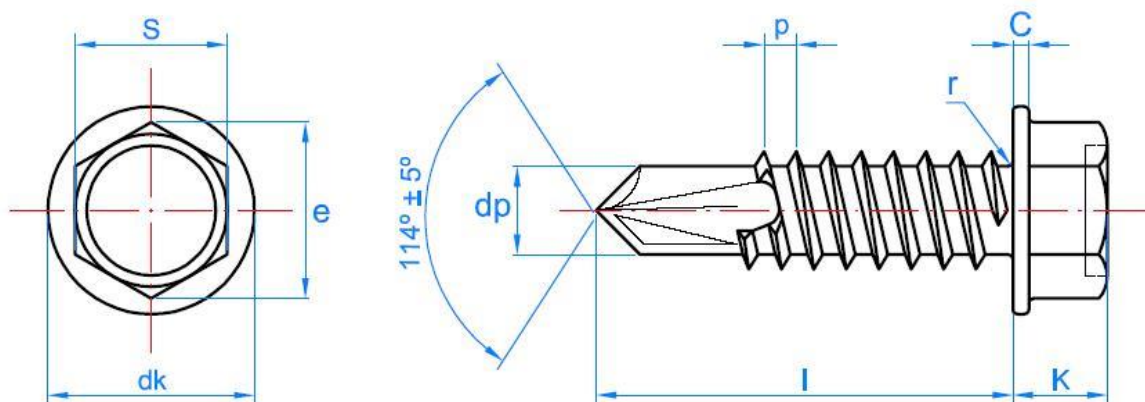
Hexagonal con
arandela
estampada



Punta broca

1.1. Datos

Código		ST 3.5	ST 4.2	ST 4.8	ST 5.5	ST 6.3
dk: diám. arandela cabeza	[mm]	8	8.5	10	10.5	12.6
k: espesor cabeza	[mm]	3.3	4.1	4.3	4.3	6.3
c: espesor arandela	[mm]	1.2	1.5	1.6	1.9	2
s: llave fija	[mm]	6	7	8	8	10
D: diámetro exterior rosca	[mm]	3.53	4.22	4.80	5.46	6.25
d: diámetro interior rosca	[mm]	2.64	3.10	3.58	4.17	4.88
p: paso rosca	[mm]	1.3	1.4	1.6	1.8	1.8
l: longitudes	[mm]	9.5 - 32	13 - 38	13 - 38	19- 75	19 - 140
lg: longitud máxima de rosca	[mm]	90	90	90	90	90
Código punta de instalación (boca magnética hexagonal)		BOCA006	BOCA007	BOCA008	BOCA008	BOCA010
Capacidad de taladrado	[mm]	0.70 - 2.25	1.75 - 3.00	1.75 - 4.40	1.75 - 5.25	2.50 - 6.00



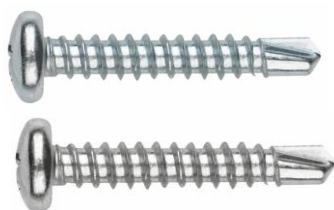
FICHA TÉCNICA

TORNILLERÍA AUTOTALADRANTE

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2. DIN 7504-N

Tornillo autotaladrante de cabeza alomada y huella Phillips



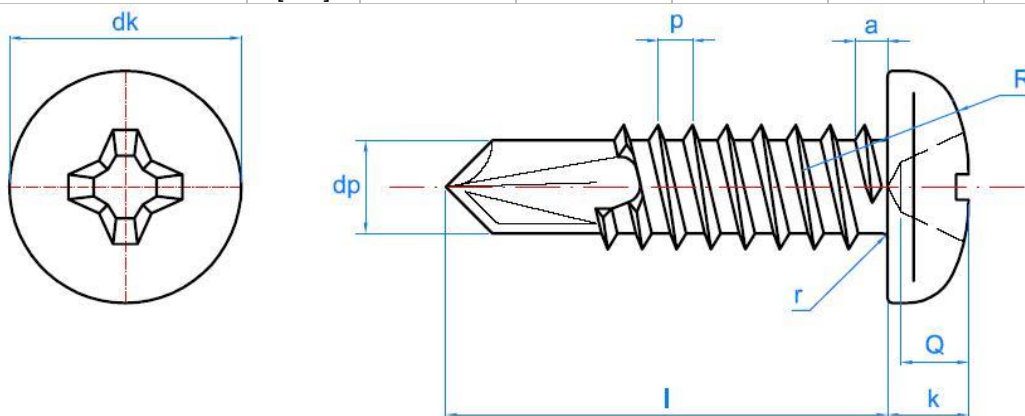
Recubrimientos



Recubrimiento
Zincado

4.1. Datos

Código		ST 3.5	ST 3.9	ST 4.2	ST 4.8	ST 5.5
dk: diámetro cabeza	[mm]	6.9	7.5	8.2	9.5	10.8
k: espesor cabeza	[mm]	2.60	2.80	3.05	3.55	3.95
Mortaja Phillips		nº 2	nº 2	nº 2	nº 2	nº 3
R: radio cabeza	[mm]	5.4	5.8	6.2	7.2	8.2
D: diámetro exterior rosca	[mm]	3.53	3.91	4.22	4.80	5.46
d: diámetro interior rosca	[mm]	2.64	2.92	3.10	3.58	4.17
p: paso rosca	[mm]	1.3	1.3	1.4	1.6	1.8
l: longitudes	[mm]	9.5 - 32	13 - 32	13 - 50	13 - 120	19- 73
Código punta de instalación (punta Philips)		PUPHC02 PUPHL02	PUPHC02 PUPHL02	PUPHC02 PUPHL02	PUPHC02 PUPHL02	PUPHC03 PUPHL03
Capacidad de taladrado	[mm]	0.70 - 2.25	0.70 - 2.40	1.75 - 3.00	1.75 - 4.40	1.75 - 5.25



- Acabado cincado (código ABR), cincado blanco (código ABR_BLE) y cincado negro (código NBR).
- Versión acero inoxidable A2 (código ABRA2) para uso exclusivamente en aluminio (no produce corrosión por par galvánico). No emplear el tornillo en acero inoxidable para taladrar acero, ya que se quemará la punta por falta de dureza.

Referencia	FT AUTOTA
Fecha	2016
	607370
	607411
	607431
Códigos	609880
	6127005
	6127100
	6127007

FICHA TÉCNICA

TORNILLERÍA AUTOTALADRANTE

3. DIN 7504-P

Tornillo autotaladrante con cabeza avellanada y huella Phillips

Propiedades



Recubrimiento
zincado



Acero

Material base



Ensamblaje chapa



Perfiles chapa

Propiedades



Phillips



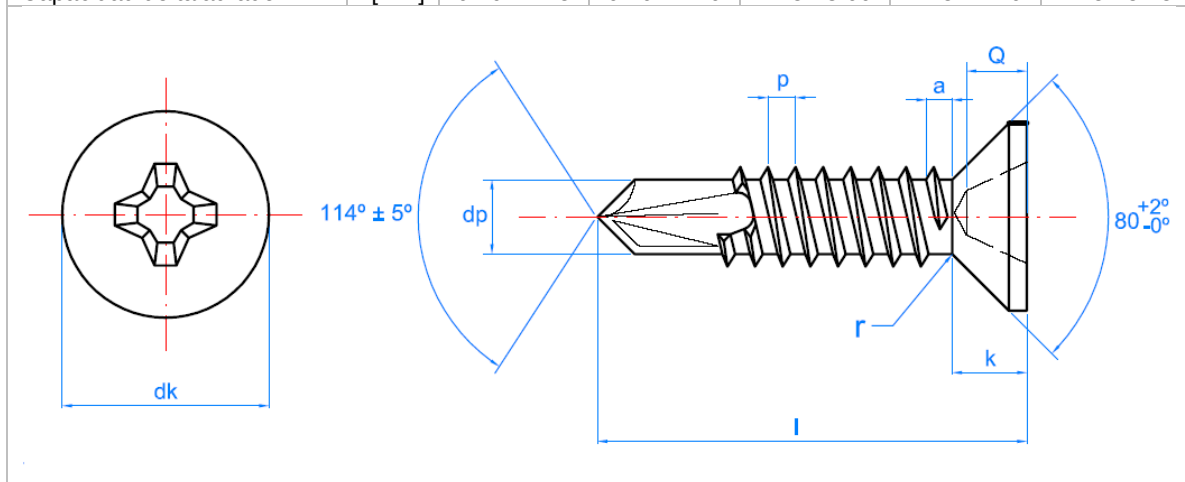
Cabeza
avellanada



Punta broca

8.1. Datos

Código		ST 3.5	ST 3.9	ST 4.2	ST 4.8	ST 5.5
dk: diámetro cabeza ≤	[mm]	6.8	7.5	8.1	9.5	10.8
k: espesor cabeza	[mm]	2.1	2.3	2.5	3.0	3.4
Mortaja Phillips		nº 2	nº 2	nº 2	nº 2	nº 3
Ángulo avellanado cabeza	°	80	80	80	80	80
D: diámetro exterior rosca	[mm]	3.53	3.91	4.22	4.80	5.46
d: diámetro interior rosca	[mm]	2.64	2.92	3.10	3.58	4.17
p: paso rosca	[mm]	1.3	1.3	1.4	1.6	1.8
L: longitudes	[mm]	9.5 - 25	13 - 38	13 - 38	13 - 50	19 - 50
Código punta instalación (punta Phillips)		PUPHC02 PUPHL02	PUPHC02 PUPHL02	PUPHC02 PUPHL02	PUPHC02 PUPHL02	PUPHC03 PUPHL03
Capacidad de taladrado	[mm]	0.70 - 2.25	0.70 - 2.40	1.75 - 3.00	1.75 - 4.40	1.75 - 5.25



- Acabado cincado (código ABP) y cincado negro (código NBP).
- Para uniones metal-metal donde se desee que el tornillo quede rasante con el material a fijar.
- Requiere avellanado previo.

4. AUTA

Tornillo para viga autotaladrante con punta broca nº5 y cabeza hexagonal



Propiedades



Recubrimiento
zincado



Acero

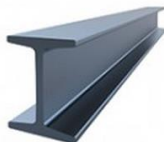
Material base



Ensamblaje chapa



Perfiles chapa



IPN



Hexagonal con
arandela
estampada



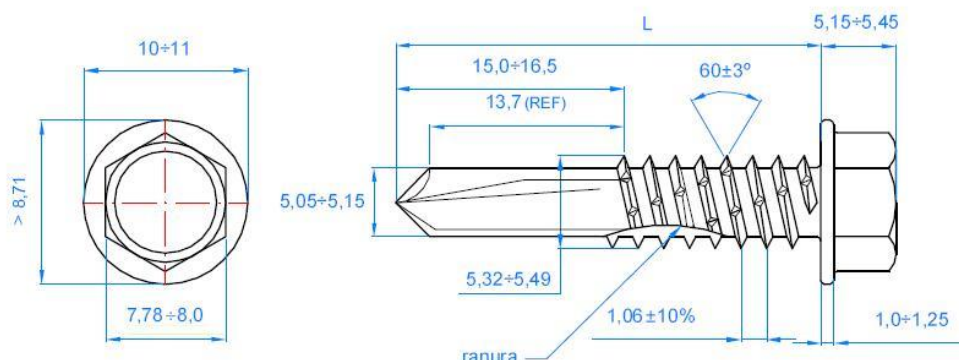
Hexagonal con
arandela
estampada



Punta broca viga

3.1. Datos

Código		M 5.5
d _k : diámetro arandela cabeza	[mm]	11
k: espesor cabeza	[mm]	5.3
c: espesor arandela	[mm]	1.15
s: llave fija	[mm]	8
Punta		#5
D: diámetro exterior rosca	[mm]	5.5
d: diámetro interior rosca	[mm]	4.6
p: paso rosca	[mm]	1.06
l: longitudes	[mm]	32 - 38
Código punta de instalación (boca magnética hexagonal)		BOCA008
Capacidad de taladrado	[mm]	4.0 – 12.0



- Acabado cincado.
- Uso general en uniones chapa-chapa para espesores hasta 12 mm.
- Versiones con arandela AREPDM montada para cierre estanco en fachadas y cubiertas.



TECHNICAL SPECIFICATIONS

SELF-TAPPING SCREW STB-T0600

STACBOND

VER: 001 / 2026

SCREW

Reference	Description
STB-T0600	DIN 7504N SELF-TAPPING SCREW

Specifications	VALUE
USE	Fixing of cassette or hanger/horizontal stiffener to profile
TYPE OF MATERIAL	Stainless Steel A2
HEAD TYPE	Philips
LENGTH	19mm
STEM DIAMETER	4.2mm
MIN. UNITS	1000 UNITS
UNITS PER BOX	1000 UNITS

DIN 7504N SELF-TAPPING SCREW STB-T0600





TECHNICAL SPECIFICATIONS

SELF-TAPPING SCREW STB-T0300

STACBOND

VER: 001 / 2026

SCREW

Reference	Description
STB-T0300	SELF-TAPPING SCREW STB-T0300

Specifications	VALUE
USE	Fixing between brackets and profiles
TYPE OF MATERIAL	Stainless Steel A4
HEAD TYPE	Hexagonal+Philips
LENGTH	20mm
STEM DIAMETER	5.5mm
MIN. UNITS	500 UNITS
UNITS PER BOX	500 UNITS

SELF-TAPPING SCREW STB-T0300

