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GENERAL TECHNICAL CONDITIONS FOR SHEET METAL PROCESSING – Elpro Križnič d.o.o.

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The paste-like (thixotropic) polyurethane sealing foam from the FERMAPOR K31 product family remains stable on a flat surface after application due to its high viscosity. After final

LASER CUTTING AND PUNCHING

Documentation

When making an inquiry, the client must attach documentation that includes a plan and a 3D model of the product in the state it wants to have it manufactured (also for all changes/revisions). If there are changes/revisions to the pieces between the sent offer and the received order, the salesperson/seller must be informed.

The client is obliged to send the documentation in STEP, DXF/DWG format in a 1:1 ratio, with a unit of measurement in mm. The client guarantees that the plan and the 3D model will match exactly. In the event that the documentation does not match or is incomplete, the company Elpro Križnič d.o.o. (hereinafter referred to as Elpro Križnič) does not assume any responsibility for any errors or discrepancies between the offer and the actual product, and will take into account the 3D model.

Any engravings must be clearly identifiable and specifically marked (different layer). All requirements, such as tolerances and other special features (threads, addendum for p. obd., ...), must be indicated in the plans in accordance with SIST EN ISO 128.

All the above-mentioned special features must be approved by Elpro Križnič before confirming the order.

Tolerances in quality

Deviation of the actual size from the nominal size on the plan

Thickness and surface flatness tolerances are summarized according to the technical conditions of the base material (EN 10088-2/EN 10095/EN 10028-7, DIN 17440/DIN 17441, DIN 17460).

For cuts, the permissible dimensional tolerances according to the SIST EN ISO 9013 standard apply.

Laser cutting:

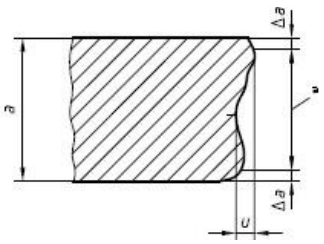
Working material thickness, mm	**Material length, mm**							
	> 0 < 3	≥ 3 < 10	≥ 10 < 35	≥ 35 < 125	≥ 125 < 315	≥ 315 < 1.000	≥ 1.000 < 2.000	≥ 2.000 < 4.000
	Permited tolerances, mm							
	± 0,04	± 0,1	± 0,1	± 0,2	± 0,2	± 0,3	± 0,3	± 0,3
	± 0,1	± 0,2	± 0,2	± 0,3	± 0,3	± 0,4	± 0,4	± 0,4
	± 0,3	± 0,3	± 0,4	± 0,4	± 0,5	± 0,5	± 0,5	± 0,6
	—	± 0,5	± 0,6	± 0,6	± 0,7	± 0,7	± 0,7	± 0,8

> 0 ≤ 1	—	± 0,6	± 0,7	± 0,7	± 0,8	± 1	± 1,6	± 2,5
> 1 ≤ 3,15								
> 3,15 ≤ 6,3								
> 6,3 ≤ 10								
> 10 ≤ 50								
> 50 ≤ 100								
> 100 ≤ 150								
> 150 ≤ 200								
	—	—	± 1,3	± 1,3	± 1,4	± 1,7	± 2,2	± 3,1
	—	—	± 1,9	± 2	± 2,1	± 2,3	± 2,9	± 3,8
	—	—	± 2,6	± 2,7	± 2,7	± 3	± 3,6	± 4,5

Limit deviations of the angle and surface of the cut according to the standard SIST EN ISO 9013

Material thickness, α mm	Δα mm
≤ 3	0,1α
> 3 ≤ 6	0,3
> 6 ≤ 10	0,6
> 10 ≤ 20	1
> 20 ≤ 40	1,5
> 40 ≤ 100	2
> 100 ≤ 150	3
> 150 ≤ 200	5
> 200 ≤ 250	8
> 250 ≤ 300	10

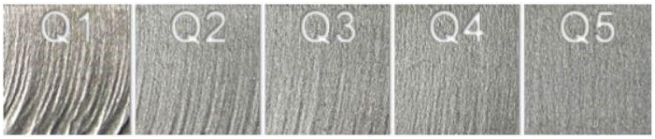
u=1,2 + 0,035*a



Roughness – cut quality

Without additional requests from the client, when laser cutting thicker materials (10-15 mm), medium cut quality (Q3) is used as standard, and for materials with a thickness of 16-25 mm, a rough or extremely rough cut (Q2 or Q1).

Q1 … extremely rough cut
Q2 … rough cut
Q3 … medium cut quality
Q4 … smooth cut
Q5 … very smooth cut



The roughness increases with the thickness of the material in thermal cuts - see table.

THICKNES [mm]	ANGULITY [mm]	Ra [µm]
1	0,02	0,5 - 1
3	0,05	0,5 - 2,5
5	0,07	1 - 3
10	0,1	3 - 6
15	0,13	5 - 14
20	0,16	8 - 16

Surface flatness

Unless otherwise ordered by the client, the products are not straightened after cutting (it is possible that the product may deform during cutting due to internal stresses in the material).

Surface quality

Since it is a thermal cutting process, melt residues (splashes) are possible on the surfaces.
On the underside of the sheet metal surface, there may be traces of manipulation and remnants of cutting burrs.

Preparation and cutting of holes

The minimum diameter of the holes:

- As a general rule, the minimum diameter of the hole should be approximately equal to the thickness of the sheet (if you are cutting a sheet of 15 mm thickness, the minimum diameter of the hole is 15 mm).

- At the request of the customer, it is possible to cut holes with a diameter of ½ depending on the thickness of the material (if you are cutting a 15 mm thick sheet, the minimum hole diameter is 7.5 mm, the quality of the hole cut in this case is not optimal, the tolerance deviations are higher. Therefore, Elpro Križnič is not responsible for achieving the tolerances - Elpro Križnič cuts such holes exclusively based on the prior agreement with the customer and on the customer's responsibility for the quality of the cut holes).

The maximum diameter of the holes:

- There are no restrictions on the diameter of the holes, but the diameter must be large enough to maintain the accuracy and quality of the cut.

Threaded holes:

- Holes cut by laser cutting without subsequent reaming to the specified thread size are not suitable for threading. When threading directly into laser-cut holes, thread deformation may occur due to suboptimal hole dimensions.
- The customer is obliged to pre-adjust the model to the appropriate dimensions, in accordance with the conditions stated above.

Punching

General tolerances for punched parts are described in ISO standard 2768-mK. Unless otherwise specified and agreed with the client, tolerance class m is used for the cut.

- m (medium) – medium accuracy

Recommended dimensional tolerances ISO 2768-1, class m - in mm, (for lengths without specifically specified tolerances):

Length (L)	Tolerance (± mm)
0.5 to 3	± 0.1
3 to 6	± 0.1
6 to 30	± 0.2
30 to 120	± 0.3
120 to 400	± 0.5
400 to 1000	± 0.8
1000 to 2000	± 1.2
2000 to 4000	± 2.0

- For very precise parts, ISO 2768-f (fine) can be used after agreement with the customer and confirmation of samples.
- For rough cuts where accuracy is not critical, ISO 2768-c (coarse) is used.

For geometric tolerances in punching, ISO 2768-2, class K, is used.
For geometric properties such as squareness, flatness and parallelism:
For thicker materials (over 3 mm), tolerances may deteriorate due to deformations during punching.

Geometrical Feature	**Recommended Tolerance (mm)**
Perpendicularity (up to 100 mm length)	0.2
Parallelism (up to 100 mm)	0.2
Concentricity (Ø up to 100 mm)	0.3
Edge flatness (up to 100 mm)	0.2

Tolerances for holes and bores in punching

The following tolerances apply to holes made by punching::

- Hole diameter: ± 0.1 mm for small holes (up to Ø10 mm).
- Distance between holes: ± 0.2 mm (depending on material thickness).
- Hole ovality: up to 10% of diameter (due to mechanical impact of punching).

For very precise bores, additional processing (drilling, grinding) is recommended.

Surface quality when punching according to DIN 6930

After punching, the edges of the sheet metal have a certain roughness and deformation:

- Roughness (Ra): typically between 3.2–12.5 µm, depending on the material and the sharpness of the tool.
- Burr height: up to 0.1 × sheet thickness, can be removed by secondary processing.

Grinding, polishing or laser cutting is used for punched parts that require perfectly smooth edges.

Summary of general recommendations for punching according to DIN 8588:

- ISO 2768-mK is the standard choice for most die-cuts.
- Tolerances of ± 0.1 to 0.5 mm are common in serial production.
- For geometric tolerances (squareness, parallelism), it is recommended to follow ISO 2768-2 K.
- Hole ovality and edge spatter are common occurrences and must be controlled.
- For very precise parts, additional processing (grinding, drilling) may be required.

Recommended punching tolerances according to

When punching, tolerances vary depending on the material, sheet thickness and tooling used. Below are recommended tolerances for stainless steel, aluminum and steel.

Stainless steel tolerances (inox, AISI 304, 316)

Sheet Thickness (mm)	**Dimensional Tolerance (ISO 2768-m) (mm)**	**Hole Tolerance (Ø mm)**	**Burr (height)**
0.5 – 1.0	± 0.1 – 0.2	± 0.1	0.05 – 0.1 mm
1.0 – 3.0	± 0.2 – 0.3	± 0.15	0.1 – 0.2 mm
3.0 – 6.0	± 0.3 – 0.5	± 0.2	0.2 – 0.4 mm

The burr may be larger than with softer materials → additional grinding recommended.
Holes smaller than 1.5 × sheet thickness may be deformed.

Aluminum tolerances (Al 1050, 6061, 7075)

Sheet Thickness (mm)	**Dimensional Tolerance (ISO 2768-m) (mm)**	**Hole Tolerance (Ø mm)**	**Burr (height)**
0.5 – 1.0	± 0.1	± 0.05 – 0.1	0.02 – 0.05 mm
1.0 – 3.0	± 0.2	± 0.1	0.05 – 0.15 mm
3.0 – 6.0	± 0.3	± 0.2	0.1 – 0.2 mm

Due to the elasticity of aluminum, the material may spring after punching.

Carbon steel tolerances (S235, S355, DC01)
Possible oxidation of the edges → additional processing (sanding, painting, galvanizing) is recommended.

Sheet Thickness (mm)	Dimensional Tolerance (ISO 2768-m) (mm)	Hole Tolerance (Ø mm)	Burr (height)
0.5 – 1.0	± 0.1	± 0.1	0.05 – 0.1 mm
1.0 – 3.0	± 0.2	± 0.15	0.1 – 0.2 mm
3.0 – 6.0	± 0.3 – 0.5	± 0.2	0.2 – 0.3 mm

Tolerances for reshaping threads

When punching a hole for roll forming/thread forming, its diameter must be precisely determined, as rolling does not remove material, but rather reshapes and redistributes it. If the hole is too large, the thread will not have sufficient strength, while if it is too small, damage to the tool or improper thread formation may occur.
Calculation of the diameter of the hole for threading:

The basic rule for determining the diameter of a pre-drilled hole when kneading threads:

$$D_{\text{hole}} = D_{\text{thread}} - (0.1 \times P)$$

Where:

- D_{hole} – diameter of the hole for thread forming,
- D_{thread} – nominal thread diameter (e.g., for M6 it is 6 mm),
- P – thread pitch (e.g., for M6×1 the pitch is 1 mm).

Punching is possible for a material thickness of up to 6 mm, the width of the cutout depends on the thickness of the material. Example: a hole with a diameter of 2 mm can be cut into a 2 mm thick material. Threads can be made from M3 to M8 in thicknesses from 0.5 to 5 mm.

To make holes with a smaller diameter than the thickness of the sheet, special guided tools are required, which must be ordered.

BENDING

Construction

When creating a 3D model, the client follows the guidelines for sheet metal modeling.
Key dimensions such as minimum bending length (bmin), minimum bending radius (rmin) follow the DIN 6935 standard.
Examples: (Valid up to a bending angle of 120°):

Materials: S235, S355, 5754A											
Thicknes T (mm)	1	1-1.5	1.5-2.5	2.5-3	3-4	4-5	5-6	6-7	7-8	8-10	12-15
r_{min} (mm)	1	1.6	2.5	3	5	6	8	10	12	16	25

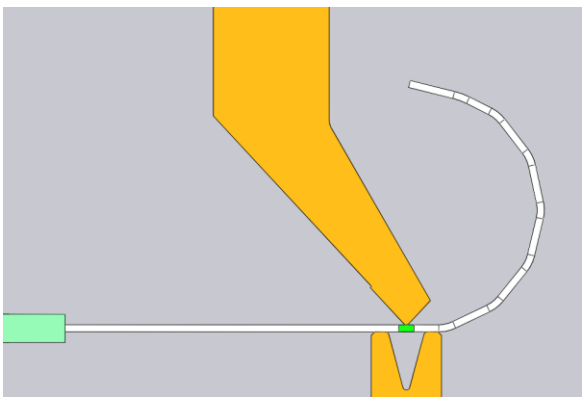
Materials: 1.4301, 1.4401, 1.4404											
Thicknes T (mm)	1	1-1.5	1.5-2.5	2.5-3	3-4	4-5	5-6	6-7	7-8	8-10	12-15
r_{min} (mm)	1.6	2.5	4	5	6	8	10	12	16	20	32

The minimum bending length is calculated according to the equation: $b_{min} > 4 * r_{min}$
Examples

Materials: 1.4301, 1.4401, 1.4404											
Thicknes T (mm)	0.5	1,0	1.25	1.5	2,0	2.5	3	4	5	6	8
r_{min} (mm)	4.5	6	6	8	9	12	15	23	30	38	45

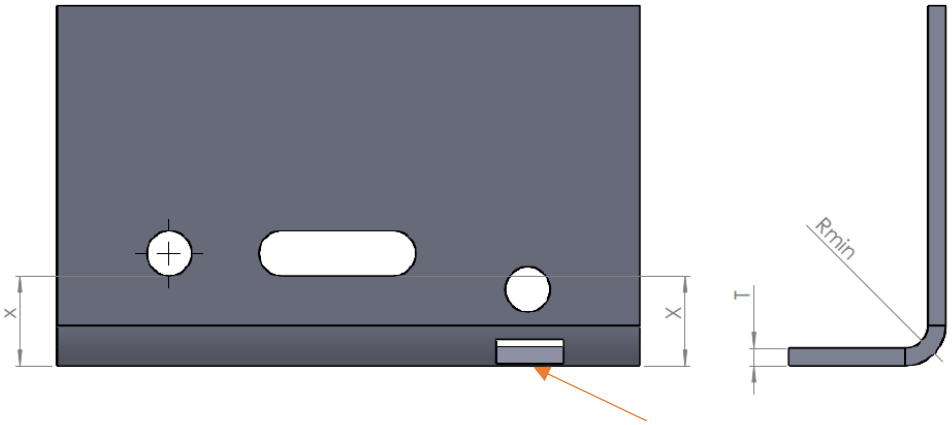
Materials: S235, S355, 5754A											
Thicknes T (mm)	0.5	1,0	1.25	1.5	2,0	2.5	3	4	5	6	8
r_{min} (mm)	3.75	4.5	6	6	8	9	12	18	23	30	38

Larger bend radious, namely r10, r15, r20, r20, 25, r30, r35, r40, r45 and r50, can be made. In case the bend length is too short and a large radius is not possible, a segmental bend is performed, as shown in the figure below.



The minimum distance of the hole or cutout from the outer edge of the bend is determined by the equation:

$x > 3\,x\,T + r_{min}$. If the offset is smaller, relief is required in the bending line.



Documentation

The client is obliged to provide the order with all technical documentation. All piece/assembly requirements such as dimensions, tolerances, special features must be marked in accordance with the SIST EN ISO 128 standard.

Tolerances, quality

When bending, the general tolerances for angularity and linear dimensions according to ISO 2768 apply.

Permissible tolerances for angles:

Accuracy class according to ISO 2768	Tolerance in ° for nominal dimensions of the shorter side (mm)		
	to 10	above 10 to 50	above 50 to 120
M (medium)	± 1°	±0°30' (± 0.5°)	±0°20' (± 0.33°)

Permissible tolerances for length dimensions:

Accuracy class according to ISO 2768	Tolerances (mm) for the range of nominal dimensions (mm)						
	0,5-3	3-6	6-30	30-120	120-400	400-1000	1000-2000
M (medium)	±0,1	±0,1	±0,2	±0,3	±0,5	±0,8	±1.2

WELDING

Unless there are special requirements from the client, welding is carried out according to best welding practice based on past experience. In this case, the quality of the welds is checked visually (TV).

Documentation

If welding plans are provided by the client, they must be produced in accordance with ISO2553. If the client does not provide them, they are produced in our company and are our property.

Welding specification - WPS

If the client requests, we can provide welding according to the welding standard EN ISO 3834-3, which corresponds to the required quality D according to EN ISO 5817:2014 or EN1090-2:2018 for EXC2.

If requested by the client, a pWPS or WPQR can be prepared for each product and then a WPS, which must be approved by the client and includes the following elements:

- Type of material: type and quality of steel used (npr. EN 10025).
- Welding process: welding process (npr. MAG, MIG, TIG, MMA).
- Material thickness: determination of material thickness ranges specified by the standard.
- Type and length of the welded joint: type of joint (e.g. rectangular, angle, notch joints) and required dimensions.
- Type of electrodes or wire: the quality and type of electrodes or welding wire used in the welding process.
- Welding parameters: parameters such as voltage, current and welding speed, which are crucial for achieving the desired welding quality.

Welder certification

Welders must be certified to perform welding in accordance with EN ISO 9606-1 (welder certificate). This means that they must have proof of qualification specific to the types of welding they perform (eg MIG/MAG, TIG, MMA). If necessary, additional certification can be carried out in agreement with the client..

Quality control of welded joints by:

- Visual inspection (VT): inspection of welded joints to check for the presence of obvious defects such as cracks, holes or irregularities.
- Penetrant Test (PT): for detecting surface defects.
- Destructive testing (DT): in some cases destructive tests are required to verify the strength and resistance of welded joints (such as tensile strength tests, bending tests, etc.).

Traceability in case of compliance with EN ISO 3834-3 (by agreement with the client)

All necessary information about materials, welding procedures, welders and test results must be documented and traceable.

POWDER COATING

The following information is required from the client: **RAL, structure and gloss, coating thickness**. If necessary, also quality requirements for the surface, the method of testing and the method of control of the painted surface.

The quality of powder coating depends on correct surface preparation, uniformity of application, adhesion, resistance to wear and weathering, and compliance with standards. If it is for industrial use, it is recommended to take into account certificates such as Qualicoat or ISO 12944. If there are no special agreements with the client, after painting, the quality of the surface is checked according to the standard for appearance **B**, and the other requirements are defined in the technical requirements, which are approved by the client.

Surface preparation

Before applying the powder paint, the surface must be properly treated, as this has a significant impact on the adhesion and durability of the coating. Standard preparation methods include:

- Degreasing – removal of oils, fats and other impurities.
- Sandblasting (Sa 2.5 or Sa 3) – creation of a rough surface for better adhesion (especially for steel)
- Chemical treatment – phosphating or chromating to increase corrosion resistance.
- Deionized rinsing – preventing residues that would affect the uniformity of the coating.

Coating thicknes

The thickness of a powder coating is usually measured in microns (µm). Typical values are:

- Thin layer coatings: 30–60 µm (interior use, decorative products).
- Standard coatings: 60–120 µm (industrial use, furniture).
- Thick layer coatings: 120-250 µm (external use, protection against corrosion).

Coating adhesion (as agreed with the client)

The coating adhesion test is carried out according to ISO 2409 standard (so-called "cross-cut" test or Gitterschnitt). Rating levels:

- 0 – no damage (best quality).
- 1–2 – minimal paint loss (still satisfactory).
- 3–5 – major paint loss (poor quality, the coating is not adequately adhered).

Corrosion resistance (as agreed with the client)

Powder coating should be resistant to rust and chemicals. Key tests:

- Salt spray chamber (ISO 9227 / ASTM B117) – tests corrosion resistance with 500–1000 hours of exposure to salt spray.
- Humidity test (ISO 6270-1) – evaluation of resistance to moisture.
- Chemical resistance – resistance to solvents, acids, bases and UV rays.

Resistance to UV and weather effects (by agreement with the client)

For outdoor surfaces, testing according to ISO 11341 (UV testing) or ISO 2810 (outdoor aging) is key. The coating must remain stable for at least 5-10 years without significant color changes or cracking.

Quality requirements for surface appearance

According to the agreement with the client, 2 quality conditions for the suitability of the surface can be taken into account:

A surface quality
B surface quality

Quality of surface A:

Viewed from a distance of at least 1 m:

- Maximum 1 defect (≤ 1 mm) or maximum 3 smaller ones (< 0.5 mm) per surface (if not close to each other – the distance between them must be at least 100 mm). The base material must not be exposed (100% coverage of the base material is required).
- Scratches (striped shapes, mechanical damage to the surface) – not permitted.
- Stains and discoloration / build-up of paint – not permitted.
- Roughness, cracks (coating: orange peel) – not permitted.Mehanske poškodbe – niso dovoljene.
- Irregularities associated with semi-finished products (dents and sanding marks) – not permitted.
- Uncoated surfaces – not permitted.
- Exception: previously agreed contact points.
- Light paint loading on edges permitted.

Quality of surface B:

- Maximum 5 defects (≤ 1 mm) per surface (if not close to each other - the distance between them must be at least 100 mm). The base material must not be exposed (100% coverage of the base material is required).
- Scratches (striped shapes, mechanical damage to the surface) – small scratches are permitted (L ≤ 20 mm, B ≤ 0.15 mm, 100% coverage of the base material is required).
- Stains and discolouration/paint build-up - light paint load on edges and corners permitted.
- Roughness (coating: orange peel) – fine structured allowed, if not over the entire surface.
- mechanical damage – not permitted.
- Irregularities related to semi-finished products (dents and grinding) – Minor deviations on the painted surface are allowed in terms of welds, minor scratches, and impressions.
- Neprevlečene površine – niso dovoljene.
- Izjema: predhodno dogovorjene kontaktne točke.

POURING SEALING FOAM

Purpose and scope

These general terms and conditions apply to all services related to pouring sealing foam using sealing foam curing machines provided by Elpro Križnič. They define the conditions for pouring the sealing foam, deviations from requirements, visibility of joints and other possible deviations from standards that may occur during the process.

The paste-like (thixotropic) polyurethane sealing foam from the FERMAPOR K31 product family remains stable on a flat surface after application due to its high viscosity. After final assembly, the product is seamlessly sealed with this sealant in accordance with DIN EN 61439 (IEC 61439).

Properties of sealing foam

We use a mix of FERMAPOR K31-A-9230-2-VP (COMP. A) and FERMAPOR K31-B-4 (COMP. B) components.

	Powder coating Indoor	Powder coating Outdoor	Powder coating UL-94 V-2
	FERMAPOR K31-A-9025-2-VP2	FERMAPOR K31-A-9230-2-VP	FERMAPOR K31-A45C2-1-UL-FR
	FERMAPOR K31-B-4	FERMAPOR K31-B-4	FERMAPOR K31 B-16-FR
Mixing ratio	4.5 : 1	4.5:1	5.7:1
Pot life time	33 sec.	50 sec.	27 sec.
Tack-free time	5 min.	8 min.	4.0 min.
Viscosity of the A component	44,000 mPas	50,000 mPas	135,000 mPas
Density	0.20 g/cm³	0.29 g/cm³	0.24 g/cm³
Hardness (Shore 00)	35	62	47
Temperature resistance	from -40 to + 80 °C	from -40 to + 80 °C	from -40 to + 80 °C

Metrological standards

When performing rubber pouring, all relevant technical specifications and client requirements regarding the dimensions and shape of the final product are taken into account. However, in certain cases, minor deviations from the required dimensions may occur due to the specific properties of the material used and pouring technology.

Deviations from the required size and form

When pouring the sealing foam, minor deviations from the prescribed dimensions may occur, which are usually within the permissible tolerances for the individual product. The tolerance of deviation can be within the following limits:

- Length/width: ± 1,5mm
- Thickness: ± 1mm
- Width: ± 1,5 mm

Width and height of the sealing foam

Due to the technology of pouring sealing foam, in certain cases it is impossible to ensure both conditions at the same time. It is generally accepted that the height of the foam is ½ the width of the foam (eg 10mm wide, 5mm high). In the event that it is impossible to ensure both dimensions, the pouring thickness is taken into account as the priority.

Visibility of joints

When pouring sealing foam, visible joints may appear due to the start and end of pouring (e.g. in the case of larger products or thicker sealing foam).

These joints appear due to a longer time span between the start and end of pouring or intermediate interruptions in pouring as shown in the image below.

Figure 1: Visibility of the joint due to the start and end of pouring

Possible irregularities when pouring sealing foam

During the process of pouring the sealing foam, various irregularities may appear, conditioned by the product on which the piece is poured.

- **Air Bubbles:** the presence of air bubbles in the material, which may be the result of improper temperature of the poured product.
- **Unevenness of the surface**: Uneven surface finish, which may be the result of an uneven poured product or pouring over individual grooves.

All these irregularities will be assessed within the framework of the technical standards for pouring sealing foam and, if they exceed acceptable limits, will be considered as defects.

If stainless steel or aluminum is used as the base material, the surface must be primed before pouring. Primer P-23 (Henkel) is used.

The coating is done with a brush - manually, so aesthetic errors may occur. Also, after a certain time, the applied primer changes color to a slightly darker color, so Elpro Križnič does not accept complaints due to the aesthetic appearance of the surface coated with primer.

SANDBLASTING

Elpro Križnič performs sandblasting of stainless steel and aluminum materials using the VJC 135S injector sandblasting booth.

The media used for sandblasting is glass beads with a size of 150–250 µm, which are suitable for finer surfaces. They provide a surface roughness of Ra ≈ 1.5–3.5 µm.

Specification	Value
External dimensions (L x W x H)	1470 x 1700 x 2140 mm
Blasting chamber dimensions (L x W x H)	1350 x 1100 x 1070 mm
Door dimensions (left and right) (W x H)	1000 x 1000 mm
Blasting chamber protection	set of rubber linings
Filter	DC-1500
Cyclone	R-400
Filter surface (polyester)	11 m²
Filter cartridge cleaning	impulse
Dust container volume	20 liters

Electrical connection	1.6 kW, 380V~50Hz
Standard load capacity	350 kg
Cabin lighting	2 x 30 watt
Fixed rotary table in cabin	ø 800 mm
Blasting gun	yes
Nozzle diameter	ø 8 mm
Nozzle material	tungsten carbide
Compressed air nozzle	yes
Working pressure of compressed air	3–6 bar
Compressed air consumption at 3–6 bar	1.0 – 2.0 Nm^3/min

Before sandblasting, the pieces must be properly prepared:

1. It is necessary to check whether the material is suitable for sandblasting with the selected beads.

2. It is mandatory to remove all traces of oils, lubricants and silicones.

3. The surface must be completely dry.

4. Critical areas must be protected (masks or protective tapes on areas that should not be sandblasted (e.g. threads, sealing surfaces)).

5. Each piece should have an ID or label (if requested by the client).

Defects that can occur during the proper sandblasting process

Elpro Križnič and the buyer agree that only these are acceptable:

1. **1. Bead residue in micro-pores or corners** (glass beads can get caught in surface micro-holes, slots or threads). During subsequent processing (e.g. anodizing, galvanizing, gluing) they can be released → contamination, uneven coating.

2. **2. Hidden surface contamination:** the surface appears clean and even, but at the microscopic level traces of oils, silicones or previous protections are present. Sandblasting does not completely remove them → poor adhesion of coatings. The cause is not sandblasting, but rather previous surface contamination, which is only "massaged" by sandblasting.

3. **Stainless steel passivation is broken:** sandblasting with inadequately clean media or in an unclean environment (despite the correct technique) can partially break down the natural passive layer of INOX. Increased sensitivity to corrosion, especially in humid or aggressive environments. Re-chemical passivation is recommended after sandblasting.

4. **Deterioration of the properties of edges or sharp elements:** even with proper sandblasting, edges are more processed than flat surfaces. Changed dimensional

accuracy or reduced edge protection when later painted. Particularly important for sealing edges and contact surfaces.

5. **Change in the colour tone of aluminium:** after sandblasting, aluminium alloys in particular may darken slightly or acquire a greyish tint. This is not a process defect, but a natural consequence of the structure after sandblasting. Inadequate appearance with decorative requirements.

6. **Revealing hidden defects in the material:** sandblasting can remove oxides or paint and reveal: Micro cracks, poorly welded surfaces, inclusions… Not a sandblasting defect, but a "discovery" of pre-existing problems → often misunderstood as a sandblasting defect.

7. **Incompatibility with subsequent processes:** blocked threads after sandblasting due to matted surface, inadequate adhesion of mechanical assemblies due to changed texture.

Slovenska Bistrica, 03.01.2025

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