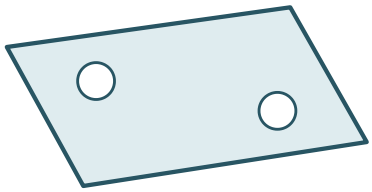
Choose the manufacturing route

Build the design from the stock and operations you intend to buy: a flat profile, a folded constant-thickness sheet, or a cut stock tube. Split an assembly into those parts before detailing the interfaces.

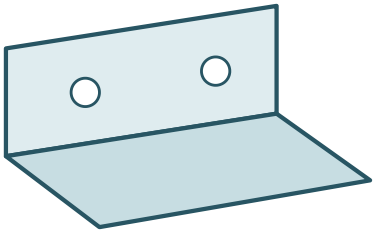
Flat plate



DXF / DWG / STEP

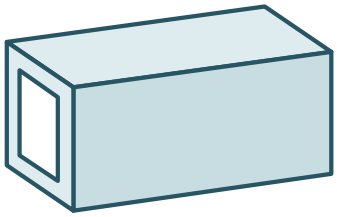
Cut → finish / tap

Folded sheet



Finished 3D STEP → cut + bend

Tube or stock profile



Stock section STEP → tube laser

Order routes [S1] [S2] [S3] [S4] [S7]

Part geometry	Production file	Specify with the order
Flat sheet	STEP, DXF or DWG	Grade, thickness, cut gas, visible face, marking, finish, tapping
Folded sheet	Finished 3D STEP	Grade, thickness, angles, radii, bend clearances and finish
Tube / stock profile	3D STEP	Actual stock section, 2.5D or XY, seam preference, engraving, rivet nuts
Bevelled tube cut	3D drawing + request	3D cutting is offered on request; ordinary upload can convert bevels to 2.5D.

For a camera support, a folded 5754 H111 bracket and a 6060 T66 rectangular tube are useful starting points. Choose the listed alloy and temper explicitly. A bracket designed as a machined 6082 T6 block needs a new sheet/tube construction or a separate machining operation. [S12] [S13]

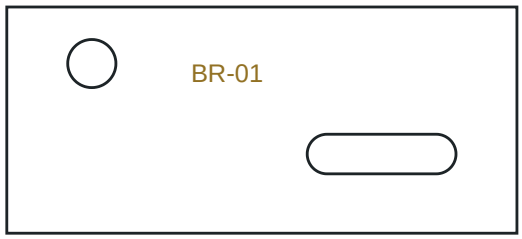
Guide map

Read in order	Pages
CAD and sheet cutting	2–6
Bending and dimensional control	7–13
Tubes, profiles and installed rivet nuts	14–17
Worked bracket, tube and mating parts	18–19
Radius / Z references, materials and submission	20–23

Dimensions are in mm unless stated. Table values are published limits; blue drawings and calculated examples are original design guidance. Source numbers link to the supplier; the sources were checked on 29 October 2026. Exact grade and tooling selection in Sophia determines the applicable combination.

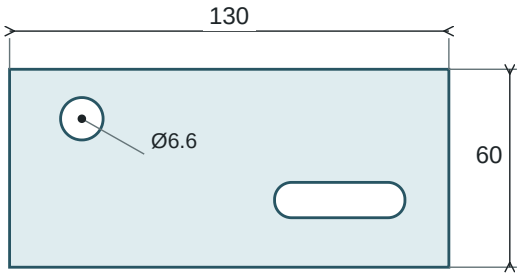
Prepare CAD that describes the intended operations

Production DXF: contours + intentional marking



1:1 · one Z plane · one part · no duplicate lines

Reference drawing: dimensions + notes



Attach separately; do not laser the annotations.

File recognition [S4]

STEP	DXF / DWG
AP203 or AP214; units mm.	1:1; one flat part per file; all entities on one Z plane.
One part or an assembly; assembly instance counts transfer.	Closed outside contour; no duplicate, self-crossing or touching contours.
Uniform sheet thickness or a recognised stock tube/profile.	Remove dimensions, frames and reference notes from the production file.
Model finished bent geometry with finite inside radii.	Use black cut contours; yellow / orange engraving; green circle for an entry point.
Omit modelled countersinks and chamfers from the standard production solid.	Supported DXF: R12–R14, 2000–2013; DWG: R13–R14, 2000–2013.

A drawing note alone does not create a purchased operation. Put the bore, slot and bend in the appropriate production geometry, then assign tapping, engraving or hardware in Sophia. Keep the dimensioned PDF alongside the production model as the interface definition.

A practical file package

- **BR-01_revA.step**: finished folded bracket, one solid, exact sheet thickness.
- **TB-01_revA.step**: tube with the correct nominal stock section and cutouts.
- **Assembly_revA.pdf**: datums, mating dimensions, fasteners and any operations after delivery.

Use one revision across the package. If you export both a flat DXF and a folded STEP, make their intended purchase route explicit so the same part is not counted twice. Inspect the imported body and part quantity before choosing the order operations. [S11]

Size a sheet part and keep slender areas stable

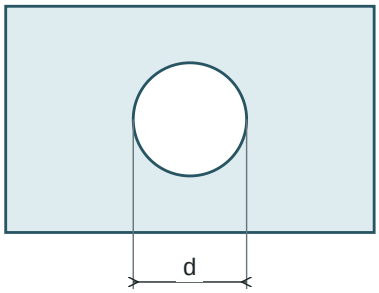
Sheet process range; exact stocked grade still applies [S1] [S5]

Material	Laser-cut thickness
Steel	0.8–25
Stainless steel	0.5–20
Aluminium	1–10

Envelope by listed thickness; brass maximum 1980 ×980 [S1]

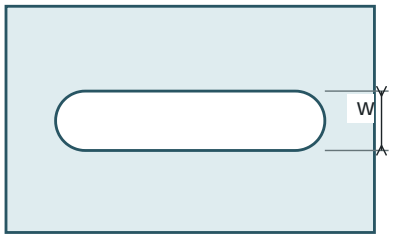
Sheet thickness t	Minimum part	Maximum part
≤5	15 ×15	2980 ×1480
6–10	18 ×18	2980 ×1480
12	18 ×18	2976 ×1476
15	18 ×18	2970 ×1470
20	20 ×20	2960 ×1460
25	25 ×25	2950 ×1450

Hole diameter d



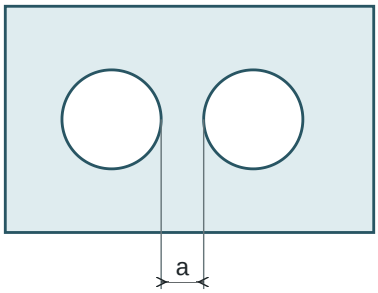
Apply the hole / ligament table.

Slot width w



Apply the slot / lead-in table.

Remaining ligament a



Measure edge to edge.

Narrow strips: supplier ranges as published [S1]

Strip length	Minimum strip width
100–750	15
750–1500	40
≥1500	60

A long rail benefits from a folded return or a tube section. This also leaves a wider flat web for laser entry and handling. For an example 1800 mm rail, start with a web at least 60 mm wide before checking the bends and loads; a 20 mm-wide strip falls below the strip rule.

Keep all intended sheet holes normal to the broad sheet face. An edge-drilled hole through the thickness needs a separate operation. Space dense perforations and long thin fingers so the part remains stable during cutting and finishing. [S1]

Choose hole, ligament and slot dimensions separately

Use **d** for a circular hole, **a** for material left between contours, and **w** for a slot. A small circular hole does not establish the allowed width of a long slot. The drawing on page 3 defines these dimensions.

Minimum hole / ligament; — = no value published for that combination [S1]

t	Steel N_2: d / a	Steel O_2: d / a	Stainless: d / a	Aluminium: d / a
0.5–0.7	—	—	0.5	—
0.8–1	0.5	—	0.5	0.5 at t=1
1.25–1.5	0.8	—	0.8	0.8 at t=1.2–1.5
2	1	—	1	1.5
2.5	1.25	—	1.25	2
3	1.5	1.5	1.5	2.5
4	2	2	2	2.5
5	3.5	2.5	2.5	3.5
6	4	2.4	3	4
8	5.5	5	3.1	5
10	—	6	3.1	7
12	—	6	3.1	—
15	—	6	4	—
20	—	11	5	—
25	—	15	—	—

Slots have their own limits [S1]

Material	Thickness	Minimum slot width / lead-in length
Steel / stainless	≤2	1.5
Steel / stainless	2.5–15	0.7t
Steel / stainless	20 or 25	t
Aluminium	1 / 1.5 / 2 / 2.5 / 3 / 4 / 5 / 6 / 8 / 10	2 / 2 / 2 / 2.5 / 3 / 3 / 3.5 / 4 / 5 / 7

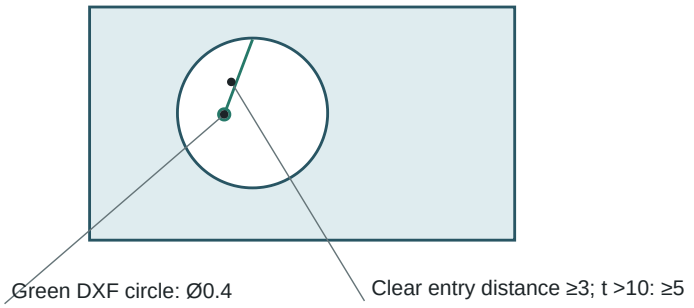
Worked selection: 3 mm aluminium

A Ø4.5 clearance hole exceeds the 2.5 minimum hole size. A 2 mm-wide adjustment slot fails the 3 mm slot limit; choose a slot at least 3 mm wide. A bend-relief slot must also meet this laser limit, even when the bending formula gives a smaller width.

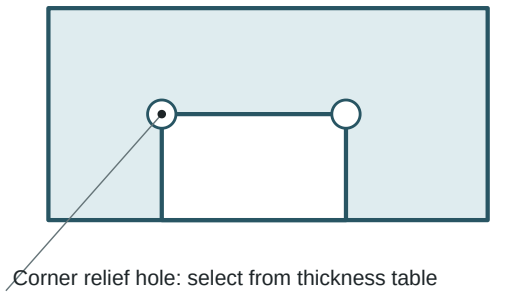
For 6 mm steel, the table gives a 4 mm hole / ligament with nitrogen and 2.4 mm with oxygen. Choose the gas and edge condition together; do not use the oxygen minimum with a nitrogen order. [S1]

Provide laser entry, corner clearance and a usable finish

Entry point belongs in waste material



Clear an inside corner for a mating tab



Detail rules [S1] [S2]

Feature	Published requirement
Straight nominal corner	Automatic radius 0.3 for t≤3; 0.1t for t>3
Corner relief hole: t=0.5–3 /4–6 /8–12 /15–25	Desired diameter 1 /1.5 /2 /4
Entry-point DXF symbol	Green Ø0.4 circle
Entry clearance to contour / end	≥3; ≥5 when t>10; allow perpendicular approach
Engraving	DXF yellow; STEP depth 0.2; line spacing ≥1.5; contour-only
Pierce / centre mark	Sheet: Ø0.2; not available on tube / profile

For text, use the supplier’s single-line laser fonts: TC Laser Sans for STEP; TC Laser Sans or OLF Simple Sans OC for DXF. Keep engraving clear of cut contours. A closed engraving around a hole can be interpreted as a cutout; use the supplier’s 0.1 mm bridge construction. For tube engraving, the published construction also uses two lines 0.1 mm apart. [S1] [S2]

Finishing envelope; the material cutting range also applies [S1]

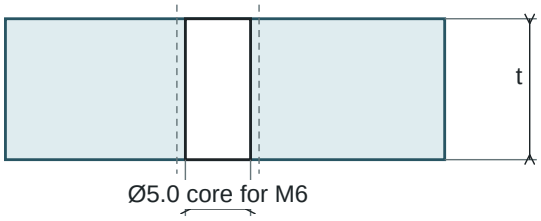
Material / operation	Part minimum	Part maximum	Thickness / mass
Steel edge breaking	250 ×60 or 340 ×30	2980 ×1300	0.5–25; ≤40 kg
Steel edge rounding	10 ×10	2980 ×1350	5–25; ≤40 kg
Stainless / Al edge breaking	50 ×50	2980 ×1250	0.5–25 equipment range; ≤40 kg

Select the visible face and one- or two-sided edge breaking with the order. Foiled, brushed or ground stock is generally limited to the non-foil side. Edge rounding is not offered for stainless or aluminium; brass and chequer plate are excluded from these finishing options. [S1]

For a mating tab, allow the inside corner radius or add a relief. For a painted assembly, select gas and finishing to suit the next operation: oxygen leaves an oxidised edge. If the surface is cosmetic, put that requirement on a defined face rather than assuming both faces remain untouched.

Use purchased tapping where it fits the part

Model the core bore; assign tapping in Sophia



Example: 3 mm aluminium, M6 × 1.0

Core Ø5.0; permitted t = 2–8 mm.

Do not upload a helical thread solid.

M3–M6, t ≥3: small entry chamfer added.

Published tapping range; all thicknesses in mm [S1]

Thread	Core Ø	Pitch	t min	Steel N_2 max	Steel O_2 max	Stainless max	Al max
M3	2.5	0.50	1.0	4	6	5	4
M4	3.3	0.70	1.4	4	6	12	4
M5	4.2	0.80	1.6	5	6	15	6
M6	5	1.00	2.0	6	8	20	8
M8	6.8	1.25	2.4	8	15	20	8
M10	8.5	1.50	3.0	8	15	20	10
M12	10.2	1.75	3.0	8	15	20	10
M14	12	2.00	4.0	8	20	20	10
M16	14	2.00	4.0	8	20	20	10
M18	15.5	2.50	5.0	8	25	20	10
M20	17.5	2.50	5.0	8	25	20	10
M22	19.5	2.50	5.0	8	25	20	10
M24	21	3.00	6.0	8	25	20	10

Flat and bent sheet can be tapped. Part envelope: 1000 ×1000 or 2000 ×500; maximum 40 kg. Draw the core bore, then select the threaded holes in Sophia. For M3–M6 at t≥3, the supplier adds a small entry chamfer. [S1]

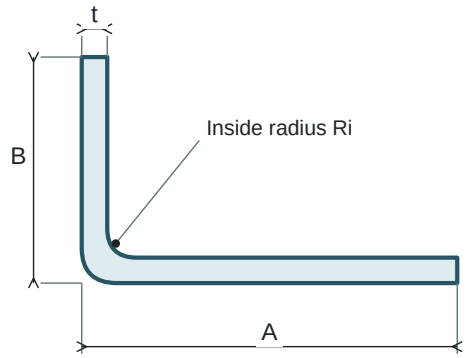
Worked fastening choice

A 3 mm aluminium camera bracket can use M6 ×1.0 with a Ø5 core: the allowed thickness is 2–8 mm. For frequent removal, choose a through-bolt or a suitable insert if the required thread life or tightening torque demands it. The production table establishes process availability, not joint load capacity.

A clearance hole and a tap core are different parts of the design. Use Ø6.6 for the example through-bolt foot on page 18, or Ø5 for an M6 tapped hole. Keep the fastener specification tied to the selected bore so a revision cannot silently change the joint type.

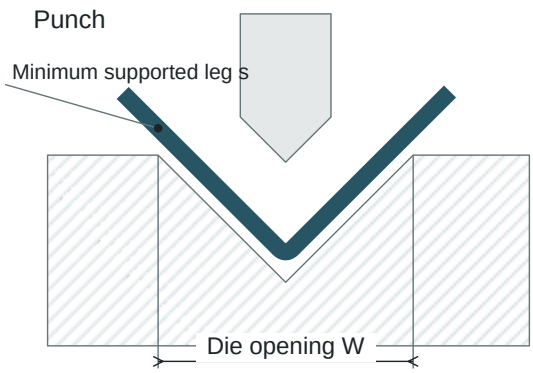
Dimension a bend from the finished part

Finished section: outside flange dimensions



Dimensions A and B refer to virtual outside corners.

The flange must remain supported by the die



Define sheet thickness **t**, included angle **α**, inside radius **Ri** and finished outside flange dimensions. The minimum leg **s** is the material support needed on the die, not a decorative minimum radius. Sophia adjusts the modelled radius to its material/tool combination. [S3]

The same thickness can require different tooling [S3]

3 mm material, 90° web reference	Inside Ri	Minimum leg s	Die W
Steel, general table	2.75	12.4	16
Stainless, general table	3.75	15.12	20
Aluminium, general table	2.50	12.4	16
S355 / CorTen A	Use exact grade/tool data	16.8	24

Select the exact material row before finalising interfaces

The downloadable material workbook contains more specific tool combinations than the web summary. For 3 mm 5754 H111, a row labelled **>90°** lists Ri=2.50, minimum 3D leg=12.13 and minimum Z=19.53. Its **<90°** row lists Ri=3.78, leg=21.905 and Z=34.205. The workbook has no explicit =90° category; page 18 uses the web's 90° reference. [S6]

Do not combine a radius from one tool row with a flange minimum from another. Use the exact material, angle class, punch and die together. For a final blank, use the supplier's unfolding/tool data rather than assuming one universal K-factor. The illustrative flat layouts in this guide do not define a cut-ready bend allowance.

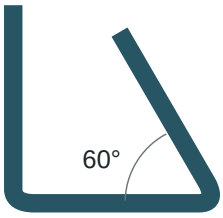
Leave enough flange for the selected die

One 90° bend only



3 mm aluminium: s ≥12.4; die W =16

Acute bend: use sharp tables throughout



3 mm aluminium: s ≥21.3; die W =24

Minimum leg s; published reference values [S3]

t	Steel / Al 90°	SS 90°	S355 / CorTen 90°	Steel / Al sharp	SS sharp	S355 / CorTen sharp
0.8	5.70	5.70	—	9.80	9.90	—
1	5.90	5.90	—	10.00	10.10	—
1.25	6.10	6.10	—	10.15	10.20	—
1.5	7.50	7.60	8.70	10.30	10.40	11.90
2	9.10	9.20	11.50	12.40	12.45	12.30
2.5	12.00	12.10	—	15.25	15.35	—
3	12.40	15.12	16.80	21.30	21.50	21.15
4	17.70	17.90	21.70	22.00	22.20	21.90
5	22.60	29.20	28.70	22.60	29.20	28.70
6	29.60	41.80	29.35	29.55	41.80	29.35
8	43	43.10	53.20	42.35	—	42.40
10	—	—	—	—	—	—
12	—	—	—	—	—	—

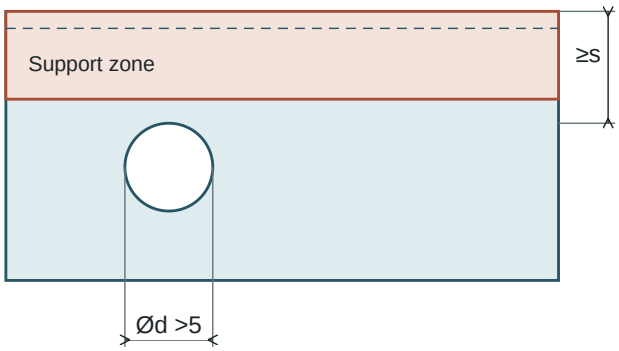
If any bend in the part is acute, the supplier says to apply the sharp tables to every bend in that part. For 3 mm aluminium, changing one bend from 90° to 60° raises the reference minimum leg from 12.4 to 21.3. A neighbouring 15 mm return that worked in the original part is then too short. [S3]

Choose finished flanges comfortably above these minima when the packaging allows it. A 40 mm flange is a more useful starting point for the worked bracket than designing to 12.4 exactly: it leaves space for holes, driver access and a stable contact edge. Use exact grade/tool values for the final model.

For 10–12 mm sheet the available full bend length is reduced. A dash means no value in that reference, not permission to bend the geometry; the material availability and force limits remain separate checks. [S3]

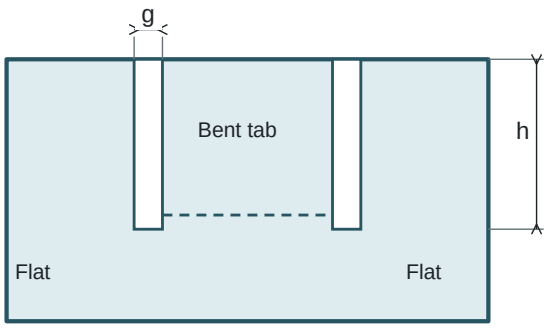
Protect holes and free edges near the bend

Keep the nearest hole edge out of the support zone



Datum: virtual outside bend corner, not the hole centre.

Relieve a bent tab next to a flat edge



g ≥t/2 AND the laser slot minimum

h ≥t + Ri + 0.5

3 mm Al: choose g =3, h =6 with Ri =2.5

For holes larger than 5 mm, keep the nearest hole edge outside the relevant minimum-leg support zone. The dimension is to the edge, not to the hole centre. The supplier text says >5 mm while the drawing labels ≥5 mm; conservatively apply the same setback at Ø5. [S3]

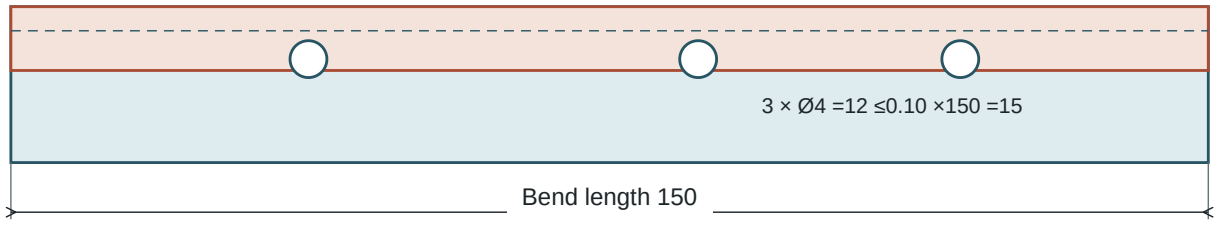
```
Hole-centre setback ≥ s + d/2
```

Example: 3 mm aluminium, 90° reference s=12.4, hole Ø6.6. Set the centre at least 15.7 from the virtual outside bend corner. Choosing 30 gives a nearest edge at 26.7, well clear of the support zone.

Two different relief cases [S3] [S8]

Situation	Size the feature
Bent tab next to a flat edge	Relief width g ≥t/2; depth h ≥t+Ri+0.5
Laser feasibility of the same relief	Also meet the slot-width table on page 4
3 mm Al example with Ri=2.5	Formula gives g≥1.5, h≥6; select g=3 and h=6
Bend-line interruption to protect a nearby hole	Published width 0.8t; length = hole’s relevant length A; corner R≤1

Small holes in the bend support zone



Within the support zone, the sum of hole diameters and/or slot lengths may not exceed 10% of the bend length. In the 150 mm example, three Ø4 holes contribute 12, below 15. Include other interruptions and the bend-end shape. Relocating the hole is often preferable to weakening the bend with another cut. [S3]

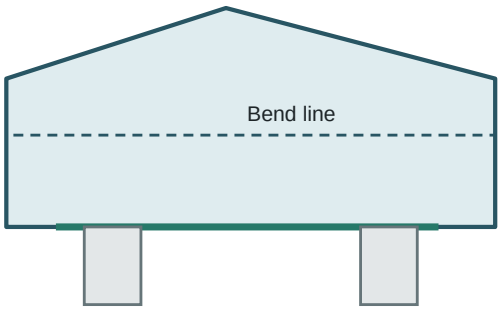
Check the bend sequence, Z offset and backgauge

Z offset: X is the total outside height



3 mm: steel / Al X ≥20.10; stainless X ≥24.75

Provide a straight backgauge contact



Straight contact ≥20, parallel to bend line

A flange can meet the minimum leg and still collide with the punch, lower tool or machine during a later bend. Check the intermediate shapes, especially U sections, return flanges and boxes. The supplier's U-profile checker and J-10 / D-10 / R-10 drawings are linked on page 23. [S3] [S6]

Access and contact dimensions [S3] [S10]

Geometry	Published constraint
Z bend	Outside height X meets the material / tool minimum; references on page 20
U shapes	D-10 normally up to 6 steel/Al and 5 stainless; R-10 for the stated heavier groups
Box-shaped part	Maximum height 230
Return flange in the illustrated horn-tool geometry	Maximum 32; this is not a universal limit for every flange
Straight backgauge edge	At least 20 long, parallel to the bend
Added backgauge tabs	Each ≥5 wide; spacing ≤40 for one gauge or ≥200 for two
Adjacent bent corners	Gap ≥0.5 at t≤3; ≥1 at t=4–6; ≥1.5 at t=7–8

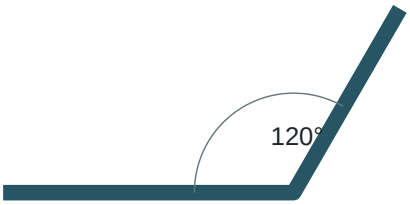
Make the contact repeatable

A tapered edge can slide or turn against a backgauge. Add a straight pad or two useful tabs, and place them where the part is stable through the bend sequence. Do not rely on a knife point as the datum. Avoid a 100 mm tab spacing that falls between the published one-gauge and two-gauge arrangements.

The bending page separately lists a 1150 mm backgauge reach and an illustrated X maximum of 1390 at a 90° bend. Those are different dimensions, so do not substitute one for the other when checking an unusually deep part. [S3]

Use permitted angles and closed hems

Angle α is the included angle



Flat =180° · right angle =90° · acute <90°

Closed hem: return length and stack height



Design the fold as a closed hem.

Fold position ±1; holes may not align after folding.

Angle envelope; stocked grade and bend length also apply [S3]

Material group	Thickness	Allowed included angle
Steel / Al, excluding chequer plate	≤4 /5–10	37–175° /67–175°
Steel	12	85–175°
Stainless	≤4 /5–8 /10	37–175° /67–175° /85–175°
S355 / CorTen A	≤3 /4–8 /10–12	37–175° /67–175° /85–175°

For the protruding-leg geometry shown by the supplier, a leg longer than 58 restricts the acute angle to at least 70° to clear the lower machine beam. Repeated-Z roof / corrugated forms require angles of at least 122° and mass ≤45 kg. These access constraints can be tighter than the basic angle table. [S3]

Closed hems: published return length H [S3]

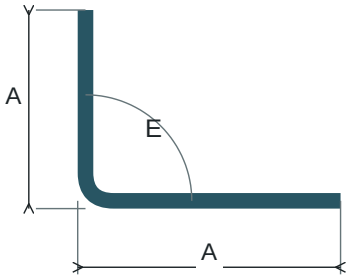
t	Steel / zinc-coated / Al: H min	Stainless: H min	Minimum radius
1	17	18	0.2
1.25	15.5	16	0.25
1.5	14.8	15	0.3
2	14	—	0.4

Hemming is closed only. Adjacent-bend distances L1≥6 and L2≥13 refer to the supplier’s hem geometry; use its drawing when positioning a nearby perpendicular bend. The final stack is 2t–2.5t. The fold-position tolerance is ±1, so two holes should not be assumed to line up after the fold. [S3]

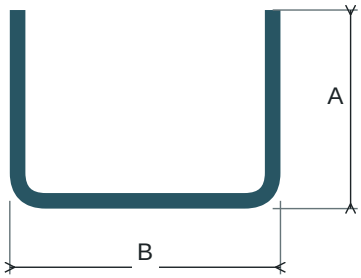
For a large or conical radius, model multiple discrete bends with spacing at least the minimum leg. Keep the lines distinct near the cone tip and provide gauge tabs. This produces a faceted radius; a continuously rolled surface is a different manufacturing choice. [S3]

Budget dimensional error through the assembly

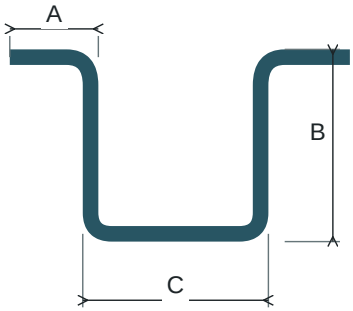
L: flange A; angle E



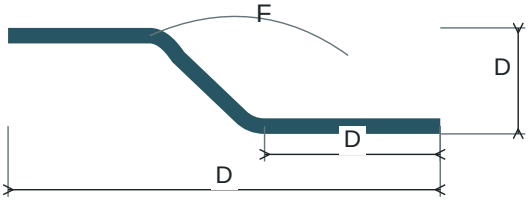
U: heights A; span B



Hat: return A; height B; web C



Z: offset dimensions D; parallelism F



F =15 arcmin /100 mm

Use the tolerance for the matching section and dimension chain.

Bend references in mm; letters follow the section geometry above [S3]

t	A ±	B ±	C ±	D ±	E ±	F
≤3	0.2	0.4	0.8	0.5	0.5°	15′ /100
4	0.3	0.6	1.2	0.6	0.5°	15′ /100
5–6	0.4	0.8	1.6	0.8	0.5°	15′ /100
8	0.5	1	2	1	0.5°	15′ /100
10	0.8	1.6	3.2	1.6	0.5°	15′ /100

For a Z section the published D applies to its illustrated offset dimensions; F is the angular parallelism reference. Chequer plate has a stated angle tolerance of ±1.5°. Heavy-part angles can have an additional deviation of 1.5° under the supplier’s heavy-part guidance. [S3] [S9]

Angular error becomes position error at the camera

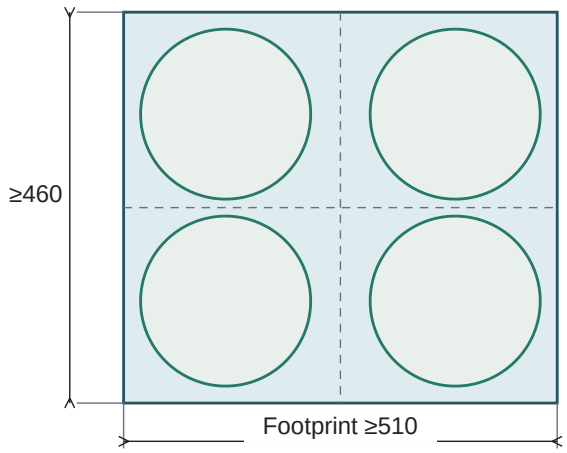
```
At a 100 mm lever arm: 100 × tan(0.5°) ≈0.87 mm
```

This is the displacement from angular error alone. Add hole position, sheet thickness, stock-section variation and interface clearance when they affect the same coordinate. For an adjustable sensor mount, use a rigid datum face and a separate means of angular adjustment rather than expecting a press-brake angle to establish the optical axis.

Place a critical hole pattern in one flat face when possible. Use one locating hole plus an adjustment slot for a non-critical second direction, or use a machined locator where the assembly needs a tighter fit. The slot must still meet the laser minimum and leave the required ligament. These are design choices, not extra supplier tolerances.

Respect bend force and heavy-part handling limits

Four solid suction patches for a 45–75 kg part



Each cup: Ø200

One cup per quadrant.

No holes under the sealing ring.

U body / flange ≥270

L flange ≥260

Heavy-part size classes, updated supplier guidance [S9]

45–75 kg part size	Maximum flange height
510 ×460 to 780 ×550	70
780 ×550 to 1630 ×780	150
From 1630 ×780	230

Reserve four solid Ø200 suction patches, one per quadrant. A U body / flange must be at least 270 wide; an L flange at least 260. Above 40 kg, edge finishing and tapping are unavailable. Closed U profiles and corrugated forms are excluded above 45 kg. [S9]

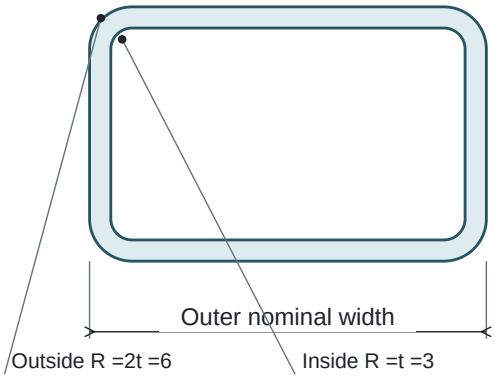
Force-limited bend lengths; availability is a separate condition [S3]

Material	Max bend length at t=8	At t=10	At t=12
S235	2459	2340	2048
S355 / CorTen A	2784	2380 (S355)	1650 (S355)
S420	2637	2254	1564
S700	1794	—	—
Stainless 304	2477	2115	Outside stated 10 mm general range
Stainless 316	2471	2107	—
Aluminium	2980	2980	Outside stated 10 mm general range

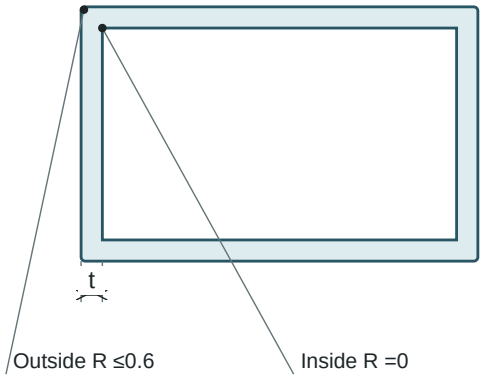
For material below 8 mm the machine-force table gives 3350, while the normal blank envelope is at most 2980 ×1480. Use the intersection of material availability, blank size, bend-line length, tool access and handling limits. A 3300 mm straight part is not made available by the force table alone. [S3]

Model the stock tube section accurately

Steel / stainless RHS, t =3



Aluminium RHS, t =3



General tube process limits [S2]

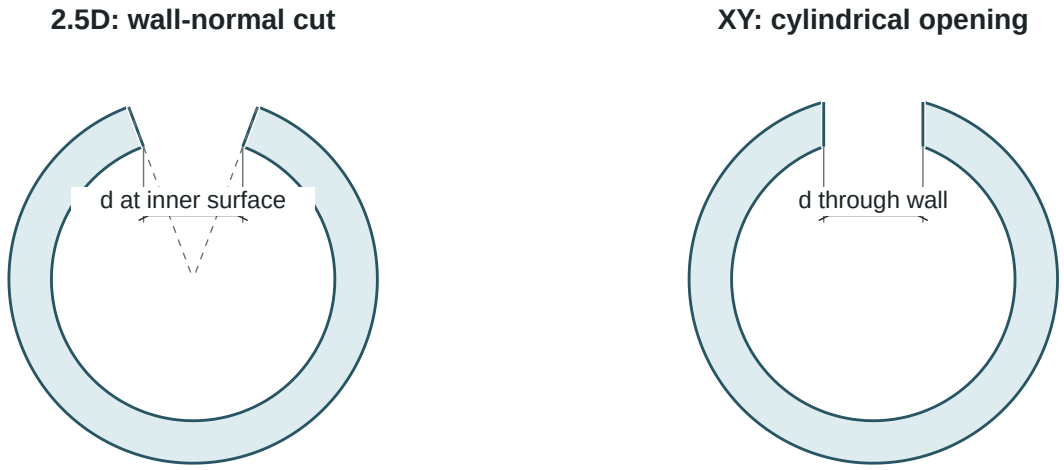
Parameter	Tube-laser envelope
Round outside diameter	Ø12–254
Square / rectangular stock	12 ×12 to 200 ×200
Wall thickness	Steel ≤12; stainless / Al ≤6
Length	10–5800; up to 7800 on request
Linear mass	≤40 kg/m
Minimum cut feature / hole	0.7 × wall thickness

For steel and stainless RHS, draw outside R=2t and inside R=t. For aluminium RHS, draw outside R≤0.6 and square inside corners. These are the supplier’s model conventions; they are not an assertion that every delivered corner is exact. Select the actual stock section from the catalogue. [S2] [S5]

Aluminium 60 ×40 ×3 is listed as EN AW-6060 T66. Do not substitute a 6082 model and assume the same stock, corner form or material properties. Use tube dimensions and wall thickness as nominal stock dimensions when fitting an insert. [S13]

For stock structural profiles, use EN 10056-1 for L, EN 10365 for H / I / U, and EN 10055 for T. Avoid overlapping cut contours and inaccessible cuts inside the rolled corner radius. This stock-profile route is separate from cutting a full-length open U shape from an RHS. [S2]

Select 2.5D, XY or requested 3D tube cutting



Opening flares toward the outer surface.

The cut sides remain parallel in this section.

Round-tube section through the hole axis; geometry exaggerated for clarity.

Current process choices [S2] [S7]

Technique	Cut geometry	Use it for
2.5D; default	Cut normal to the local tube wall; round-tube holes flare outward	Ordinary profiles and joints drawn for wall-normal cuts
XY; select in Sophia	Straight cylindrical holes in curved tube walls	Round-tube openings requiring a cylindrical passage
3D; on request	Tilting head; explicit bevels up to 45°	Specified bevelled joints or requested countersunk tube cuts

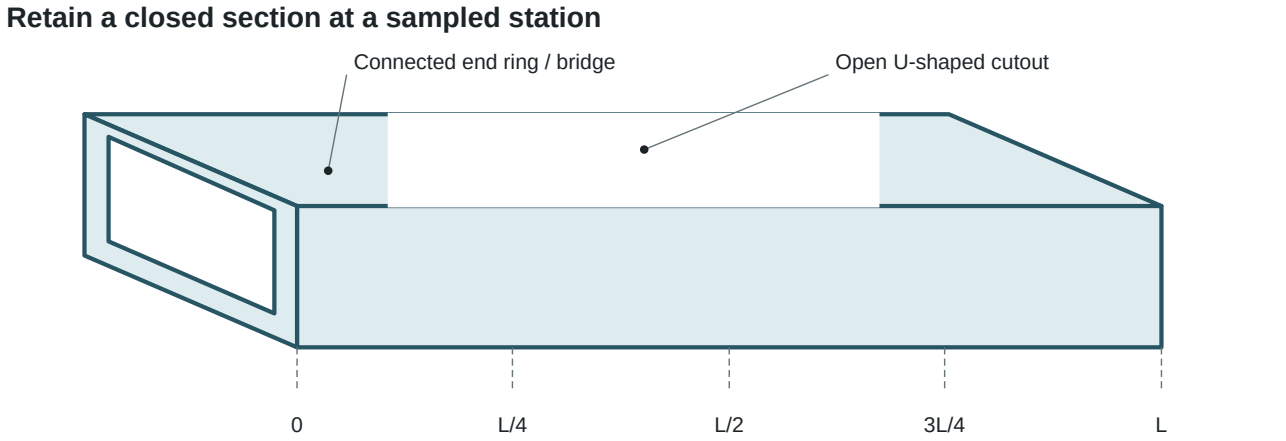
With 2.5D, the hole size on the inner surface matches the drawn diameter; the outside opening is larger and elliptical. It is unsuitable as a tap bore. A cylindrical round-tube hole is limited to approximately half the tube outside diameter, whichever cutting technique is used. [S2]

Worked selection: Ø50 tube with a transverse sleeve

For a perpendicular Ø20 sleeve passage, the size is below the approximate Ø25 cylindrical-hole cap. Select XY for a cylindrical opening, then allow the assembly clearance and stock tolerances. Selecting XY does not itself establish a close sliding fit or add a thread.

For a 45° mitred frame joint, 2.5D and XY produce the same type of cut face and can leave a groove at the outside of the joint. If the design needs an explicit bevel or full-face mating, request 3D cutting with the joint geometry specified. Ordinary Sophia conversion can turn a modelled 3D bevel into a wall-normal cut. [S2] [S7]

Keep tube cutouts recognisable and the joint accessible



For a tube model, at least one of the five sampled sections—0, L/4, L/2, 3L/4 or L—must retain a closed perimeter. A full-length shell cut open into a U shape can fail recognition. A connected sacrificial ring or bridge can preserve a closed sampled section; include its later removal in the part design. [S2]

Tube detail decisions [S2]

Detail	Design action
Feature close to a wall / radius boundary	Keep the published ≥0.1 separation; avoid coincident cut geometry
Steel tube seam	Choose its preferred face in Sophia; for RHS supply a short-face and long-face preference
Insert or telescoping member	Leave room for stock variation, inside corner form and weld bead
Internal laser spatter	Allow cleanup access where it affects a sliding fit or cable path
Tube engraving	0.2 deep, line spacing ≥1.5; no filled pockets or engraving touching cuts
Mark / pierce	Not available on tube, RHS or profile

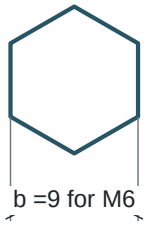
Design a welded frame as an assembly

Show how both cut faces meet after the chosen cutting conversion. Put locating tabs where a laser can reach them and keep a useful weld path around the joint. The 0.1 geometry separation rule is not a universal weld gap or a guaranteed assembly clearance.

The tube page refers to ISO 9013 and to stock shape/dimensional standards such as EN 10219; it does not publish one universal ± value for every tube. Stock eccentricity, flex and cut heat affect centring. A precision pin through opposite walls may require a later machining setup referenced to the finished assembly. [S2]

Provide room for installed rivet nuts in RHS

ER hexagonal opening: b across flats



Match the selected ER / FTTE bore form.

Internal space depends on nut placement



One face	Opposed	Adjacent
H ≥24	H ≥31	Both ≥41

M6 example; H is the outside section size.

Published nut and installation dimensions; adjacent-face case is centred on each face [S2]

Thread	Supported listed walls	ER b	FTTE b / k	One face H	Opposed H	Adjacent H
M4	0.5 /1 /1.5 /2	6	6 /1	19	21	28
M5	0.5 /1 /1.5 /2 /2.5 /3	7	7 /1	22	27	35
M6	0.5 /1 /1.5 /2 /2.5 /3	9	9 /1.5	24	31	41
M8	0.5 /1 /1.5 /2 /2.5 /3	11	11 /1.5	26	35	47

Installed rivet nuts are offered in square / rectangular sections up to 150 ×150. ER is zinc-plated steel; FTTE is zinc-plated steel or stainless. Only one nut type is allowed per order. The head/flange must remain clear of the corner radius. [S2]

For ER, the drawing above defines the hex opening b across flats. For FTTE, use the supplier’s matching bore and head drawing; b and k in the table retain that drawing’s symbols. Do not use the ER hex detail as an interchangeable model of every FTTE option. [S2]

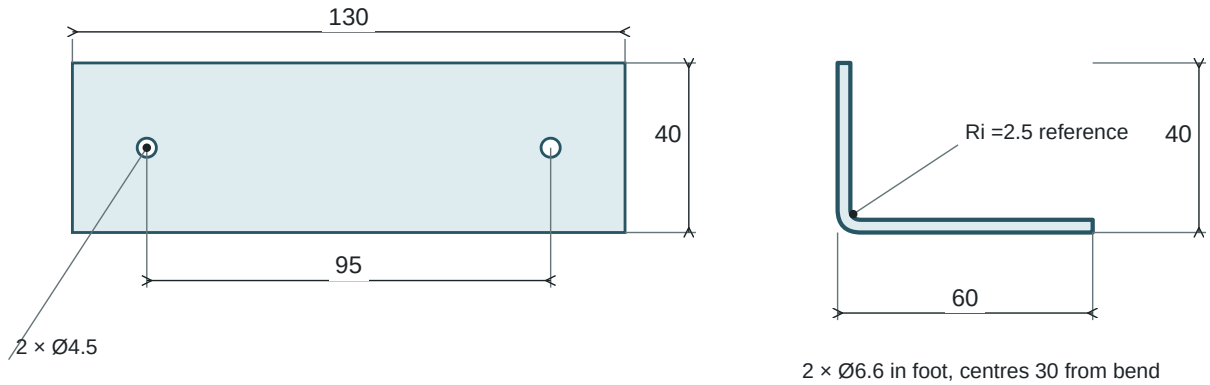
The published flange-location distance L is at least 2t, measured from the outside sidewall to the nut-flange edge in the supplier drawing. On a 3 mm wall that gives L≥6. Also leave the flange entirely on the flat face; the hole-centre setback must include the flange radius. [S2]

60 ×40 ×3 RHS with M6

Across the 40 mm dimension, one-face installation clears H≥24 and opposed installation clears H≥31. The centred adjacent-face case requires both section dimensions ≥41, so the 40 mm side fails that case. Keep the nuts on one or opposite faces, or change to an adequately sized stock section.

Worked design: folded camera mounting bracket

Worked design: 130-wide camera bracket, 3 mm Al



Front face: centres 20 from outside bend corner.

2 × Ø6.6 in foot, centres 30 from bend

Width stations: 25 and 105 from left edge

Finished outside dimensions; illustrative camera hole pattern.

Proposed example geometry; camera pattern is illustrative

Definition	Example value
Material / thickness	AlMg3 EN AW-5754 H111, t=3
Finished shape	Width 130; vertical flange 40; foot 60; included angle 90°
Inside radius	Ri=2.5 web reference; final radius follows selected tooling
Camera face	2 ×Ø4.5; width pitch 95; height 20 from outside bend corner
Foot	2 ×Ø6.6; width stations 25 /105; centres 30 from bend
Order route	Finished STEP; cut + bend; edge breaking if envelope / sequence allows

Apply the limits to the dimensions

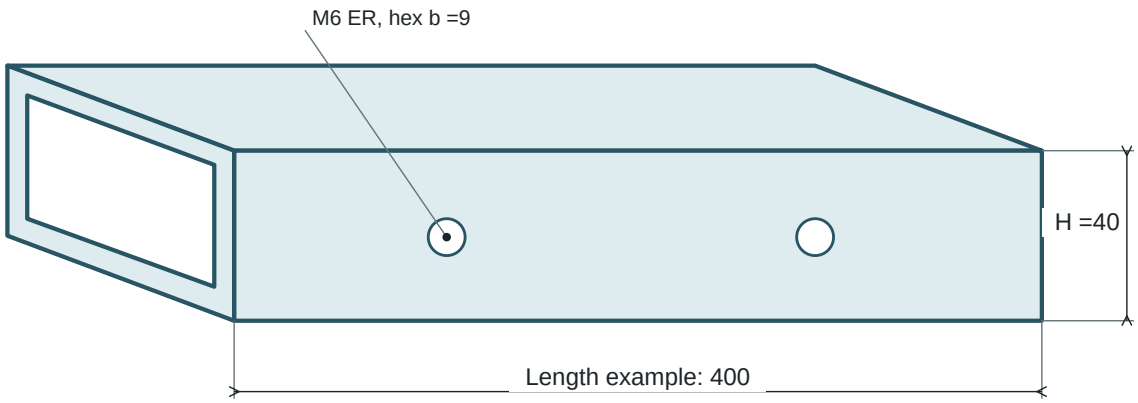
The 40 and 60 flanges exceed the 12.4 reference minimum for 3 mm aluminium at 90°. The Ø6.6 foot holes have a nearest edge 30−3.3=26.7 from the bend, above 12.4. The smaller Ø4.5 face holes are also placed well outside the support zone. Both hole sizes exceed the 2.5 laser hole minimum. [S1] [S3]

The hole at width station 17.5 leaves 15.25 to the side edge after subtracting its radius. No narrow adjustment slots are needed in this version. If a later design adds slots, keep their width at least 3. A tab-to-flat-edge relief would use at least width 3 and depth 6 for the chosen reference radius.

Export the folded solid and inspect Sophia’s resulting radius and finished dimensions. Let the selected tooling establish the blank. Choose a visible face and keep any part identifier away from the holes and edges. This example demonstrates manufacturing fit; mounting stiffness, camera load and the actual camera hole pattern remain part-specific design inputs.

Worked design: tube support and mating clearances

RHS 60 × 40 × 3, aluminium EN AW-6060 T66



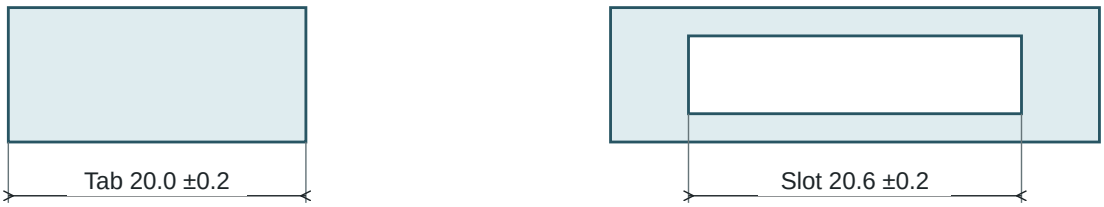
Place the thread on a flat face; keep its flange clear of the corner radius.

Stock and options for the example support [S2] [S13]

Tube definition	Example
Stock	Aluminium EN AW-6060 T66, RHS 60 ×40 ×3
Length	400
Corner model	Outside R≤0.6; inside R=0
Cutting / thread choice	2.5D on flat face; M6 ER installed nut, b=9
Nut position	One face; keep flange on the flat area; L≥6

For a support with a separate locating tab, dimension the tab and slot from one datum. Allow both parts to vary; a nominal 20 mm tab in a nominal 20 mm slot has no guaranteed clearance.

Laser tab and slot: calculate both extremes



Minimum gap =20.4 −20.2 =0.2

Maximum gap =20.8 −19.8 =1.0

For dimensions in this range on 3 mm cut sheet, the cutting table gives ±0.2. The example therefore has at least 0.2 total gap and at most 1.0. The nominal 0.6 gap is not the worst case. [S1]

This calculation applies to two laser-cut contour widths. A slot accepting the **sheet thickness** needs the actual stock thickness tolerance instead; it is not justified by the contour table. Likewise an insert fitting inside RHS needs the stock-section limits and corner form. Locate one function precisely and give the other interface room to assemble.

Radius and Z-offset reference tables

Inside radii; web references, not stock availability [S3]

t	Ri steel 90°	Ri SS 90°	Ri Al 90°	Ri steel sharp	Ri SS sharp	Ri Al sharp
0.8	1.39	1.56	-	1.41	1.72	-
1	1.40	1.58	1.27	1.35	1.62	1.28
1.25	1.42	1.57	-	1.27	1.52	-
1.5	1.65	1.90	1.47	1.19	1.42	1.12
2	1.88	2.22	1.67	1.30	1.59	1.22
2.5	2.41	2.94	2.11	1.73	2.17	1.61
3	2.75	3.75	2.50	2.51	3.73	2.86
4	3.02	4.48	3.30	2.24	3.28	2.48
5	3.62	7.82	4.07	2.45	5.44	2.70
6	4.62	11.91	5.34	3.08	8.78	3.53
8	8.00	11.64	8.12	4.74	-	4.33
10	—	—	—	—	—	—
12	—	—	—	—	—	—

Minimum outside Z height X; S355 column also covers CorTen A [S3]

t	X steel / Al 90°	X SS 90°	X S355 90°	X steel / Al sharp	X SS sharp	X S355 sharp
0.8	8.15	8.35	—	18.25	18.60	—
1	8.50	8.70	—	18.60	19.00	—
1.25	8.95	9.15	—	19.00	19.40	—
1.5	10.65	10.95	12.30	19.40	19.80	18.95
2	13.80	14.20	13.40	20.65	21.15	20.15
2.5	18.80	19.45	—	25.80	26.55	—
3	20.10	24.75	23.45	34.95	36.05	33.75
4	26.15	27.40	31.80	36.50	37.60	35.45
5	34.65	44.10	40.40	40.40	44.10	40.35
6	42.90	63.20	41.15	42.90	63.20	41.15
8	63	66.30	70.40	62.20	—	60
10	—	—	—	—	—	—
12	—	—	—	—	—	—

Use the X definition on page 10. If the part includes an acute bend, use the sharp class throughout. The downloaded exact-material workbook can give different values from these broad reference tables; do not mix tool rows. Values beyond a grade’s listed bendable thickness do not establish availability. [S3] [S6]

Sheet cutting tolerances and listed bendable stock

Symmetric cutting tolerance ±mm by nominal dimension L; first thickness row excludes t=0.5 [S1]

t	0<L<3	3–<10	10–<35	35–<125	125–<315	315–<1000	1000–<2000	≥2000
> 0.5 ≤ 1	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.65
> 1 ≤ 3	0.2	0.2	0.2	0.25	0.25	0.35	0.4	0.65
> 3 ≤ 6	0.2	0.2	0.25	0.25	0.3	0.4	0.45	0.7
> 6 ≤ 10	-	0.25	0.3	0.3	0.35	0.45	0.55	0.75
> 10 ≤ 15	-	0.3	0.35	0.35	0.45	0.55	0.65	0.85
> 15 ≤ 20	-	0.4	0.4	0.4	0.55	0.75	0.85	1.2
> 20 ≤ 25	-	0.45	0.45	0.5	0.7	0.9	1.1	1.6

Grade-specific list on the bending page; regional availability in Sophia [S3] [S5]

Listed bendable stock	Thickness range
DC01 / Zincor St12	0.8–3
S235JR pickled/oiled / mill-blue	3–8 /2
S355MC pickled/oiled or mill-blue	3–8
S420MC pickled/oiled	3–6
CorTen A cold-rolled / hot-rolled	1.5–2 /3–5
Sendzimir DX51+Z275 / Magnelis S250	0.75–4 /1–4
5754 H111 / with one-sided foil	1–8 /1–3
Brass CuZn37 HH	1–3
304L 2B / 304L 2B one-sided foil	0.8–6 /1–3
304L K240Si foil / K320Si foil	2 /1–4
316L 2B / K320Si foil	1–5 /1–3
430 K240 foil / BA	1 /1
1.4003 cold 2B / hot 1D	1.5–2 /3–4

The bending page’s general maximum is steel 12, stainless 10 and aluminium 10, but its named material list is narrower. For example, the 5754 catalogue includes 10 mm sheet while the bendable-stock list stops at 8. Treat such a combination as unresolved until the exact material / bend is available in Sophia; the broad maximum alone is insufficient. [S3] [S12]

The page separately assigns some thicker materials to stronger-tool groups: 304L 2B at 5–6, 316Ti 1D at 6, S235JR at 8, S355MC at 6 and 5754 H111 at 8. Select the workbook/tooling for the actual grade instead of extending a thin-sheet table. [S3]

Turn the model into a defined Sophia order

Submission sequence [S4] [S11] [S2]

Step	What to establish in the order view
1. Import	Correct units, revision, number of bodies and quantities. Use the folded STEP for a bent part.
2. Assign stock	Exact grade / temper / finish, thickness or stock section, and material availability.
3. Inspect operations	All intended holes are cuts; markings are engravings; bends and their finished shape are recognised.
4. Choose options	Cut gas, visible / foil side, grain direction where applicable, edge finish, tapping or installed rivet nuts.
5. For tubes	Select 2.5D or XY; specify seam preferences again on repeat orders. Request 3D separately if required.
6. Resolve the geometry	Use the displayed tool/radius and any feasibility feedback to revise the part and recheck mating dimensions.
7. Keep the released package	Store the purchased model revision, order options and assembly / secondary-operation drawing together.

Exact-material tooling data

The bending workbook contains radius, die, punch, minimum 3D leg, spacing between bends, minimum Z and maximum bend length for material rows. Filter by material code, thickness and angle class, and keep the selected row together. Its <90 / >90 labels do not explicitly document the exact-90 boundary. [S6]

The U-profile checker tests the specific material / shape against tooling. Use the downloadable punch geometry for a deep U or a return that approaches the tool. These are more informative than a single generic “minimum bend radius” rule. [S6]

Files stored with this note

Local reference copy	Use
reference/bending-specifications-per-material.xlsx	Exact material / tool rows downloaded 29 October 2026
reference/u-profiel-checker.xlsx	Supplier U-profile checker, unchanged
drawings: *.svg and *.png	Editable vector originals and Obsidian previews
pdf-source/guide.html + fonts	Reproducible layout source for this PDF

The worked examples apply the published constraints to proposed geometry. Carry their dimensioning approach into the actual part, then retain the resulting material and operation selections with its revision.

Source links and supplier tools

All links below are primary 247TailorSteel sources. Numerical references were checked on 29 October 2026. The supplier’s current material selection and order-specific tool combination govern later revisions.

S1 · Sheet laser cutting
https://247tailorsteel.com/nl/aanleverspecificaties/richtlijnen-voor-lasersnijden-van-plaatmetaal

S2 · Tube and profile laser cutting
https://247tailorsteel.com/nl/aanleverspecificaties/richtlijnen-voor-buislasersnijden

S3 · Press-brake bending
https://247tailorsteel.com/nl/aanleverspecificaties/richtlijnen-voor-kanten

S4 · CAD file delivery
https://247tailorsteel.com/nl/aanleverspecificaties

S5 · Material catalogue
https://247tailorsteel.com/nl/materiaaloverzicht

S6 · Bending data and tooling downloads
https://247tailorsteel.com/nl/aanleverspecificaties/downloads

S7 · 2.5D, XY and 3D tube processes
https://247tailorsteel.com/nl/over-ons/kenniscentrum/blog/technieken-buislasersnijden

S8 · Bend reliefs
https://247tailorsteel.com/nl/over-ons/kenniscentrum/blog/bend-reliefs

S9 · Bending heavy parts, updated 9 October 2026
https://247tailorsteel.com/nl/over-ons/kenniscentrum/blog/zware-onderdelen-kanten

S10 · Positioning against the backgauge
https://247tailorsteel.com/nl/over-ons/kenniscentrum/blog/aanslag-bij-kanten

S11 · Sophia manual (PDF)
https://247tailorsteel.com/hubfs/Documents%20and%20files/Manuals/NL/Sophia_Manual_NL.pdf

S12 · 5754 H111 sheet stock
https://247tailorsteel.com/nl/materiaaloverzicht/almg3-en-aw-5754-h111

S13 · 6060 T66 rectangular tube stock
https://247tailorsteel.com/nl/materiaaloverzicht/rechthoekige-buis-aluminium-en-aw-6060-t66

Direct spreadsheet downloads

Bending specifications per material

U-profile checker

The technical illustrations are original schematics made for this guide. They define the labelled dimensions and examples; use the dimensions rather than scaling the page. The Markdown version contains the same content and embeds PNG previews of the vector drawings.