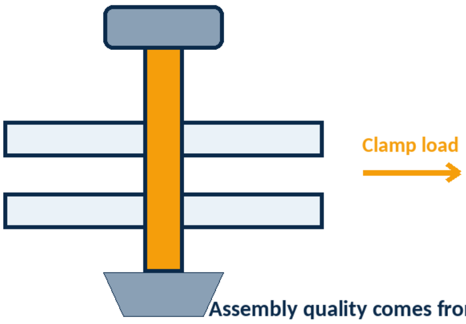
KINGSFORM METALWORKS

ENGINEERING TOOLKIT

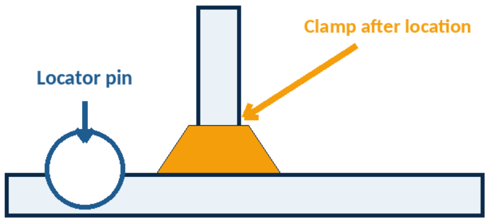
ASSEMBLY DESIGN GUIDE

Location, fits, fasteners, torque, access, sequence, serviceability and verification

BOLTED JOINT



LOCATE, THEN CLAMP



Assembly quality comes from controlled location, clamp load and access.

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Engineering reference only. The released drawing, governing specification, validated fastening data and customer requirements remain controlling.

Scope and how to use this guide

A practical DFM reference for metal frames, brackets, enclosures, equipment and modular fabricated assemblies.

Use this guide before interfaces, datums, joining methods, tightening requirements, access and verification criteria are frozen.

This guide connects product function with the realities of assembly. It focuses on location, degrees of freedom, tolerance accumulation, fastener systems, thin-sheet hardware, access, sequence, serviceability and inspection. It does not replace structural calculation, a bolted-joint design standard, supplier installation data or customer-specific requirements.

Recommended use

1. Identify service loads, vibration, sealing, corrosion, appearance, safety and maintenance requirements.
2. Define the assembly architecture and functional interfaces before choosing hardware.
3. Establish datums and a locating strategy; then determine fits, slots and adjustment features.
4. Select a joining system together with access, tightening, process capability and inspection.
5. Validate the assembly sequence, tolerance stack, tool access and service path before quotation and first article.

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Primary audience: product designers, purchasing engineers, quality teams and suppliers reviewing manufacturability before production release.

Design workflow and requirement hierarchy

The assembly architecture should follow the load path and functional interfaces, not the hardware catalogue.

Assembly design workflow

Freeze requirements in the order that controls function, build and verification.

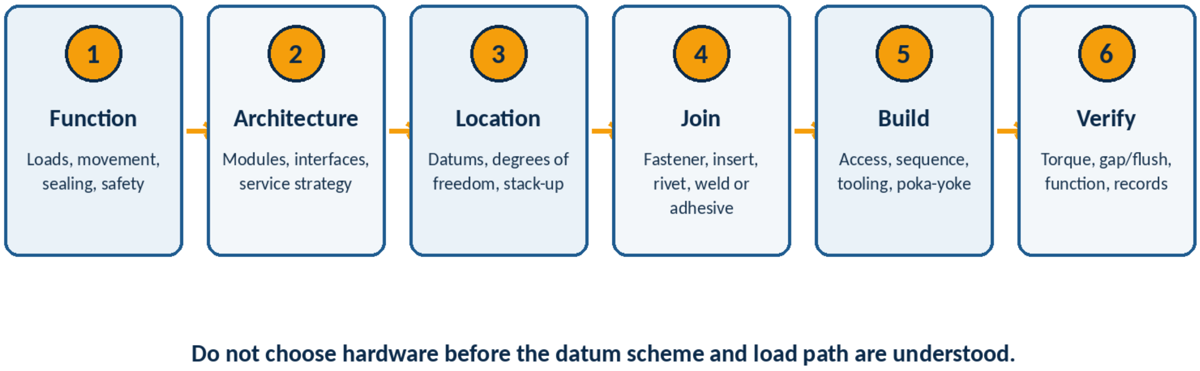


Figure 1. Requirement-driven sequence for assembly design.

Requirement hierarchy

Level	Question to freeze	Typical evidence
1. Function	What load, motion, sealing, alignment or safety result must the assembly deliver?	Load cases, interface definition, functional test
2. Architecture	Which parts are permanent modules, replaceable modules or service items?	Exploded view, interface control document
3. Location	Which surfaces and features establish each degree of freedom?	Datum scheme, locator concept, stack-up
4. Joining	How is clamp load or permanent load transfer created and retained?	Fastener / rivet / weld / adhesive specification
5. Build and verify	Can it be assembled, tightened, inspected, serviced and traced?	Work sequence, tool envelope, inspection plan

Release gates

- Do not use fasteners to pull a mislocated or distorted assembly into position unless that is an explicitly validated forming operation.
- Keep functional interfaces under direct control; do not let a chain of cosmetic or non-functional dimensions define alignment.
- Treat surface finish, lubrication and locking method as part of the fastening system because they influence friction and reuse.

03 JOINT ARCHITECTURE

Joining-method selection

Select the method that meets load, access, rate, service and environmental requirements with the least uncontrolled variation.

Joining method selection

Choose the joint as a system: load path, access, service, rate and finish.

	Bolts / screws	Blind rivets	Clinch / rivet nuts	Welding	Adhesive + mechanical
Best use	Serviceable	One-side access	Reusable thread	Permanent structure	Sealing / damping
Constraint	Two-side or tapped access	Permanent / drill-out	Thin sheet / tube	Heat and distortion	Surface preparation
Trade-off	Medium-high cost	Fast thin-sheet build	Supplier limits apply	High stiffness	Cure and durability

No single method is “best”; select against the service and manufacturing requirements.

Figure 2. Common assembly methods and their principal trade-offs.

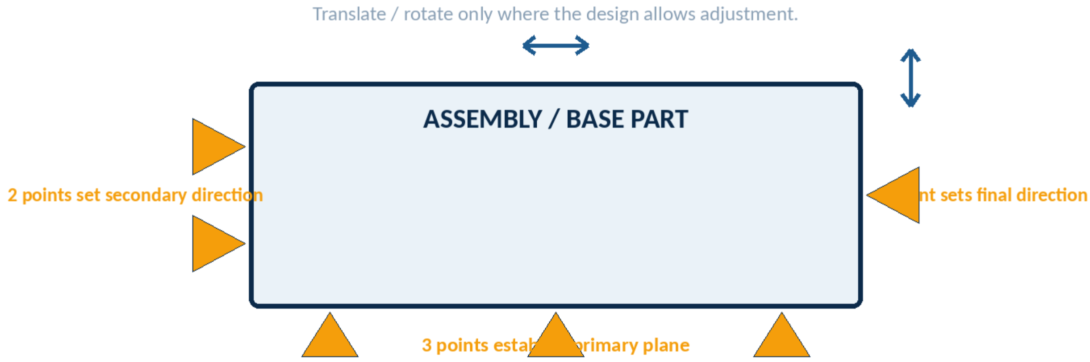
Selection factor	Bolts / screws	Rivets / inserts	Weld / adhesive
Serviceability	High; suitable for repeated removal when wear and locking are controlled.	Low to medium; rivet nuts provide reusable threads, blind rivets require removal.	Low; typically permanent, although bonded modules may be cut or replaced.
Access	May require two sides, a tapped feature or captive nut.	Good for one-side assembly when the installation tool can reach.	Weld requires torch / electrode and inspection access; adhesive requires bond-line control.
Variation driver	Friction, preload, hole clearance, bearing and embedment.	Hole quality, grip range, installation force and parent-material strength.	Fit-up, heat input, cure, surface preparation and distortion.
Best cost position	Medium volume, serviceable interfaces and configurable products.	High-rate thin-sheet assembly or one-side access.	Permanent high-stiffness structures or sealing / damping interfaces.
Choose the full joint system: hardware + parent material + surface condition + installation process + inspection + service environment.			

Functional datums and locating strategy

A repeatable assembly is located by intended features and only then clamped or fastened.

3-2-1 location principle

Constrain six degrees of freedom with a deliberate, non-redundant datum strategy.



Locate first. Clamp second. Avoid using clamps to force a mislocated stack into position.

Figure 3. Simplified 3-2-1 location concept for constraining six degrees of freedom.

Design rule	Why it matters	Common failure
Use a primary, secondary and tertiary datum hierarchy.	Makes the assembly coordinate system explicit and inspectable.	Multiple unrelated dimensions compete to locate the same part.
Use one round locator and one slot for two-pin location when thermal or manufacturing variation must be absorbed.	Prevents overconstraint while fixing orientation.	Two close-tolerance round holes bind or force parts into stress.
Locate with hard features; clamp only to seat the part.	Separates position control from retention force.	Clamp force shifts parts because contact geometry is unstable.
Place datums near functional interfaces and load transfer.	Reduces error amplification across brackets and spacers.	Cosmetic outer surfaces define the mechanism alignment.
Provide adjustment intentionally when fabrication variation cannot economically be eliminated.	Allows controlled setting rather than uncontrolled rework.	Technicians enlarge holes, bend brackets or add random shims.

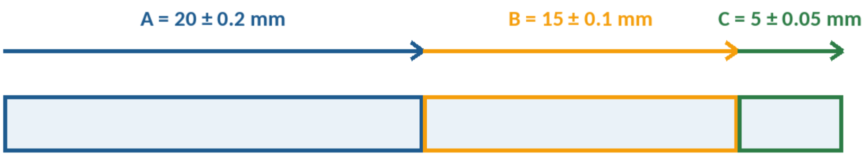
Overconstraint is not “more accurate.” It can create assembly force, distortion, wear and unpredictable datum shift.

Clearance, fits and tolerance stack-up

Start with the functional result - gap, alignment, preload, travel or seal compression - then allocate component variation.

Tolerance stack-up

Control the functional result, not every component dimension independently.



Functional gap: G = A - B - C

Nominal G = 0.00 mm | **Worst-case = ±0.35 mm** | **RSS ≈ ±0.229 mm**

Use RSS only when variation is independent, centered and statistically justified.

Figure 4. Example of worst-case and root-sum-square tolerance accumulation.

Method	Use	Limitations / required evidence
Worst-case arithmetic	Safety, hard interference, short chains, low volume and guaranteed interchangeability.	Conservative; assumes every dimension reaches its adverse limit together.
Root-sum-square (RSS)	Centered, independent process variation with adequate capability data.	Not valid for biased, correlated, drifting or non-normal processes without justification.
Monte Carlo / measured distribution	Long or nonlinear stacks, complex geometry and production data.	Requires valid distributions, correlations and a documented acceptance target.
Selective assembly / adjustment	High-value assemblies when adjustment is intentional and controlled.	Requires sorting, setting, traceability and a repeatable verification method.

Design actions

- Use slots for adjustment or tolerance absorption only in the intended direction; use a round hole or datum face to control the perpendicular direction.
- Keep clearance holes large enough for the position tolerance and installation method, but verify washer / bearing coverage and edge distance.
- Specify gap and flush requirements at the assembled interface instead of deriving them from many unrelated component dimensions.

06 ERROR PREVENTION

Poka-yoke and orientation control

Reduce assembly errors by geometry, sequence and unambiguous identification rather than relying on inspection alone.

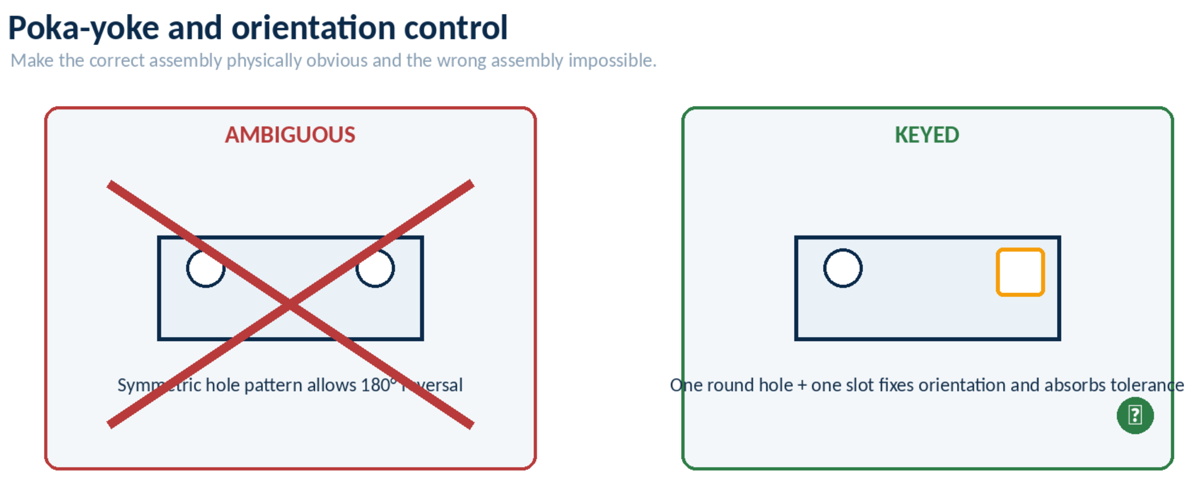


Figure 5. A keyed pattern prevents reversal and controls orientation without adding inspection burden.

Technique	Application	Design check
Asymmetric hole / tab pattern	Left-right, front-back or top-bottom orientation.	Wrong orientation cannot start or cannot fully seat.
Different connector / fastener sizes	Preventing interchange of similar subassemblies.	Service tools and spares remain practical.
One round hole + one slot	Orientation plus one-direction tolerance absorption.	Slot direction aligns with the intended adjustment / expansion.
Captive or pre-installed hardware	Preventing omitted washers, nuts or spacers.	Hardware survives shipping, coating and repeated service.
Assembly sequence interlock	Part B can only install after Part A is correctly seated.	The sequence does not create inaccessible fasteners later.
Visible witness / label	Verification of torque, position, revision or connector pairing.	Mark remains readable in final service condition.

A good poka-yoke prevents the defect; a weak poka-yoke merely makes the defect easier to detect.

07 FASTENERS

Fastener-system selection

Specify a compatible system, not a nominal diameter and generic material description.

Figure 6. Fastener selection must include mechanical class, material, coating, geometry and mating parts.

Fastener class / family	Engineering interpretation	Assembly implication
Carbon-steel class 8.8	Nominal tensile strength 800 MPa; nominal yield ratio 0.8.	Common structural / equipment fastener; match nut and washer capacity.
Carbon-steel class 10.9	Nominal tensile strength 1000 MPa; nominal yield ratio 0.9.	Higher preload capability; parent material and bearing surfaces may govern.
Carbon-steel class 12.9	Nominal tensile strength 1200 MPa; nominal yield ratio 0.9.	High strength with tighter control of embrittlement, corrosion and installation.
Stainless A2 / A4 property classes	Corrosion-resistant families with separate grade and property-class system.	Check galling, temperature, chloride exposure and lubricant compatibility.
Washer / nut / insert	Must support the bolt proof load and bearing pressure for the joint.	Do not mix an upgraded bolt with a lower-capacity mating component.

- Define thread system and tolerance class, head style, length, grip, property class, material, coating, lubrication state and locking feature.
- Keep threads out of the primary shear plane when the design depends on a smooth shank and bearing-type load transfer.
- Check galvanic compatibility and coating damage at washers, serrations, weld nuts and electrical bonding points.

08 THREADS

Thread engagement and tapped joints

The tapped parent material must carry the required load without thread stripping, bottoming or installation damage.

Tapped-joint geometry

Thread engagement is a material-and-load decision, not a universal multiple of diameter.

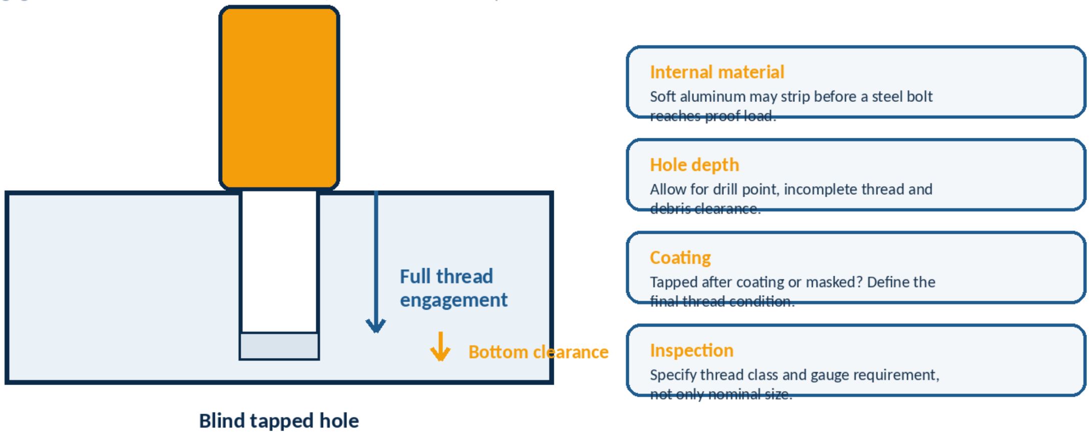


Figure 7. Blind tapped-hole geometry must account for complete threads, runout and bottom clearance.

Control item	Design requirement	Failure prevented
Engagement length	Calculate or validate against bolt proof load, internal-material shear strength and thread geometry.	Internal thread stripping before the fastener develops intended clamp load.
Blind-hole depth	Include drill point, incomplete threads, chip / debris space and screw-length tolerance.	Screw bottoming that produces false torque and low clamp load.
Thread class	State the final thread tolerance system and whether threads are made before or after finish.	Interference, loose fit, un-gaugeable threads or coating blockage.
Edge / wall thickness	Maintain sufficient parent material around the thread or use a reinforced boss / insert.	Boss cracking, pull-out or local bulging in thin tube and cast features.
Repeated service	Use wear-resistant insert or replaceable nut when soft material will be cycled.	Progressive loss of thread fit and clamp repeatability.

A simplified stripping-area concept uses area proportional to pitch diameter × engagement length, but the final calculation must follow the applicable joint method and actual material data.

09 TIGHTENING

Preload, torque and tightening sequence

Joint performance comes from clamp load and joint stiffness; torque is only one indirect way to create it.

Torque, friction and clamp load

Torque is an indirect control. Most input torque is consumed by thread and bearing friction.

Illustrative only - actual friction split varies with finish, lubrication and reuse.

Simplified relation

$T \approx K \times F \times d$

Validate K with the actual fastener system.

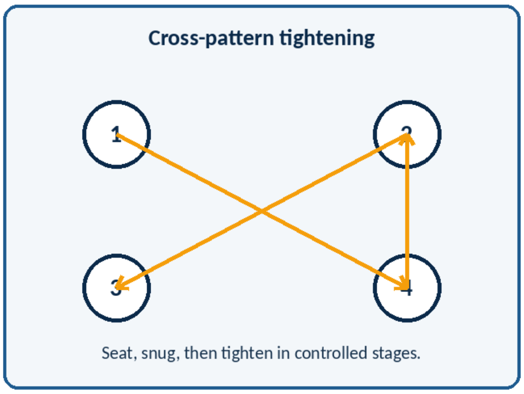


Figure 8. Simplified torque-to-preload relation and cross-pattern tightening.

Control method	Best use	Key control
Torque only	General equipment joints with validated friction window.	Fastener finish, lubrication, tool accuracy, seating and reuse state.
Torque + angle	More consistent post-snug rotation where joint geometry supports it.	Defined snug point, grip length, material stiffness and angle tool.
Direct tension / elongation	Critical joints where preload accuracy justifies measurement.	Access to measure elongation or load-indicating device.
Yield-control tightening	Specialized high-utilization joints.	Validated fastener system and controlled procedure; not a generic shop method.

Illustrative calculation

Using the simplified relation $T \approx K \times F \times d$: for an M8 fastener, target preload $F = 18$ kN and assumed nut factor $K = 0.20$, $T \approx 0.20 \times 18{,}000 \times 0.008 = 28.8$ N·m. This is not a production torque specification; K can change substantially with coating, lubrication, bearing surface and reuse.

- Tighten multi-fastener flanges and covers in stages using a defined sequence to reduce local distortion and uneven gasket compression.
- Record the tool ID, setting, calibration status and any angle / trace data when the joint is quality-critical.
- Never apply the same torque blindly after changing plating, lubricant, washer, threadlocker or prevailing-torque hardware.

Joint retention under vibration

Prevent loss of clamp load first; choose a locking method for the actual loosening mechanism and service environment.

Joint retention under vibration

First preserve clamp load; add a locking feature only for the identified failure mode.

Prevailing-torque nut	Reusable only within validated cycle limits	**Temperature and friction sensitive**
Threadlocker	Good for sealed threads and small hardware	**Surface cleanliness and cure matter**
Mechanical lock	Tab washer, lockwire, cotter pin	**Positive retention; more parts and labor**
Double nut / jam nut	Useful in adjustment mechanisms	**Requires correct tightening method**
Serrated flange	Adds bearing friction / bite	**Can damage coatings and thin sheet**

Do not rely on a locking device to compensate for poor joint stiffness, embedment or inadequate preload.

Figure 9. Common locking approaches and their principal constraints.

Failure mechanism	Primary design response	Secondary retention
Embedment / surface settlement	Use suitable bearing area, hard washers and clean stable interfaces.	Retorque only when procedure and service conditions justify it.
Joint separation under external load	Increase preload, bolt / joint stiffness ratio or number / position of fasteners.	Mechanical positive lock if safety consequence requires.
Transverse slip and self-loosening	Design friction / shear transfer, locate the joint and limit slip.	Prevailing torque, threadlocker or positive locking device.
Thermal cycling	Match materials, grip length and compliance; avoid overconstraint.	High-temperature-compatible locking element and lubricant.
Frequent service	Use replaceable, inspectable and cycle-rated retention.	Captive fastener, new locking element or documented replacement interval.

A locking feature cannot restore clamp load lost through joint separation, plastic embedment, crushed sheet or an inadequately stiff interface.

11 THIN MATERIAL

Thin-sheet and tube fastening

Thin parent material often governs the joint through bearing, pull-out, spin-out, crushing or local distortion.

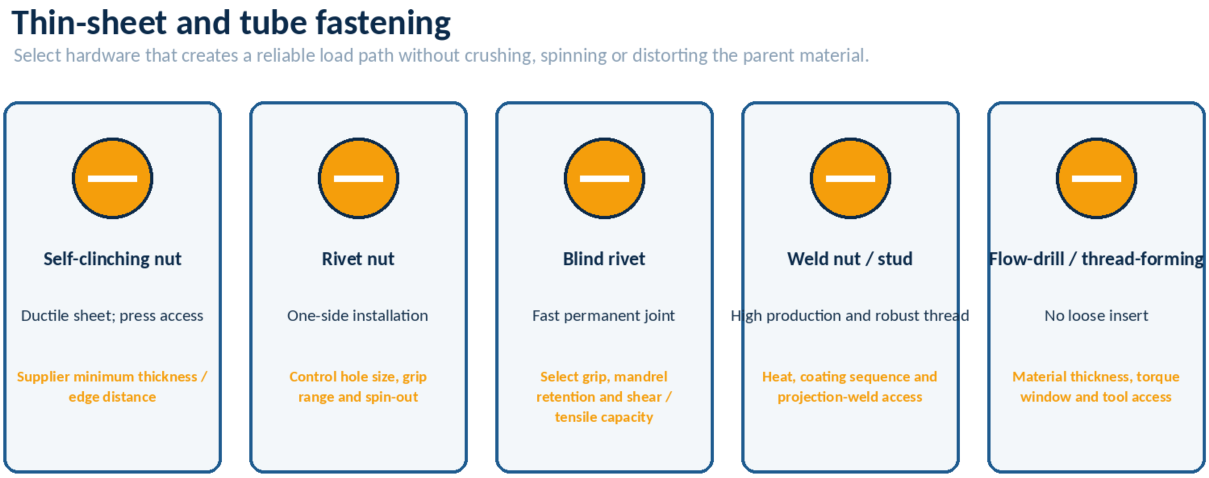


Figure 10. Common hardware families for thin sheet and hollow sections.

Method	Suitable condition	Controls to specify
Self-clinching hardware	Ductile sheet with press access and sufficient thickness.	Supplier part number, sheet hardness / thickness, hole size, edge distance and installation force.
Rivet nut / blind threaded insert	One-side access in sheet, extrusion or tube.	Grip range, hole geometry, anti-rotation feature, setting stroke and spin / pull-out verification.
Blind rivet	Permanent one-side assembly.	Diameter, body / mandrel material, grip range, head, hole size and structural loading.
Weld nut / weld stud	High-rate assembly with robust captive thread.	Projection / process, location, coating sequence, thread protection and proof / torque test.
Thread-forming / flow-drill system	Material and production volume support forming a thread without loose hardware.	Approved material / thickness, pilot condition, installation torque window and tool access.

- Use supplier installation data; minimum thickness, hole size and edge distance vary by hardware family, material and size.
- Protect tube walls from collapse during installation and define whether internal support tooling is required.
- Verify hardware after coating: paint and plating can reduce seating, clog threads or alter electrical bonding.

12 BUILDABILITY

Access, tooling and assembly sequence

Design the tool path, human reach, part insertion and removal sequence in the CAD model - not after the first build.

Access, tooling and assembly sequence

A joint that is strong on paper can still be impossible to build or service.

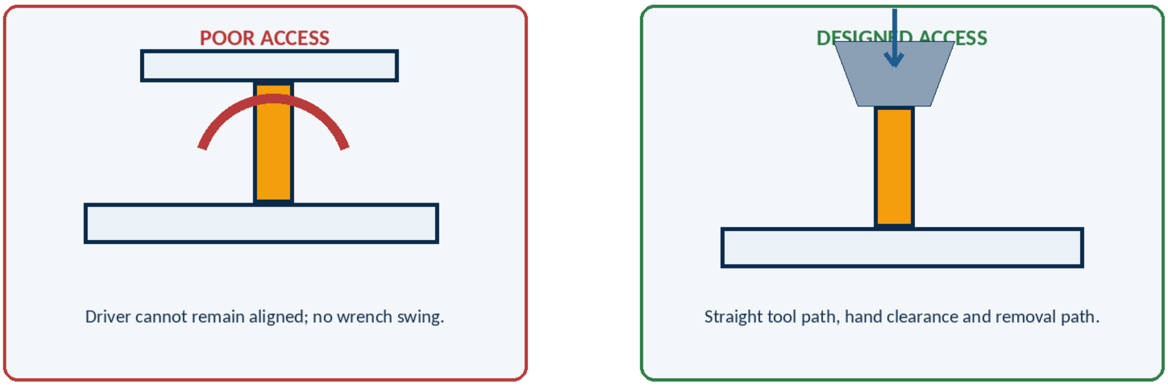


Figure 11. Tool alignment and removal paths must remain available in the final assembly state.

Access question	Evidence required	Typical corrective action
Can the fastener be inserted and retained before engagement?	Insertion envelope, magnet / feeder / hand path, captive feature.	Change head style, add captive nut or reverse installation direction.
Can the driver remain coaxial under reaction torque?	Actual socket / bit / extension envelope, not a nominal cylinder.	Increase clearance, use side access or relocate the joint.
Can the mating nut or insert be held?	Wrench swing, anti-rotation feature or one-side hardware.	Use captive nut, rivet nut, weld nut or accessible flat.
Can the assembly be removed for service?	Removal translation / rotation and cable / hose slack.	Split into modules, add removable panel or change sequence.
Can quality inspect the result?	View, gauge and traceability access.	Add witness hole, inspection surface, test point or recordable process control.

The final fastener in the sequence must not block the tool needed for an earlier or service-critical fastener.

Frames, brackets and enclosures

Use self-locating interfaces and controlled adjustment to manage realistic fabrication and coating variation.

Frames, brackets and enclosure interfaces

Use self-location and controlled adjustment instead of forcing fabricated parts to perfect nominal geometry.

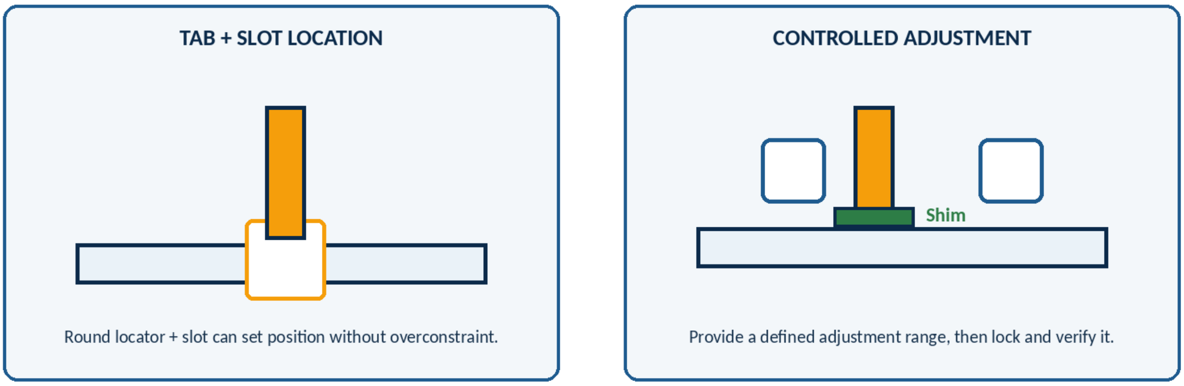


Figure 12. Self-location and defined adjustment are more robust than forced nominal alignment.

Interface feature	Recommended intent	Avoid
Tab and slot	Locate or temporarily support parts; size clearance for cut edge, coating and insertion angle.	Using every tab as a tight locator, creating overconstraint.
Round hole + slot	Fix one point and orientation while allowing one-direction adjustment or growth.	Two tight slots that leave the assembly free to drift.
Shim interface	Provide a flat, accessible, measurable and retained shim location.	Loose random washers or field bending without records.
Adjustable bracket	Define travel, scale / witness, locking method and final acceptance.	Unbounded slots with no datum or final-position verification.
Door / panel interface	Control hinge axis, latch compression, gap / flush and seal land from functional datums.	Dimensioning each panel edge independently to the outer frame.

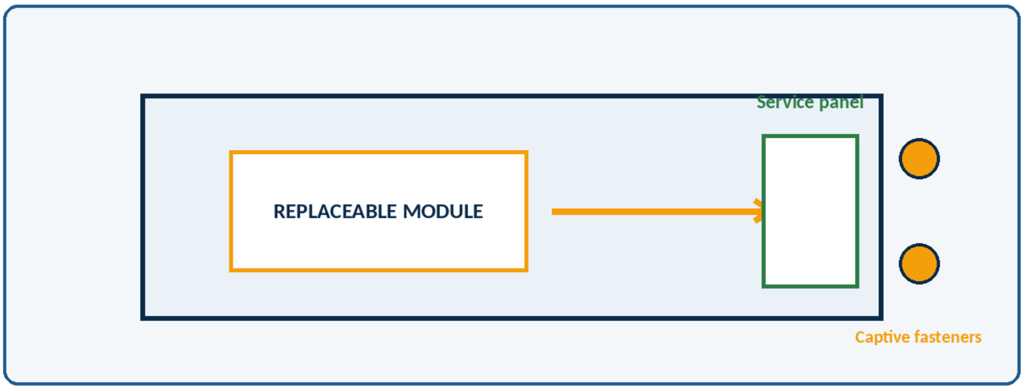
- Account for weld distortion, coating thickness, burr direction and frame diagonal variation in the interface clearance.
- Do not place precision alignment entirely on long flexible sheet-metal flanges; use local hard points or locating blocks.
- Where electrical bonding is required, define masked areas, serration / washer strategy, corrosion protection and inspection.

Serviceability and maintenance

A serviceable product needs a defined replacement path, standard tools, retained hardware and recoverable adjustments.

Serviceability and maintenance

Design the replacement path, tool access and retained hardware before the housing is finalized.



Standard tools | visible labels | no hidden clips | no cable strain | safe lifting points

Figure 13. Service modules should have a clear removal path and controlled retained hardware.

Service design item	Practical requirement	Common failure
Replaceable module	Disconnect, release, remove and reinstall without disturbing unrelated alignment.	Replacement requires cutting ties, removing welded brackets or dismantling the full frame.
Fastener access	Use common tools and keep driver / wrench access after adjacent modules are installed.	A hidden nut spins or the tool can only enter at a damaging angle.
Captive hardware	Retain screws, washers and spacers where dropped parts create risk or delay.	Loose hardware falls into equipment or is omitted during reassembly.
Wear interface	Use replaceable bush, insert, nut plate or pad when threads / contact surfaces will cycle.	Soft parent threads or painted bearing faces degrade each service cycle.
Adjustment recovery	Mark, gauge or fixture the setting; lock it after adjustment.	Technicians cannot restore alignment, preload, seal compression or travel.

Serviceability is a geometric requirement. Validate it with the actual tool, hand space, PPE, cable routing and part weight.

15 VERIFICATION

Assembly inspection and functional verification

Inspect the assembled outputs that prove location, retention and function - not only the individual components.

Assembly inspection and functional verification

Measure the outputs that prove fit, clamp, alignment and function.

1. **Gap / flush** — Feeler, step gauge, profile or visual standard
2. **Fastener control** — Torque / angle record, witness mark, fastener presence
3. **Geometry** — Datum fixture, CMM, runout, alignment or go/no-go gauge
4. **Function** — Load, travel, latch, leak, electrical continuity or cycle test
5. **Traceability** — Part revision, lot, operator, tool ID and deviation record

Define acceptance, sampling, gauge suitability and reaction plan before production release.

Figure 14. Verification should cover geometry, fastening, function and traceability.

Characteristic	Possible verification	Planning requirement
Fastener presence / type	Visual, barcode, image system or controlled kitting.	Define wrong / missing hardware reaction and traceability.
Clamp / tightening process	Torque / angle trace, direct tension, witness mark or audit test.	Tool ID, calibration, sequence, lubrication and rework rule.
Gap, flush and alignment	Feeler, step gauge, profile gauge, fixture, CMM or optical scan.	Functional datums, sampling and acceptance at specified locations.
Movement / function	Travel, latch force, free rotation, load, leak, electrical continuity or cycle.	Test load, speed, environment, pass criteria and data record.
Post-assembly damage	Visual standard for scratches, distortion, coating damage and contamination.	Lighting, viewing distance, touch-up / repair rule and packaging release.

- When measurements are near a limit, define the conformity decision rule and consider measurement uncertainty.
- Use fixtures that reproduce the datum strategy rather than forcing the assembly into nominal geometry during inspection.
- Record deviations, concessions and rework because they can change preload, alignment, coating integrity and service life.

Assembly design review checklist

Use this checklist before supplier quotation, first article and production release.

No.	Design review item	No.	Design review item
01	Functional loads, motion, sealing, safety and service life are defined.	14	Torque / angle / tension method is validated for the actual friction condition.
02	Permanent, replaceable and adjustable modules are identified.	15	Tightening sequence and staged tightening are defined where needed.
03	Primary, secondary and tertiary assembly datums are explicit.	16	Locking method addresses the identified loosening mechanism.
04	Each degree of freedom is intentionally located or intentionally adjustable.	17	Thin-sheet hardware follows supplier thickness, hole and edge requirements.
05	No redundant locator creates binding or forced assembly.	18	Coating, lubrication, galling and galvanic compatibility are reviewed.
06	Functional gap, flush, alignment and travel stack-ups are evaluated.	19	Actual tools have insertion, alignment, reaction and removal clearance.
07	Worst-case or statistical stack method is justified and documented.	20	Assembly sequence does not block later tightening or inspection.
08	Poka-yoke prevents reversed, mirrored or swapped components.	21	Service modules have a safe removal path and retained hardware.
09	Joining method matches load, access, service and production volume.	22	Adjustment features include range, datum, lock and final verification.
10	Fastener thread system, class, material, coating and length are specified.	23	Gap / flush, fastener, functional and visual acceptance criteria are stated.
11	Nut, washer, insert and parent-material capacity match the fastener.	24	Inspection fixtures and gauges reproduce the intended datum strategy.
12	Grip length, shear plane and bearing area are appropriate.	25	RFQ package includes drawings, BOM, 3D data, fastener specifications and test requirements.
13	Tapped engagement, blind-hole depth and thread finish condition are defined.		

Release only after all safety-, function- and service-critical items are closed or formally accepted through the project deviation process.

High-risk triggers for specialist review

- Fatigue-critical or safety-critical bolted joints; pressure / leak containment; large thermal cycles; high vibration; lifting interfaces; unusual coatings or lubricants; repeated high-cycle service; electrical bonding or high-current joints.
- Assemblies where fastener failure, loss of preload or incorrect service reassembly could cause injury, fire, loss of containment or major equipment damage.

Standards and RFQ handoff

Use the edition invoked by the drawing, purchase order or governing customer specification; confirm current status before release.

Reference	Primary assembly use	Official source
ISO 965-1:2026	Metric screw-thread tolerance principles	https://www.iso.org/standard/87889.html
ISO 965-2:2024	Limits for common metric internal / external thread classes	https://www.iso.org/standard/87890.html
ISO 898-1:2013	Mechanical properties of carbon / alloy steel bolts, screws and studs	https://www.iso.org/standard/60610.html
ISO 3506-1:2020	Mechanical properties of corrosion-resistant stainless fasteners	https://www.iso.org/standard/70045.html
ISO 2320:2015	Functional properties of prevailing-torque steel nuts	https://www.iso.org/standard/61175.html
ISO 16047:2005 + Amd 1:2012	Torque / clamp-force testing of threaded fasteners	https://www.iso.org/standard/27788.html
ISO 6789-1 / -2:2017	Conformance and calibration of hand torque tools	https://www.iso.org/standard/62549.html
ISO 286-1:2010	ISO code system for tolerances and fits on linear sizes	https://www.iso.org/standard/45975.html
ISO 5459:2024	Datums and datum systems	https://www.iso.org/standard/87855.html
ISO 1101:2017	Geometrical tolerancing symbol language and interpretation	https://www.iso.org/standard/66777.html
ISO 14253-1:2017	Conformity decision rules with measurement uncertainty	https://www.iso.org/standard/70137.html
ASME Y14.5-2018 (R2024)	Dimensioning and tolerancing / GD&T	https://www.asme.org/codes-standards/find-codes-standards/y14-5-dimensioning-tolerancing

RFQ / supplier handoff package

Required file or decision	Minimum content
Released drawing and 3D model	Assembly datums, interface dimensions, fastener callouts, coating and final acceptance.
BOM and approved hardware list	Manufacturer / standard, size, class, finish, alternates and quantity.
Assembly specification	Sequence, torque / angle / tension method, locking, lubrication, witness marking and rework.
Functional and inspection requirements	Gap / flush, alignment, load, travel, leak, electrical, sampling and reports.
Packaging and service constraints	Protection of finished surfaces, captive parts, shipping condition and service access.

Do not copy proprietary standard tables into the RFQ. State the standard, edition, class and project-specific requirement, then provide the controlled source through the customer or quality system.

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