

Weld Symbol Reference Chart

Read common fillet, groove, plug, spot, seam, and supplementary symbols under AWS A2.4:2020 and ISO 2553:2019. Use this chart to locate the weld, read the dimensions, and check the supplementary notes on a fabrication drawing.

Common Weld Symbol Reference Chart

A symbol name identifies the weld type only. Its complete meaning also depends on reference-line position, dimensions, joint geometry, and supplementary symbols.

WELD TYPE	SCHEMATIC SYMBOL DESCRIPTION	TYPICAL JOINT OR APPLICATION	INFORMATION COMMONLY ADDED
Fillet	Right-triangle symbol	T-joints, lap joints, and corner joints	Leg size or throat basis, weld length, pitch, contour, and side
Square groove	Two parallel edges or lines	Butt joints where little or no edge preparation is needed	Root opening, groove weld size, length, backing, and penetration requirement
V-groove	V-shaped groove symbol	Butt joints with access from one side or both sides	Groove angle, root opening, depth, effective throat, backing, and CJP/PJP requirement
Bevel groove	One square edge and one angled edge	Joints where one member receives the bevel preparation	Bevel angle, root opening, depth, effective throat, and prepared-member indication
U-groove	U-shaped groove symbol	Thicker sections where a rounded preparation can reduce weld volume	Groove radius, angle, root opening, depth, and penetration requirement
J-groove	J-shaped groove symbol	Thick or restricted-access joints where one member receives a J preparation	J radius, groove angle, root opening, depth, and prepared-member indication
Flare-V groove	Two curved surfaces forming a V	Joining formed, rolled, or curved members	Effective throat, root opening, length, and side
Flare-bevel groove	One curved surface and one square edge	Joining a formed member to a flat or square-edged member	Effective throat, root opening, length, and side
Plug	Circular hole filled with weld metal	Overlapping members where a circular opening provides access	Hole diameter, depth or plug size, number, spacing, and side
Slot	Elongated hole filled with weld metal	Overlapping members where a slot provides a longer welded area	Slot width, length, depth, number, spacing, and side

WELD TYPE	SCHEMATIC SYMBOL DESCRIPTION	TYPICAL JOINT OR APPLICATION	INFORMATION COMMONLY ADDED
Spot	Circular resistance or arc-weld symbol	Sheet-metal lap joints and resistance-welded parts	Weld size or strength as permitted, number, spacing, and side
Seam	Seam-weld symbol, commonly shown as a circle with parallel bars	Continuous or intermittent welded seams in sheet metal	Seam size or strength as permitted, length, pitch, and side
Edge	Edge-weld symbol	Members joined along adjacent or flanged edges	Weld size, length, pitch, contour, and side
Stud	Stud-weld symbol	Studs attached to a plate or other surface	Stud diameter or size, number, spacing, and location
Surfacing	Surfacing or buildup symbol	Deposited weld metal used for buildup, cladding, or hardfacing	Deposited thickness, extent, orientation, and material or process note

Important: AWS A2.4:2020 and ISO 2553:2019 are not interchangeable drawing conventions. Confirm the governing standard in the title block, general notes, project specification, or CAD template before interpreting the symbol. The official standard and the actual drawing geometry control.

How to Read the Core Elements

A complete welding symbol can contain several elements. Read them in a consistent order:

1. Identify the weld symbol itself: fillet, groove, plug, slot, spot, seam, edge, stud, or surfacing.
2. Determine which side of the joint is specified by the applicable standard.
3. Read dimensions and extent information around the weld symbol.
4. Check for supplementary symbols such as all-around, field weld, contour, backing, spacer, or melt-through.
5. Read the tail, drawing notes, WPS reference, inspection requirement, and title-block standard.

Reference line and arrow

The reference line is the anchor for the welding symbol. The arrow connects that line to the joint, feature, or area being specified. The arrow does not by itself tell the reader to weld every surface it touches; the symbol and the governing standard determine the specified location.

- A weld symbol below the reference line indicates the arrow side of the joint.
- A weld symbol above the reference line indicates the other side of the joint.
- Matching symbols above and below the reference line indicate welding on both sides.
- A broken or bent arrow can identify the member that receives a preparation in certain groove-weld cases.

Caution: The arrow-side rule above is an AWS convention. Do not copy it onto an ISO drawing without checking which ISO 2553 system the drawing uses.

Dimensions Around the Weld Symbol

Dimension placement is part of the notation. Typical information includes:

DIMENSION OR NOTE	WHAT IT CAN CONTROL	DRAWING CHECK
Size to the left of the symbol	Fillet leg size, throat, groove depth, or another weld-size value depending on the standard and weld type	Confirm whether the value is a leg size, throat, effective throat, or groove depth
Length to the right of the symbol	Continuous weld length or each segment length for an intermittent weld	Confirm the measurement direction and whether the dimension is nominal or finished
Pitch after an intermittent-weld length	Center-to-center spacing of repeated weld segments in conventions that use a length-pitch format	Confirm whether the project uses AWS-style or ISO-style intermittent notation
Number before or near a symbol	Number of welds, studs, spots, or segments where the governing standard uses that position	Confirm whether the number applies to one side, both sides, or a pattern
Tail note	Process, WPS, filler metal, inspection, backgouging, or other special instruction	Trace abbreviations to the project legend or referenced specification

Check: Do not treat a dimension as self-explanatory when the drawing does not identify its basis. For example, a fillet value can represent a leg dimension in one convention and a throat dimension in another.

AWS A2.4:2020 vs. ISO 2553:2019

Both standards provide a structured way to communicate weld geometry, manufacture, quality, and testing information. The most important drafting decision is which side-of-joint system applies.

DRAWING FEATURE	AWS A2.4:2020	ISO 2553:2019
Reference-line systems	Uses the AWS reference-line convention for locating weld symbols above, below, or on both sides of the line	Defines two systems: a dual-reference-line system and a single-reference-line system
Arrow-side interpretation	Below the reference line is the arrow side; above is the other side, subject to the standard's detailed cases	Interpretation depends on the selected ISO system; the drawing should identify or make the system unambiguous
Fillet size basis	Commonly expressed as leg size	Can be expressed using throat thickness a or leg length z; verify the drawing legend
Symbol orientation	Follow AWS A2.4 figures and the drawing standard, especially for groove preparations	Follow the selected ISO 2553 system and symbol figures; do not infer orientation from AWS practice
Dimensions and units	The standard does not impose a single unit system; the drawing title block or notes control	Use the units and dimensioning rules stated by the drawing and project documentation

DRAWING FEATURE	AWS A2.4:2020	ISO 2553:2019
Process and special requirements	Use the tail, notes, WPS, and referenced specifications as applicable	Use the tail, notes, WPS, and referenced specifications as applicable

International note: ISO 2553’s two-system structure is particularly important on international work. A drawing can look familiar while assigning side significance differently from an AWS drawing. If a drawing imports geometry from another CAD system, preserve the standard designation and legend during translation.

Fillet Size: a versus z

When an ISO drawing uses a for an equal-leg fillet, a denotes the theoretical throat thickness. When it uses z, z denotes the leg length. For an ideal equal-leg fillet:

$$a = 0.707 \times z$$

$$z = a \div 0.707$$

Where: **a** = theoretical throat thickness, **z** = equal leg length.

Example: a6 corresponds to $z = 6 \div 0.707 = 8.49$ mm, or approximately 8.5 mm before drawing rounding.

Caution: This relationship is only an equal-leg geometric conversion. It is not a substitute for the design calculation, applicable code, or project weld-size requirement. For metric and inch equivalents, keep the drawing’s controlling unit and round the converted value only for reader convenience.

Supplementary Weld Symbols and Notes

Supplementary symbols add information that the basic weld symbol cannot convey by itself.

SUPPLEMENTARY ITEM	SCHEMATIC DESCRIPTION	MEANING OR USE	RELEASE CAUTION
Weld all around	Small circle at the arrow/reference-line junction in conventions that use it	Weld continues around the specified joint perimeter	Define the perimeter; a circle does not automatically mean every nearby edge is welded
Field weld	Flag or pennant at the arrow/reference-line junction where the standard uses it	Weld is made at the installation or field location	Confirm access, position, weather protection, inspection, and responsibility for fit-up
Contour	Flush, convex, or concave contour mark	Specifies the desired weld-face profile	State the finishing method when the profile or cosmetic result matters
Finish method	Letter associated with a contour mark, where applicable	Identifies grinding, machining, chipping, or another finish method	Check the governing standard’s finish-letter meaning rather than reusing a local abbreviation

SUPPLEMENTARY ITEM	SCHEMATIC DESCRIPTION	MEANING OR USE	RELEASE CAUTION
Backing	Backing-bar or backing indication	A separate material supports the root during welding	Identify backing material, removal requirement, and whether it remains in the assembly
Spacer	Spacer indication	A separate insert or spacer is present at the root	Confirm material compatibility, thickness, and whether the spacer is permanent
Melt-through	Root-side penetration or reinforcement indication	Visible root reinforcement or penetration is required on the opposite side	Coordinate with access, root opening, process, and inspection requirements
Tail	Forked or open tail at the end of the reference line	Process, WPS, filler metal, NDT, or special notes	Do not leave critical process or inspection information in an unexplained abbreviation

Note: Not every supplementary mark has the same graphical treatment in AWS and ISO drawings. The drawing’s standard, legend, and referenced specification control when a symbol’s appearance or position differs.

Design Checks Before Releasing a Drawing

- Name the governing welding-symbol standard in the title block, general notes, or project specification.
- Identify the base-metal grade, temper where relevant, thickness, joint type, and accessible welding sides.
- Confirm the weld-size basis: AWS leg size, ISO throat a, ISO leg z, groove depth, or effective throat.
- Show the measurement origin for critical dimensions: edge, centerline, tangent, weld end, or joint datum.
- Define continuous versus intermittent welds, segment length, pitch, quantity, and whether the pattern is chain or staggered.
- Use an all-around indication only when the complete joint perimeter is intended and accessible.
- Distinguish shop and field welding where location affects fit-up, distortion, access, or inspection.
- Reference the welding process, WPS, filler metal, preheat/interpass limits, post-weld treatment, and inspection method when required by the design or specification.
- Check clearance to bends, hardware, coatings, machined surfaces, seal faces, and mating parts.
- Define post-weld dimensions and inspection condition when distortion or finish can change the part’s functional fit.

Why Weld Symbol Errors Cause Fabrication Problems

Weld symbols compress a large amount of design intent into a small drawing area. A small interpretation error can change the weld side, weld volume, preparation, access plan, inspection method, or finishing sequence.

DRAWING AMBIGUITY	LIKELY FABRICATION CONSEQUENCE	BETTER DRAWING ACTION
AWS and ISO conventions are mixed	Weld is placed on the wrong side or the groove preparation is reversed	Identify one governing system and add a project-specific legend when documents are exchanged internationally

DRAWING AMBIGUITY	LIKELY FABRICATION CONSEQUENCE	BETTER DRAWING ACTION
Fillet size basis is unstated	Weld may be materially smaller or larger than intended	Use the applicable leg or throat notation and state the standard
Length or pitch is missing	A continuous weld may be made where an intermittent weld was intended, or vice versa	Show length, pitch, quantity, and pattern explicitly
All-around mark is used without a defined perimeter	Unwanted welds, blocked drainage, excess distortion, or inaccessible welds	Mark the exact joint perimeter and review access
Finish or contour is vague	Grinding, machining, or as-welded profiles do not match the mating or cosmetic requirement	Specify contour, finish method, and inspection condition
Process or inspection is left to assumption	Consumable, access, distortion, or acceptance criteria may not match the design intent	Reference the WPS, applicable code, NDT method, and acceptance criteria

What to Do When a Weld Symbol Is Ambiguous

OPTION	WHEN IT HELPS	TRADE-OFF
Add the governing standard and symbol legend	A package contains AWS and ISO-originated drawings or multiple CAD templates	Adds drawing space and document-control work, but reduces interpretation risk
Replace a shorthand symbol with a dimensioned detail	Joint preparation, root opening, backing, or finishing is safety- or fit-critical	Makes the drawing longer, but transfers less design responsibility to the fabricator
Reference a qualified WPS or project specification	Process, filler metal, preheat, interpass, or inspection requirements are controlled elsewhere	Requires the referenced document to be available and revision-controlled
Request a supplier DFM review before release	Access, distortion, bend clearance, coating sequence, or inspection access is uncertain	May add an early review cycle, but can prevent rework after welding
Use a prototype or first-article inspection plan	The assembly has tight fit, cosmetic, or post-weld dimensional requirements	Adds inspection effort and may extend the initial schedule

Reference chart only. The governing AWS A2.4:2020 or ISO 2553:2019 standard, title block, and drawing geometry control final interpretation.



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