KINGSFORM METALWORKS

ENGINEERING TOOLKIT

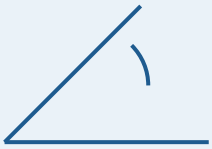
ISO 2768 TOLERANCE GUIDE

General dimensional tolerances, class selection, drawing application and transition to modern ISO GPS

LINEAR SIZES

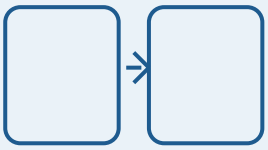
Classes f, m, c and v for unspecified linear dimensions.

ANGULAR SIZES



Tolerance by shorter side length, plus practical offset checks.

GPS TRANSITION



How to replace legacy ISO 2768-2 practice with ISO 22081 and ISO 1101.

DOCUMENT	VERSION	RELEASE DATE	LANGUAGE
KFR-016	1.0	2026-07-18	English
FORMAT	OWNER	CONTACT	WEBSITE
A4 PDF reference	KingsForm Engineering	info@kingsformmetalworks.com	kingsformmetalworks.com

01 STATUS, SCOPE AND DECISION HIERARCHY

Use ISO 2768 only where a general tolerance is actually appropriate

The standard reduces repetitive dimension notes; it does not replace functional tolerancing, datum strategy or process validation.

STATUS AT RELEASE - 18 JULY 2026

ISO 2768-1:1989 remains published, but ISO states that Edition 2 is under publication and will replace it. ISO 2768-2:1989 is withdrawn; ISO 22081:2021 is the current successor for rules governing general geometrical specifications. Recheck status before issuing a new drawing template.

Use ISO 2768-1 when...	Do not rely on it when...
A linear or angular size has no individual tolerance and falls within the stated size ranges.	The dimension controls fit, sealing, bearing location, safety, interchangeability or a regulated characteristic.
The part is made by material removal or formed from sheet metal, within the standard scope.	The part is a welded fabrication, casting, forging, additive part or flexible component unless a separate specification explicitly adopts it.
A class has been selected from demonstrated process capability and economic need.	The drawing needs form, orientation, location, run-out, profile or datum-based control.
The title block clearly states the standard, class and any exclusions.	The nominal size is below 0.5 mm, outside the table range or the table contains no value for that class.

DECISION HIERARCHY

1. **Function**
   Define mating, load, seal, clearance, appearance and service requirements.
2. **Individual controls**
   Apply explicit size or GD&T to every characteristic whose failure affects function.
3. **General tolerance**
   Apply ISO 2768 only to remaining unspecified linear/angular sizes.
4. **Verification**
   Select instruments, datum simulation and decision rules before production release.

02 DRAWING APPLICATION

Make the precedence rules unambiguous

An individual tolerance always takes precedence over a general tolerance. Reference, basic and theoretically exact dimensions need their own interpretation.

RECOMMENDED TITLE-BLOCK LOGIC

Legacy size-only note

GENERAL DIMENSIONAL TOLERANCES: ISO 2768-m

Applies class m to eligible unspecified linear and angular sizes.

Legacy combined note

ISO 2768-mK

On an existing drawing: m referred to Part 1 and K to withdrawn Part 2. Do not copy this note into a new template without a controlled migration plan.

Modern approach

GENERAL SIZE TOLERANCES: ISO 2768-m. GENERAL GEOMETRICAL SPECIFICATIONS: SEE COMPANY GPS-001 / ISO 22081.

Separates size tolerances from geometric controls and identifies the controlled source for general geometry.

PRECEDENCE - READ FROM THE FEATURE OUTWARD

1 Individual tolerance / feature control frame

2 Local drawing note or specification

3 Title-block general tolerance

4 Default GPS rules and contract documents

IMPORTANT EXCLUSIONS

Do not apply general tolerances to dimensions identified as reference, theoretically exact/basic, maximum/minimum-only, stock sizes governed by a material standard, or dimensions explicitly covered by another specification. State exclusions in the title block or drawing notes.

03 LINEAR DIMENSIONS

Working reference for ISO 2768-1:1989 linear tolerances

Values below are symmetrical deviations in millimetres for eligible dimensions without individual tolerance indications. Verify against the licensed standard and the forthcoming Edition 2.

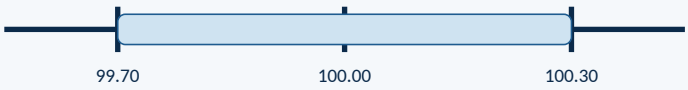
Nominal size range (mm)	f - fine	m - medium	c - coarse	v - very coarse
0.5 to 3	+/-0.05	+/-0.10	+/-0.20	-
over 3 to 6	+/-0.05	+/-0.10	+/-0.30	+/-0.50
over 6 to 30	+/-0.10	+/-0.20	+/-0.50	+/-1.00
over 30 to 120	+/-0.15	+/-0.30	+/-0.80	+/-1.50
over 120 to 400	+/-0.20	+/-0.50	+/-1.20	+/-2.50
over 400 to 1000	+/-0.30	+/-0.80	+/-2.00	+/-4.00
over 1000 to 2000	+/-0.50	+/-1.20	+/-3.00	+/-6.00
over 2000 to 4000	-	+/-2.00	+/-4.00	+/-8.00

FAST INTERPRETATION EXAMPLES

Drawing note	Nominal dimension	Applicable band	Acceptance limits
ISO 2768-m	25.0 mm	over 6 to 30: +/-0.20	24.80 to 25.20 mm
ISO 2768-m	250 mm	over 120 to 400: +/-0.50	249.50 to 250.50 mm
ISO 2768-c	1200 mm	over 1000 to 2000: +/-3.00	1197 to 1203 mm
ISO 2768-f	2500 mm	No f value in this range	Specify an individual tolerance

Example: 100 mm under class m

Class m for over 30 to 120 mm: +/-0.30 mm



04 BROKEN EDGES, CHAMFERS AND EXTERNAL RADII

Do not confuse edge-size tolerance with edge condition

The table controls the nominal height of a chamfer or the nominal external radius when no individual tolerance is shown. It does not define burr direction, sharp-edge removal, surface profile or cosmetic quality.

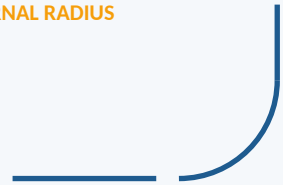
Nominal chamfer height / external radius (mm)	f / m	c / v
0.5 to 3	+/-0.20	+/-0.40
over 3 to 6	+/-0.50	+/-1.00
over 6	+/-1.00	+/-2.00

CHAMFER SIZE

2 x 45 deg

The 2 mm height may use the general broken-edge tolerance only when no individual tolerance is stated.

EXTERNAL RADIUS



R4

The radius size is covered; blend quality and tangent continuity are not automatically controlled.

UNSPECIFIED EDGE

BREAK SHARP EDGES

A workmanship note is needed. ISO 2768 does not define a universal burr or sharp-edge limit.

WHAT TO SPECIFY SEPARATELY

- Burr height and burr direction, especially for laser cutting, punching, machining and shearing.
- Minimum edge break or maximum sharp-edge radius where handling, sealing, coating or electrical clearance matters.
- Cosmetic blend, tangent continuity, polishing direction and whether tool marks are permitted.
- Internal fillets: the ISO 2768-1 broken-edge table is not a substitute for a functional internal radius requirement.

05 ANGULAR DIMENSIONS

Angular tolerance depends on the shorter side length

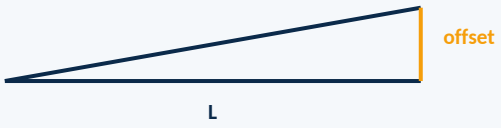
Use the length of the shorter angle leg, not the arc length or the longest overall part dimension. Convert the angle error to a linear offset when selecting an inspection method.

Shorter side length (mm)	f / m	c	v
up to 10	+/-1 deg	+/-1 deg 30 min	+/-3 deg
over 10 to 50	+/-0 deg 30 min	+/-1 deg	+/-2 deg
over 50 to 120	+/-0 deg 20 min	+/-0 deg 30 min	+/-1 deg
over 120 to 400	+/-0 deg 10 min	+/-0 deg 15 min	+/-0 deg 30 min
over 400	+/-0 deg 5 min	+/-0 deg 10 min	+/-0 deg 20 min

CONVERT ANGLE ERROR TO EDGE OFFSET

Delta ~= L x tan(angle error)

For small angles, radians give a quick approximation: Delta ~= L x alpha(rad).



Example	Result
100 mm leg, +/-0 deg 20 min	approx. +/-0.58 mm at the edge
400 mm leg, +/-0 deg 10 min	approx. +/-1.16 mm at the edge
20 mm leg, +/-2 deg	approx. +/-0.70 mm at the edge

INSPECTION RULE

A protractor may verify a loose angle, but a surface plate, height gauge, functional fixture or CMM is often better when the function is a linear offset at a defined distance. State the datum setup and measurement span.

06 CHOOSING F, M, C OR V

Select the loosest class that still protects function

A tighter general class increases inspection burden and scrap risk across every unspecified dimension - including dimensions that may not need that control.

f

FINE

Precision machining and controlled sheet-metal features where a broad drawing-wide fine class is proven necessary.

m

MEDIUM

Common default for general machined and formed dimensions when capability supports it.

c

COARSE

Fabricated, formed or non-critical dimensions where assembly and appearance allow larger variation.

v

VERY COARSE

Large, non-critical dimensions only; many small-size cells are not defined.

CLASS-SELECTION QUESTIONS

Question	Evidence needed	Decision impact
What fails if this dimension drifts?	Assembly stack, clearance, seal, load path, appearance zone	Critical features should receive individual controls.
What can the process hold across lots?	Capability study, tooling condition, material variation, operator method	Do not select a class from a single first-off part.
How will every unspecified size be measured?	Gauge list, setup time, access, uncertainty	A tight class can create hidden inspection cost.
Is the whole drawing one process family?	Machined, laser-cut, bent, welded and coated features identified	Mixed-process parts often need scoped notes or zone-specific requirements.

PRACTICAL DEFAULT

Start with class m only when the part family, size range and process capability justify it. Move critical dimensions to individual tolerances; relax the remaining drawing to c where function permits. Do not use class f as a generic signal for good quality.

07 WHAT ISO 2768-1 DOES NOT CONTROL

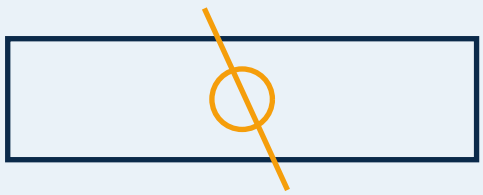
Size tolerance is not geometric tolerance

A dimension can be within its +/- limits while the surface is bowed, the hole axis is tilted, or the pattern is misplaced. Use ISO 1101 controls and a datum system when geometry matters.

Controlled by ISO 2768-1, when eligible	Not controlled by ISO 2768-1
Linear size between two opposed features or a stated linear dimension	Flatness, straightness, circularity and cylindricity
Angular size, with range selected by shorter side length	Parallelism, perpendicularity and angularity to datums
Nominal chamfer height and external radius under the broken-edge table	Position, coaxiality/concentricity concepts, symmetry and profile
Only dimensions without an individual tolerance	Run-out, total run-out, datum establishment and pattern relationship

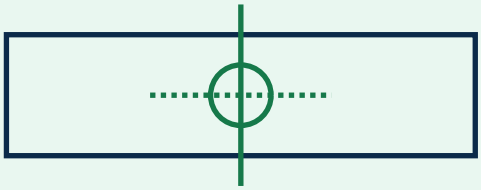
SAME SIZE - DIFFERENT GEOMETRY

SIZE ACCEPTABLE, GEOMETRY POOR



Hole diameter can pass; axis may still be tilted or misplaced.

SIZE AND GEOMETRY CONTROLLED



Size plus position/perpendicularity to the defined datums protects assembly.

GENERAL GEOMETRY

ISO 2768-2:1989 is withdrawn. New drawings should not assume its H, K or L classes remain a universal modern default. Define general geometrical specifications under ISO 22081 or apply explicit ISO 1101 controls to the features that need them.

08 MIGRATING LEGACY ISO 2768-MK DRAWINGS

Treat the change as an engineering review, not a text substitution

ISO 22081 provides rules for general geometrical and general size specifications; it is not a one-to-one table replacement for ISO 2768-2 classes.

1. **Inventory** — Find drawings using ISO 2768-mK, -fH, -cL or similar combined notes.
2. **Classify function** — Identify which legacy geometric defaults are actually required for assembly or inspection.
3. **Create datum strategy** — Define functional datums and the features that establish them.
4. **Specify geometry** — Use explicit ISO 1101 controls or a controlled company general GPS specification linked under ISO 22081.
5. **Validate** — Run fit, capability and inspection studies before revising production drawings.

TITLE-BLOCK MIGRATION EXAMPLE

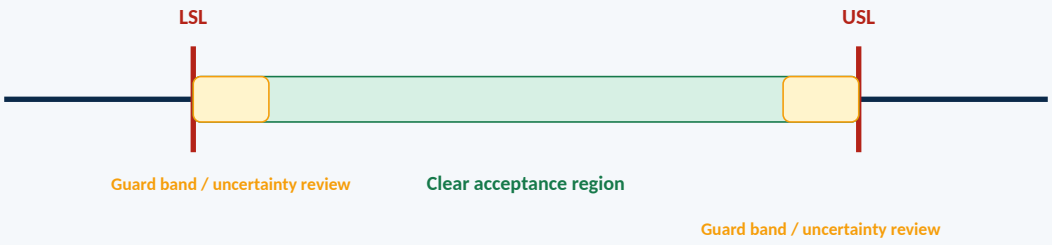
Legacy note	Risk	Controlled replacement
ISO 2768-mK	K is based on withdrawn ISO 2768-2 and may be interpreted inconsistently.	GENERAL SIZE TOLERANCES: ISO 2768-m. GENERAL GEOMETRICAL SPECIFICATIONS: [controlled document], applied per ISO 22081.
ISO 2768-m	Controls eligible sizes only; some teams incorrectly assume geometry is also covered.	Retain for sizes, then add explicit datum and geometric requirements where function demands them.

09 INSPECTION AND DECISION RULES

A tolerance is incomplete without an agreed verification method

Measurement uncertainty, temperature, part restraint, datum simulation and instrument resolution can change an apparent pass/fail result.

SPECIFICATION LIMITS AND GUARD BANDS



Characteristic	Typical method	Key setup controls
Linear size / thickness	Caliper, micrometer, height gauge, CMM	Contact points, force, cosine error, temperature, coating state
Large fabricated dimension	Tape, laser tracker, fixture, CMM	Support condition, sag, datum alignment, thermal expansion
Angle	Angle gauge, sine setup, height gauge, CMM	Shorter-side reference, measurement span, datum planes
Chamfer / radius	Optical comparator, radius gauge, CMM/profile scan	Nominal definition, edge break, burr, tangent points

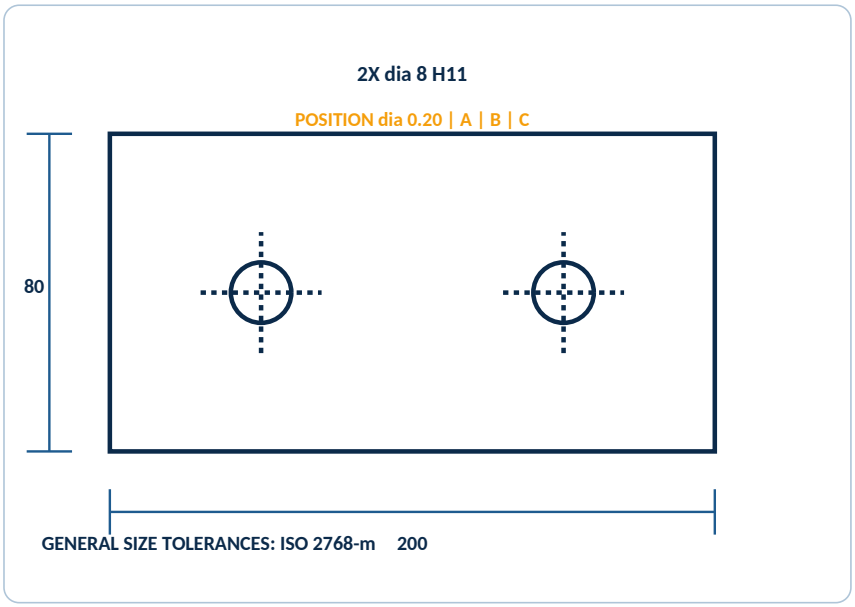
ISO 14253-1 PRINCIPLE

When a measured value lies close to a specification limit, conformity decisions should account for measurement uncertainty under the agreed rule. Define the default decision rule in the quality agreement or drawing package instead of debating borderline parts after production.

10 WORKED DRAWING REVIEW

Separate functional tolerances from general tolerances

The example below shows how a general class can simplify a drawing while critical interfaces retain individual controls.



Feature	Control
Overall 200 x 80	General class m: +/-0.5 for 200; +/-0.3 for 80
Hole diameter	Individual H11 size tolerance
Hole pattern	Individual position to A|B|C
Flatness / datum face	Specify explicitly if assembly requires it
Edge break	Separate workmanship note

COMMON ERRORS THAT CREATE SUPPLIER DISPUTES

- Applying ISO 2768-m to a reference dimension or to a dimension already controlled by limits or GD&T.
- Using the part overall length to select an angular tolerance instead of the shorter side of the angle.
- Assuming ISO 2768 controls flatness, hole position, perpendicularity or weld distortion.
- Calling out class f on a mixed-process welded and coated assembly without a capability study.
- Leaving the standard edition, exclusions, measurement condition or precedence unclear.
- Copying ISO 2768-mK into a new title block even though ISO 2768-2 is withdrawn.

11 RELEASE CHECKLIST AND REFERENCES

Twenty-four checks before a general tolerance note is approved

Use this page for drawing release, supplier handoff and template migration reviews.

- ☐ 01 Standard designation and edition/status verified
- ☐ 02 Part/process falls within the intended scope
- ☐ 03 General class selected from functional need
- ☐ 04 Process capability evidence reviewed
- ☐ 05 Every critical size individually toleranced
- ☐ 06 Fits and threads excluded from the general note
- ☐ 07 Reference/basic dimensions interpreted correctly
- ☐ 08 Dimensions below 0.5 mm individually controlled
- ☐ 09 Out-of-range dimensions individually controlled
- ☐ 10 Angular shorter-side length identified
- ☐ 11 Chamfer/radius note separated from burr control
- ☐ 12 Datum system defined for geometric requirements
- ☐ 13 Form/orientation/location not assumed covered
- ☐ 14 Legacy ISO 2768-2 note reviewed
- ☐ 15 ISO 22081/company GPS link controlled
- ☐ 16 Coating and heat treatment measurement state defined
- ☐ 17 Inspection method and access confirmed
- ☐ 18 Instrument resolution and uncertainty acceptable
- ☐ 19 Temperature/support/restraint conditions defined
- ☐ 20 Acceptance decision rule agreed
- ☐ 21 Supplier drawing and customer drawing consistent
- ☐ 22 FAI/sample plan identifies critical characteristics
- ☐ 23 Revision history records tolerance changes
- ☐ 24 Licensed standards available to responsible teams

OFFICIAL REFERENCES - STATUS CHECKED 18 JULY 2026

ISO 2768-1:1989 - General tolerances, Part 1. Published; expected to be replaced by ISO 2768 Edition 2. https://www.iso.org/standard/7748.html

ISO 2768 Edition 2 - Under publication; will replace ISO 2768-1:1989. https://www.iso.org/standard/85741.html

ISO 22081:2021 - General geometrical specifications and general size specifications; confirmed in 2026. https://www.iso.org/standard/72514.html

ISO 14405-1:2025 - Dimensional tolerancing, linear sizes. https://www.iso.org/standard/14405-1

ISO 8015:2011 - GPS fundamentals, concepts, principles and rules. https://www.iso.org/standard/55979.html

ISO 1101:2017 - Geometrical tolerancing symbol language and interpretation. https://www.iso.org/standard/66777.html

ISO 5459:2024 - Datums and datum systems. https://www.iso.org/standard/87855.html

ISO 14253-1:2017 - Decision rules for verifying conformity/nonconformity. https://www.iso.org/standard/70137.html