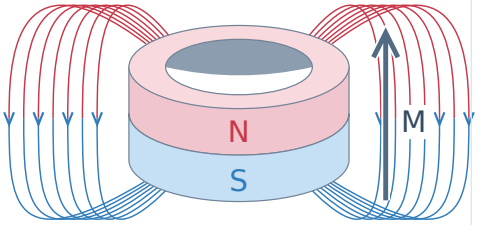
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# Magnet calculation report

MP 24/16x2 / N38
Generated: 15.11.2026 10:56:42
**Open the interactive calculator with this configuration →**

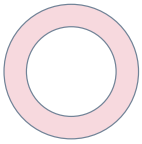
Scanning the code opens the interactive calculator with an identical set of parameters

3D schematic

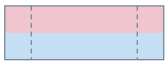



D 24 / d 16 / H 2 mm

Top view



Side view



H 2 mm

Red: N pole | Blue: S pole | M: magnetization S → N
External field: N → S. Pole colours are symbolic.
Not to scale; field paths are schematic, not a simulation.

| | |
|---|---|
| **Shape:** | ring |
| **Dimensions:** | ⌀24.0 / ⌀16.0 × 2.0 mm |
| **Grade:** | **N38** |
| Br: | 12.2-12.6 kGs |
| Hcb: | 860-915 kA/m |
| BHmax: | 287-303 kJ/m³ |
| Temperature: | **≤ 80 °C** |

## Catalog data

### MP 24x16x2 / N38 - ring magnet

| | | | |
|---|---|---|---|
| Catalog number | **030495** | Induction | **101.91 mT / 1,019 Gs** |
| GTIN / EAN | **5906301812364** | Coating | **[NiCuNi] Nickel** |
| Dimensions | **⌀24.0 / ⌀16.0 × 2.0 mm** | Grade | **N38** |
| Magnetization direction | **axial** | | |

https://dhit.pl/en/product/ring-magnet-24x16x2-n38-axial

## Calculation result

| **N/D** | **-484** Gs | **3.77** g | **0.173** Pc |
|---|---|---|---|
| PULL FORCE | BZ (Z = 0,01 MM) | MAGNET MASS | PERMEANCE COEFF. |

*Range resulting from material tolerance: Bz -491.79 – -476.17 Gs*

*Pull force unavailable: axial field in the bore is not the field across the annular pole face. A product measurement is required.*

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### Key takeaways for the designer

**1.** Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

**2.** Bz describes a point on the axis in air; field sign is not force sign.

**3.** The Br interval is a material tolerance, not evidence of measurement accuracy.

**4.** Check temperature, coating and actual mounting for the specific product.

## Model methodology and validation

Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

The k_cal = 1.4837 calibration for solid flat pole faces is not applied here to determine pull force.

Cylinder axial field; z measured from the face

$$B_c(R,H,z) = \frac{B_r}{2}\left[\frac{H+z}{\sqrt{R^2+(H+z)^2}} - \frac{z}{\sqrt{R^2+z^2}}\right]$$

Ring — signed difference of two cylinder fields

$$B_z(z) = B_c(R_o,H,z) - B_c(R_i,H,z)$$

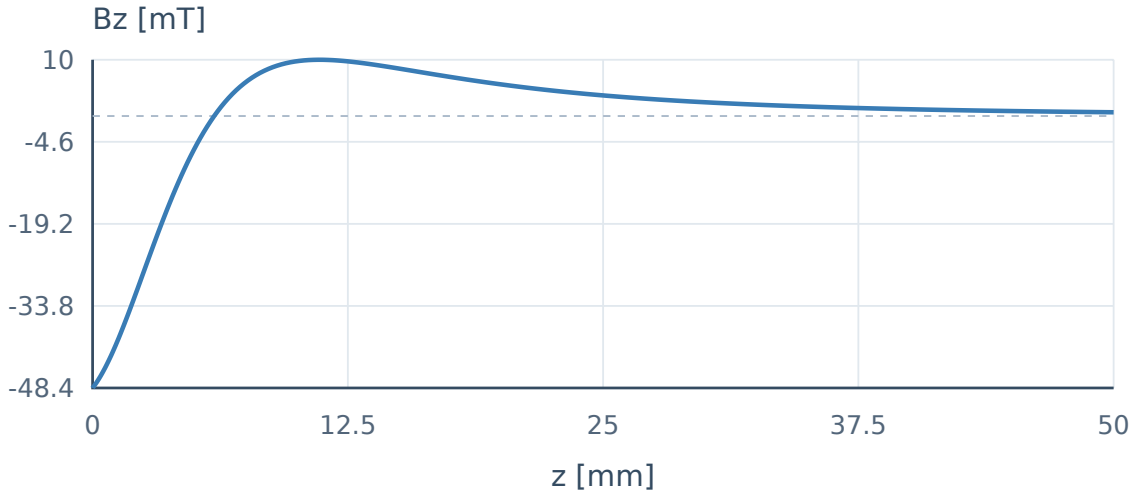
Permeance coefficient — geometry approximation

$$P_c = \frac{1.7\,k}{1+0.9\,k};\ k = \frac{H}{D_e}$$

Equivalent diameter for permeance

$$D_e = 2\sqrt{R_o^{\,2} - R_i^{\,2}}$$

## Force and induction vs. distance




| z [mm] | Bz [Gs] | Bz [mT] |
|---|---|---|
| 0.00 | -484.45 | -48.445 |
| 0.01 | -483.98 | -48.398 |
| 1.00 | -419.11 | -41.911 |
| 2.00 | -327.66 | -32.766 |
| 3.00 | -228.13 | -22.813 |
| 5.00 | -57.35 | -5.735 |
| 10.00 | 97.59 | 9.759 |
| 15.00 | 84.53 | 8.453 |
| 20.00 | 56.33 | 5.633 |
| 30.00 | 24.46 | 2.446 |
| 50.00 | 6.65 | 0.665 |

z is measured from the sphere pole surface or the top plane of the ring. A negative Bz indicates direction, not a negative pull force.

## Shear force (sliding)

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Effect of steel thickness

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Demagnetisation curve and operating point

Pc is exactly 2 for a uniformly magnetized sphere; for a ring it is a geometry approximation. The air operating point below is a linear model, not a measured B–H curve. The steel-contact operating point of a cylinder is not transferred.

| Pc | Bd [T] | \|Hd\| [kA/m] |
|---|---|---|
| 0.173 | 0.175 | 807.041 |

## Force loss vs. temperature

| T [°C] | Br [T] | Bz [Gs] | Ideal model [kg] | Scope |
|---|---|---|---|---|
| 20 | 1.240 | -483.98 | Not applicable / no validated model. | Reversible model |
| 40 | 1.213 | -473.33 | Not applicable / no validated model. | Reversible model |
| 60 | 1.185 | -462.68 | Not applicable / no validated model. | Reversible model |
| 80 | 1.158 | -452.04 | Not applicable / no validated model. | Reversible model |
| 100 | Not applicable / no validated model. | Not applicable / no validated model. | Not applicable / no validated model. | Outside catalogue limit |

Constant geometry; Br coefficient −0.11%/K as in the web model. Above the grade limit, extrapolation is not published as an allowable result.

## Extended thermal analysis

No validated irreversible-loss model for this configuration. Temperature limit from the grade-properties export: 80.0 °C.

## Sensitivity and tolerance analysis

| Br bound | Br [T] | Bz [Gs] |
|---|---|---|
| min | 1.220 | -476.17 |
| avg | 1.240 | -483.98 |
| max | 1.260 | -491.79 |

This range comes from the specified Br interval; it is not a statistical confidence interval or measurement accuracy.

## Comparison of calculation methods

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Axial field thresholds — not safe clearances

Axial field thresholds are not safety clearances. Implant manufacturer guidance and medical advice apply; no safe distance is determined here.

Ring axial field need not decrease monotonically. Neither the first threshold crossing nor the sign of Bz is used to assess reach.

## Magnetic flux

| Parameter | Value |
|---|---|
| m | 0.496000 A·m² |
| V | 0.503 cm³ |
| Mass | 3.770 g |
| Pc | 0.173 |

m = (Br/μ0)·V. Pole-face flux is not replaced by bore field times annulus area, or by a sphere great-circle area.

## Attraction dynamics

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Force vs. load angle

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Typical mounting scenarios

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## How many magnets do I need?

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Load direction vs. real holding force

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Grade comparison

| Grade | Br [T] | Bz [Gs] |
|---|---|---|
| N35 | 1.190 | -464.46 |
| N38 | 1.240 | -483.98 |
| N42 | 1.305 | -509.35 |
| N45 | 1.345 | -524.96 |
| N48 | 1.395 | -544.48 |
| N52 | 1.445 | -563.99 |

Same geometry and uniform axial magnetization; no product specifications are changed.

## Two magnets — attraction and repulsion

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Magnet stack

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Additional parameters

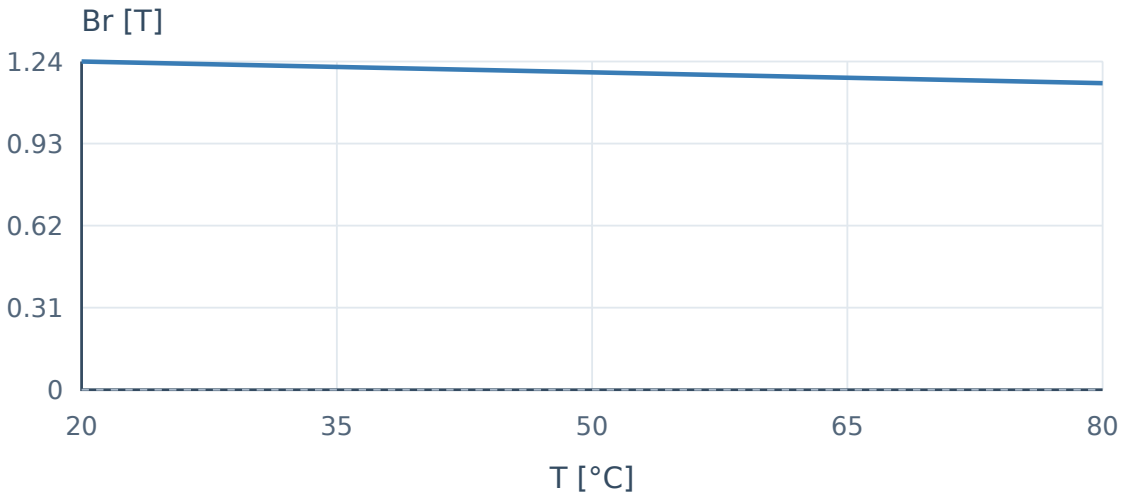
| Parameter | Value |
|---|---|
| m | 0.496000 A·m² |
| V | 0.503 cm³ |
| Mass | 3.770 g |
| Pc | 0.173 |

Not applicable / no validated model. Contact pressure and frictional holding torque are not calculated.

## Engineering indicators

Compare mass, geometry, magnetic moment and Bz. Do not use force/mass or force/price indicators without a validated contact-force rating.

## Temperature derating curve




Reversible Br change only, at constant geometry up to the catalogue temperature limit. This is not an irreversible-demagnetization model.

## Steel thickness effect curve

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## Ageing and long-term stability

Percentage pull-force losses are not presented as long-term measurements for this geometry. Durability also depends on coating, environment, temperature and damage.

## Recommended safety factors

Not applicable / no validated model. Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

## How to use this data in practice

1. Check grade and dimensions. 2. Establish contact and loading direction. 3. For an unavailable result, measure the actual part rather than using zero. 4. Check magnet temperature and coating condition.

## Material data sources

Grade properties come from the same properties.json export as the web calculator. Sphere equations match the separate JS fieldAt/pullForce model; the ring model superposes two cylinders. This is not independent measurement validation.

## Production repeatability

The Br interval describes material tolerance. Idealized values and model fitting do not replace checks of the actual specimen and tests on the intended surface.

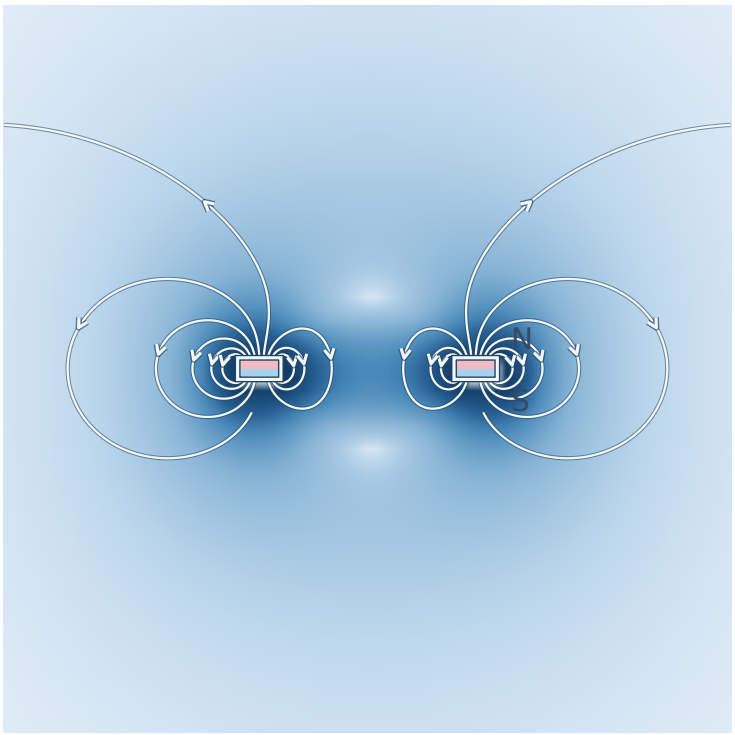
## Reference conditions

Axial Bz is the field in the bore, not the field distribution across the annular pole face. Substituting it into Maxwell pressure does not yield a valid pull-force rating.

Field: uniform axial magnetization in air, without steel or a housing. The sphere model does not use cylinder calibration; the ring model does not determine pull force.

## Calculated field in air — axial magnetization

Field in air | B [mT] | axial magnetization




B [mT]

- < 1
- 1–5
- 5–20
- 20–50
- 50–100
- 100–300
- ≥ 300

M: S → N

Red: N

Blue: S

Interpolated colours

x: −33.6 … +33.6 mm; z: −33.6 … +33.6 mm

J ≈ Br = 1.24 T; uniform magnetization; no steel or housing.

Calculated lines N → S outside. Not a pull-force or safety-clearance model.

## Magnet grades and catalogue temperature limits

## Family N

| Grade | Br [kGs] | Hcj [kA/m] | T [°C] |
|---|---|---|---|
| **N30** | 10.8-11.2 | ≥ 955 | ≤ 80 |
| **N33** | 11.4-11.7 | ≥ 955 | ≤ 80 |
| **N35** | 11.7-12.1 | ≥ 955 | ≤ 80 |
| **N38** | 12.2-12.6 | ≥ 955 | ≤ 80 |
| **N40** | 12.6-12.9 | ≥ 955 | ≤ 80 |
| **N42** | 12.9-13.2 | ≥ 955 | ≤ 80 |
| **N45** | 13.2-13.7 | ≥ 955 | ≤ 80 |
| **N48** | 13.7-14.2 | ≥ 955 | ≤ 80 |
| **N50** | 14-14.6 | ≥ 955 | ≤ 60 |
| **N52** | 14.2-14.7 | ≥ 955 | ≤ 60 |
| **N54** | 14.5-15.1 | ≥ 955 | ≤ 60 |

## Family M

| Grade | Br [kGs] | Hcj [kA/m] | T [°C] |
|---|---|---|---|
| **N30M** | 10.8-11.2 | ≥ 1114 | ≤ 100 |
| **N33M** | 11.4-11.7 | ≥ 1114 | ≤ 100 |
| **N35M** | 11.7-12.1 | ≥ 1114 | ≤ 100 |
| **N38M** | 12.2-12.6 | ≥ 1114 | ≤ 100 |
| **N40M** | 12.6-12.9 | ≥ 1114 | ≤ 100 |
| **N42M** | 12.9-13.2 | ≥ 1114 | ≤ 100 |
| **N45M** | 13.2-13.7 | ≥ 1114 | ≤ 100 |
| **N48M** | 13.7-14.2 | ≥ 1114 | ≤ 100 |
| **N50M** | 14-14.6 | ≥ 1114 | ≤ 100 |

## Family H

| Grade | Br [kGs] | Hcj [kA/m] | T [°C] |
|---|---|---|---|
| **N27H** | 10.2-10.6 | ≥ 1353 | ≤ 120 |
| **N30H** | 10.8-11.2 | ≥ 1353 | ≤ 120 |
| **N33H** | 11.4-11.7 | ≥ 1353 | ≤ 120 |
| **N35H** | 11.7-12.1 | ≥ 1353 | ≤ 120 |
| **N38H** | 12.2-12.6 | ≥ 1353 | ≤ 120 |
| **N40H** | 12.6-12.9 | ≥ 1353 | ≤ 120 |
| **N42H** | 12.9-13.2 | ≥ 1353 | ≤ 120 |
| **N44H** | 13.2-13.6 | ≥ 1353 | ≤ 120 |
| **N48H** | 13.7-14.2 | ≥ 1353 | ≤ 120 |

## Family SH

| Grade | Br [kGs] | Hcj [kA/m] | T [°C] |
|---|---|---|---|
| **N27SH** | 10.2-10.6 | ≥ 1592 | ≤ 150 |
| **N30SH** | 10.8-11.2 | ≥ 1592 | ≤ 150 |
| **N33SH** | 11.4-11.7 | ≥ 1592 | ≤ 150 |
| **N35SH** | 11.7-12.1 | ≥ 1592 | ≤ 150 |
| **N38SH** | 12.2-12.6 | ≥ 1592 | ≤ 150 |
| **N40SH** | 12.6-12.9 | ≥ 1592 | ≤ 150 |
| **N42SH** | 12.9-13.2 | ≥ 1592 | ≤ 150 |
| **N45SH** | 13.2-13.7 | ≥ 1592 | ≤ 150 |

## Family UH

| Grade | Br [kGs] | Hcj [kA/m] | T [°C] |
|---|---|---|---|
| **N25UH** | 9.8-10.2 | ≥ 1990 | ≤ 180 |
| **N28UH** | 10.4-10.8 | ≥ 1990 | ≤ 180 |
| **N30UH** | 10.8-11.2 | ≥ 1990 | ≤ 180 |
| **N33UH** | 11.4-11.7 | ≥ 1990 | ≤ 180 |
| **N35UH** | 11.7-12.1 | ≥ 1990 | ≤ 180 |
| **N38UH** | 12.2-12.6 | ≥ 1990 | ≤ 180 |
| **N40UH** | 12.6-12.9 | ≥ 1990 | ≤ 180 |

## Family EH

| Grade | Br [kGs] | Hcj [kA/m] | T [°C] |
|---|---|---|---|
| **N25EH** | 9.8-10.2 | ≥ 2388 | ≤ 200 |
| **N28EH** | 10.4-10.8 | ≥ 2388 | ≤ 200 |
| **N30EH** | 10.8-11.2 | ≥ 2388 | ≤ 200 |
| **N33EH** | 11.4-11.7 | ≥ 2388 | ≤ 200 |
| **N35EH** | 11.7-12.1 | ≥ 2388 | ≤ 200 |
| **N38EH** | 12.2-12.5 | ≥ 2388 | ≤ 200 |
| **N40EH** | 12.5-12.8 | ≥ 2388 | ≤ 200 |
| **N42EH** | 12.8-13.2 | ≥ 2388 | ≤ 200 |

## Family AH

| Grade | Br [kGs] | Hcj [kA/m] | T [°C] |
|---|---|---|---|
| **N28AH** | 10.4-10.8 | ≥ 2624 | ≤ 230 |
| **N30AH** | 10.8-11.3 | ≥ 2624 | ≤ 230 |
| **N33AH** | 11.3-11.7 | ≥ 2624 | ≤ 230 |
| **N35AH** | 11.7-12.2 | ≥ 2624 | ≤ 230 |
| **N38AH** | 12.2-12.5 | ≥ 2624 | ≤ 230 |
| **N40AH** | 12.5-12.8 | ≥ 2624 | ≤ 230 |

***N M H SH UH EH AH***

*Colours identify material families, not pull force. The number denotes an energy grade; the suffix distinguishes coercivity and temperature classes. Check the temperature limit of the selected product; N50/N52/N54 in this catalogue are limited to 60°C.*

*Catalogue limits are not a guarantee for every geometry. Coating, magnetic circuit and actual magnet temperature matter. Colour halves illustrate magnetization, not two separate magnets.*

## Coatings: selection and limitations

| Coating / encapsulation | Purpose | Limitations |
|---|---|---|
| Ni-Cu-Ni (standard) | General-purpose metallic finish for dry indoor use. | Do not assume protection during permanent immersion. Damage exposes the core. |
| Ni-Cu-Ni-Au (gold) | Thin decorative gold finish over a nickel-based coating. | Can wear off; gold colour does not prove biocompatibility or suitability for medical use. |
| Ni-Cu-Ni-Cr (chrome) | Metallic finish used where surface wear matters. | Not a guarantee of water resistance; check the individual specification. |
| Ni-Cu (copper) | Copper-coloured finish, mainly decorative. | May darken and wear; not a substitute for an environmental barrier. |
| Epoxy (resin) | Polymer barrier for applications exposed to moisture. | Protection depends on an intact coating; scratches and impacts can expose the core. |
| Rubber coated | Protects the mating surface and can increase friction. | Adds a gap and can reduce pull force; friction and sealing depend on the actual construction. |
| Plastic overmolding | Encapsulation can isolate the magnet from its surroundings. | Wall thickness adds a gap. Do not assume a watertight assembly without a product specification. |

*General selection guide, not the coating specification of the calculated magnet. Check the product card. No coating changes the NdFeB grade or increases its temperature rating. Coating thickness, added gaps and friction require product-specific data; this table does not change the calculation.*

*DHIT technology: coatings and working conditions*

## Scope and limitations

Friction, steel-thickness response, housing gains, ageing, irreversible thermal loss and market comparisons are illustrative scenarios, not measured product specifications. Catalogue fitting is not independent validation. Axial field thresholds are not safe clearances for medical implants. Consult the implant manufacturer; do not use these tables to assess personal safety. Impact energy is an idealized mechanical scenario, not an injury prediction. The basic temperature table shows reversible force change (Br squared); the extended table adds an unvalidated irreversible-loss scenario. Above Tmax, neither table authorizes operation.

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