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Magnet calculation report

MW 8x4 / N38
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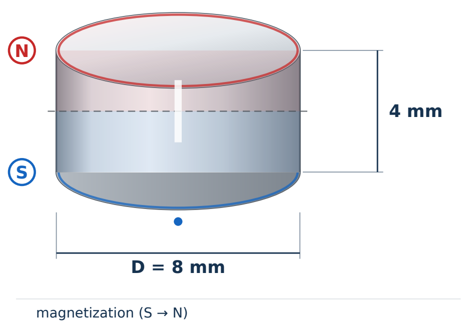
https://dhit.pl/en/magnet-calculator/?shape=disc&mat=4&dia=8&h=4&prec=2



Shape:	disc
Dimensions:	⌀8,0 × 4,0 mm
Grade:	**N38**
Br:	12.2-12.6 kGs
Hcb:	860-915 kA/m
BHmax:	287-303 kJ/m³
Temperature:	**≤ 80 °C**

Catalog data

MW 8x4 / N38 - cylindrical magnet

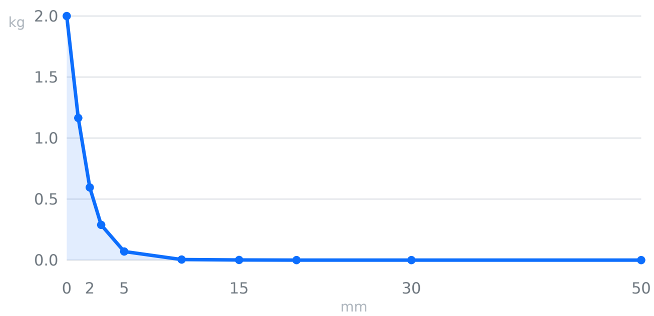
Catalog number	**010104**	Induction	**437,78 mT / 4 378 Gs**
GTIN / EAN	**5906301811039**	Coating	**[NiCuNi] Nickel**
Dimensions	**⌀8,0 × 4,0 mm**	Grade	**N38**
Magnetization direction	**axial**		

https://dhit.pl/en/product/magnes-neodymowy-walcowy-8x4-n38-osiowy

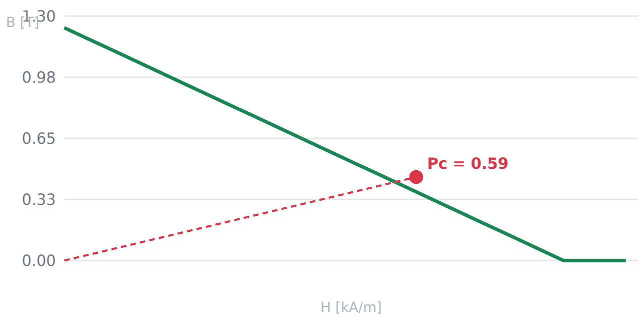
Calculation result

2,04 kg	**4 374** Gs	**1,51** g	**0,59** Pc
PULL FORCE	SURFACE INDUCTION	MAGNET MASS	PERMEANCE COEFF.

Range resulting from material tolerance: 1,98 – 2,11 kg



Force vs. distance



B-H demagnetization curve

Force and induction vs. distance

Distance	Gauss	mT	kg	lbs	N	Force share
0 mm	4 374	437,4	**2,04**	4,50	20,0	100%
1 mm	3 338	333,8	**1,19**	2,62	11,7	58%
2 mm	2 386	238,6	**0,61**	1,34	6,0	30%
3 mm	1 663	166,3	**0,30**	0,65	2,9	14%
5 mm	824	82,4	**0,07**	0,16	0,7	4%
10 mm	205	20,5	**0,00**	0,01	0,0	0%
15 mm	76	7,6	**0,00**	0,00	0,0	0%
20 mm	36	3,6	**0,00**	0,00	0,0	0%
30 mm	12	1,2	**0,00**	0,00	0,0	0%
50 mm	3	0,3	**0,00**	0,00	0,0	0%

Shear force (sliding)

Surface	Friction	kg	N
Bare steel	0,30	**0,61**	6,0
Painted steel	0,20	**0,41**	4,0
Oily surface	0,10	**0,20**	2,0
Rubber coating	0,50	**1,02**	10,0

Effect of steel thickness

Thickness	Utilisation	Force
0,5 mm	10%	**0,20 kg**
1,0 mm	25%	**0,51 kg**
2,0 mm	50%	**1,02 kg**
3,0 mm	75%	**1,53 kg**
5,0 mm	100%	**2,04 kg**
8,0 mm	100%	**2,04 kg**
10,0 mm	100%	**2,04 kg**
12,0 mm	100%	**2,04 kg**

Force loss vs. temperature

Temperature	Loss	Force	%
20 °C	0,0%	**2,04 kg**	100%
40 °C	-2,2%	**2,00 kg**	98%
60 °C	-4,4%	**1,95 kg**	96%
80 °C	**-6,6%**	**1,91 kg**	93%
100 °C	**-28,8%**	**1,45 kg**	71%

Safe distances (health & safety)

	Gs	cm
Pacemaker	< 5	**4,2**
Hearing aid	< 10	**3,2**
Watch	< 20	**2,6**
Phone	< 40	**2,0**
Payment card	< 400	**0,8**
HDD drive	< 600	**0,6**

Magnetic flux

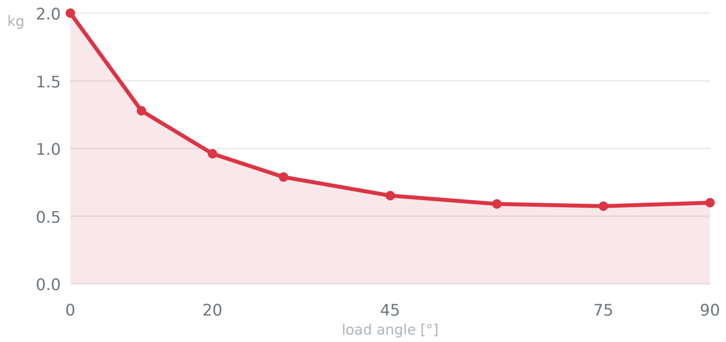
Φ	**2 233 Mx**
Φ (SI)	**22,3 µWb**
Bd	**4 443 Gs**
Pc	**0,59**
A	**0,50 cm²**
V	**0,20 cm³**

Attraction dynamics

Release distance	Speed	km/h	Energy	Risk
10 mm	10,32 m/s	37,2	**0,08 J**	Safe
30 mm	17,85 m/s	64,3	**0,24 J**	Safe
50 mm	23,05 m/s	83,0	**0,40 J**	Safe
100 mm	32,59 m/s	117,3	**0,80 J**	Safe

How fast the magnet will hit a steel plate if released from a given distance. Above 5 J the risk of crushed fingers is real – hold the magnet from the side, never between the magnet and the steel.

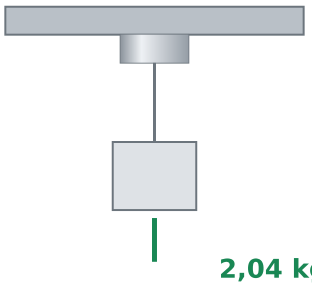
Force vs. load angle



Angle	Capacity	%
0°	**2,04 kg**	100%
10°	**1,31 kg**	64%
20°	**0,98 kg**	48%
30°	**0,81 kg**	39%
45°	**0,67 kg**	33%
60°	**0,60 kg**	30%
75°	**0,59 kg**	29%
90°	**0,61 kg**	30%

The chart shows how much the magnet will really hold depending on the direction of the load. 0° means pulling straight off the surface (catalogue value), 90° means dragging along the plate. The drop is steep — at just 30° you lose half the holding force.

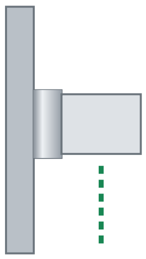
Typical mounting scenarios



2,04 kg

Ceiling

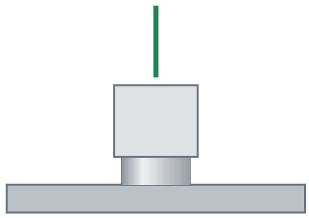
The load hangs vertically below the magnet — perpendicular pull, full catalogue force.



0,61 kg

Vertical wall

The load tries to slide the magnet down the plate — only friction works, capacity drops to about 30%.



2,04 kg

Floor / horizontal

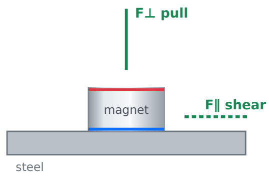
The magnet sits on a horizontal plate, load acts upward — full perpendicular force.

How many magnets do I need?

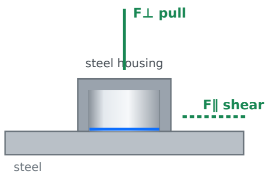
Mass to hold	**10,0 kg**	Load direction	**perpendicular (pull-off)**
Safety margin	**2,0×**	Capacity of one magnet	**2,04 kg**
Magnets required	**10**	Total set capacity	**20,42 kg (2,0×)**

The calculation accounts for the load direction and the chosen safety margin. For applications where mounting failure would be dangerous, use a margin of at least 3×.

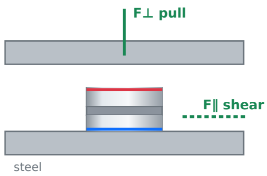
Load direction vs. real holding force



Bare magnet
magnet without housing
F⊥ pull: **2,04 kg**
F∥ shear: **0,61 kg**



Single-sided pot
magnet in steel housing
F⊥ pull: **4,49 kg**
F∥ shear: **1,35 kg**



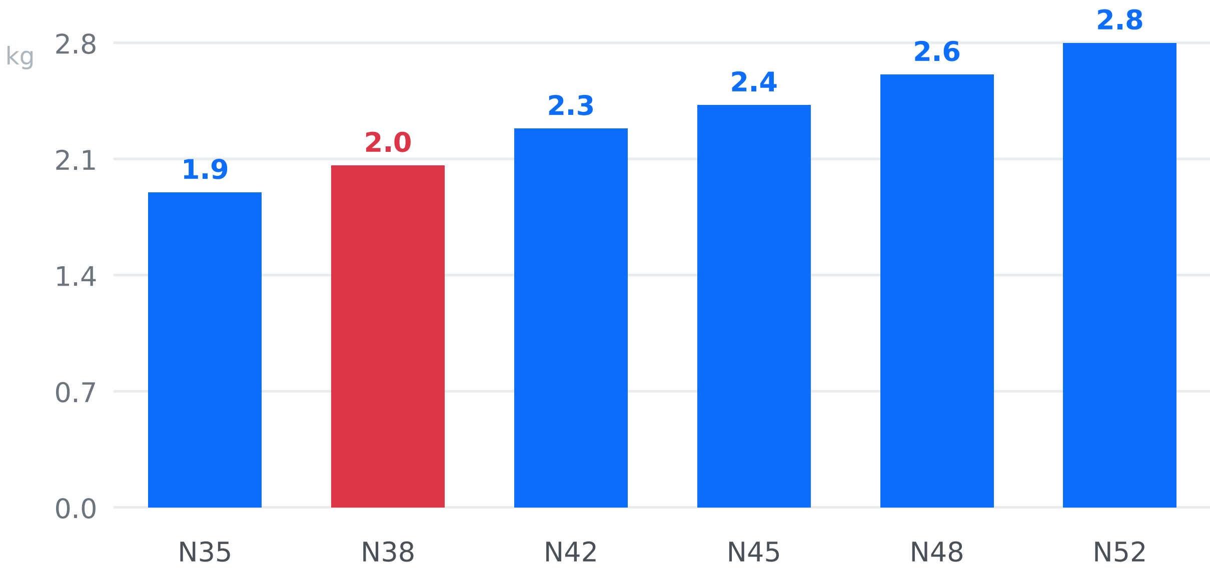
Double-sided pot
two magnets, shared housing
F⊥ pull: **4,04 kg**
F∥ shear: **1,21 kg**

Mounting variant	Perpendicular force (pull)	Parallel force (shear)	Share
Bare magnet	**2,04 kg**	0,61 kg	30%
Single-sided pot	**4,49 kg**	1,35 kg	30%
Double-sided pot	**4,04 kg**	1,21 kg	30%

Perpendicular force is the catalogue value — measured when pulling the magnet straight off the surface. Parallel force (shear) applies when the load tries to slide the magnet along the plate and is only a fraction of the former. Values for bare steel, friction coefficient 0.30.

> **When designing a mounting, always check which way the load acts. A magnet rated at 100 kg will hold a vertically suspended weight of around 30 kg — and that is without any safety margin.**

Grade comparison



The same magnet made from different NdFeB grades. A higher class means greater pull force at identical dimensions.

Two magnets — attraction and repulsion

Gap	Attraction	Repulsion
0 mm	**2,04 kg**	1,84 kg
1 mm	**1,19 kg**	1,07 kg
2 mm	**0,61 kg**	0,55 kg
3 mm	**0,30 kg**	0,27 kg
5 mm	**0,07 kg**	0,07 kg
10 mm	**0,00 kg**	0,00 kg
20 mm	**0,00 kg**	0,00 kg
30 mm	**0,00 kg**	0,00 kg

Magnet stack

Quantity	Stack pull force	Gain
1	**2,04 kg**	×1,00
2	**2,03 kg**	×1,00
3	**1,67 kg**	×0,82
5	**1,30 kg**	×0,64
10	**1,15 kg**	×0,57

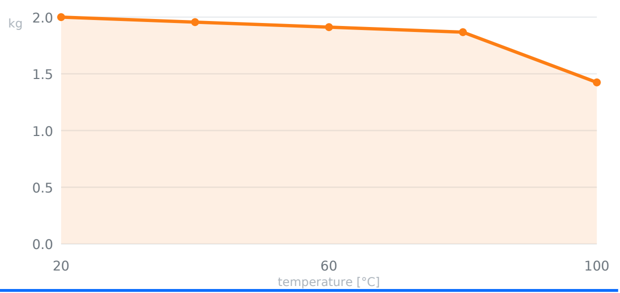
Stacking magnets increases pull force only up to a point. The optimum is usually at a height of 0.6–0.8 of the diameter — beyond that the force starts to fall, even though you keep adding material. Our warehouse measurements confirm this: a ⌀10 mm magnet peaks at 8 mm height (3.39 kg), while at 15 mm it holds only 2.61 kg.

Additional parameters

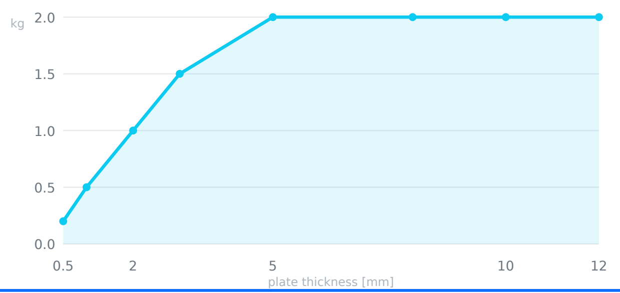
0,02 N·m	**0,03** J	**1,12** kg	**398** kPa
ROTATION RESISTANCE TORQUE	DETACHMENT WORK	CAPACITY AT PLATE EDGE	UNIT PRESSURE

A magnet placed right at the plate edge loses part of the flux and holds weaker. Resistance the magnet offers when you try to rotate it on the steel surface.

Temperature derating curve



Steel thickness effect curve



Reference conditions

Magnetization direction: axial · Poles are on the end faces, the field runs along the dimension **4,0 mm**

Pull force is calculated for a plate of non-alloy structural steel (S235 / A36) at least 10 mm thick, with a smooth, clean and degreased surface, zero air gap and force acting perpendicular to the surface. Austenitic stainless steel (304, 316) is non-magnetic — a magnet will not stick to it.

Values are calculated from a physical model calibrated against 127 measured products. They are estimates for design purposes — always apply a safety margin.