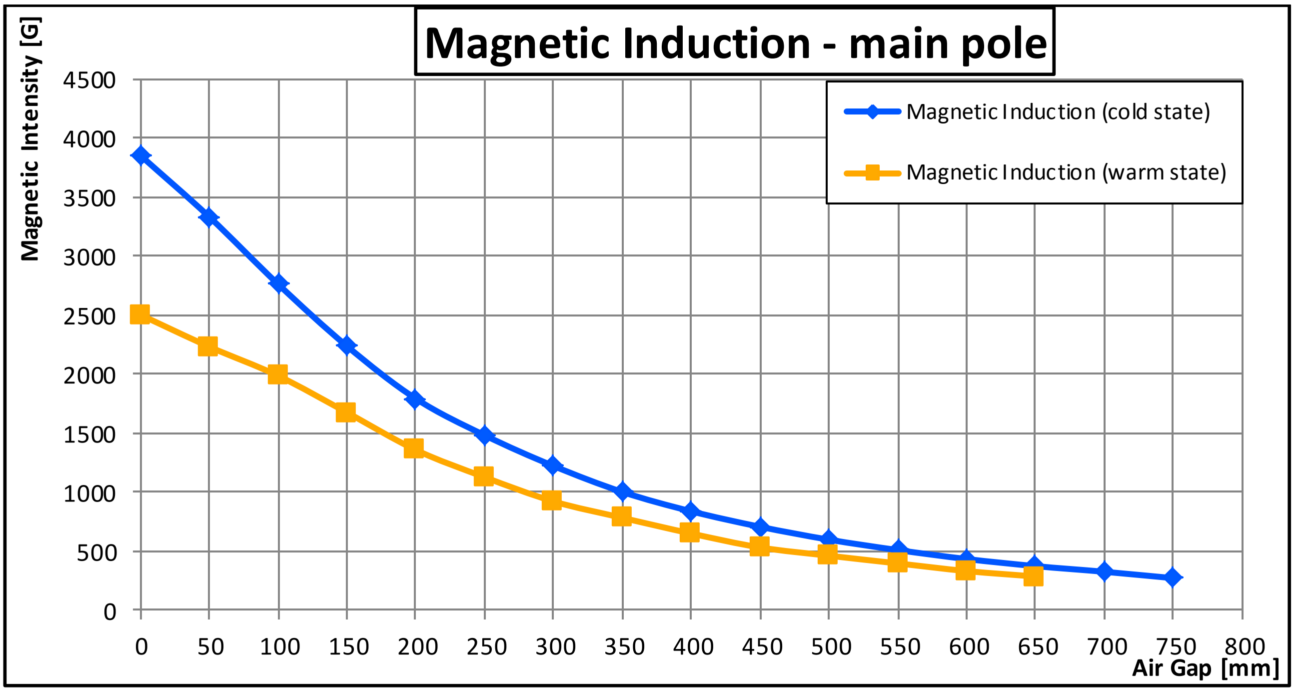
| | |
|---|---|
| Test engineer | Jiří Semerád |
| Test date | 24-4-2018 |
| ERP reference | 18OP010100000144 |
| Product key | ROE-08-C-140-W-G-L-B-B-B-B-NA |
| Object of test | SEEB140022 |
| Magnet type | Electromagnet - main p. |
| Tesla meter | Tesla meter type: HGM09s, ser. number: 01113110 |
| Tesla meter probe | HGM.T02.45.35.6., s.n.: 151113046 |

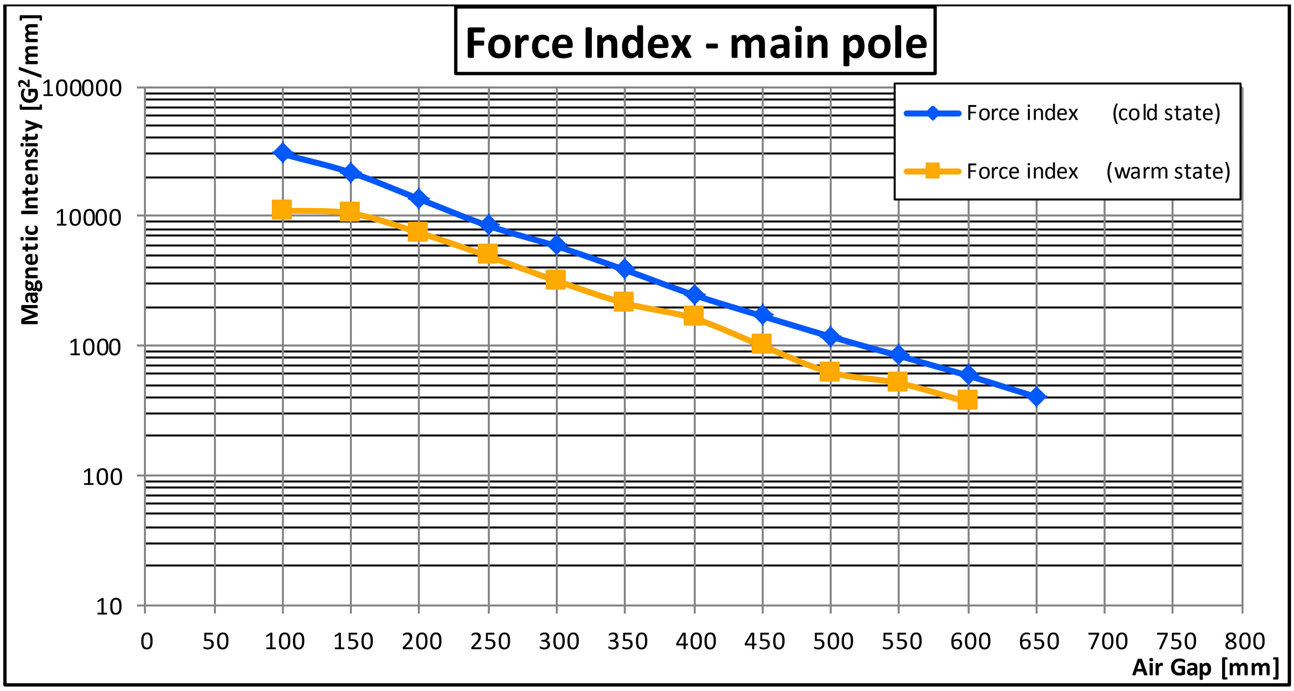
| State | Cold | | Warm | |
|---|---|---|---|---|
| Ambient temperature | 20 | [C°] | 20 | [C°] |
| Oil temperature | 23 | [C°] | 93,4 | [C°] |
| Coil voltage | 223 | [V] | 233 | [V] |
| Coil current | 44 | [A] | 31,6 | [A] |
| Power | 9,81 | [kW] | 7,3628 | [kW] |

| Air gap | Magnetic Induction (cold state) | Force index (cold state) | Magnetic Induction (warm state) | Force index (warm state) |
|---|---|---|---|---|
| [mm] | [Gauss] | [Gauss²/mm] | [Gauss] | [Gauss²/mm] |
| 0 | 3850 | | 2500 | |
| 50 | 3330 | 36297 | 2230 | 11507 |
| 100 | 2760 | 30222 | 1984 | 11051 |
| 150 | 2235 | 21680 | 1673 | 10506 |
| 200 | 1790 | 13515 | 1356 | 7431 |
| 250 | 1480 | 8436 | 1125 | 4905 |
| 300 | 1220 | 5856 | 920 | 3165 |
| 350 | 1000 | 3840 | 781 | 2124 |
| 400 | 836 | 2466 | 648 | 1626 |
| 450 | 705 | 1692 | 530 | 996 |
| 500 | 596 | 1174 | 460 | 621 |
| 550 | 508 | 833 | 395 | 514 |
| 600 | 432 | 588 | 330 | 366 |
| 650 | 372 | 402 | 284 | |
| 700 | 324 | | | |
| 750 | 270 | | | |
| 800 | | | | |
| 850 | | | | |
| 900 | | | | |

| Test objects | Cold | | Warm | |
|---|---|---|---|---|
| Ball Ø 25 mm. | 370 | [mm] | 310 | [mm] |
| Hex nut M16 (DIN934) | - | [mm] | - | [mm] |
| Hex nut M30 (DIN934) | - | [mm] | - | [mm] |
| Nail Ø 2,5 x 63 mm. | 820 | [mm] | 760 | [mm] |
| Rod Ø 15x75 mm (VDE 0580) | 700 | [mm] | 650 | [mm] |
| Rod Ø 20x120 mm (VDE 0580) | - | [mm] | - | [mm] |
| Hex bolt M20x50 | - | [mm] | - | [mm] |

| | | | | |
|---|---|---|---|---|
| Distance of 400 gauss | 620 | [mm] | 540 | [mm] |
| Max [Gauss] | - | [mm] | - | [mm] |



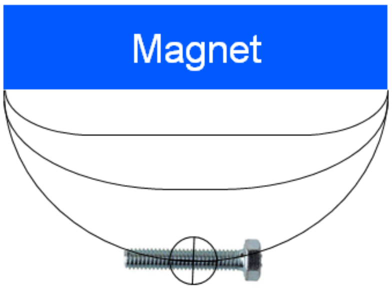



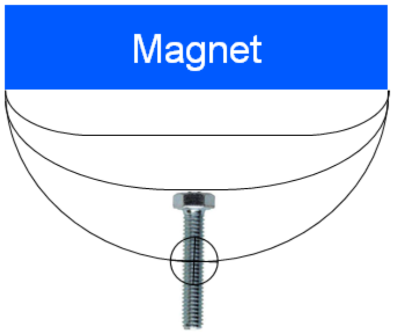

**Notes:**

- Flux density values measured from magnet (from wear plate = 0 mm)

## Orientation:

When measuring a magnet, the orientation of the particle to be caught is very important. We believe that, placing the particle **always** horizontal, and the **centre** of the particle being zero, will give the most representative situation in comparison to the field. A bolt for example can be placed horizontally or vertically. The vertical situation is way easier to catch, but very unlikely to occur in practice.




## Size, shape and material:

The main factor that determines the type of magnet required, is the amount of Force Index (Gauss $^2$/mm) that is needed to remove a target size and shape of ferrous from a burden of product material travelling at a certain belt speed.

### Size

The size of an object is far less important than the shape of a ferrous particle to be caught. Theoretically the shape determines the catching distance. However, in the field, a ferrous particle is most likely underneath some material or some material sticks to it, making it heavier. This negatively affects the catching distance. This phenomenon will play a larger role with small sized particles compared to large sized particles.

### Shape

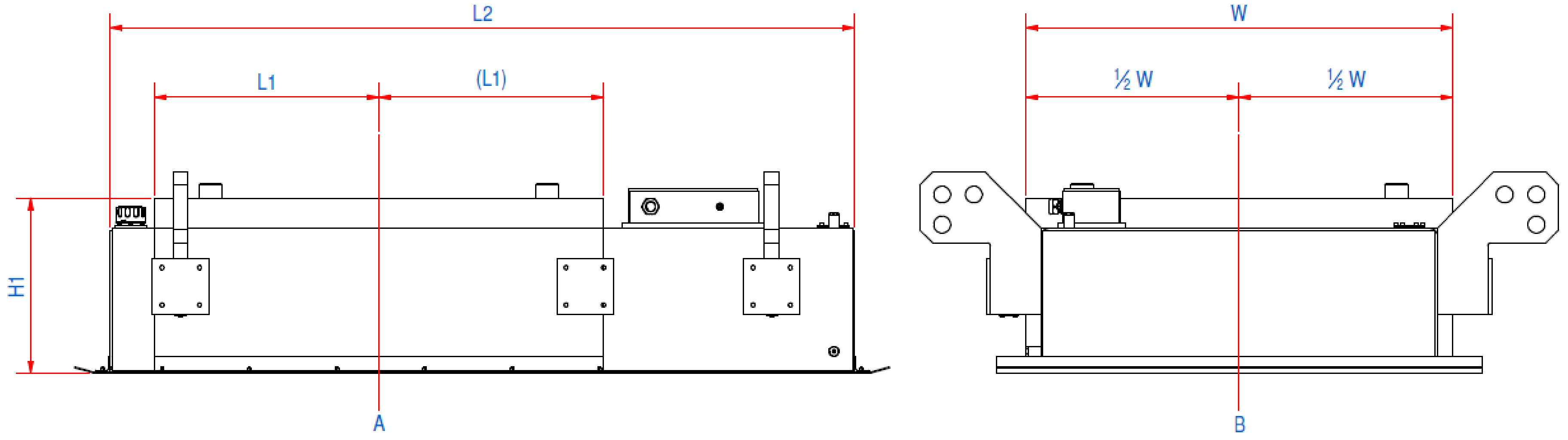
Nails, beams, rods, plates and other oblong shapes are relatively easy to remove as they are easily orientated north-south and present a larger surface area to the magnet. Spherical shaped ferrous like; nuts, cubes, balls and spheres are very difficult to remove.

### Material

Ferrous material is attracted by a magnet. The degree of magnetization of a material in response to a magnetic field is called permeability. Simply stated: the higher the proportion of Fe, the higher the permeability, the easier the particle is to catch.

| Test objects | [Gauss²/mm] | [$10^{-8}$ Tesla²/m] | Photo |
|---|---|---|---|
| Ball Ø 8 mm | 3181 | 31810 |  |
| Ball Ø 25 mm | 3181 | 31810 |  |
| Hex nut M16 (DIN934) | 1650 | 16500 |  |
| Hex nut M20 (DIN934) | 1650 | 16500 |  |
| Hex nut M30 (DIN934) | 1650 | 16500 |  |
| Nail Ø 2,5 x 63 mm | 150 | 1500 |  |
| Ø 15 x 70 mm (VDE 0580) | 550 | 5500 |  |
| Ø 20 x 120 mm (VDE 0580) | 550 | 5500 |  |
| Hex bolt M20x70 | 267 | 2670 |  |
| Crown closure | 200 | 2000 |  |
| Cube 12x12x12 mm | 1600 | 16000 |  |

GOUDSMIT MAGNETICS




| Dimension | Length [mm] |
|---|---|
| W | 1330 |
| L1 | 700 |
| L2 | 700 |
| H1 | 484 |

The measurement spot of the main pole is located on the cross section of line **A** and **B**, right against the wear plate is the **0 mm mark** (start point for measuring). Performing a flux density measurement of **increasing steps of 50 mm** gives a clear view on the performance and the condition of the magnet.

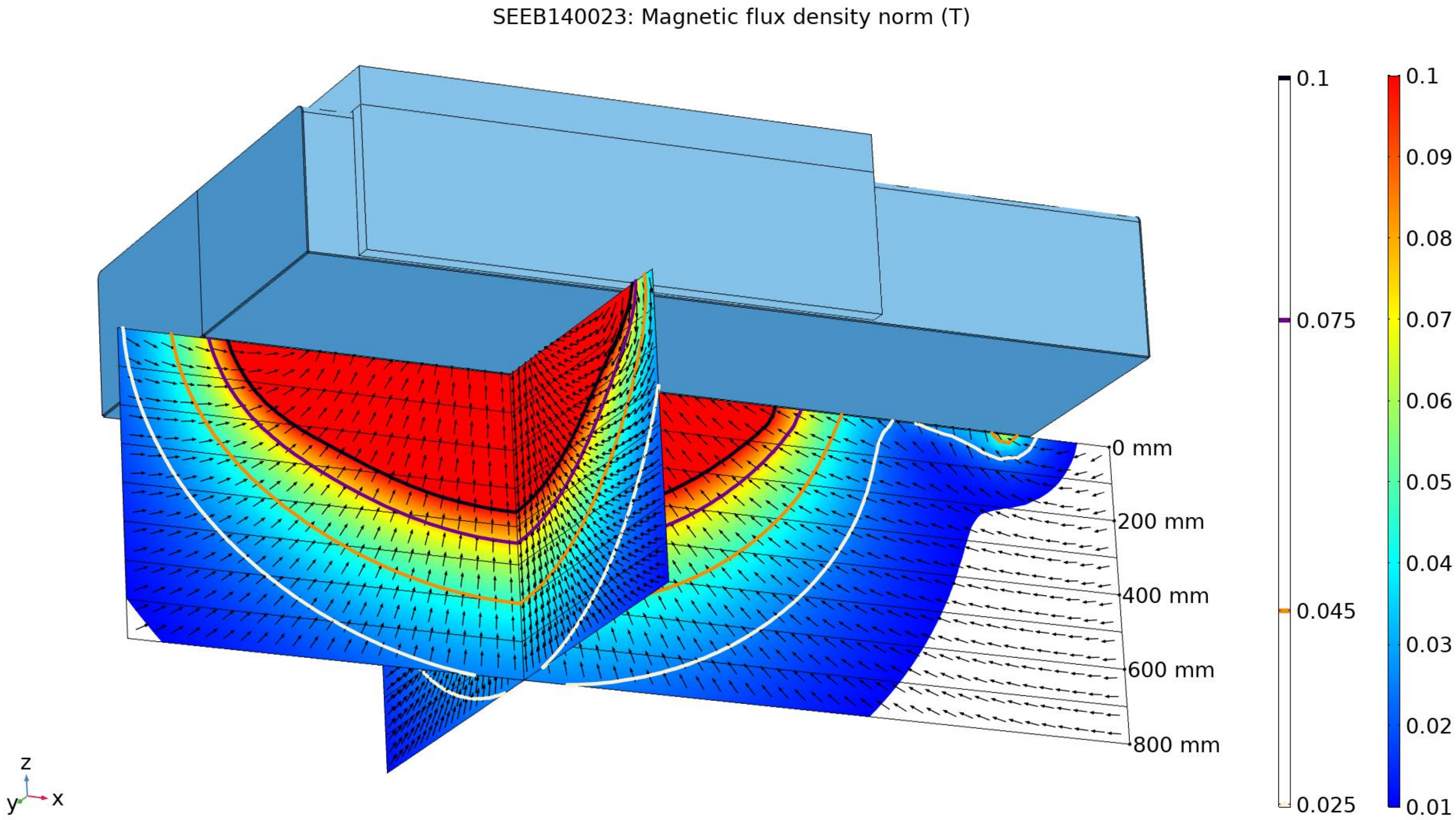



**Figure 1: Simulated Flux density [Tesla] (cold state)**

Note: Tesla to Gauss in this overview is x 10.000 (1 Tesla = 10.000 Gauss)

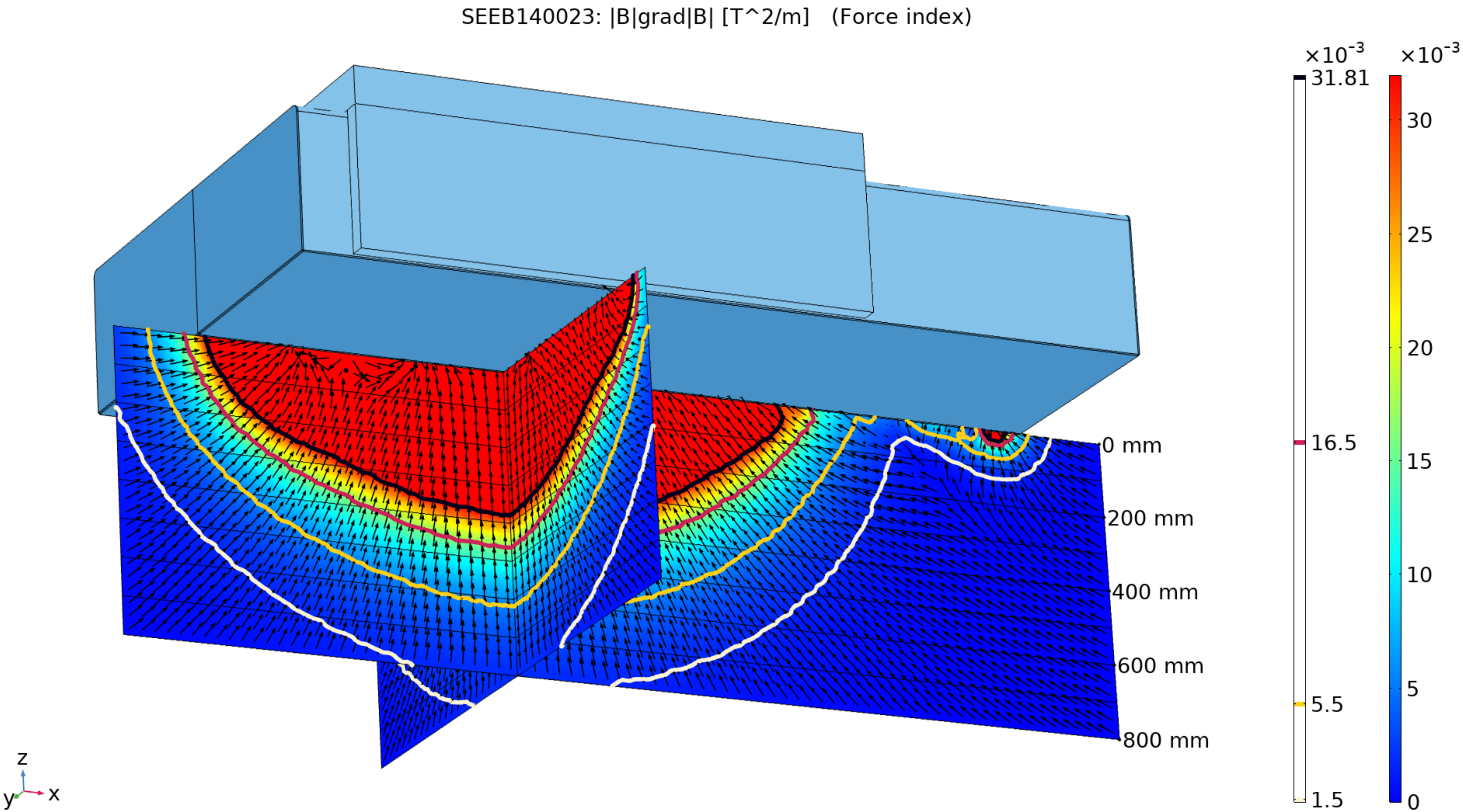



**Figure 2: Simulated Force index [Tesla²/m] (cold state)**

Note: Tesla²/m to Gauss²/mm in this overview is x $10^5$ ( 1 Tesla²/m = 100.000 Gauss²/mm)