VACUUMSCHMELZE

# VACODYM 131 TP / VACODYM 131 DTP

## for low temperature applications

At temperatures below approx.140 Kelvin, conventional VACODYM®*) magnets undergo a spin-reorientation of the magnetic polarization of up to 30 °. This reorientation results in a reduction of the maximum energy density compared to the original direction by up to 25 %. Therefore, conventional Nd-Fe-B magnets can normally only be used to their full extent down to 140 Kelvin. For some applications, such as cryogenic undulators, lower application temperatures are required.

Two new VACODYM alloys have been developed for this low temperature application range. They set themselves apart by the fact that, even at very low temperatures, far below that of liquid nitrogen at 77 Kelvin, they show no change in the preferred magnetic axis direction and thereby achieve the full potential of the magnet.

The magnetic properties of VACODYM 131 TP and VACODYM 131 DTP are shown in the following table. VACODYM 131 DTP is produced by using a grain boundary diffusion treatment with VACODYM 131 TP as the base material. Through this treatment, the coercive field strength is increased by approx. 400 kA/m, with no decrease in the remanent magnetisation. The increased coercive field strength allows, for example, the installation of magnetic systems at room temperature without the risk of irreversible losses occurring. Our technical experts are happy to provide you with more information on VACODYM 131 TP or VACODYM 131 DTP.

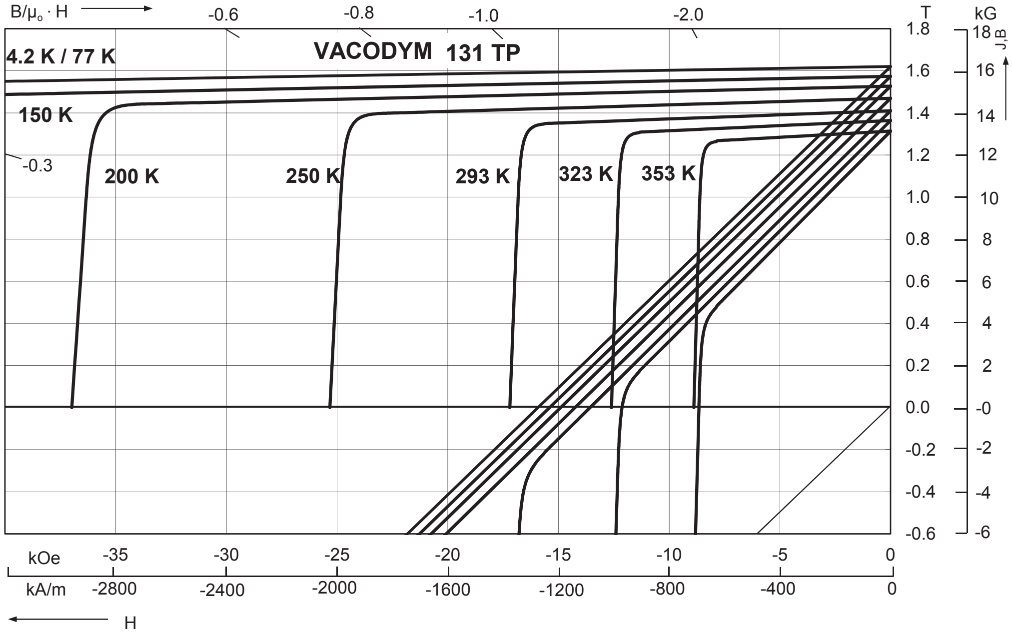
The physical properties and the safety instructions to be followed are very similar to those of other VACODYM magnets and the according information is provided in our magnet brochure PD-002 on rare earth permanent magnet materials.

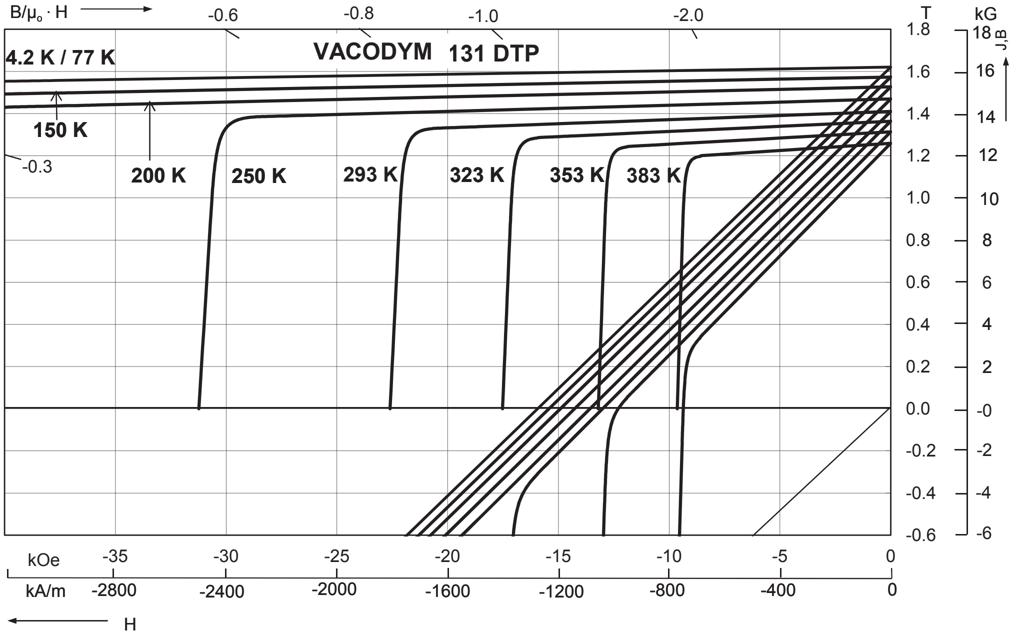
**CHARACTERISTIC PROPERTIES (preliminary)**

| Material type<br>Code[1] | Temperature | Remanence | | Coercivity | | | Energy density | | Temperature coefficient<br>20-100 °C | | $T_{max}$ [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | T<br>°C<br>Kelvin | $B_r$<br>typ.<br>Tesla<br>kG | $B_r$<br>min.<br>Tesla<br>kG | $H_{cB}$<br>typ.<br>kA/m<br>kOe | $H_{cB}$<br>min.<br>kA/m<br>kOe | $H_{cJ}$<br>min.<br>kA/m<br>kOe | $(BH)_{max}$<br>typ.<br>kJ/m³<br>MGOe | $(BH)_{max}$<br>min.<br>kJ/m³<br>MGOe | TK ($B_r$)<br>typ.<br>%/°C | TK ($H_{cJ}$)<br>typ.<br>%/°C | $T_{max}$<br>°C<br>°F |
| VACODYM 131 TP<br>360/123 | 20<br>293 | 1.41<br>14.1 | 1.38<br>13.8 | 1080<br>13.6 | 1035<br>13.0 | 1230<br>15.5 | 380<br>48 | 360<br>45 | -0.117 | -0.800 | 70<br>158 |
| VACODYM 131 DTP[3]<br>360/164 | 20<br>293 | 1.41<br>14.1 | 1.38<br>13.8 | 1080<br>13.6 | 1035<br>13.0 | 1640<br>20.6 | 380<br>48 | 360<br>45 | -0.117 | -0.700 | 110<br>230 |
| VACODYM<br>131 TP / 131 DTP | -123[4]<br>150 | 1.57<br>15.7 | 1.54<br>15.4 | 1225<br>15.4 | 1185<br>14.9 | >3185<br>>40 | 480<br>60 | 455<br>57 | | | |
| | -196[4]<br>77 | 1.62<br>16.2 | 1.58<br>15.8 | 1265<br>15.9 | 1230<br>15.5 | >3185<br>>40 | 510<br>64 | 490<br>61 | | | |

1) Code according to IEC 60606-8-1. The maximum values generally exceed the values of the IEC standard.
2) The maximum application temperature depends considerably on the dimensions of the system.
The guideline values indicated refer to magnets which are operated at a working point of $B/\mu_0H = -1$.
3) The properties indicated are valid for parts up to a thickness of 5 mm.
4) The information relating to the temperature properties is not shown in the standard and must be specified according to individual cases.

Typical demagnetization curves B(H) and J(H) at different temperatures




Typical irreversible losses at different working points as a function of temperature