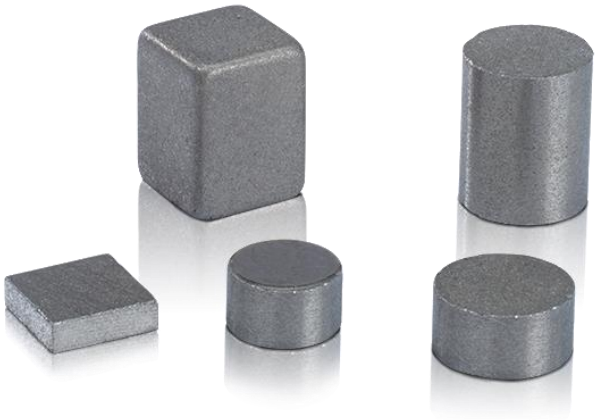
Goudsmit samarium cobalt grade system



Introduction

This document provides magnetic, physical and mechanical data of all the samarium cobalt (Sm-Co) magnets Goudsmit sells and which are relevant for the selection of magnets and design of magnetic systems.

SmCo grades

Goudsmit grade code	Type	Remanence B_r	Normal coercivity H_{cB}	Intrinsic coercivity H_{cJ}	Maximum energy product $(BH)_{max}$	Remanence temperature coefficient $\alpha(B_r)$	Intrinsic coercivity temperature coefficient $\beta(H_{cJ})$	Maximum operating temperature T_{max}
		minimum value	minimum value	minimum value	minimum value	minimum typical value	minimum typical value	maximum value
		[mT]	[kA/m]	[kA/m]	[kJ/m³]	[%/°C]	[%/°C]	[°C]
S20	SmCo5	850	637	1194	150	-0.050	-0.30	250
S22	SmCo5	900	644	1194	159	-0.050	-0.30	250
S24	Sm2Co17	920	661	1194	175	-0.035	-0.20	300
S26	Sm2Co17	1000	677	1194	191	-0.035	-0.20	300
S28	Sm2Co17	1030	677	1194	207	-0.035	-0.20	300
S30	Sm2Co17	1080	700	1194	220	-0.035	-0.20	300
S32	Sm2Co17	1100	755	1194	230	-0.035	-0.20	300

These are the most common grades. Please contact Goudsmit for questions on other grades available at Goudsmit.

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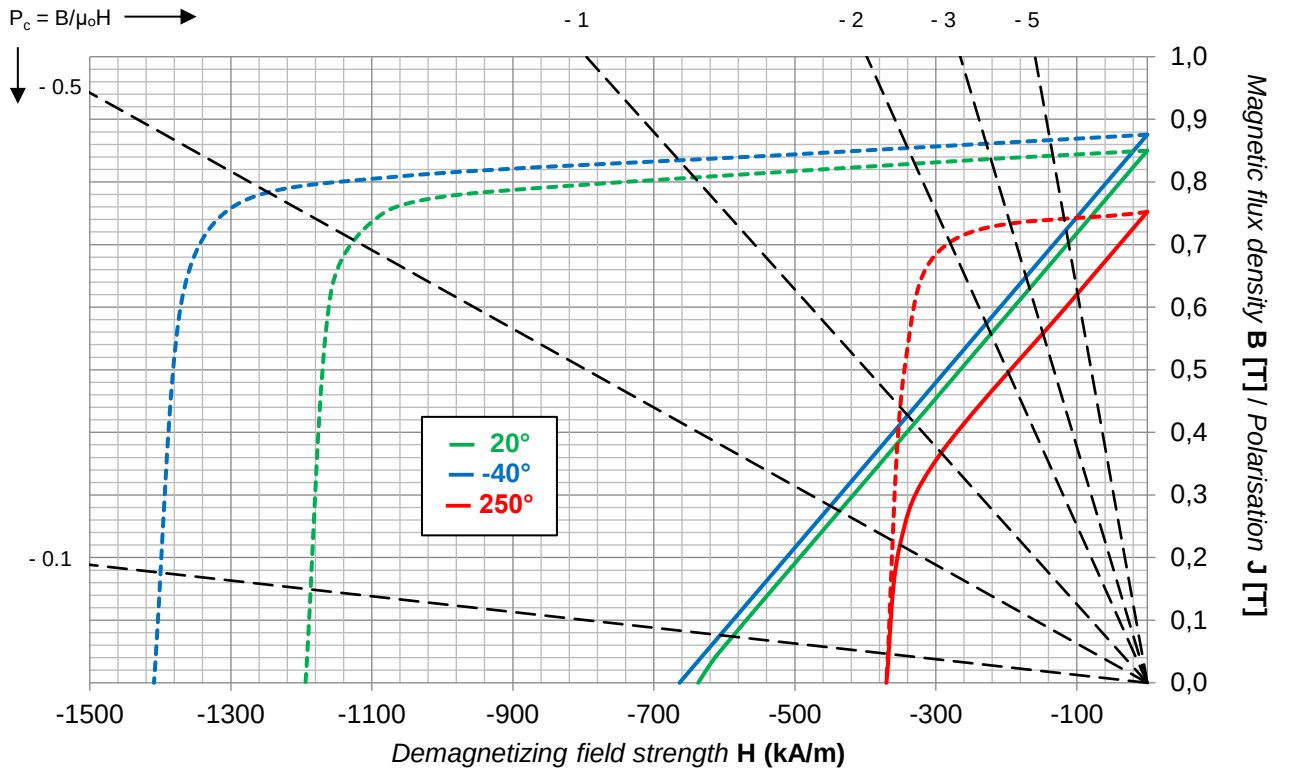
Technical datasheet: Samarium Cobalt **S20** – $SmCo_5$

Demagnetization curve **S20**



Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization curves can be obtained. For that, contact us on the address below.

Magnetic properties @20°C			
B_r	min	0.85	T
H_{cB}	min	637	kA/m
H_{cJ}	min	1194	kA/m
$(BH)_{max}$	min	150	kJ/m^3
$\alpha(B_r)$	min typ	-0.050	%/°C
$\beta(H_{cJ})$	min typ	-0.30	%/°C
T_{max}		250	°C
μ_r	typ	1.05	-

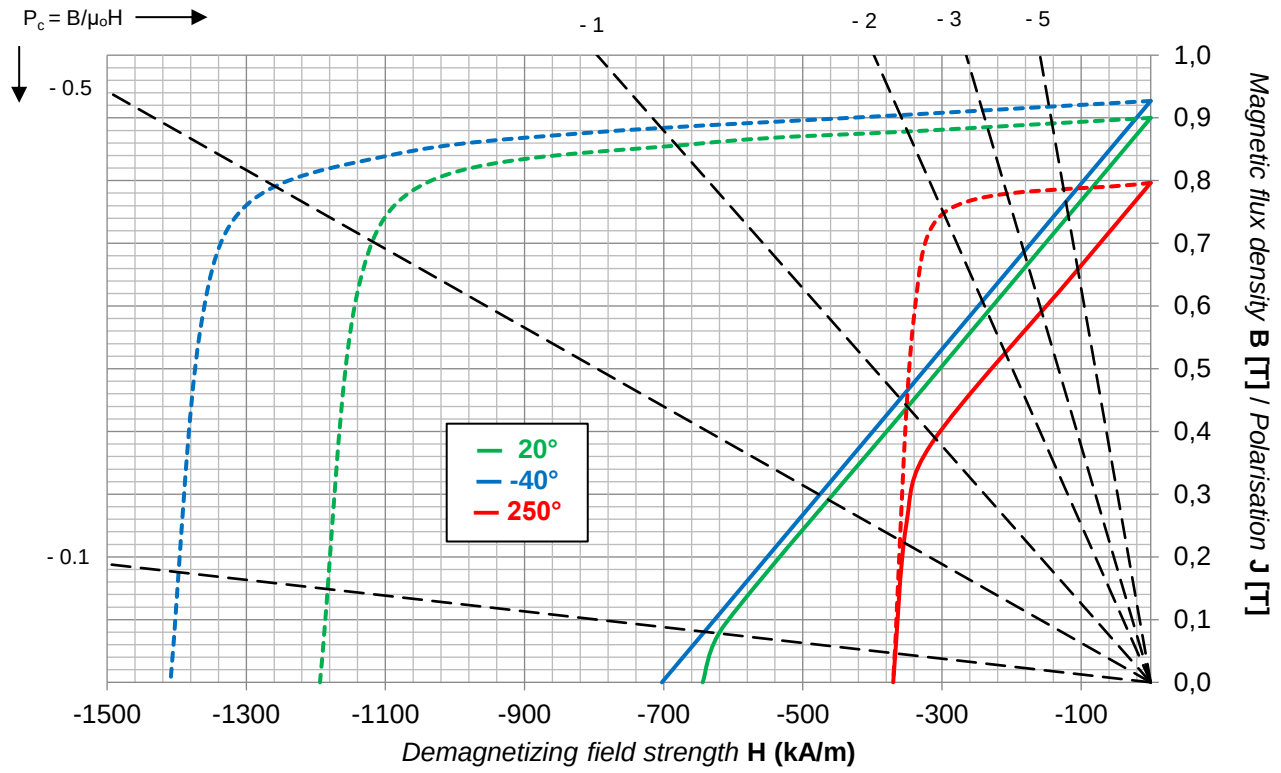
Physical & Mechanical properties @20°C			
Density	typ	8200 - 8500	kg/m^3
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	100 - 200	GPa
Flexural / bending strength	typ	120 - 180	MPa
Compressive strength	typ	800 - 1200	MPa
Tensile strength / ultimate strength	typ	30 - 50	MPa
Electrical resistivity	typ	0.5 – 0.9	μΩm
Specific heat capacity	typ	330 - 370	J/(kg K)
Thermal conductivity	typ	10 - 13	W/(m K)
Coefficient of linear thermal expansion, || DOM*	typ	6 - 12	10^{-6}/K
Coefficient of linear thermal expansion, ⊥ DOM*	typ	10 - 15	10^{-6}/K

* DOM = Direction Of Magnetization

Issue date: 14-3-2023

Technical datasheet: Samarium Cobalt **S22** – $SmCo_5$

Demagnetization curve **S22**



Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization curves can be obtained. For that, contact us on the address below.

Magnetic properties @20°C			
B_r	min	0.90	T
H_{cB}	min	644	kA/m
H_{cJ}	min	1194	kA/m
$(BH)_{max}$	min	159	kJ/m^3
$\alpha(B_r)$	min typ	-0.050	%/°C
$\beta(H_{cJ})$	min typ	-0.30	%/°C
T_{max}		250	°C
μ_r	typ	1.05	-

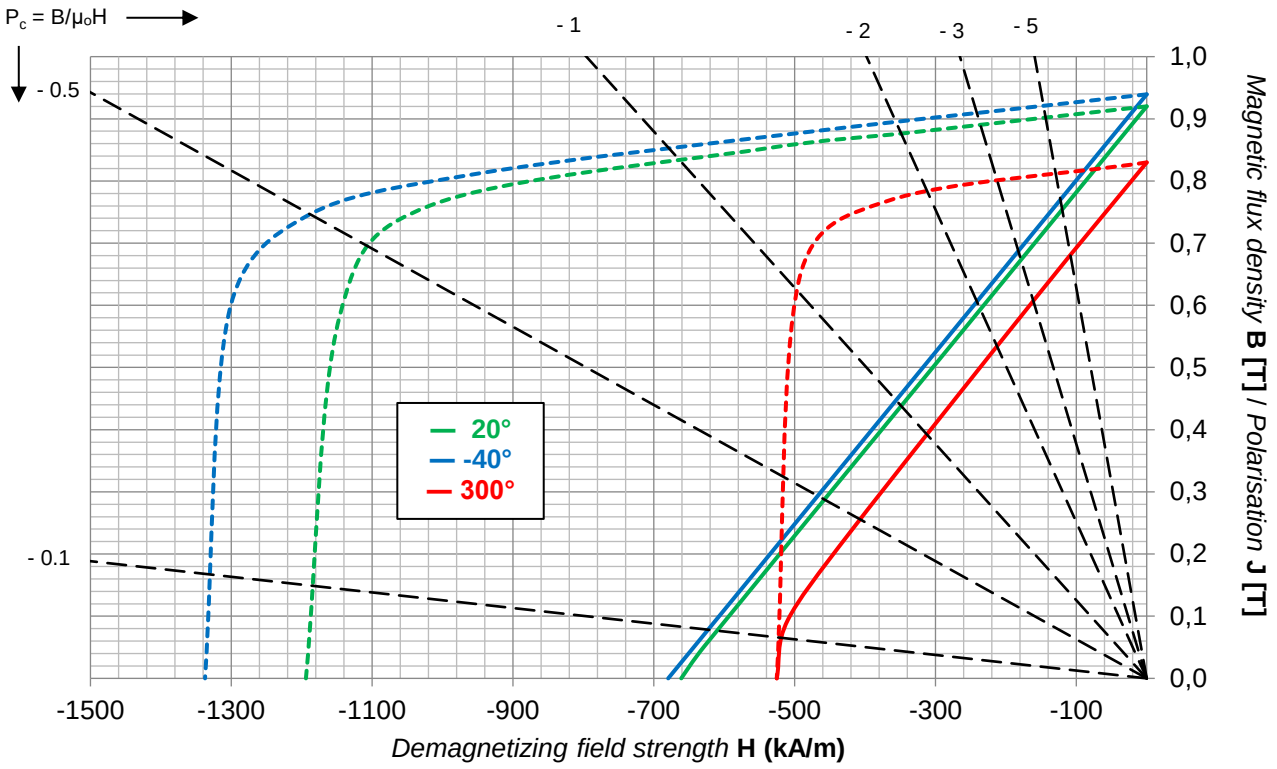
Physical & Mechanical properties @20°C			
Density	typ	8200 - 8500	kg/m^3
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	100 - 200	GPa
Flexural / bending strength	typ	120 - 180	MPa
Compressive strength	typ	800 - 1200	MPa
Tensile strength / ultimate strength	typ	30 - 50	MPa
Electrical resistivity	typ	0.5 – 0.9	μΩm
Specific heat capacity	typ	330 - 370	J/(kg K)
Thermal conductivity	typ	10 - 13	W/(m K)
Coefficient of linear thermal expansion, || DOM*	typ	6 - 12	10^{-6}/K
Coefficient of linear thermal expansion, ⊥ DOM*	typ	10 - 15	10^{-6}/K

* DOM = Direction Of Magnetization

Issue date: 14-3-2023

Technical datasheet: Samarium Cobalt **S24** – Sm_2Co_{17}

Demagnetization curve **S24**



Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization curves can be obtained. For that, contact us on the address below.

Magnetic properties @20°C			
B_r	min	0.92	T
H_{cB}	min	661	kA/m
H_{cJ}	min	1194	kA/m
$(BH)_{max}$	min	175	kJ/m^3
$\alpha(B_r)$	min typ	-0.035	%/°C
$\beta(H_{cJ})$	min typ	-0.20	%/°C
T_{max}		300	°C
μ_r	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	8200 - 8500	kg/m^3
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	100 - 200	GPa
Flexural / bending strength	typ	90 - 180	MPa
Compressive strength	typ	650 - 1200	MPa
Tensile strength / ultimate strength	typ	30 - 50	MPa
Electrical resistivity	typ	0.5 – 0.9	μΩm
Specific heat capacity	typ	320 - 390	J/(kg K)
Thermal conductivity	typ	10 - 13	W/(m K)
Coefficient of linear thermal expansion, || DOM*	typ	5 - 12	10^{-6}/K
Coefficient of linear thermal expansion, ⊥ DOM*	typ	10 - 13	10^{-6}/K

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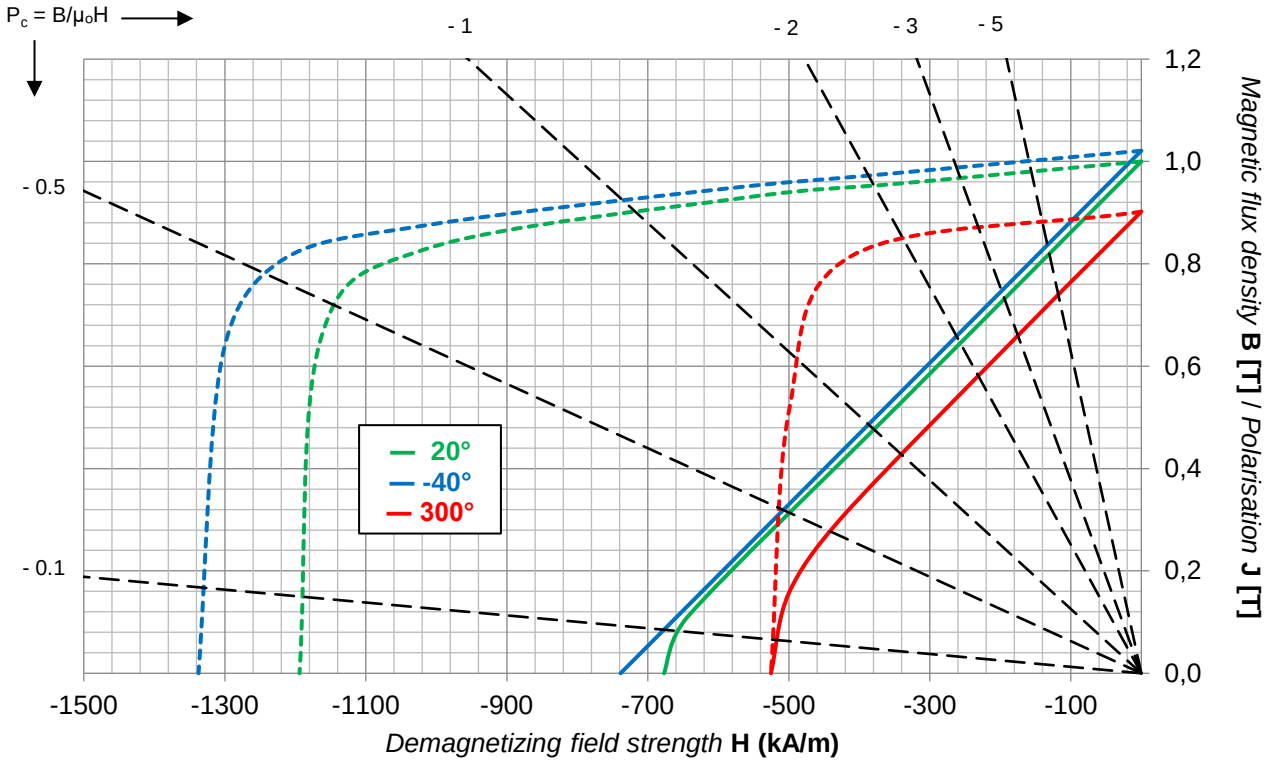
Issue date: 14-3-2023

Technical datasheet: Samarium Cobalt **S26** – Sm_2Co_{17}

Demagnetization curve **S26**



Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization curves can be obtained. For that, contact us on the address below.

Magnetic properties @20°C			
B_r	min	1.00	T
H_{cB}	min	677	kA/m
H_{cJ}	min	1194	kA/m
$(BH)_{max}$	min	191	kJ/m^3
$\alpha(B_r)$	min typ	-0.035	%/°C
$\beta(H_{cJ})$	min typ	-0.20	%/°C
T_{max}		300	°C
μ_r	typ	1.1	-

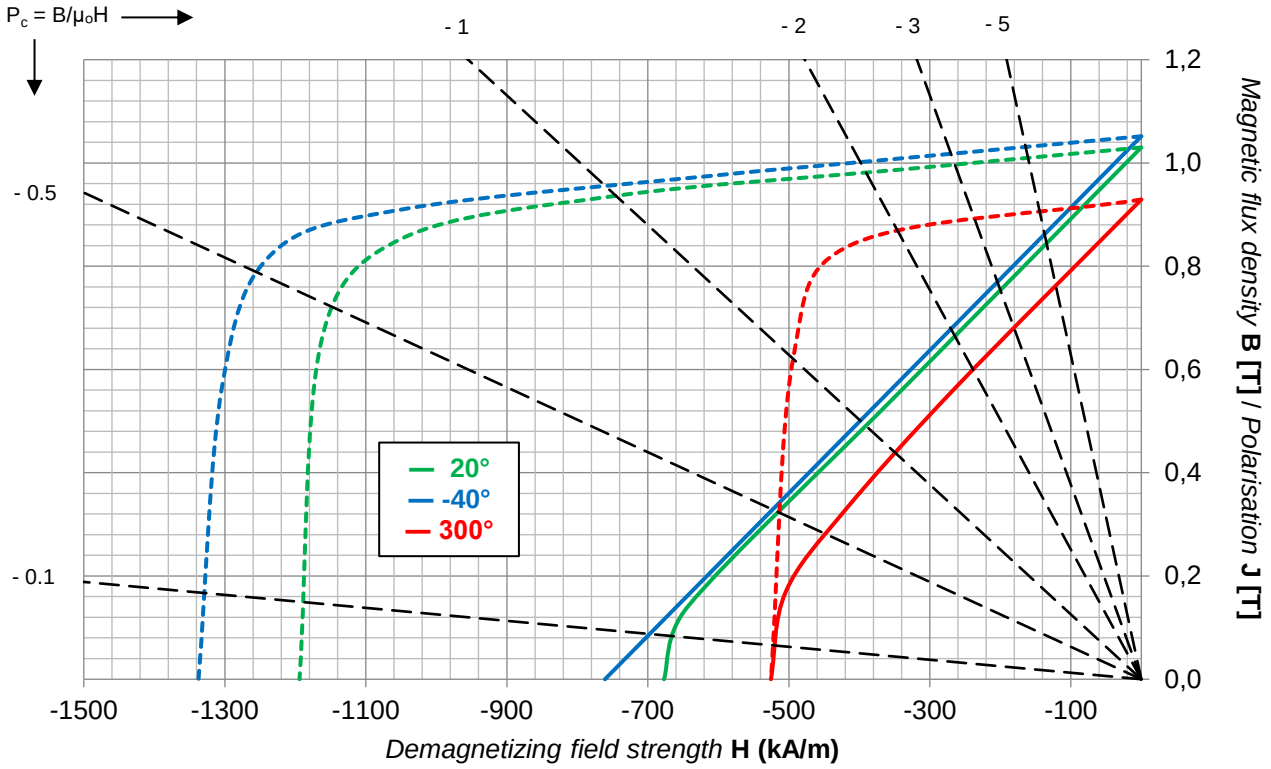
Physical & Mechanical properties @20°C			
Density	typ	8200 - 8500	kg/m^3
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	100 - 200	GPa
Flexural / bending strength	typ	90 - 180	MPa
Compressive strength	typ	650 - 1200	MPa
Tensile strength / ultimate strength	typ	30 - 50	MPa
Electrical resistivity	typ	0.5 – 0.9	μΩm
Specific heat capacity	typ	320 - 390	J/(kg K)
Thermal conductivity	typ	10 - 13	W/(m K)
Coefficient of linear thermal expansion, || DOM*	typ	5 - 12	10^{-6}/K
Coefficient of linear thermal expansion, ⊥ DOM*	typ	10 - 13	10^{-6}/K

* DOM = Direction Of Magnetization

Issue date: 14-3-2023

Technical datasheet: Samarium Cobalt **S28** – Sm_2Co_{17}

Demagnetization curve **S28**



Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization curves can be obtained. For that, contact us on the address below.

Magnetic properties @20°C			
B_r	min	1.03	T
H_{cB}	min	677	kA/m
H_{cJ}	min	1194	kA/m
$(BH)_{max}$	min	207	kJ/m^3
$\alpha(B_r)$	min typ	-0.035	%/°C
$\beta(H_{cJ})$	min typ	-0.20	%/°C
T_{max}		300	°C
μ_r	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	8200 - 8500	kg/m^3
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	100 - 200	GPa
Flexural / bending strength	typ	90 - 180	MPa
Compressive strength	typ	650 - 1200	MPa
Tensile strength / ultimate strength	typ	30 - 50	MPa
Electrical resistivity	typ	0.5 – 0.9	μΩm
Specific heat capacity	typ	320 - 390	J/(kg K)
Thermal conductivity	typ	10 - 13	W/(m K)
Coefficient of linear thermal expansion, || DOM*	typ	5 - 12	10^{-6}/K
Coefficient of linear thermal expansion, ⊥ DOM*	typ	10 - 13	10^{-6}/K

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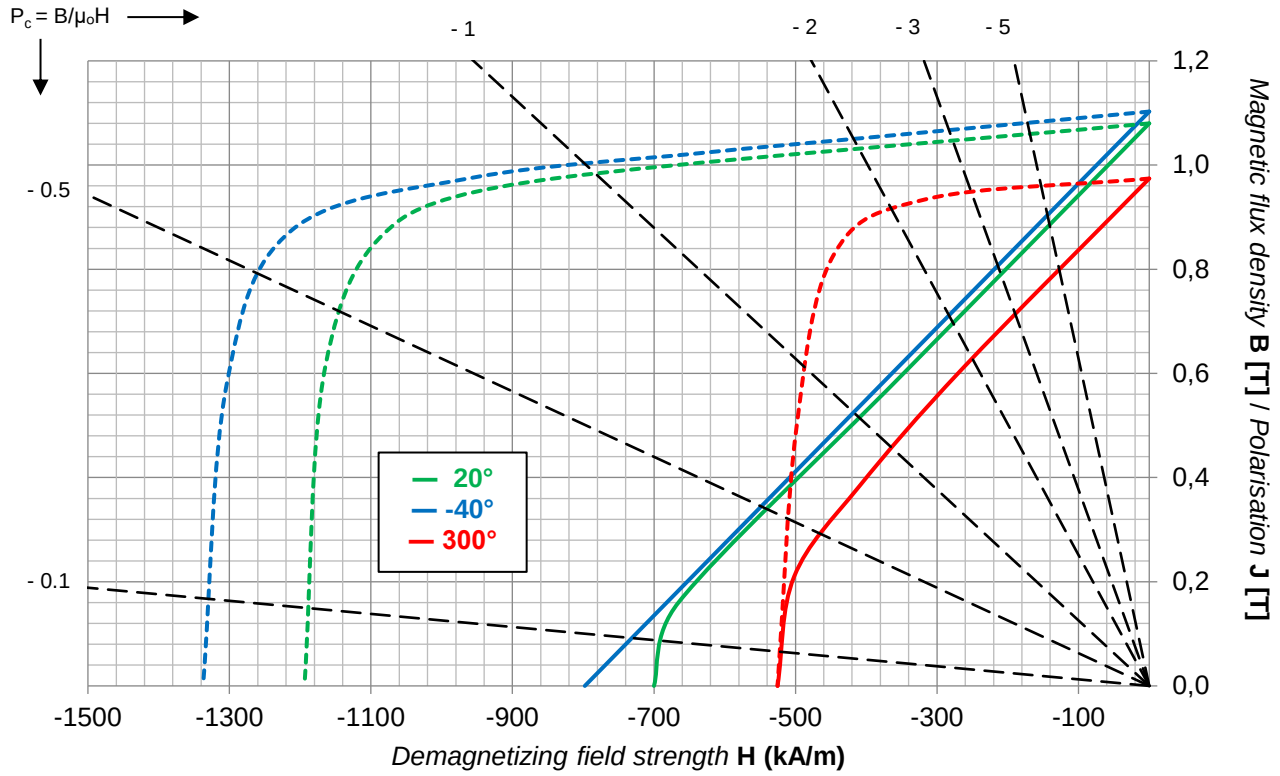
Issue date: 14-3-2023

Technical datasheet: Samarium Cobalt **S30** – Sm_2Co_{17}

Demagnetization curve **S30**



Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization curves can be obtained. For that, contact us on the address below.

Magnetic properties @20°C			
B_r	min	1.08	T
H_{cB}	min	700	kA/m
H_{cJ}	min	1194	kA/m
$(BH)_{max}$	min	220	kJ/m^3
$\alpha(B_r)$	min typ	-0.035	%/°C
$\beta(H_{cJ})$	min typ	-0.20	%/°C
T_{max}		300	°C
μ_r	typ	1.1	-

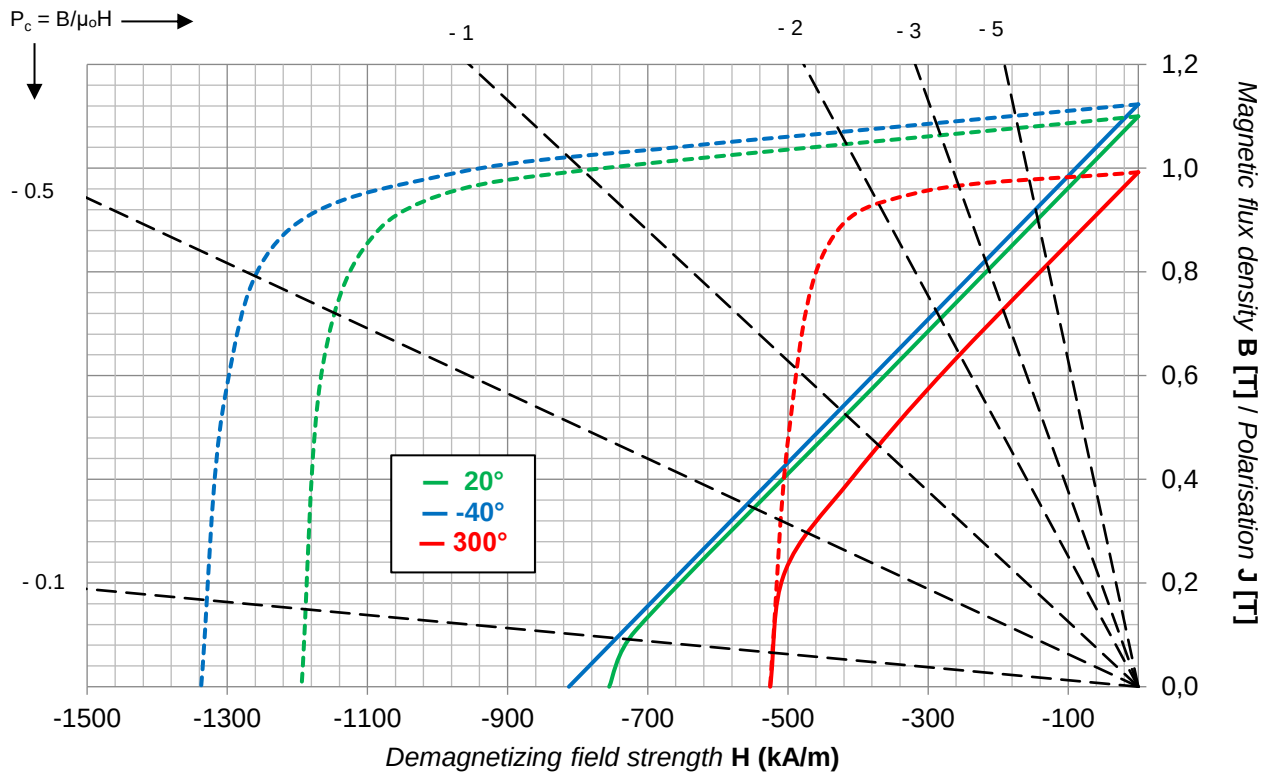
Physical & Mechanical properties @20°C			
Density	typ	8200 - 8500	kg/m^3
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	100 - 200	GPa
Flexural / bending strength	typ	90 - 180	MPa
Compressive strength	typ	650 - 1200	MPa
Tensile strength / ultimate strength	typ	30 - 50	MPa
Electrical resistivity	typ	0.5 – 0.9	μΩm
Specific heat capacity	typ	320 - 390	J/(kg K)
Thermal conductivity	typ	10 - 13	W/(m K)
Coefficient of linear thermal expansion, || DOM*	typ	5 - 12	10^{-6}/K
Coefficient of linear thermal expansion, ⊥ DOM*	typ	10 - 13	10^{-6}/K

* DOM = Direction Of Magnetization

Issue date: 14-3-2023

Technical datasheet: Samarium Cobalt **S32** – Sm_2Co_{17}

Demagnetization curve **S32**

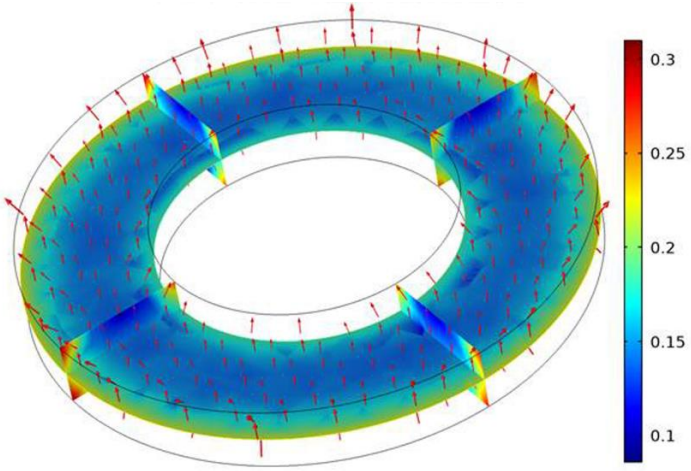


Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization curves can be obtained. For that, contact us on the address below.

Magnetic properties @20°C			
B_r	min	1.10	T
H_{cB}	min	755	kA/m
H_{cJ}	min	1194	kA/m
$(BH)_{max}$	min	230	kJ/m^3
$\alpha(B_r)$	min typ	-0.035	%/°C
$\beta(H_{cJ})$	min typ	-0.20	%/°C
T_{max}		300	°C
μ_r	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	8200 - 8500	kg/m^3
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	100 - 200	GPa
Flexural / bending strength	typ	90 - 180	MPa
Compressive strength	typ	650 - 1200	MPa
Tensile strength / ultimate strength	typ	30 - 50	MPa
Electrical resistivity	typ	0.5 – 0.9	μΩm
Specific heat capacity	typ	320 - 390	J/(kg K)
Thermal conductivity	typ	10 - 13	W/(m K)
Coefficient of linear thermal expansion, || DOM*	typ	5 - 12	10^{-6}/K
Coefficient of linear thermal expansion, ⊥ DOM*	typ	10 - 13	10^{-6}/K

* DOM = Direction Of Magnetization



Goudsmit offers a wide range of services with regards to the design and selection of the appropriate magnet for your specific application. For instance, we apply magnet calculations and FEM simulations to quickly identify the best magnet for your product. In addition, we have all the necessary processes in place to supply the automotive and aerospace industries, including IATF16949 and AS9120 certifications.

The possibilities with magnet technology are endless, which is why it can quickly become confusing. Goudsmit has more than 60 years of experience in the world of magnetism and is happy to help you with advice and a range of services:

- FEM simulation & magnet calculations: gain quick insight into the operation of your design.
- Prototyping & samples: tangible magnet technology based on your requirements.
- Engineering: development of magnet assemblies and components.
- Quality control: critical properties tested and validated in our own measurement lab.
- Certification: ISO9001, IATF16949 or AS9120 for your industry.
- Stock management service: delivery of your magnets on demand through our modern warehouse.

You can choose whatever form of support you want. This guarantees you the right magnet for your specific application.

LRQA CERTIFIED ISO 9001 | LRQA CERTIFIED ISO 14001 | LRQA CERTIFIED IATF 16949 | LRQA CERTIFIED AS 9120