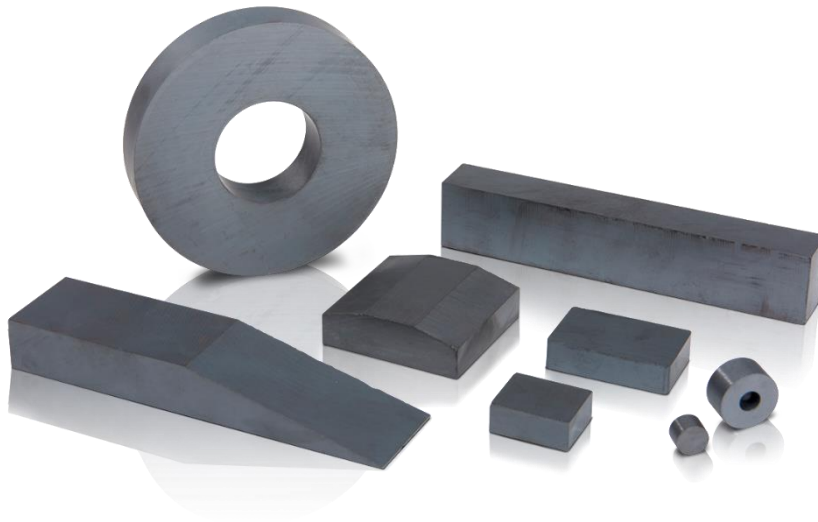


## Goudsmit ferrite grade system



### Introduction

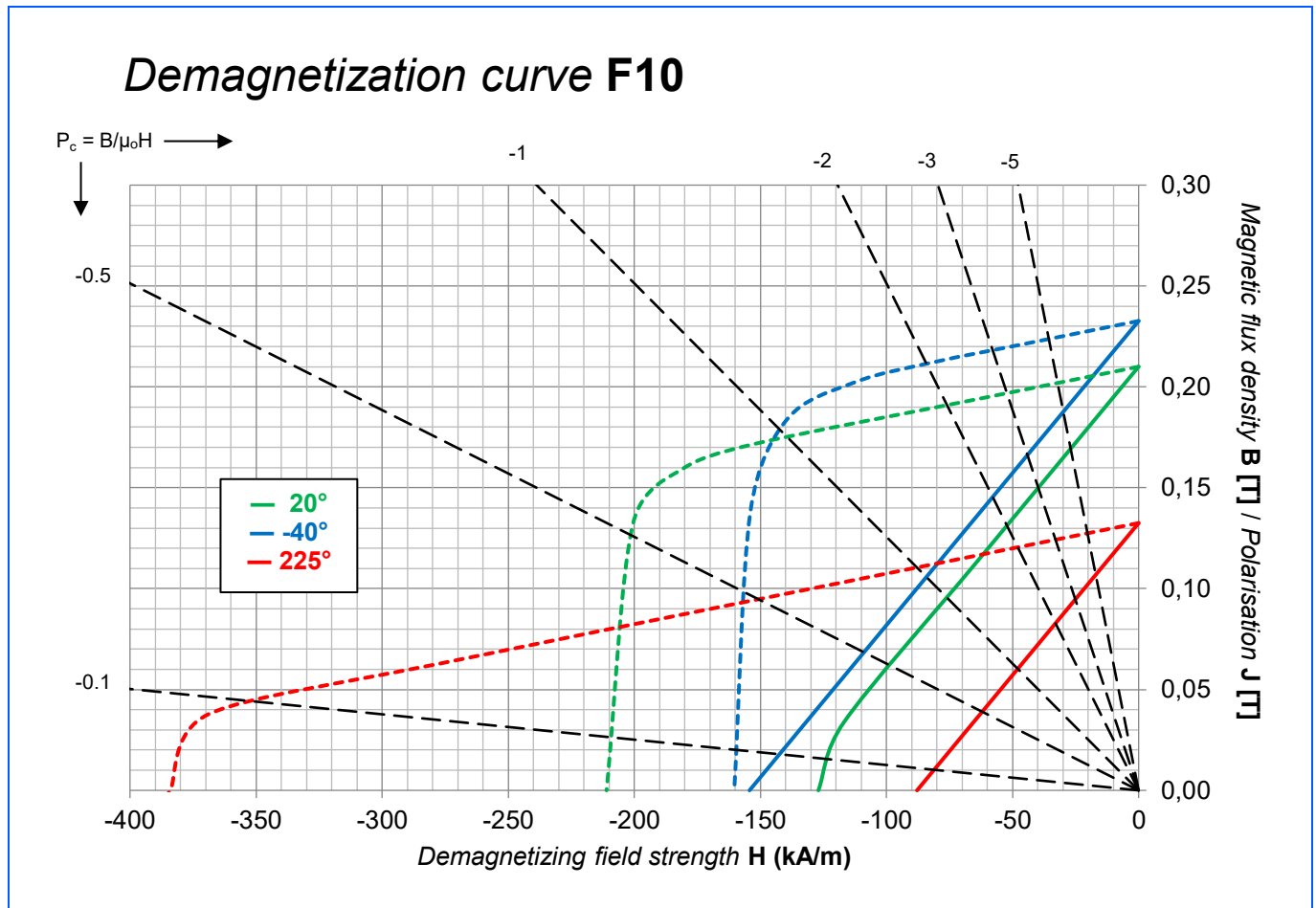
This document provides magnetic, physical and mechanical data of all the ferrite magnets Goudsmit sells and which are relevant for the selection of magnets and design of magnetic systems.

## Ferrite grades

Goudsmit grade code	Magnetic field orientation	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/m <sup>3</sup> ]	[%/°C]	[%/°C]	[°C]
<a href="#">F10</a>	isotropic	210	127	211	6.4	-0.18	0.40	225
<a href="#">F25</a>	anisotropic	380	143	147	25.5	-0.18	0.50	225
<a href="#">F30</a>	anisotropic	390	175	179	27.1	-0.18	0.45	225
<a href="#">F33</a>	anisotropic	390	239	243	27.1	-0.18	0.40	225
<a href="#">F34</a>	anisotropic	370	263	307	24.7	-0.18	0.35	225
<a href="#">F40</a>	anisotropic	390	271	307	28.7	-0.18	0.40	225
<a href="#">F42</a>	anisotropic	415	215	219	30.3	-0.18	0.40	225
<a href="#">F44</a>	anisotropic	430	247	251	33.4	-0.18	0.40	225
<a href="#">F45</a>	anisotropic	440	318	347	36.6	-0.18	0.20	225
<a href="#">F47</a>	anisotropic	460	328	368	41.5	-0.18	0.25	225

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

## Technical datasheet: Ferrite F10 – Isotropic



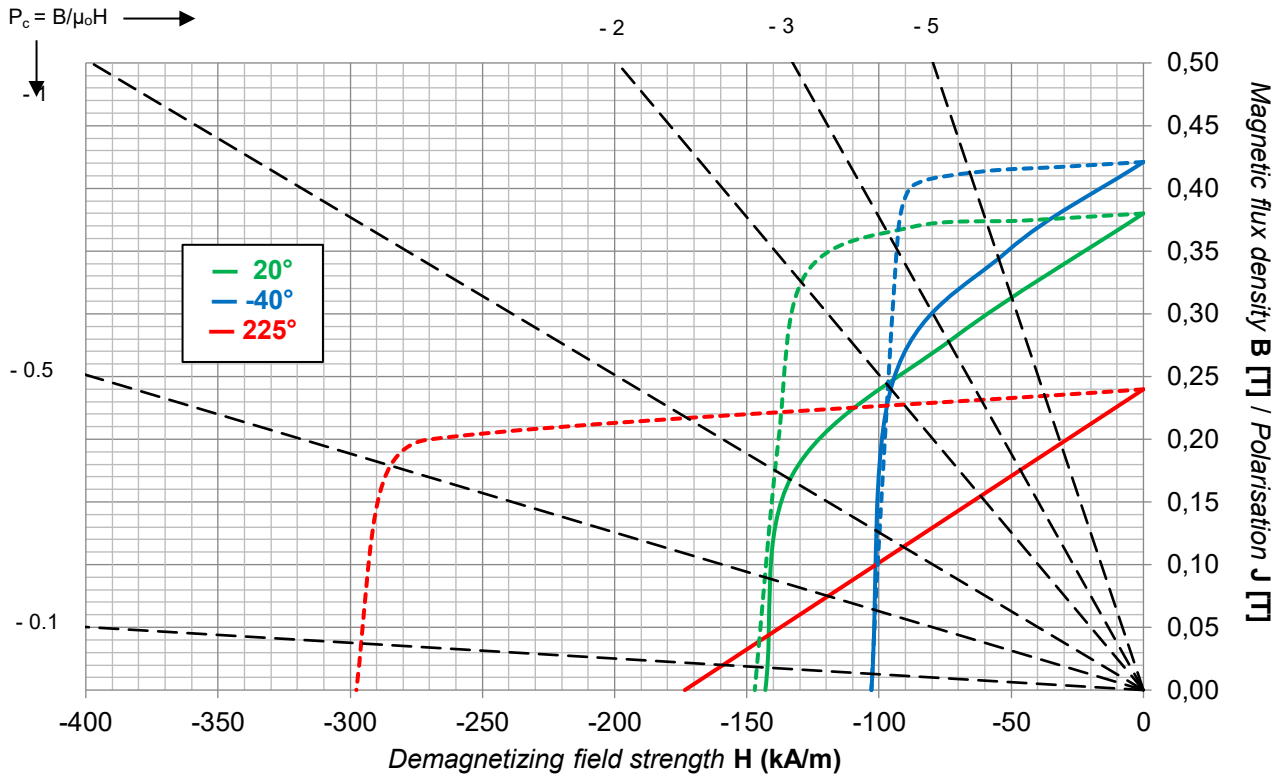
Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C				Physical & Mechanical properties @20°C			
$B_r$	min	0.21	T	Density	typ	4700 - 5100	kg/m <sup>3</sup>
$H_{cB}$	min	127	kA/m	Vickers Hardness	typ	400 - 700	HV
$H_{cJ}$	min	211	kA/m	Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
$(BH)_{max}$	min	6.4	kJ/m <sup>3</sup>	Flexural / bending strength	typ	50 - 90	MPa
$\alpha(B_r)$	min typ	-0.18	%/°C	Compressive strength	typ	680 - 900	MPa
$\beta(H_{cJ})$	min typ	0.40	%/°C	Tensile strength / ultimate strength	typ	20 - 50	MPa
$T_{max}$		225	°C	Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega m$
$\mu_r$	typ	1.2	-	Specific heat capacity	typ	500 - 900	J/(kg K)
				Thermal conductivity	typ	2 - 10	W/(m K)
				Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
				Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

## Technical datasheet: Ferrite F25 – Anisotropic

### Demagnetization curve F25



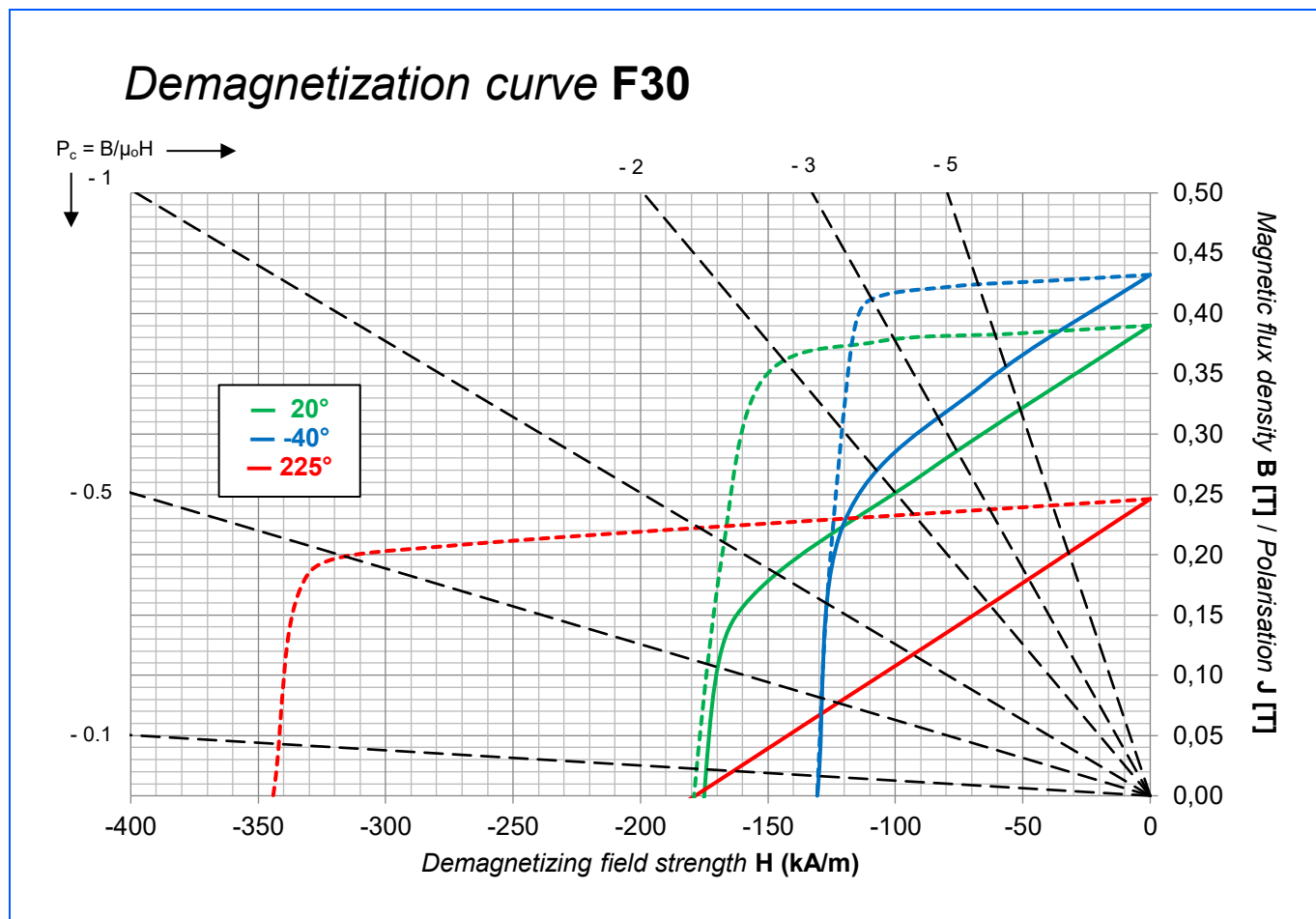
Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C			
$B_r$	min	0.38	T
$H_{cB}$	min	143	kA/m
$H_{cJ}$	min	147	kA/m
$(BH)_{max}$	min	25.5	kJ/m <sup>3</sup>
$\alpha(B_r)$	min typ	-0.18	%/°C
$\beta(H_{cJ})$	min typ	0.50	%/°C
$T_{max}$		225	°C
$\mu_r$	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	4700 - 5100	kg/m <sup>3</sup>
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
Flexural / bending strength	typ	50 - 90	MPa
Compressive strength	typ	680 - 900	MPa
Tensile strength / ultimate strength	typ	20 - 50	MPa
Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega\text{m}$
Specific heat capacity	typ	500 - 900	J/(kg K)
Thermal conductivity	typ	2 - 10	W/(m K)
Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

## Technical datasheet: Ferrite F30 – Anisotropic



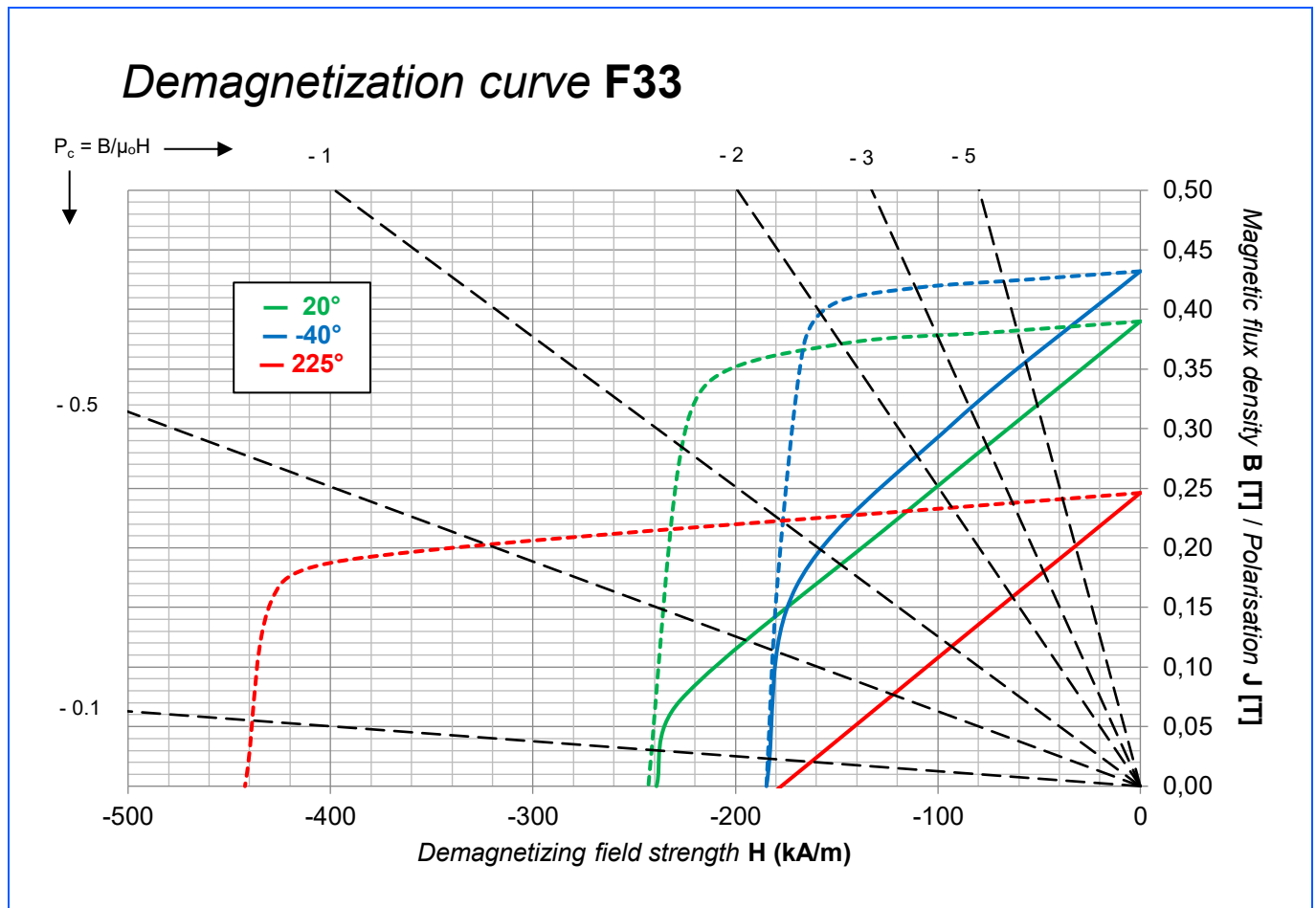
Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C			
$B_r$	min	0.39	T
$H_{cB}$	min	175	kA/m
$H_{cJ}$	min	179	kA/m
$(BH)_{max}$	min	27.1	kJ/m <sup>3</sup>
$\alpha(B_r)$	min typ	-0.18	%/°C
$\beta(H_{cJ})$	min typ	0.45	%/°C
$T_{max}$		225	°C
$\mu_r$	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	4700 - 5100	kg/m <sup>3</sup>
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
Flexural / bending strength	typ	50 - 90	MPa
Compressive strength	typ	680 - 900	MPa
Tensile strength / ultimate strength	typ	20 - 50	MPa
Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega\text{m}$
Specific heat capacity	typ	500 - 900	J/(kg K)
Thermal conductivity	typ	2 - 10	W/(m K)
Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

## Technical datasheet: Ferrite **F33** – Anisotropic



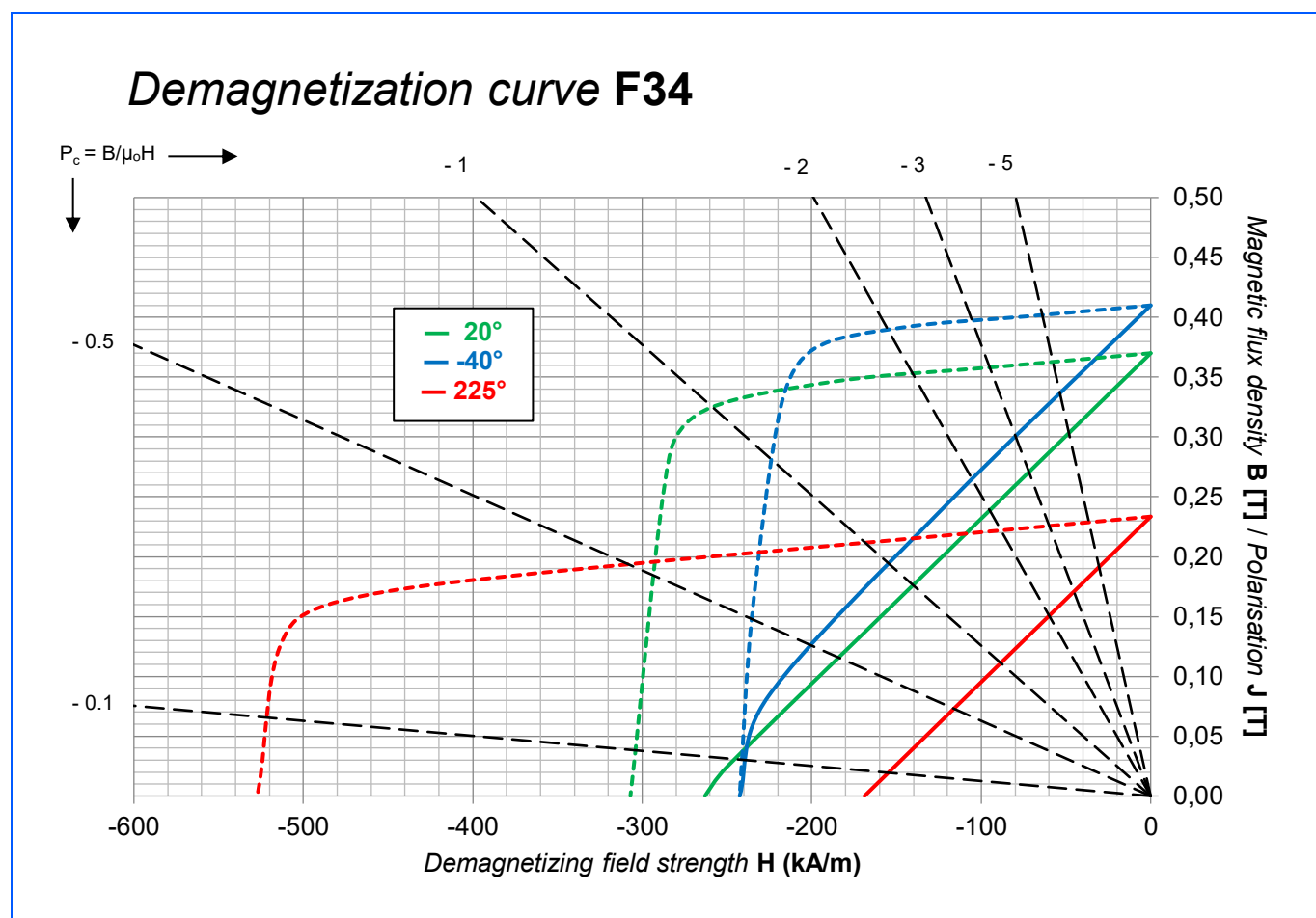
Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current GoudsmIT grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C			
$B_r$	min	0.39	T
$H_{cB}$	min	239	kA/m
$H_{cJ}$	min	243	kA/m
$(BH)_{max}$	min	27.1	kJ/m <sup>3</sup>
$\alpha(B_r)$	min typ	-0.18	%/°C
$\beta(H_{cJ})$	min typ	0.40	%/°C
$T_{max}$		225	°C
$\mu_r$	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	4700 - 5100	kg/m <sup>3</sup>
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
Flexural / bending strength	typ	50 - 90	MPa
Compressive strength	typ	680 - 900	MPa
Tensile strength / ultimate strength	typ	20 - 50	MPa
Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega$ m
Specific heat capacity	typ	500 - 900	J/(kg K)
Thermal conductivity	typ	2 - 10	W/(m K)
Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

## Technical datasheet: Ferrite **F34** – Anisotropic

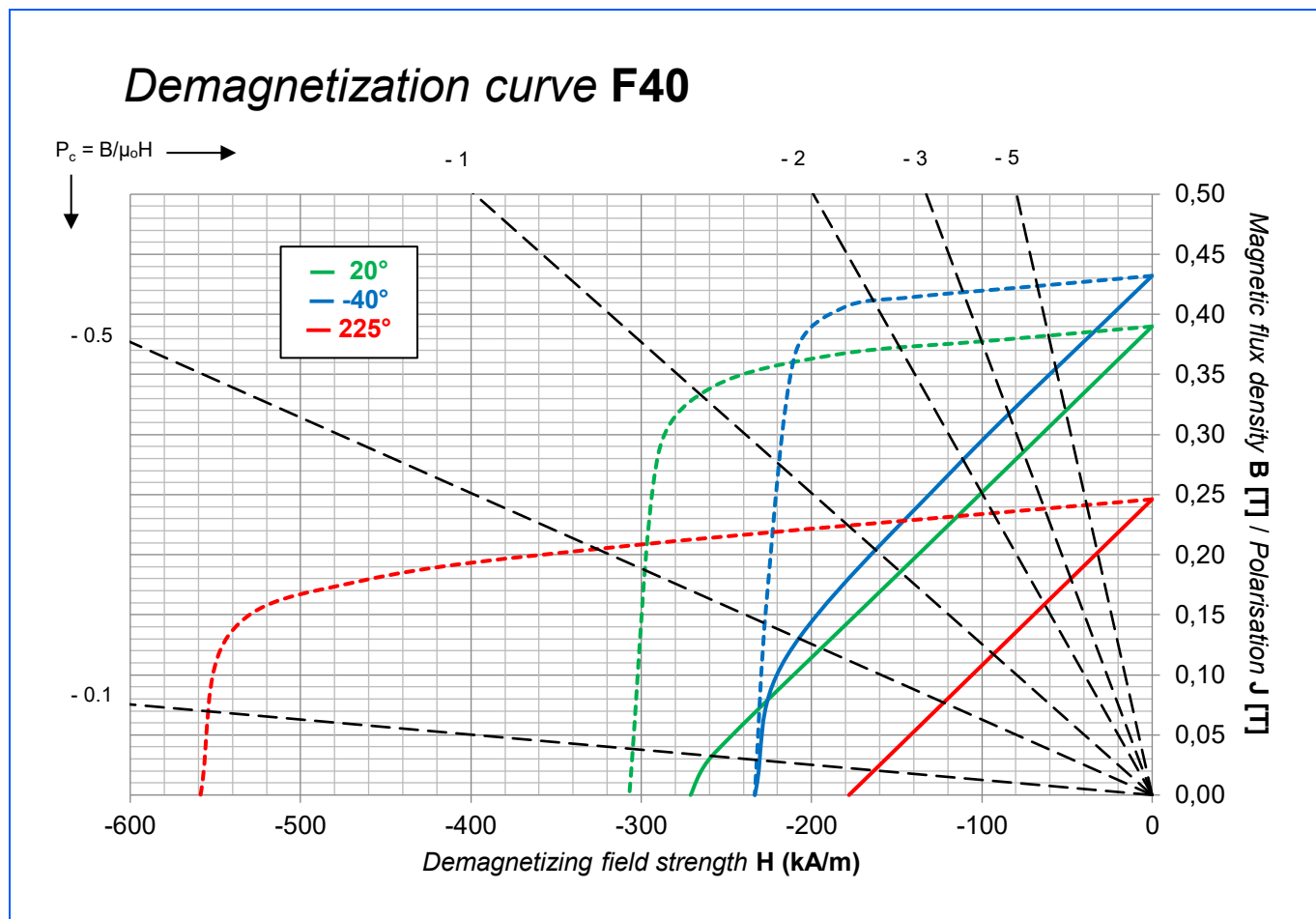


Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current GoudsmIT grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C				Physical & Mechanical properties @20°C			
$B_r$	min	0.37	T	Density	typ	4700 - 5100	kg/m <sup>3</sup>
$H_{cB}$	min	263	kA/m	Vickers Hardness	typ	400 - 700	HV
$H_{cJ}$	min	307	kA/m	Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
$(BH)_{max}$	min	24.7	kJ/m <sup>3</sup>	Flexural / bending strength	typ	50 - 90	MPa
$\alpha(B_r)$	min typ	-0.18	%/°C	Compressive strength	typ	680 - 900	MPa
$\beta(H_{cJ})$	min typ	0.35	%/°C	Tensile strength / ultimate strength	typ	20 - 50	MPa
$T_{max}$		225	°C	Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega\text{m}$
$\mu_r$	typ	1.1	-	Specific heat capacity	typ	500 - 900	J/(kg K)
				Thermal conductivity	typ	2 - 10	W/(m K)
				Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
				Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

## Technical datasheet: Ferrite **F40** – Anisotropic



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.

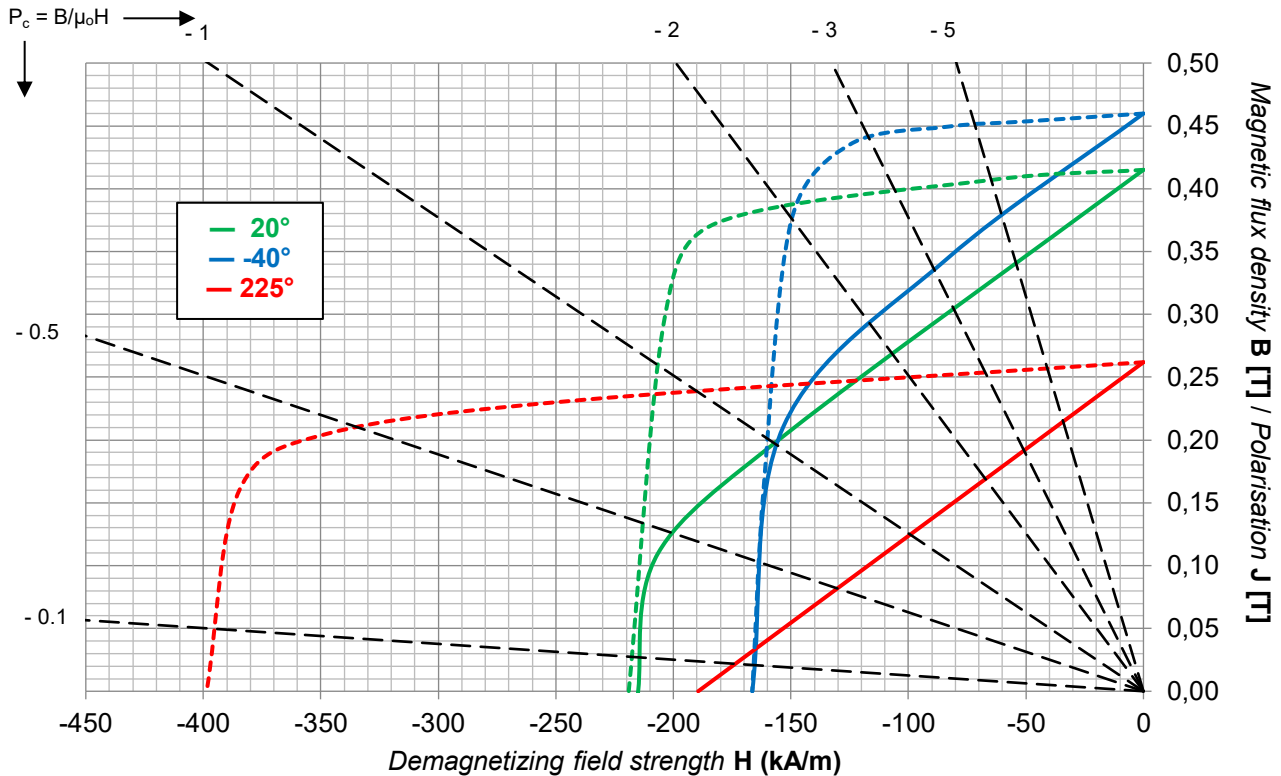
Magnetic properties @20°C				Physical & Mechanical properties @20°C			
$B_r$	min	0.39	T	Density	typ	4700 - 5100	kg/m <sup>3</sup>
$H_{cB}$	min	271	kA/m	Vickers Hardness	typ	400 - 700	HV
$H_{cJ}$	min	307	kA/m	Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
$(BH)_{max}$	min	28.7	kJ/m <sup>3</sup>	Flexural / bending strength	typ	50 - 90	MPa
$\alpha(B_r)$	min typ	-0.18	%/°C	Compressive strength	typ	680 - 900	MPa
$\beta(H_{cJ})$	min typ	0.40	%/°C	Tensile strength / ultimate strength	typ	20 - 50	MPa
$T_{max}$		225	°C	Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega\text{m}$
$\mu_r$	typ	1.1	-	Specific heat capacity	typ	500 - 900	J/(kg K)
				Thermal conductivity	typ	2 - 10	W/(m K)
				Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
				Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization



## Technical datasheet: Ferrite F42 – Anisotropic

### Demagnetization curve F42



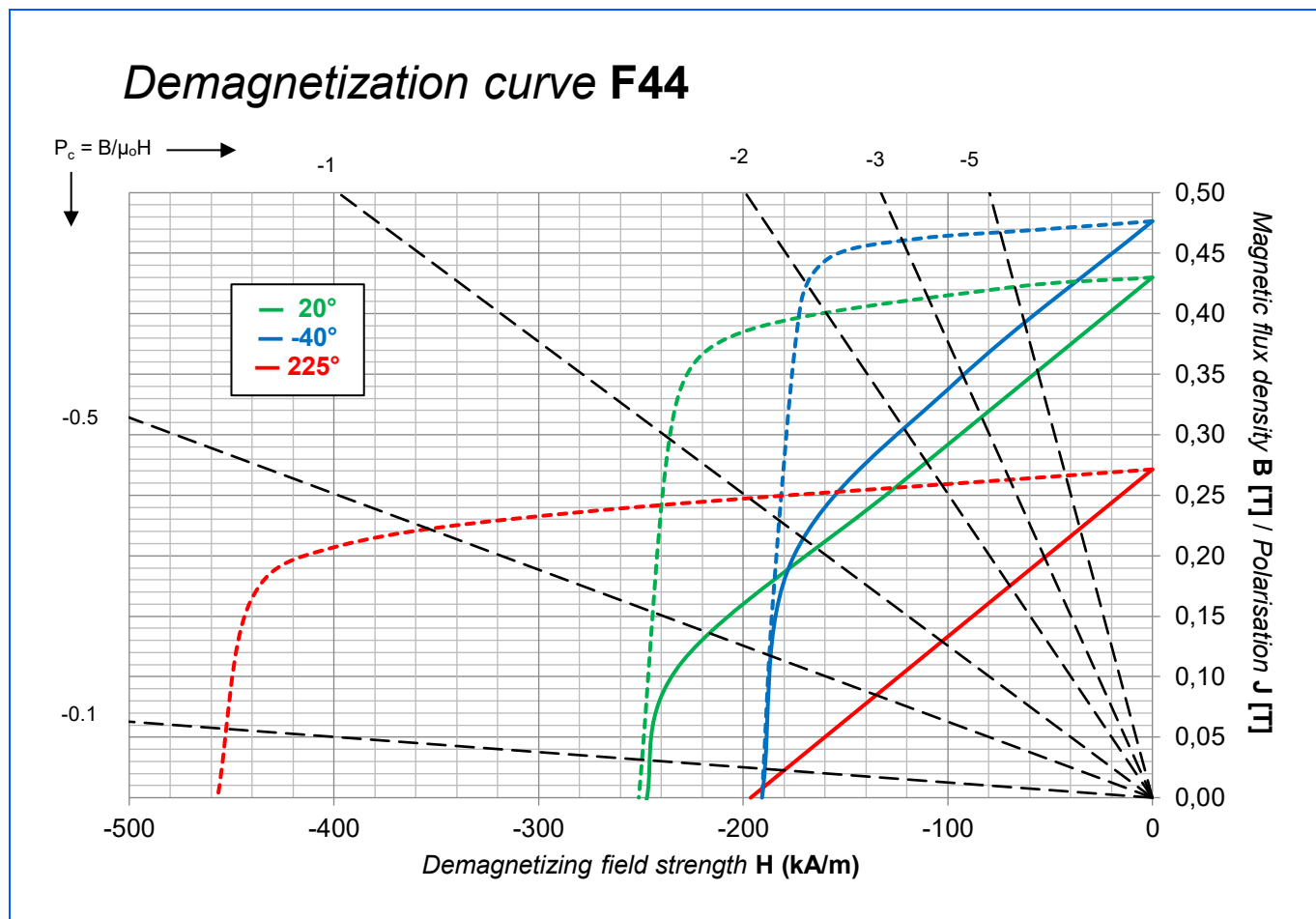
Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C			
$B_r$	min	0.415	T
$H_{cB}$	min	215	kA/m
$H_{cJ}$	min	219	kA/m
$(BH)_{max}$	min	30.3	kJ/m <sup>3</sup>
$\alpha(B_r)$	min typ	-0.18	%/°C
$\beta(H_{cJ})$	min typ	0.40	%/°C
$T_{max}$		225	°C
$\mu_r$	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	4700 - 5100	kg/m <sup>3</sup>
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
Flexural / bending strength	typ	50 - 90	MPa
Compressive strength	typ	680 - 900	MPa
Tensile strength / ultimate strength	typ	20 - 50	MPa
Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega\text{m}$
Specific heat capacity	typ	500 - 900	J/(kg K)
Thermal conductivity	typ	2 - 10	W/(m K)
Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

## Technical datasheet: Ferrite **F44** – Anisotropic



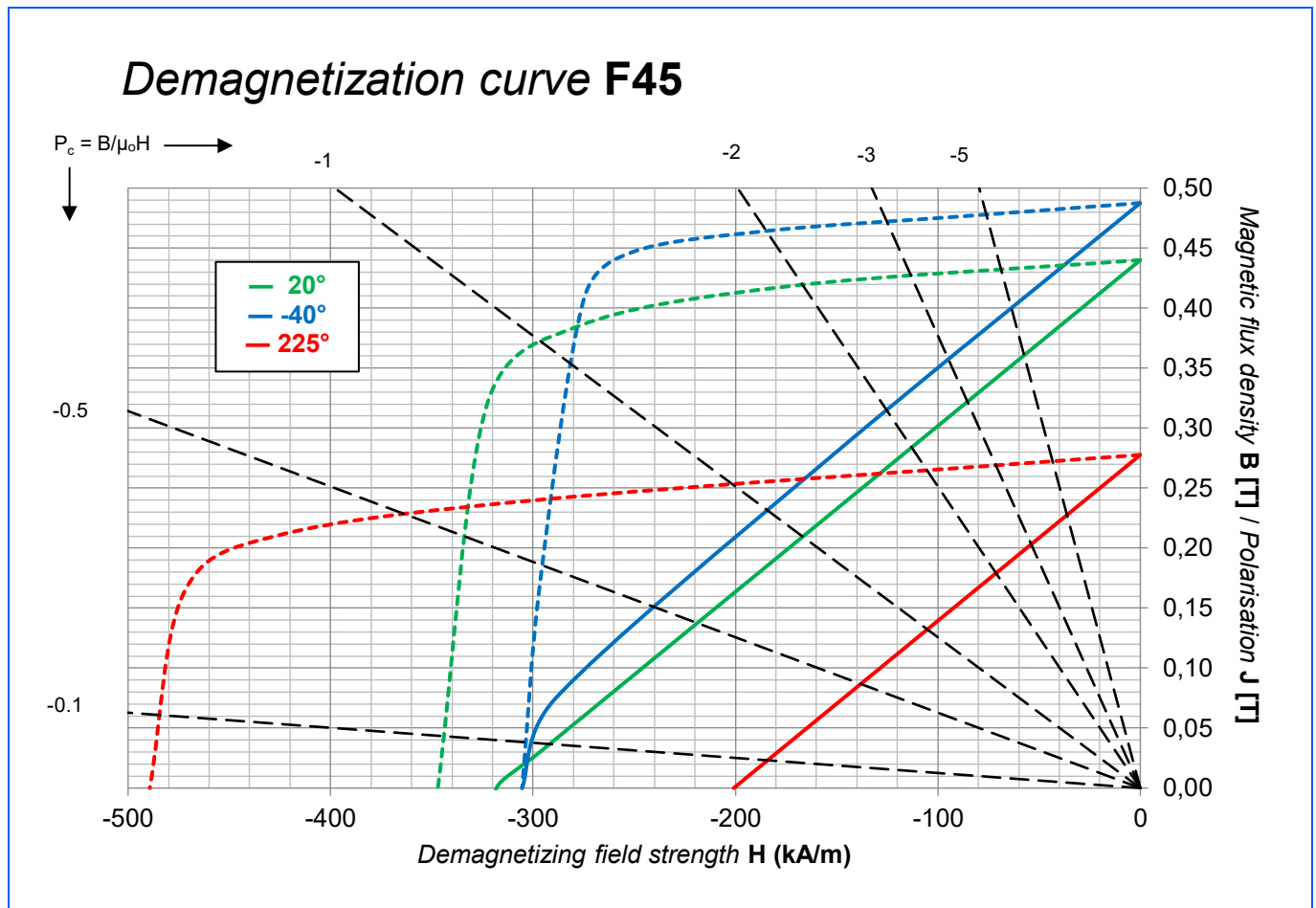
Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current GoudsmIT grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C			
$B_r$	min	0.43	T
$H_{cB}$	min	247	kA/m
$H_{cJ}$	min	251	kA/m
$(BH)_{max}$	min	33.4	kJ/m <sup>3</sup>
$\alpha(B_r)$	min typ	-0.18	%/°C
$\beta(H_{cJ})$	min typ	0.40	%/°C
$T_{max}$		225	°C
$\mu_r$	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	4700 - 5100	kg/m <sup>3</sup>
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
Flexural / bending strength	typ	50 - 90	MPa
Compressive strength	typ	680 - 900	MPa
Tensile strength / ultimate strength	typ	20 - 50	MPa
Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega\text{m}$
Specific heat capacity	typ	500 - 900	J/(kg K)
Thermal conductivity	typ	2 - 10	W/(m K)
Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

## Technical datasheet: Ferrite **F45** – Anisotropic



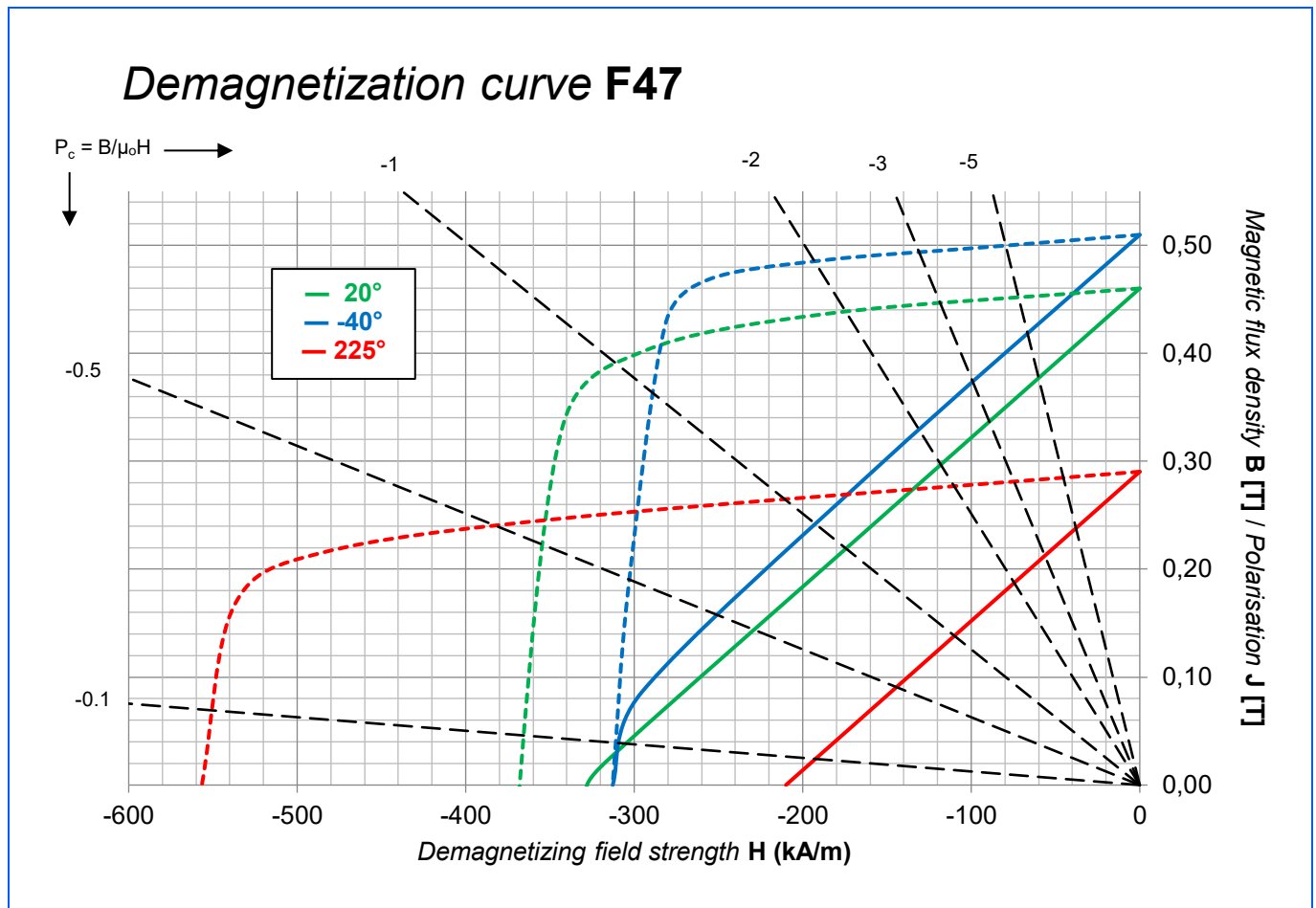
Solid lines represent magnetic flux densities. Dashed lines represent polarisations. The curves here are estimates obtained from data available from the current Goudsmit grade system (Available on the website. See also the magnetic properties below). On request, actual measurements of demagnetization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

Magnetic properties @20°C			
$B_r$	min	0.44	T
$H_{cB}$	min	318	kA/m
$H_{cJ}$	min	347	kA/m
$(BH)_{max}$	min	36.6	kJ/m <sup>3</sup>
$\alpha(B_r)$	min typ	-0.18	%/°C
$\beta(H_{cJ})$	min typ	0.20	%/°C
$T_{max}$		225	°C
$\mu_r$	typ	1.1	-

Physical & Mechanical properties @20°C			
Density	typ	4700 - 5100	kg/m <sup>3</sup>
Vickers Hardness	typ	400 - 700	HV
Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
Flexural / bending strength	typ	50 - 90	MPa
Compressive strength	typ	680 - 900	MPa
Tensile strength / ultimate strength	typ	20 - 50	MPa
Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega\text{m}$
Specific heat capacity	typ	500 - 900	J/(kg K)
Thermal conductivity	typ	2 - 10	W/(m K)
Coefficient of linear thermal expansion,    DOM*	typ	7 - 16	10 <sup>-6</sup> /K
Coefficient of linear thermal expansion, $\perp$ DOM*	typ	7 - 15	10 <sup>-6</sup> /K

\* DOM = Direction Of Magnetization

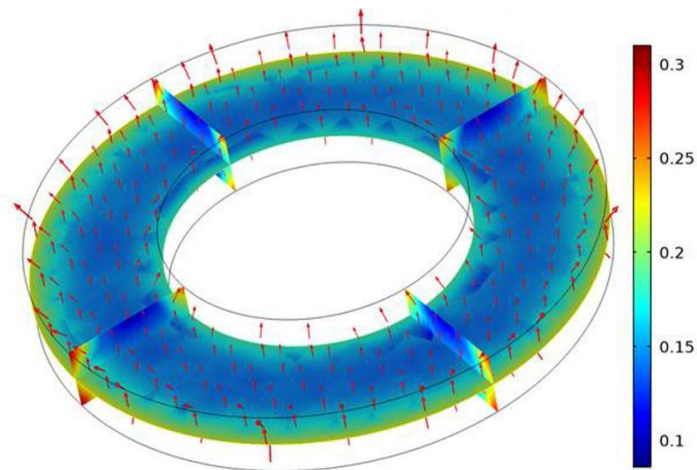
## Technical datasheet: Ferrite F47 – Anisotropic



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				Physical & Mechanical properties @20°C			
$B_r$	min	0.46	T	Density	typ	4700 - 5100	kg/m <sup>3</sup>
$H_{cB}$	min	328	kA/m	Vickers Hardness	typ	400 - 700	HV
$H_{cJ}$	min	368	kA/m	Modulus of Elasticity / Young's modulus	typ	120 - 180	GPa
$(BH)_{max}$	min	41.5	kJ/m <sup>3</sup>	Flexural / bending strength	typ	50 - 90	MPa
$\alpha(B_r)$	min typ	-0.18	%/°C	Compressive strength	typ	680 - 900	MPa
$\beta(H_{cJ})$	min typ	0.25	%/°C	Tensile strength / ultimate strength / stretching strength	typ	20 - 50	MPa
$T_{max}$		225	°C	Electrical resistivity	typ	>10 <sup>4</sup>	$\mu\Omega m$
$\mu_r$	typ	1.1	-	Specific heat capacity	typ	500 - 900	J/(kg K)
				Thermal conductivity	typ	2 - 10	W/(m K)
				Coefficient of linear thermal expansion, parallel to DOM*	typ	7 - 16	10 <sup>-6</sup> /K
				Coefficient of linear thermal expansion, perpendicular to DOM*	typ	7 - 15	10 <sup>-6</sup> /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.

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 and ISO14001.
- 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.

