SUMITOMO METAL MINING CO., LTD
Advanced materials Div.
Applied powder materials business Unit.
Website https://crossmining.smm-g.com/

Hereby are evaluation results for mold product obtained by our company.
Result stated may differ depends on shape, mold design and molding conditions of the mold product.

① Compound properties

(magnetic properties)

Type				S4A-7M	S4A-5M	S4A-4M	S4A-3M
Directional Property／Molding Process				an-isotropy/Injection Molding			
Component	Magnet power			$Sm_2Fe_{17}N_3$／Ferrite			
	Binder Resin			PA12			
	Specific Gravity		-	4.0-4.3	3.8-4.2	3.7-3.9	3.6-3.9
Magnetic Properties	Residual Induction	Br	T	0.52-0.57	0.44-0.50	0.40-0.45	0.36-0.40
			kG	5.2-5.7	4.4-5.0	4.0-4.5	3.6-4.0
	Coercive Force	H_{cB}	kA/m	330-390	290-330	260-300	240-290
			kOe	4.2-4.8	3.7-4.1	3.3-3.8	3.1-3.5
	Intrinsic Coercive Force	H_{cj}	kA/m	560-770	480-680	530-610	430-520
			kOe	7.1-9.6	6.1-8.5	6.7-7.7	5.5-6.5
	Maximum Energy Product	(BH)max	kJ/m^3	51-60	35-44	28-35	19-28
			MGOe	6.5-7.4	4.5-5.4	3.5-4.4	2.5-3.4
	Recoil Permeability	μ rec	-	1.1-1.2			
	Reversible temperature coefficient	α	%/K	-0.04	-0.08	-0.11	-0.14
		β	%/K	-0.44	-0.40	-0.35	-0.30

Sample-Size：ϕ20mm×L13mm、BH curve tracer

Representative value for mechanical properties

Type			S4A-4M
Mechanical Properties	Tensile strength	MPa	31.9
	Tensile elongation at break	%	0.61
	Tensile modulous of elasticity	MPa	9710
	Flexural strength	MPa	47.8
	Flexural modulous of elasticity	MPa	8470
	Poisson's ratio	-	0.34

- Tensile test：ASTM D638 compliance (Test temperature 23℃)
- Flexural test：ASTM D790 compliance (Test temperature 23℃)

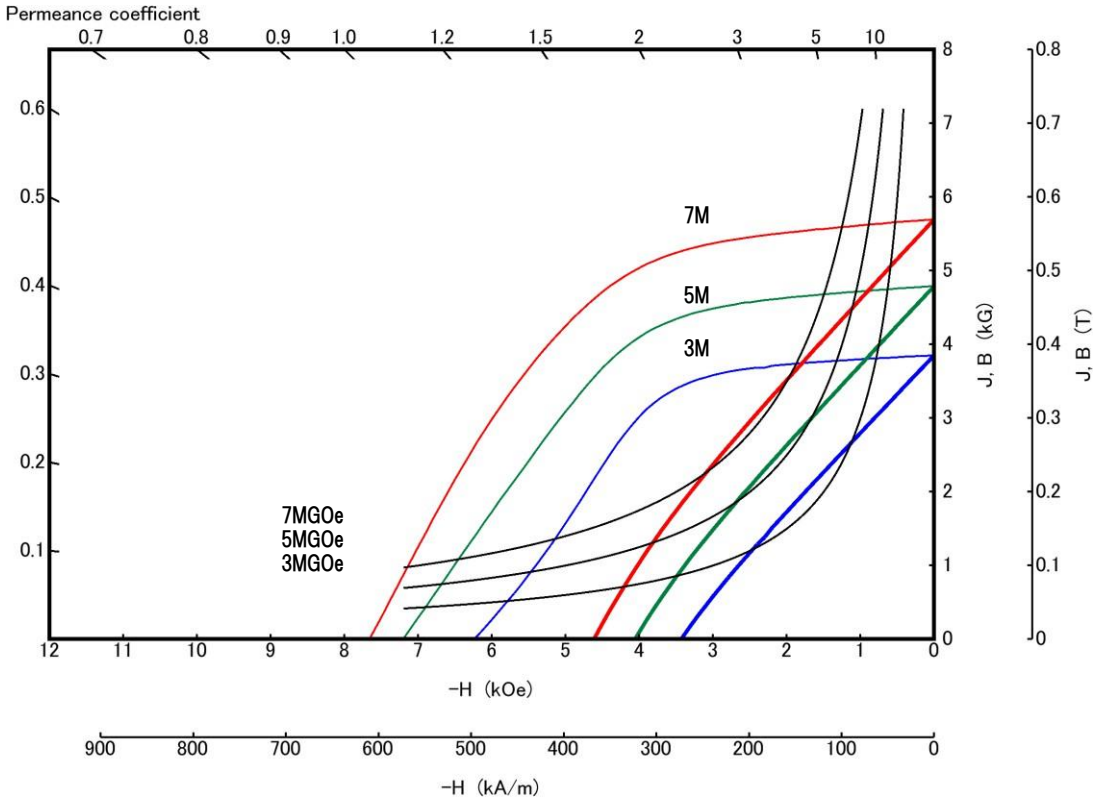
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Representative value for thermal properties

Type				S4A-4M
Directional Property／Molding Process				an-isotropy/Injection Molding
Thermal Properties	Flowability	MFR	g/10min.	1700
		Q-value	cm^3/s	0.6
	Temp. of deflection on load	Td	℃	111
	Linear thermal expansion coefficient		10^{-5}/℃	6.94
	Molding Srinkage		%	0.81
	Flammability Rating			UL-94HB

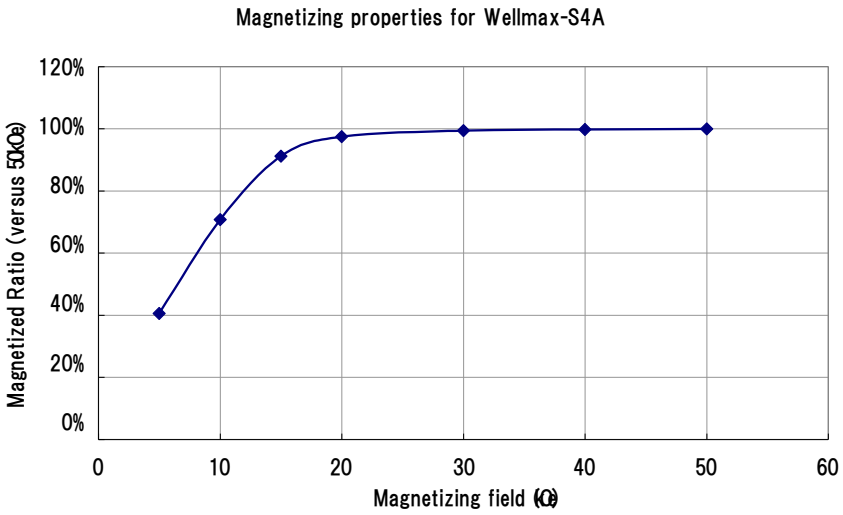
- Temperature for load deflection：ASTM D648 compliance

② **Demagnetizing curve** (Sample Size：φ20mm×L13mm)

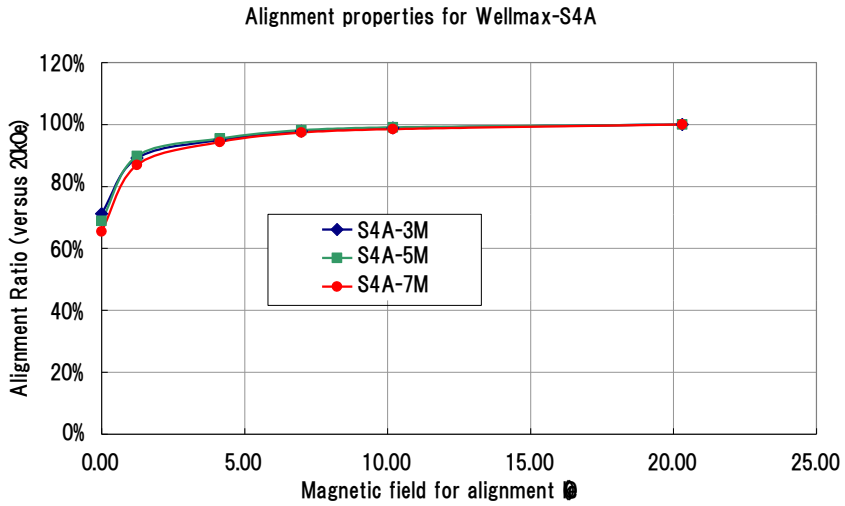


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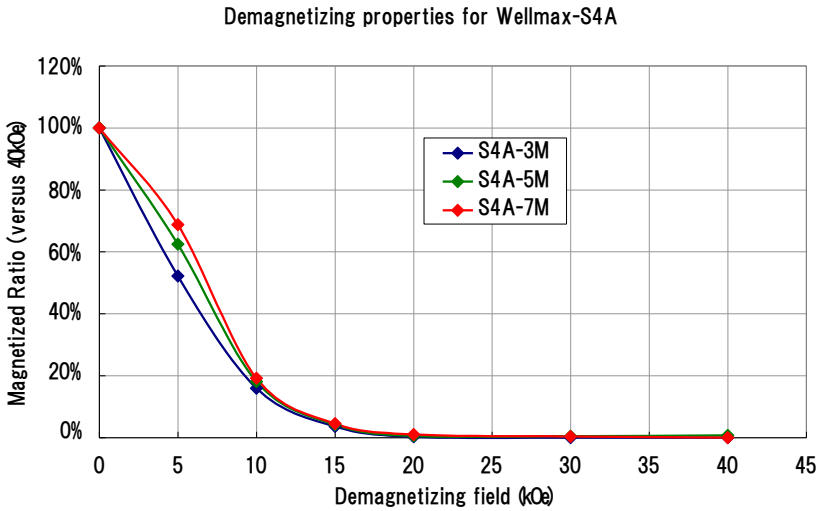
③ Magnetizing properties (Sample Size: φ10mm×L7mm)



④ Alignment properties (Sample Size: φ10mm×L7mm)

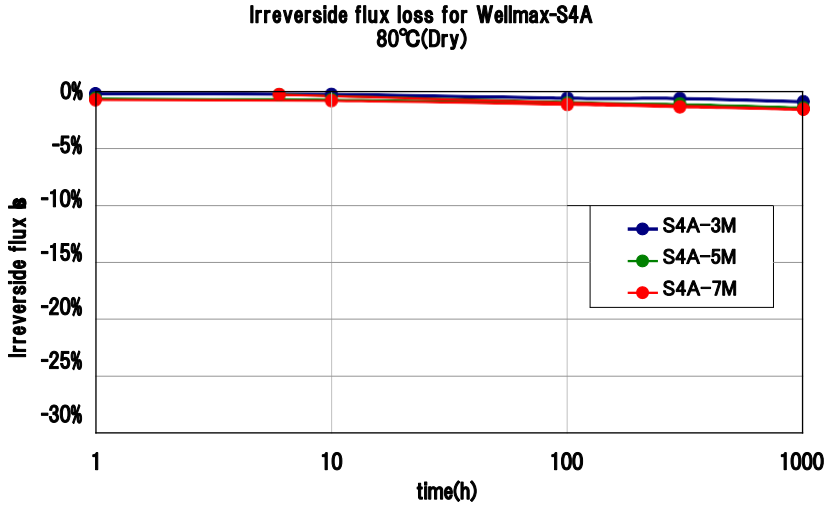


⑤ Demagnetizing properties (Sample Size: φ10mm×L7mm)



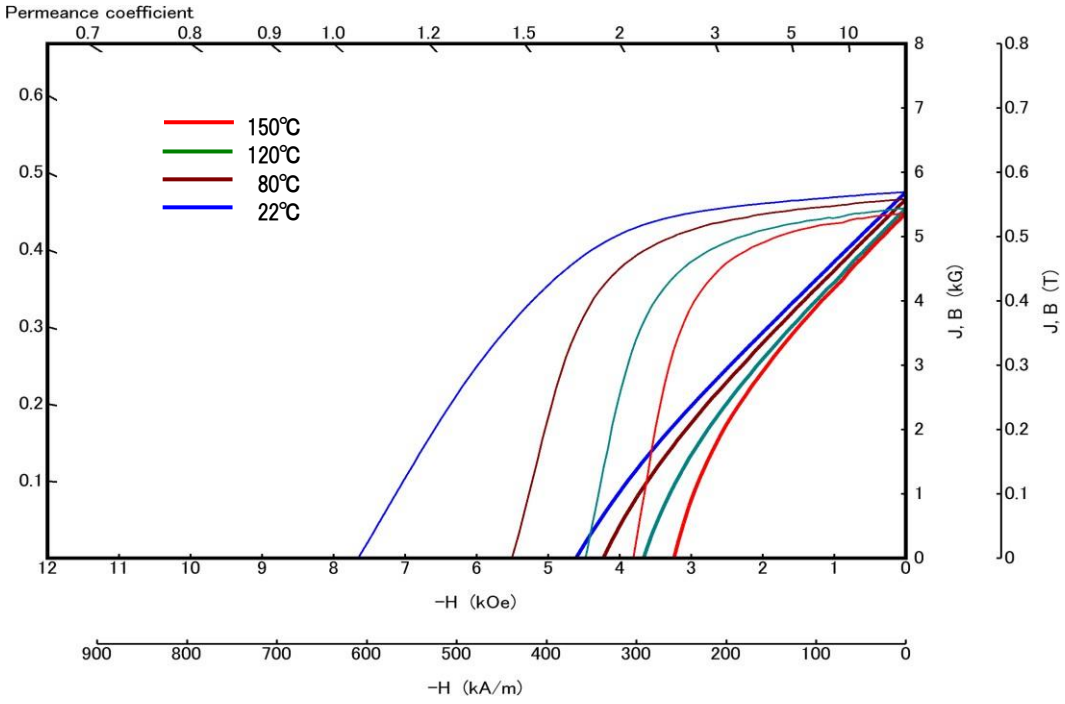
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⑥ Irreversible flux loss （Sample Size：φ10mm×L7mm）



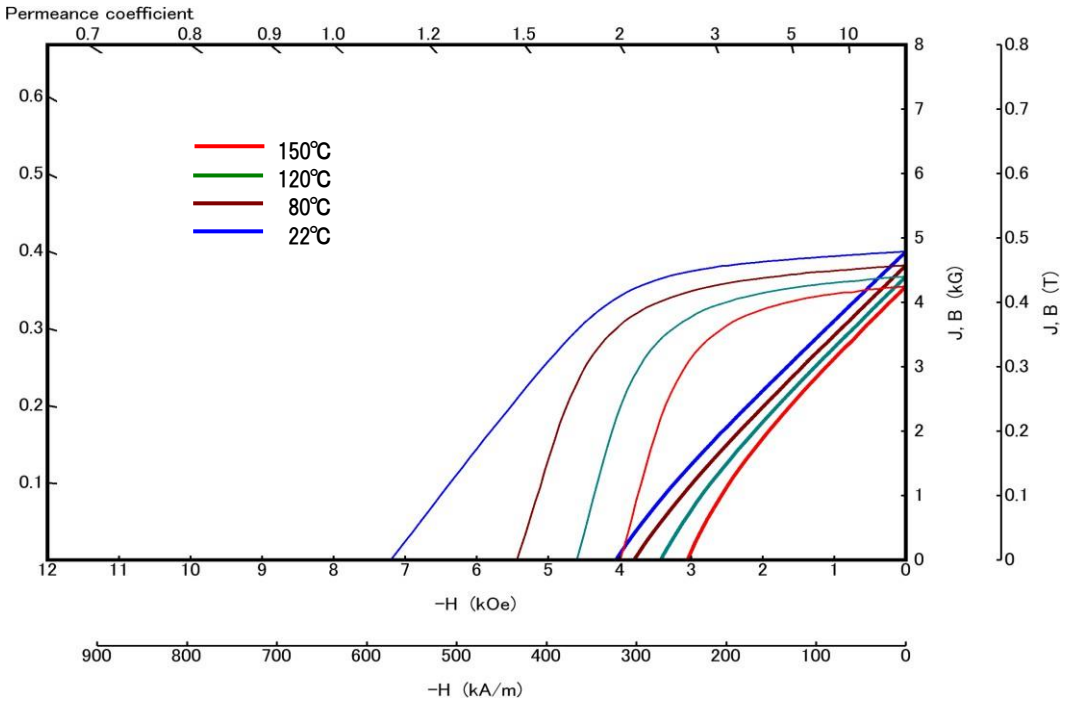
⑦ Variations of temperature for demagnetization

S4A-7M

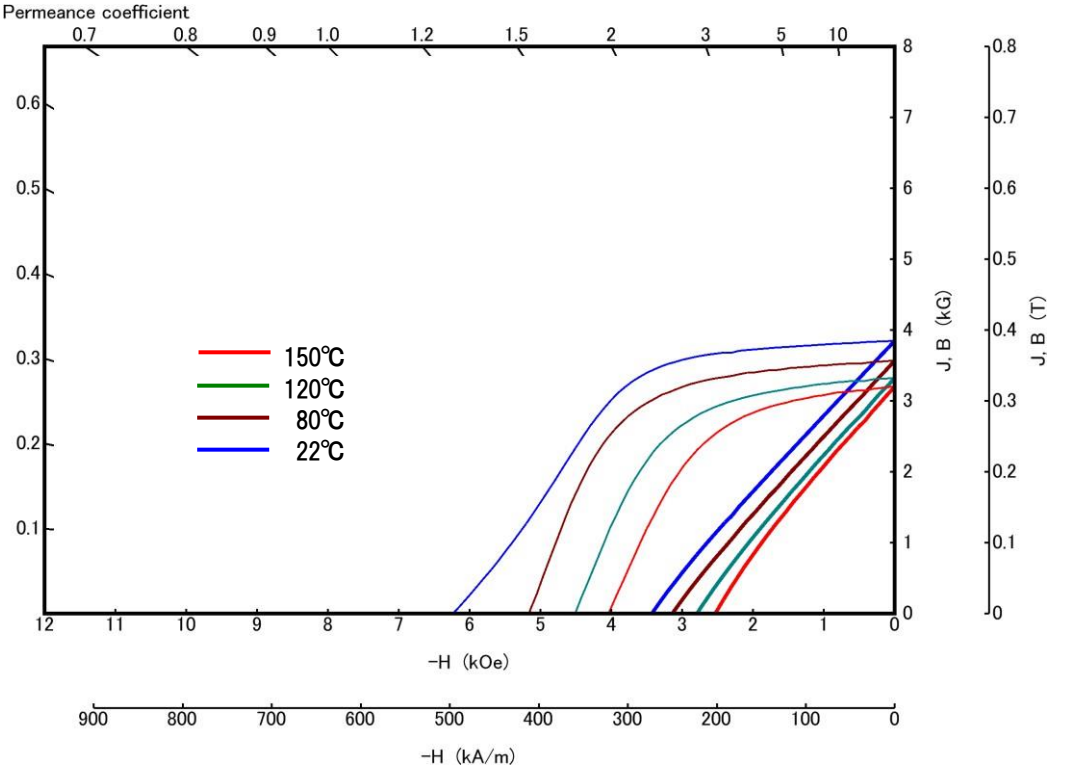


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S4A-5M


Permeance coefficient
0.7 0.8 0.9 1.0 1.2 1.5 2 3 5 10
150℃
120℃
80℃
22℃
J, B (kG)
J, B (T)
-H (kOe)
-H (kA/m)
900 800 700 600 500 400 300 200 100 0

S4A-3M


Permeance coefficient
0.7 0.8 0.9 1.0 1.2 1.5 2 3 5 10
150℃
120℃
80℃
22℃
J, B (kG)
J, B (T)
-H (kOe)
-H (kA/m)
900 800 700 600 500 400 300 200 100 0

⑧ Recommended molding conditions

Conditions	Wellmax-S4A-7M/ S4A-5M/ S4A-3M
Cylinder temperature	210～250℃
Mold temperature	80～100℃
Magnetic field for alignment	≧6 kOe ／ ≧480 kA/m
Others	Increasing the injection speed is recommend
	Increasing the cylinder temperature will tend to increase the magnetization and decrease the coercive force