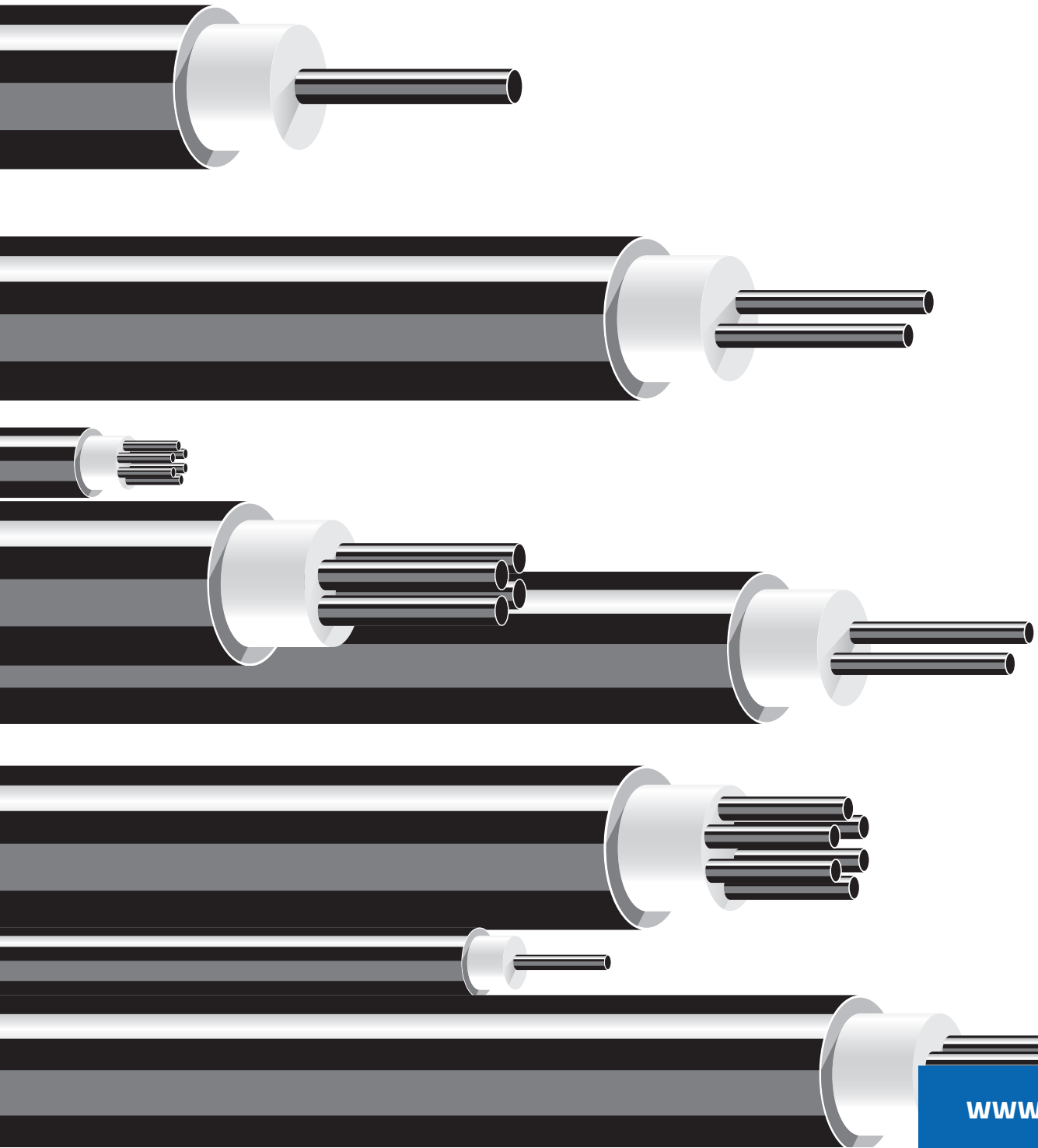
ISOMIL®

KNOW-HOW

> INSULATION MATERIALS AND DIELECTRIC STRENGTH



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Insulation Material

Typical Composition of the Standard Quality MgO and the High Purity Qualities MgO and Al2O3.

	MgO (97%) (Standard)	MgO (High Purity)	Al2O3 (High Purity)
MgO	>97,0	>99,4	0,08
Al2O3	0,15	0,019	99,8
CaO	0,7	0,02	0,004
Fe2O3	0,09	0,018	0,009
5iO22	2,0	0,02	0,08
B, Cd, S	>10 ppm	>10 ppm	>10 ppm
C *	10 ppm	50 ppm	20 ppm

*) can be reduced further if necessary (exposure to radiation) before use.

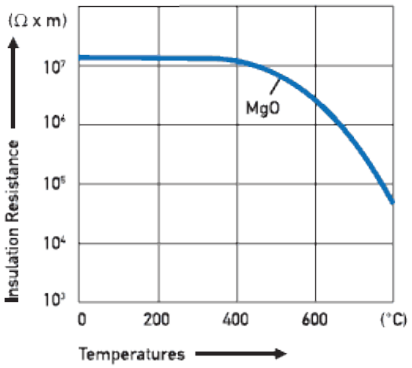
Physical Properties of Insulation Materials

Typical Composition of the Standard Quality MgO and the High Purity Qualities MgO and Al2O3.

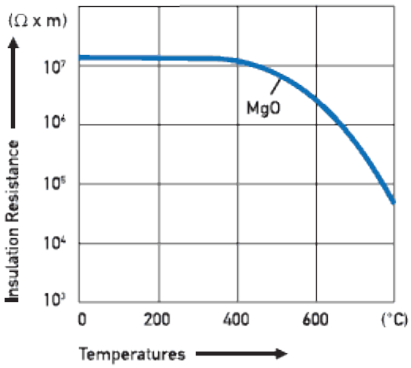
	MgO	Al2O3	Unit
Density (crystal)	3,65	3,98	g/cm3
Density in MIC	3,0	2,9	g/cm3
Melting Point	2800	3000	°C
Specific Heat (20-300°C)	1,03	0,95	J/gK
Coefficient of Exp. 20-200°C	11,3	6,55	10-6/K
Coefficient of Exp. 20-600°C	13,2	7,62	10-6/K
Resistivity 20°C	5x1016	1x1014	Ω x m
Resistivity 400°C	1x1013	1x1012	Ω x m
Resistivity 800°C	5x108	2x108	Ω x m
Dielectric Constant 20°C	5	9	-
Knoop Hardness	3700	21000	N/mm²
Modulus of Elasticity 20°C	3x105	3,6x105	N/mm²

Insulation Resistance

The two figures show typical curves for the insulation resistance.



Insulation resistance of ISOMIL measured with 20V DC.

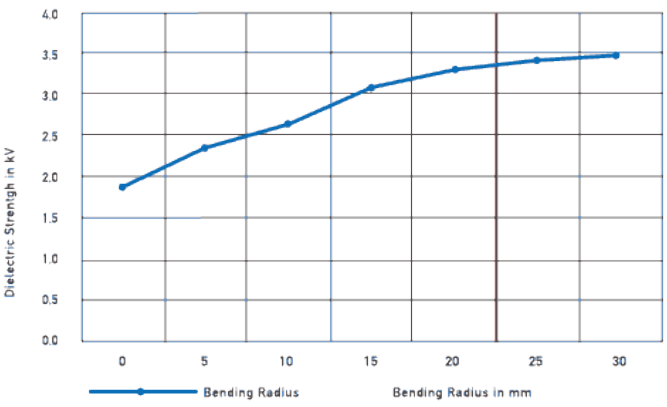


Insulation resistance of ISOMIL measured with 500V AC / 50Hz.

For both mineral insulated thermocouples and mineral insulated heating cables the standards (e.g. DIN 43721, ASTM E 420/71, VDE 0284) lay down dc measurements. Since polarization currents are accompanied by a time dependent increase of the insulation resistance after applying dc voltage, the measurement value is read off after 60 ± 3s. The displacement currents lead to considerably lower insulation resistances especially in the temperature range below 600°C. When considering an FI switch as a protective measure, the above must be given careful consideration when designing the circuitry in equipment with mineral insulated heating cables.

Dielectric Strength - Bending Radius

Mineral insulated cables can easily be wound into a spiral. The minimum bending radius varies according to the width of the sheath and is three to five fold the outer diameter. Bending causes a reduction in density in the insulation material under the outer edge of the sheath, this reduction increases the smaller the bending radius. The associated reduction in dielectric strength conductor/sheath is of significance especially for ISOMIL-H.



Measurements have shown that the dielectric strength is virtually temperature independent up to 800°C.

Dielectric strength as a function of bending radius- measured on ISOMIL-H at alternating voltage (50 Hz).

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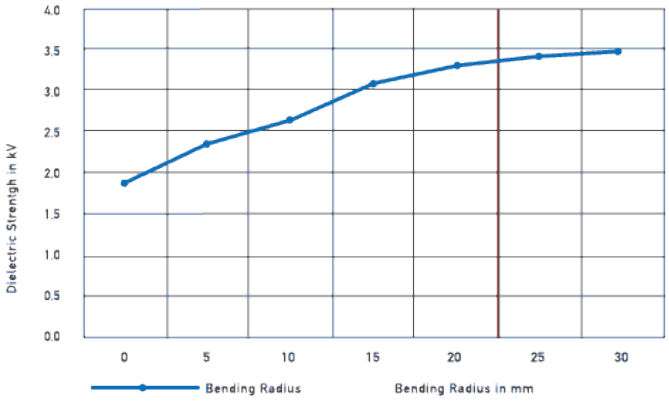

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