



**DURALOX 997 RE-CRYSTALLIZED
CERAMIC PYROMETRY TUBES
SINGLE-MULTIBORE INSULATORS
SOLID RODS & PROFILES**





From the Chairman's Desk

For over 4 decades, Jyoti has been manufacturing industrial Ceramics in a wide variety of composites such as Alumina, Zirconia, Zirconia Toughened Alumina, Mullites, Cordierites, Steatites, Forsterite, etc.

Jyoti's growth has been consistent with the needs of the industry, offering world standard quality industrial ceramics. Today, Jyoti is recognized world over as one of the dependable global source of supplies of Ceramic Micro-macro Milling Media, Wear-resistant Lining Tiles, Ball Mill Lining blocks, low tension Electrical Fuse-Switch Gear Insulators, Electrical Heater parts, Fluid Handling Pump parts, Spark Igniting Electrodes, Flame Sensors and Ceramic custom engineered parts.

Looking at the limited number of global manufacturers and growing international demand for high-temperature creep resistant ceramic pyrometry tubes and custom parts, we welcomed the opportunity to manufacture high purity 99.7% Re-Crystallized Alumina Ceramics in India with advanced German technical know-how and suitably expanded manufacturing facilities by installing state-of-the-art hot type micro-processor controlled ($> 1800^{\circ}\text{C}$) high temperature German kilns, high pressure de-airing ram extruders, automatic dry/wet bag isostatic presses and other special purpose machines required for ceramic body preparation, product manufacture and quality control.

We ensure world-class quality for our products at most competitive prices with committed deliveries.

Shyam Merani

Duralox 997 Ceramic Pyrometry Tubes

Duralox stands for Durable Aluminium Oxide and is a registered trade name of Jyoti Ceramic Industries Pvt. Ltd. It stands for Aluminum Oxide ceramic compositions content 90 to 99.7% & above percentage of Al_2O_3 in its residue.

Duralox 997 Re-crystallized Alumina Ceramic

Duralox 997 Re-crystallized Alumina Ceramic is fine grained, non porous, dense and impervious to all acids except hydrofluoric acid. Duralox 997 is exceptionally high purity Alumina Ceramic, containing 99.7% Al_2O_3 and SiO_2 less than 0.05% in its residue.

- **Stability at high temperature and Chemical Inertness**
Duralox 997 is inert even at high temperatures in reducing atmosphere and flux attack due to low silica content in its residue.
- **Physical Strength**
Duralox 997 Alumina is extremely hard with high mechanical strength and resistant to abrasion & corrosion and good thermal conductor at high temperatures.
- **Imperviousness**
Duralox 997 Alumina products are fired at extremely high temperature around 1750°C which ensures impermeability under severe & critical conditions.
- **Product Range**
Duralox 997 Alumina product range includes solid rods Dia. 0.5 mm and above, Pyrometry Tubes with one end closed, both ends open, tubes with single & multibores, thin-wall tubes, capillary tubes, thin & thick ballistic armor tiles, pallets, profiles & custom designed parts.
- **Good Electrical Resistivity**
Duralox 997 Alumina maintains good electrical resistivity at high temperatures.
- **High heat Conductivity**
Duralox 997 Alumina products are considered as high-tech products and are manufactured with advanced technology, therefore maximum density is ensured with minimum wall thickness. This makes the highest possible heat transfer.
- **Amphoteric**
Duralox 997 Alumina is highly resistant to acid slugs.

Pyrometry Sheaths

The main feature of Duralox 997 Re-crystallized Alumina is its very high degree of chemical inertness. It offers a high degree of protection against reactive slags or furnace gasses and its low silica content ensures that there is no contamination of rare metals such as platinum by silicon a frequent cause of loss of calibration in thermocouples.

Tubes

Duralox 997 Re-crystallized Alumina tubes pass good electrical resistivity as well as high thermal conductivity at high temperatures. When supported adequately, they can be used up to a temperature of 1800°C+ (3272°F+) and are suitable for molybdenum and tungsten wound tube furnaces, particularly for processes requiring a tube of an impervious nature.

Single and Multibore Insulators

Duralox 997 Re-crystallized Alumina can be used up to a temperature of 1800°C. It is particularly suitable for use as an insulator for rare metal thermocouples, because of its low silica content ensures that there is no contamination of rare metals such as platinum with silicon. Duralox 997 alumina one end closed thermocouple protection tubes are fired vertically at around 1750°C temperature in oxygen atmosphere in micro processor controlled state-of-the-art kiln. After sintering, 100% thermocouple sheaths are tested under air pressure @4 bar to ensure gas tightness.

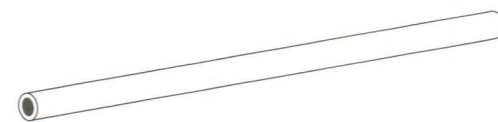
Advantages

Duralox 997 Re-crystallized Alumina Ceramic offers following advantages over the metals:

1. Continuous high temperature resistance > 1750°C.
2. Higher thermal stability.
3. Lower thermal expansion.
4. Higher electrical insulation.
5. Higher modules of elasticity, hence higher rigidity.
6. Greater hardness and wear resistance.
7. Higher abrasion corrosion and oxidation resistance.
8. Higher compressive strength.
9. Inert to Hydrogen, Carbon and refractory metals under most severe conditions, non toxic, non-radioactive, non-magnetic and non-aging.

Duralox 997 (DIN VDE 0335) Re-crystallized Alumina Ceramic Protection Sheaths For Thermocouples & Sensors

Outer Dia (OD)	Inner Dia (ID)	Length Up to (L)	One Part (Iso pressed)
6	4	1500	-
6.35	4.8	1500	-
7	5	213	YES
8	5	1500	-
9	6	1500	-
9.5	6.35	1500	-
10	6	1500	-
10	6	225	YES
12	8	1500	-
13	9	1500	-
15	6	1500	-
15	10	1500	-
15	6	1030	YES
15	10	1030	YES
15	10.5	330	YES
17	13	1000	YES
17	13	1500	-
20	8	1000	YES
20	10	1000	YES
20	15	1000	YES
20	8	1500	-
20	10	1500	-
20	15	1500	-
24	18	1000	YES



• Pyrometer protection sheaths (closed one end) are available from 100 to 1500 mm long.

Only against specific enquiry, we can offer protection thermocouple sheaths and tubes with open both ends and with flanges, price on request. Please do not fail to specify length of the sheath in your purchase enquiry.

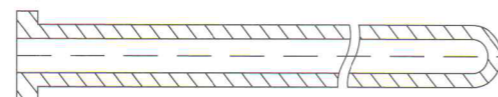
Pyrometer Sheath sizes not shown in above table can be made on request, if found feasible.

Workable dimensional tolerances are adhered to DIN standards 40680 medium class. Tubes with close tolerances can be manufactured on enquiry. Code RC PS corresponds to Re-crystallized Pyrometry Protection Sheath. Sheath means closed one end Pyrometer tube.

Iso Pressed closed one end (COE) tubes with collar*

* Prices on request.

Confirm collar dimensions, tube OD, tube ID and length.



Duralox 997 (DIN VDE0335) Re-crystallized Alumina Ceramic, Solid Round, Oval Rods, Single & Multibore Tube Insulators (All dimensions are in mm)

Solid Round Rods	Single Bore Tubes	2 Bore Insulators	4 Bore Insulators	Oval 2 Bore Insulators
Dm (Ø)	O Ø / I Ø	O Ø / B Ø	O Ø / B Ø	L / W X B Ø
0.6 to 50	1 x 0.25	2.5 x 0.6	3 x 0.8	3/1.5 x 0.8
	1.35 x 0.6	3 x 0.8	3.5 x 1	4.2 x 2.2 x 1.2
	1.4 x 0.5	3 x 1	4 x 1	
	1.5 x 0.75	4 x 0.8	4.5 x 1	
	2.5 x 1.3	4 x 1	4.5 x 1.3	
	2.5 x 1.5	4.5 x 1	5 x 1.2	
	2.7 x 1.7	4.5 x 1.5	5 x 1.3	
	3.2 x 1.5	5 x 1.3	6 x 1.3	
	4.75 x 1.35	5 x 1.8	6 x 1.5	
	4.8 x 3	5.5 x 2	7 x 1.5	
	6 x 4	6.4 x 0.8	8 x 2.3	
	8 x 5	6 x 2	8.5 x 1.5	
	10 x 2.5	6.5 x 1.8	8.5 x 2.5	
	10 x 6	6.5 x 2	9.5 x 2.5	
	12 x 8	7 x 2	10 x 1.8	
	15 x 6	7 x 2.5	10 x 3.1	
	15 x 10		6.6 x 2	
	20 x 8			
	20 x 10			
	20 x 15			

* Ø = diameter in mm O Ø = outer diameter in mm B Ø = bore diameter in mm

Profiles, solid round & oval rods, tubes and multibore insulators other than above sizes can be manufactured on request. All tubes are open at both ends. Solid Rods and Tubes of length 5 to 1500 mm can be produced depending on outer Diameter. Specify length of Solid Rod, Tube or Insulator in purchase enquiry.

Duralox 997 single and multibore tubes and insulators are used for insulating thermocouple wires suitable for maximum temp 1800°C according to DIN 43725 standards. Tube sizes other than as above shown in table can be made on request if found feasible. Dimensional tolerances are maintained to DIN 40680 medium class Standards.

Typical Properties Of Impervious Re-crystallized 997 Alumina Ceramics

Material Property	Units	Duralox 997
Chemical Composition		Al ₂ O ₃ : 99.7% Alkali : 0.05%
Colour		Ivory
Density	gm/cc	3.85-3.90
Porosity		Nil, gas tight
Hardness(Vicker's) (Moh's scale)	HV 10	1550 ⁻¹⁶⁰⁰ 9+
Flexural Strength	Kg/cm ²	3000
Young's Modulus	X 10 ⁶ kg/cm ²	3.5
Coefficient of linear thermal expansion (25°C-1000°C)	X 10 ⁻⁶ / °C	8
Thermal Conductivity (25°C)	W/m ⁰ K	26
Max. Working temp. in oxidizing atmosphere @ no load	°C	1800+
Dielectric strength (25°C) (1.5 mm thick)	KV/mm	25
Volume Resistivity (25°C)	Ohm.cm	10 ¹⁴
Thermal shock resistance	°C	Good (170°C) (120°C-170°C)

Chemical Characteristics of Duralox 997

In Vacuum

Reacts with carbon at about 1650°C
Reacts with zirconia at about 1800°C
Reacts with magnesia at about 1900°C
Reacts with thoria at about 1990°C
Reacts with beryllia at about 1860°C

In Oxidising Atmosphere

Reacts with magnesia at about 1600°C
Reacts with zirconia at about 1700°C
Reacts with thoria at about 1900°C

In Inert Atmosphere

No reaction with molybdenum at 1800°C
No reaction with nickel at 1800°C
Slight reaction with niobium at 1600°C
Violent reaction with niobium at 1800°C
Slight reaction with titanium at 1600°C
Violent reaction with titanium at 1800°C
Slight reaction with beryllium at 1800°C
Slow reaction with silicon at 1400°C
Violent reaction with silicon at 1600°C
Slow reaction with zirconium at 1600°C
Violent reaction with zirconium at 1800°C

Dimensional tolerances and allowances are conforming to DIN Standard 40680 Medium Class

DIN Standard 40680 Medium Class

For Diameters (OD-ID)-Length-Camber-Ovality and Eccentricity

On diameter	Tolerances
1 to 5 mm	± 0.2 mm or 4% whichever is greater
5.1 to 40 mm	± 0.3 mm or 2% whichever is greater

On length	Tolerances
20 to 150 mm	± 0.5 mm or 2% whichever is greater
151 to 1500 mm	± 2 mm or 1 % whichever is greater
Allowance on Camber	0.5% of the length
Allowance on Ovality	0.1 mm or 0.5% of the diameter whichever is greater
Allowance on Bore eccentricity	0.05 mm or 0.5% of the diameter

Tolerances closer than above on request.

Duralox 997 Alumina Ceramic Pyrometry Tubes and Insulators are formed by high pressure extrusion, dry/wet bag isostatic pressing.

We are constantly working for improvement of the product quality, hence the data given in the brochure may change as and when found necessary.

Information contained herein is to the best of our knowledge, true and accurate and is based upon measurements made in our R&D Laboratory. Recommendations, suggestions and data are practical guidelines and not guarantees. Actual results may vary with conditions of use and with variations in the methods of manufacture, size and shape of the ceramic part. We disclaim any liability that may be incurred in connection with use of suggestions or data. This publication is not to be taken as license to operate under or a recommendation to infringe any patents. Observation of all legal regulations and patents is the responsibility of the user.

High Temperature Ceramic Adhesive Cement



Alucem-HT2

Alucem-HT2 is a two component chemical setting Inorganic Adhesive Cement, cures at room temperature. Alucem-HT2 consists of two parts. Part I dry powder and part II liquid (curing agent).

Typical Applications:

- Ideal for bonding, assembling, sealing, joining Ceramic to Metal, Ceramic to Ceramic, Glass to Glass, Glass to Ceramic, Ceramic to Quartz etc.
- Excellent adhesive with bonding strength.
- Good thermal conductivity, electrical and mechanical properties.
- Ideal for fixing ceramic Pyrometry Tube with metal tube for thermocouple assembly.
- Maximum continuous working temperature 1500°C.
- Also can be used for electrical application such as bonding, potting, encapsulation of electrical heater elements, metal terminal parts, embedding hot plates, resistor elements etc.
- Ideal for thin and thick coatings and for bonding application.

Alucem-HT2 two component ceramic adhesive (powder/liquid) cement

Parameters	Powder	Liquid
Colour	White dry powder	Slightly turbid
Mesh size	Passed through 60 mesh sieve	--
PH	--	12
Mixing ratio	Powder : Liquid 1 : 1 by weight	
Pot life at 25°C	30 minutes	
Curing time	24 Hrs at 25°C for 1 mm thick coat	
Max. service Temp	1500°C	

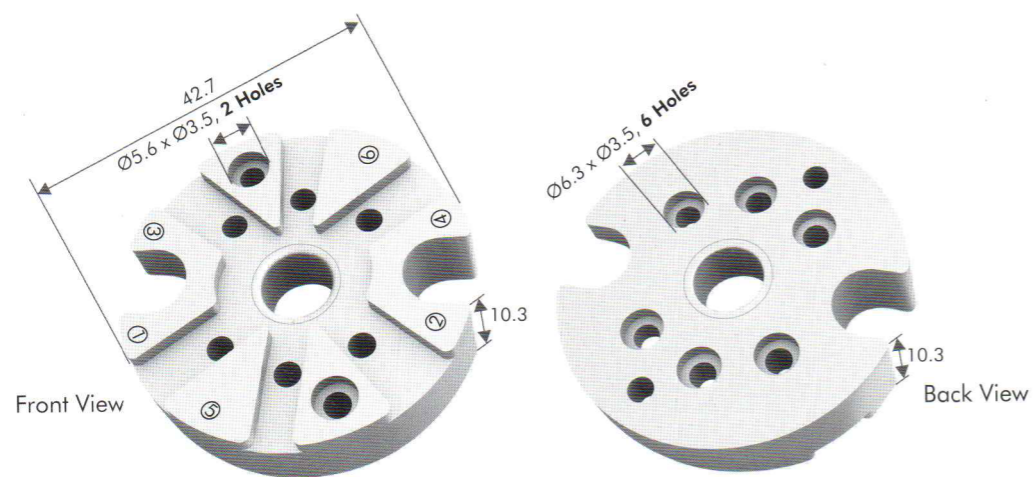
Typical properties for HT2 cement

Density	: 2.3 gm/cc ³
Compressive strength	: 425 Kg/cm ²
Flexural strength	: 210 Kg/cm ²
Tensile strength	: > 40 Kg/cm ²
Co-efficient of linear thermal expansion (20°C – 1000°C)	: 5 x 10 ⁻⁶
Thermal conductivity	: 3 w/m ⁻¹ /k
Dielectric strength	: 7 – 10 Kv/mm at 25°C
Volume resistivity	: >107 ohm.cm at 25°C
Shelf life for HT2	: 12 months in a original closed airtight container

Packaging:

Alucem-HT2 cement is available in 1, 5, 10 Kg packings in strong sturdy HDPE plastic containers and liquid in separate plastic bottles.

Terminal Block Insulator (All dimensions are in mm)



Steatite ceramic thermocouple terminal insulator for connecting thermocouple cables. Material grade HF-82 Steatite corresponding to German grade KER 221 with controlled close dimensions, satin smooth finish, non porous and fully vitrified.

Typical properties:

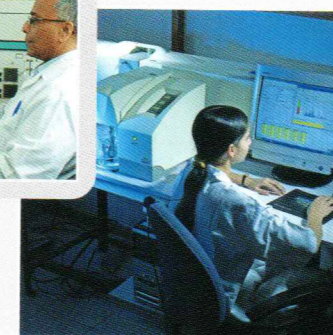
Properties	Units	Steatite
Colour	--	Off white
Specific gravity	--	2.7
Water absorption	%	0.0
Flexural strength	Kg/cm ²	1,300
Compressive strength	Kg/cm ²	8,500
Hardness	Hv10	520
Co-efficient of linear thermal expansion (20°C - 1000°C)	X10 ⁻⁶ /°C	8.5
Safe operating temperature (No load)	°C	1,050
Dielectric strength (20°C)5 mm thick	KV/mm	22
Dielectric constant (20°C : 1 MHZ)	--	6
Dissipation factor 20°C : 1 MHZ	--	0.0004
Volume resistivity (20°C)	Ohm-cm	10 ¹³



Scanning Electron Microscope



X-Ray Diffractometer



Particle Size Analyzer

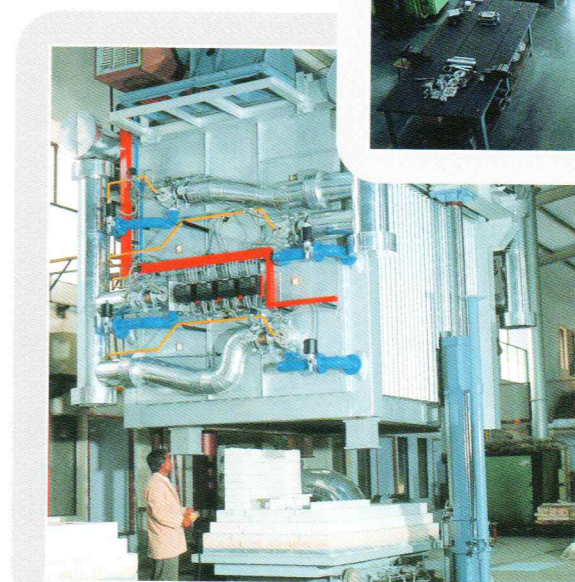


Battery of Isostatic/Uniaxial Moulding Presses

Glimpses from our state-of-the-art facilities.



Tool Room



Bell Type (1800°C) High Temp. Kiln



Consistently
delivering
exclusive quality
since four decades.



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NOTE: The information gathered in this brochure is based on the results obtained from our R&D Laboratory and is believed to be reliable. Since the conditions of application and use of ceramic component is beyond our control. We cannot stand any warranty or accept representation regarding the results obtained by the use of the product, or that such use will not infringe on any patent. This information is provided in good faith that the user will evaluate the material through testing and determine the suitability of the product. JYOTI ceases the liability for any damage, injury etc. caused by the mis-handling of the product. JYOTI disclaims any warranty of merchantability or fitness for particular application.