

# Enameled wires

## Thermibond® TS Alu FL

- Enameled winding wire with a surface layer of thermosetting adhesive
- Insulation based on polyamide-imid enamel
- Temperature Index 220

### General description

THERMIBOND® TS rectangular wires are insulated with a modified polyamide-imide varnish resulting in good thermal and mechanical properties and an overcoat of thermosetting bonding varnish of aromatic polyamide. When the temperature of windings of THERMIBOND® TS wires are raised above 180 °C, the surface film softens at first so that the windings can bond between each other and after that it cures. In this way the thermosetting bonding varnish of THERMIBOND® TS is well adapted to replace impregnating varnishes and makes the handling of the windings easier.

### Application

- Stator windings of motors and generators

### Conventional Types

Rectangular copper wires:

|                  |                           |
|------------------|---------------------------|
| - Thickness:     | 1.70 to 7.00 mm           |
| - Width:         | 4.25 to 18.00 mm          |
| - Cross-section: | 15 to 100 mm <sup>2</sup> |
| - Ratio W/T:     | 1.10 to 7.00              |
| - Coating class: | Grade 2                   |

The standard dimensions of the conductors (nominal dimension), the overall dimensions and the tolerances comply with the standard IEC 60317-0-9.

### Standards

There are no existing standards for this product at today.

The test methods are based on IEC Publication 60851:

- 60851-1 General
- 60851-2 Definition of dimensions
- 60851-3 Mechanical properties
- 60851-4 Chemical properties
- 60851-5 Electrical properties
- 60851-6 Thermal properties

### Advantages

- Cost savings: no varnish waste disposal, no procuring of impregnating agents, less working area needed, shorter manufacturing cycles - Environmental: no pollution, clean and safe working places, without fire or explosion hazard.
- Technical: very good thermal resistance, high bonding strength.
- Better reliability: homogeneity of coating, no influence of solvents or impregnating agents.

### Processing Instructions

Windings made of THERMIBOND® TS must be cured at temperatures between 180 and 200 °C. Optimal results are obtained when the windings are compressed during the phase of heating at min. 0.04 N/mm<sup>2</sup>. The curing temperature has to be kept for at min. 30 minutes before cooling down the windings. Pay special attention previously to not elongate the wire during the winding operations.

### Storage Conditions

THERMIBOND® TS wires have to be stored protected from light. All reels must be covered during storage. Storage time is limited to 1 year at room temperature.

### Order Data

Quantity, Designation, Supply form e.g.:

The designation shall comprise:

|                                |               |
|--------------------------------|---------------|
| For rectangular shape of wire: | FL            |
| Designation of the insulation: | THERMIBOND TS |
| Nominal dimension in mm:       | 2.24 x 5.00   |
| Reel type: e.g.:               | VM 630        |

Example of complete order:

2000 kg FL TB TS 2.24x5.00mm V630

|   | unit       | value               | Test standard      |
|---|------------|---------------------|--------------------|
| <b>Mechanical properties</b>  |            |                     |                    |
| Elongation at break   | %          | ≥ 15                | IEC60851-3 test 6  |
| Springiness   | °          | ≤ 5.0               | IEC60851-3 test 7  |
| Adherence after elongation  | Mini. 15 % | No loss of adhesion | IEC60851-3 test 8  |
| Flexibility - edgewise bent<br>For width < 10 mm: mandrel Ø 4 x width<br>For width ≥ 10 mm: mandrel Ø 5 x width |            | no cracks           | IEC60851-3 test 8  |
| Flexibility - flatwise bent on mandrel Ø 4 x thickness  |            | no cracks           | IEC60851-3 test 8  |
| <b>Electrical properties</b>  |            |                     |                    |
| Break down voltage Grade 2  | V          | ≥ 2000              | IEC60851-5 test 13 |
| <b>Thermal properties</b>   |            |                     |                    |
| Heat shock 30 min /240 °C mandrel Ø 6 x thickness   |            | no cracks           | IEC60851-6 test 9  |
| Bonding temperature   | °C         | 180 .... 200        |                    |
| Thermal endurance   | TI         | 220                 | IEC60172           |

#### Appearance

Slight color variations are raw material or process-related and have no influence on the technical properties of the wire

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