

# Fiber-insulated wires

## DAGLAS THERMEX FL

- **Enameled flat copper wire insulated with a glass/polyester Fiber blend**
- **Winding wire with excellent thermal and mechanical properties**
- **Temperature Index 155, 180 or 200**

### General description

THERMEX®220 enameled wires of rectangular cross section are insulated with a single or double covering of glass and polyester fibers which is fused or melted with the adequate heat treatment.

DAGLAS-covered enameled wires can also be supplied with an impregnation varnish of modified polyesterimide (V180) or silicone (V SI).

DAGLAS-covered enameled wires can be supplied in a thermal-adhesive version (K) for thermal classes 180. Silicone impregnation is not available in the thermal-adhesive version.

### Application

- Windings for generators (with or without Roebelting technology)
- HV motors (in stators or rotors)
- Magnetic coils

### Conventional Types

Covered enameled copper wires THERMEX® 220 Grade 2, insulated with:

- 1 covering layer (1 x)
- 2 covering layers (2 x)
- optional: varnish impregnation
- coating varnishes: modified polyesterimide, silicone, 'B'-Staged varnish

Cross section: 2 to 80 mm<sup>2</sup>  
 Width: 2,00 to 22,00 mm  
 Thickness: 1,00 to 6,00 mm.

The standard dimensions of the conductors (nominal dimensions), the tolerances and the overall dimensions of the enameled wire comply with the IEC standard 60317-0-8.

### Build Criteria Rectangular Wire

Bare conductor width w (mm)	Max. increase in dimensions (mm)	
	Daglas fiber covering over Grade 2 enameled Conductor	
	Single covering	Double covering
2.00 ≤ w ≤ 3.40	0.23 to 0.32	0.32 to 0.39
w > 3.4	0.23 to 0.32	0.35 to 0.44

### Standards

DAGLAS-covered flat bare copper wires meets the requirements of IEC-Publications 60317-0-8, 60317-60-1 (TI155 fused, without impregnation) 60317-61 (TI180) --> V180 60317-62 (TI200) --> VSi

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

- Covering with high mechanical and bonding strength
- Great resistance to abrasion and scraping
- Good resistance to impregnating varnish solvents (for more information, consult our customer service)

### Processing Instructions

Can be processed without reservation under normal working conditions. For the items with a thermal adhesive bond-coat, the storage time is limited to 1 year at room temperature and 60 % relative humidity.

### Order Data

Quantity, Designation, Supply Form e.g.:

The designation shall comprise:

For flat shape:	FL
Enameled wire:	Thermex 220 Grade 2
Designation of the yarn covering:	2Daglas
Nominal dimension in mm:	2.24x5.00mm
Reel type:	e.g. DIN 500

Example of complete order:

2000 kg FL TX220 G2 2Daglas 5.00x2.24 mm D500

		Thermex 220 1 or 2DAGLAS® not impregnated	Thermex 220 1 or 2DAGLAS® V180 (K)	Thermex 220 1 or 2DAGLAS® VSI	Test norm
<b>Mechanical properties</b>					
Elongation at break / Thickness up to 2.50 mm	%	≥ 30	≥ 30	≥ 30	IEC60851-3 test 6
Elongation at break / Thickness above 2.50 mm	%	≥ 32	≥ 32	≥ 32	IEC60851-3 test 6
Springiness	°	≤ 5.5	≤ 5.5	≤ 5.5	IEC60851-3 test 7
Adherence after Elongation	min. 20 %	no loss of adherence	no loss of adherence	no loss of adherence	IEC60851-3 test 8
Flexibility if width up to 10 mm - Edgewise bent on mandrel		no cracks	no cracks	no cracks	IEC60851-3 test 8
Flexibility if width above 10 mm - Edgewise bent on mandrel Ø 6xwidth		no cracks	no cracks	no cracks	IEC60851-3 test 8
Flexibility - Flatwise bent on mandrel Ø 8xthickn.		no cracks	no cracks	no cracks	IEC60851-3 test 8
Shear Strength (V180 K) 1.47.14	N/mm <sup>2</sup>	-	≥4	-	FIM test no.
<b>Electrical properties</b>					
Breakdown Voltage after bending (G2, 1x)		V≥2200	≥2200	≥2200	IEC60851-5 test 13
Breakdown Voltage after bending (G2, 2x)	V	≥2400	≥2400	≥2400	IEC60851-5 test 13
<b>Thermal properties</b>					
Heatshock 30 min / 180 °C if width up to 10 mm - Edgewise Ø 7xwidth		no cracks	-	-	IEC60851-6 test 9
Heatshock 30 min / 180 °C if width above 10 mm - Edgewise Ø 8xwidth		no cracks	-	-	IEC60851-6 test 9
Heatshock 30 min / 200 °C if width up to 10 mm - Edgewise Ø 7xwidth		-	no cracks	no cracks	IEC60851-6 test 9
Heatshock 30 min / 200 °C if width above 10 mm - Edgewise Ø 8xwidth		-	no cracks	no cracks	IEC60851-6 test 9
Thermal Endurance	TI	155	180	200	NEMA MW 1000

## Appearance

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

The product properties set forth in this data sheet are based on the results of testing of typical material produced by the company Torns Fil De Bobinage SAS. Some variation in product properties is typical. Comments or suggestions relating to any subject other than product properties are offered only to call the end-user's or other person's attention to considerations which may be relevant in the independent determination of the use and/or manner of use of product. Torns Fil De Bobinage SAS does not claim or warrant that the use of its product will have the results described in this data sheet or that the information provided is complete, accurate or useful. The user should test the product to determine its properties and its suitability for the intended use. Torns Fil De Bobinage SAS expressly disclaims any liability for any damage, harm, injury, cost or expense to any person resulting directly or indirectly from that person's reliance on any information contained in this data sheet. Nothing contained in this data sheet constitutes representation or warranty as to any matter whatsoever. Torns Fil De Bobinage SAS makes no warranties whatsoever in this data sheet, expressed or implied, including any implied warranty or fitness for a particular use or purpose. Torns Fil De Bobinage SAS shall in no event be liable for incidental, exemplary, punitive or consequential damages.