



**THEVA**

# HTS CONDUCTORS FOR MAGNET TECHNOLOGY

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## THEVA AT A GLANCE

Company THEVA GmbH, HQ in Ismaning, Germany, established 1996

Team 50 FTE (mainly engineers and production team)

### Product portfolio



HTS wire  
THEVA Pro-Line



HTS coils



Inspection tools  
TapeSTAR™



### Value proposition

- Robust, high performance products
- Reliable wire supply
- Expertise and engineering support

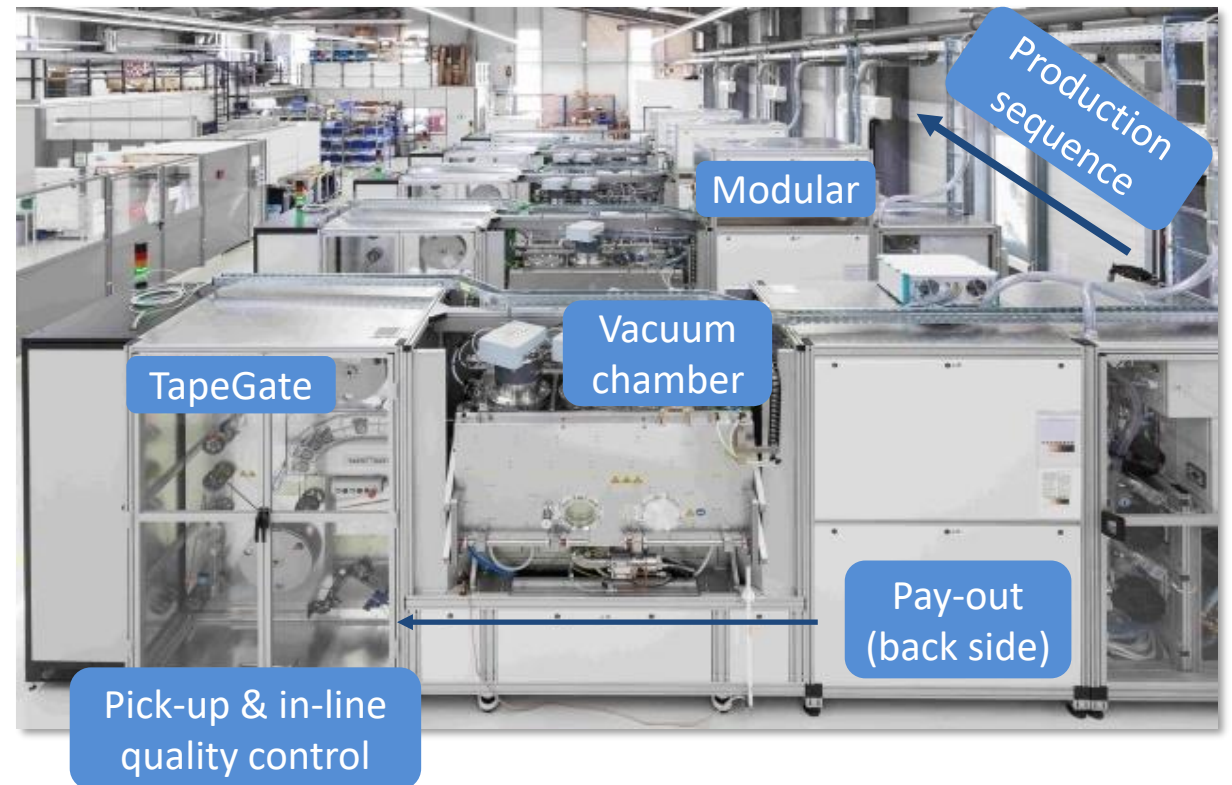
### Main applications

- HTS cables and bus bars for high current
- Current leads (with low heat input)
- Magnets: high field, fusion, industrial

# PROVEN HTS – WIRE PRODUCTION TECHNOLOGY

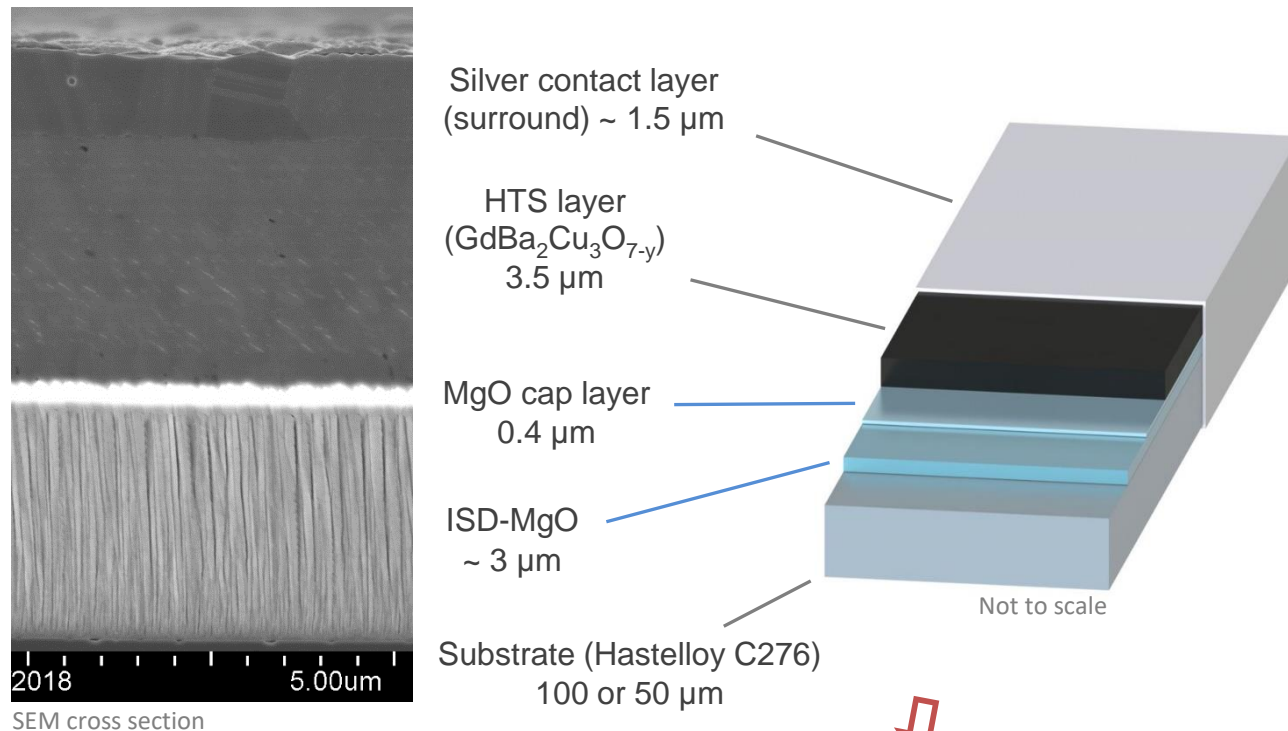
## Features of production

- Operational since 2016
- Capacity: 120 km/yr  
@ 12 mm-width
- Production wire length:  
300 m – 600 m (1000 m possible)
- Physical vapor deposition using vacuum systems
- Integrated QC for highest quality
- Stringent quality management



# THEVA PRO-LINE HTS WIRE

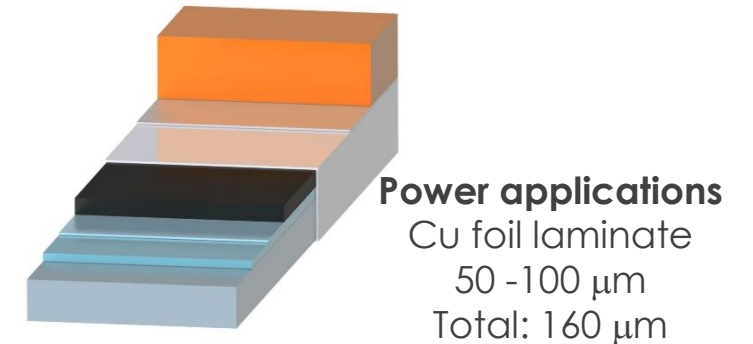
## Basic wire architecture



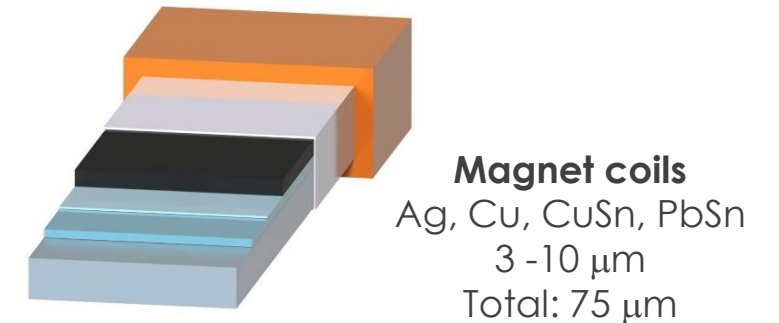
**Low heat conductivity  
for current leads**

## Customized technical wire

### Laminated, robust, strong stabilization



### Slim, surround stabilized



# HIGH - PERFORMANCE HTS WIRE

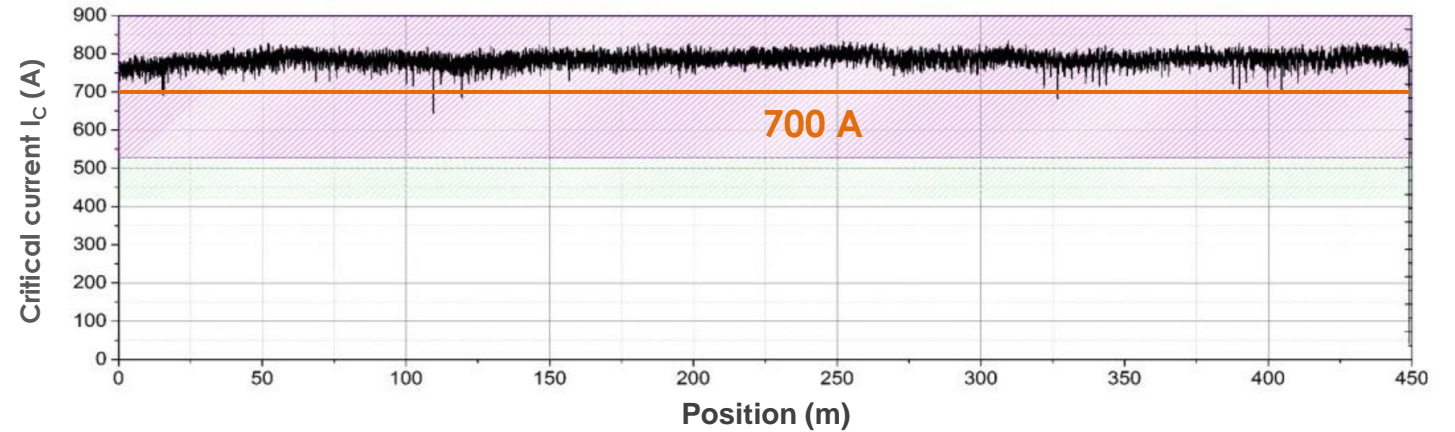
## Regular production wire

Width: 12 mm

3,4 6 mm available by Laser slitting

$I_{C,min}$  (77K, s.f.) = 500 A – 700 A

Piece length: 50 m – 200 m

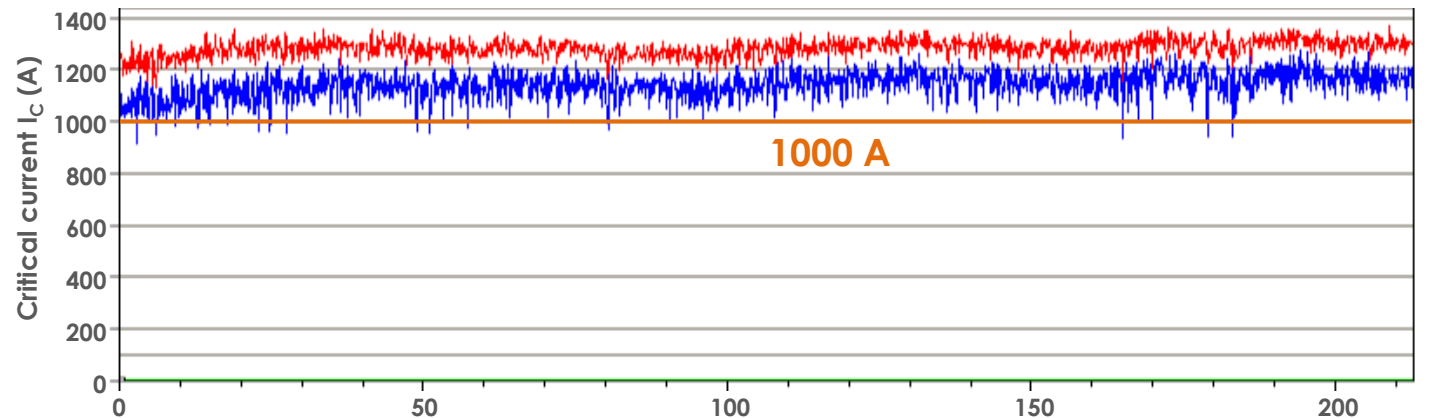


## High performance wire

Enhanced HTS thickness

$I_{C,min}$  (77K, s.f.) = 750 A – 1000 A

Piece length: 50 m – 200 m





# MAGNETIC FIELD PERFORMANCE

## Standard wire

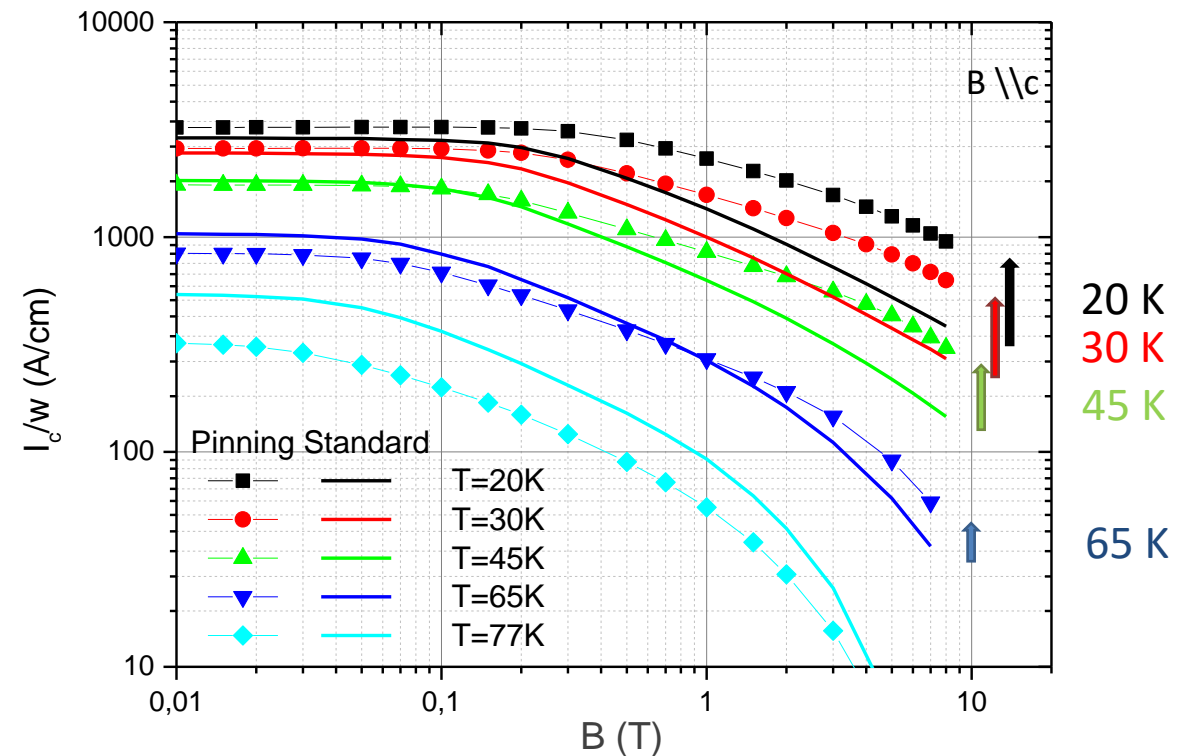
### Standard Pro-Line wire @ 4.2K

Current density for  $B \perp$  tape plane ( $0^\circ$ ) for 3mm wire on 50  $\mu\text{m}$  substrate and 5  $\mu\text{m}$  surround Cu coating

- 10 T: 280 A  $\rightarrow$  1170 A/mm<sup>2</sup>
- 20 T: 208 A  $\rightarrow$  870 A/mm<sup>2</sup>
- 29 T: 180 A  $\rightarrow$  750 A/mm<sup>2</sup>

**Factor 2 enhancement possible with AP** 

## Artificial pinning (AP) wire



- Below 60 K increased  $I_c$  in magnetic field
- Factor 2  $I_c$  enhancement above 5 T
- Intro in production in July 2021

# HTS – MAGNET COILS

Design and manufacturing of HTS magnet coils

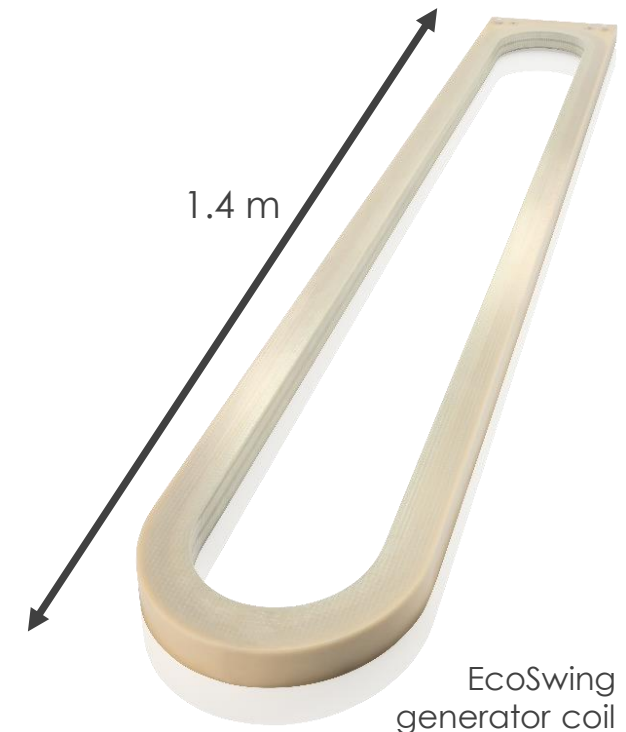
➤ **Robust coils for industrial applications**

Coil winding and casting technology:

- Resin potted
- Single or double pancake winding
- Up to 1.4 m in length or 1×1 m<sup>2</sup>
- Shape adaptable (circular, square, racetrack....)
- Smooth surfaces ideal for dry cooling

➤ **FEM-aided design to customer specs**

➤ **Non-insulated, solder-cast coils**



Thank you!



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# THEVA Pro-Line HTS wire

Product Type	TPL1100	TPL1120	TPL2100	TPL2120	TPL4121	TPL5121
Description	HTS wire with surround silver metallization	thin HTS wire with surround silver metallization	HTS wire with laminated Cu stabilization	thin HTS wire with laminated Cu stabilization	thin HTS wire with surround copper stabilization	thin HTS wire with surround copper stabilization and SnPb solder coating
Typical applications	stacks or stacked conductors for levitation and cables	high current density stacks or stacked conductors for levitation and cables	medium magnetic field coils for rotating machines etc.	medium magnetic field coils for rotating machines etc.	coils or stacks with very high current density, small bending radii designs	solder cast coils and stacked conductors
Substrate	100 µm Hastelloy C276	50 µm Hastelloy C276	100 µm Hastelloy C276	50 µm Hastelloy C276	50 µm Hastelloy C276	50 µm Hastelloy C276
Buffer layer	MgO	MgO	MgO	MgO	MgO	MgO
Superconducting layer	GdBaCuO	GdBaCuO	GdBaCuO	GdBaCuO	GdBaCuO	GdBaCuO
Metallization	Ag	Ag	Ag	Ag	Ag	Ag
Stabilization	none	none	100 µm Cu soldered on HTS side	100 µm Cu soldered on HTS side	10 µm Cu surround - different thicknesses available on request	10 µm Cu surround coated with a thin layer of SnPb40
Thickness	0.11 mm	0.06 mm	0.22 mm	0.17 mm	0.08 mm	0.08 mm
Width	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
Min. double bending diameter (RT, 95 %)	60 mm	40 mm	60 mm	40 mm	40 mm	40 mm
Recommended max. handling force	100 N (10 kg)	50 N (5 kg)	100 N (10 kg)	50 N (5 kg)	50 N (5 kg)	50 N (5 kg)
Maximum rated stress (RT)	600 MPa	600 MPa	300 MPa	300 MPa	500 MPa	500 MPa
Maximum rated tensile strain (95 %)	0.30 %	0.30 %	0.30 %	0.30 %	0.30 %	0.30 %
$I_c$ (77 K, sf)	typical 360 A - 500 A, higher values available on request					
Piece length	typical 25 m - 200 m, longer pieces available on request					