

# MASTERING THE THERMAL CHALLENGES OF ELECTRIC BATTERIES

*Implementing an effective thermal-management system is  
key to ensure efficiency, safety, and longevity of electrical  
batteries*



# Electrification stands out as a pivotal solution

---

In a world grappling with increasing energy demands and the imperative to mitigate climate change, the **transition to sustainable energy sources** is more critical than ever.

By 2050, forecasts suggest continued reliance on fossil fuels, emphasizing the urgency of shifting towards renewable alternatives to curb greenhouse gas emissions.

**Electrification, particularly through electrical batteries,** stands out as a pivotal solution in various applications from portable electronics to electric vehicles and renewable energy storage. However, there are significant challenges and stakes associated with their development and deployment.





# Still many challenges to overcome...

**Scarcity of essential raw materials** (lithium, cobalt, and nickel)

**Environmental impact of mining and processing** of battery materials

Thermal runaway possibly causing **significant safety risks**

Handling and disposal to prevent **environmental hazards and health risks**

**Limited lifespan** (frequent replacements & complex waste management)

**Recycling challenges** (valuable materials recovery & limitation of environmental impact)

**High costs** (both material costs & complex manufacturing processes)

**Economic Viability** (make energy storage solutions more affordable)

**Limited capacity** (frequent charging need)  
**Efficiency losses** over time



**Materials and Resources**



**Safety risks**



**Lifecycle and Sustainability**



**Cost**



**Energy Density and Efficiency**



**Climate change mitigation**



**Public health**



**Energy security**



**Economic impact**

**Reducing greenhouse gases & mitigating global warming**

**Improving the carbon footprint** of the transportation sector

**Reducing the air pollution & improving public health** and life expectancy

Improving **renewable integration** (storing / balancing intermittent renewable energy sources)

Providing **grid stability** through backup power and demand response services

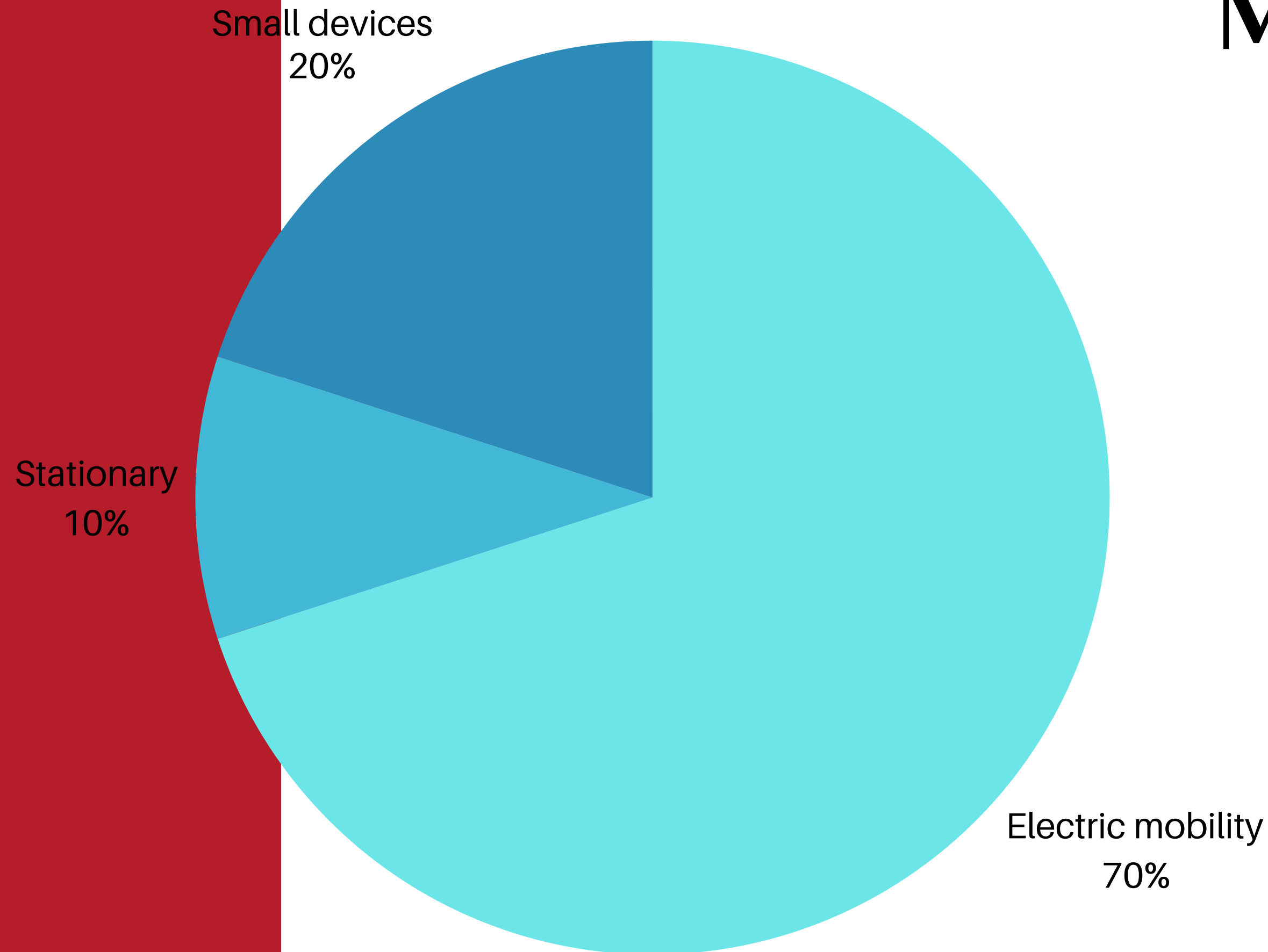
Creating **job opportunities** in numerous sectors (research, manufacturing, recycling)

Boosting **technological research**, and driving **economic growth**



# Major uses of electric batteries

---



Electric batteries cater to 3 main market segments and address numerous decarbonization applications:

1. **Mobility** (EV, etc.), today 70% of market demand and expected to increase tenfold, reaching 30% of global car sales by 2030.
2. **Small electronics & household appliances** (phone, etc.), 20% of the market.
3. **Stationary** (grid-scale storage, outdoor power storage for events etc.), the remaining 10% of the market but growing with the development of renewable power.





# Understanding the thermal phenomena : testing & collecting data



Central to the electrification transition, notably in the mobility sector, are lithium-ion batteries (LIBs), renowned for their high energy and power density, efficiency, and cycle life.

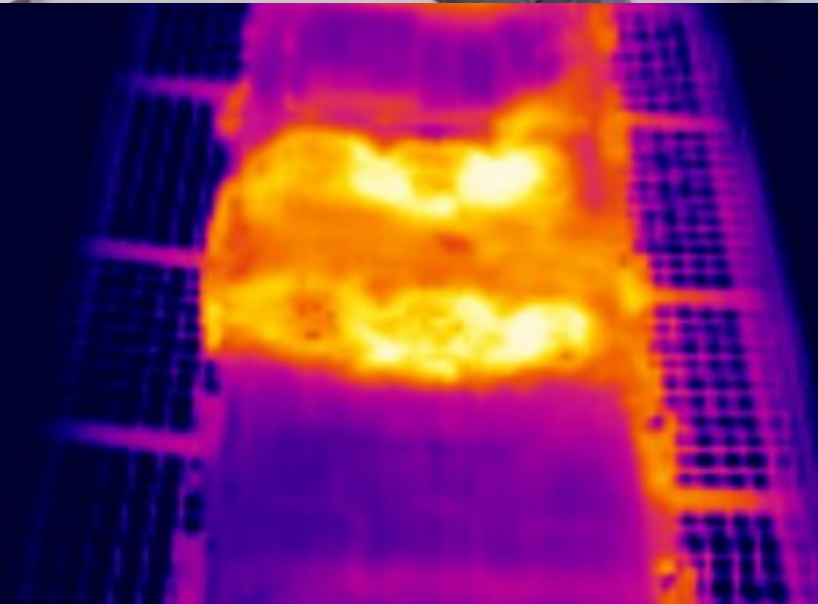
However, LIBs face significant thermal challenges that hinder their widespread adoption, especially during turbo charging, when exposed to high temperature or when continuously used for many hours in a row...

European regulation requires a certain number of tests to be carried out by manufacturers of rechargeable battery systems found in electric motor vehicles. These tests are intended to ensure :

- Security and risk of fire
- Overall battery life length & cycle
- Autonomy of the vehicle
- Speed of charge time







Numerous tests need to be carried out in a controlled environment, under the intended conditions of use, and cover the entire heating cycle of the battery.

- Internal propagation of a battery fire coming from the thermal runaway of a cell
- External fire exposition
- Internal and external short-circuit
- Overcharge test / Over discharge test
- Thermal cycle
- Thermal shock
- Abusive temperature...

To **efficiently collect precise and reliable data**, you need high-performance **sensors**.

These sensors must offer **superior technical measurement capabilities** and be **customized for specific applications**. They should accommodate space limitations, installation requirements, and **financial considerations**, especially in destructive testing conditions.



At MESUREX, we have been designing and building temperature sensors since 1972.

For many years already, we have been collaborating closely with research labs, test centers, equipment manufacturers or directly with end users from the mobility industry.

Specific & reliable solutions have been developed to meet the highest technical standards of temperature measurement of course, but also the dimensions, installation and budget constraints.

# Our specific sensors for testing the thermal phenomena in batteries

---



## DS2047

### FLEXIBLE ULTRA-THIN PT100

- Measuring range : -70°C to 200°C
- Response time : 0.1 s
- Dimensions : 20 x 47 x 0.1 mm (Teflon wire thickness: 0.3/0.5mm)
- 2, 3, or 4-Wire on demand, length on demand

## DS48

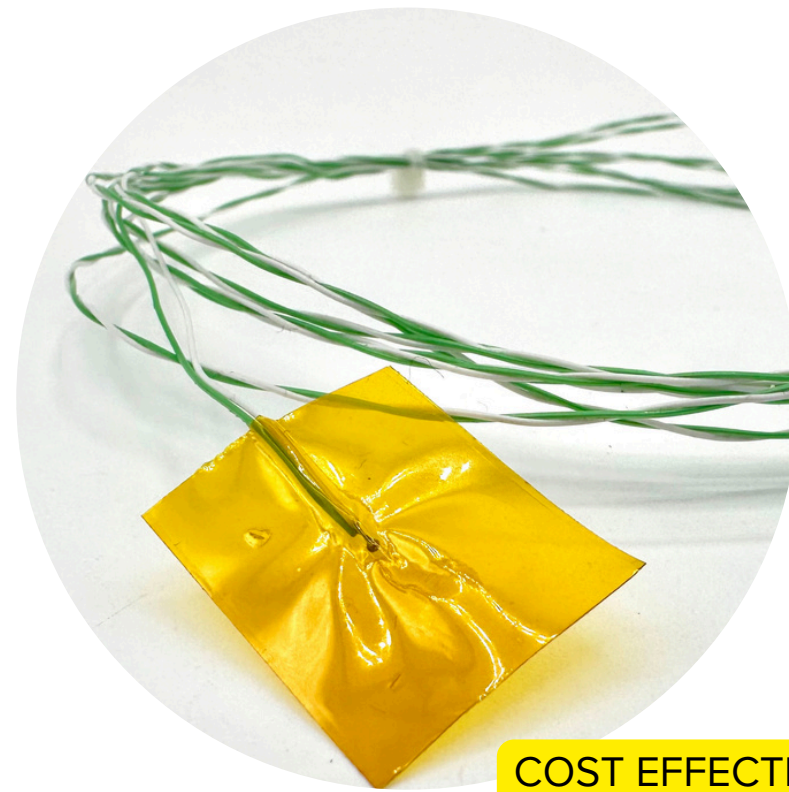
### ULTRA-MINIATURE

### PT100/PT1000/THERMOCOUPLE (T/K)

- Measuring range : -100°C to 200°C
- Response time : 0.5 s
- Dimensions (on demand) : standard 4 x 8 x 2 mm (Kapton / or Teflon wire thickness: 0.8 mm)
- 2, 3, or 4-Wire on demand (PT100/PT1000), length on demand







COST EFFECTIVE

## DSTORS THIN TEFLON THERMOCOUPLE (K/T) WITH KAPTON TAPE

- Measuring range : -75°C to 250°C
- Dimensions : 0,1 / 0,2 / 0,5 / 0,8 mm (length on demand)
- Teflon insulated
- Connection : Bare wire (standard), Miniature or Standard connector (optional)

## FGG GLASS SILK INSULATED THERMOCOUPLE (K/J)

- Measuring range : -100°C to 350°C (peak 500°C)
- Cable diameter : 0.1 / 0.2 / 0.5 / 0.8 mm (length on demand)
- Connection : bare wire (standard), Miniature or standard male/female connector (optional)



IDEAL consumable for fire testing





## DS7

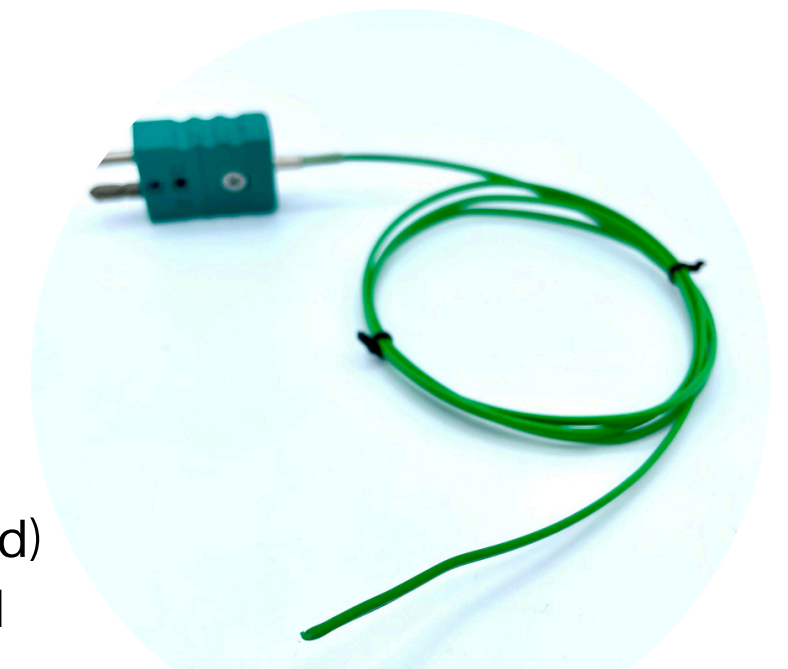
### THIN KAPTON® TAPE THERMOCOUPLE (K/T)

- Measuring range : -200°C to 200°C
- Response time : 0.1 s
- Dimensions : 7 x 0.25 mm (length on demand)
- Connection : Miniature male or female connector, Standard male or female connector

## FIT / FTT

### TEFLON® INSULATED PT100/PT1000/THERMOCOUPLE (K/J/T)

- Measuring range : -200°C to 250°C
- Response time : 0.5 s
- Cable diameter : 0.1 / 0.2 / 0.5 / 0.8 mm (length on demand)
- Connection : 2, 3 or 4-wire (PT100), bare wire or insulated
- Connector: Miniature or standard



COST EFFECTIVE ideal for consumables



## FKK

### KAPTON® INSULATED THERMOCOUPLE (K/T)

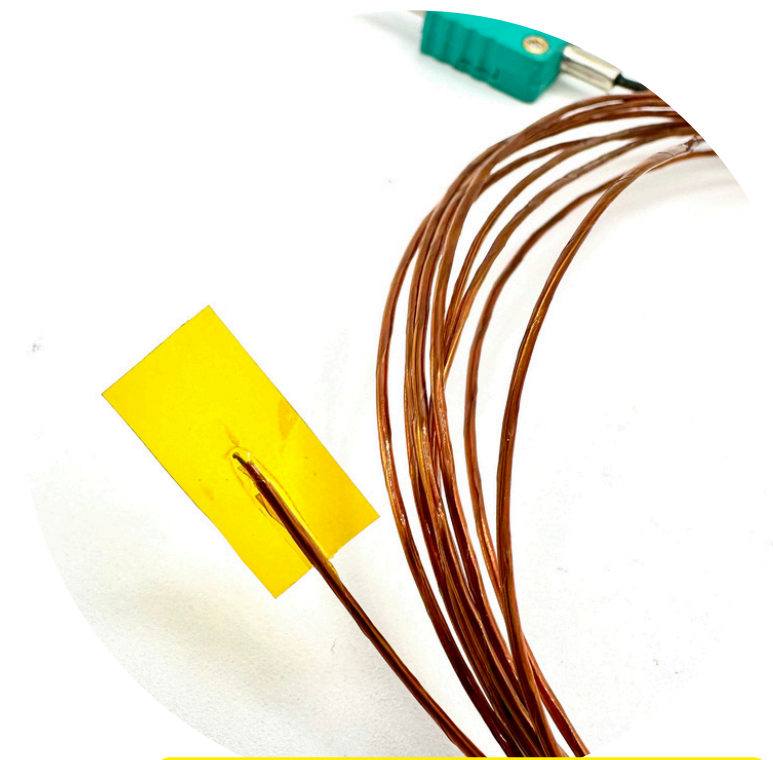
- Measuring range : -200°C to 300°C
- Response time : 0.3 s
- Cable diameter : 0.25 or 0.5 mm (length on demand)
- Connection : bare wire standard
- Connector: Miniature or standard



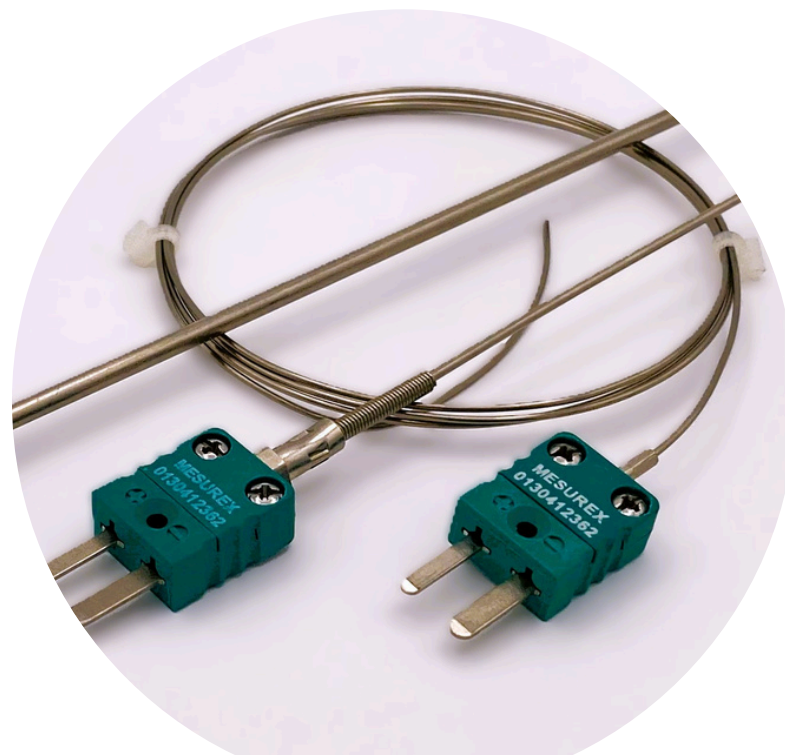
## DS1020

### KAPTON FLEXIBLE SURFACE THERMOCOUPLE (K/J /T)

- Measuring range : -100°C to 350°C
- Insulation : Kapton (standard), Teflon, glass silk or other on request
- Cable diameter : 0.1 / 0.25 / 0.5 mm (length on demand)
- Connection : bare wire (standard), Miniature or standard male/female connector (optional)
- Kapton



COST EFFECTIVE + REUSABLE



COST EFFECTIVE ideal for consumables

## CC

### MINERAL INSULATED THERMOCOUPLE (K/J)

- Measuring range : -200°C to 1200°C (acc. sheath Ø and TC type)
- Cable diameter : 0.5 / 1 / 1.5 / 2 / 3 / 4.5 / 6 mm (length on demand)
- Connection : Miniature male (standard), Miniature female or standard male/female (optional)



MESUREX, 50 YEARS OF EXPERTISE IN MEASUREMENT

# Mesurex, 50 years of knowledge & know-how in the measurement sector

Since 1972, Mesurex has been **designing and producing complete sensors and measurement systems** in its factory in the Paris region.

We keep up with technological developments while **remaining attentive to customer needs**. Based on their specifications, we manufacture **tailor-made products - small or large series** - to meet the most demanding demands in the **aeronautics, automotive, defense, manufacturing industry, research & test centers**, etc.

Our turnkey solutions integrate **every step of the project**: from sensor design, manufacturing, wiring, signal processing to final calibration.



ISO 9001  
BUREAU VERITAS  
Certification



EN 9100  
BUREAU VERITAS  
Certification



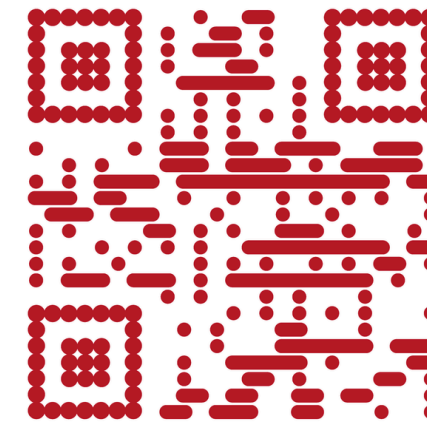
[www.mesurex.fr](http://www.mesurex.fr)





# Contact-us

---



+33 (0)1 30 41 23 62



[mesurex@mesurex.fr](mailto:mesurex@mesurex.fr)



[www.mesurex.fr/en](http://www.mesurex.fr/en)



*Share your pioneering research and innovations with us,  
and we'll tailor the perfect measuring solution just for you!*

MESUREX, sensor manufacturer since 1972

[www.mesurex.fr](http://www.mesurex.fr)