

Attracting Tomorrow



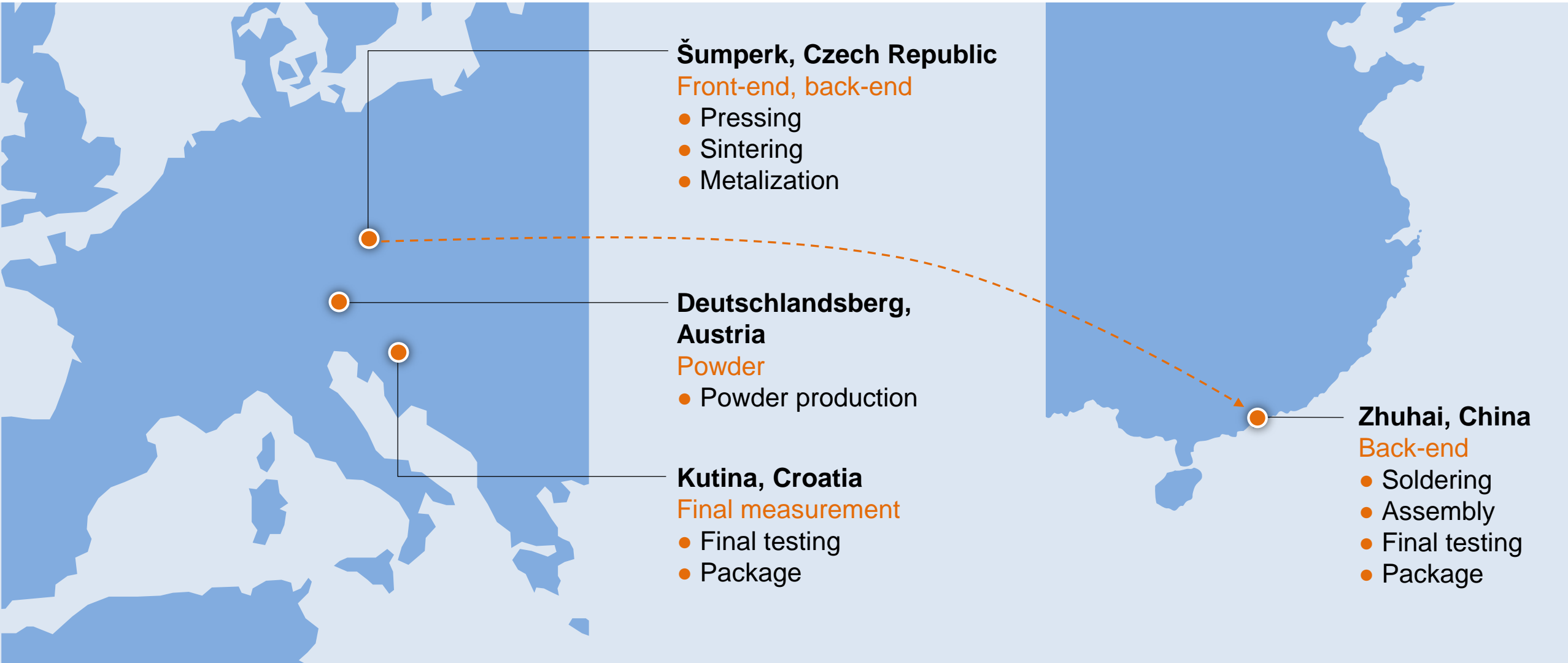
# PTC Heaters

## Self-Regulating Heating Elements

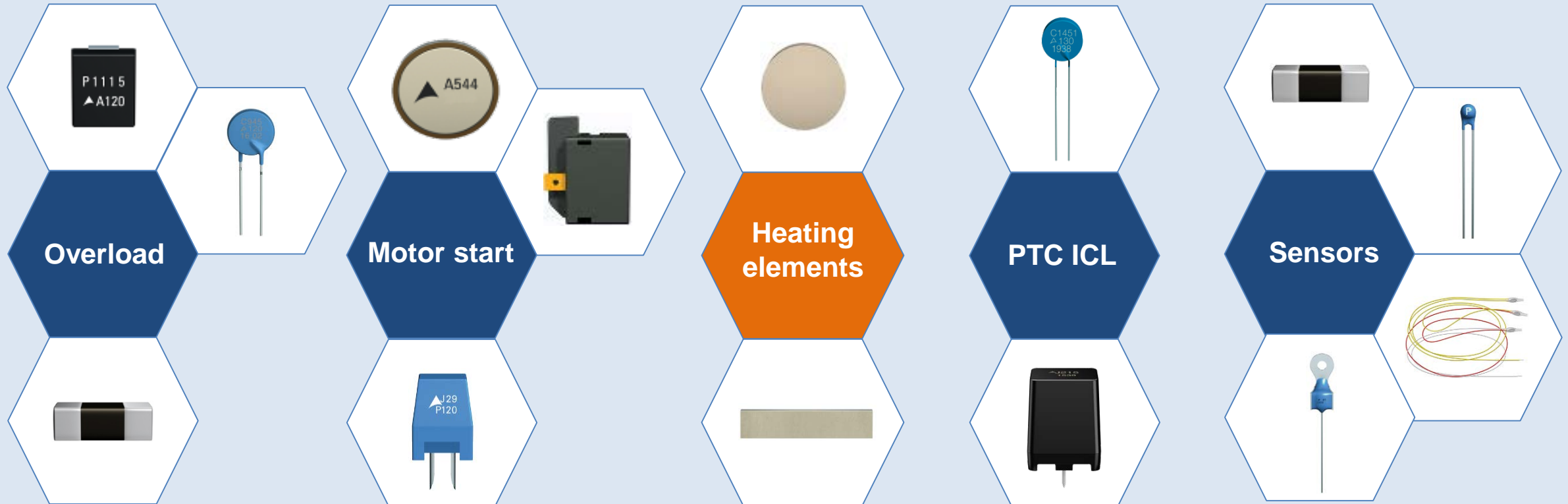
**TDK Electronics AG**  
Piezo and Protection Devices Business Group  
Product Marketing PTC Thermistors  
Munich, Germany  
January 2020



# Production plants



# PTC product spectrum



**Overload**

**Motor start**

**Heating elements**

**PTC ICL**

**Sensors**

**Parameters**

U: 12...500 V  
 R: 0.3...1800 Ω  
 Ø: 4...22 mm  
 SMD: 0603...4032

**Parameters**

U: 180...265 V  
 R: 4.7...5000 Ω  
 Ø: 16...20 mm

**Parameters**

U: 12...800 V  
 R: 0.75...960 Ω  
 th: 1...3.0 mm  
 Ts: 40...280 °C

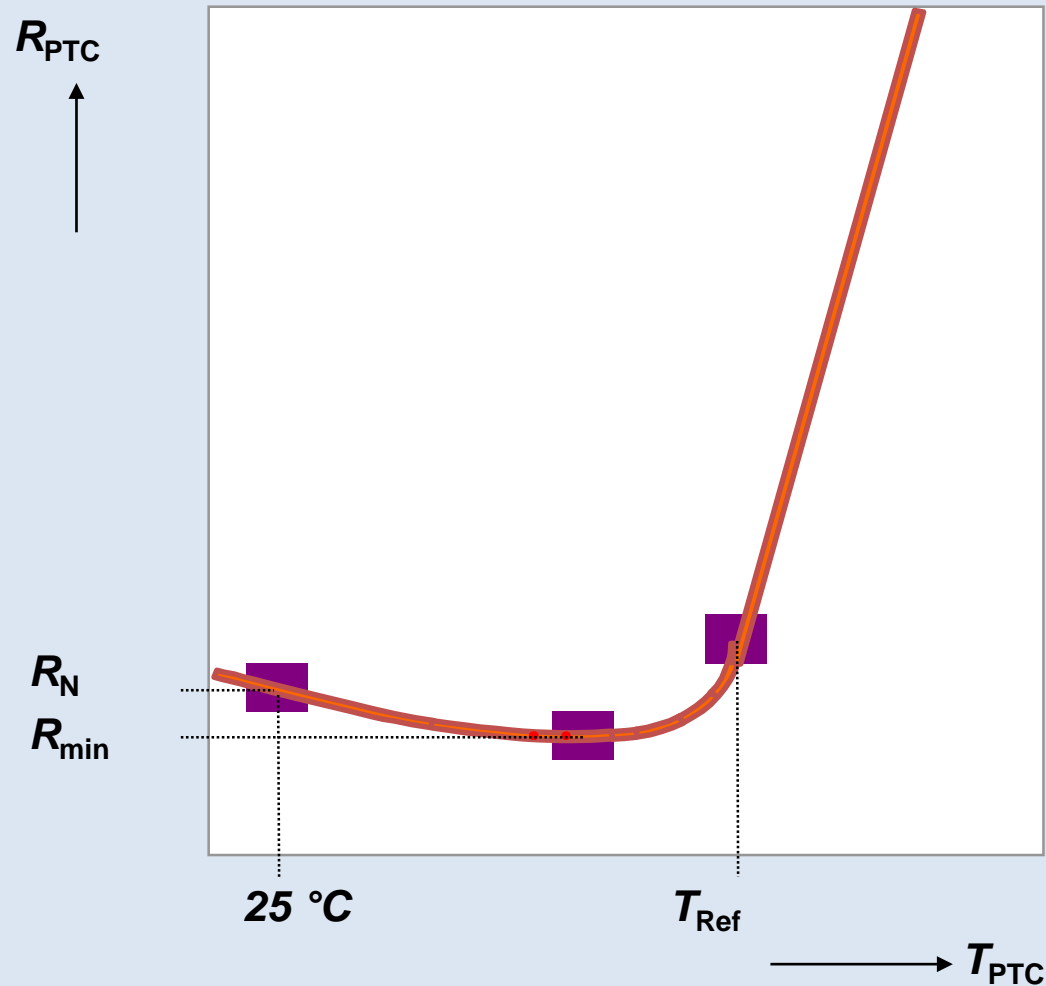
**Parameters**

U: 400...1000 V  
 R: 22...7500 Ω  
 C<sub>th</sub>: 0.5...2.3 J/K

**Parameters**

T<sub>sens</sub>: 60...180 °C  
 Size: Leaded, SMD,  
 single, tripple sensor  
 SMD: 0402, 0603, 0805

# Description of a PTC and key parameters: Typical R/T curve



## What is a PTC?

A PTC (**P**ositive **T**emperature **C**oefficient) is a resistor whose resistance varies with temperature.

With increasing temperature, the resistance of the PTC will increase.

$R_N$  Resistance value at  $25\text{ }^\circ\text{C}$

$R_{min}$  Minimum resistance of the PTC

$T_{ref}$  Reference temperature or Curie temperature; at this temperature, the resistance value is  $2 \times R_{min}$

# PTC heaters technology advantages



- Self-regulating
- No overtemperature protection necessary
- No risk of fire compared to fixed resistors
- No changes of the product characteristics during lifetime of the application
- Quick heating



# TDK company advantages PTC heaters

- 50 years experience in PTC technology
- All common voltages available (12 V to 800 V)
- Customer specific geometries available
- Wide temperature range (40 °C to 280 °C)
- 100% resistance measuring
- 100% automatic pulse testing
- 100% AOI of HV PTC heaters

# PTC heater portfolio

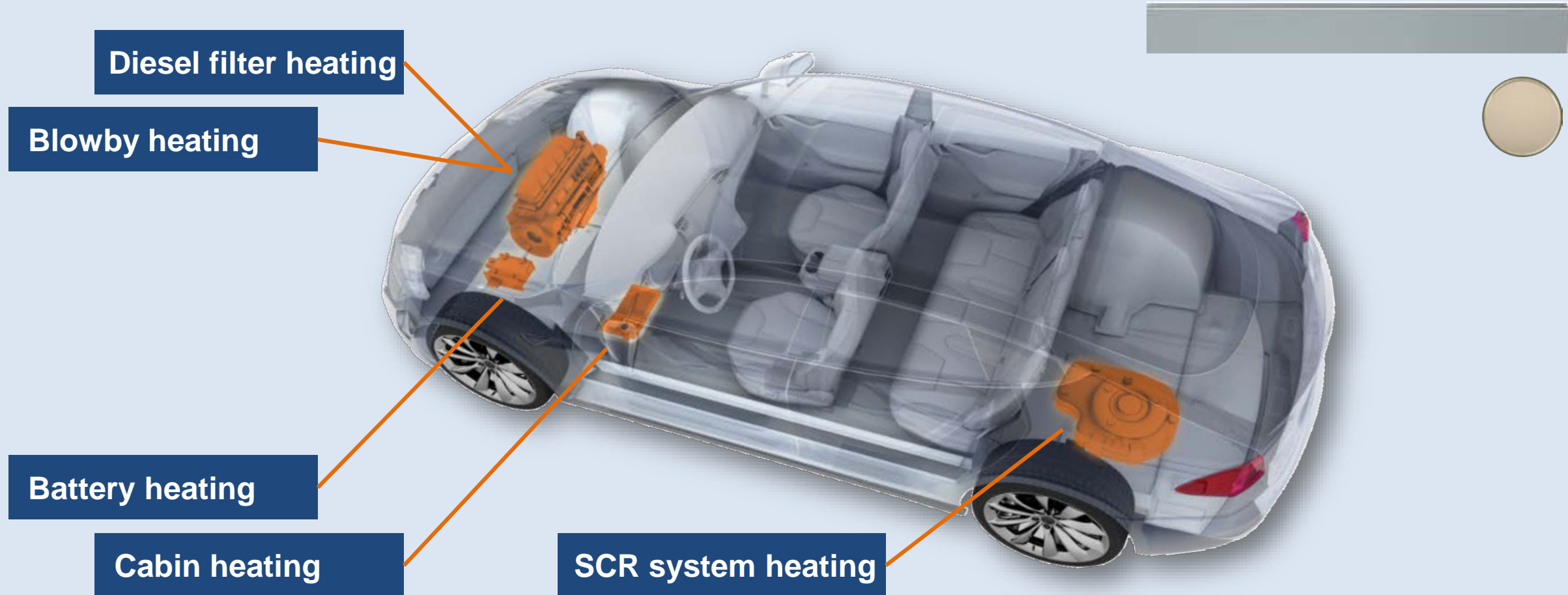
	LV PTC heater	HV PTC heater
<b>Shape</b>		
<b>Rated voltage</b>	12 V, 24 V, 48 V	230 V, 350 V, 800V
<b>Thickness</b>	1.0 ... 1.4 mm	2.0 ... 3.0 mm
<b>Reference temperature</b>	0 °C ... 220 °C	50 °C ... 270 °C
<b>Surface temperature</b>	40 °C ... 230 °C	100 °C ... 280 °C
<b>Min. resistance</b>	0.75 Ω ... 20 Ω	85 Ω ... 960 Ω
<b>Metalization</b>	Al, Ag	Al, Ag

# Comparison of PTC electrodes

Features (pros and cons)	Ag	Al
Low ohmic contact to ceramic	Same	Same
Adhesion to ceramic	Same	Same
Resistance drift over time	Same	Same
Thermal conductivity	+	-
Electrical conductivity	+	-
Current load capacity	+	-
Stability against corrosion	-	+
Stability against migration	-	+
Cost impact	More expensive	Less expensive



# Automotive applications for PTC heaters



# Household and industrial applications for PTC heaters

## Doorlock



## Insecticide and perfume vaporizer



## Wax actuators in thermostats



# Checklist of design inputs

Mechanical parameters	Electrical parameters	Others
Dimensions (LxWxT)	Operating voltage (min, max)	Packaging
Contact method	Preferred $T_{ref}$	Marking
Contact material	Preferred $T_{surf}$	Labeling (part and packing)
Preferred electrode	Preferred R25 or Rmin	
	Breakdown voltage	



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