



PT RTD SENSOR ASSEMBLIES: FORWARD INTEGRATION TO MATCH YOUR SENSING NEEDS

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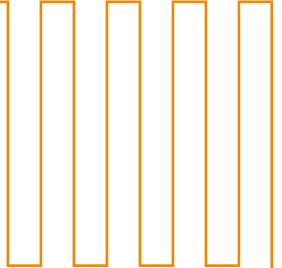
OUR HERAEUS NEXENSOS EXPERTS

CHARLOTTE CLEMEN
SAMPLE AND RAMP-UP ENGINEERING LEAD



DOMINIK SCHNEIDER
PRODUCT & MARKET SEGMENT MANAGER





AGENDA.

DEFINITION SENSOR ASSEMBLIES

TECHNOLOGY & MATERIALS TOOLBOX

DESIGN TO APPLICATION

PERFORMANCE & TESTING

NEXENSOS APPROACH & EXPERTISE

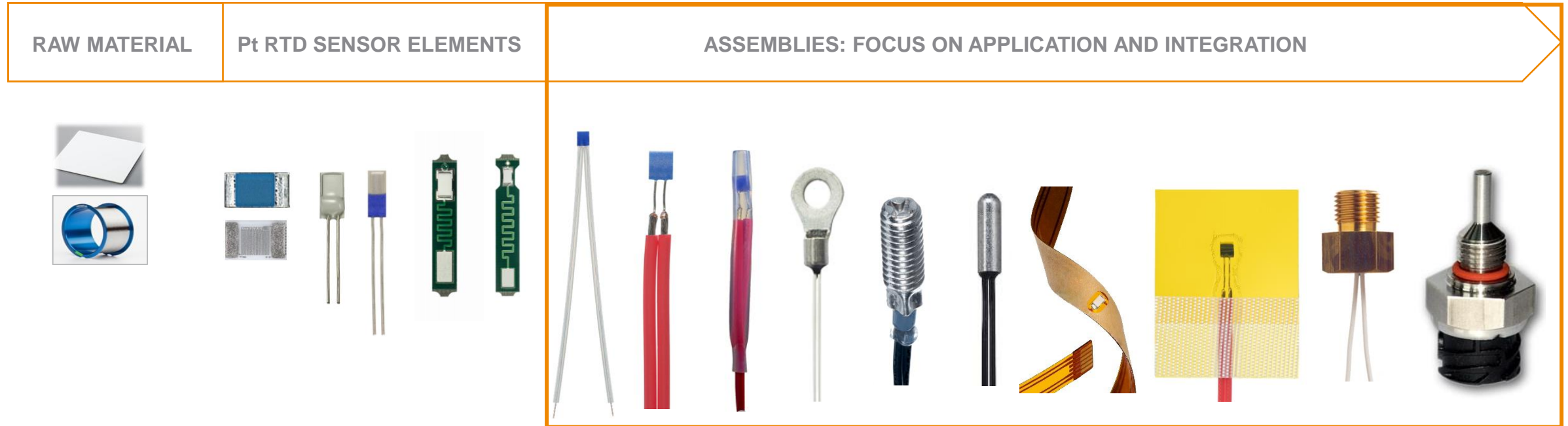
Q&A

DEFINITION FOR TEMPERATURE SENSOR ASSEMBLIES

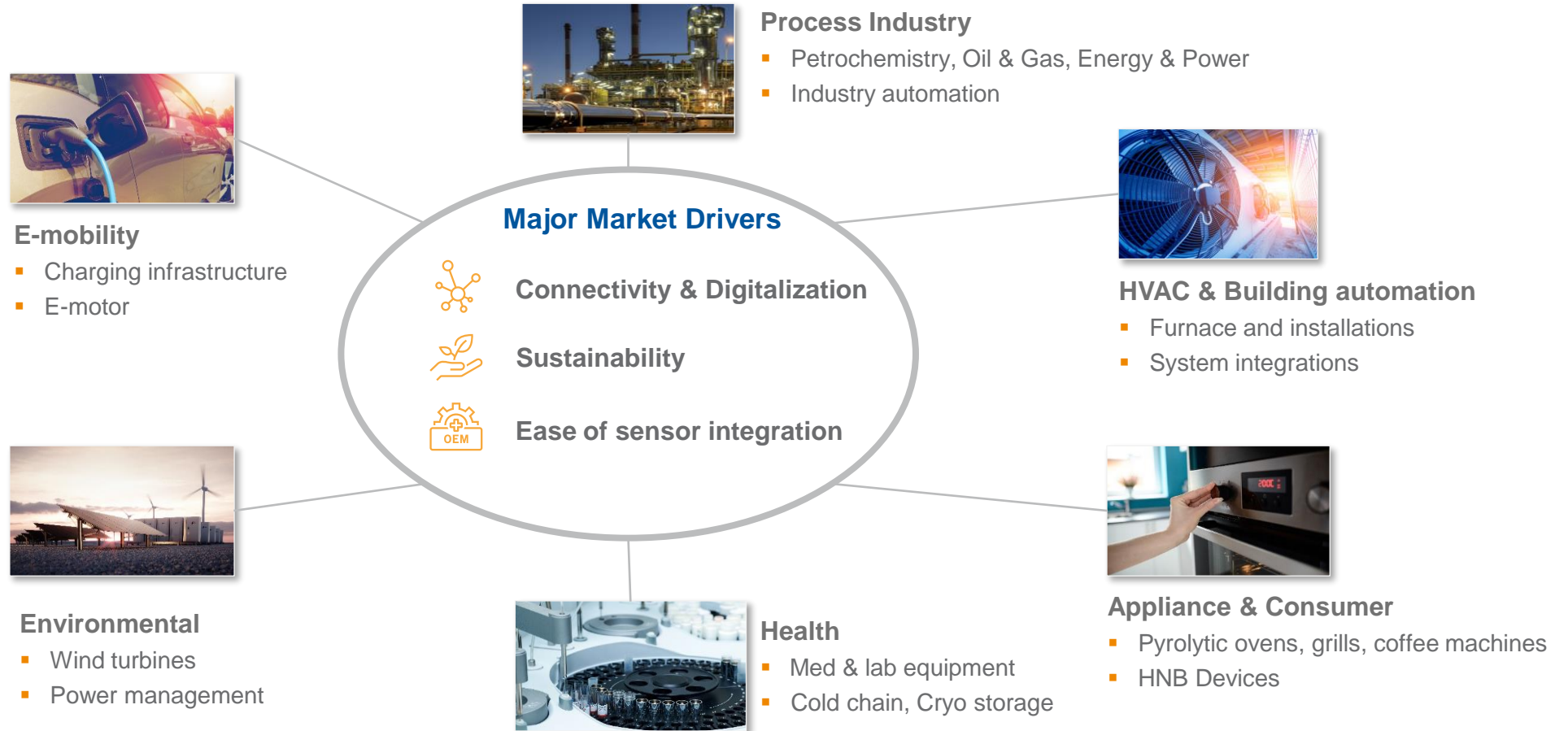
NEXENSOS VALUE CHAIN

- In house supply chain from materials to complex assemblies
- Customization along entire value chain
- Tailoring to sensing application

Webinar focus area



LEADING MARKETS FOR PT RTD ASSEMBLIES TRANSFORMATION TO INTEGRATED SENSING



IMPACTS TO DESIGN & SHAPE OF A SENSOR PT RTD ASSEMBLY

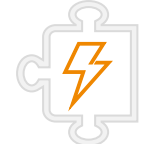
EVERY APPLICATION IS A NEW PUZZLE

Typical customer request:

I need to control temperature in a liquid cooled fast charging station. Can you support with a sensor?



Temperature range & accuracy?



Currents & voltages to survive?



Location and method of mounting the sensors?



Size to fit measurement location?



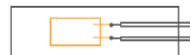
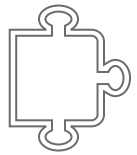
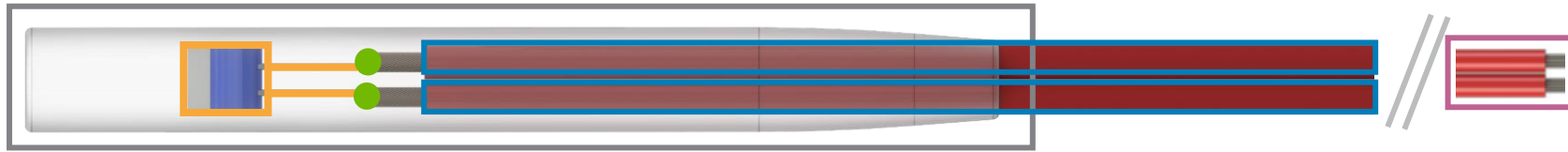
Protection towards operating environment?



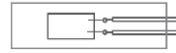
Performance stability?

SENSOR ASSEMBLY TOOL BOX

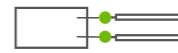
EVERY SENSOR ASSEMBLY IS A NEW PUZZLE



Sensor Element



Sensor Tip



Connection Technology



Conductor



Tail-end

Measuring Performance: Accuracy, Long-term stability, Drift Behavior, Response Time	High Impact		Low Impact		
Temperature: Maximum, Minimum, Range	High Impact				
Environmental Conditions: Insulation, Humidity, Oil, Chemical, Shock and Vibration Resistance	High Impact		Low Impact		
Installation Condition: Size, Mounting Methods, Electrical Installation	High Impact		Low Impact		

SENSOR ASSEMBLY TOOL BOX TECHNOLOGIES AND MATERIALS

Sensor Element

Broad sensor portfolio



Conductor

Material Insulation

- PTFE
- Fiberglass
- FEP
- PVC
- Silicon
- ...

Diameters

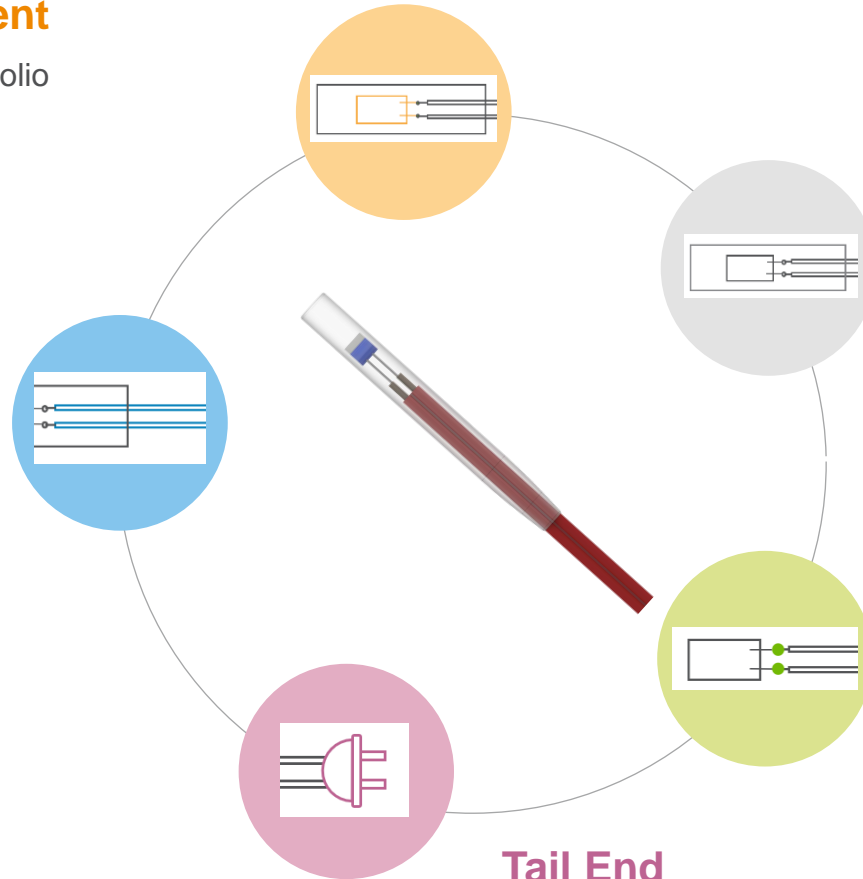
- AWG 24
- AWG 26
- AWG 28
- ...

Electrical Conductor




- CuAg strand
- CuNi strand
- Ni strand
- Ni wire
- ...

Wire Configurations

- 2-wire connection
- 3-wire connection
- 4-wire connection










Tail End

- Strip 
- Semi-strip 
- Different connector types 

Sensor Tip

Housing

- Polymer Tip 
- Steel Sleeve 
- Screw 
- Hex Screw 
- Ring Terminal 
- Polyimide 
- Overmolded 

Protection Material


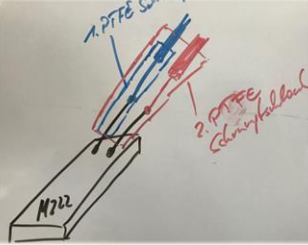
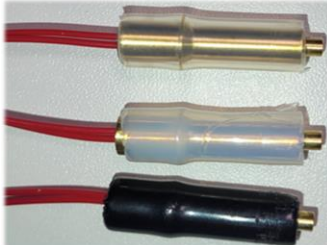

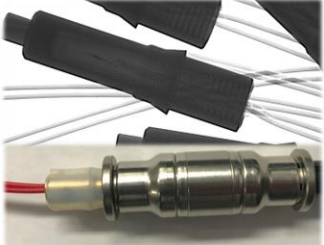

- Ceramic
- Silicon
- Epoxy

Connection Technology

- Soft Soldering
- Hard Soldering
- Laser Welding
- Resistance Welding
- Ultra sonic Welding
- Crimping

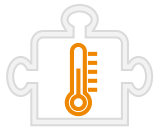
FLOW SENSOR: FROM CHALLENGE TO SOLUTION

APPLICATION EXAMPLE FOR COOLED FAST CHARGING STATION

Customer Need	RTD Concept	Sensor Housing	Fit for Function	Performance Test	Scale to Volume
					
<ul style="list-style-type: none"> ▪ Locate sensor in hydraulic cooling system ▪ Fast response ▪ Easy integration and repositioning 	<ul style="list-style-type: none"> ▪ Sensor element ▪ Laser welding ▪ PTFE insulated AgCu strands 	<ul style="list-style-type: none"> ▪ Primary brass housing ▪ Secondary polymer housing ▪ Retention feature ▪ Ceramic potted 	<ul style="list-style-type: none"> ▪ Metal coupling ▪ Re-positioning ability ▪ System integration 	<ul style="list-style-type: none"> ▪ Application specific testing <ul style="list-style-type: none"> ▪ X- Ray ▪ Pressure test ▪ Tensile test 	<ul style="list-style-type: none"> ▪ Automotive qualification (PPAP) ▪ IP 67 labeling ▪ Cost efficient assembly location

FLOW SENSOR – CUSTOMIZED ASSEMBLY

PERFORMANCE & DESIGN TAILORED TO APPLICATION



Temperature Range

-50 °C to +200 °C. Materials chosen to withstand extreme outside conditions.



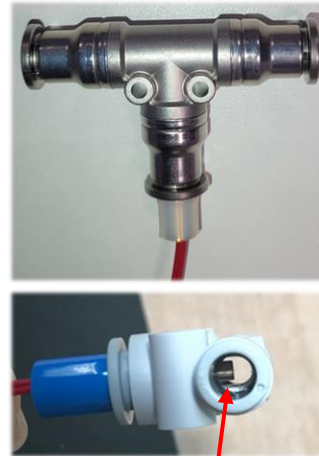
Size

Smallest sensor M310 to allow housing AND fit to Coupling ID.



Mounting Method

Standard coupling for flexible mounting locations. Ease of repositioning.



Pt Sensor location

Currents and Voltages

Housing made to withstand 6kV AC.



Fit for Environment

Hermetic seal construction.
Optimized heat transfer.
Pt RTD located in fluid.



Performance Stability

Pt RTD at core minimizes drift over time.
Materials & Connections to survive product lifetime.



EC3032 – APPLIED AS HVAC TEMPERATURE SENSOR MAXIMUM PROTECTION IN A MINIMUM PACKAGE



Temperature Range

Exceeds most HVAC standards.
From -50 °C to +200 °C (temp. 250°C).



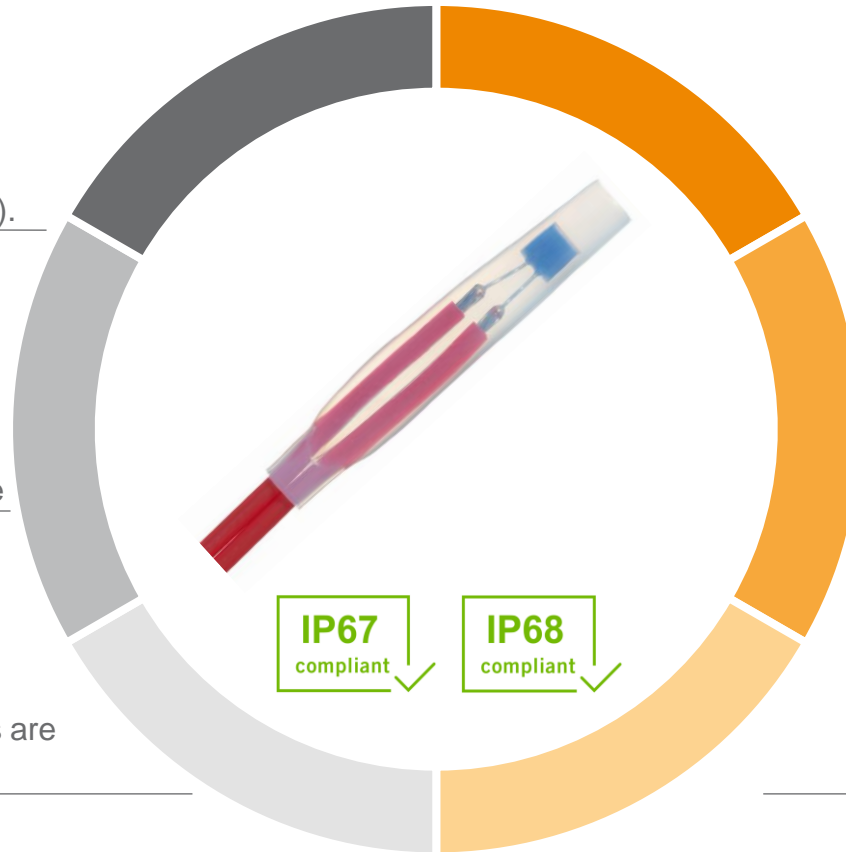
Operation Safety

Safe against condensation moisture.
Designed to withstand 100 N pull force



Ease of Assembly

Many standard housing configurations are used in HVAC applications.



Precise Temp. Measurement

Low mass – outperforming response time.



Isolation from the Environment

IP67/68 rated to protect against failure from moisture, oil and dust intrusion.



Miniaturization

Fit for small diameter sensor probes housings; standardization possible



OUR TEST CAPABILITIES OVERVIEW



Measuring Performance

- Mainly depending on the sensor element.
- Influenced by the sensor tip.



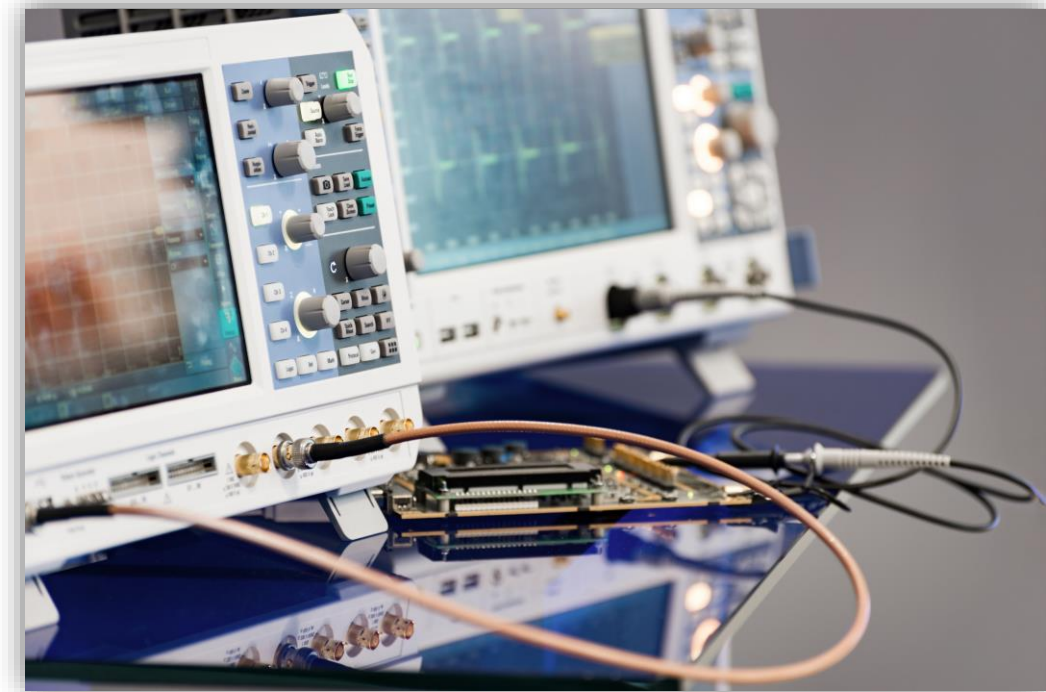
Environmental Conditions

- Each application has different requirements and environmental conditions.
- Especially the sensor tip has to align with these conditions.



Installation Conditions

- To evaluate different performance data.
- To provide visual control of sensor assembly design and process steps.

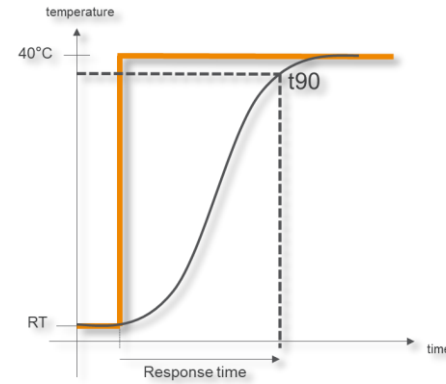


OUR TEST CAPABILITIES MEASURING PERFORMANCE

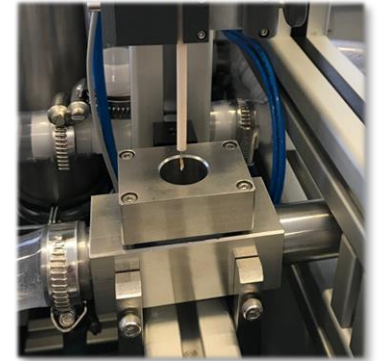


Measuring Performance

- Accuracy
- Long-term stability
- Drift behavior
- Response time
- Self-heating



Response Time
Measurement



Self-Heating



Temperature Cycling

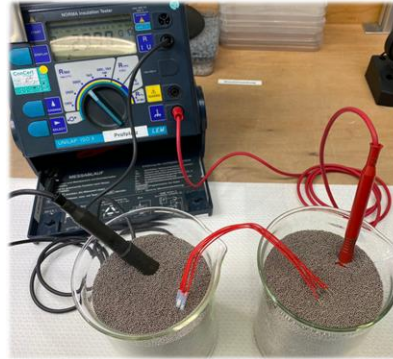


Temperature Storage



Low Temperature
Measurement

OUR TEST CAPABILITIES ENVIRONMENTAL CONDITIONS



Insulation Resistance



Dielectric-Strength



Shock and Vibration
Resistance



Environmental Conditions

- Insulation Resistance
- Dielectric Strength
- Humidity Resistance
- Shock and Vibration Resistance
- Oil Leak Test



Oil Leak Test



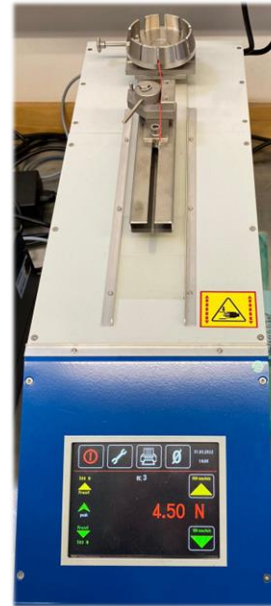
Heat-Humidity Test

OUR TEST CAPABILITIES INSTALLATION CONDITIONS

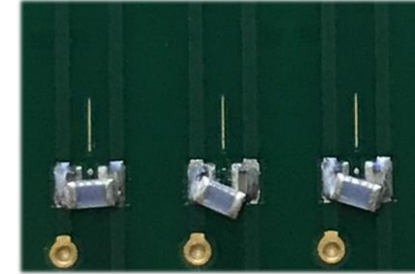


Installation Conditions

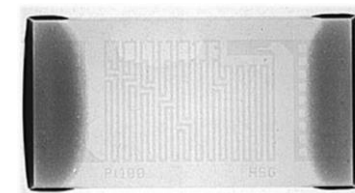
- Tensile Tester
- Shear Test
- Light Microscopy
- X-Ray



Tensile Tester



Shear Test

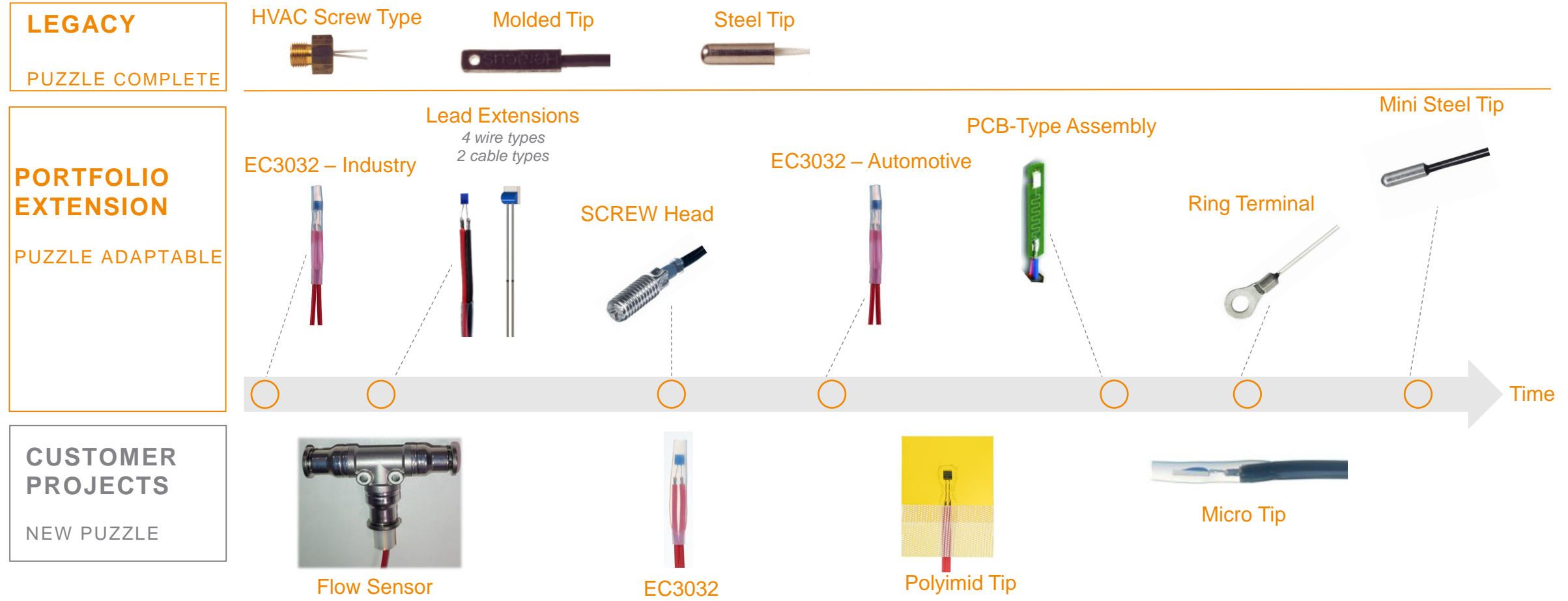


X-Ray



Light Microscopy

TYPES OF OFFERINGS – OVERVIEW OF THE DIFFERENT VARIANTS



WE ARE THE EXPERTS FOR MAXIMUM RELIABILITY IN TEMPERATURE SENSING.

TECHNOLOGY & QUALITY

- Millions of sensors in the field
- Sensor assemblies engineered to custom applications
- Industry standards (IATF and AEC-Q200, IP67/IP68 etc.)
- Advanced sensor assembly performance testing

SCALABILITY

- Partner from early prototypes to large scale manufacturing
- Global application labs
- Cost competitive assembly operations in Malaysia

SUSTAINABILITY

- Temperature sensor pioneer since 1906
- Sustainable supply chains
- Focus on long term partnerships

CLOSE TO WHERE YOU ARE.



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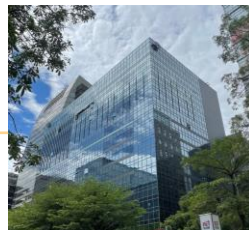
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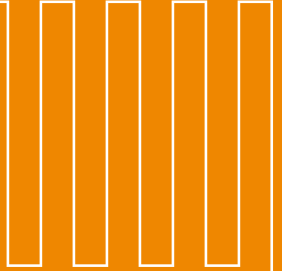
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EXPERTS FOR MAXIMUM SENSING.