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Advanced cooling of power electronics with copper cold sprayed aluminum heatsinks & busbars

使用冷喷铜铝散热器和汇流排的先进电子电力设备冷却系统

Impact Innovations GmbH

Impact Innovations history

– THE TECHNOLOGY LEADING BRAND –

Impact Innovations 发展历史

- 技术领先的品牌 -

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2009

3 engineers want to bring cold spray into industrial production

3 位工程师希望将冷喷技术引入工业生产

2010

incorporation of Impact Innovations GmbH

成立 Impact Innovations GmbH 公司

2012

First EVO CS system

首个 EVO CS 系统

2017

Automated spraycells

自动化 冷喷单元

2022

New plant for mass production

用于大规模生产的新工厂

2023

Over 100 systems sold

已售出超过 100 系统

- With increasing performance of **BEV´s** the inverter cooling has to match the needs

- 随着 BEV 性能的不断提高，逆变器冷却系统必须满足需要

Hybrid heatsinks for better cooling performance by less weight

– Best of 2 worlds –

混合散热片重量更轻冷却性能更佳

– 两个世界的最佳选择 –

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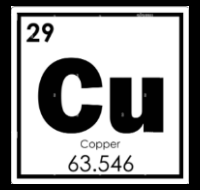
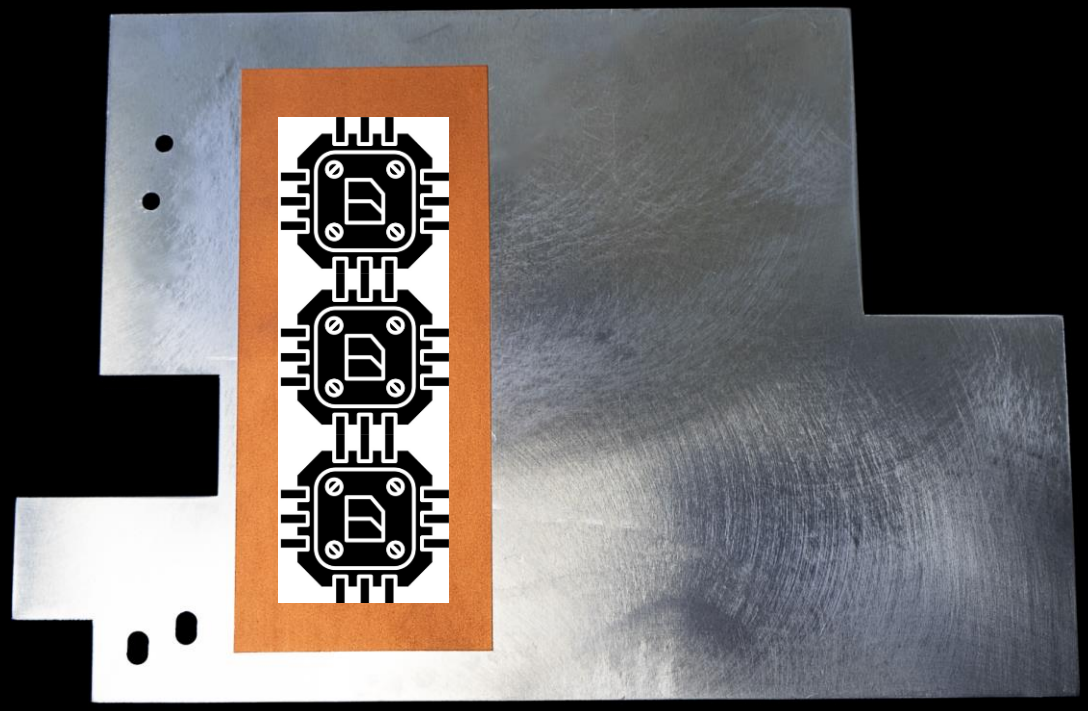




Proof of concept

概念验证

In cooperation with
与Fraunhoter合作

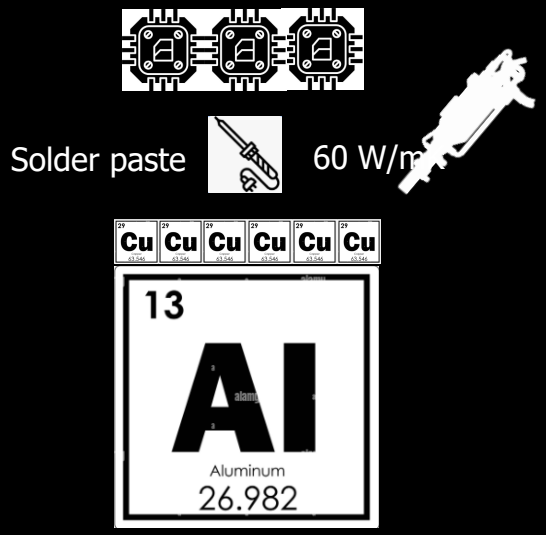
Fraunhofer

Solder paste has up to 20x better heat conductivity

– Soldering compared to TIM material –

焊膏的导热性能可高达20倍

– 焊接与导热界面材料的比较 –



Testing process in 3 steps

– Soldering compared to TIM material –

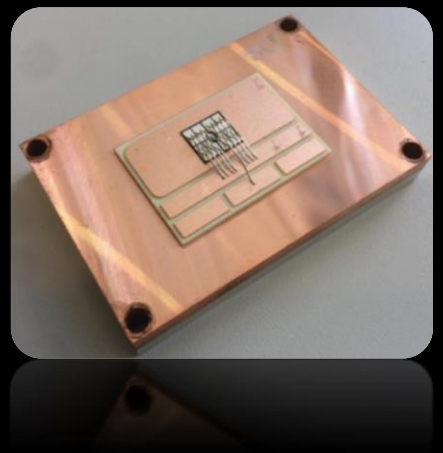
三步测试流程

– 焊接与导热界面材料的比较 –

1. spraying

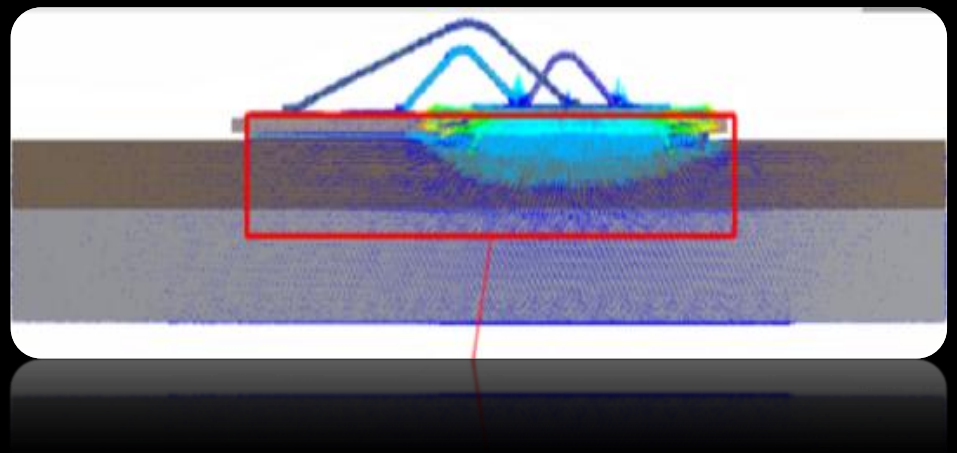
1. 喷涂

2. solder & TIM process



2. 焊接与导热界面材料工艺

3. measurements



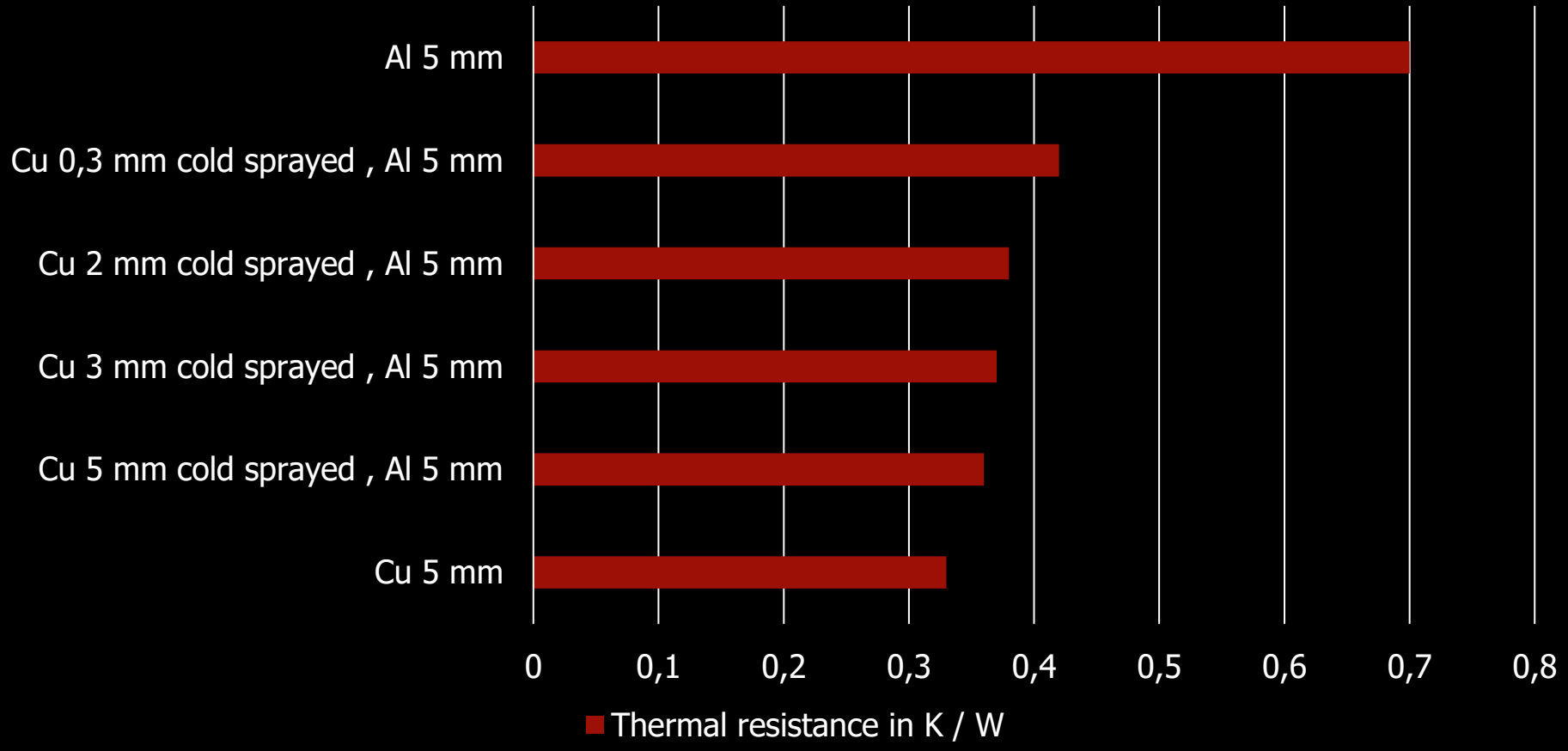
3. 测量

The thermal resistance of cold sprayed hybrid heatsinks is comparable to Cu-heatsinks

– Comparison of thermal resistances of different heat sinks –

冷喷涂混合散热器的 热阻与铜散热器相当

– 不同散热器热阻的比较 –

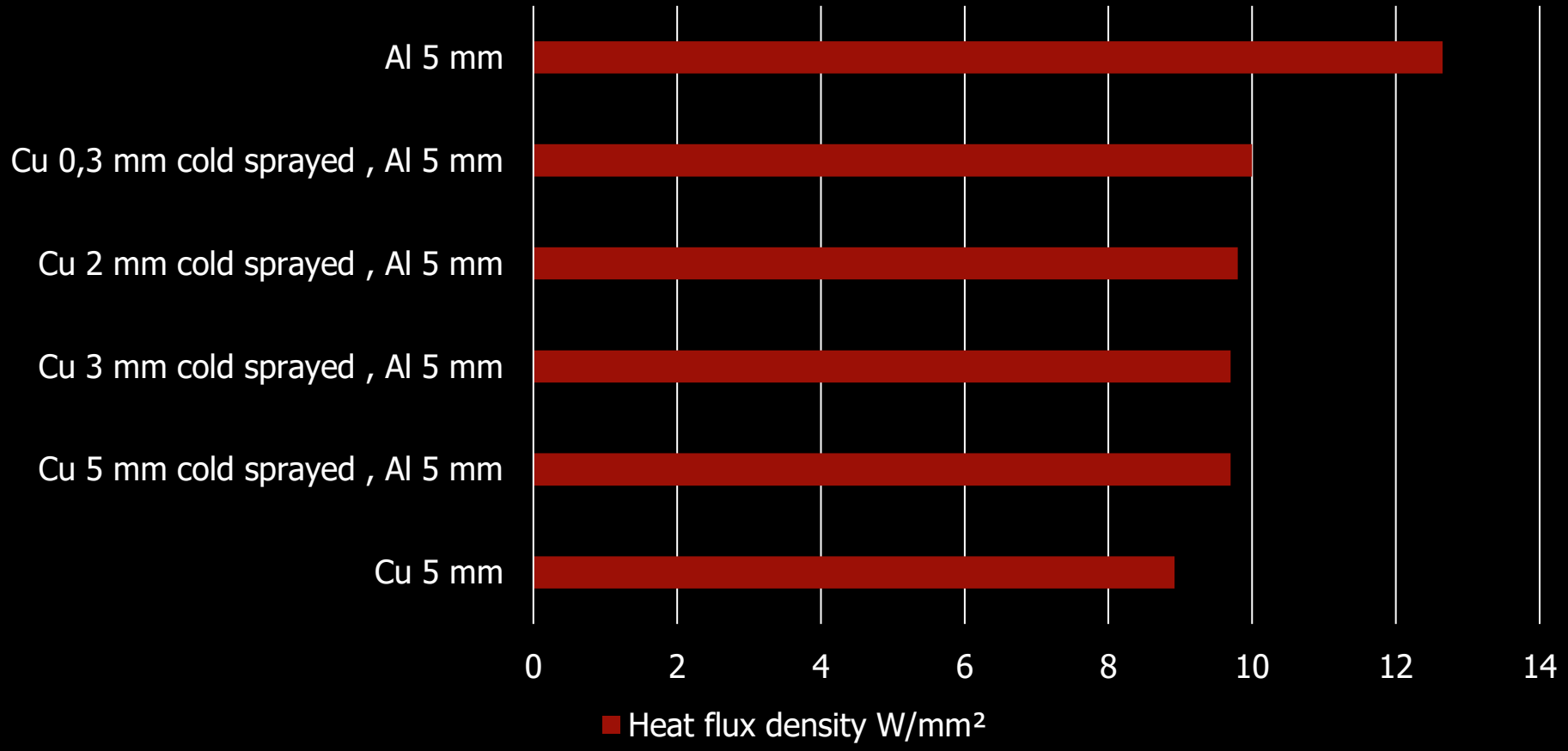


Impact cold sprayed hybrid heatsinks have a similar heat flux density as Cu-heatsinks

– Comparison of thermal resistances of different heat sinks –

冲击冷喷涂混合散热器的热流密度与铜散热器相似

– 不同散热器热阻的比较 –

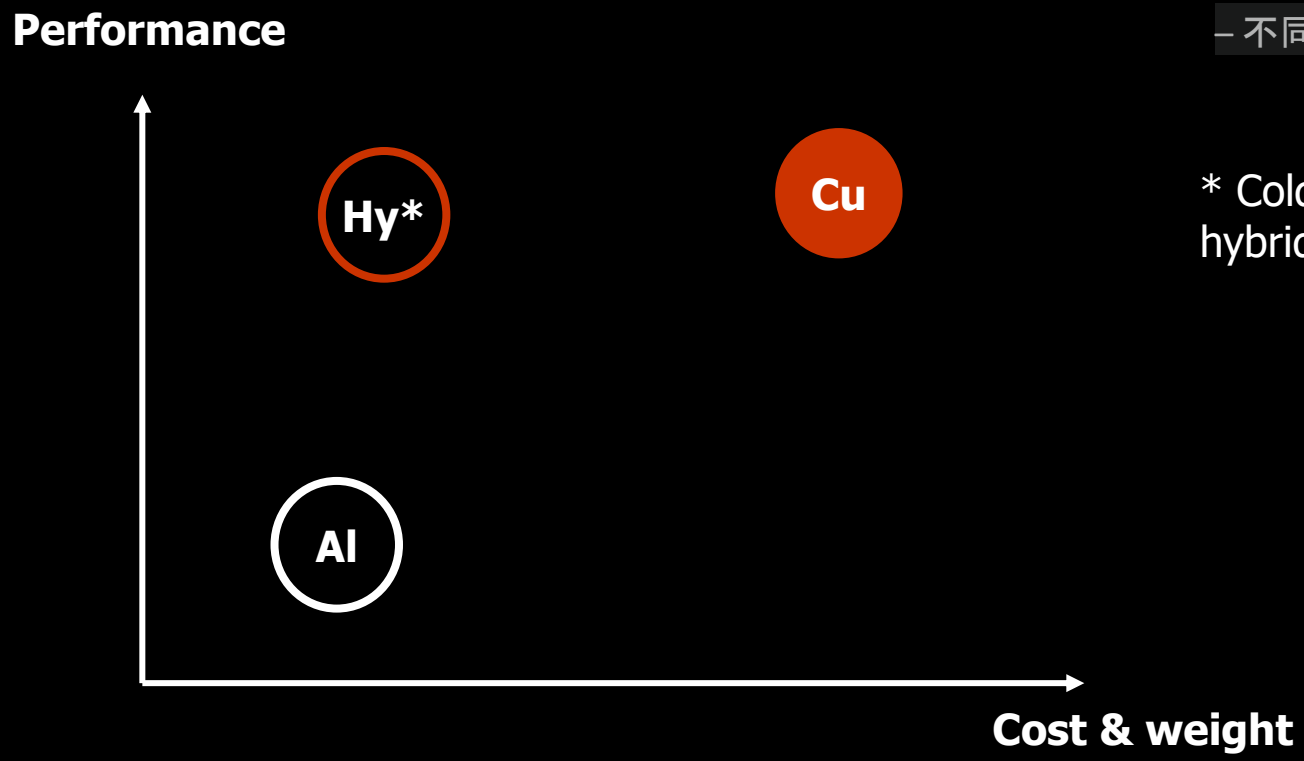


The performance of CS hybrid heatsinks is comparable to the performance of Cu-heatsink

– Comparison of thermal resistances of different heat sinks –

冷喷混合散热器的性能可与铜散热器的性能相媲美

– 不同散热器热阻的比较 –



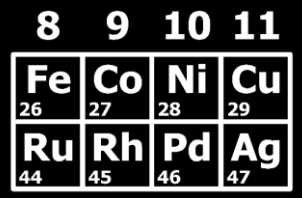
* Cold sprayed hybrid heatsink

Physical properties of cold sprayed copper

– Properties driven by the industry –

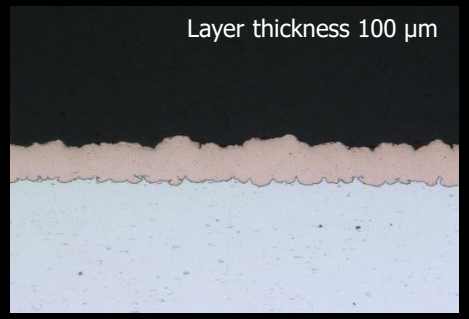
物理特性冷喷铜

– 由行业驱动的特性 –



Copper
Purity 99,98

铜
纯度99.98%



Overall flatness

0,15mm

整体平整度0.15毫米

Bonding
> 60 Mpa

粘合强度
> 60兆帕

Deposition
efficiency
Up to 99,8%

沉积效率高达
99.8%

> 1.000.000
parts yearly

年产量 >
1,000,000件

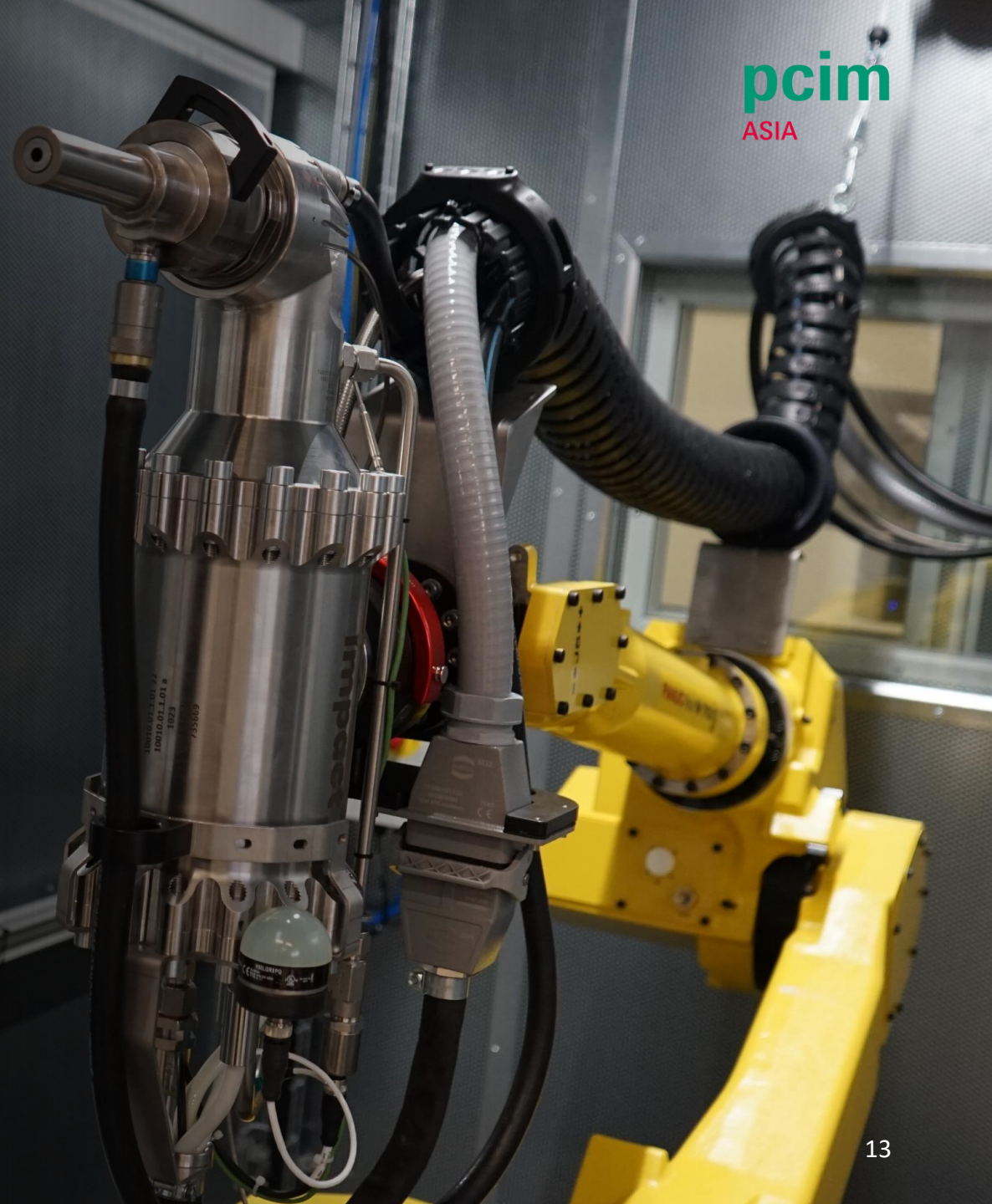
impact CSHSCB
the turnkey solution

冲击 CSHSCB
一站式解决方案

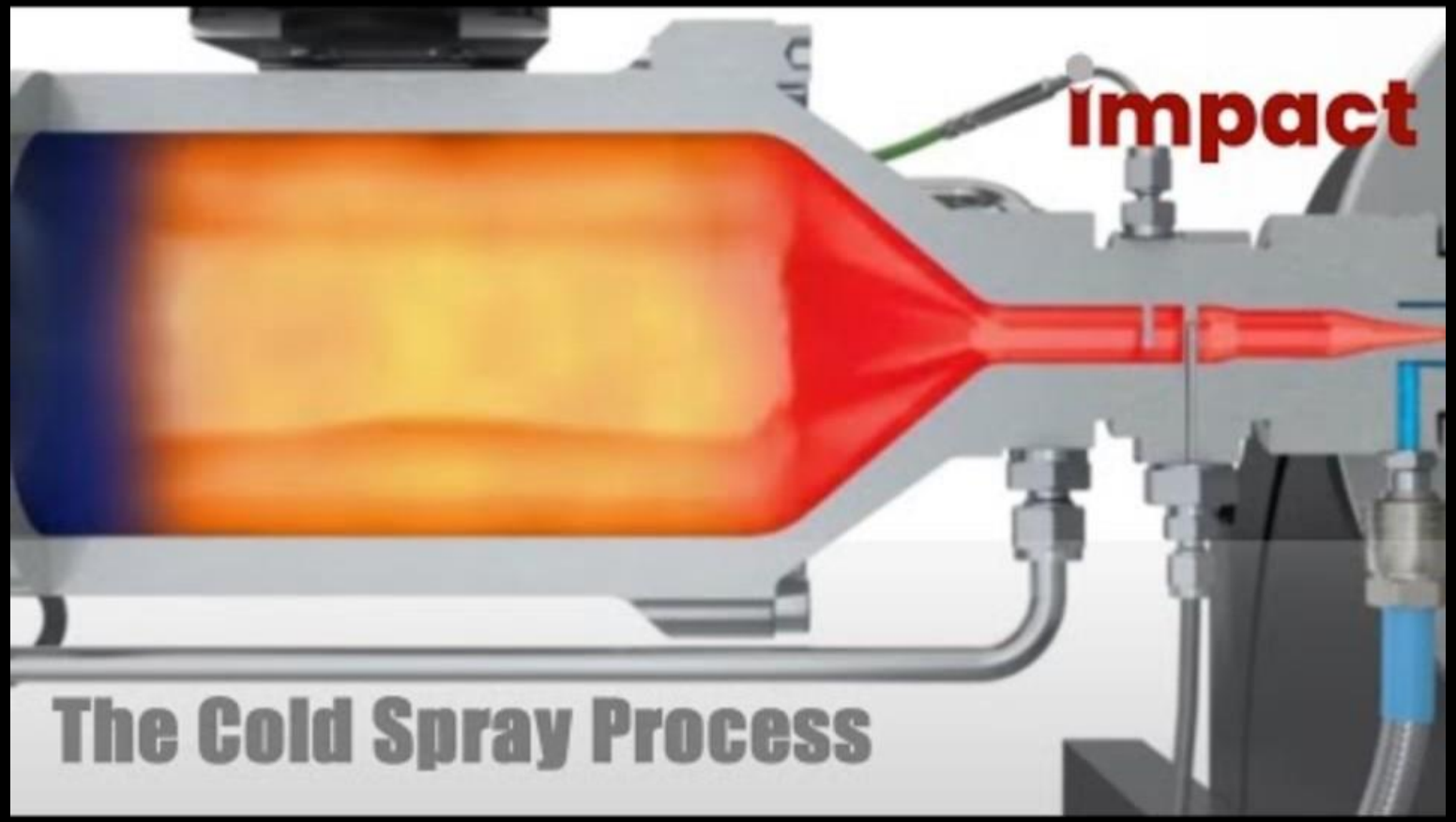
EVO CS II 6/11 spraygun

- ✓ 10 kg / hour feedrate
- ✓ 24/7 operation
- ✓ 150 parameters to control process
- ✓ Built for 3 shift production
- ✓ Up to 99,8% efficiency

- ✓ 10 公斤 / 小时进料速度
- ✓ 24/7 全天候运行
- ✓ 150个参数控制过程
- ✓ 为三班生产而建
- ✓ 高达99.8%的效率



Cold Spray technology



Automated coating box CSHSCB

自动涂层箱CSHSCB

- ✓ Capacity up to 1.500.000 parts yearly
- ✓ Flexibility for various cooler designs
- ✓ Automated spray cell
- ✓ High efficiency
- ✓ Cycle time 8-16 seconds
- ✓ Cost saving
- ✓ Deposition efficiency up to 99.8%

- ✓ 年产量高达1,500,000件
- ✓ 适用于各种冷却器设计的灵活
- ✓ 自动喷涂单元
- ✓ 高效率
- ✓ 循环时间8-16秒
- ✓ 节约成本
- ✓ 沉积效率高达99.8%

Copper cold spray turnkey solution

– Soldering compared to TIM material –

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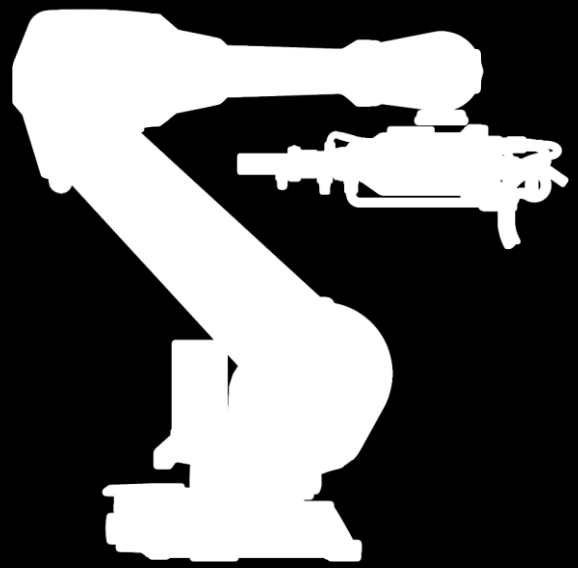
铜冷喷涂一站式解决方案

– 焊接与TIM材料的比较 –



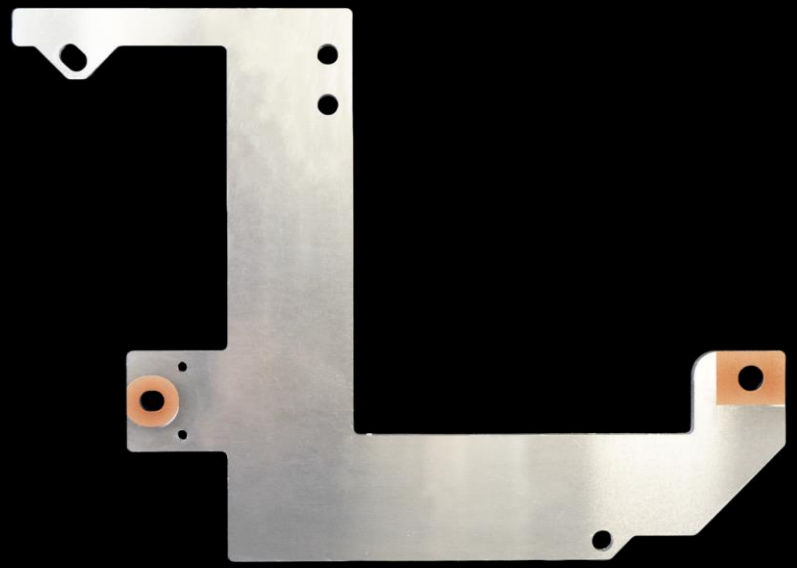
impact CSHSCB

Future applications

– Cold spray technology has a high potential in the future –

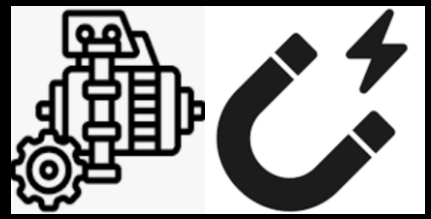
未来应用

– 冷喷涂技术在未来具有很高的潜力 –



Hybrid busbars for automotive applications

汽车应用的混合母线



Additive manufacturing of aluminium, copper, magnetic material and many more

铝、铜、磁性材料等的增材制造

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Thank you!