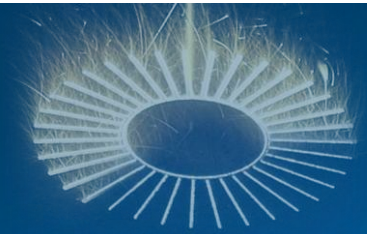
AM Heat-exchangers for demanding applications

Challenges and opportunities from technology to certification!



Rapid.Tech 05/2025

Philipp Schwarz, Head of Business Development, Rosswag GmbH

Agenda

1. About Rosswag Engineering
2. Development of High-Performance Heat-Exchangers HPEX®
3. Certification according to Pressure Equipment Directive
4. Status Quo with Project Examples

Rosswag GmbH

Edelstahl Rosswag

SINCE 1911

TRADITION

ROSSWAG engineering

SINCE 2014

INNOVATION

Metal AM Service Provider

HOLISTIC METAL AM
FORGING NEW WAYS








ROSSWAG
engineering

qualloy - The Marketplace for Metal Powders

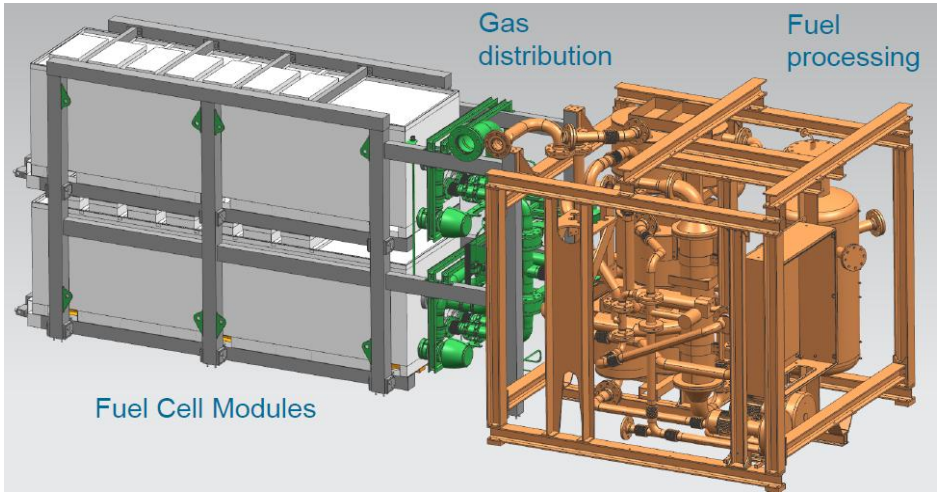
Our mission: Metal Powders. Made Easy.

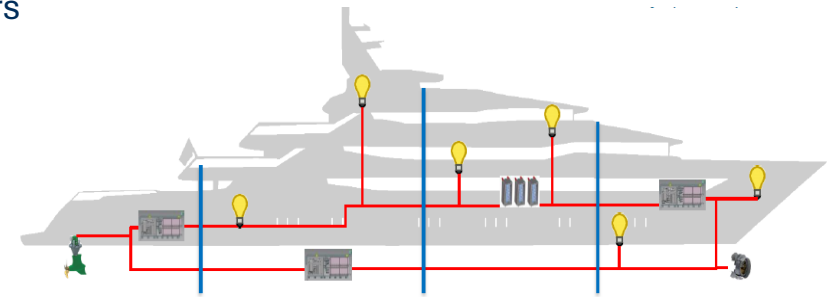
qualloy

High-Performance Heat-Exchangers HPEX®

Start of the Development in e4ships

Decentralized power supply with fuel cells (SOFC) on cruise ships from LNG
Demand for ultra-compact high-temperature heat exchangers





High-Performance Heat-Exchangers HPEX®

ROSSWAG engineering

The world of conventional heat-exchangers

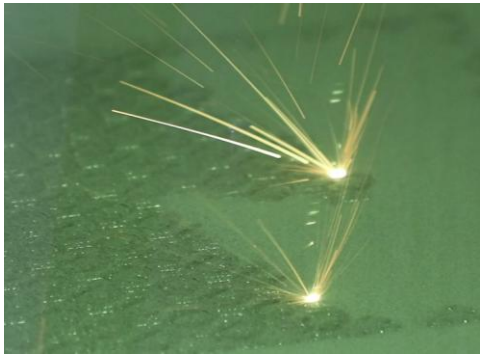
Tube HX

- ⊕ High operational safety
- ⊕ Long term stability
- ⊕ Low pressure drop
- ⊖ Small heating surface
- ⊖ Large dimensions

Plate HX

- ⊕ Large heating surface
- ⊕ Small size
- ⊖ Lower operational safety
- ⊖ Short service life
- ⊖ High pressure drop

Additive Manufacturing

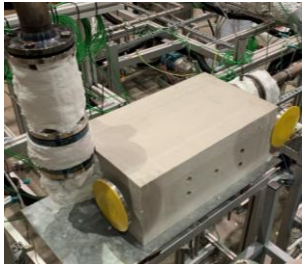


Combine the advantages!

High-Performance Heat-Exchangers HPEX®

Development & Optimization






Size

Power Density

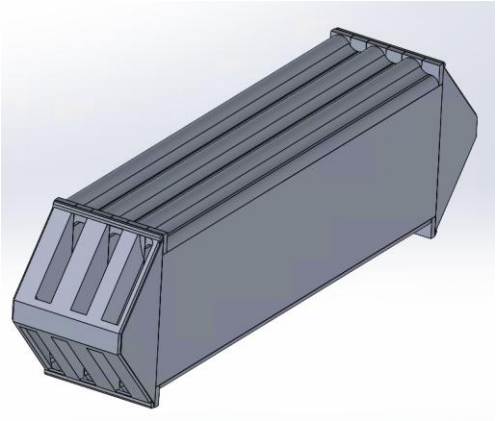



High-Performance Heat-Exchangers HPEX®

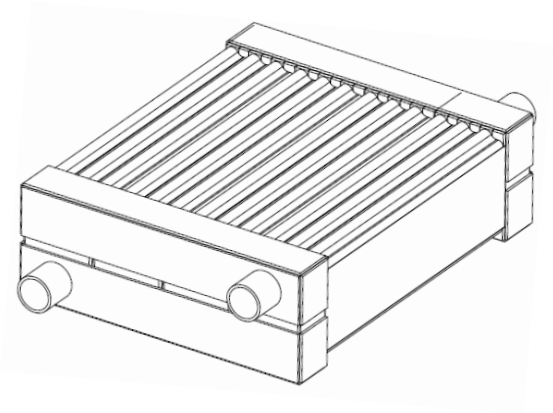
ROSSWAG engineering

Modular & scalable for individual boundary conditions

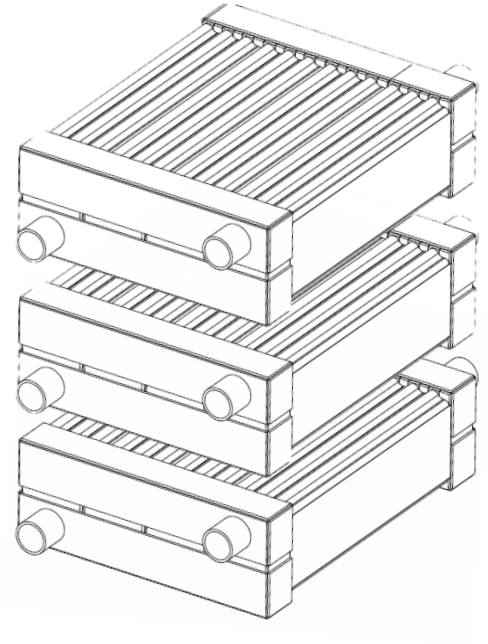
1 x Module



4 x Modules

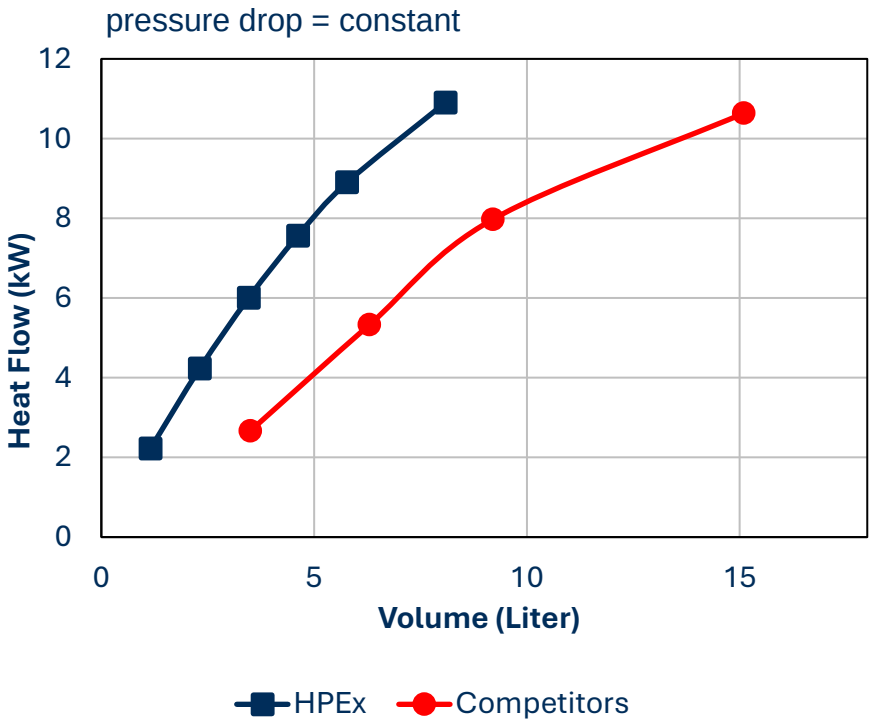


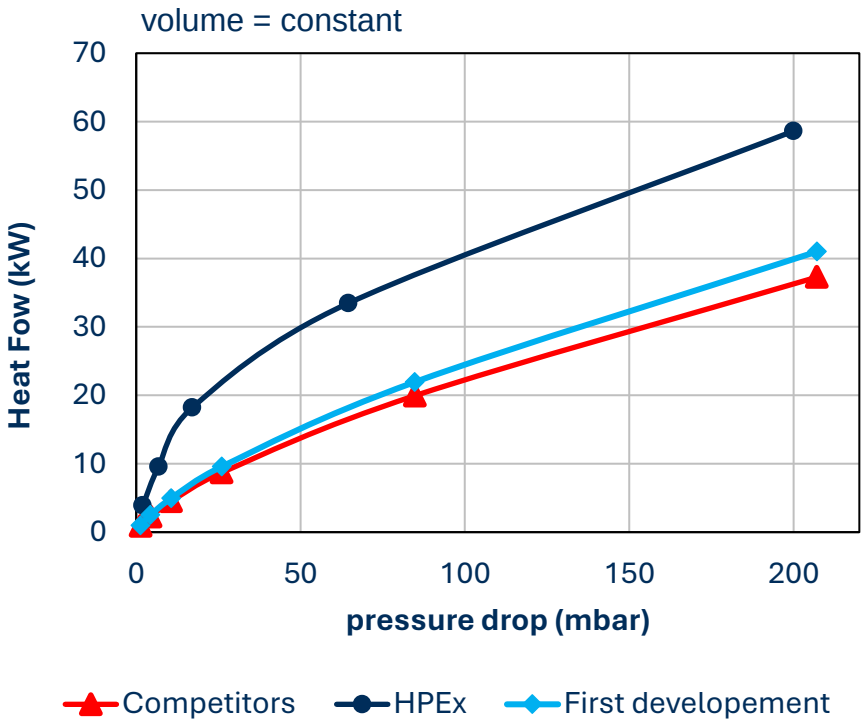
12 x Modules



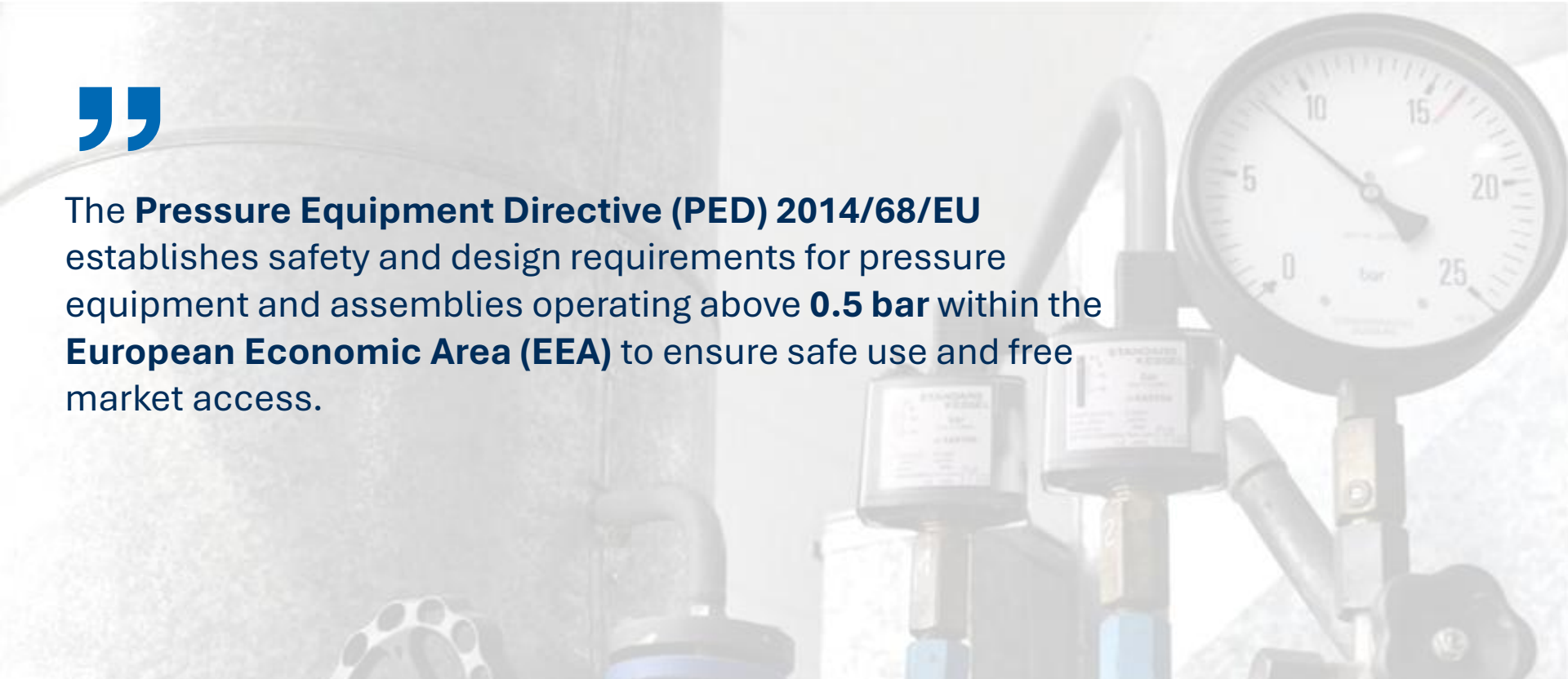
High-Performance Heat-Exchangers HPEX®

Numerical and experimental results





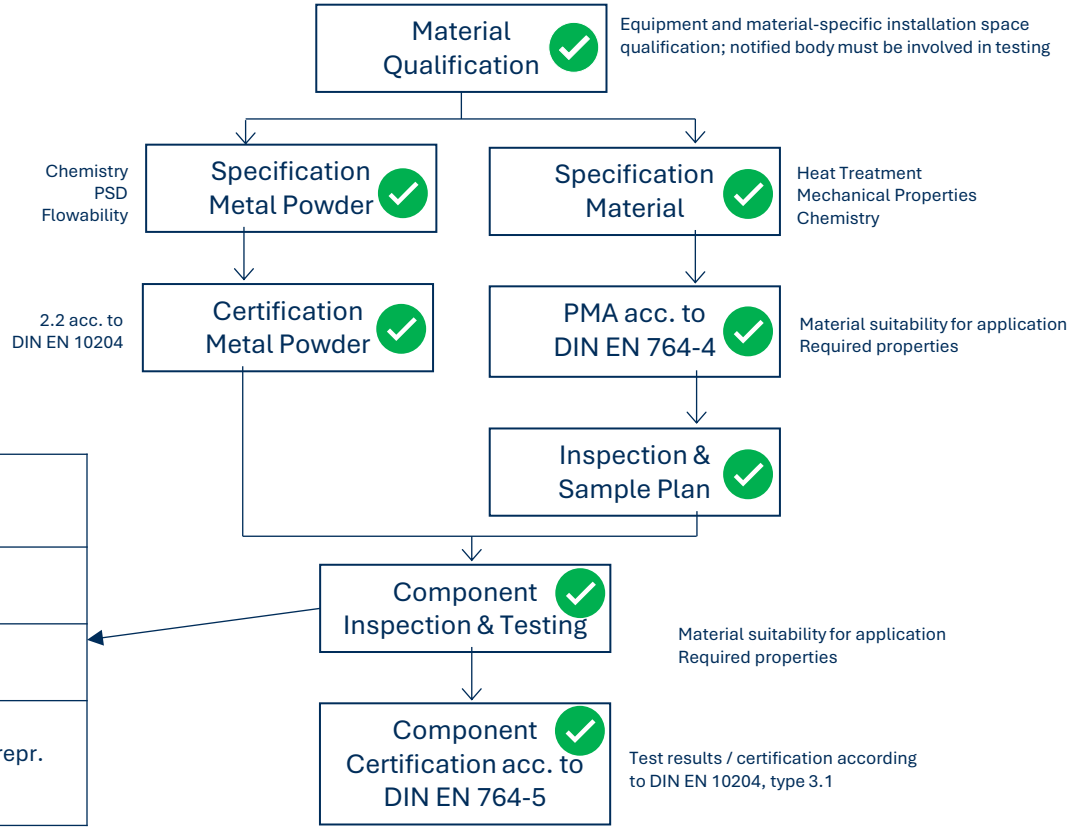
Pressure Equipment Directive DGRL 2014/68/EU



The **Pressure Equipment Directive (PED) 2014/68/EU** establishes safety and design requirements for pressure equipment and assemblies operating above **0.5 bar** within the **European Economic Area (EEA)** to ensure safe use and free market access.

Component qualification

based on prEN 13445



Design Class	Destructive Testing	Non-destructive Testing
1	• Tensile Tests • Charpy Tests • Chemical Tests • Corrosion Tests	100 % visual & 100 % RT, UT or CT Internal geometries: 100% CT
0.85		100 % visual & 25 % RT, UT or CT Internal geometries: 100% CT
0.7		0 % Visual Internal geometries: 100 % CT or repr. Sample

Material Portfolio for LPBF

TRL 1 2 3

Materials in Qualification

Fe Base
1.4923
1.4521
1.4901
1.3343
1.4906

Other
Waspaloy

TRL 4 5 6

Materials for Prototyping

Fe Base
1.3964 | AISI XM19
1.4021 | AISI 420
1.4462 | AISI 318LN

Ni Base
ABD®-900 AM

Other
AlMgty 80

TRL 7 8 9

Series Ready Materials

Fe Base
1.4404 | AlSI 316L
1.2709 | AlSI M300
Invar 36
1.4828 | AlSI 309
1.4545 | 15-5 PH
Specialis®
1.7225 | 42CrMo4

Ni Base
IN625
IN718
VDM® Alloy 699 XA
Hastelloy X

Other
AlSi10Mg
Aheadd® CP1
Ti6Al4V
CoCr28Mo6

... more materials under NDA

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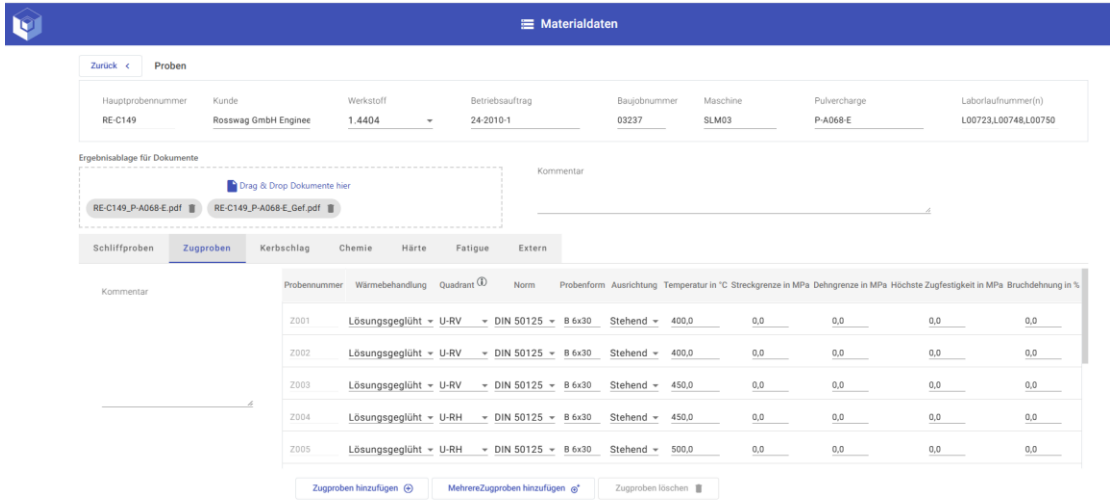
Data Basis for Materials

Holistic Manufacturing Execution System AddiPlan

Large Data Basis for Materials



ROSSWAG engineering

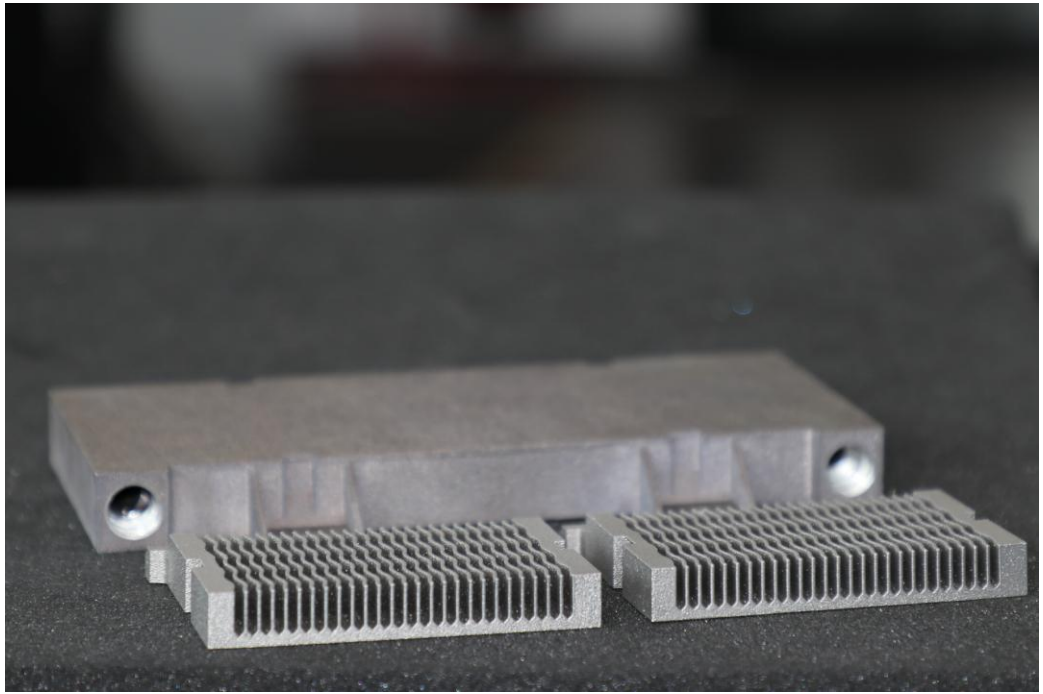
Certifications at Rosswag

Quality Assurance System in accordance with the Pressure Equipment Directive 2014/68/EU, Annex I, Section 4.3 as well as EN 764-5, Para. 4.2

RE4404 (316L)	Approved for -196° to 450 °C
IN625	Ongoing Qualification for up to 850 °C
Alloy 699 XA	Database available, certification can be implemented quickly.

HPEX Projects

Lightweight HPEX for Mobility Applications with Aheadd® CP1

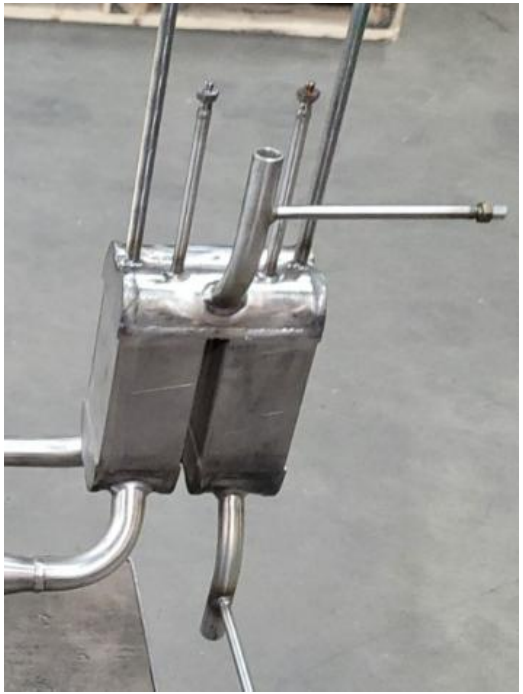


Key Facts

- Tmax ~ 80 °C
- P ~ 1,5bar
- Aheadd® CP1
- Fuel Cell powered Aircrafts

HPEX Projects

Evaporator for hydrogen production from biomass

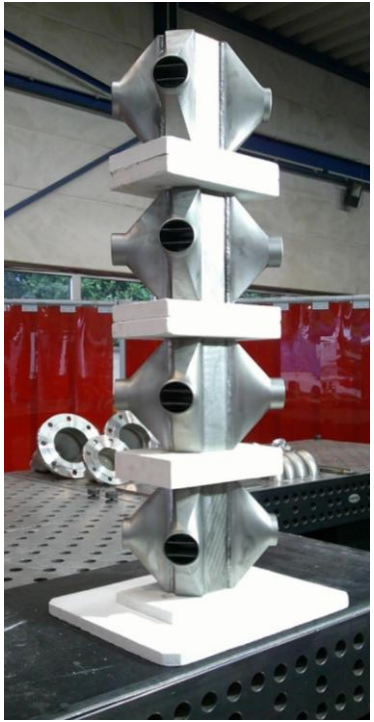


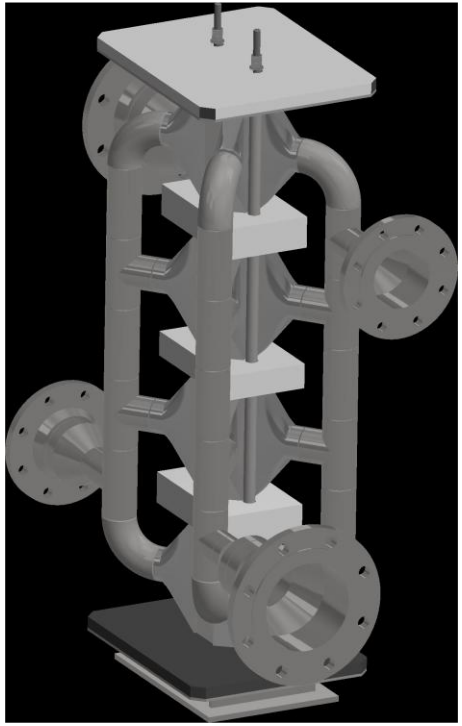
Key Facts

- Tmax ~ 950°C
- P ~ 1,5bar
- Inc. 625
- P ~ 3kW
- P_max ~ 8kW

HPEX Projects

Heat exchanger in refinery





Key Facts

- M_flow ~ 500kg/h
- Low dust concentration
- T_max ~ 1.000° C
- p_drop < 15mbar
- H ~ 1.000mm
- Smaller and cheaper

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