

Where EB Welding Meets Additive Manufacturing - Introducing Hybrid WEBAM

Thomas Wiehler, Additive Manufacturing

pro-beam additive GmbH
September 2025

www.pro-beam.com

Why Hybrid WEBAM?

And what are its advantage?

- Conventional manufacturing for thin-walled components leads to:
 - High material waste
 - Time-consuming machining
 - Design limitations due to subtractive constraints



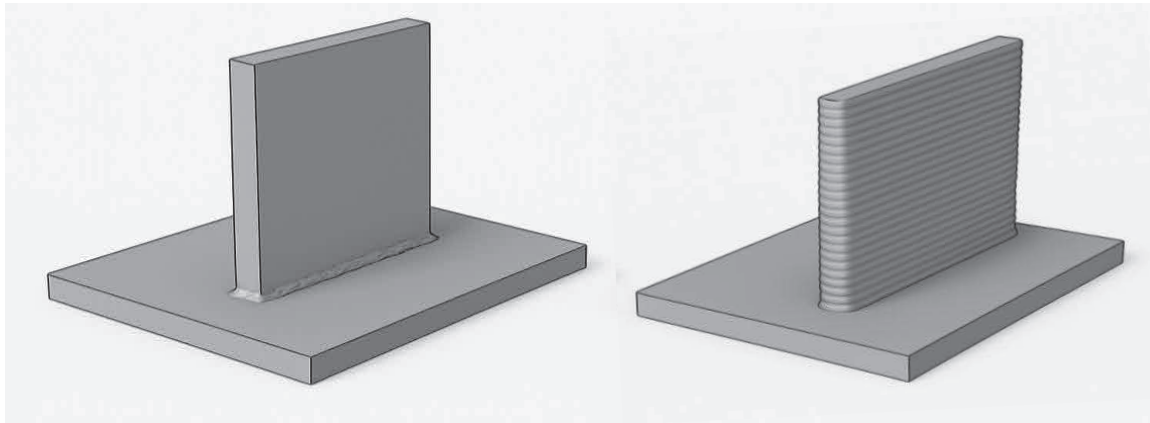
Aerospace Structure Parts



Company — WSI Industries
Titanium Machining Technologies | Aluminum Machining | Radical Departures

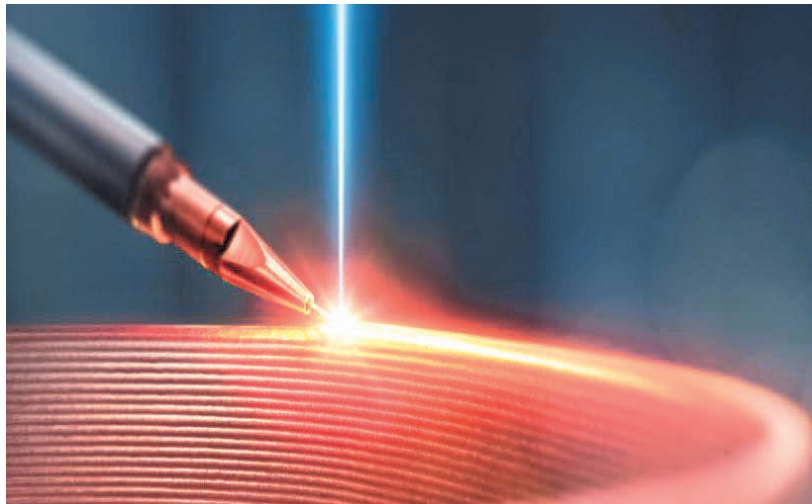
WEBAM (Wire Electron Beam Additive Manufacturing) –Welding in 3D

pro beam



T-Joint weld

Printed WEBAM wall



- WEBAM essentially is welding with the goal of creating geometries
- It belongs to the Direct Energy Deposition (DED) family, using filament as feedstock and an electron beam as energy source
- It's not just welding with filler material. The filament is the main source of deposited material

- Unlocks design freedom
- Cuts material waste significantly
- Reduces machining time and tool wear
- Perfectly suited for high-performance alloys such as titanium and inconel



WEBAM Structural Components

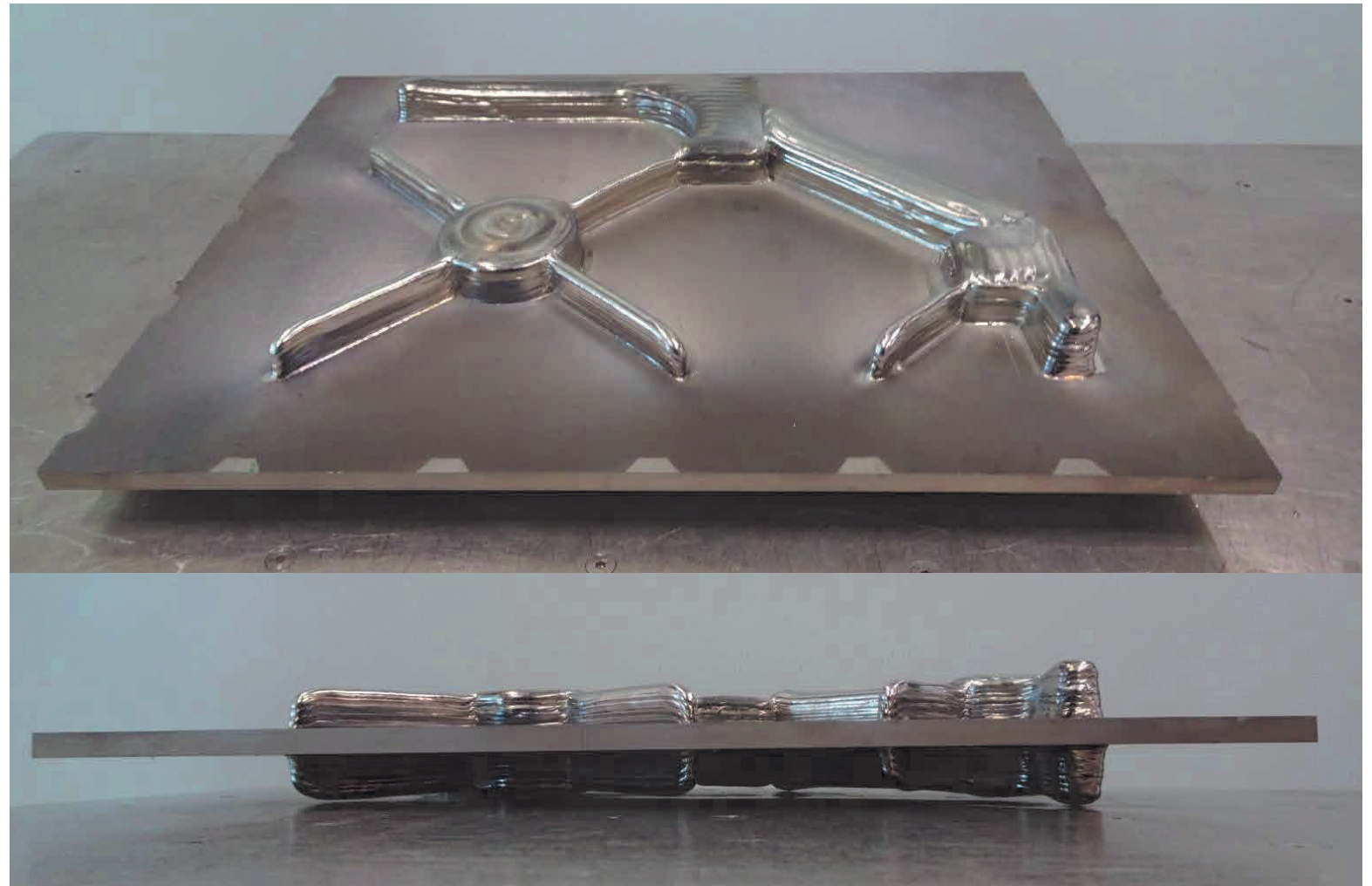
double sided structure

- material: Ti6Al4V
- thickness baseplate: 10 mm
- single track part
- maximum distortion ~1mm



double sided structure

- material: Ti6Al4V
- thickness baseplate: 10 mm
- multi track part
- maximum distortion < 1mm

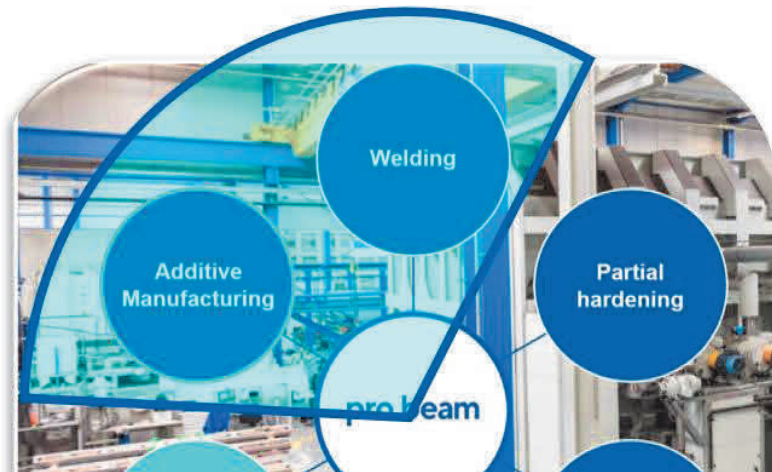


single sided structure

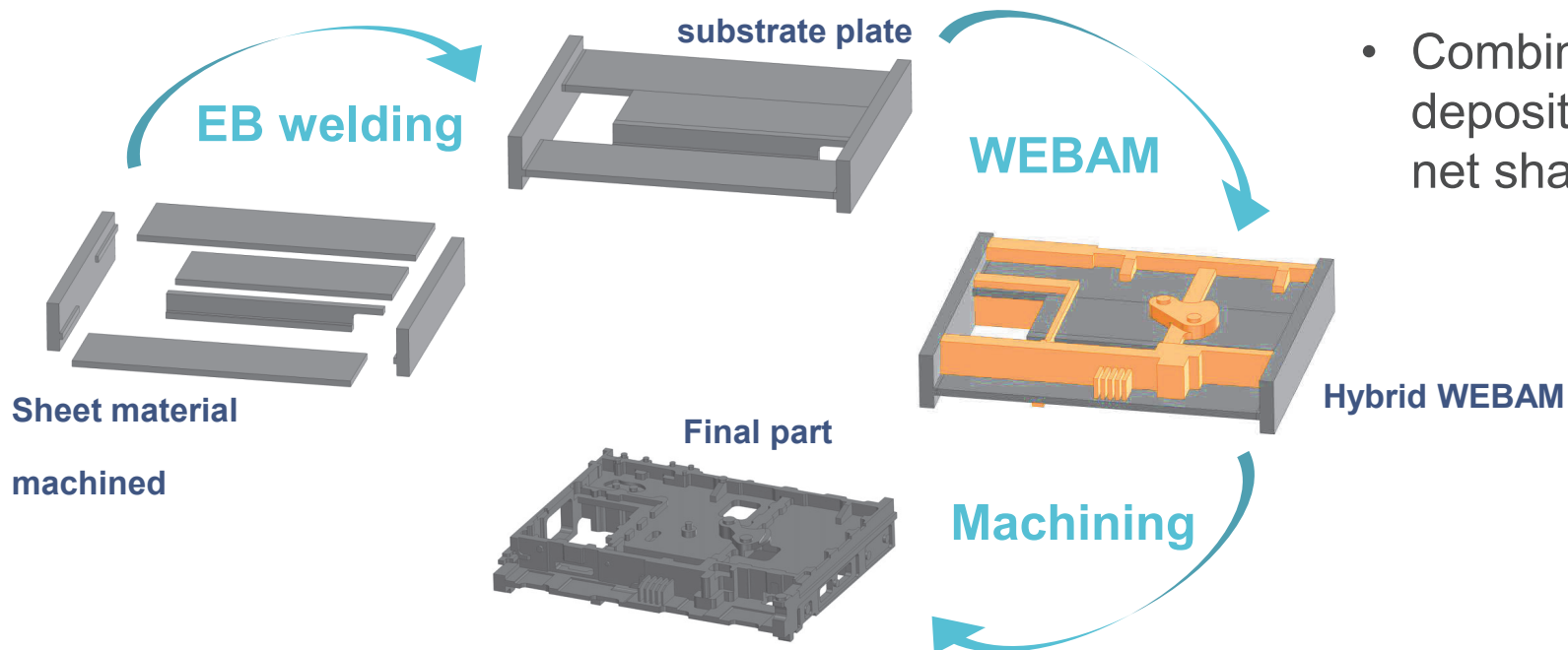
- material: Ti6Al4V
- thickness baseplate: 5 mm
- single track part
- maximum distortion < 2mm



What is Hybrid WEBAM



EB welded



- Hybrid WEBAM merges Additive Manufacturing with Welding
- Combining a welded substrate with additive deposition via WEBAM to produce a final near net shape component

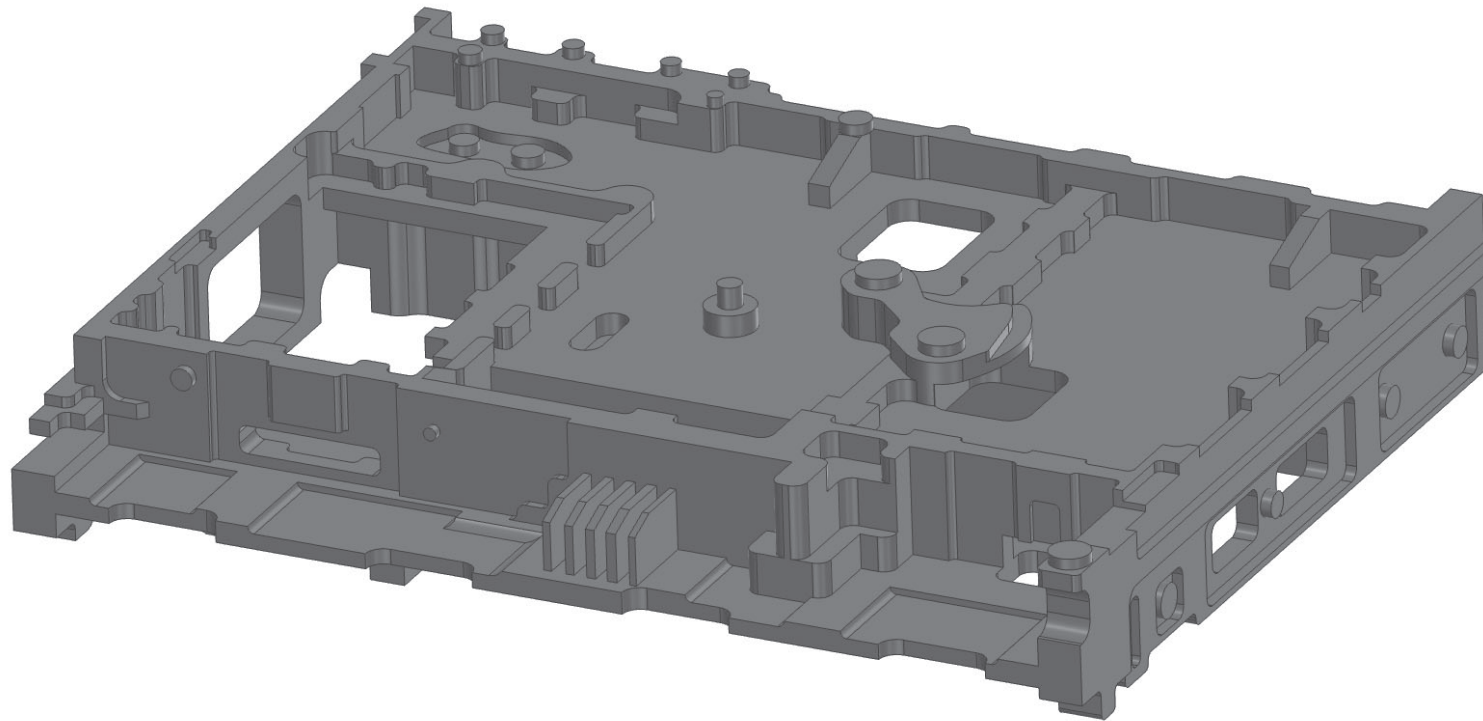
What is common for EB Welding and WEBAM

- Shared core technology
 - Electron beam as energy source
 - Vacuum environment
- Material knowledge
 - Weldability corresponds to printability
 - Shared understanding of energy deposition, thermal distortion
- Know-how and abilities
 - Machine operating
 - Process Parameters
 - Use of existing wire feeder



Hybrid WEBAM Demonstrator

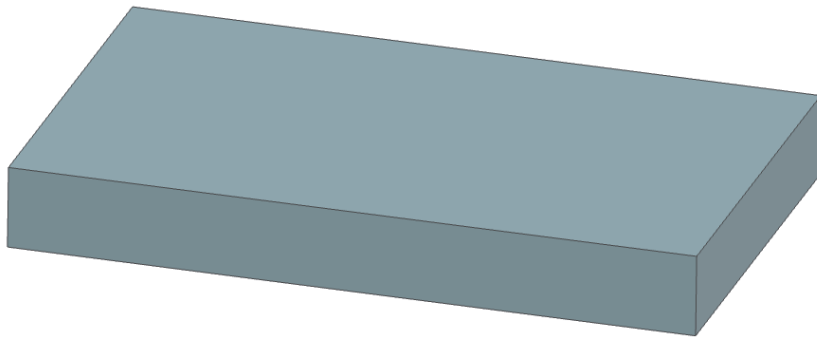
- Concept part benefiting from Hybrid WEBAM



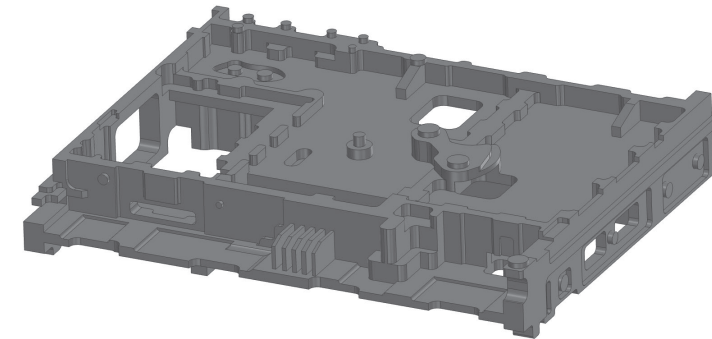
Comparison between different concepts

Conventional Machining – WEBAM – Hybrid WEBAM

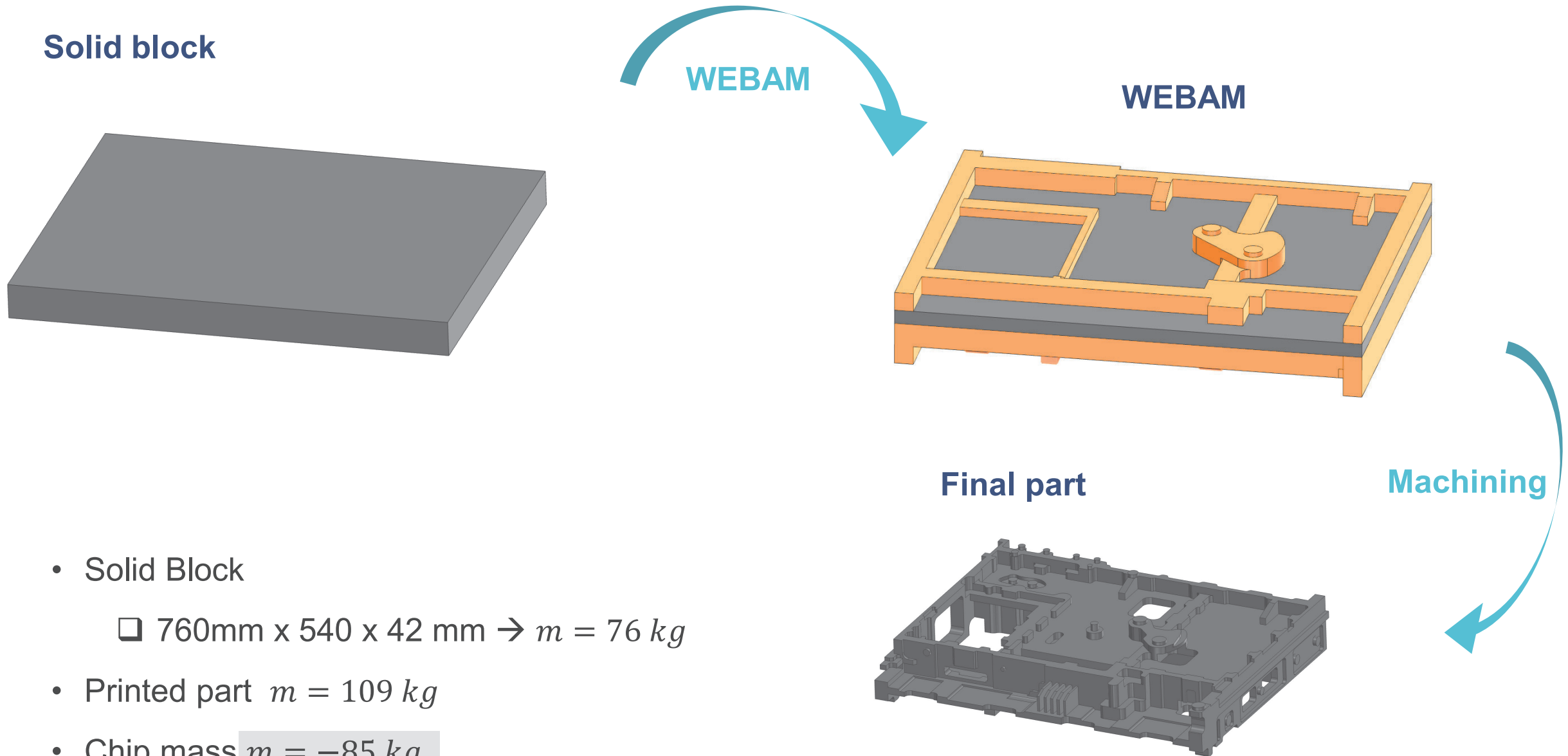
Solid block



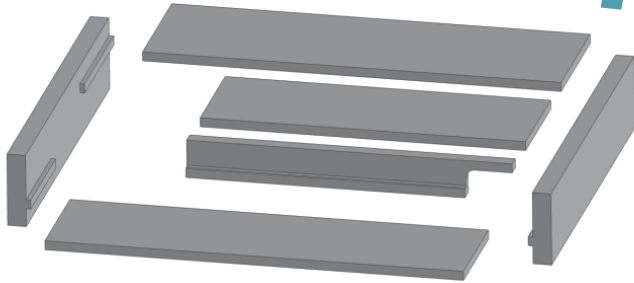
Final part



- Solid Block
 - 760mm x 540 x 114 mm $\rightarrow m = 207\text{ kg}$
- Machined part $m = 24\text{ kg}$
- Chip mass $m = -193\text{ kg}$

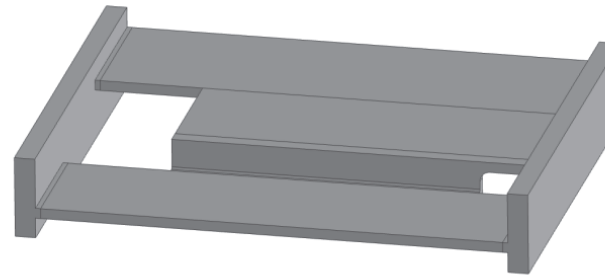


Sheet material machined



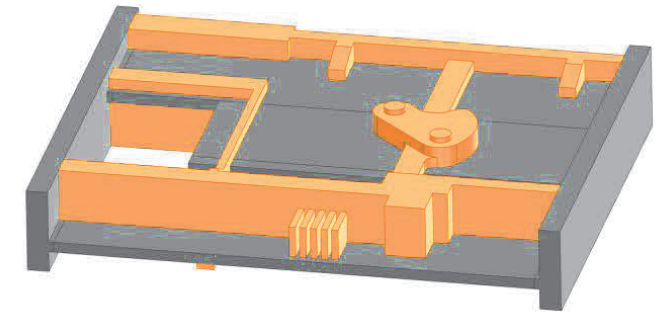
EB welding

EB welded substrate plate

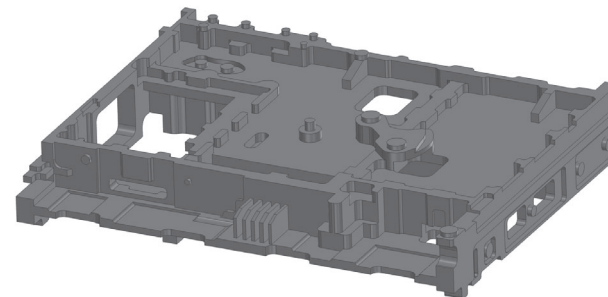


WEBAM

Hybrid WEBAM



Final part



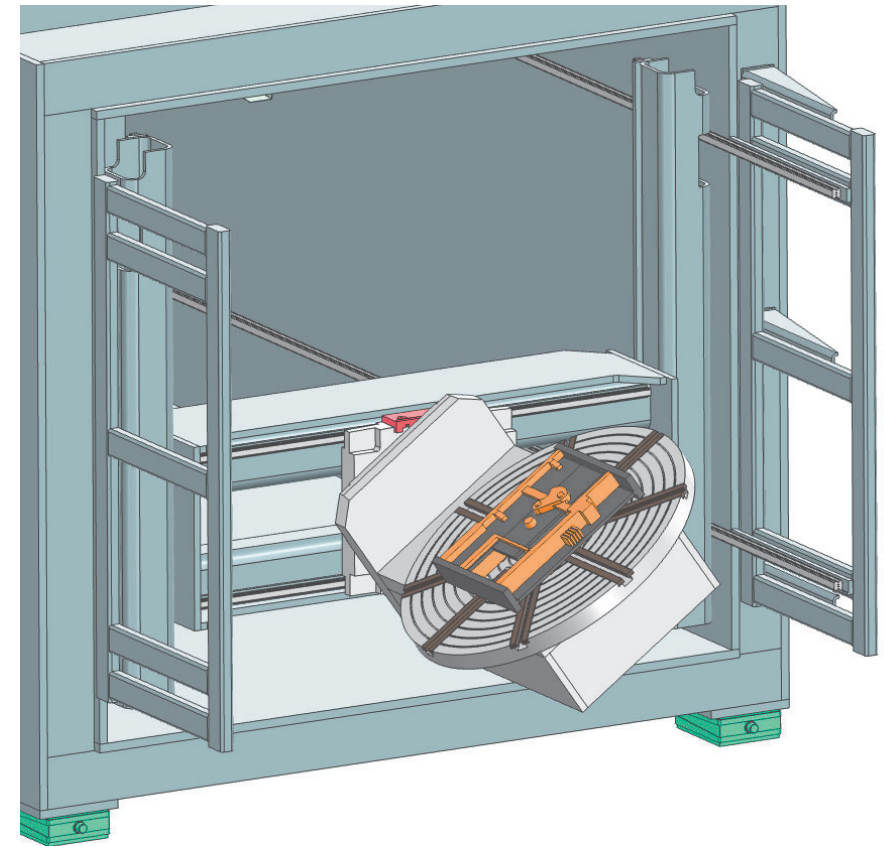
Machining

- EB welded base plate $m = 71 \text{ kg}$
- WEBAM: $m_{WEBAM} = 8 \text{ kg}$
- Mass hybrid WEBAM Part $m = 79 \text{ kg}$
- Chip mass $m = -55 \text{ kg}$

- Efficient material usage through EB welding
- Flexible additive deposition
- Reduced chip mass and minimized distortion

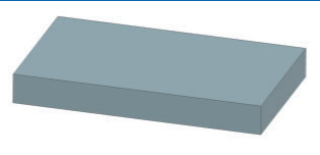
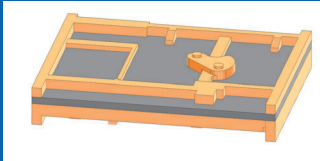
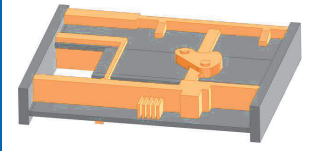
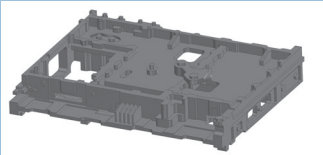
WEBAM 100 – WELD and PRINT on one machine

pro beam



Price comparison full WEBAM and Hybrid WEBAM

pro beam

	Conventional		WEBAM		Hybrid WEBAM	
						
Base material	207 kg	5.100 €	76 kg	1.800 €	77 kg	2.000 €
Machining	-	-	-	-	-6kg	882 €
EB Welding		-		-		6.690 €
WEBAM		-	+33kg	15.110 €	+8kg	
Machining	-183kg	26.901 €	-85kg	12.495 €	-55kg	8.085 €
Total Price		32.001 €		29.405 €		17.657 €
	24kg					

Enhancing manufacturing solutions with Hybrid WEBAM technology

- Cuts material waste by 70%
- Reduces machining time and tool wear
- Minimize distortion and defects
- Unlock new design possibilities

What do you think?

Can you see Hybrid WEBAM in your production environment?

Thank you very much for your attention

Thomas Wiehler

pro-beam additive GmbH
September 2025

www.pro-beam.com