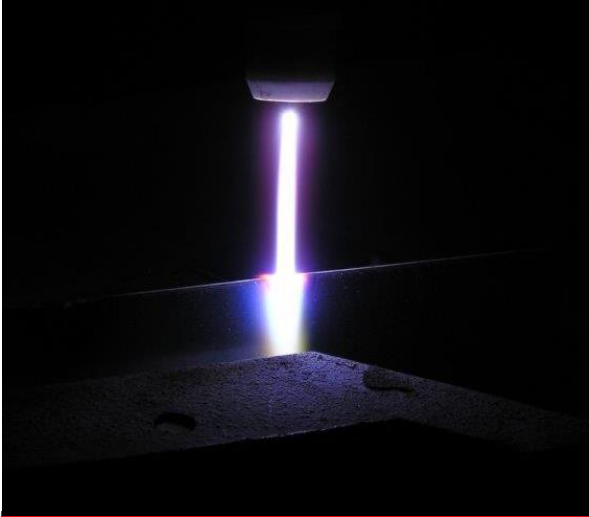




SBI COMPANY PRESENTATION FOCUS AM

Johannes Niedermayer

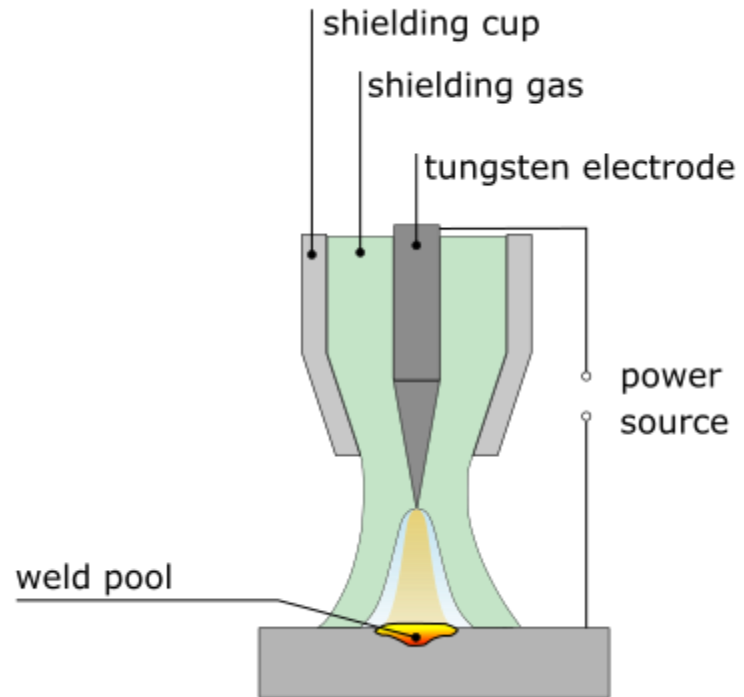
credit: Syrovatka
courtesy RHP



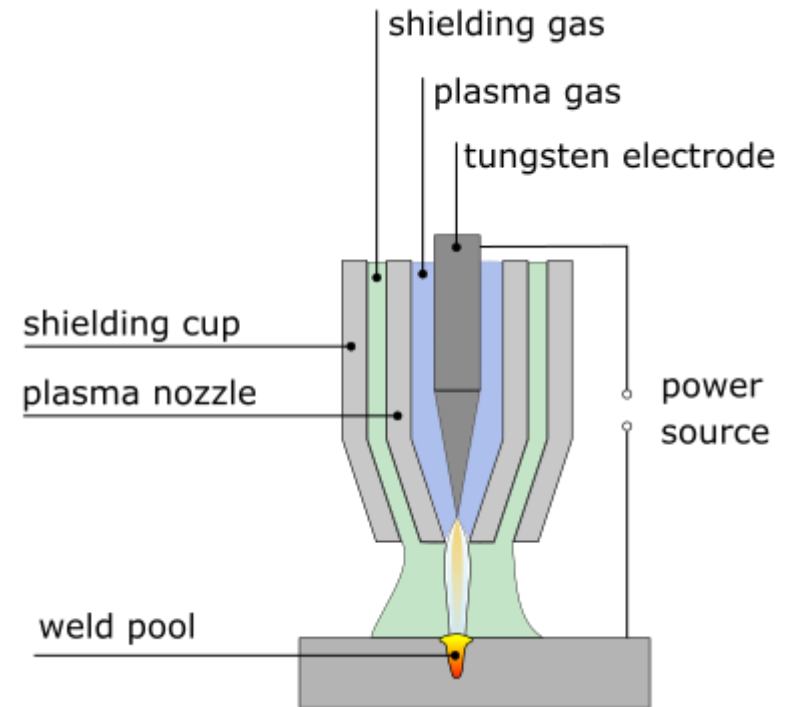
WELDING



ADDITIVE
MANUFACTURING



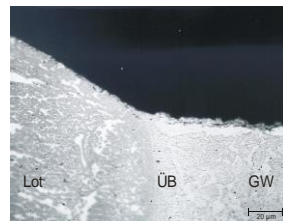
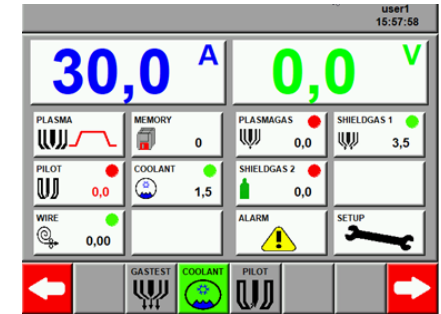
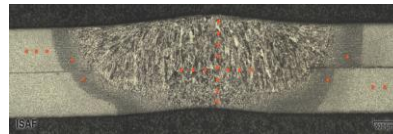
Gas tungsten arc welding



Plasma jet plasma arc welding

Process 155 according to EN ISO 4063

- Multi welding process equipment (GTAW & Plasma)
- Compact design including cooling
- User friendly touch screen control with pictograms
- Process gases manual or electronic controlled
- Remote maintenance
- Quality data recording
- Standard interface (e.g. ProfiBUS, ProfiNET,...)
- Plasma Control Software for remote control
- Wide range of accessories available



Welding current:
Control range:
100% DC (40°C):
Dimensions (l x w x h):
Operating Mode:

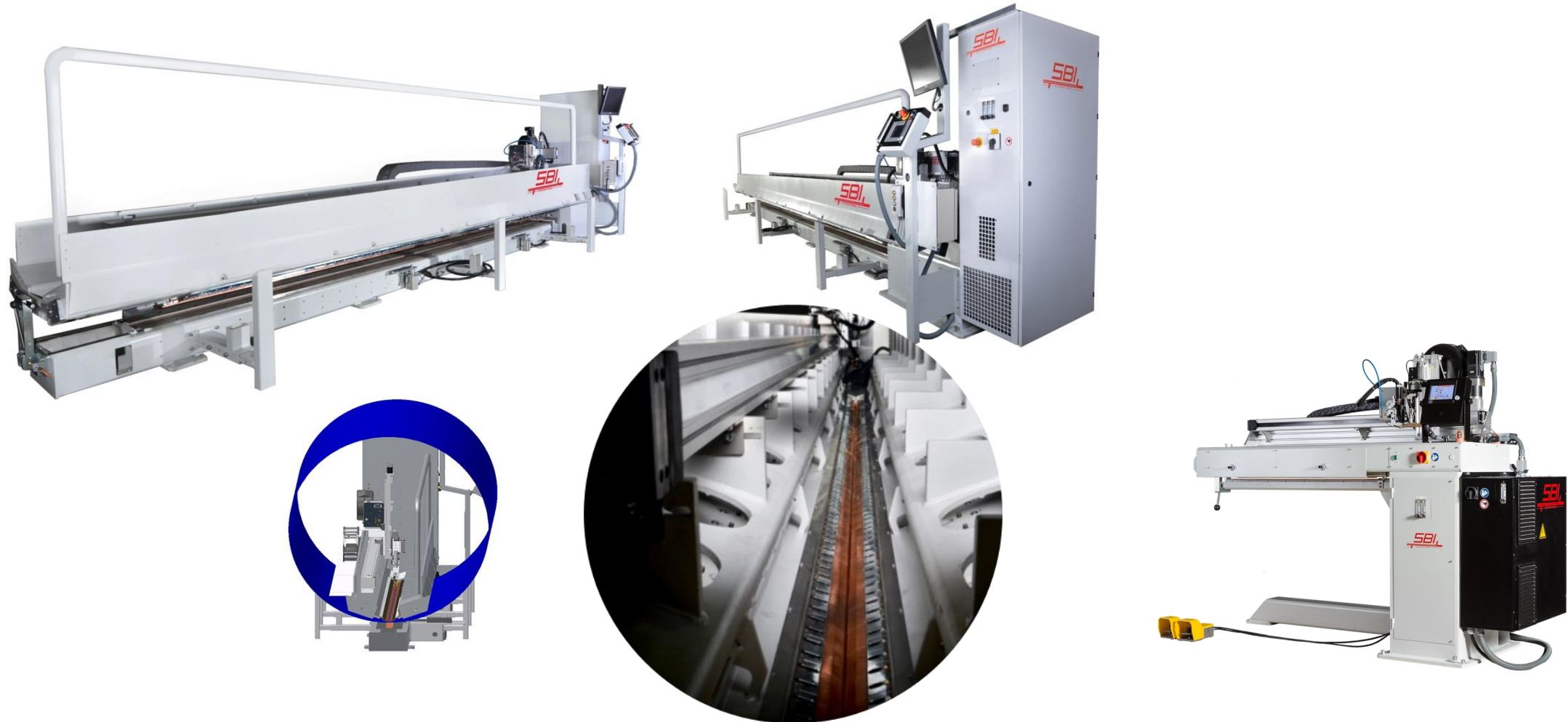
PMI* – 50	PMI – 350	PMI – 500	PMI – 350 AC/DC
			
0,5-50A 30A 620 x 300 x 555 mm DC	3-350A 290A 1120 x 450 x 935 mm DC	5-500A 300A 1120 x 450 x 935 mm DC	5-350A 280A 1120 x 450 x 935 mm AC / DC

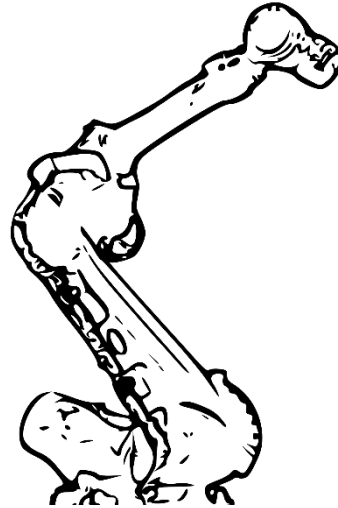


- Wire feeder / powder feeder
- Plasma & GTAW torches for
 - Cladding
 - Spot welding
 - Micro plasma
 - Soft plasma
 - Keyhole welding
- Interfaces
- Welding camera
- Foot controller, manual controller

Modular accessories can be tailored according to the customers application

Seam welding units for up to 8000 mm welding length

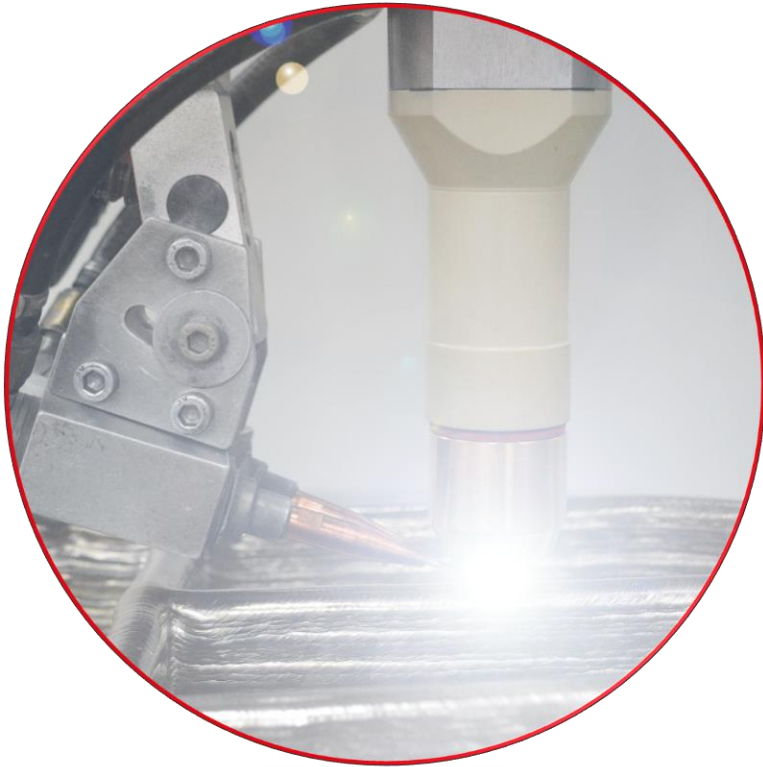




M3DP®

PMD
PLASMA METAL DEPOSITION
R o b o t i c

M3DP SL



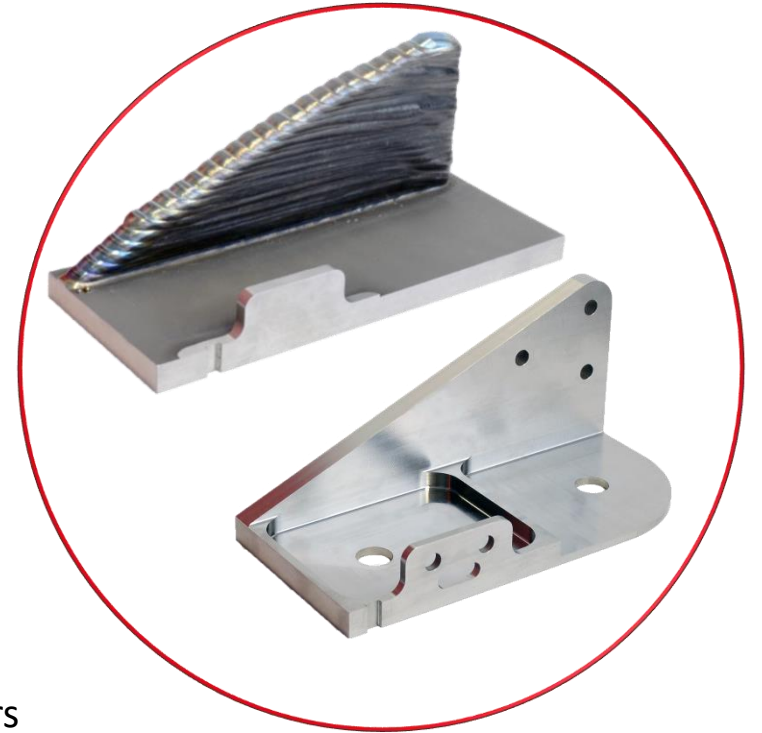
AND / OR



- ✓ Multiple wires
- ✓ Wire preheating



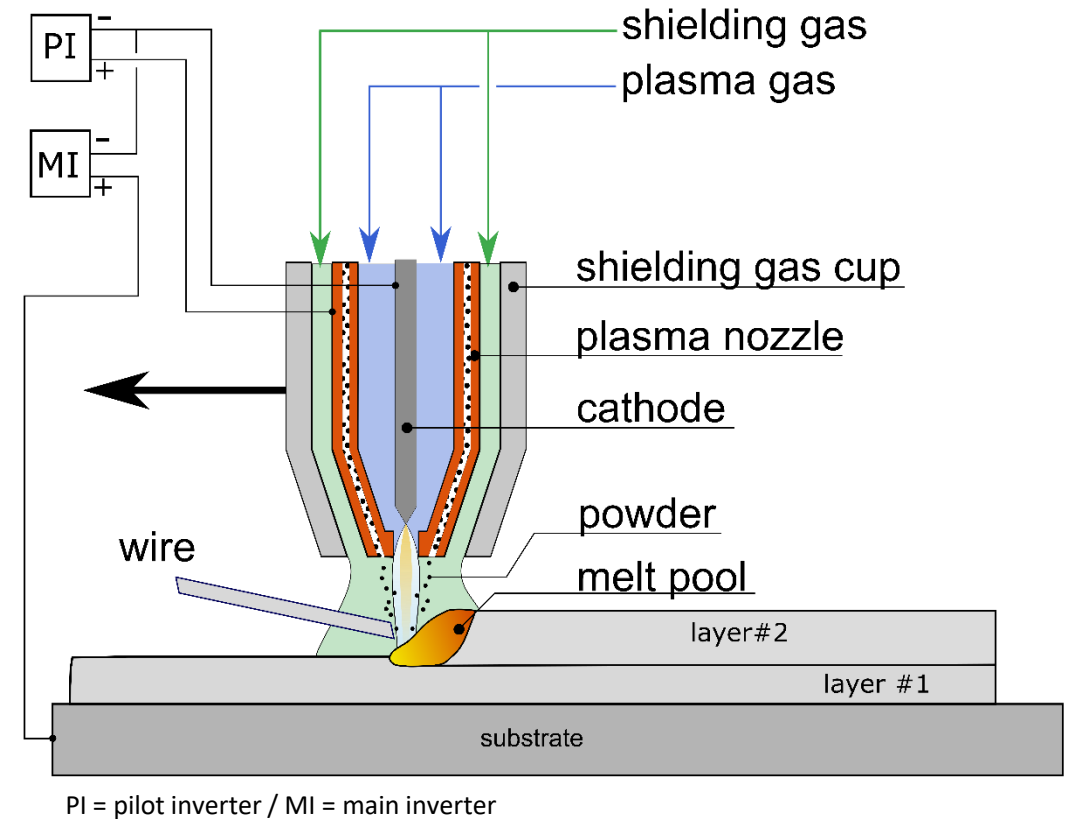
- ✓ Multiple powders

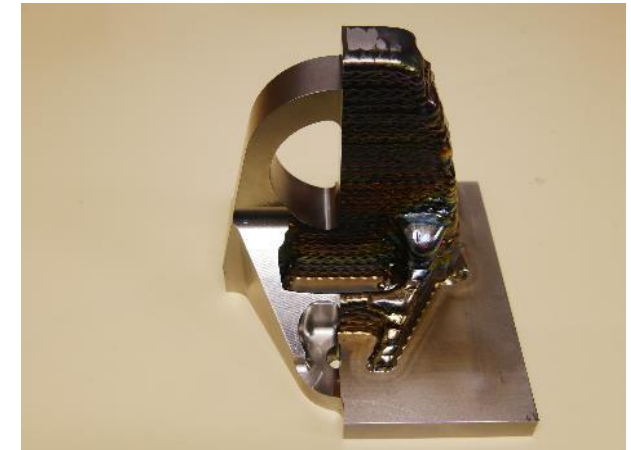
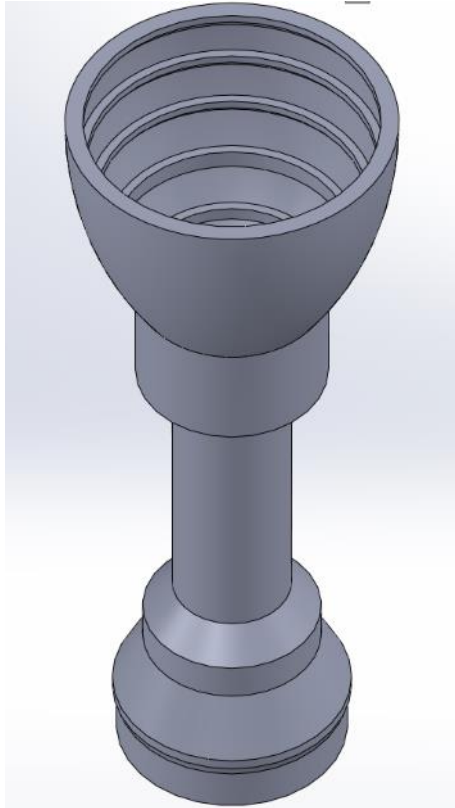


PMD
PLASMA METAL DEPOSITION

PMD PLASMA METAL DEPOSITION

- Near net shape process
- Works with Fe, Ti, Al, Mg, ...
- The M3DP is a pure AM-system and therefore has no subtractive function
- Flexible
- Scalable
- Uses max. 2 wires, max. 2 powder or a combination of both (2 wire and 2 powder feeds)

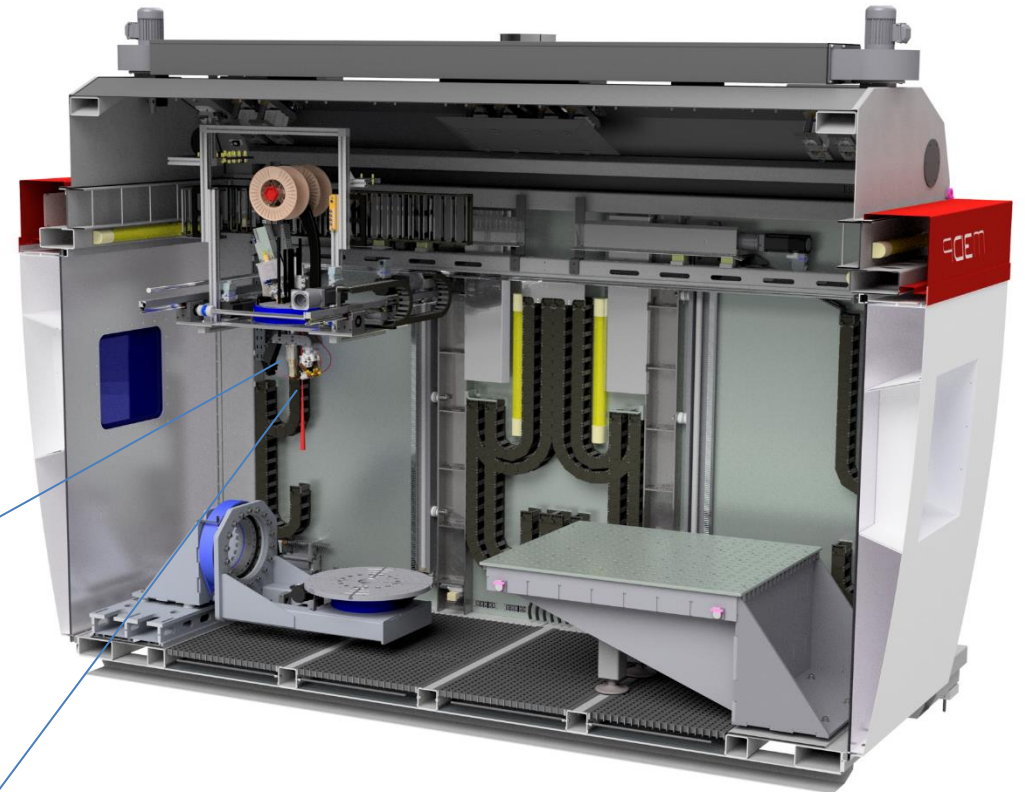
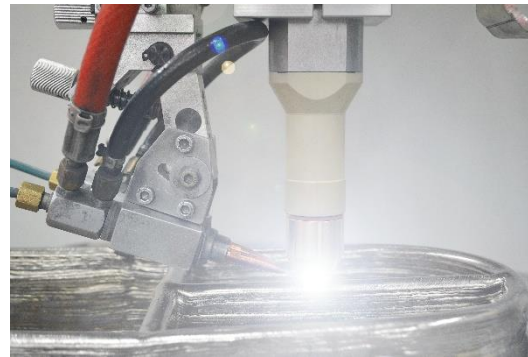
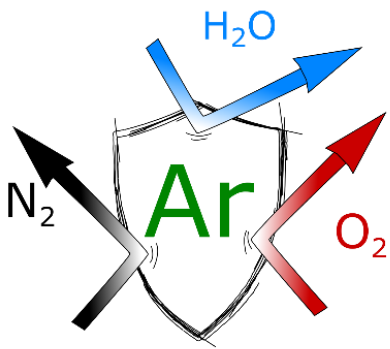




M3DP - METAL 3D PRINTER



- **Size** – 4400x2300x3400mm (W-B-H)
- **Torch manipulation:** Cartesian coordinate system
- **Substrate manipulation:** Static table / tilt turn table
- **Stainless steel frame**
- **Inert gas atmosphere:** 10ppm and below



13 26.981
Al
Aluminium
+alloys

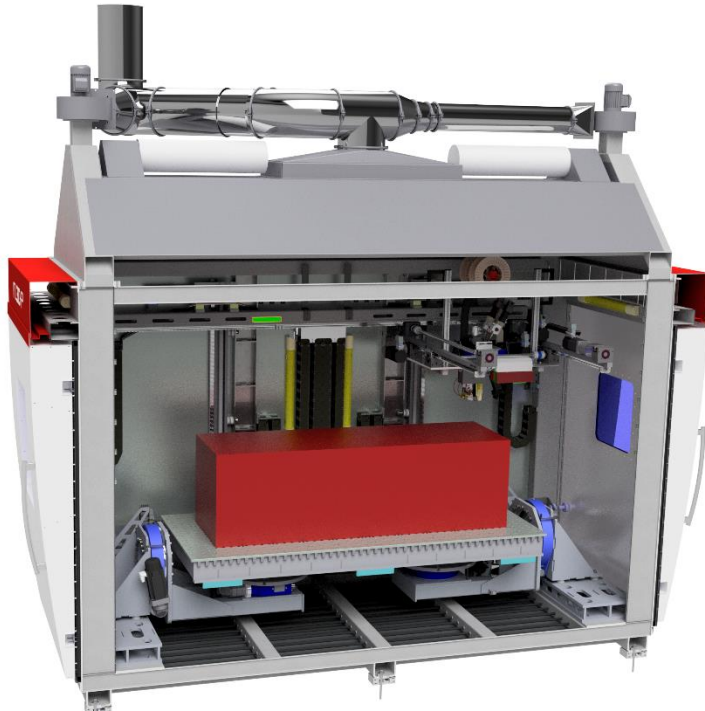
22 47.867
Ti
Titanium
+alloys

24 51.996
Cr
Chromium
+alloys

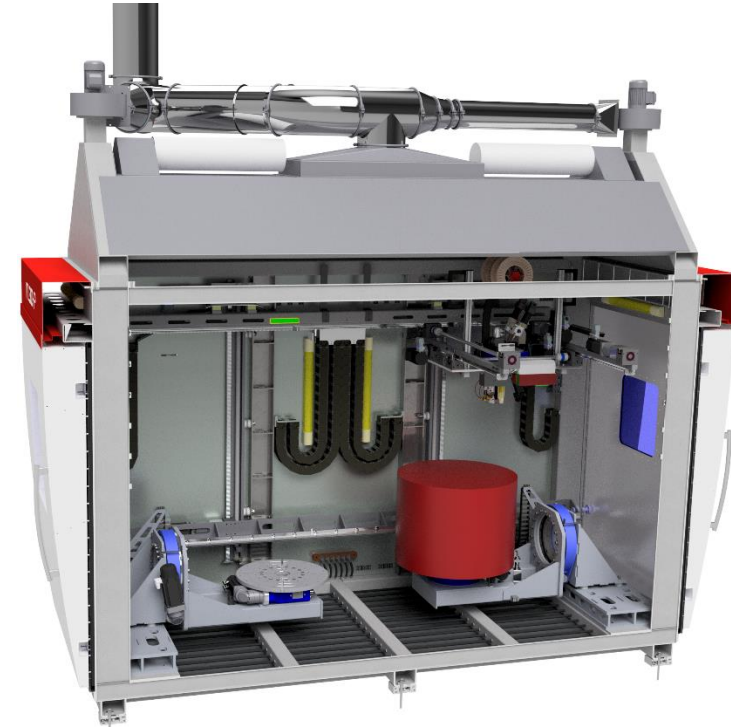
26 55.845
Fe
Iron
+alloys

27 58.933
Co
Cobalt
+alloys

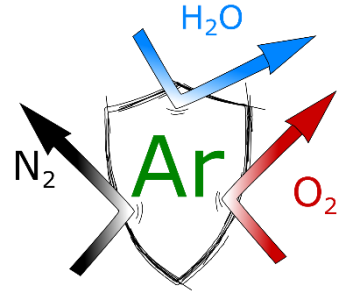
28 58.693
Ni
Nickel
+alloys



Buildvolume 2000 x 600mm x 600mm
5-Axis-System for 2.5D build-up



Buildvolume Ø1000mm x 800mm
8-Axis-System for 3D build-up

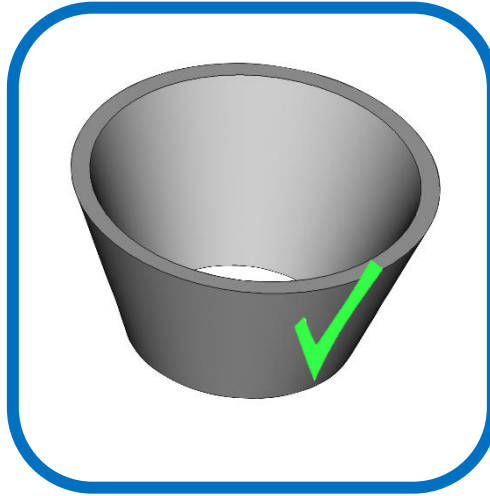


- **Size:** 2400 x 1400 x 2300 mm W-B-H
- **Torch manipulation:** Cartesian coordinate system
- **Substrate manipulation:** Static table / tilt turn table
- **Aluminum frame**
- **Mobile**
- **Work envelope:** 400 x 400 x 400mm
- **Inert gas atmosphere:** 10ppm and below

26 55.845 Fe Iron +alloys	27 58.933 Co Cobalt +alloys	28 58.693 Ni Nickel +alloys
22 47.867 Ti Titanium +alloys	24 51.996 Cr Chromium +alloys	13 26.981 Al Aluminium +alloys

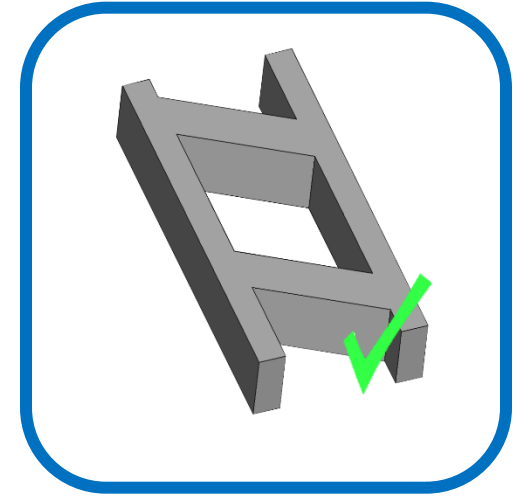
- **Cylindric**

- tubes
- pipes



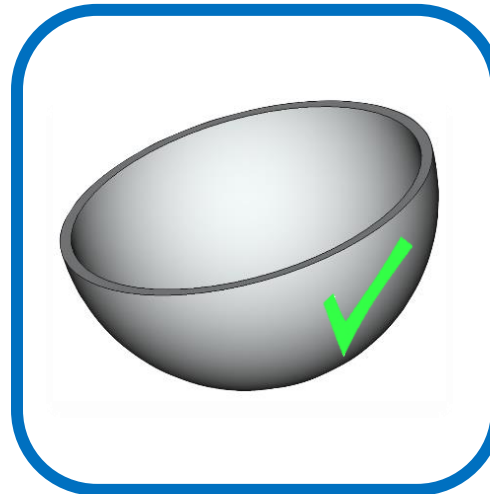
- **2.5D & 3D parts**

- Structural parts
- consoles
- Print2Forge



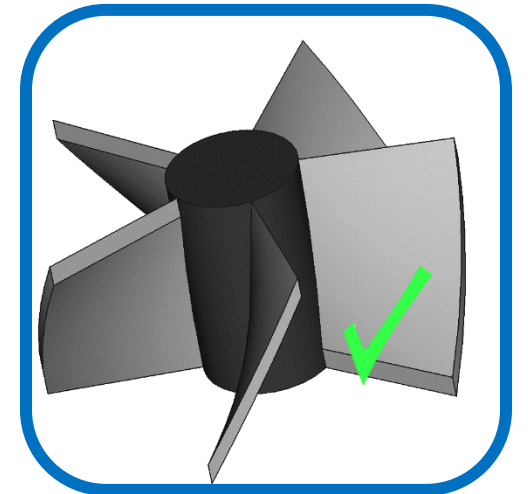
- **Spherical**

- Domes
- Tanks

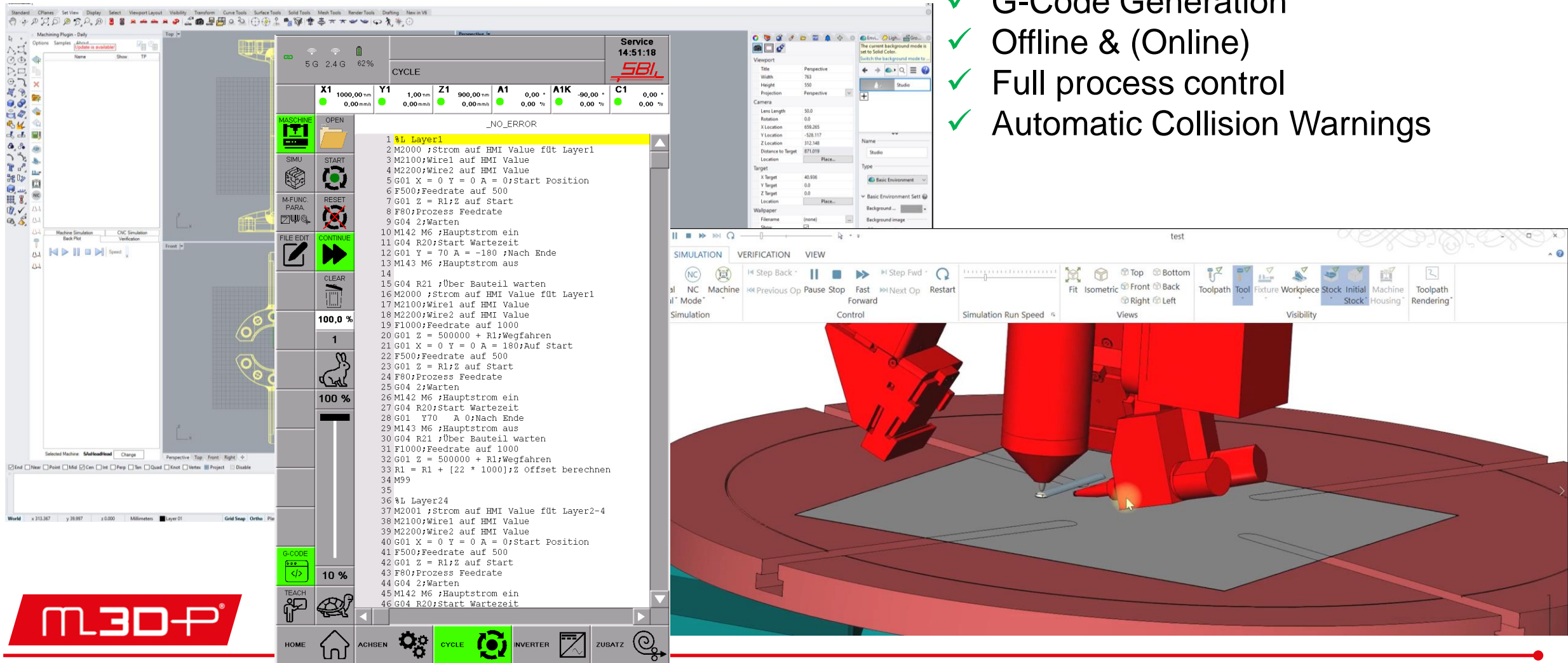


- **Hybrid**

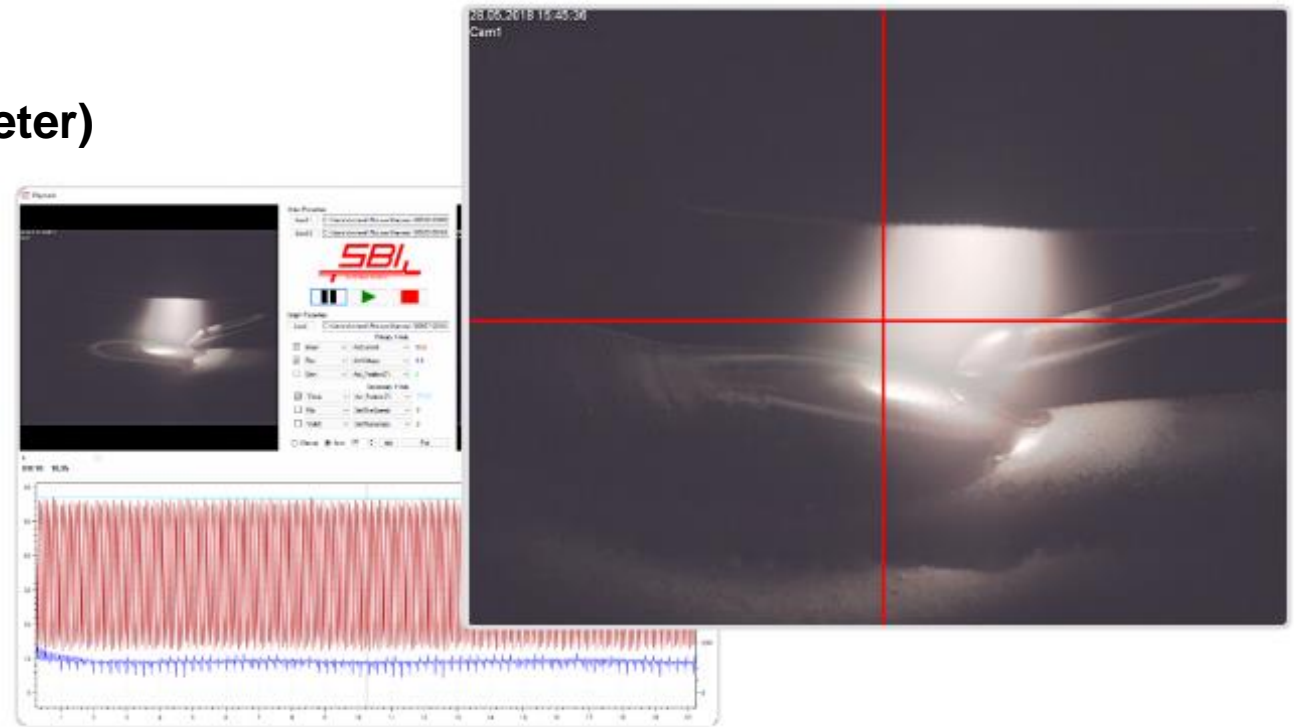
- turbines
- bliscs
- repair
- Forge2Print



- ✓ G-Code Generation
- ✓ Offline & (Online)
- ✓ Full process control
- ✓ Automatic Collision Warnings



- ✓ SBI Camera system
- ✓ SBI Datalogger (for all process parameter)
- ✓ Toolpath compensation
- ✓ Pyrometer implementation



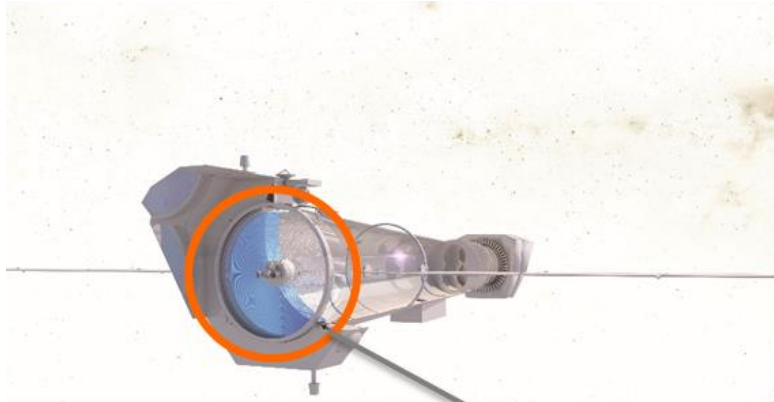
TITANIUM 64 – PMD POWDER & PMD WIRE



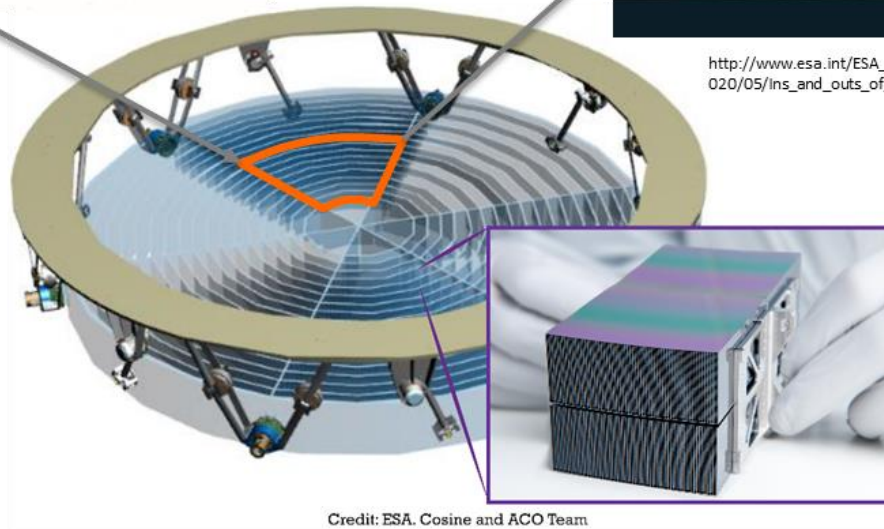
Feasibility study for 3m diameter X-ray Eye structure in Ti64.
Processed with powder and wire options - fully inspected.



STUDY: ATHENA SPACE TELESCOPE PART

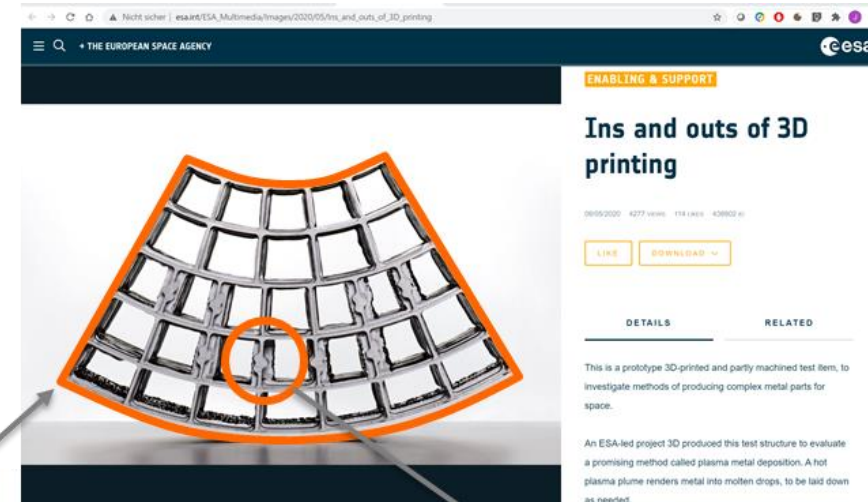


https://www.the-athena-x-ray-observatory.eu/media/rokgallery/f/f853731b-aa06-4967-e9aa-a9c23c19ecab/InsideAthena_XIFU_movie.jpg

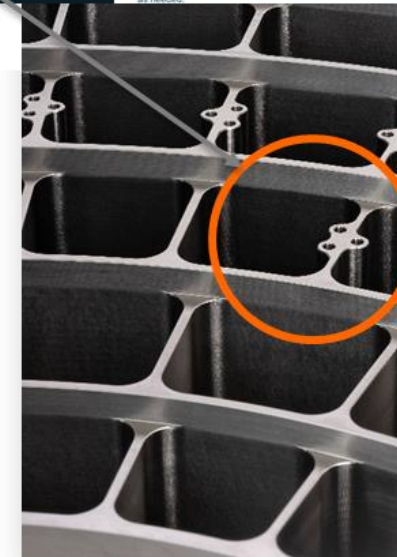


Credit: ESA, Cosine and ACO Team

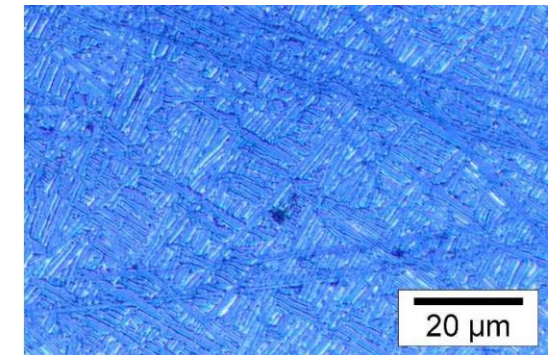
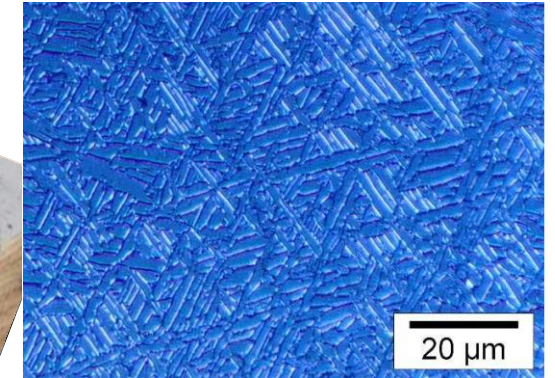
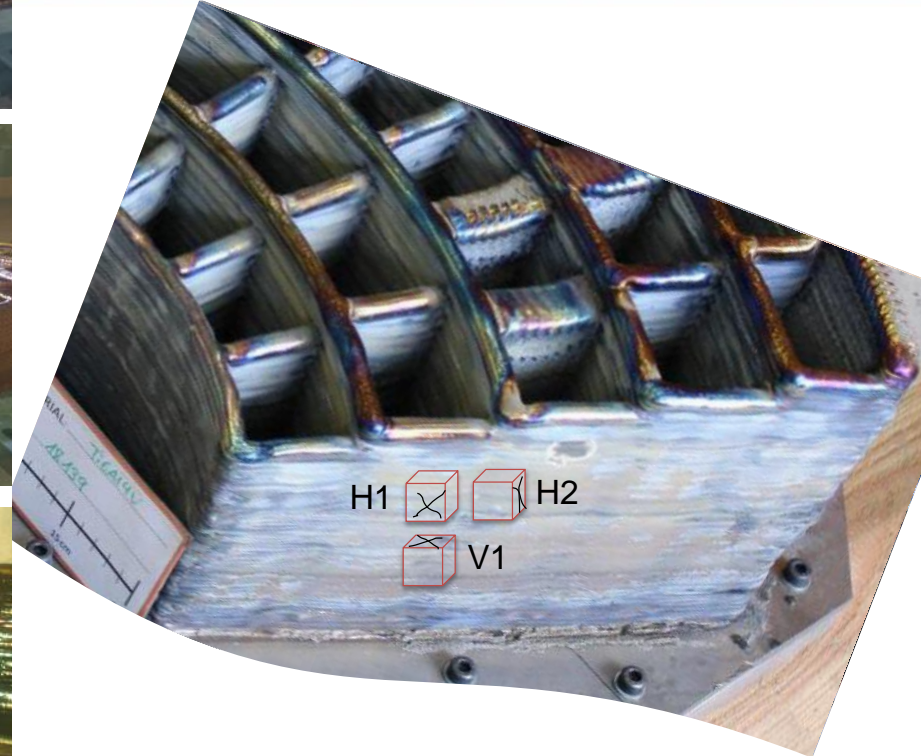
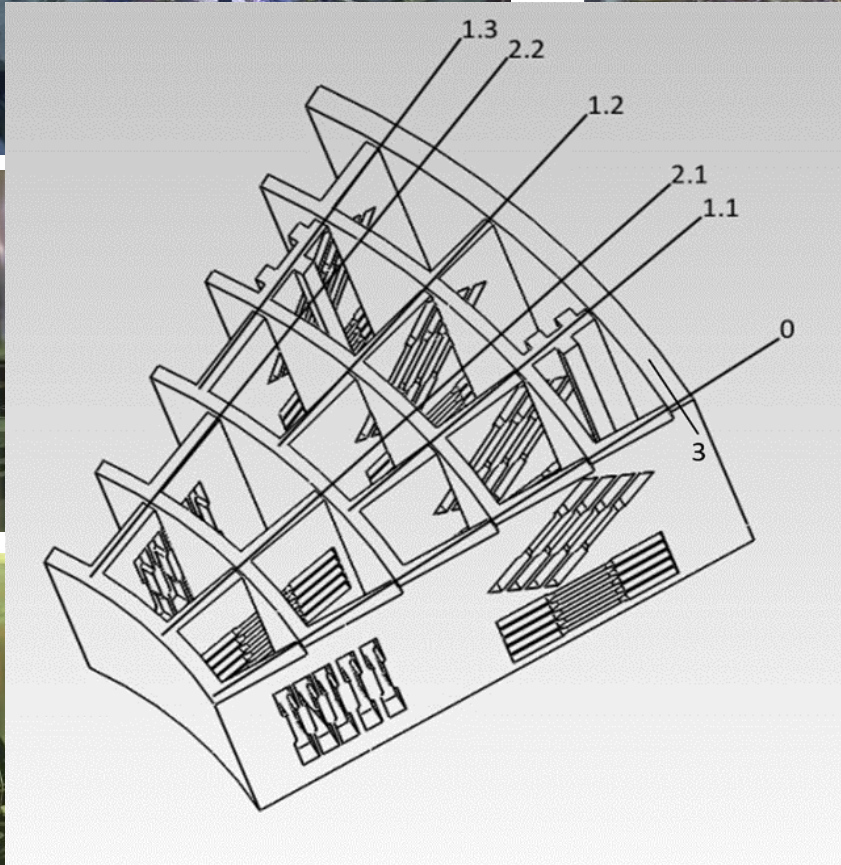
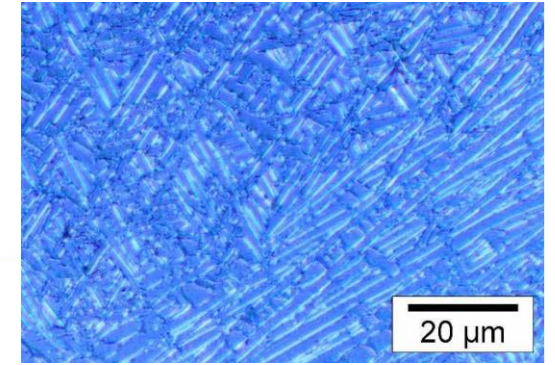
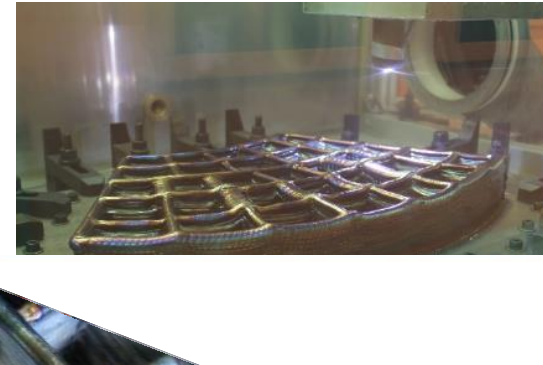
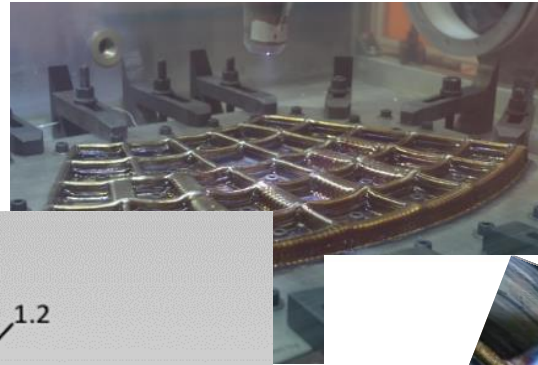
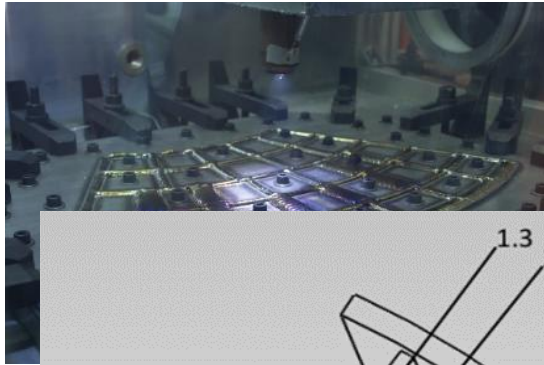
https://www.the-athena-x-ray-observatory.eu/images/Nuggets/AN08_ima.gif



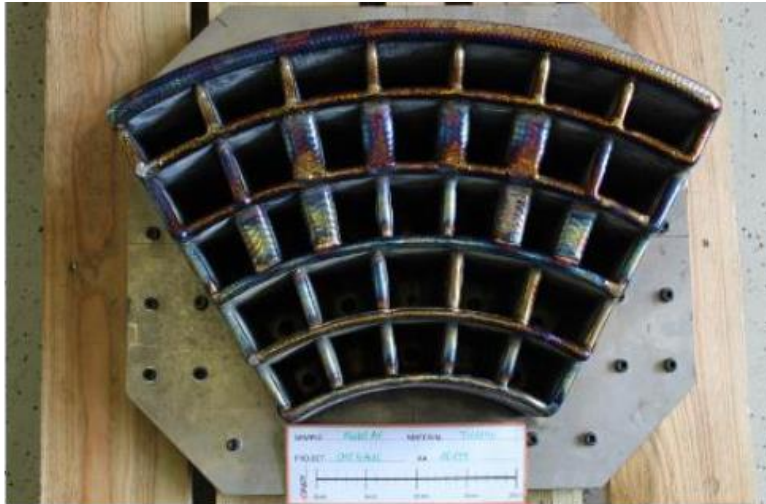
http://www.esa.int/ESA_Multimedia/Images/2020/05/Ins_and_outs_of_3D_printing



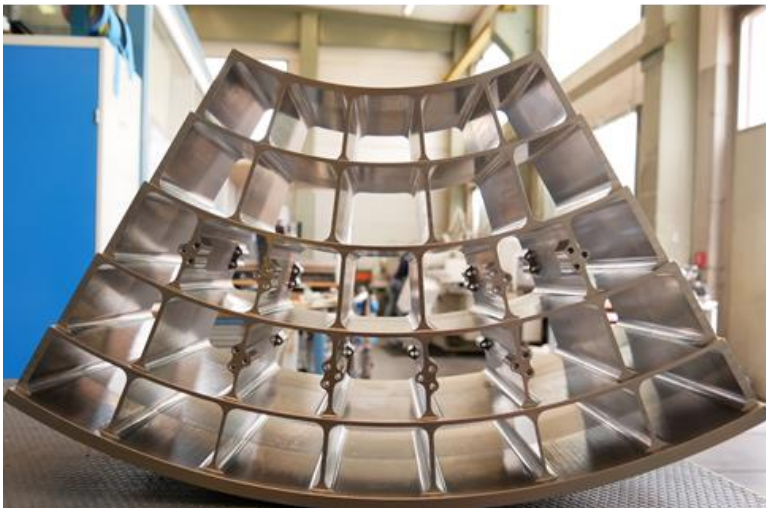
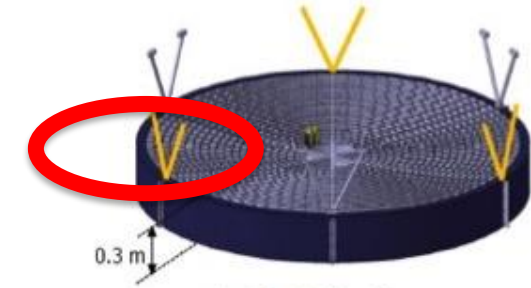
STUDY: ATHENA SPACE TELESCOPE PART



STUDY: ATHENA SPACE TELESCOPE PART



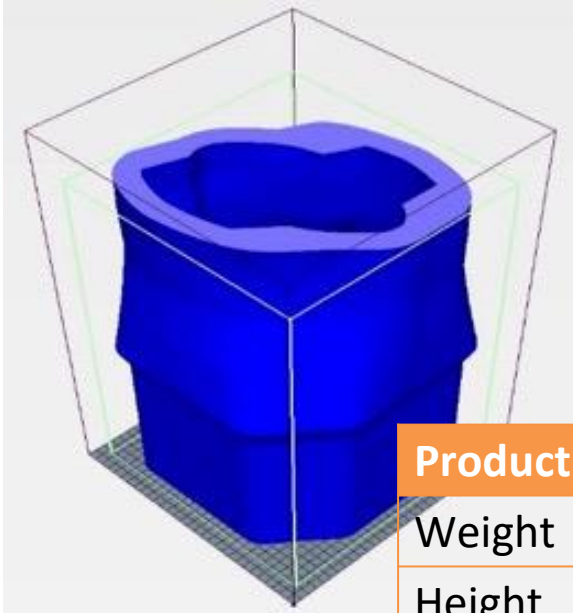
1 Segment	PMD®-ALM	Machining
Raw Material need	290 kg	1.600 kg
Final Part weight	ca. 160 kg	ca. 160 kg
Buy to Fly (BTF)	ca. 1,8: 1	~ 10: 1!
Material Waste	130 kg	1.440 kg !



Demonstrator	PMD®-ALM	Machining
Raw Material need	45 kg	205 kg
Final Part weight	ca. 25 kg	ca. 25 kg
Buy to Fly (BTF)	ca. 1,8:1	~ 8,4: 1!
Material Waste	ca. 20 kg	180 kg !

6 Segments -> 8,6 tons of waste vs. 800kg of waste





Production data

Weight	67 kg
Height	Ca. 450 mm

Invar is not easy to mill, so AM near net shape geometries are of high interest. Second, the thermomechanical properties of INVAR need to survive the AM processing. This was confirmed by the study.



Foto: Alpex, "Addi@tive Tooling"





Material properties

Standard	Material	Origin	Mechanical properties		
			UTS MPa	YS MPa	A %
ASTM A693	17-4PH	Sheet	1103	793	5
DIN 10088-3	1.4542	Billet	1070- 1270	1000	10
RHP	1.4542	PMD + PH	1075- 1140	995-1095	10-11

courtesy RHP



SBI GmbH
Gewerbering 15
3710 Ziersdorf, Austria

www.sbi.at

WE DO IT PLASMA!