GF Machining Solutions

# MACHINE TOOL PLATFORM MILL P 800U DED

Jonathan Créquy – 18.09.2019

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# BASE MACHINE: MILL P 800 U




| Main specifications | |
|---|---|
| Travel X, Y, Z | 800 x 800 x 550 mm |
| Swiveling axis tilting axis | +91/-121 / n x 360 ° |
| Working Spindle (40% ED, S6) | 20000 (HSK-A63) / 36 / 120 rpm / kW / Nm |
| Rapid traverse X, Y, Z | 45 m / min |
| Rapid traverse (swiveling, rotating) | 25 / 35 rpm |
| Clamping surface / Max. load | Ø 550, 631 mm / kg |
| Tool magazine | 30 / 60 / 120 / 170 / 215 / 245 piece |
| Automation pallet size number mm piece | 400x400/ 12 // 500x500/ 9 // 500x630/ 7 |
| Control unit - Heidenhain / Siemens | TNC 640 (all) / 840D sl (ST/D) |

Biggest GF 5X machining centre – most flexible system for the market

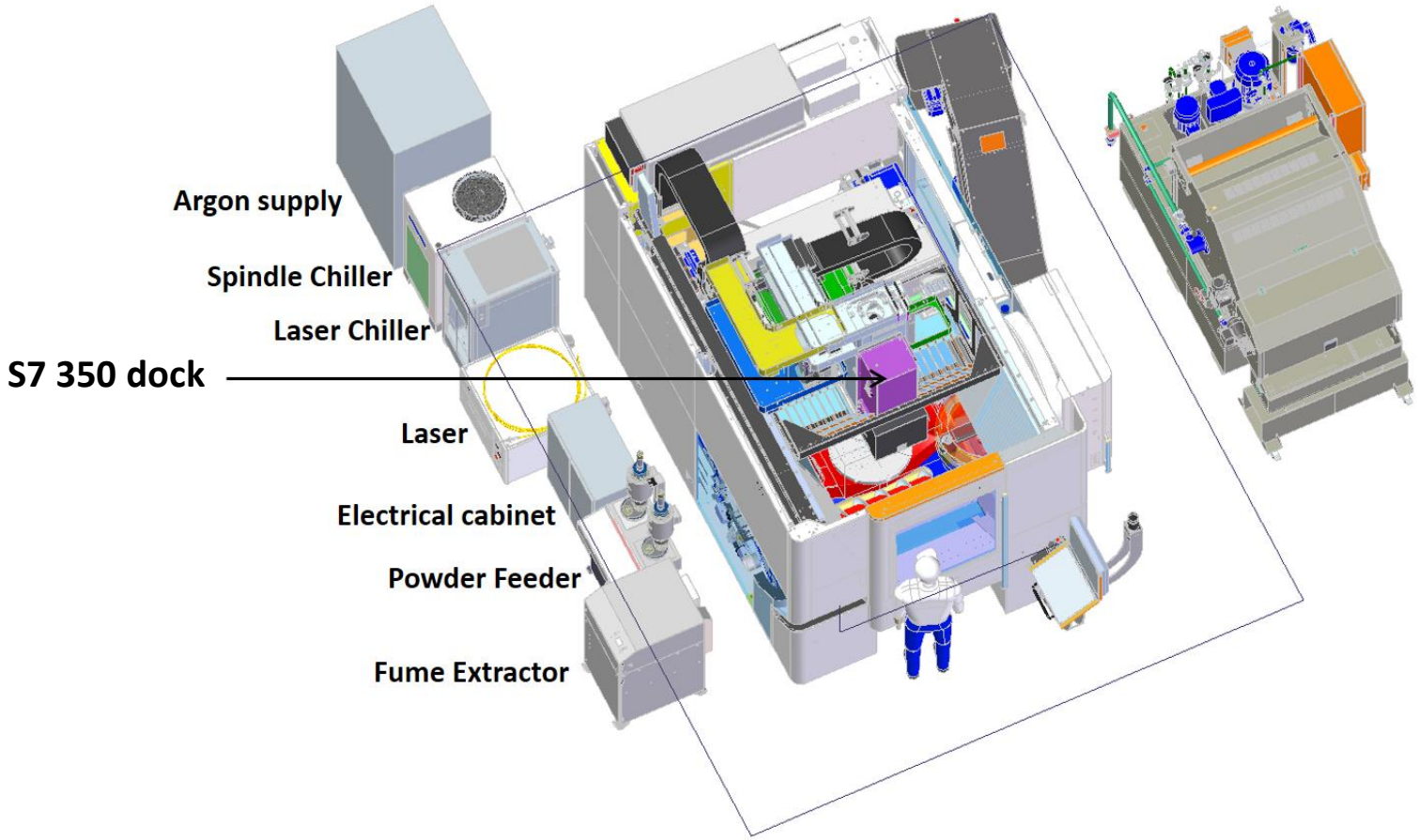
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# INTEGRATION CONCEPT



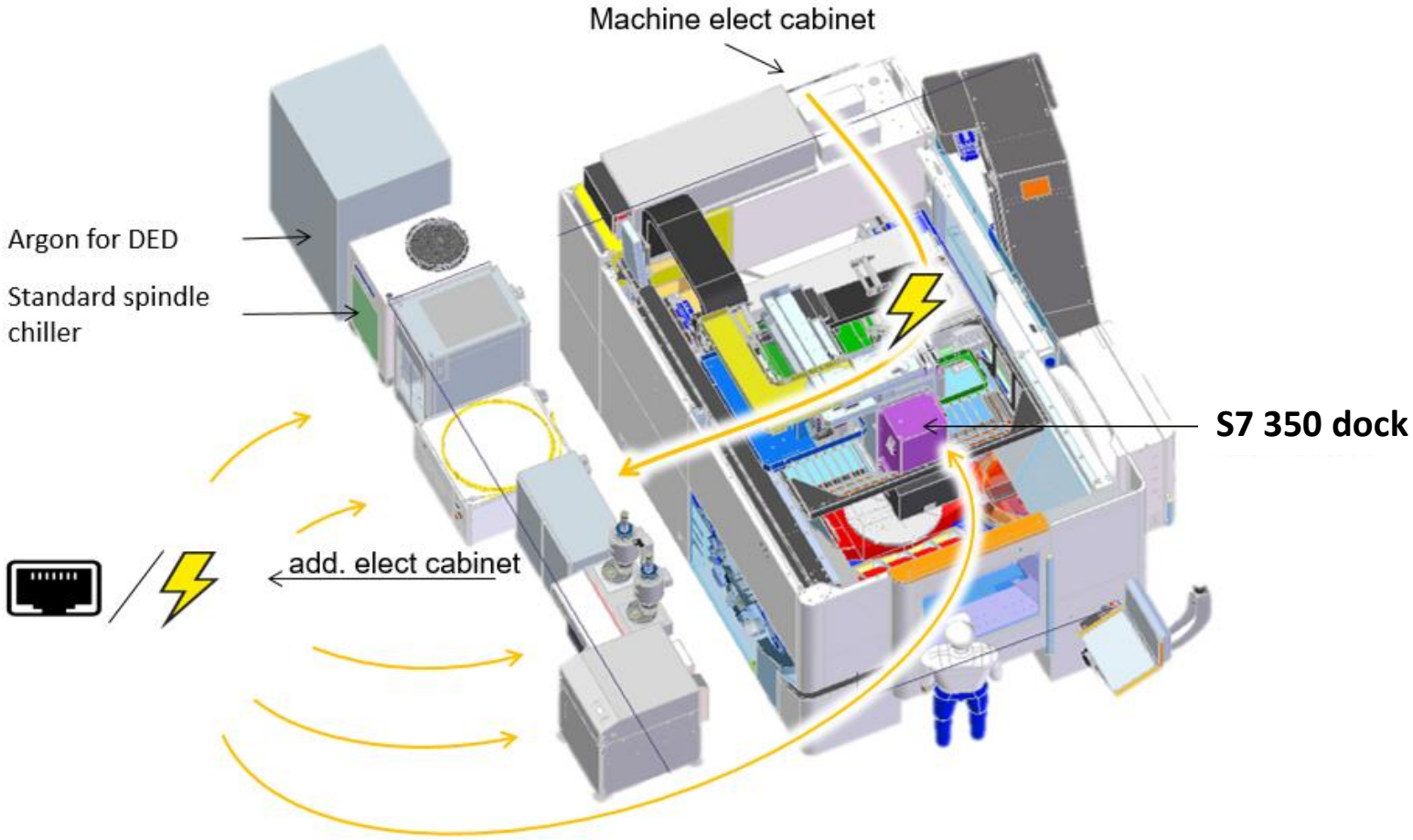
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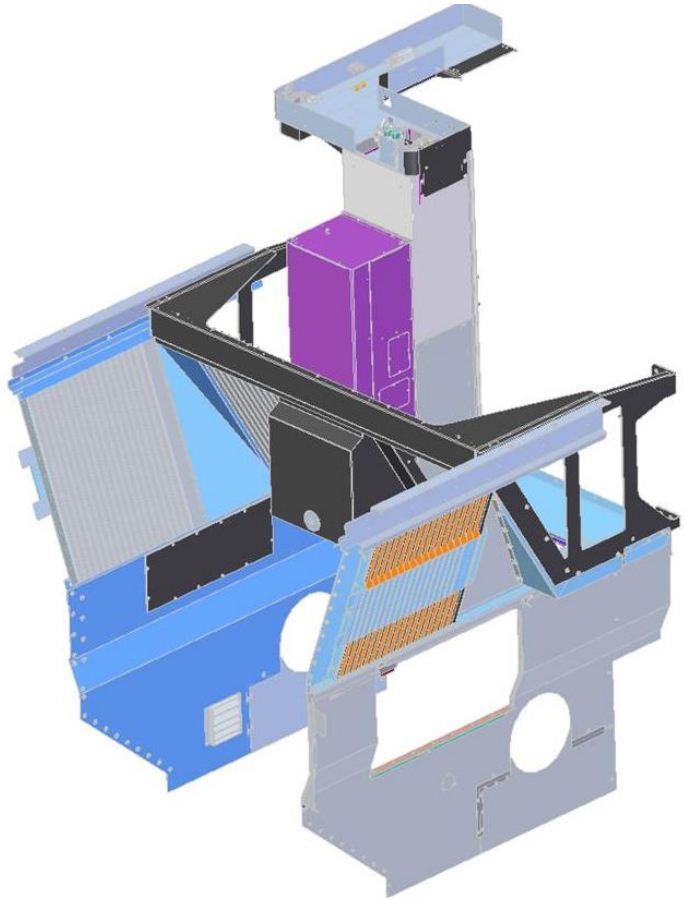

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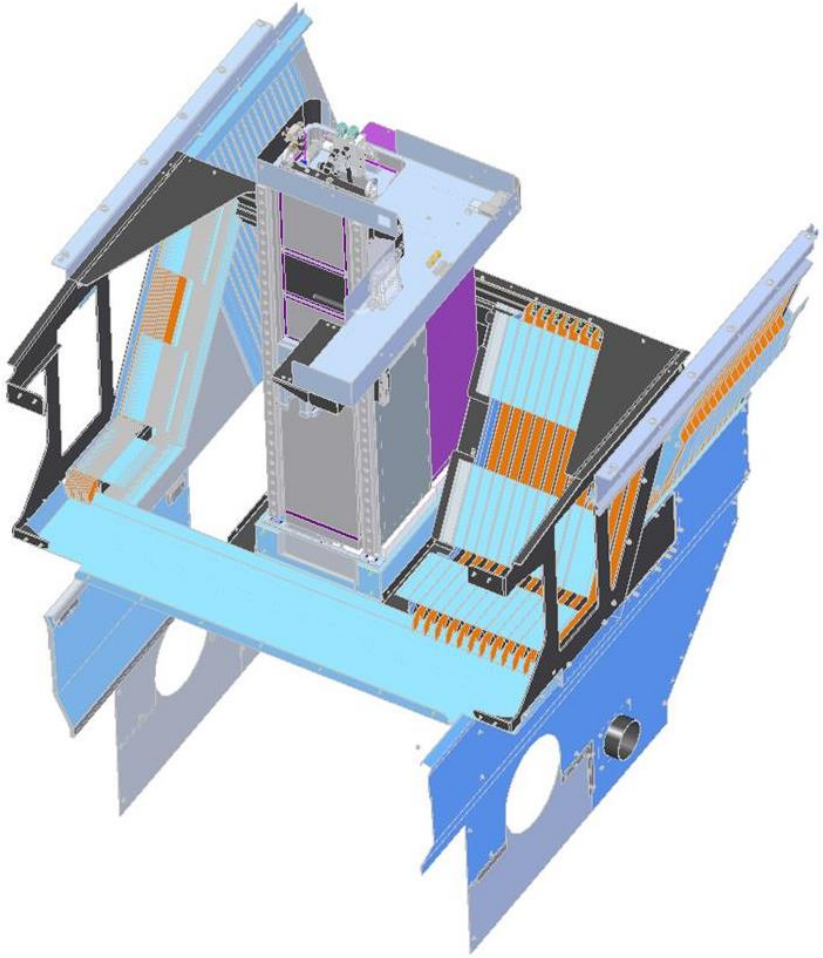
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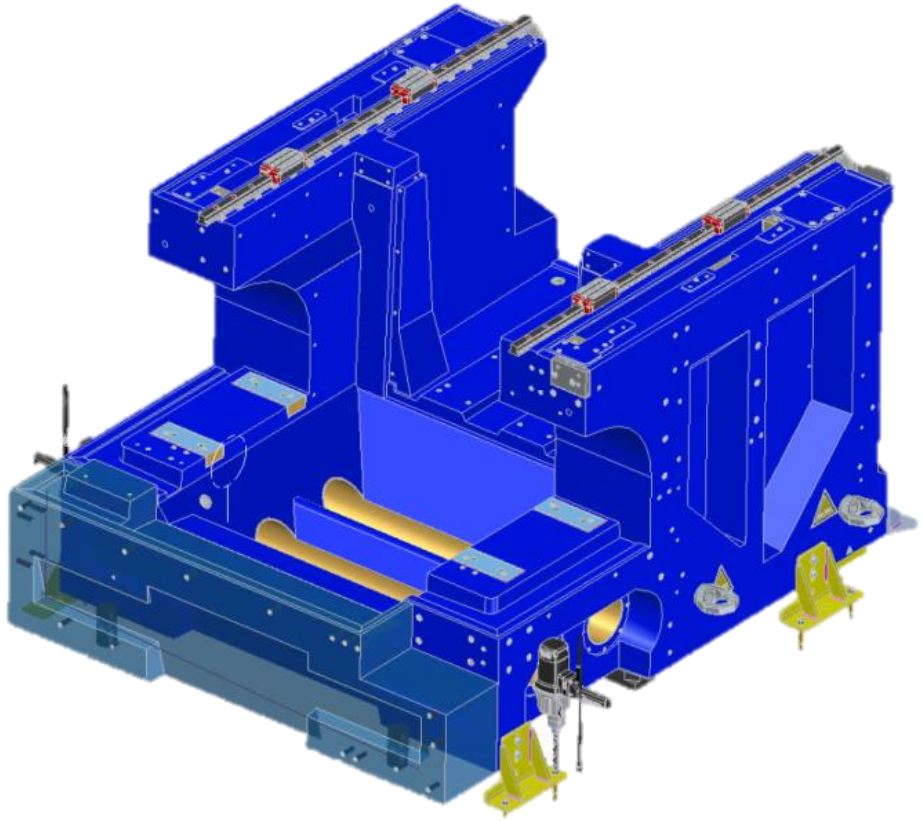
# REDESIGN COMPLETE COVERING OF THE Z-AXIS

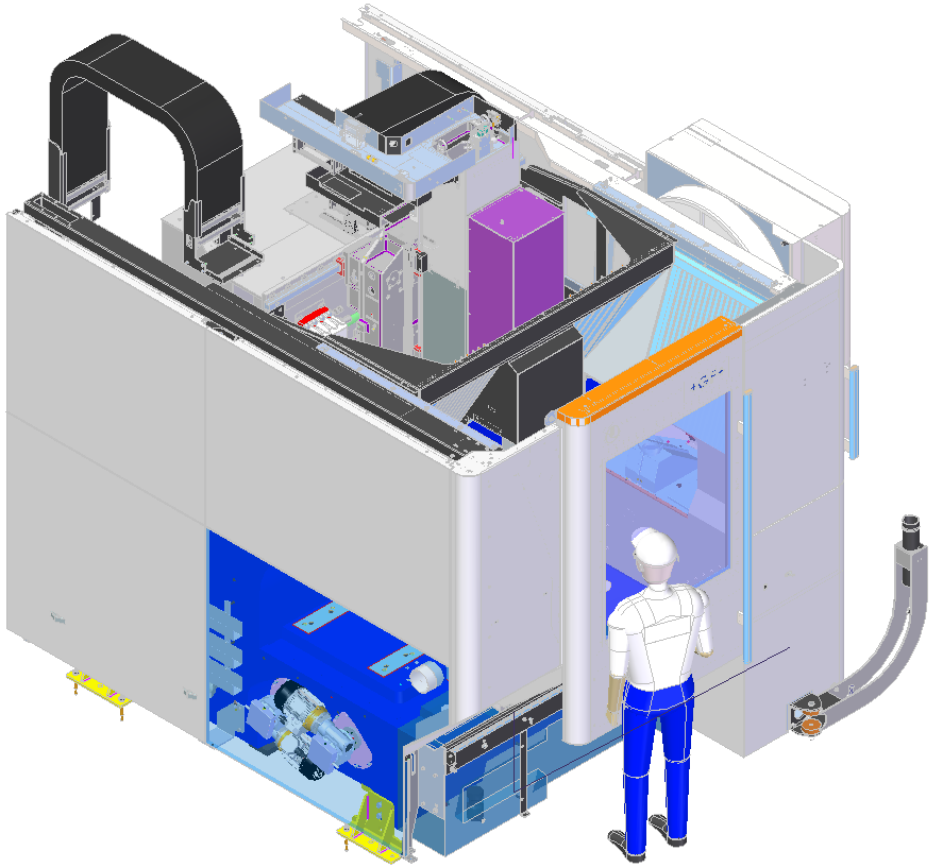




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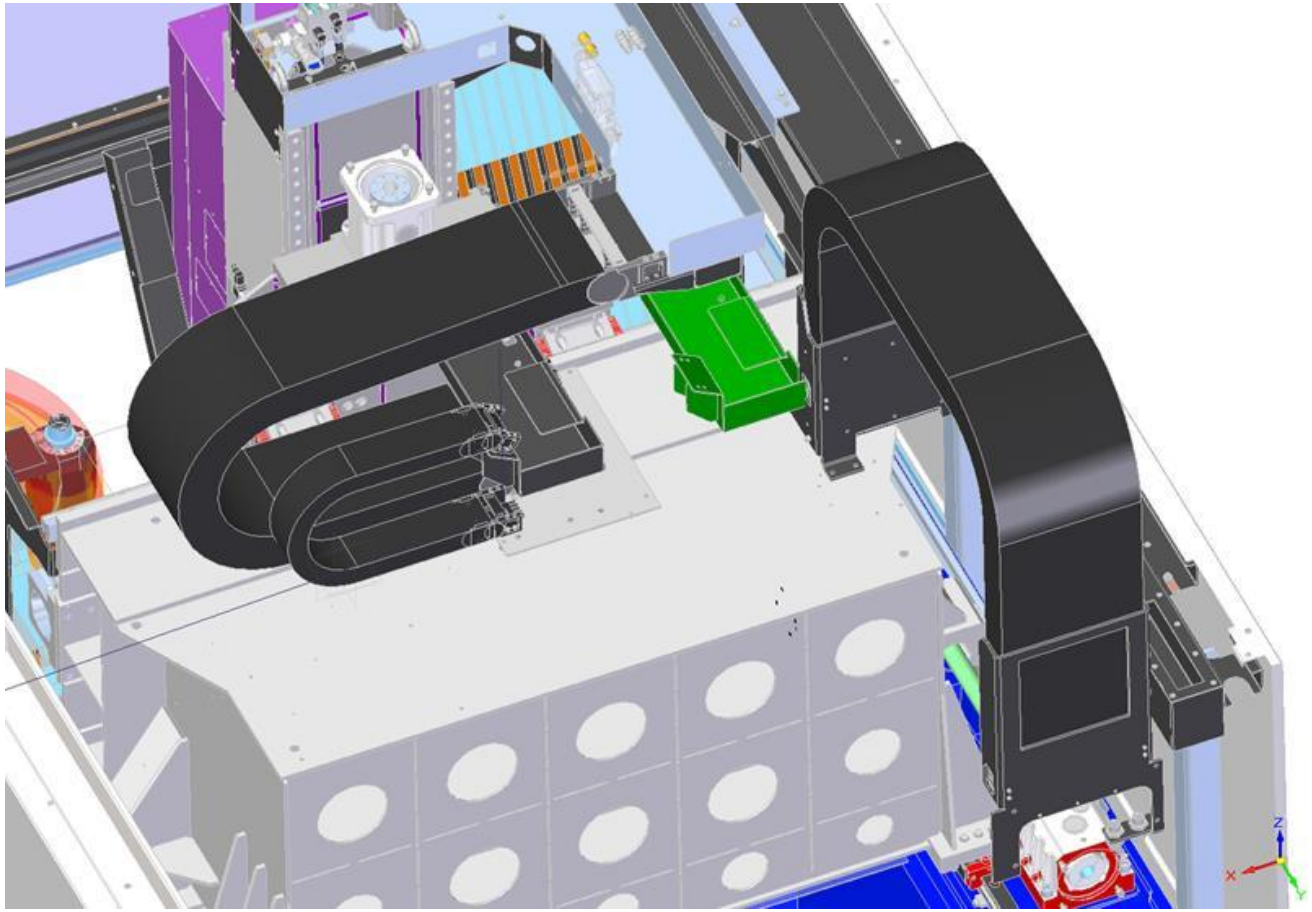
# MACHINE EXTENSIONS





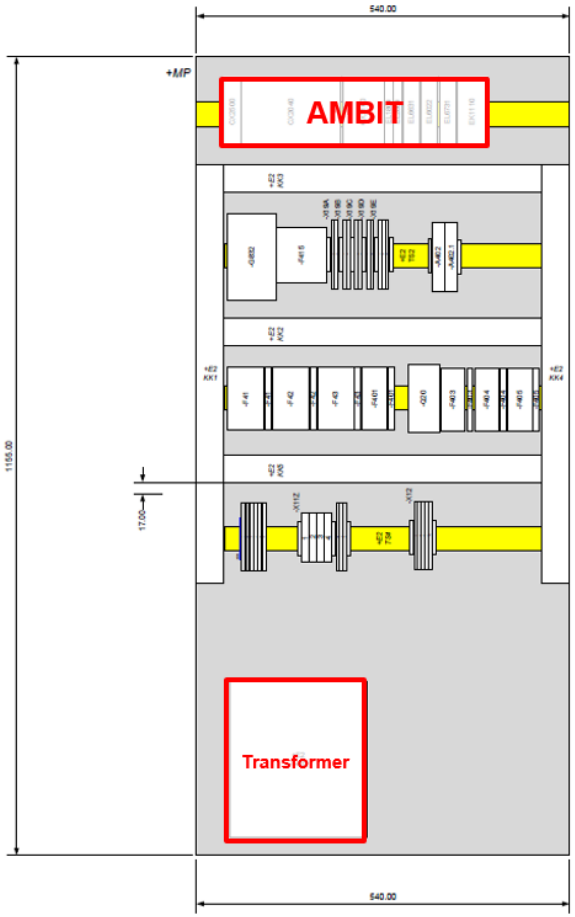
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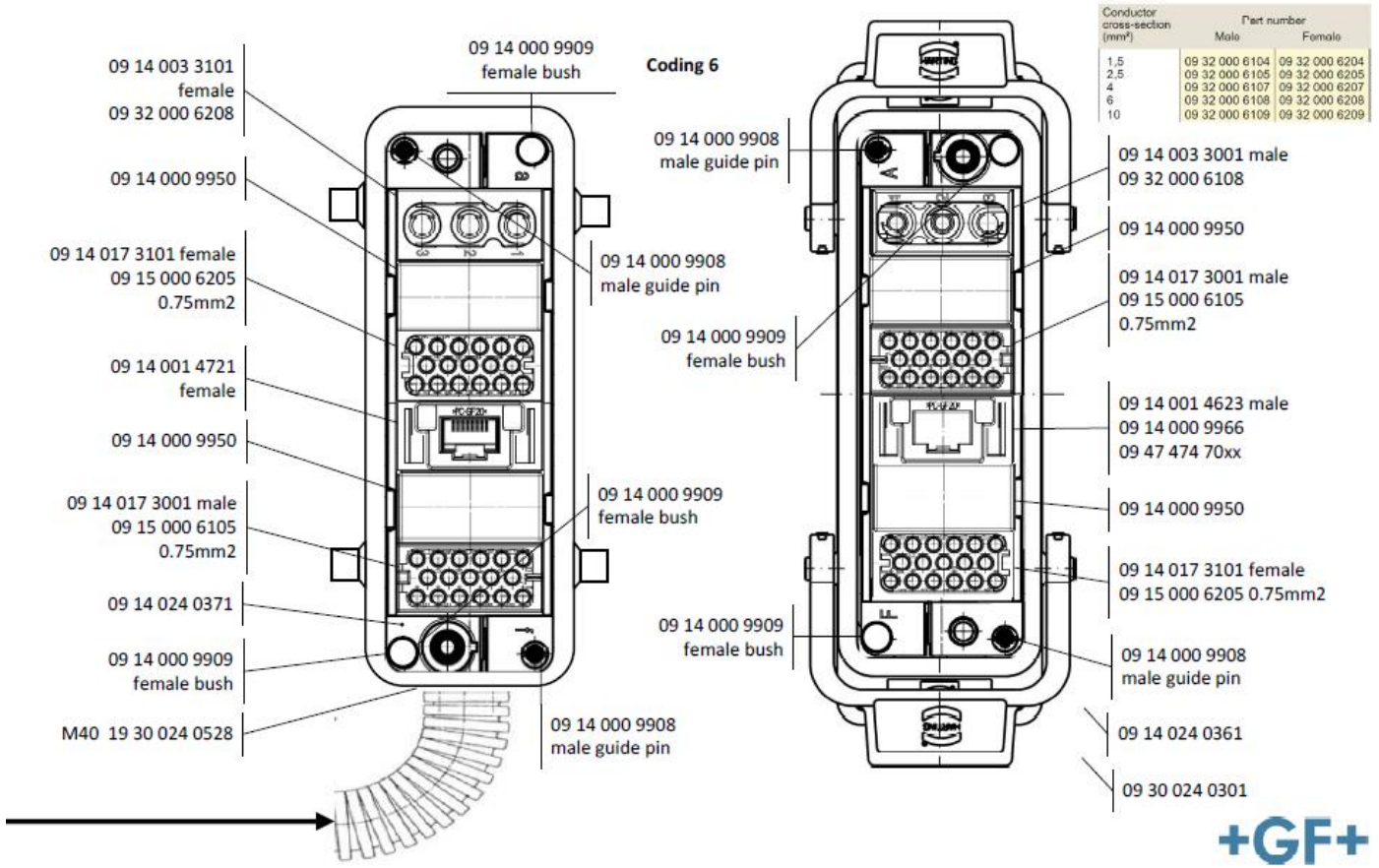
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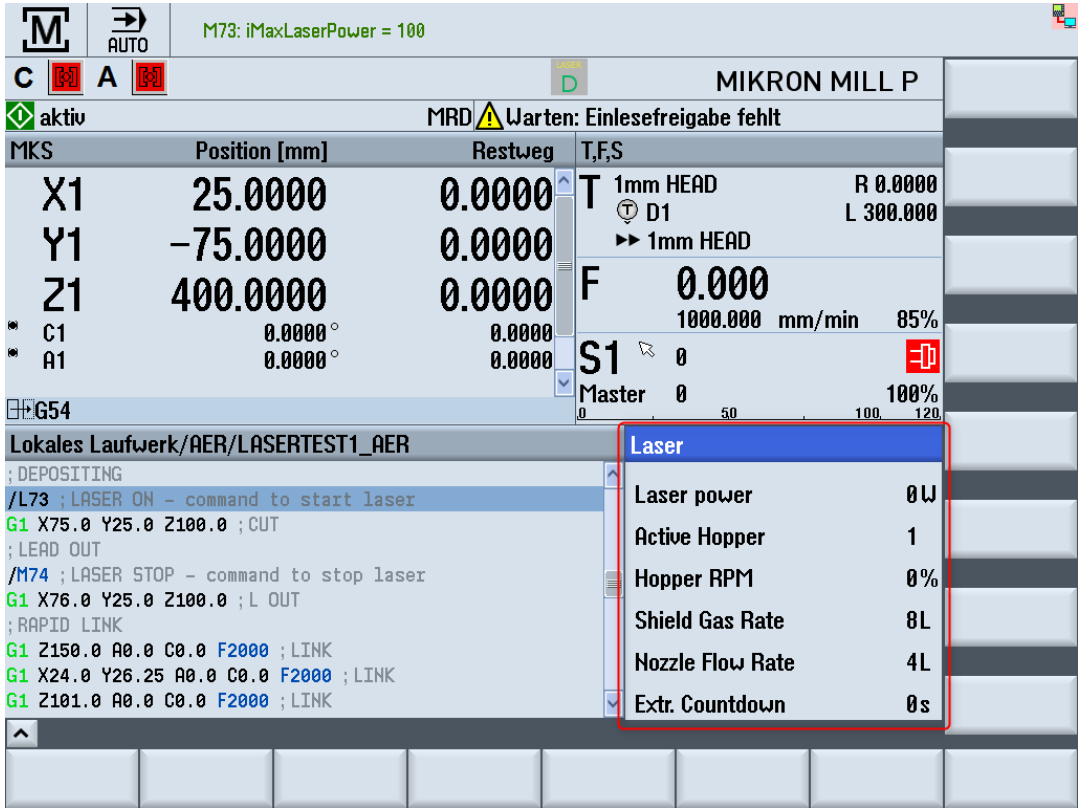
# ADDITIONAL ELECTRICAL CABINET

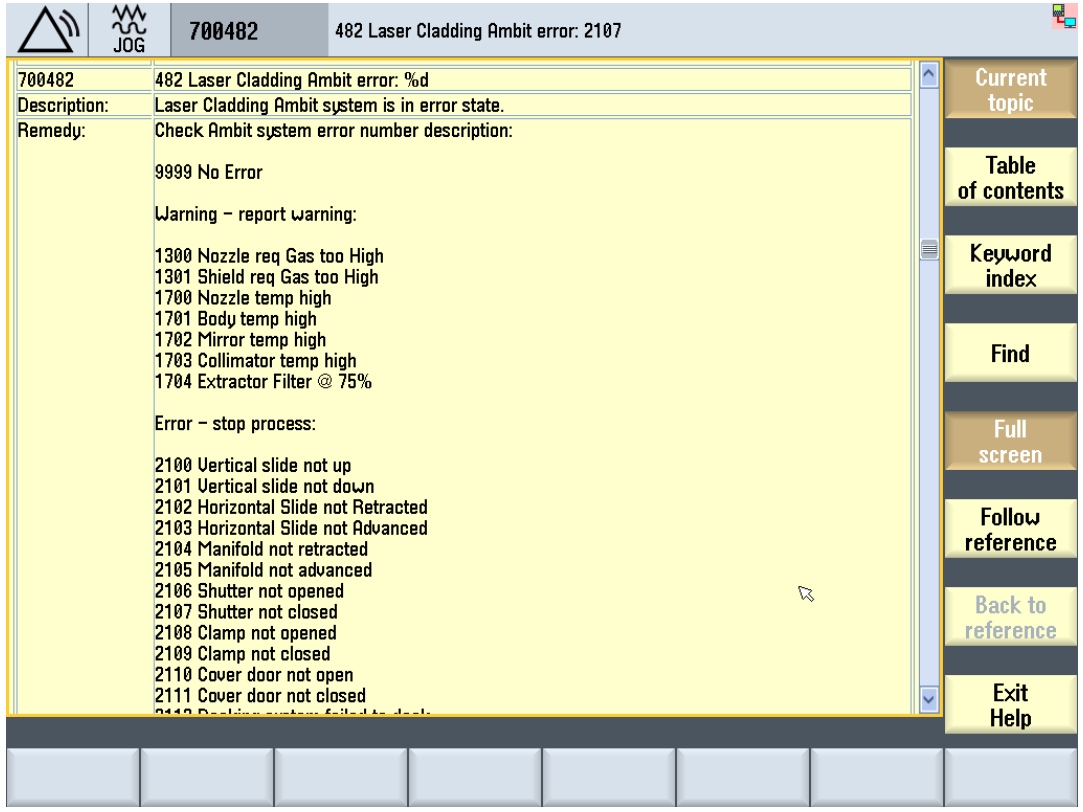



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# SOFTWARE INTEGRATION



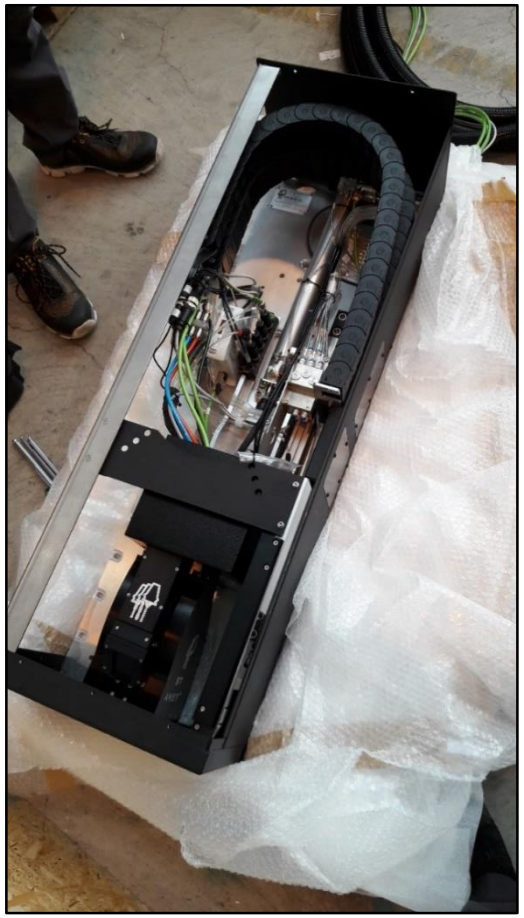




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# MACHINE ASSEMBLY

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# PRE-ASSEMBLY






S8 Docking assembly on the Y-/Z-axis

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# MECHANICAL ASSEMBLY



Assembly on the machine base of:

- S8 Docking + Y-/Z-axis on the machine base
- X-axis
- Rotary table – B-/C-axis
- Energy chains
- Structural elements

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# MECHANICAL ASSEMBLY




Assembly of:

- Metal covers
- NC controller
- Structural elements

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# FIRST START / FIRST TESTS




Assembly of:

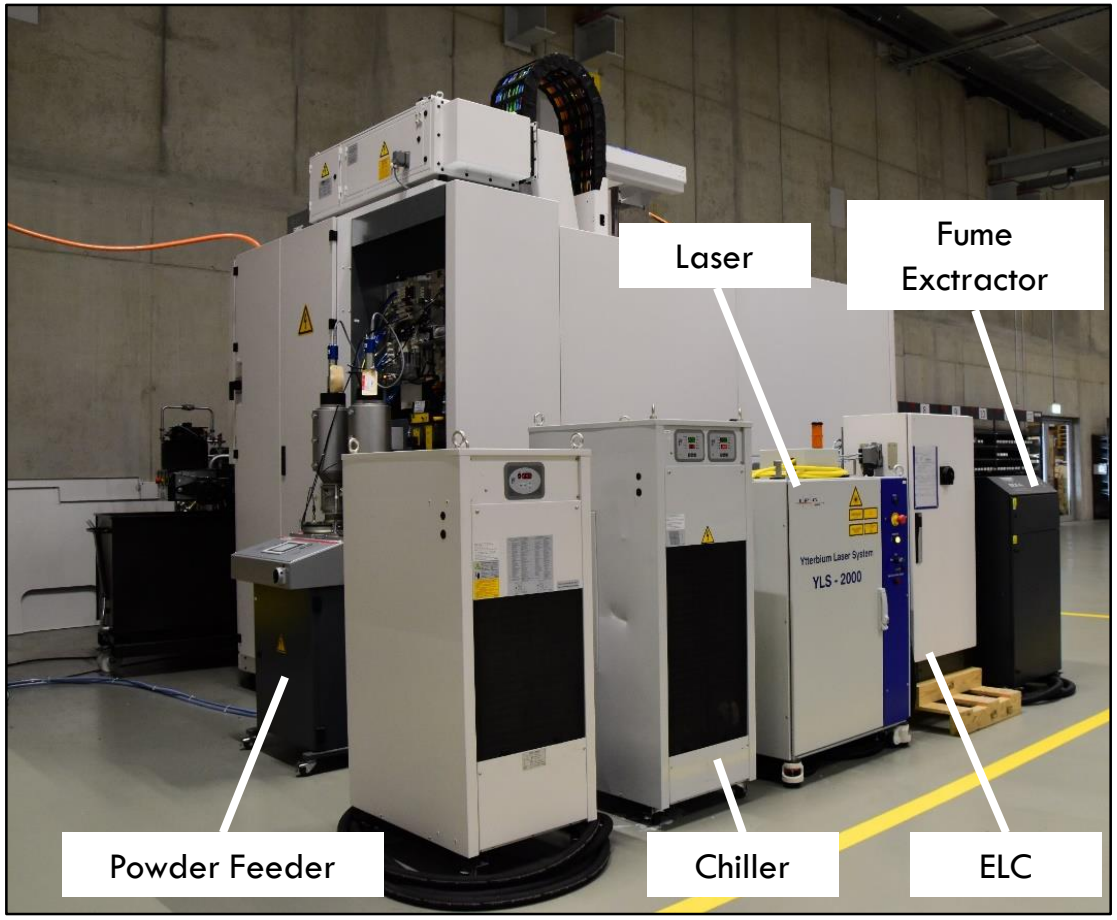
- Front door with laser safety glass
- Machine cabinet enclosure
- Metal covers

First start of the machine:

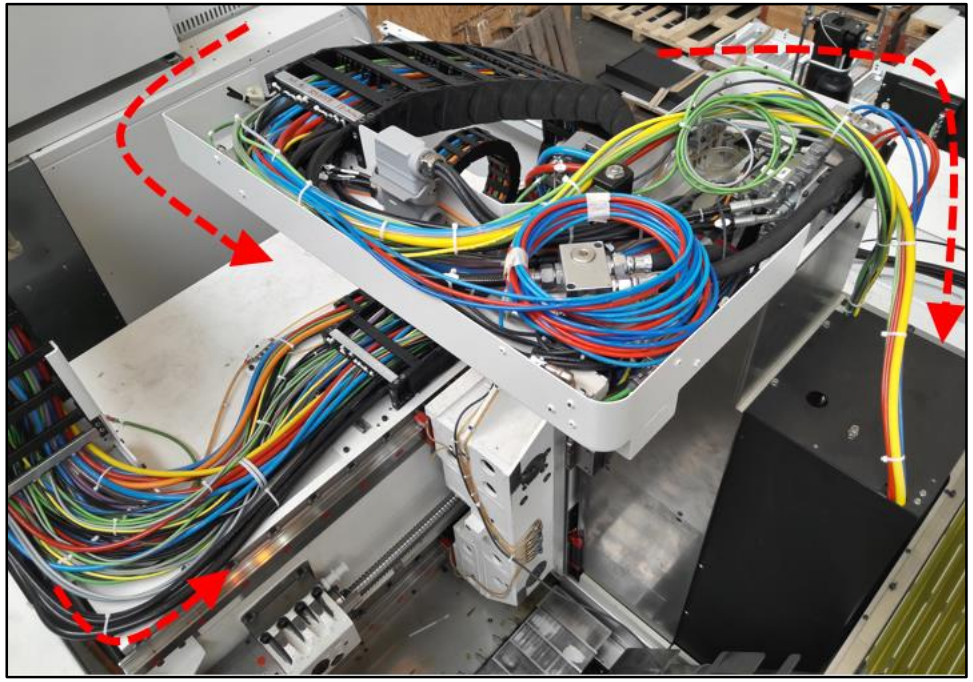
- NC command tests / signals
- Machine leveling /calibration
- Axis run

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# DED PERIPHERIES




Connexion of the DED peripheries



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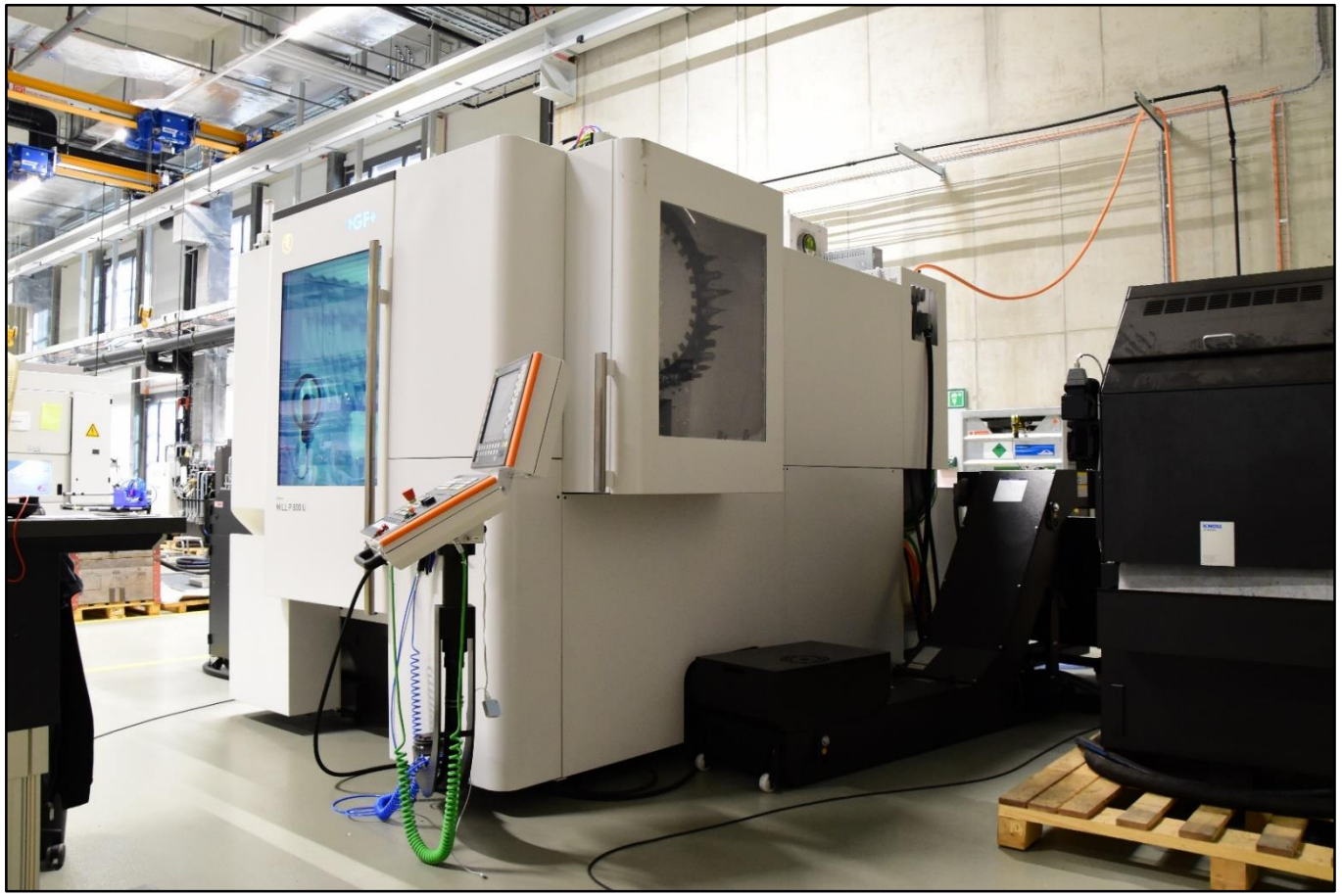

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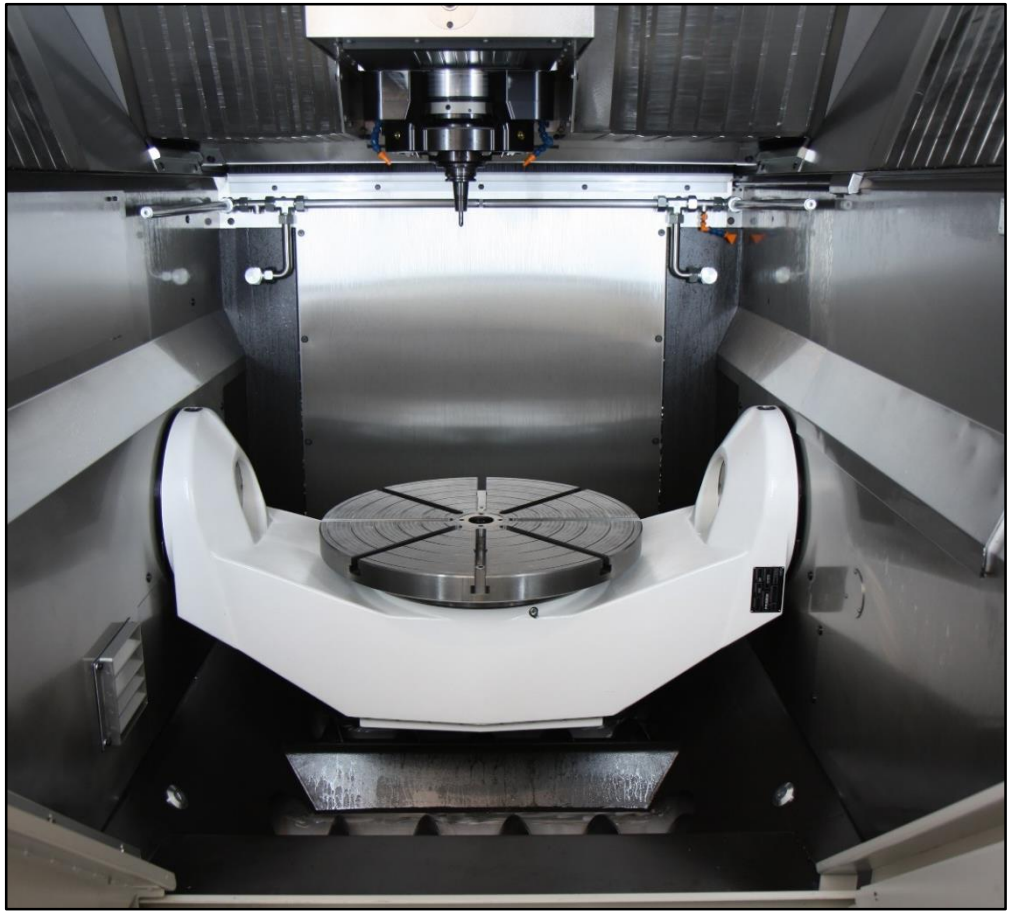




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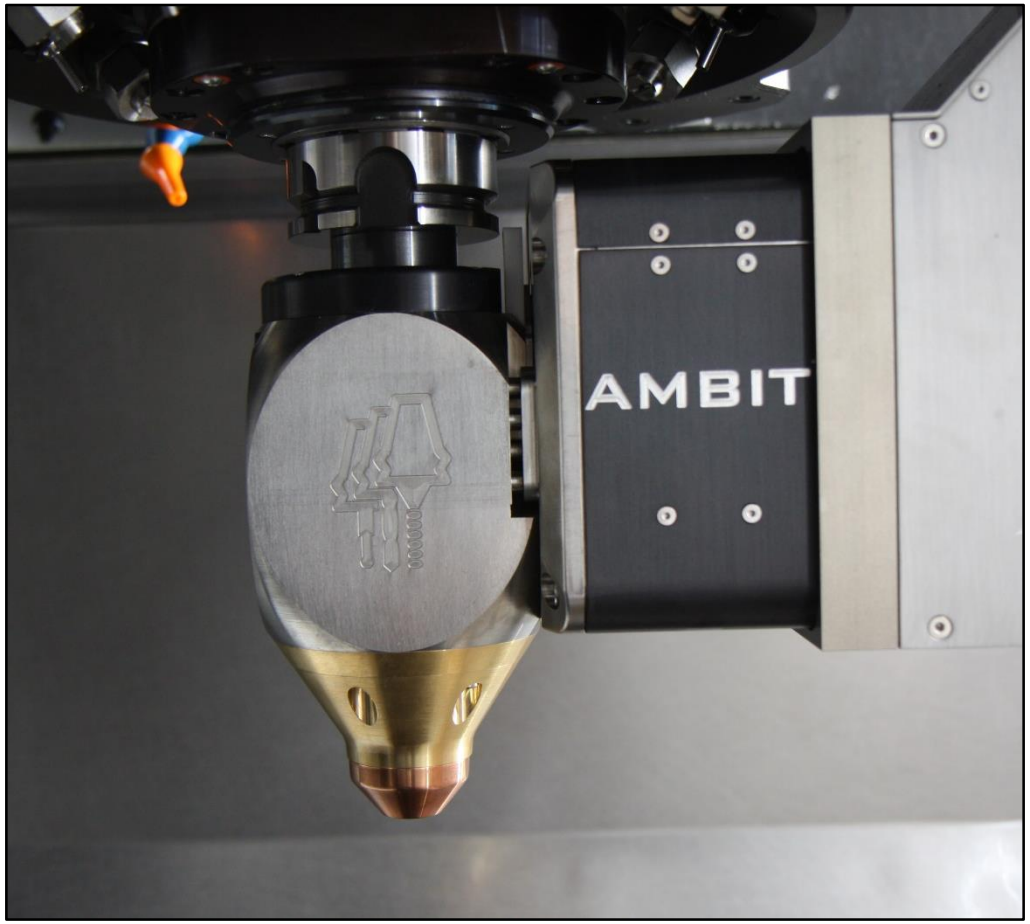
# MILL P 800 U DED




| | **Fine rate head** |
|---|---|
| Laser type | IPG 2kW CW |
| Power range [W] | < 500 |
| Spot size [mm] | 1 |
| Nominal work distance [mm] | 5 |
| Powder type | Non-reactive metal powder |
| Deposition rate [g/min] | 5 - 15 |
| Powder size [µm] | 45 – 106 ± 10 |

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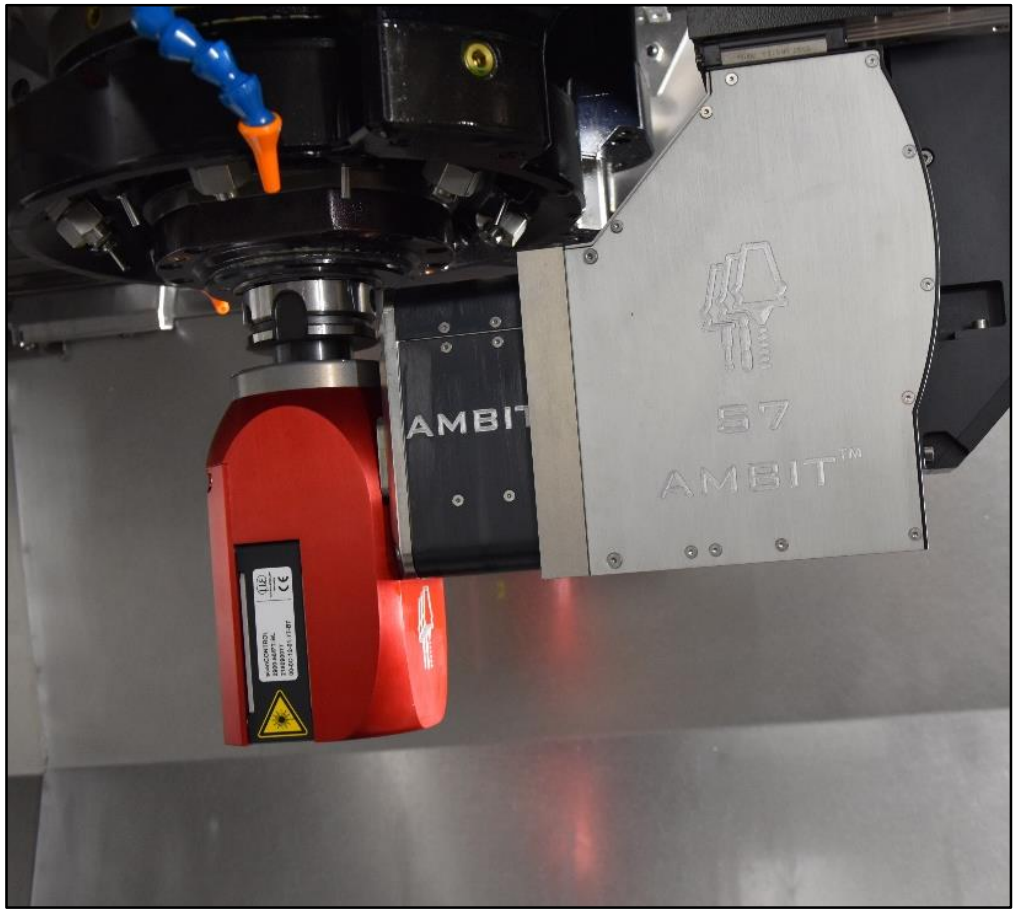
# MILL P 800 U DED




| | **High rate head** |
|---|---|
| Laser type | IPG 2kW CW |
| Power range [W] | Up to 1.5kW |
| Spot size [mm] | 3 |
| Nominal work distance [mm] | 10 |
| Powder type | Non-reactive metal powder |
| Deposition rate [g/min] | 10 - 50 |
| Powder size [µm] | 45 – 106 ± 10 |

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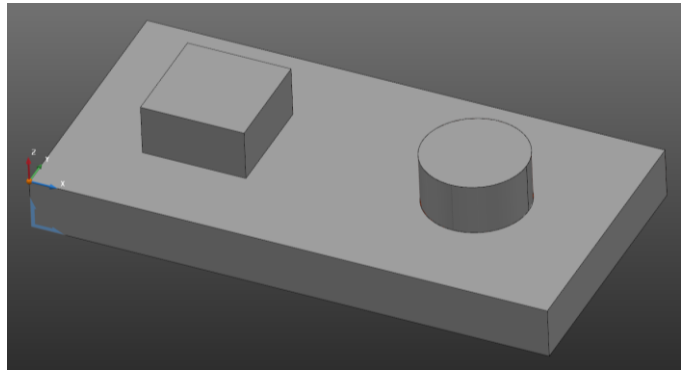


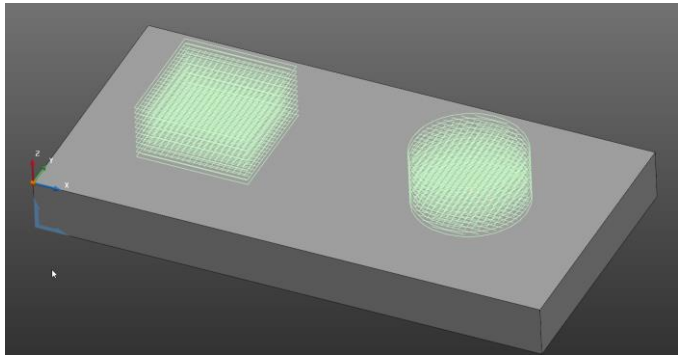

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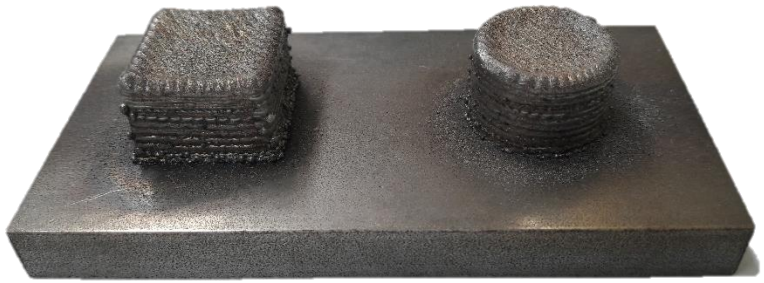
# DED PROCESS TESTS

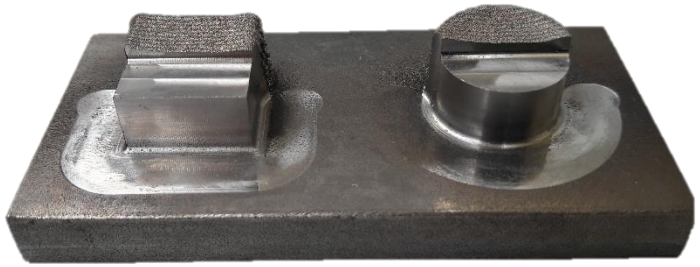
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# MILL P 800 U DED











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# RISK ANALYSIS & TESTS

| Anlagekomponente / Gefährdung Nr. | Sonderbetriebsarten: A Montage Werk | B Inbetriebnahme Werk | C Kundenschulung | D Transportbereitschaft im Werk | E Transport | F Aufbau | G Inbetriebnahme beim Betreiber | H1 Manueller Einrichtbetrieb 2 | H2 Manueller Einrichtbetrieb 3 | H3 Manueller Einrichtbetrieb 4 | I Rüsten im Stillstand | K Rüsten im Normalbetrieb | L Reinigen | M Störungssuche | N Wartung, Unterhalt | O Demontage | P Entsorgung | Gefahrenquelle | Betroffene Personen gemäss Betriebsarten + Drittpersonen | Auslösender Faktor | Ereignis (Worst Case) (Ohne Schutzmassnahmen) | Schaden-umfang: 1 leicht, 4 mittel, 10 schwer | Eintritts-wahrscheinlichkeit: 1 selten <10%, 2 oftens 10-90, 3 häufig >80% | Risikobewertung (<=3: 4-8; 9-20; >20) | Kategorie / PLr / (SIL) | Schaden-umfang: gering, mittel, hoch | SI-Kategorie EN 954-1 | Schutzziel: Es muss verhindert werden, dass.... | Schutzmassnahmen | Bei HPM 600/800U realisiert ? (J/N) | Restrisiken | Betriebsanleitung / Wartungsplan | Bemekungen |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cladding in sich betrachtet** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | x | x | x | | | | x | x | x | x | ? | x | | x | | | | Reflected/deviated laser light (>class 1) outside of the machine casing. | | Tool head plugged and docked with the laser turned on while the machine door is opened. | The person will have his skin and/or his eyes exposed to the laser light above class 1 (heat and wavelength) and will thus irreversibly be harmed. | | | x | x | 20 | 3/d | | | The laser cannot run while the door is opened for all the machine modes | Safety door interlook - the laser is switched-off when the door is opened for all the machine modes??? According to SN_EN_ISO 11553-1_2010-12 | | The openable roof does not have an additional safety circuit | | -Mandatory to control the laser exits<br>-Mandatory to check if the laser is stopped with every modes |
| | x | x | x | | | | x | x | x | x | ? | x | | x | | | | Reflected/deviated laser light (>class 1) outside of the machine casing. | | Tool head plugged and docked with the laser turned on. The reflected/deviated light will melt the machine enclosure. | The person will have his skin and/or his eyes exposed to the laser light above class 1 (heat and wavelength) and will thus irreversibly be harmed. | | | x | x? | 1 | | | | The laser cannot melt the machine enclosure. | None if the laser energy is not strong enough to melt the enclosure. | | The combination of highly reflective surfaces exposure and low axis feed rate may still cause the damaging of the enclosure and/or the safety window (remove once the tests done) | | -Critic laser conditions will be calculated according to SN_EN_60825-4_A_A2 and tested according to IEC_60825-1. |
| | x | x | x | | | | x | x | x | x | ? | x | | x | | | | Reflected/deviated laser light (>class 1) outside of the machine casing. | | Tool head plugged and docked with the laser turned on. The reflected/deviated light finds a path to the outside of the machine. | The person will have his skin and/or his eyes exposed to the laser light above class 1 (heat and wavelength) and will thus irreversibly be harmed. | | | x | | 10 | | | | The laser energy is not strong enough to harm the person. | None if the exiting light is above the AEL according to IEC_60825-1. If not, additional covers or stickers at the critical openings (TBC) | | | | -Critic laser conditions will be calculated according to SN_EN_60825-4_A_A2 and tested according to IEC_60825-1. |
| | x | x | x | | | | x | x | x | x | | | | x | x | | | Non-controlled flying metal powder | | Leakage on the powder hoses between the powder distribution system and the process area; flow of powder in the machine with the door opened. | The person will have his skin and/or his eyes in contact with the powder; the person will inhale powder. The person will thus be harmed. | x | | x | | 1 | | | | The person will not have his skin and/or his eyes in contact with the powder; the person will not inhale powder. | None | | | | The person should wear PPE (including a face mask with P3 filters) when the machine door is opened. |
| | x | x | x | | | | x | x | x | x | | | | x | x | | | Non-controlled flying metal powder | | Leakage on the powder hoses between the powder distribution system and the process area; flow of powder in the machine with the door opened; lack of shielding gas in the process area during the deposition process. | The metal powder will enter into contact with a fire ignition source (laser or other), consequently there will be a powder fire/explosion and the person will be harmed. | x | | x | | 1 | | | | No risk of fire | None | | | | Operator manual recommendation: only non-reactive powder for the process. |
| | x | x | x | | | | x | x | x | x | | | | x | x | | | Non-controlled flying argon | | Leakage on the gas hoses between the argon distribution system and the process area; flow of argon from the deposition nozzle during the deposition process. | The oxygen concentration in the machine and around the machine will decrease; the person will inhale argon and thus will die. | | | x | x | 1 | | | | The person will not inhale argon. | None | | | | - Maximum flow is 22l/min and unless the machine is airtight, it is unlikely there would be a problem. -<br>- Operator manual recommendation: An oxygen depletion monitor should be set in the base of the machine or worn by the person |
| | x | | x | | | | x | x | x | x | ? | x | | x | | | | Hazardous fumes generation | | The laser welding of material generates hazardous fumes around the process area. Hazardous fumes will accumulate in the machine and around the machine. | The person will inhale hazardous fumes during the deposition process; the person will inhale hazardous fumes when the door will be opened after the deposition process. The person will thus get irreversible damages in his body or will die. | | | x | | 20 | 3/d | | | Hazardous fumes will be sucked during and after the process. | A fume extraction close to the machine table will run in parallel of the metal deposition process. The fume extraction will run for a certain time after the end of the process in order to suck potential remaining fumes. The hazardous fumes will go through two particles filters. | | The suction time after the process is too short to suck the fumes. | | - Critic suction conditions will be tested and measured<br>- The operator should always wear a protection mask |

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