MELTIO

Q4 / 2024

Meltio Engine Blue

CNC Installation and Integration Requirements

Applies to Meltio Engine Blue CNC / Q4 2024 / V1



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1. CNC Requirements

Meltio follows an open-platform strategy for both hardware and software. In the context of CNC, this strategy is reflected in the Meltio Engine CNC Integration, which is compatible with any brand provided the following requirements are met:

1.1. CNC Thrust

The current weight of the Meltio Engine Deployment Mechanism is 35 kg. **Meltio recommends a minimum thrust of 100kg** on the relevant axis to ensure the CNC can accurately follow the additive toolpath.While printing, the welding wire is being pushed against the print, which generates a normal force on the CNC axis. Therefore, the CNC must be sufficiently rigid to maintain the correct trajectory.

Meltio technology allows to deposit a layer of a height within 0.4 and 1.2 mm, so that a minimal deviation can compromise part quality.

There is no disadvantage to choosing a CNC with a higher thrust.

1.2. CNC Accuracy & Repeatability

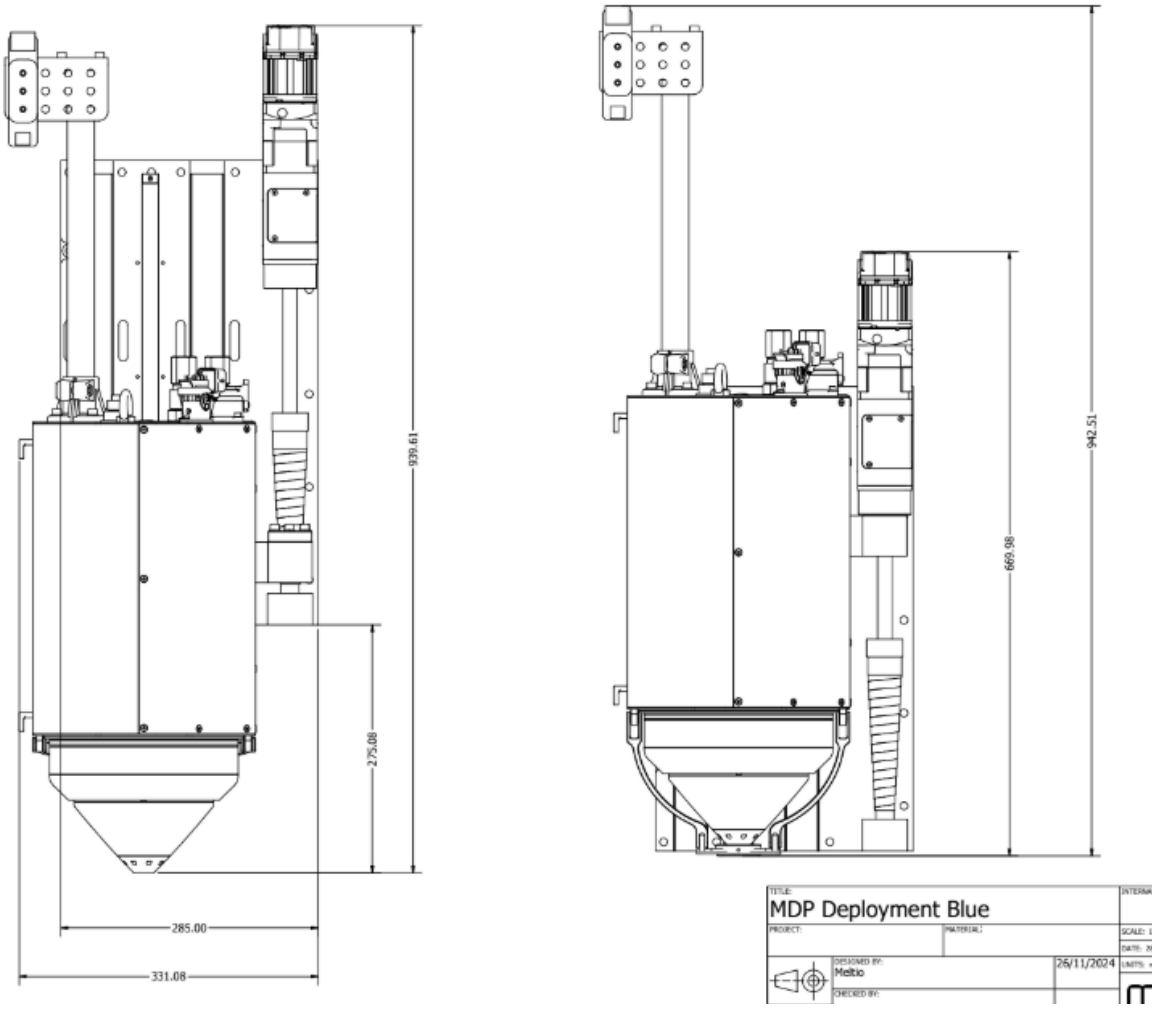
Meltio recommends a position repeatability of ± 0.06 mm according to ISO 9283. This specification is crucial for toolpath quality—the lower the repeatability value, the better the results.

1.3. CNC Travels

The CNC travel distances and any additional axes determine the build volume of the 3D printing solution (CNC + Meltio Engine). Note that the workspace is limited by the travel distances and the number of axes (e.g., 3-axis vs. 5-axis systems).

On the right side of the spindle tower, the deployment mechanism (with dimensions 255 x 342 x 1075-1140 mm) can be mounted without risk of collision. Modifications can be made to the limit switches and machine enclosure to prevent collisions.

When integrating the Meltio Engine in the CNC, some travel distance may be lost; the exact amount depends on the machine spindle’s dimensions.



1.4. Additional Axes: Tracks, Positioners or a 2-axis Rotary-Tilting Table

Installing additional axes can offer more printing strategies as well as increase the building volume of the solution. Any track or positioner is compatible with the Meltio Engine Integration if it is fully controlled by the CNC controller.

The installation, configuration and calibration of the additional axes must be ready before the Meltio Engine Integration can start. The Meltio Technical Support Team cannot help or work on the configuration of these additional axes.

While Meltio's Open Platform supports additional axes, the final results depend on the software chosen by the integrator. For specialized configurations, software modifications may be necessary. Please contact your integrator or software provider to verify compatibility.

1.5. CNC Communication Protocol

The CNC must provide at least four unused machine code-controlled relays to manage the basic functions of the Meltio Engine. Preferably, these relays should allow for triggering an active state, waiting for a handshake signal before continuing the program, and deactivating the signal. For example, Haas CNCs typically use the M59, M29, and M69 commands.

Minimum Digital I/O Requirements:

Module	Outputs Needed	Inputs Needed
Standard Meltio Engine	8	At least 1 (8 recommended)

1.5.1. Advanced Communication Protocols

Both the CNC Controller and the Meltio Engine should be connected to the local network with static IP addresses. The user must know these IP addresses to connect to the Meltio Engine using OPC DA (OPC Data Access) or Socket TCP/IP communication protocols.

The CNC must be connected to the Local Network using the WAN connector in the CNC controller. If it is connected using the controller LAN connection, it will create a DHCP Server assigning an IP to every device on the network, which creates conflict with the local network.

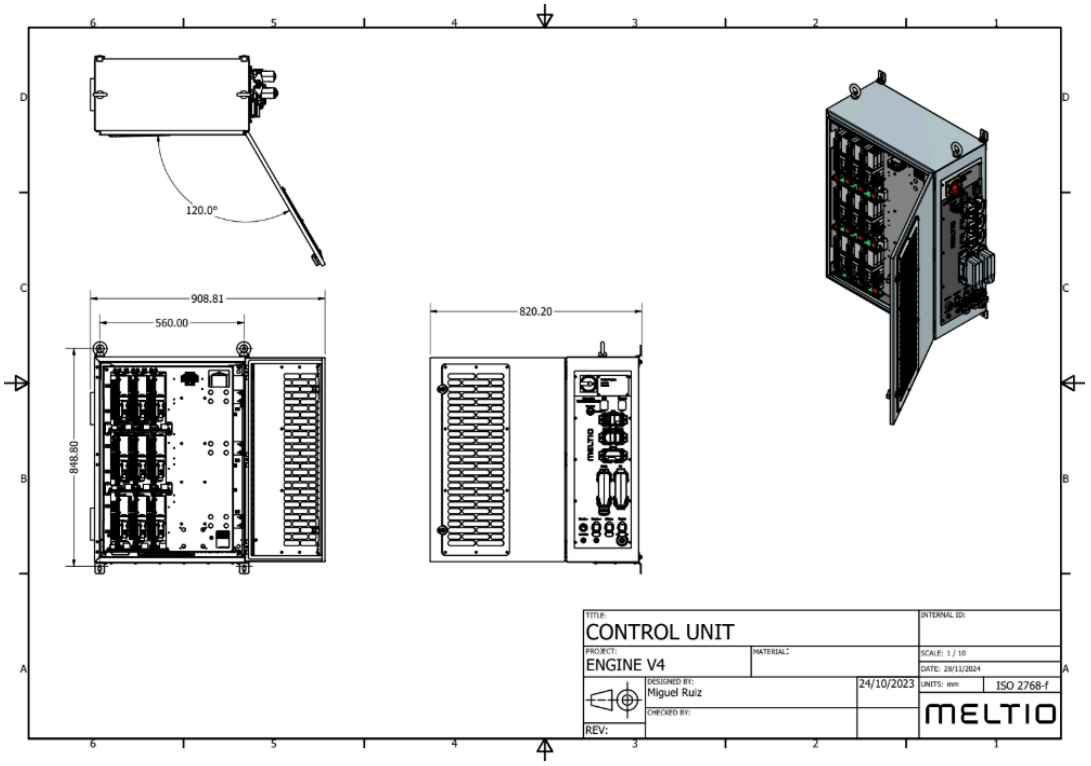
2. Installation of the Meltio Engine CNC

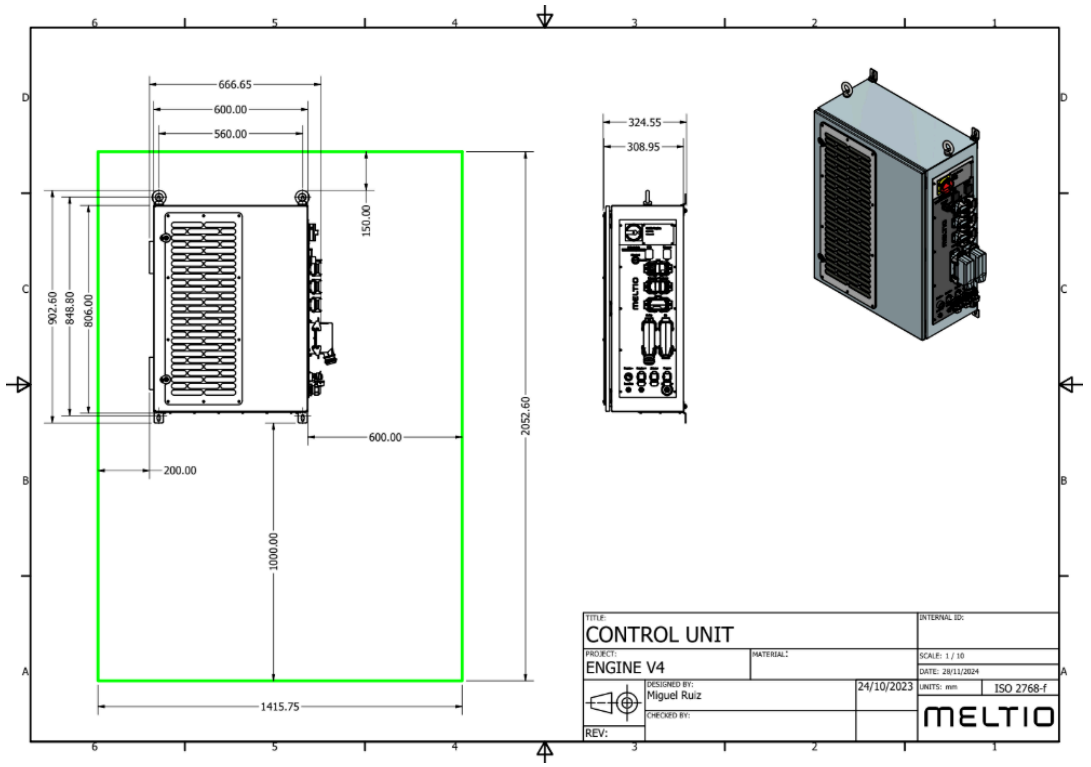
- The CNC must be fully installed before beginning the Meltio Engine Integration. This includes ensuring that the CNC has a proper power supply and that all necessary data cables are installed between the CNC and the CNC controller.
- The CNC must be securely anchored to the floor following the manufacturer's guidelines.
- The installation and configuration should be completed in a way that does not create dangerous conditions during the Meltio Engine installation.
- The CNC must be calibrated as specified in its manual. Meltio is not responsible for print quality issues arising from improper calibration or configuration.

All of this needs to be in order for the Meltio Technical Support team to help on the integration.

Additional Installation Requirements:

- The Meltio Engine requires a clearance of 0.5 m on each side to facilitate maintenance and 30 cm of clearance at the rear to connect Meltio Engine ports.
- A shielding gas connection is necessary to prevent oxidation during printing and to protect the sensitive optical system from dust and smoke. Either Argon or Nitrogen may be used. A connection (Meltio recommends using a pressure regulator and not a flow regulator) must be installed between the printer and the gas bottle. The Meltio Engine controls the gas mass flow internally and requires a constant pressure connection of 4–6 bars.
- The chiller requires 30 cm of clearance on both the left and right sides for airflow intake and 20 cm at the rear for connections.


120.0°
908.81
560.00
848.80
820.20
CONTROL UNIT
ENGINE V4
Miguel Ruiz
24/10/2023
ISO 2768-f
MELTIO


666.65
600.00
560.00
324.55
308.95
150.00
902.60
848.80
806.00
600.00
200.00
1000.00
2052.60
1415.75
CONTROL UNIT
ENGINE V4
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ISO 2768-f
MELTIO

2.1. CNC Safety Modifications

As the Meltio Engine Blue uses lasers with a maximum output power of 1000W or 1400W at 450nm wavelength, laser safety and the operator eye's protection are the primary safety risks related to the system. Therefore, the machine enclosure must be constructed to be laser-safe and interlocked with a compliant safety system that can only be activated if the system is fully enclosed and in a safe state.

Laser safety windows must be installed alongside or in place of existing CNC windows. Note that these windows are not impact-resistant. These viewing windows must be made of laser safety glass with an optical density of 7+ at 450 nm, in compliance with the following norms: EN 207 - Total protection, EN 60825. The installation of laser safety glasses is the responsibility of your Integrator.

Any additional CNC openings or windows must be sealed or replaced to maintain safety.

2.2. Security Circuit

A security circuit must be pre-installed. The system should include door and window sensors to confirm that they are closed and should be capable of locking them. In case a door is opened, a CNC alarm will be triggered and the printing will stop. Meltio can provide basic documentation and guidance on this setup.

2.3. Software Compatibility

Every CNC configuration needs to be reflected in the slicing software. A CNC operator must gather any configuration and calibration data from the CNC controller to be updated in the software. Since each CNC brand uses its own programming language, choosing one of the most common brands can enhance compatibility.

Most CNC machines allow for different offsets; for example, the spindle might use G54 while the Meltio Engine uses G55. The software should allow these offsets to be adjusted as needed. Visit [Meltio Software Partners] for more details.



2.4. CNC Operator

The end-user must have a qualified CNC operator capable of controlling, configuring and jogging the CNC, as well as calibrating the tool, positioner or any working plane.

This operator will assist the Meltio Technical Support team during the integration process regarding any robot-related aspects.



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