SmartCow®

An AI Engineering Company

# Mars User's Manual

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# Declaration of conformity

FCC

This equipment has been tested and verified to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area (domestic environment) is likely to cause harmful interference, in which case the user will be required to correct the interference (take adequate measures) at their own expense.

CE

The product described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

# Safety precautions

- All cautions and warnings on the device should be noted.
- All cables and adapters supplied by SmartCow are certified and in accordance with the material safety laws and regulations of the country of sale. Do not use any cables or adapters not supplied by SmartCow to prevent system malfunction or fires.
- Make sure the power source matches the power rating of the device.
- Position the power cord so that people cannot step on it. Do not place anything over the power cord.
- Always completely disconnect the power before working on the system's hardware.
- No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
- If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
- Always disconnect this device from any AC supply before cleaning.
- While cleaning, use a damp cloth instead of liquid or spray detergents.
- Make sure the device is installed near a power outlet and is easily accessible.
- Keep this device away from humidity.
- Place the device on a solid surface during installation to prevent falls.
- Do not cover the openings on the device to ensure optimal heat dissipation.
- Watch out for high temperatures when the system is running.
- Do not touch the heat sink or heat spreader when the system is running.
- Never pour any liquid into the openings. This could cause fire or electric shock.
- As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.
- If any of the following situations arises, please contact our service personnel:
    - Damaged power cord or plug
    - Liquid intrusion to the device
    - Exposure to moisture
    - Device is not working as expected or in a manner as described in this manual
    - The device is dropped or damaged
    - Any obvious signs of damage displayed on the device
- Do not leave this device in an uncontrolled environment with temperatures beyond the device's permitted environment with temperatures (see specification) to prevent damage.
- RTC battery warnings
    - Use replacement batteries that comply with the recommended battery safeguards, especially for certain types of lithium batteries.
    - Do not dispose of batteries into a fire or oven, or crush them, as this can lead to an explosion.
    - Do not leave batteries in extremely hot environments, as this can cause flammable liquids or gases to leak and ignite.
    - Do not subject batteries to extremely low air pressures, as this may cause flammable liquids or gases to leak, resulting in an explosion.

# Warranty and RMA

Warranty Period

SmartCow warrants that products will be free from defects in material and workmanship for 2 years (24 months), beginning on the date of invoice by SmartCow. SmartCow will provide free of charge warranty coverage to all the products manufactured and sold in case the purchased product is proven defective in material or workmanship under normal use during the warranty period.

Return Merchandise Authorization (RMA)

- Customers can claim RMA service by requesting “SmartCow RMA Service Form” from the account manager. After filling out the form, the account manager will reply with a corresponding RMA number.
- Customers must collect all the information about the problems encountered and note anything abnormal or, print out any on-screen messages, and describe the problems on the “SmartCow RMA Service Form” for the RMA number application process.
- Customers shall return the RMA to SmartCow within 7 working days after the RMA number was generated and enclose the “SmartCow RMA Service Form” with the returned packages.
- SmartCow has the right to refuse providing repair services for products no longer in warranty. If SmartCow chooses to provide repair services, the customer will be charged for the repair fees and component fees. Additionally, the needed repairing time depends on component acquisition.
- Any products returned by SmartCow to other locations besides the customers’ site will bear an extra charge and will be billed to the customer.

# RoHS compliance

SmartCow RoHS environmental policy

SmartCow is a global citizen for building digital infrastructure. We are committed to providing green products and services, which are compliant with European Union RoHS (Restriction on Use of Hazardous Substance in Electronic Equipment) directive 2011/65/EU and 2015/863, to be your trusted green partner and to protect our environment.

RoHS restricts the use of Lead (Pb) < 0.1% or 1,000ppm, Mercury (Hg) < 0.1% or 1,000ppm, Cadmium (Cd) < 0.01% or 100 ppm, Hexavalent Chromium (Cr6+) < 0.1% or 1,000ppm, Polybrominated biphenyls (PBB) < 0.1% or 1,000ppm, and Polybrominated diphenyl Ethers (PBDE) < 0.1% or 1,000ppm.

In order to meet the RoHS compliant directives, SmartCow has established an engineering and manufacturing task force to implement the introduction of green products. The task force will ensure that we follow the standard SmartCow development procedure and that all the new RoHS components and new manufacturing processes maintain the highest industry quality levels for which SmartCow is renowned.

The model selection criteria will be based on market demand. Vendors and suppliers will ensure that all designed components will be RoHS compliant.

# Contents

# About Mars 1

**Topics:**



Mars is an IP65-rated gateway that was designed using the NVIDIA® Jetson AGX Orin™ developer kit.

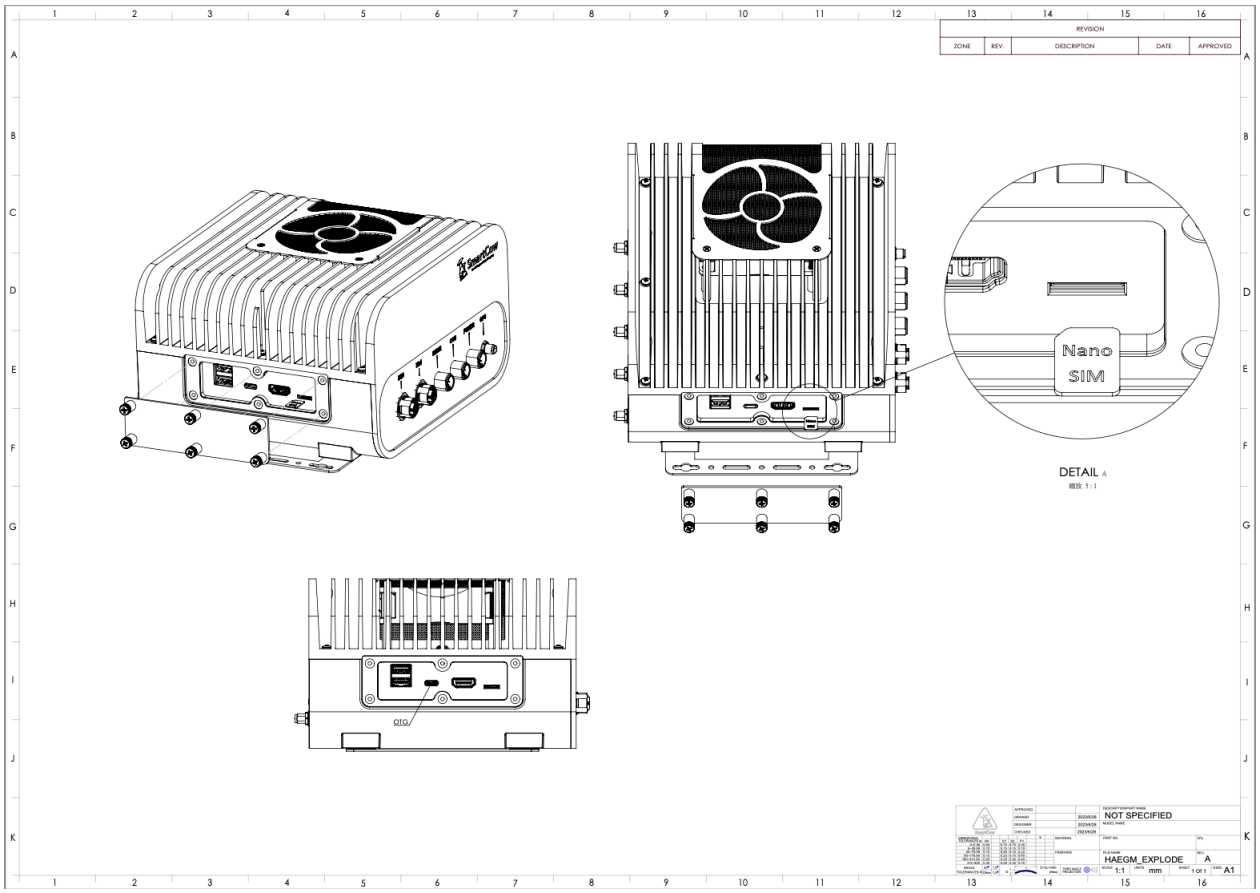
Mars can handle complex AI models with large volumes of video input analysis and data transmission. This makes it suitable for the construction of smart cities. Other use cases include smart traffic monitoring and running smart factory environments.

## Key features of Mars

- **Supports 24/7 out-of-band (OOB) management:** This enables remote control and device recovery, which prevents system crashes.
- **Supports complex AI models:** Mars can handle the massive volumes of data needed to monitor and manage large complex environments.

## Mars diagrams

The following technical diagrams show Mars from different angles.



## Mars specifications

| | | | |
|---|---|---|---|
| NVIDIA® Jetson AGX Orin™ | AGX Orin™ 32GB | CPU | 8-core NVIDIA Arm® Cortex A78AE v8.2 64-bit CPU 2MB L2 + 4MB L3 |
| | | GPU | 1792-core NVIDIA Ampere GPU with 56 Tensor Cores |
| | | Memory | 32GB 256-bit LPDDR5 204.8 GB/s |
| | | Storage | 64GB eMMC 5.1 |
| | AGX Orin™ 64GB | CPU | 12-core NVIDIA Arm® Cortex A78AE v8.2 64-bit CPU 3MB L2 + 6MB L3 |
| | | GPU | 2048-core NVIDIA Ampere GPU with 64 Tensor Cores |
| | | Memory | 64GB 256-bit LPDDR5 204.8 GB/s |
| | | Storage | 64GB eMMC 5.1 |
| General | Storage | 1TB NVMe SSD | |
| | BSP | Jetpack 5.0.2 | |
| | Power input | 24V DC input with M12 power connector | |
| | Certification | CE, FCC | |
| Physical I/O | Display | 1 × HDMI | |
| | Ethernet | 1 × GbE port (OOB function only)<br>1 × 10 GbE port<br>1 × 2.5 GbE port | |
| | GPS | 1 × GPS | |
| | USB | 1 × USB3.2 Gen1 Type A | |
| | SIM card | 1 × Nano SIM slot | |
| | Antenna | 4 × antennas for 5G module<br>2 × antennas for Wi-Fi modules (optional) | |
| | RS232 | 1 × RS232 (M12 connector) | |
| Internal connector | USB | 1 × USB3.0 Type C (OTG only) | |
| | 2-pin header | 1 × RTC with CR2032 battery | |
| | 4-pin header | 1 × Fan | |
| | 4-pin header | 1 × Sensor board | |
| | 8-pin header | 1 × Reset/ Recovery | |
| | Expansion slots | 2 × M.2 2280 Key M (1 Slot with 1TB NVMe SSD)<br>1 × M.2 2230 Key E<br>1 × M.2 3052 Key B | |
| Environment | Operating temperature | -20°C ~+60°C | |
| | Storage temperature | -40°C ~+85°C | |
| | Storage humidity | 95% @ 40°C (non-condensing) | |

| | | |
|---|---|---|
| Mechanical | Dimension | 200 × 180 × 114mm (L × W × H) |
| | Weight | 5kg |

## Mars ordering information

| Part number | Description |
|---|---|
| HAEGM-AR32/AR64 | 32G/ 64G AGX Orin with fan, M.2 1TB NVMe SSD, 200 × 180 × 114mm, 24V DC, 100W power adapter, IP65, -20 ~ 60°C |

## Mars packing list

| Item | Description | Quantity |
|---|---|---|
| HAEGM-AR32/AR64 | AI embedded system with NVIDIA® Jetson module | 1 |
| Power adapter | DC 100W 24V | 1 |

## Mars accessories list

| Part number | Description |
|---|---|
| 1Y0701800200LI | US power cord |
| 1Y0701800100LI | EU power cord |
| 61-ULT00001RQU | M.2 B-key 3052 5G module: QUECTEL RM502Q-AE |
| 61-UWF000000IT | M.2 E-key 2230 WIFI module: Intel® Wireless-AC 9260, Wi-Fi 5 (802.11ac), BT5.1 |

# Installing Mars 2

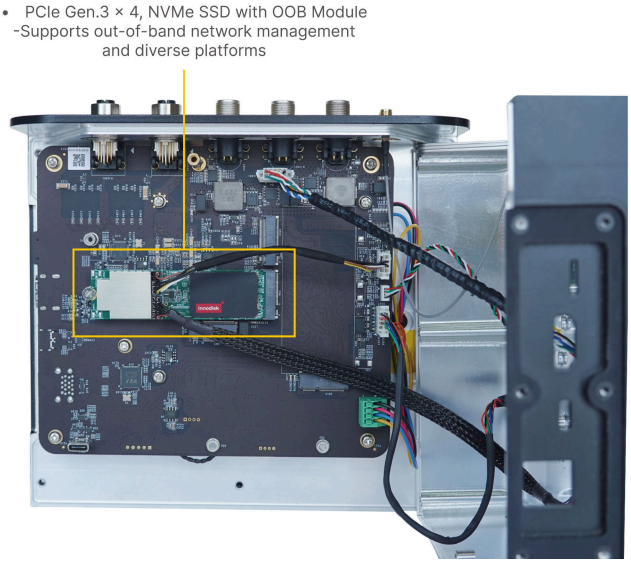
**Topics:**

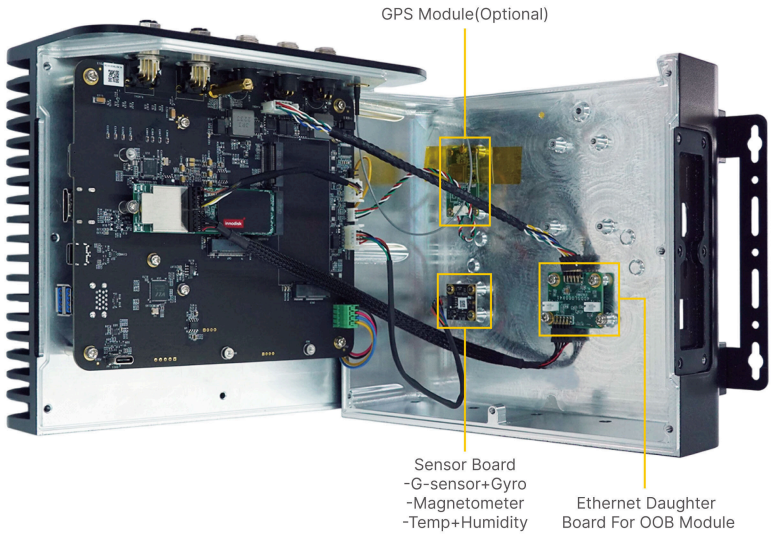


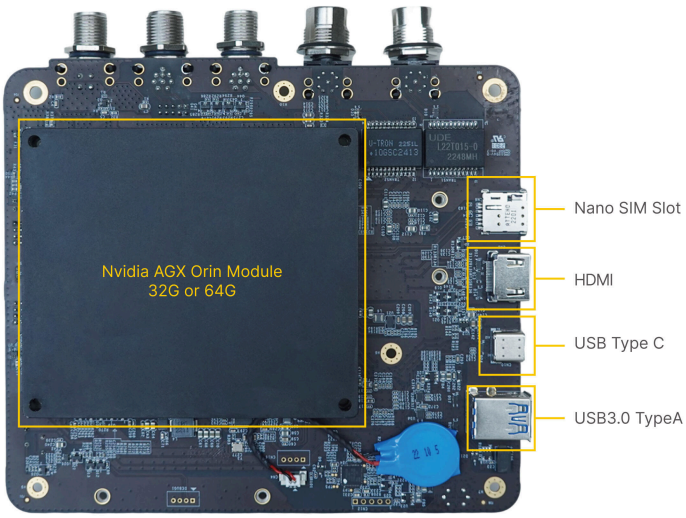
## Mars key components

The following section covers the key internal components of Mars.

**Note:** Mars is a IP65-rated device. Therefore, you cannot open or disassemble it.

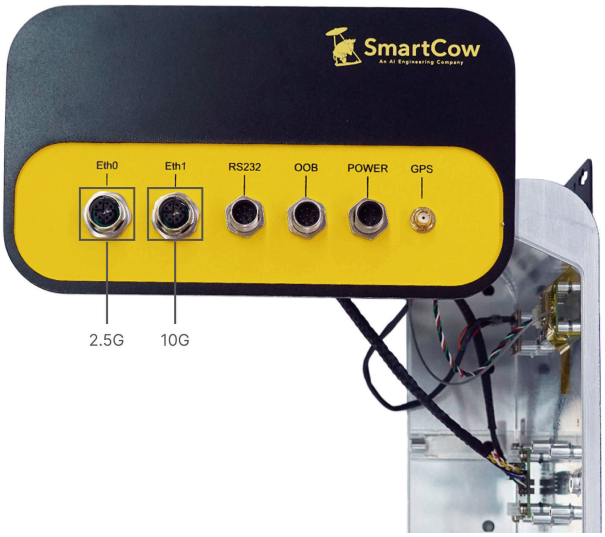


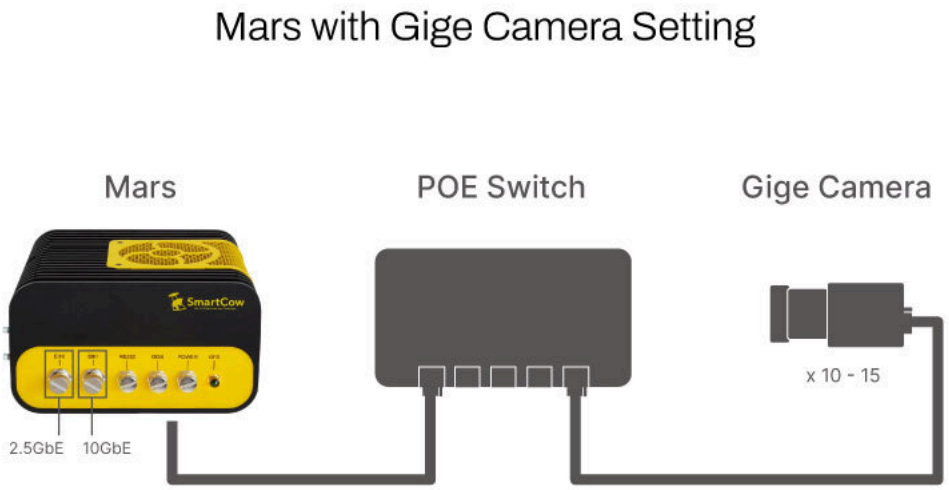



## Connecting Mars to a power source

When you connect Mars to a 24V power adapter, the system can boot without any setting.




## Connecting IP cameras to Mars



# Flashing Mars firmware 3

**Topics:**



## Putting Mars into recovery mode

There are two ways to put Mars into recovery mode.

**Before you begin**

- Prepare a computer that can meet the basic Ubuntu 18.04 hardware requirements.
- Use a USB type A to USB type C cable to connect the USB-C socket on the computer. Then, connect the USB-A to the computer.

**Procedure**

You can use one of the following methods to put Mars into recovery mode.

- When the device is powered on, follow these steps.
  a. Keep pressing the recovery button.
  b. Press the reset button and then release it.
  c. Release the recovery button.
- When the device is powered off, follow these steps.
  a. Keep pressing the recovery button.
  b. Power on the device.
  c. Release the recovery button.

## Flashing Mars firmware for AGX ORIN 32G

**Procedure**

1. Extract the SmartCow Board Support Package (BSP) image.

```
tar xvjf SmartCow_BSP_image_file_name
```

2. Flash eMMC by running the following commands.

```
sudo tar xpfv mfi_jetson-agx-orin-devkit_mars32_emmc.tar.gz
```

```
mv mfi_jetson-agx-orin-devkit mfi_jetson-agx-orin-devkit_mars32_emmc
```

3. Change the current working directory to the directory named `mfi_jetson-agx-orin- devkit_mars32_emmc`.

```
cd mfi_jetson-agx-orin-devkit_mars32_emmc
```

4. Connect the Jetson board to a host computer and enter the RCM mode on that board.
5. Flash the firmware of the Jetson device by running the following command.

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --flash-only --massflash 8
```

6. Flash NVME using the following commands.

```
sudo tar xpfv mfi_jetson-agx-orin-devkit_mars32_nvme.tar.gz
```

```
mv mfi_jetson-agx-orin-devkit mfi_jetson-agx-orin-devkit_mars32_nvme
```

7. Change the current working directory to the directory named `mfi_jetson-agx-orin- devkit_mars32_nvme`.

```
cd mfi_jetson-agx-orin-devkit_mars32_nvme
```

8. Connect the Jetson board to a host computer and enter the RCM mode on that board.
9. Flash the firmware of the Jetson device by running the following command.

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --flash-only --massflash 8
```

## Flashing Mars firmware for AGX ORIN 64G

**Procedure**

1. Extract the SmartCow Board Support Package (BSP) image.

```
tar xvjf SmartCow_BSP_image_file_name
```

2. Flash eMMC by running the following commands.

```
sudo tar xpfv mfi_jetson-agx-orin-devkit_mars64_emmc.tar.gz
```

```
mv mfi_jetson-agx-orin-devkit mfi_jetson-agx-orin-devkit_mars64_emmc
```

3. Change the current working directory to the directory named `mfi_jetson-agx-orin- devkit_mars64_emmc`.

```
cd mfi_jetson-agx-orin-devkit_mars64_emmc
```

4. Connect the Jetson board to a host computer and enter the RCM mode on that board.
5. Flash the firmware of the Jetson device by running the following command.

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --flash-only --massflash 8
```

6. Flash NVME using the following commands.

```
sudo tar xpfv mfi_jetson-agx-orin-devkit_mars64_nvme.tar.gz
```

```
mv mfi_jetson-agx-orin-devkit mfi_jetson-agx-orin-devkit_mars64_nvme
```

7. Change the current working directory to the directory named `mfi_jetson-agx-orin- devkit_mars64_nvme`.

```
cd mfi_jetson-agx-orin-devkit_mars64_nvme
```

8. Connect the Jetson board to a host computer and enter the RCM mode on that board.

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --flash-only --massflash 8
```

# Document control

| Document version | Product version | Release date |
|---|---|---|
| 1.0 | 1.0 | 2023-08-04 |