

Fanless Embedded Computing

User Manual



MODULAR LINK

DIN Mount Industrial Gateway
with the NXP i.MX93 processor

REVISION HISTORY

Revision	Date	Note	Ref
0.1	16.Dec. 2025	ESI Release/ Draft	PU/MS
02	16.Sept. 2026	First release	MS

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Every effort has been made to ensure the accuracy of this manual. However, SECO S.p.A. accepts no responsibility for any inaccuracies, errors or omissions herein. SECO S.p.A. reserves the right to change precise specifications without prior notice to supply the best product possible.

For further information on this module or other SECO products, but also to get the required assistance for any and possible issues, please contact us using the dedicated web form available at <http://www.seco.com> (registration required).

Our team is ready to assist.

INDEX

Chapter 1. INTRODUCTION.....	6
1.1 Warranty	7
1.2 Information and assistance	8
1.3 RMA number request	9
1.4 Safety	9
1.5 Electrostatic discharges	9
1.6 RoHS compliance	10
1.7 FCC certification.....	10
1.8 Waste Disposal	12
1.9 Manufacturer Identification.....	12
1.10 Identification Label.....	12
1.11 Installation	13
1.11.1 Vertical mount on DIN RAIL	13
1.12 Admissible environmental conditions	14
1.13 Pictograms	15
Chapter 2. OVERVIEW.....	16
2.1 Introduction	17
2.2 Technical specifications	18
2.3 Electrical specifications	19
2.3.1 Power Consumption.....	19
2.4 Mechanical specifications	20
Chapter 3. CONNECTORS	21
3.1 Introduction	22
3.2 Connectors overview	23
3.3 Connectors description	24
3.3.1 USB 2.0 (2x) J3.....	24
3.3.2 Ethernet 1 and Ethernet 2 (J6 ; J7)	24
3.3.3 Serial Port J8	25
3.3.4 Debug Port J12.....	26
3.3.5 Buttons / LED.....	27
3.3.6 Antenna	28

Chapter 4. FW SETUP29

4.1 Modular Link Clea OS..... 30

4.2 Development Environment 31



Chapter 1.

INTRODUCTION

- Warranty
- Information and assistance
- RMA number request
- Safety
- Electrostatic discharges
- RoHS compliance
- FCC certification
- Waste Disposal
- Manufacturer Identification
- Identification Label
- Installation
- Admissible environmental conditions
- Pictograms



1.1 Warranty

This product is subject to the Italian Law Decree 24/2002, acting European Directive 1999/44/CE on matters of sale and warranties to consumers.

The warranty on this product lasts for 1 year.

Under the warranty period, the Supplier guarantees the buyer assistance and service for repairing, replacing or credit of the item, at the Supplier's own discretion.

Shipping costs that apply to non-conforming items or items that need replacement are to be paid by the customer.

Items cannot be returned unless previously authorized by the supplier.

The authorization is released after completing the specific form available on the web-site <http://www.seco.com/en/prerma> (RMA Online). The RMA authorization number must be put both on the packaging and on the documents shipped with the items, which must include all the accessories in their original packaging, with no signs of damage to, or tampering with, any returned item.

The error analysis form identifying the fault type must be completed by the customer and has must accompany the returned item.

If any of the above-mentioned requirements for the RMA is not satisfied, the item will be shipped back and the customer will have to pay any and all shipping costs.

Following a technical analysis, the supplier will verify if all the requirements, for which a warranty service applies, are met. If the warranty cannot be applied, the Supplier will calculate the minimum cost of this initial analysis on the item and the repair costs. Costs for replaced components will be calculated separately.

SECO offers Engineering Samples for early evaluation and development. Engineering Samples are sold "as-is" with no warranty of any kind, neither explicit nor implied.

Here <https://www.seco.com/it/EngineeringSamplesPolicy> is defined the framework of SECO and customer responsibilities regarding Engineering Samples.

1.2 Information and assistance

What do I have to do if the product is faulty?

SECO S.p.A. offers the following services:

- SECO website: visit <http://www.seco.com> to receive the latest information on the product. In most cases it is possible to find useful information to solve the problem.
- SECO Sales Representative: the Sales Rep can help to determine the exact cause of the problem and search for the best solution.
- SECO Help-Desk: contact SECO Technical Assistance. A technician is at disposal to understand the exact origin of the problem and suggest the correct solution.

E-mail: technical.service@seco.com

Fax (+39) 0575 340434

- Repair centre: it is possible to send the faulty product to the SECO Repair Centre. In this case, follow this procedure:
 - Returned items must be accompanied by a RMA Number. Items sent without the RMA number will be not accepted.
 - Returned items must be shipped in an appropriate package. SECO is not responsible for damages caused by accidental drop, improper usage, or customer neglect.

Note: Please have the following information before asking for technical assistance:

- Name and serial number of the product;
- Description of Customer's peripheral connections;
- Description of Customer's software (operating system, version, application software, etc.);
- A complete description of the problem;
- The exact words of every kind of error message encountered.

1.3 RMA number request

To request a RMA number, please visit SECO's web-site. On the home page, please select "RMA Online" and follow the procedure described.

A RMA Number will be sent within 1 working day (only for on-line RMA requests).

1.4 Safety

The Modular Link system uses only low voltages.

While handling the system, please use extreme caution to avoid any kind of risk or damages to electronic components.



Always switch the power off, and unplug the power supply unit, before handling the board and/or connecting cables or other boards.

Avoid using metallic components - like paper clips, screws and similar - near the board when connected to a power supply, to avoid short circuits due to unwanted contacts with other board components.

If the board has become wet, never connect it to any external power supply unit or battery.

Check carefully that all cables are correctly connected and that they are not damaged.

Batteries should not exceed the storage temperature of $-20/+40^{\circ}\text{C}$ and a relative humidity of $60\pm 15\%$. Danger of explosion if the battery is replaced with another one of the wrong type. Batteries must be disposed of as required by the European directive.

1.5 Electrostatic discharges

The Modular Link system, like any other electronic product, is an electrostatic sensitive device: high voltages caused by static electricity could damage some or all the devices and/or components on-board.



Whenever handling an Modular Link System, ground yourself through an anti-static wrist strap. Placement of the board on an anti-static surface is also highly recommended.

1.6 RoHS compliance

The Modular Link system is designed using RoHS compliant components and is manufactured on a lead-free production line. It is therefore fully RoHS compliant.

1.7 FCC certification

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:



Warning!

All changes or modifications to the equipment not explicitly approved by SECO S.p.A. could impair the equipment's functionalities and could void the warranty

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all nearby persons.

SECO S.p.A.
Model: SF-E39-FLE
FCC ID:

1.8 Waste Disposal

Electrical equipment no longer in use must not be thrown away with normal municipal waste. The substances and materials it contains must be disposed of separately in an appropriate manner.

The device must be disposed correctly as it is a waste of electric and electronic equipment (WEEE).

1.9 Manufacturer Identification

Manufacturer: SECO S.p.A.

Address: via Achille Grandi, 20

52100 Arezzo – Italy

Tel. +39 0575 26979

1.10 Identification Label

The device is equipped with an identification label which is placed on the bottom of the device. On the label are written all the device's identification data that must be communicated to SECO S.p.A. if necessary

Three possible labels are available, depending on the modem installed (if any):



Example

SF-E39-FLE-XXXX-XXXX-CX

XXXX-XXXX-CX is the configuration key which indicates the configuration of the system, according to the scheme indicated at chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**



Warning!

Do not remove or replace the identification label.

1.11 Installation

Easy Edge shall be mounted on a vertical wall, in the position shown in the pictures below, with the following condition

Positioning:

- Always keep the SMA connectors for external antennas on top

Temperature:

- Working Temperature -20°-70°C

For the installation, it is possible to consider three different mounting options:

1.11.1 Vertical mount on DIN RAIL

Please look at the following picture as a reference for installation.



1.12 Admissible environmental conditions

The installation and usage environment must NOT show:

- Exposure to environmental temperatures out of the range $0^{\circ}\text{C} \div +40^{\circ}\text{C}$
- Exposure to zones at height over 2000 above sea level
- Exposure to excessive humidity (min 5%, max 85 %) and rapid changes of relative humidity (more than 0,005 p.u./h)
- Exposure to corrosive flue gases
- Exposure to excessive dust
- Exposure to abrasive powder
- Exposure to oil vapours
- Exposure to explosive gas or powders mixtures
- Exposure to salty air
- Exposure to vibrations, impacts or shocks
- Exposure to weather elements or dripping
- Exposure to non-usual transportation or storage conditions
- Exposure to fast or high thermal gradients (more than 5K/h)
- Presence of nuclear radiations.



Caution!

Environmental conditions that differ from those specified may seriously damage the device. Positioning the device in environments that do not correspond to those indicated shall render the warranty null and void for the parts to be replaced. SECO S.p.A. shall not be held liable if these instructions are not repeated.

1.13 Pictograms

The device and the manual are provided with symbols, as indicated in the table below:

PICTOGRAM	DESCRIPTION
	CE Marking
	Warning! Read the manual before use
	WEEE/RAEE Indicates the separate collection of electronic and electrical equipment according to Directive 2012/19/EU.
	Symbol used to identify important warnings for the safety of the user and/or of the device

Chapter 2. OVERVIEW

- Introduction
- Technical specifications
- Electrical specifications
- Mechanical specifications



2.1 Introduction

The Modular Link MX93 is an industrial PC based on NXP i.MX 93 multicore processor, integrating hardware acceleration for AI inference and a secure enclave for enhanced security. These enable lower OPEX—edge computing minimizes network transmission, OTA updates enable remote patching and less costly maintenance. For legacy meter interfacing, the gateway offers Ethernet, USB, RS-232/422/485 via RJ12; Wi-Fi/LTE options for wireless deployment. Its compact, fanless case supports industrial temperature range and flexible mounting (including DIN rail).

Its true strength is modularity: compatible daughter cards allow expansion for additional I/O or communication, letting smart suppliers incrementally tailor their system without replacing base hardware.

Integration procedure

Assessment: Inventory meters/sensors/gateways, protocols, power supplies, mounting, identify bottlenecks (bandwidth, management, security).

Protocol/data translation: Build software bridges from legacy fieldbus to modern IoT protocols; SECO's Clea software framework included.

Security/device management: Switch on secure boot, encryption, firewall via processor's secure enclave; enroll in OTA management for updates/monitoring (EdgeLock 2GO).

Edge analytics: Deploy local analytics for load forecast and anomaly detection.

Phased rollout: Pilot test, then gradual expansion running new/old gateways to verify data before replacing legacy units.

Lifecycle management: Harmonize configuration, update scheduling, adopt predictive maintenance, add modular features.

Modular Link is a scalable, secure, modular solution for stable energy management and the transition to Industry 4.0.

2.2 Technical specifications

Module

NXP i.MX93

- 2x Arm® Cortex®-A55 1.5GHz
- Arm® Cortex®-M33 @ 250Mhz
- Arm® Ethos™ U-65 microNPU

System Memory

Up to 2GB LPDDR4 3700MT/s

Mass Storage

Up to 32GB eMMC 5.1 drive soldered on-board

Video Interface

Optional HDMI® interface on MiniHDMI® connector

Video Resolution

Up to 1080p @60Hz

Networking

Up to 2x Gigabit Ethernet RJ45 connectors

Optional WiFi (802.11 ac / a / b / g / n) + BT5.0 module soldered on-board, 2x external antennas*

miniPCIe full-size card slot for optional LTE modem with nanoSIM slot, up to 2x external antennas**

*Certified **Certification upon request RF Power:

USB:

Dual USB 2.0 Type-A connector (one with OTG capability)

Serial Ports:

1x RS-232/RS-422/RS-485 UART software configurable, on

RJ12 connector

1x Debug UART on USB Type-C

Other Interfaces:

Optional terminal block connectors with the following I/O:

- 2x digital outputs
- 4x digital inputs

1x button software configurable

1x button hardware reset

3x LEDs: power presence, WWAN activity, 1x software configurable.

Other: TPM 2.0, RTC, watchdog

Expansion: custom connector for stacking Daughter systems

exposing I2C, SPI, GPIO, CAN, USB, UART interfaces and power

Mounting Options:

DIN-Rail mount

Wall mount

Power supply

+12VDC - 36VDC

Operating temperature

-20°C ÷ +70°C

Dimensions

140 x 96x 36 mm

2.3 Electrical specifications

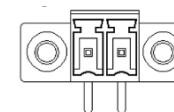
The Modular Link system can be supplied with any voltage in the range $+12V_{DC} \div +36V_{DC}$ range (absolute voltage range).

It is recommended to use a supply voltage in the range 12V - 36VDC, however.

This voltage can be supplied through a standard 2-poles connector (P1), type PV02-3.81-H-P connector or equivalent. Mating connector

Type SV02-3.81-H-P or equivalent

Power Input – Terminal Block J9	
Pin	Signal
1	V_{IN}
2	GND



2.3.1 Power Consumption

For the Modular Link system current absorptions have been measured under multiple use conditions and referred to multiple supply voltages. These are reported as average values (30 seconds acquisition).

Supply	Idle	typical	max.
12 V	tbd	tbd	tbd
24 V	tbd	tbd	tbd
36 V	tbd	tbd	tbd

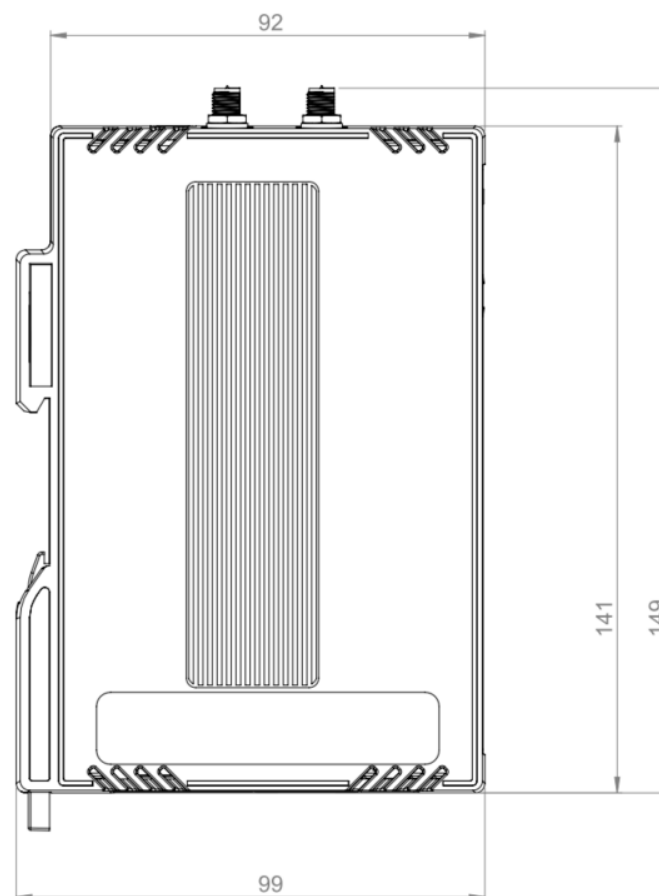
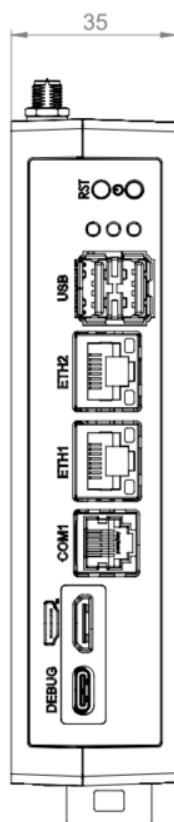


It is required to insert a 2A 32V_{DC} fast-acting fuse in series to the power source.

2.4 Mechanical specifications

The dimensions are 140 x 96 x 36 mm. (Mother System)

The printed circuit of the internal board is made of six layers, some of them are ground planes, for disturbance rejection.



Chapter 3.

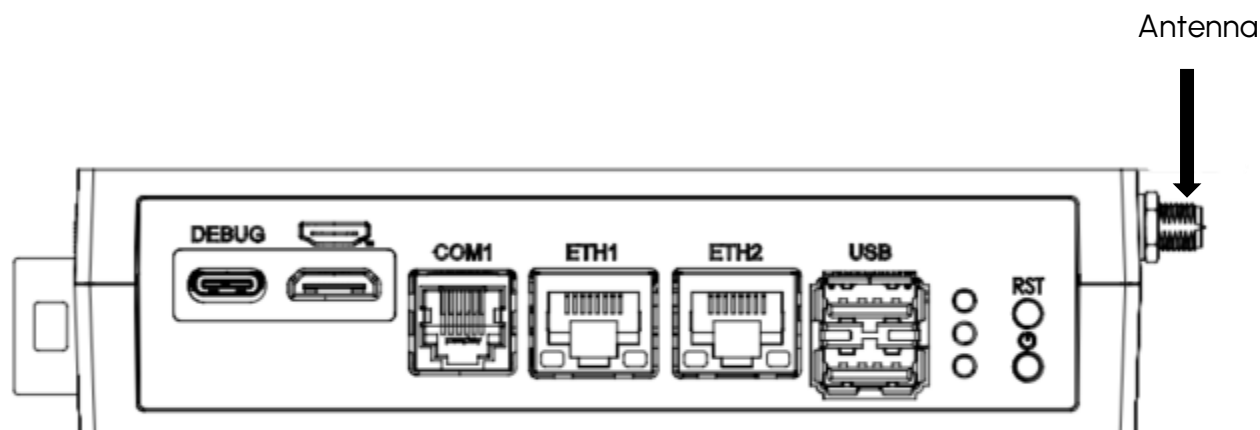
CONNECTORS

- Introduction
- Connectors overview
- Connectors description



3.1 Introduction

On The Modular Link Module , there are several connectors located on the front and upper part of the enclosure. Moreover, there is a hardware reset and power button and three LEDs for activity, connection.



Please be aware that, depending on the configuration purchased, the appearance of the system could be slightly different from the above pictures.

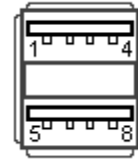
3.2 Connectors overview

Name	Description	Name	Description
J3	2 x USB 2.0	J9	Power connector
J4	Daughter Connection	J12	Debug
J6	Ethernet 0 RJ45	J15	mHDMI
J7	Ethernet 1 RJ45	SW1	Power Buttom
J8	Serial RJ11	SW2	RESET
			Antenna

3.3 Connectors description

3.3.1 USB 2.0 (2x) J3

The Modular Link System provides 2 USB 2.0 port .

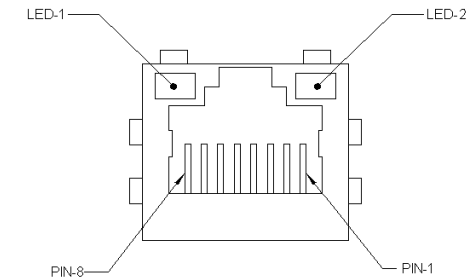


USB 2.0 - Connector J3	
Pin	Signal
1 / 5	USB_VCC
2 / 6	USB0- /USB1-
3 / 7	USB0+ /USB1+
4 / 8	GND

3.3.2 Ethernet 1 and Ethernet 2 (J6 ; J7)

The Modular Link system offers a RJ45 Ethernet connector with LED for Speed and Link active.

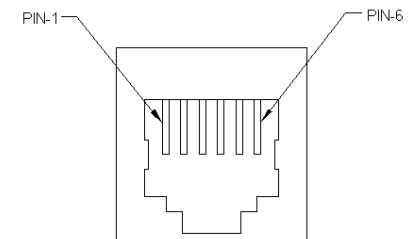
Ethernet RJ45- Connector J6 , J7	
Pin	Signal
1	MDI0+
2	MDI0-
3	MDI1+
4	MDI1-
5	MDI2+
6	MDI2-
7	MDI3+
8	MDI3-



3.3.3 Serial Port J8

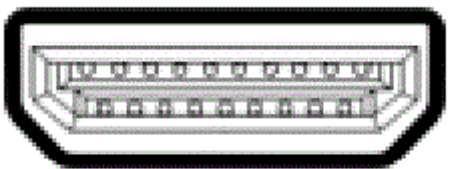
The Modular Link system offers 1x RS-232/RS-422/RS-485 UART configurable by software and accessible on a RJ12 connector. RJE0166201

Serial Port interface – RJ12 Connector J8		
Pin	RS-232 Signal	RS422/RS485
1	GND	GND
2	RxD	Rx+ / -
3	TxD	Tx- / Data-
4	RTS	Tx+ / Data+
5	CTS	Rx- / -
6	NC	NC



3.3.3.1 HDMI Type C J10

The Modular Link is equipped with a microHDMI port for Monitor access.
The port is following the HDMI standard



3.3.4 Debug Port J12

Serial connection for debugging and Programming. The used Connector is USB Type -C . For debugging you can use a standard cable which provide min. 1 USB-C connector.

Debug-Port- Connector J12	
Pin	Signal
A1 / B1	GND
A2/B2	TXI+
A3/B3	TXI-
A4/B4	VBUS
A5 / B5	CC
A6 /B6	D+
A7 /B7	D-



A8 /B8	SBU
A9 /B9	VBUS
A10 / B10	RX2-
A11 / B11	RX2+
A12 / B12	GND

3.3.5 Buttons / LED

On the Modular Vision there are two buttons.

One is the power button to switch on the system and the other a pushbutton for RESET, which must be used to restart the module.

There are also three LEDs onboard.

Buttons / LED	
Button	Function
Power	Status
RESET	System RESET
LED	
Blue	Power Status
Red	Software configurable
Green	Network Status

3.3.6 Antenna

The Modular Link is equipped with 2 RP-SMA sockets for external Antenna. Type : RSMA/Ko.8I-IPEX(20cm)-MHF

Chapter 4.

FW SETUP

- Clea OS Firmware
- Development Environment
- Fehler! Verweisquelle konnte nicht gefunden werden.



4.1 Modular Link Clea OS

The board, unless otherwise agreed with the customer, comes with a preloaded Clea OS Firmware.

- **Clea OS** is the main operating system for SECO Modular Vision products, based on Yocto and designed for industrial IoT and HMI applications.
- It features OTA updates, double partitions, fallback procedures, and integrates a Device Manager for fleet management.

The Binaries can be found at : <https://git.seco.com/clea-os/seco-manifest/-/releases>

Clea OS can be found <https://git.seco.com/clea-os/seco-manifest>

Specially for iMX read <https://git.seco.com/clea-os/seco-manifest/-/blob/scarthgap/soc/imx/README.md>

Clea OS on Modular Link provides reliable over-the-air updates and secure fallback options, which increase system stability. Its modular design allows for flexible customization and integration in various industrial environments. The integrated Device Manager supports efficient fleet management and remote device monitoring. Clear documentation and an intuitive interface simplify deployment and maintenance for support teams such as SECO NE.

4.2 Development Environment

Clea OS enhances the Modular Link platform by enabling rapid deployment of industrial solutions. Its architecture is optimized for seamless connectivity between different modules, supporting efficient data exchange and system scalability. The operating system is designed to minimize downtime, with features that facilitate quick recovery and straightforward troubleshooting. For support teams like SECO NE, Clea OS on Modular Link streamlines technical assistance by providing consistent system behavior across various hardware configurations.

meta-seco-imx: <clea-os/layers/seco/meta-seco-imx>

This layer is intended to contain Clea OS recipes needed to build the Board Support Package (BSP) for all NXP boards supporting Clea OS.

meta-seco-clea-os: <clea-os/layers/seco/meta-seco-clea-os>

This layer is intended to contain all Clea OS main recipe for image, the Clea OS features recipes and packages. The support allows to create a flexible image based on what is needed. Through the right setting, by choosing the main image, Things and Embedded distros can be chosen. Clea OS Things distro is designed to offer the highest standards in terms of security and stability thanks to features like double partitions and fallback procedures.

Clea OS Things integrates a device manager to communicate with the Cloud and allows a family of products to be managed as a fleet. Clea OS Embedded provides a graphic environment for SECO's embedded devices.

□ meta-seco-imx: <clea-os/layers/seco/meta-seco-imx>

This layer is intended to contain Clea OS recipes needed to build the Board Support Package (BSP) for all NXP boards supporting Clea OS.



SECO S.p.A. - Via A. Grandi, 20
52100 Arezzo - ITALY
Ph: +39 0575 26979 - Fax: +39 0575 350210
www.seco.com

