ARMXY EMBEDDED

COMPUTER DATASHEET

ARMxy BL450 Series

Version History

Version	V1.0	2024-10-19	Initial Release	

Contents

1. Overview

BL450 Series ARM Embedded Computer is an industrial-grade ARM controller with flexible I/O configuration, based on the Rockchip RK3588J/RK3588 processor, featuring a quad-core ARM Cortex-A76 + quad-core ARM Cortex-A55 + triple-core ARM Cortex-M0 architecture, with a clock speed of up to 2.0G/2.4GHz. It is equipped with 32GB/64GB/128GB eMMC and 4GB/8GB/16GB LPDDR4X RAM and ROM configurations. Supporting a rich set of I/O interfaces, it also integrates a 6TOPS NPU, enabling deep learning capabilities. The BL450 series is widely used in industrial control, edge computing, AIoT, artificial intelligence, communication management, AGV robots, machine vision inspection, robotics, industrial IoT gateways, energy storage systems, automation control, and transportation infrastructure.

BL450 Series ARM Embedded Computer offers 1 to 3 optional RJ-45 network ports, including two 10/100/1000M ports and one 10/100M adaptive port, along with 2×USB 3.1, one optional HDMI 2.1, and optional X-series and Y-series I/O boards for communication, PWM output, pulse counting, and other data acquisition and control functions. It supports 8K@30fps H.264 video encoding and 8K@60fps H.265 video decoding. Built-in Mini PCIe interface allows support for Bluetooth, Wi-Fi, 4G, and 5G communication modules.

BL450 Series supports multiple operating systems, including Linux-5.10.209, Linux-RT-5.10.209, Ubuntu 20.04, Debian 11, and Android 13. It is also compatible with Docker containers, Node-Red, and Qt-5.15.10 for graphical development. The BLIoTLink industrial protocol conversion software enables fast industrial data acquisition and conversion, facilitating seamless integration with mainstream IoT cloud platforms and industrial SCADA software. Additionally, the BLRAT remote access tool provides remote access and maintenance, while Node-Red allows for rapid IoT application development.

Designed with professional electrical performance and high/low-temperature testing, the BL450 series operates reliably under harsh electromagnetic interference and extreme temperatures ranging from -40°C to 85°C. With DIN35 rail mounting, it is suitable for various industrial applications.

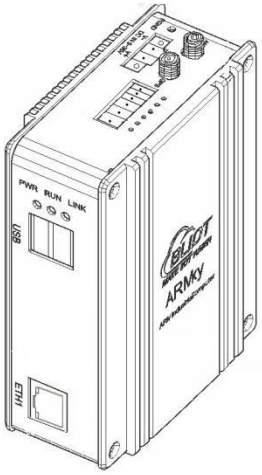
2. Typical Application Areas

- ✓ Industrial Control
- ✓ Energy Storage System EMS/BMS
- ✓ AIoT & Artificial Intelligence
- ✓ Smart Manufacturing

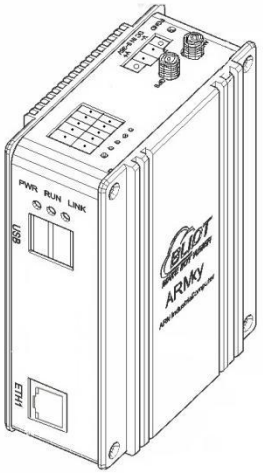
- ✓ Communication Management Unit
- ✓ AGV Robots
- ✓ Machine Vision
- ✓ Edge Computing
- ✓ Motion Control
- ✓ Robotics
- ✓ Rail Transit
- ✓ Smart Devices

3. Software and Hardware Specifications

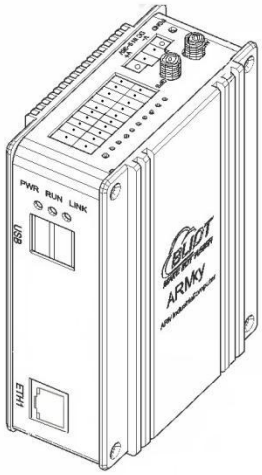
Exterior Structure and Dimensions of Product with 1 Ethernet Port:



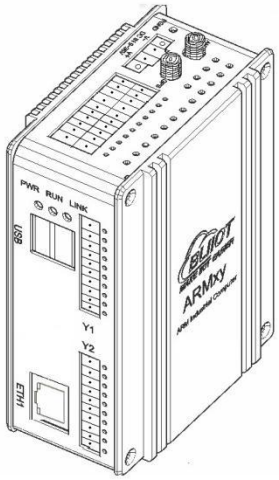
Basic
42*83*110mm



C Type
42*83*110mm

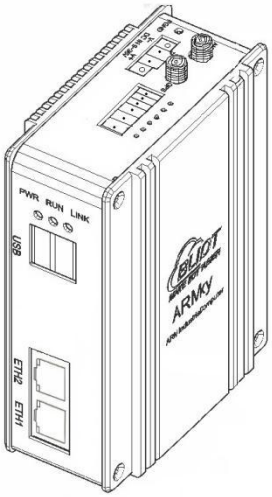


A Type
42*83*110mm



B Type
48*83*110mm

Exterior Structure and Dimensions of Product with 2 Ethernet Ports:



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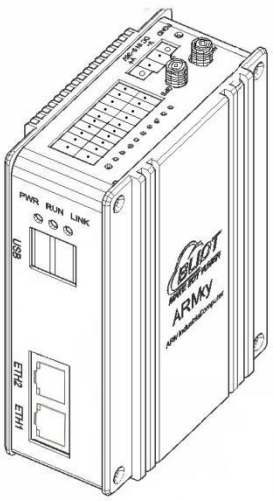
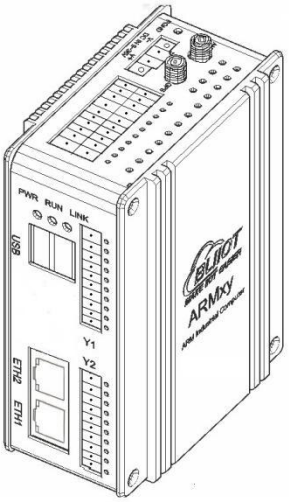
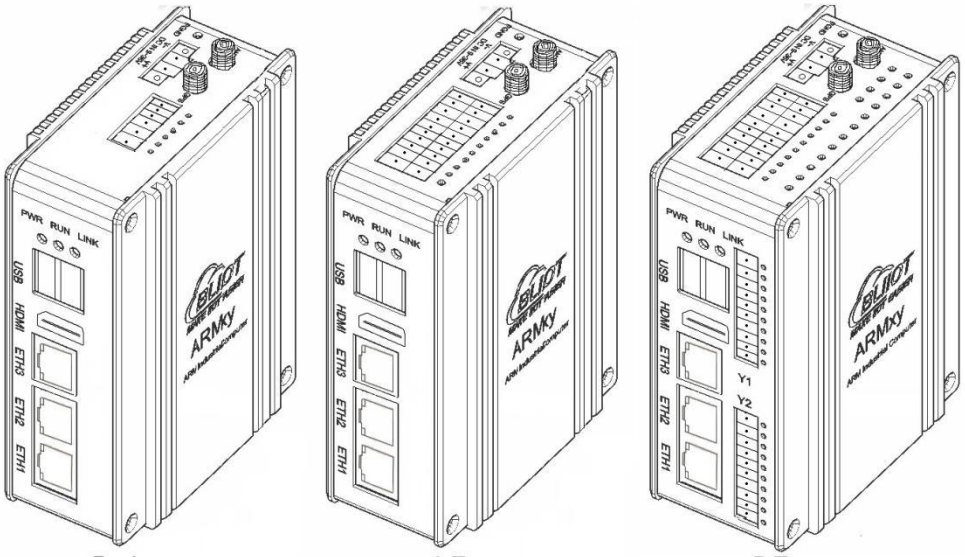


A Type
42*83*110mm



B Type
48*83*110mm

Exterior Structure and Dimensions of Product with 3 Ethernet Ports:



Hardware	Parameters
CPU	Rockchip RK3588J/RK3588, 64-bit, 8nm.
	4 x ARM Cortex-A76 RK3588J Clock Speed: Normal Mode 1.6GHz, Overdrive Mode 2.0GHz RK3588 Clock Speed: 2.4GHz
	4 x ARM Cortex-A55 RK3588J Clock Speed: Normal Mode 1.3GHz, Overdrive Mode 1.7GHz RK3588 Clock Speed: 1.8GHz
	3 x ARM Cortex-M0 (PMU_M0, NPU_M0, DDR_M0) PMU_M0 Clock Speed: 200MHz Note: NPU_M0 and DDR_M0 are not yet officially available; release date to be determined.
	NPU: 6TOPS Supports INT4/INT8/INT16/FP16/BF16/TF32 Compatible with TensorFlow, PyTorch, Caffe, and MXNet deep learning frameworks.
	GPU: Mali-G610 MP4, Supports OpenGL ES 1.1/2.0/3.2, OpenCL 2.2, and Vulkan 1.2.
	ISP: 2x ISP (ISP0/ISP1), Supports HDR, 3DNR, and the following inputs: 48M: 8064x6048@15fps (dual ISP)

	32M: 6528x4898@30fps (dual ISP) 16M: 4672x3504@30fps (single ISP)
	Encoder: Supports 8K@30fps H.265/H.264.
	Decoder: Supports 8K@60fps H.265 and 8K@30fps H.264.
ROM	32/64/128GByte eMMC
RAM	4/8/16GByte LPDDR4X
ETH	RJ-45, 1~3, 2x10/100/1000M, 2x10/100M, ESD Level 3, EFT Level 3
USB	2 x USB 3.1 HOST (USB1, USB2). Speed up to 5Gbps, ESD Level 3.
HDMI	1 x HDMI 2.1. Supports 4K@120fps and 8K@60fps.
I/O Slot	X series I/O board slot: 1, X series I/O board, support RS485, RS232, RS 422, DI, DO, GPIO, etc; Y series I/O board slot: 2, Y series I/O board, support RS485, RS232, RS 422, DI, DO, Relay output, AI, AO, PT100, PT1000, TC, etc.
LED	1 x power indicator light
	2 x user-programmable indicator light
PCIe M.2	NVME 2230/2242
Mini PCIe	1, Supports Bluetooth, Wi-Fi, 4G module, etc.
SIM Slot	1 slot, NANO
Antenna	2, For 4G/5G/Wi-Fi/GPS
Debug	1 x Micro USB debug port
SD Slot	1
Reset	1 reset button
Watchdog	Onboard independent hardware watchdog
Power	Rated DC 24V, supports wide voltage range of 12-24VDC Equipped with reverse polarity protection and overcurrent protection 2-pin terminal block with screw terminals
Grounding	1-pin GND terminal
Installation	DIN35 rail mounting, wall mounting
Material	Aluminum alloy casing + stainless steel
Dimension	110x83x42mm or 110x83x48mm

Software	Parameters
Kernel	Linux-5.10.209, Linux-RT-5.10.209

File System	Buildroot-2021.11 (Linux-5.10.209, Linux-RT-5.10.209) Ubuntu 20.04 (Linux-5.10.209, Linux-RT-5.10.209)
GUI development tool	Qt-5.15.10

4. Software Ecosystem

Category	Software	Type	Highlights
Industrial Communication & Protocols	IGH EtherCAT Master	Open Source	Supports real-time EtherCATmaster for high-precision motion control and synchronized I/O.
Data Acquisition Edge Processing	BLIoTLink	Proprietary	Data acquisition and protocol conversion, supporting multiple protocols and API-based secondary development.
	Node-RED	Open Source	Low-code logic orchestration tool,supporting visual flow design and custom nodes.
	Vnode	Open Source	Lightweight edge computing node,suitable for high-efficiency data pipeline processing.
Industrial Control & Execution	OpenPLC	Open Source	Open-source PLC, suitable for simple logic control and local automation.
	CODESYS Runtime	Licensed	Industrial control platform, supporting full IEC61131-3 programming and motion control.
	Beremiz	Open Source	Open-source IEC61131-3 compliant PLC integrated development environment for machine automation,providing tools to create HMI.
	NexPLC	Proprietary	Next-generation industrial control and operation & maintenance integrated platform, supporting cloud-based collaboration.
Visualization & Monitoring	FUXA	Open Source	Lightweight web-based SCADA, suitable for rapid configuration and small to medium monitoring

			projects.
	Ignition	Open Source	Enterprise-level industrial platform,supporting integrated SCADA, MES, and IoT deployment.
	Grafana	Open Source	Professional time-series data visualization and analytic dashboards, supporting multiple data sources.
Communication &Middleware	Nginx/Apache	Open Source	Web portal for exposing and securely managing edge services.
AI / Machine Vision	YOLOv5/8 OpenCV	Open Source	Complete edge AI vision stack, supporting object detection and image prepossessing.
	TensorFlow Lite, PyTorch Mobile	Open Source	Lightweight AI model inference frameworks, supporting edge-side intelligent analysis.
Remote Operation & Maintenance Management	BLRAT	Proprietary	Secure remote operation & maintenance channel, supporting remoted evice debugging and maintenance.
	QuickConfig	Proprietary	Graphical gateway configuration and management tool, supporting one-click deployment and monitoring.
Development & Support Environment	Python, C/C++, Node.js, Java	Open Source	Multi-language development support, suitable for diverse development scenarios and performance requirements.
	Python 3, Node.js	Open Source	Provides standard runtime, supporting scripting and containerized applications.
	Docker, Kubernetes(K3s)	Open Source	Supports application containerization and cluster management, enabling micro services architecture.
	API Documentation, Deployment Guides, Sample Projects	Proprietary / Open Source	Provides comprehensive technical documentation and typical scenario examples.
System & Security	OpenSSL	Open Source	Provides communication encryption and secure tunneling to ensure data transmission security.
	iptables	Open Source	Kernel-level firewall for network protection.
	Encryption Chi	Proprietary	Encapsulates SHA-256 encryption

	p Demo		and authentication algorithms.
	Wireshark, tcp dump	Open Source	Network protocol analysis for security monitoring.
	Prometheus + Grafana	Open Source	System resource monitoring and alerting, supporting visualized operation & maintenance.

5. Product Selection

The ARMxy series ARM embedded controllers adopt a flexible design concept, allowing users to customize ROM and RAM combinations by choosing different System-on-Module(SOM) boards as needed. Additionally, various X and Y boards can be selected to achieve diverse I/O configurations, catering to the requirements of different application scenarios.

Product naming convention

Host Model Number - SOM Model Number - X Board Model Number - Y1 Board Model Number - Y2 Board Model Number

For example, if we had a specific product configuration:

BL450-SOM450-X10

Means 1 Ethernet port, 32GB eMMC storage, 4GB LPDDR4X, and 2 RS485 ports

If you need to add Wi-Fi, then you would append "W" to the host model number.

For example: BL450W-SOM450-X10

If you need to add a 4G module, you would append "L" to the host model number.

For example: BL450L-SOM450-X10

ARMxy BL450 Model List

Model	ETH	USB	HDMI	X board I/O Slot	Y board I/O Slot	Dimension
BL450	1x10/100/1000M	2	X	1x6PIN	X	42x83x110 mm
BL450A	1x10/100/1000M	2	X	1x20PIN	X	42x83x110 mm
BL450B	1x10/100/1000M	2	X	1x20PIN	2	48x83x110 mm
BL450C	1x10/100/1000M	2	X	1x10PIN	X	42x83x110 mm

BL451	2x10/100/1000M	2	X	1x6PIN	X	42x83x110 mm
BL451A	2x10/100/1000M	2	X	1x20PIN	X	42x83x110 mm
BL451B	2x10/100/1000M	2	X	1x20PIN	2	48x83x110 mm
BL452	2x10/100/1000 M，1x10/100M	2	1	1x6PIN	X	42x83x110 mm
BL452A	2x10/100/1000 M，1x10/100M	2	1	1x20PIN	X	42x83x110 mm
BL452B	2x10/100/1000 M，1x10/100M	2	1	1x20PIN	2	48x83x110 mm

ARMxy BL450 SOM Model List

You can select the appropriate ROM, RAM, and temperature grade based on your requirements.

Model	MCU	Clock Speed	Kernel	NPU	eMMC	LPDDR 4X	Temperature
SOM450	RK3588J	2.0GHz	4 x A76 + 4 x A55 + 3 x M0	6TOPS	32GByte	4GByte	-40~85°C
SOM451	RK3588J	2.0GHz	4 x A76 + 4 x A55 + 3 x M0	6TOPS	64GByte	8GByte	-40~85°C
SOM452	RK3588J	2.0GHz	4 x A76 + 4 x A55 + 3 x M0	6TOPS	128GByte	16GByte	-40~85°C
SOM453	RK3588	2.4GHz	4 x A76 + 4 x A55 + 3 x M0	6TOPS	64GByte	4GByte	0~80°C
SOM454	RK3588	2.4GHz	4 x A76 + 4 x A55 + 3 x M0	6TOPS	64GByte	8GByte	0~80°C

X Series I/O Board Model List

You can select the appropriate X series I/O board based on your requirements, ensuring that the number of pins on the X series I/O board is compatible with the industrial computer's casing.

BL450 does not support IO boards with CAN ports.

Model	RS232/RS485	CAN	DI	DO	GPIO	PIN

X10	2	x	x	x	x	6PIN
X13	x	x	2	2	x	6PIN
X14	x	x	4	x	x	6PIN
X15	x	x	x	4	x	6PIN
X16	x	x	x	x	4	6PIN
X20	4	x	x	x	x	10PIN
X23	4	x	4	4	x	20PIN
X26	2	x	8	4	x	20PIN
X28	2	x	12	x	x	20PIN
X30	x	x	x	x	16	20PIN

Y Series I/O Board Model List

You can select the appropriate Y series I/O board based on your requirements, as the Y series I/O modules are compatible with all Y slots.

When the Y63 is selected, you can not choose second Y-series I/O board.

Model	Description	Model	Description
Y01	4xDI+4xDO(NPN)	Y41	4xAO, 0~20mA/4~20mA
Y02	4xDI+4xDO(PNP)	Y43	4xAO, 0~5V/0~10V
Y11	8xDI(NPN)	Y46	4xAO, ±5V/±10V
Y12	8xDI(PNP)	Y51	2xRTD, 3-Wire PT100
Y13	8xDI(Dry Contact)	Y52	2xRTD, 3-Wire PT1000
Y21	8xDO(PNP)	Y53	2xRTD, 4-Wire PT100
Y22	8xDO(NPN)	Y54	2xRTD, 4-Wire PT1000
Y24	4xDO(Relay)	Y56	Resistance Measurement
Y31	4xAI, Single-ended, 0~20mA/4~20mA	Y57	Voltage Measurement
Y33	4xAI, Single-ended, 0~5V/0~10V	Y58	4xTC
Y34	4xAI, Differential, 0~5V/0~10V	Y63	4xRS485 or RS232
Y36	4xAI, Differential, ±5V/±10V	Y95	4xPWM Output(NPN) + 4xPulse Counter Input
Y37	4xIEPE	Y96	4xPWM Output(PNP) + 4xPulse Counter Input

Ordering Notes

Y01: DI channels support dry contacts or NPN-type wet contact sensors.

Y02: DI channels support dry contacts or PNP-type wet contact sensors.
Y58: Supports thermocouples of types J, K, T, E, R, S, B, and N

6. Electromagnetic Compatibility Testing

Test	Item	Standard	Level	Condition	Result	Remarks
Electromagnetic Emission	Conducted Emission	GB/T 9254 Class A/ CISPR 32 Class A	Class A	150 kHz - 30 MHz	PASS	Complies with limits for general industrial environments
	Radiated Emission	GB/T 9254 Class A/ CISPR 32 Class A	Class A	30 MHz - 1 GHz	PASS	Complies with limits for general industrial environments
Immunity Testing	ESD	GB/T 17626.2/IEC 61000-4-2	Level III	Contact discharge: ±4 kV; Air discharge: ±8 kV	PASS	—
	Radiated RF Immunity	GB/T 17626.3/ IEC 61000-4-3	Level III	Field strength: 10 V/m, 80 MHz – 1 GHz	PASS	—
	EFT	GB/T 17626.4/ IEC 61000-4-4	Level III	Power lines: 2 kV; Signal lines: 1 kV	PASS	—
	Surge	GB/T 17626.5/ IEC 61000-4-5	Level III	Differential mode: 2 kV; Common mode: 4 kV	PASS	—
	Voltage Dips and Interruptions	GB/T 17626.11/ IEC 61000-4-11	Level III	Voltage dip: 70% for 500 ms; Complete interruption: 10 ms	PASS	—
	Power Frequency Magnetic Field Immunity	GB/T 17626.8/ IEC 61000-4-8	Level III	Test intensity: 30 A/m, 50 Hz	PASS	—

7. Environmental Suitability Testing

Test Item	Standard	Level	Condition	Result	Remarks
Low-Temperature Startup & Operation	GB/T 2423.1-2008/IEC 60068-2-1	N/A	Ambient temperature: +40°C, device starts and operates normally	Compliant	Meets basic low-temperature startup requirements for

					industrial environments.
High-Temperature Startup & Operation	GB/T 2423.2-2008/IEC 60068-2-2	N/A	Ambient temperature: +85°C, device starts and operates normally	Compliant	Meets basic high-temperature startup requirements for industrial environments.
Constant Damp Heat	GB/T 2423.3-2016/IEC 60068-2-78	N/A	Ambient temperature: +40°C, relative humidity: 85%, powered operation for 48 hours	Compliant	Ensures stable operation in humid environments.
Sinusoidal Vibration	GB/T 2423.10-2019/IEC 60068-2-6	N/A	Frequency range: 5 Hz to 500 Hz, acceleration: 2g, 10 cycles per axis (3 axes)	Compliant	Validates vibration resistance during transportation and installation.
Free Fall	GB/T 2423.7-2018/IEC 60068-2-31	N/A	With packaging: Free fall from 0.8 meters, 1 drop per face (6 faces total)	Compliant	Ensures impact resistance during transportation.
IP	GB/T 4208-2017/IEC 60529	IP30	Dust protection: Prevents entry of solid foreign objects ≥2.5mm in diameter	Compliant	Meets industrial environmental protection requirements.

Test Conclusion

After undergoing fundamental environmental adaptability testing, the device fully complies with the basic requirements of the Chinese GB/T national standards and corresponding IEC standards, demonstrating stable operation in standard industrial environments.

The following results ensure the device meets a wide range of industrial application scenarios:

- Low/High-Temperature Tests: Validates the device's operational capability under basic industrial environmental conditions.
- Vibration and Free Fall Tests: Ensures reliability during transportation and installation.
- IP Test: Complies with fundamental protection requirements for industrial environments.

8. Packing List

- One ARM embedded controller
- One set of DIN35 mounting brackets
- Ubuntu file system
- Pressure-free terminal blocks configured according to selected accessories
- When purchasing Wi-Fi and 4G modules, antennas for Wi-Fi and 4G modules will be included.

9. Technical Support & Services

- ◆ Provide system firmware images, file system images, kernel driver source code, and a variety of demo programs.
- ◆ Offer a comprehensive platform development kit and introductory tutorials to save software organization time and simplify application development.
- ◆ Provide a rich set of development examples for reference to simplify application development, including:

- ✓ Linux, Linux-RT, Qt Application Development Examples
- ✓ BLIoTLink Industrial Protocol Data Collection and Cloud Platform Integration Development Case
- ✓ BLRAT Remote Access Usage Case
- ✓ Node-Red IoT Application Development Case
- ✓ Docker Container Technology, MQTT Communication Protocol Examples
- ✓ Baremetal (Bare-metal), RT-Thread (RTOS) development cases
- ✓ Cortex-A53 and Cortex-M0 Core Communication Example
- ✓ Qt-5.15.10 is a comprehensive software development kit (SDK)
- ✓ Demonstration examples for Debian, Ubuntu, and Android operating systems
- ✓ Debian-based ROS Demonstration Example
- ✓ IgH EtherCAT Master and CAN Development Case
- ✓ NPU, ISP, OpenCV Development Cases
- ✓ 4G/5G/Wi-Fi/Bluetooth Development Cases
- ✓ X-board, Y-board and other peripheral drivers
- ✓ Assistance with Product Customization and Development
- ✓ Customized Research and Development (R&D) and Manufacturing
- ✓ Provide Long-Term After-Sales Service

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