PHYTEC

NEW PRODUCTS EMBEDDED VISION

21/22

ENGLISH

phyCAM-M-mini

smallest
Board-Level Camera
for M12 Lenses

phyCAM-L

Board-Level Camera
with up to 15 m
Camera Cable

phyCAM-L Kits

Starter Kits – long
cable lengths
Efficiently evaluated

phyCONTROL-Ain

flexible
Control Unit in
DIN rail housing

phyCORE-i.MX 8M Plus

powerful Computer
Module for AI
Applications

phyBOARD-Pollux

i.MX 8M Plus Imaging Kit
with ISP and NPU for
Embedded Vision

phyCORE-i.MX 8M Mini

low-cost Computer
Module for
Image Processing

phyBOARD-Polis

i.MX 8M Mini Imaging Kit
Embedded Vision
made easy

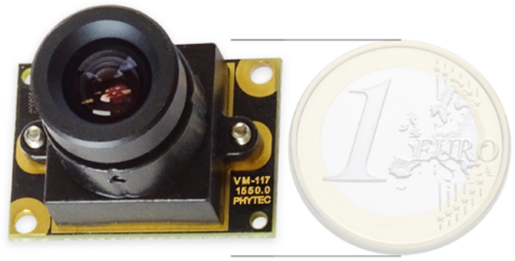
phyCAM®-**M-mini**

VM-116 / VM-117

Extremely small board-level cameras with MIPI CSI-2 interface

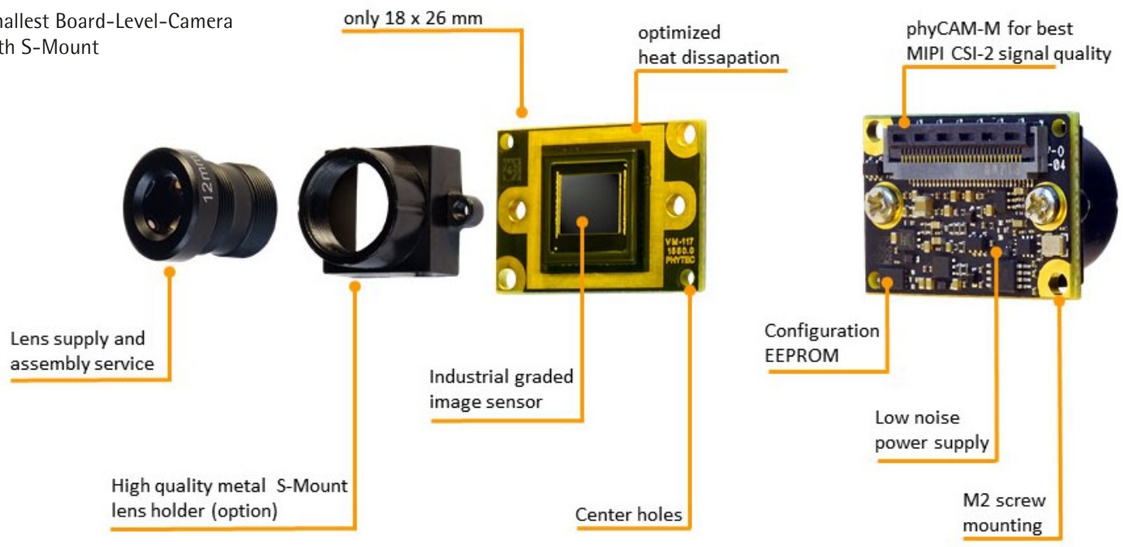
Your Benefits

- Only 18 mm x 26 mm size
- Monochrom or Color Sensor
- Suitable for industry for professional series use
- -25°C to +85°C
- MIPI CSI-2-Standard
- EMI optimized phyCAM-M-Interface
- Exchangeable, long-term available camera modules



phyCAM-M-mini

Smallest Board-Level-Camera with S-Mount



Outstanding Image Quality

The VM-116/VM-117 opens the phyCAM-M-mini series from PHYTEC. The 18 mm x 26 mm camera modules are functionally identical to their "big brothers" VM-016/ VM-017. Both board-level cameras feature modern CMOS sensors and are available as color or monochrome versions. While the VM-016/VM-017 with the phyCAM standard size of 34 mm x 34 mm are mechanically compatible with the other models of the phyCAM series and are optionally available with S-mount (M12) and C/CS-mount lens holders, the focus of the VM-016/VM-017 is on the most compact design possible for S-mount lenses.

The camera modules are electrically compatible through the phyCAM-M interface and can be connected immediately to all PHYTEC boards with MIPI CSI-2 camera interface. During the development of the VM-116/117, special attention was paid to mechanical features due to the compact design. In addition to two full-size mounting holes, two centering holes ensure easy and accurate mounting. Optimal heat dissipation is provided by support surfaces on the front, which in the S-mount version also use the metallic holder for dissipation. As for all phyCAM models, PHYTEC supplies the appropriate driver software ready for use in the BSPs of its development kits. The lens assembly service enables the customer to receive their camera module fully assembled with individual lens.

Main Characteristics

	VM-117	VM-116
Resolution	2592 x 1944 (5 MP)	1280 x 800 (1 MP)
Color/Monochrome	-COL / -BW	-COL / -BW
Color Format (-COL/-BW)	Bayer Pattern / Y	Bayer Pattern / Y
Interface	phyCAM-M (MIPI CSI-2)	phyCAM-M (MIPI CSI-2)
Image Sensor (-COL/-BW)	AR0521	AR0144
Sensor Size	1/2.5" 5.7 mm x 4.3 mm	1/4" 3.84 mm x 2.4 mm
Pixel Size	2.2 µm x 2.2 µm	3 µm x 3 µm
Shutter Type	Rolling	Global
Frame Rate (full-size image)	60 fps (max.)	60 fps
Frame Rate (Standard Video)	120 fps (Full HD)	66 fps (HD)
Dynamic Range	40 dB	63.9 dB
Features (optional)	Strobe / Trigger	Strobe / Trigger
Operating Voltage	3.3 V DC	3.3 V DC
Connector Type (Signal)	FFC/FPC 30 pin, 0.5 mm pitch	FFC/FPC 30 pin, 0.5 mm pitch
Operating Temperature	-25°C...+85°C (Junction)	-25°C...+85°C (Junction)
Lens Mount	plain sensor / M12	plain sensor / M12
Lens	optional, customizable	optional, customizable
PCB Dimensions	18 mm x 26 mm	18 mm x 26 mm

NEW

phyCAM-M-mini VM-117

→ To Product Side

NEW

phyCAM-M-mini VM-116

→ To Product Side

More Characteristics

	VM-117	VM-116
Sensor Technology	CMOS, Backside Illumination	CMOS, Backside Illumination
Sensitivity	18.8 ke−/lux*sec (COL) 36.0 ke−/lux*sec (BW)	22.3 ke−/lux*sec (COL) 56.0 ke−/lux*sec (BW)
Chief Ray Angle	9°	0°
ROI	yes	yes
Skipping	2 / 3 / 4	2 / 4 / 8 / 16
Binning	yes	yes
Mirror / Flip	yes	yes
Defective Pixel Correction	yes	yes
Control Interface	I²C	I²C
Interface Data Width	8/10/12 Bit	8/10/12 Bit
Special Feature	interleaved HDR	AEC / AGC
Mounting Points	2 x M2	2 x M2

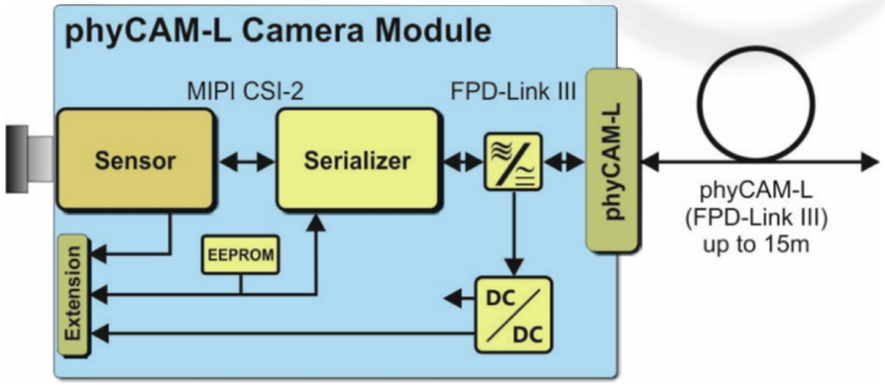
phyCAM®-L

VM-016 / VM-017

Board-Level Cameras with FPD-Link III Interface and Mini-Coaxial Jack

Your Benefits

- Monochrome or Color Sensor
- Signalübertragung up to15 m
- A coaxial cable for data and power supply
- Single-board camera for industrial series production
- FPD-Link III-Transmission
- Optimized for internal and external device use
- Easy connection to MIPI CSI-2 receiver



Experience New Ranges

With the new phyCAM-L camera interface, PHYTEC solves the problem of the length limitation of the MIPI CSI-2 interface. While MIPI CSI-2 allows a maximum of approx. 15 cm between camera module and processor board, phyCAM-L allows up to 15 m to be bridged. By using subminiature connectors, phyCAM-L is very compact and cost-effective as a single-board module. The flexible coaxial cable functions simultaneously as a data channel and power supply. No additional cable is required. Data is transmitted using the FPD-Link III protocol, which has been tried and tested in the automotive sector. The camera modules even offer a plug-in connection for extensions.

A special feature of phyCAM-L is that the system is also particularly well suited for device-internal cabling. This can be done with a millimeter-thin, cost-effective RG1.37 cable. External connections can be customized to the task at hand using pigtail adapters. A kit with a phyCAM receiver board is available for development, which can be connected to all processor boards using a phyCAM-M MIPI CSI-2 interface.

NEW

phyCAM-L VM-017

→ To Product Side

NEW

phyCAM-L VM-016

→ To Product Side

Main Characteristics

	VM-017	VM-016
Resolution	2592 x 1944 (5 MP)	1280 x 800 (1 MP)
Color/Monochrome	-COL / -BW	-COL / -BW
Color Format (-COL/-W)	Bayer Pattern / Y	Bayer Pattern / Y
Interface	phyCAM-L (FPD-Link III)	phyCAM-L (FPD-Link III)
Image Sensor (-COL/-BW)	AR0521	AR0144
Sensor Size	1/2.5" 5.7 mm x 4.3 mm	1/4" 3.84 mm x 2.4 mm
Pixel Size	2.2 µm x 2.2 µm	3 µm x 3 µm
Shutter Type	Rolling	Global
Frame Rate (full-size image)	48 fps (max.)	60 fps
Frame Rate (Standard Video)	84 fps (Full HD)	66 fps (HD)
Dynamic Range	40 dB	63.9 dB
Features (optional)	Strobe / Trigger	Strobe / Trigger
Operating Voltage	4.5 - 13.2 V DC	4.5 - 13.2 V DC
Connector Type (Signal)	UMCC Gen1, Coaxial	UMCC Gen1, Coaxial
Operating Temperature	-25°C...+85°C (Junction)	-25°C...+85°C (Junction)
Lens Mount	plain sensor / M12 / C-CS	plain sensor / M12 / C-CS
Lens	optional, customizable	optional, customizable
PCB Dimensions	34 mm x 34 mm	34 mm x 34 mm

More Characteristics

	VM-017	VM-016
Sensor Technology	CMOS, Backside Illumination	CMOS, Backside Illumination
Sensitivity	18.8 ke-/lux*sec (COL) 36.0 ke-/lux*sec (BW)	22.3 ke-/lux*sec (COL) 56.0 ke-/lux*sec (BW)
Chief Ray Angle	9°	0°
ROI	yes	yes
Skipping	1 / 2 / 3 / 4	2 / 4 / 8 / 16
Binning	yes	yes
Mirror / Flip	yes	yes
Defective Pixel Correction	yes	yes
Control Interface	I²C	I²C
Interface Data Width	8/10/12 Bit	8/10/12 Bit
Special Feature	I2C / Power / Strobe-Connector	AEC / AGC
Connector Type Trigger / Sync.	JST 3 pin	JST 3 pin
Mounting Points	4 x M2.5	4 x M2.5

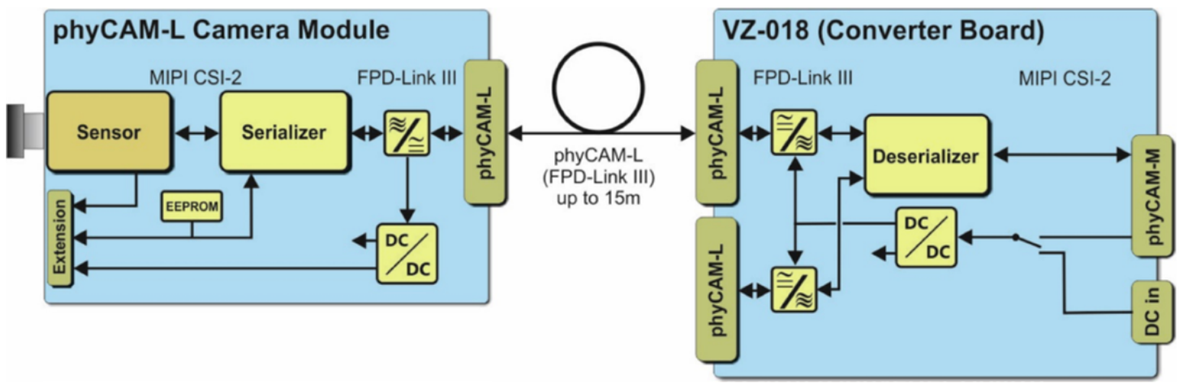
phyCAM®-L Starter Kits

FPD-Link III Starter Kits

phyCAM-L Board-Level Camera incl. Converter to phyCAM-M (MIPI CSI-2) interface

Your Benefits

- Starter Kit for easy implementation of phyCAM-L solutions
- FPD-Link III Standard
- Creation of a transparent MIPI CSI-2 channel
- Connection to all imaging boards with phyCAM-M input
- Up to 15 m coaxial cable length (Power-over-Coax)
- Kit contents: Camera module with FPD-Link III interface, VZ-018: FPD-Link III converter board phyCAM-L/ M with phyCAM-M output (MIPI CSI-2), reference schematics, accessories



This is how efficiency works

The kits allow the VM-016-L or VM-017-L board-level camera to be commissioned on any compatible embedded imaging kit. The phyCAM-L interface connects the camera module and converter board via a single coaxial cable of up to 15 m length. Power-over-coax eliminates the need for an additional power supply cable.

On the receiver side, the VZ-018 converter board provides conversion to MIPI CSI-2 and can be easily connected to a compatible embedded imaging kit via the phyCAM-M interface.

The FPD-Link III based phyCAM-L interface is transparent for data transfer. After initialization of the transmission path, the camera driver already integrated in the BSP can be used for the camera modules.

The converter board has two phyCAM-L inputs. Two camera modules can be connected to the phyCAM-M output. The power supply for the camera module can be provided directly from the computer board via the phyCAM-M interface or, if required, can be supplied externally at the converter board.

The kit contains a highly flexible coaxial cable of type RG1.37, which is particularly suitable for internal device wiring. It can be connected directly to the UMCC Gen.1 sockets of the camera module and converter board. Other cable types (e.g. RG174) can be used via pigtail adapters (accessories). Adapters are available e.g. with SMA or FAKRA connectors.

For serial use, the converter circuit is usually integrated on the base board. The necessary information and reference schematics are included in the kit.

Starter Kits

- VM-016-L FPD-Link III Starter Kit
- VM-017-L FPD-Link III Starter Kit

Suitable Embedded Imaging Kits →

- phyBOARD-Pollux Imaging Kit
- phyBOARD-Polaris Imaging Kit
- phyBOARD-Polis Imaging Kit
- phyBOARD-Nunki Imaging Kit

NEW

VM-017-L FPD-Link III Starter Kit

→ To Product Side

NEW

VM-016-L FPD-Link III Starter Kit

→ To Product Side

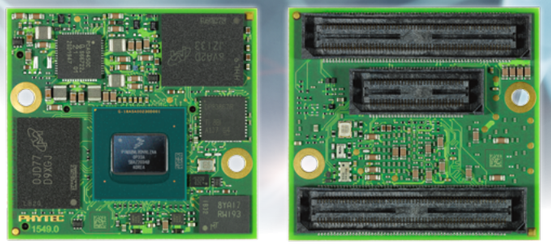
The phyCONTROL-Ain already has an on-board converter and can be connected directly to a phyCAM-L camera module via a Fakra adapter.

→ p. 12

phyCORE®-i.MX 8M Plus

ARM Cortex™-A53/-M7

The "smartest" i.MX 8 module

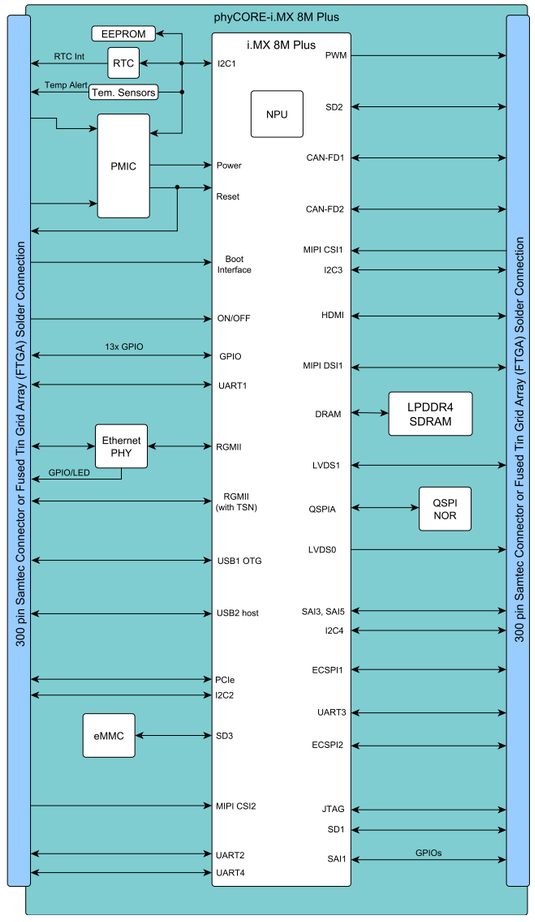


Your Benefits

- Neural Processing Unit
- 2x Image Signal Processor + 2x MIPI CSI-2
- HiFi 4 Audio DSP
- 2x LVDS, MIPI DSI-2, HDMI
- Real-time with Cortex-M7
- 2x GB Ethernet (1x with TSN)
- 2x CAN FD, 2x USB 3.0
- High reliability (DRAM inline ECC, ECC on on-chip RAM)
- Scalable plug-in module (60 pin connector optional) or FTGA (Fused Tin Grid Array) solder module

Based on the NXP i.MX 8M Plus SoC, the phyCORE-i.MX 8M Plus is the "smartest" PHYTEC module. Equipped with up to 4 Cortex-A53, one Cortex-M7 for real-time applications, and a unique combination of a variety of multimedia interfaces with a powerful NPU (Neural Processing Unit) and the integrated image signal processors (ISPs), the i.MX 8M Plus SoC is ideally suited for machine learning (ML), image processing, advanced multimedia, and industrial IoT applications.

The scalable and size-optimized phyCORE-i.MX 8M Plus is the perfect basis for using all the i.MX 8M Plus features in areas where intelligent and fast processing of multimedia data in a small space is required. Be it in the Smart Home (e.g. home automation), the Smart City (e.g. people/traffic monitoring), Industry 4.0 (e.g. intelligent robot control, HMI) or IIoT applications (e.g. edge computing).



NEW

phyCORE-i.MX 8M Plus

→ To Product Side

phyBOARD®-Pollux

NXP i.MX 8M Plus Imaging Kit

Embedded vision development kit with phyCAM-M camera

Your Benefits

- phyCORE-i.MX 8M Plus Processor board
- 2 MIPI CSI-2 Inputs
- 2 integrated image signal processors (ISP)
- NPU Neuronal Processing Unit
- Incl. global shutter HD color camera
- Ready to go: pre-installed Linux image with integrated V4L2 camera driver
- Two independent phyCAM-M MIPI CSI-2 camera interfaces
- Hardware Video Encoder/Decoder (H.264/H.265)
- Connectivity: Gigabit Ethernet, 2x USB 3.0, miniPCIe

Premier League Embedded Vision
The phyCORE-i.MX 8M Plus board opens up a new performance class for embedded vision applications:

- The integrated Image Signal Processors (ISP) process the camera image data independently of the CPU. Bayer demosaicing of high-resolution live streams is possible in real time without CPU load.
- Two independent camera interfaces for MIPI CSI-2 camera modules of the latest generation. Due to the standardized phyCAM-M connectors on the base board, different camera boards can be connected easily.
- The 1.6 GHz Quad Cortex-A53 NXP processor with an M7 real-time co-processor enables the creation of completely new and powerful image processing systems.
- The advanced video encoder and decoder can also process H.265 formats in both directions.

AI Edge Computing
The first module with integrated neural co-processor drastically accelerates AI and machine learning processing. The NPU unit with 2.3 TOPS can accelerate the processing of neural networks by a factor of 20. Even more complex tasks can be computed on the module without having to process the data in the cloud. The NPU is integrated in the BSP via Tensor-Flow Lite.

Exceptional Connectivity
The phyBOARD-Pollux integrates the greatest possible variety of interfaces: in addition to the two phyCAM-M interfaces, the board is equipped with 2x USB 3.0, 2x CAN FD, 2x Gigabit Ethernet, miniPCIe, LVDS display, MIPI DSI, HDMI, audio and digital I/Os.

Better Integrated – Faster in Series
The kit is based on the production-ready components phyCORE-i.MX 8M Plus and phyCAM VM-016-M camera module. You develop with exactly the components that will later be used in your series device. This makes the transfer to series production particularly easy and safe.

Use our support, our enclosed reference circuit diagrams and our advance services for your designs or create your design together with us.

The Embedded Imaging Kit Pollux can also be delivered with other hardware configurations (e.g. with other camera modules of the phyCAM-M series). Let us put together your individual desired kit for you.

NEW

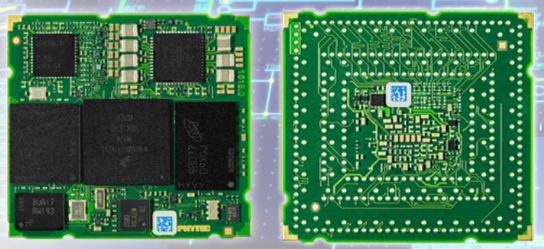
phyBOARD-Pollux Imaging Kit

→ To Product Side

phyCORE®-i.MX 8M Mini/Nano

ARM Cortex™-A53/-M4

Energy-efficient computing power on only 40 mm x 37 mm



Your Benefits

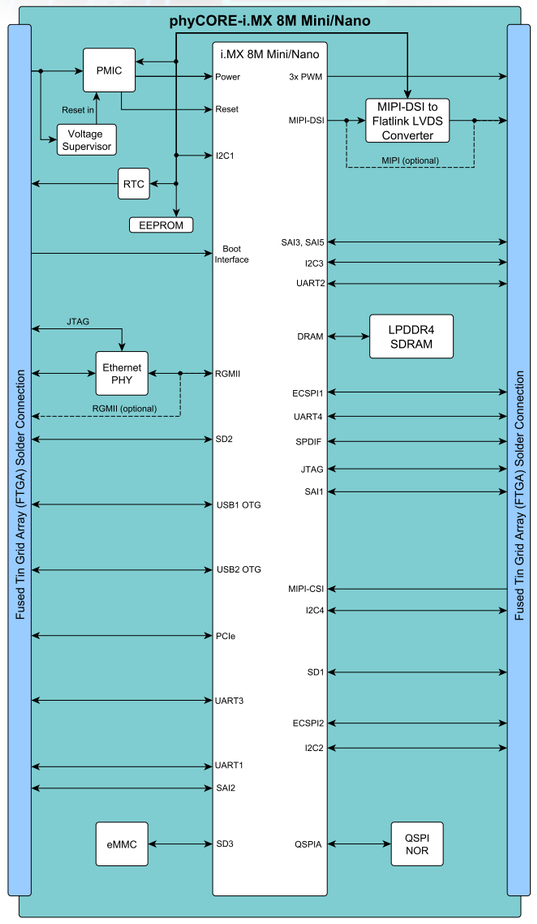
- Scalable performance i.MX 8M Mini SoloLite to Quad
- Cortex-M4 for real-time applications
- MIPI-DSI to FlatLink converter
- Optimal EMI and EMC properties
- FTGA soldering technology
- Resistance to shock and vibration
- 1080p Video Encoding/Decoding
- 2D/3D Graphics acceleration
- MIPI CSI-2
- Multi-channel Audio
- Pin compatible with i.MX 8M Nano processor

Multimedia-Encoder – Video, Grafic, Audio
The i.MX 8M Mini encodes video and converts camera raw data into a transferable format. i.MX 8M Mini is the performance-oriented multimedia professional, i.MX 8M Nano has slimmer multimedia features and is more cost-effective.

Scalable Performance Across the i.MX 8 Family
PHYTEC maintains the same SW infrastructure under Yocto for all derivatives of the entire i.MX 8 family.

Hard Real-Time and Convenient Application
The Cortex-A53 processor comfortably handles application tasks with the support of an operating system. The Cortex-M4 controller handles deterministic tasks with real-time requirements.

High Performance with Low Power Consumption
Simpler heat dissipation designs due to favorable Mips per Watt ratio of Advanced 14LPC FinFET Process technology.



NEW

phyCORE-i.MX 8M Mini / Nano

→ To Product Side

phyBOARD®-Polis

NXP i.MX 8M Mini Imaging Kit

Embedded Vision Development Kit with phyCAM-M camera

Your Benefits

- phyCORE-i.MX 8M Mini Processor board
- 4-lane MIPI CSI-2 Iput (phyCAM-M)
- Integrated H.264 Encoder/Decoder
- Incl. 1 MPixel Global Shutter HD-color camera
- Incl. 10" Display incl. capacitive touch
- Ready to go: pre-installed Linux image with integrated V4L2 camera driver
- i.MX 8M Mini-Processor with 4 x Cortex-A53 Cores and 1 x Cortex-M4
- WiFi/BLE4.2 onboard
- Hardware Video Encoder/Decoder Hantro (H.264/H.265) 1080p60
- Connectivity: Gigabit-Ethernet, 2 x USB 2.0, miniPCIe

Embedded vision made easy
The phyCORE-i.MX 8M Mini Board is particularly suitable for simple and cost-effective embedded vision applications. Compared to the vision all-rounder i.MX 8M plus, emphasis was placed here on the most important entry-level components of an image processing system:

- A camera interface for MIPI CSI-2 camera modules of the latest generation. The standardized phyCAM-M connector on the baseboard makes it easy to connect different camera boards.
- Direct image data transfer from the CSI interface to the system bus and provision for processing in the CPU and GPU.
- H.264 Video-Encoder and H.264/H.265 Decoder with 1080p60.
- 1,6 GHz Quad Cortex-A53 NXP processor with an M4 real-time co-processor allows building simple yet powerful image processing systems.

Better integrated – Faster in series
The kit is based on the production-ready components phyCORE i.MX 8M Mini and the phyCAM VM-016-M board-level camera. You develop with exactly the components that will later be used in your series device. This makes the transfer to series production particularly easy and safe. Take advantage of our support, our enclosed reference schematics and our advance services for your designs or create your design together with us. The Embedded Imaging Kit Polis can also be delivered with other hardware configurations (e.g. with other camera modules of the phyCAM-M series). Let us put together your individual desired kit for you.

NEW

phyBOARD-Polis Imaging Kit

→ To Product Side

ANNOUNCEMENT

phyCONTROL®-Ain

IIoT-Control Unit

Intelligent and innovative
Control unit in DIN rail housing

Highlights

- Industrial and long-term available i.MX 8M Plus Cortex-A53/-M7 controller
- Machine learning without cloud connection
- Two independent camera editing stations for e.g. 2D/3D image processing
- Supports a wide range of industrial network standards (5x Gbit Ethernet (4x TSN), CAN FD, I2C, SPI, etc.)
- Protection of customer data and know-how through optional TPM chip
- Open to innovation through expansion plugs
- OEM modifiable in terms of branding and delivery condition
- 1 x phyCAM-M (Mipi CSI-2) internal
- 1 x phyCAM-L (FPD-Link III) external

Das phyCONTROL-Ain is the powerful and intelligent allrounder from the family of OEM solutions. It offers high computing power, outstanding graphical capabilities, the possibility for real-time applications, as well as a powerful NPU that allows AI or machine learning without cloud connection. A multitude of industrial interfaces, two camera interfaces, display connectors, a mini-PCIe slot and much more allow almost unlimited application possibilities, whether for Industry 4.0, IIoT applications, medical technology, etc.

Flexible assembly options enable optimal adaptation with regard to application area and costs. A sophisticated range of services, such as partial or complete development, production and assembly, branding and labeling, packaging and logistics, makes it possible to go into series production quickly and ensures an easy and successful market launch.

NEW

phyCONTROL-Ain IIoT-Control Unit

→ To Product Side

Your Benefits

- Extensive pre-service package for fast and and favorable implementation of your innovative ideas
- Easy time to market and success with applications for e.g. embedded imaging, artificial intelligence, industrial communication (especially TSN)
- Easy integration of your systems into cloud solutions
- Security for your customers through secure boot, secure root file system, and certificate management
- Up-to-date Linux/Yocto versions from the start including long-term maintenance
- Update service for your customers through device management solutions from PHYTEC
- Extension packages for embedded imaging and AI