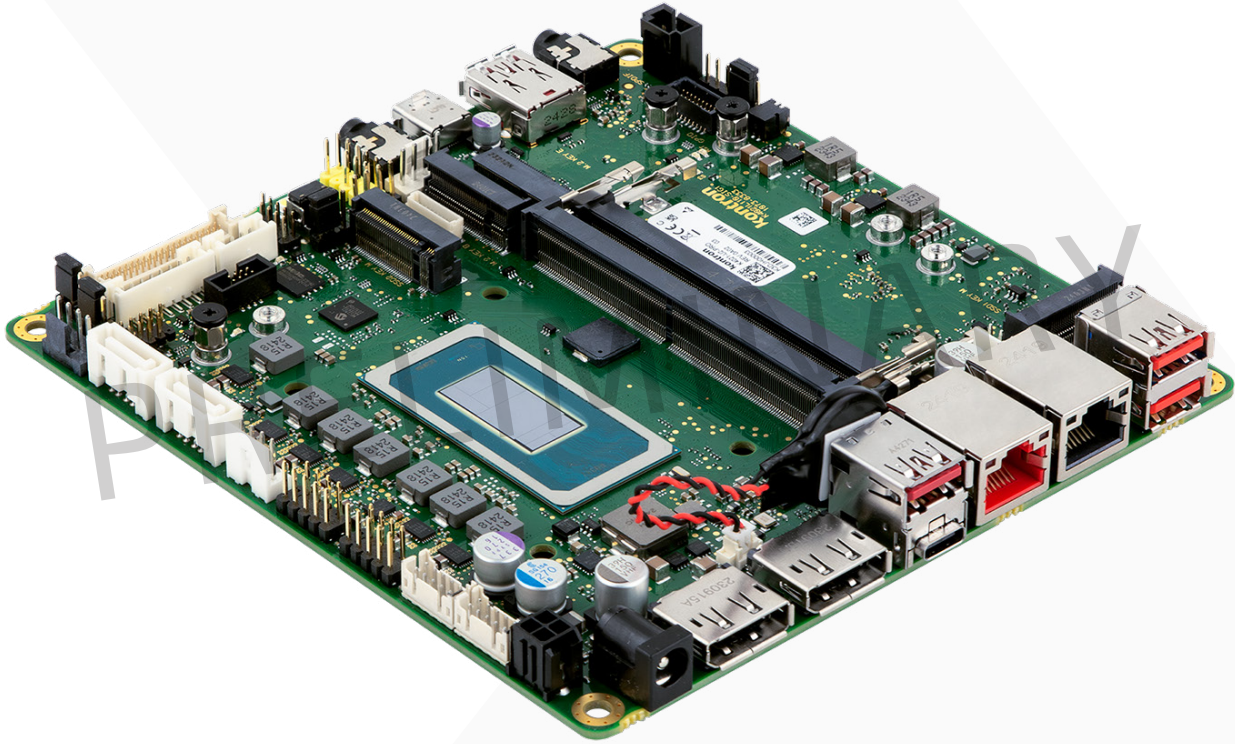


K4021-U mSTX Industrial Series



Intel® Core™ Ultra 7 & 5 Processors Meteor Lake U

- ▶ Latest DDR5 memory technology for best-in-class system performance
- ▶ Intel® Graphics - driven by Intel® X^e architecture (within SoC)
- ▶ Up to four concurrent 4K60 HDR displays or two 8K displays / Thunderbolt 4 support
- ▶ Dual Channel LVDS (24 Bit) and eDP V1.4b (4 K) onboard
- ▶ New integrated NPU for dedicated AI acceleration with up to 20x performance/watt improvement

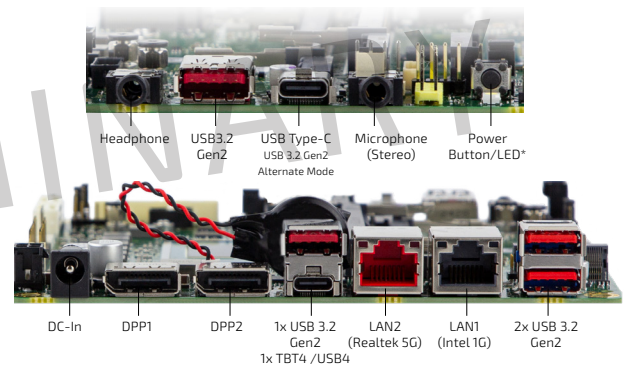
K4021-U mSTX Industrial Series

The Industrial Motherboard K4021-U mSTX is based on the latest Intel® Core™ Ultra with powerful UHD Gen12 graphics using Intel® Xe architecture. There are two DisplayPorts, one DisplayPort via front USB-Type-C and one Display Port via rear USB-Type-C with Thunderbolt 4 support plus onboard connectors for Embedded DisplayPort and Dual-Channel 24bit LVDS panels. Four independent displays with up to 4K display resolution or up to two with 8K are supported.

The K4021-U is equipped with four M.2 (Storage and Wifi) connectors and in addition to this offers many other connectivity options like GPIO, two COM ports, Thunderbolt 4, and USB 3.2 Gen2. Designed and approved for 24/7 continuous operation and an enhanced temperature range up to 60 °C the K4021-U is applicable in many vertical markets.

- Intel® Core™ Ultra Processors
- DDR5-5600 SODIMM, max 96 GByte
- Intel® Graphics @ MTL-U, Xe LPG (within SoC)
- 2x DisplayPort V1.4a
- Dual Channel LVDS (24 bit) and eDP V1.4b
- 8 Bit GPIO & HD Audio onboard
- 4x USB3.2 Gen2
- 1x USB Type-C with DP Alt mode
- 1x USB Type-C with Thunderbolt 4 / USB4 Support
- 1x Intel® i219LM (with iAMT support) GbE LAN, 1x Realtek RTL8126 5GbE incl. Teaming
- 2x SATA 6G
- 2x M.2 Key M x4 Gen4
- 1x M.2 Key B
- 1x M.2 Key E (WLAN)
- Intel® integrated iTPM V2.0
- 2x RS-232 support onboard

- HW Watchdog onboard
- WideRange internal/external DC input 9-24V PowerDelivery Sink Mode (20V DC-In via Rear USB-C)



Technical Information

SYSTEM	PROCESSOR MEMORY	Intel® Core™ Ultra 7 155U Intel® Core™ Ultra 5 125U DDR5 5600 SDRAM 2x SO DIMM socket, up to 96 GByte memory, non-ECC
VIDEO	GRAPHICS	Intel® Graphics driven by Intel® Xe® with up to 8 Xe-cores 1x Thunderbolt 4 (DP2.1 up to UHBR20 8K) 2x DP V1.4a up to 8K 1x USB-C with DPoC* 1x eDP V1.4b up to 5K/1x Dual-Channel 24bit LVDS** 1x Dual-Channel 24bit LVDS Supports 4 simultaneous 4K encode streams
AUDIO	AUDIO CODEC AUDIO INTERFACE	Realtek ALC256 Stereo, High Definition Audio Codec
NETWORK CONNECTION	ETHERNET 1 ETHERNET 2	Intel® i219LM with 10/100/1000 MBit/s, iAMT features, Wake-on-LAN (WoL) by interesting Packets, Link Status Change and Magic Packet™, PXE Support, BIOS MAC Address Display, Teaming Support Realtek RTL8126 with 10/100/1000/2500/5000 MBit/s, TSN Support, Wake-on-LAN (WoL) by interesting Packets, Link Status Change and Magic Packet™, PXE Support, BIOS MAC Address Display, Teaming Support
PERIPHERAL CONNECTION	USB SERIAL PORT OTHER I/Os	4x USB 2.0 (by headers) 1x USB-C 3.2 Gen2 + 1x USB-C with Thunderbolt 4/USB4 support 4x USB3.2 Gen2 Type A 2x RS232 (by headers) 8 Bit GPIO (by header); WLAN LED support, WLAN enable/disable support 3.3 V/5 V/12 V supply voltage output; SMBus controller PCA9554A

*) DPoC: DisplayPort over USB-Type-C (Alternate Mode)
**) Simultaneous use of LVDS and eDP is not supported.

STORAGE & EXPANSION	SATA PCIe/M.2 SLOTS	2x Serial ATA III 600 Interface (up to 6Gbit/s), NCQ, AHCI, 1x M.2 2230/2242/2280 (Key-M, PCIe x4/Gen4/NVMe SSD modules) 1x M.2 2230/2242 (Key-M, PCIe x4/Gen4/NVMe SSD modules) 1x M.2 2242 (Key-B PCIe x2/USB2) 1x M.2 2230 (Key-E, WLAN/Bluetooth modules, PCIe/USB/CNVio)
POWER	CONNECTOR INPUT VOLTAGE	External/Internal DC-In (DC Jack/4-Pin Micro-Fit) DC Input 9–24V, max. 5A/100W (external DC-In), max. 10A/100W (internal DC-In) USB-C PowerDelivery (Sink, 20V, max. 100 W)
FIRMWARE	BIOS	AMI Aptio 5.x (UEFI) BIOS modified and adapted by Kontron; Recovery BIOS, SM-BIOS (DMI), BIOS and CPU Microcode Update, Quick Boot, Logo Boot, Quiet Boot, Plug & Play, Automatic DRAM and PCIe Configuration, BIOS Support for S.M.A.R.T., Advanced Power Management, ACPI S3/S4 (planned), Wake on time from S5.
	WATCHDOG REAL TIME CLOCK TPM	No legacy OS support, no MBR installation (UEFI only) BIOS POST-/BIOS BOOT-/OS-HW Watchdog TPM V2.0 (Intel® integrated)
SYSTEM CONTROL	FP HEADER SECURITY	1x Header for Reset button, HDD LED, Power button, Power LED Recovery BIOS, System and BIOS Password, Boot Sequence Control, Serial-/USB-Port Access Protection, Write Protection for Flash BIOS, EraseDisk (BIOS Feature), Intel integrated TPM V2.0
COOLING	FAN	2x PWM fan (CPU/System)
SOFTWARE	OS SUPPORT	MS Windows 10, MS Windows 11, MS Windows 10 IoT, Linux-64 No legacy OS support, no MBR installation (UEFI only)
MECHANICAL	DIMENSION (L x W)	Mini-STX: 5.5" x 5.8" (140 x 148 mm)
ENVIRONMENTAL	OPERATION TEMPERATURE	0 °C - 60 °C
CERTIFICATION	EMC + SAFETY	Planned: cTUVus acc. IEC62368-1, CE Class B incl. Industrial Immunity, UKCA, FCC-B verified

PRELIMINARY

Motherboard Versions

	PROCESSOR (SoC)	GRAPHICS Intel® UHD Gen12 Gfx	MEMORY
K4021-U2	Intel® Core™ Ultra 5 125U 12-Core @15W TDP (Flex cTDP option **) TDP 15W: 1.3 / 4.3 GHz	GPU @ 1.85 GHz 64x EU Up to 4 displays (4K120/5K60 HDR (1 pipe/1 port), 8K60 (2 pipe/1 port), 4x4K60 HDR (concurrent))	DDR5-5600 Two sockets Max. 96 Gbyte
K4021-U5	Intel® Core™ Ultra 7 155U 12-Core @15W TDP (Flex cTDP option **) TDP 15W: 1.7 / 4.8 GHz	GPU @ 1.95 GHz 64x EU Up to 4 displays (4K120/5K60 HDR (1 pipe/1 port), 8K60 (2 pipe/1 port), 4x4K60 HDR (concurrent))	DDR5-5600 Two sockets Max. 96 Gbyte

*) Base Frequency / 1 core Turbo / Multi core Turbo
**) cTDP – Easy & flexible reduction of CPU TDP down to 12 W

Power Supply Requirements

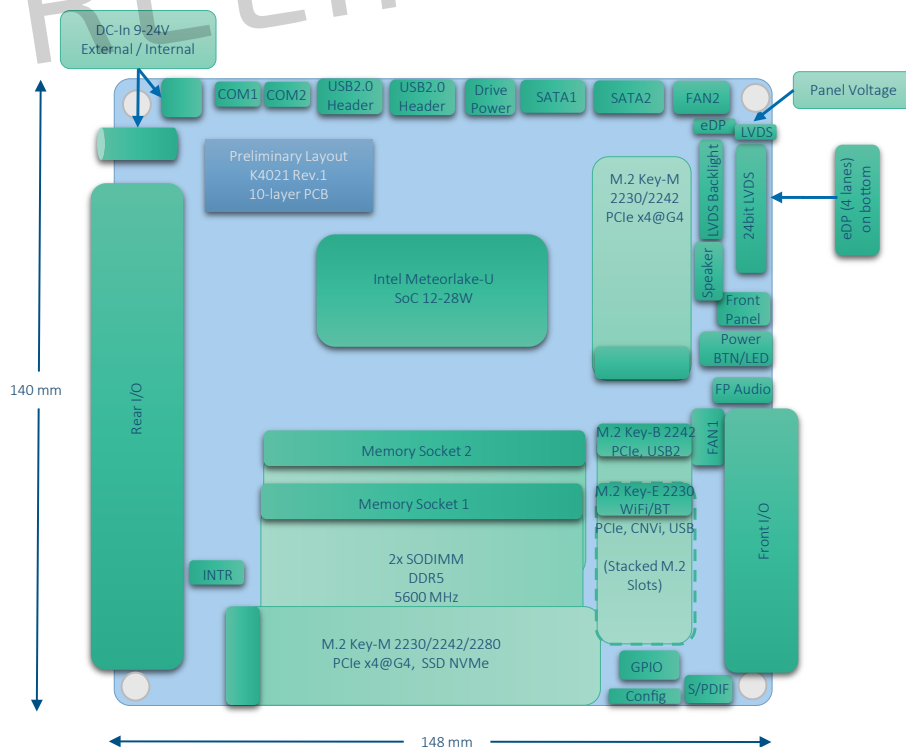
SOURCE	VOLTAGE RANGE	MIN. PS LOAD	MAX. VOLTAGE TOLERANCE	TYP. MOTHERBOARD INPUT POWER¹	MAX. MOTHERBOARD INPUT POWER²
DC-IN (WideRange)	9–24V	0 A	-5%/+10%, max 28V	tbd	100 W (external or internal DC-In)
USB-C	20V PD Sink	0 A	20V: +-5%	tbd	100 W

1) Motherboard incl. Memory and M.2 NVMe SSD (approximations for MS Windows 10 Idle Mode / Full Processor Load @ 15 W TDP)
2) Motherboard incl. Memory, M.2, PCIe/M.2 PCIe devices, USB
See TechNotes document for detailed power requirements

FEATURES	Chipset / SoC (APU) DPP / HDMI / LVDS / eDP Stereo Audio / 5.1 Multichannel Audio / Front Panel Audio Buzzer /int. Speaker support (stereo) ² GbE LAN / Dual GbE LAN / 2.5 GbE LAN / 5 GbE Lan WoL / PXE / LAN Teaming / TSN SATA / SATA RAID / M.2 (SATA) / M.2 (PCIe/NVME) USB 2.0 / USB 3.2 (Gen1) / USB 3.2 (Gen2) / USB 3.2 (Gen1) Type-C FAN monitored & controlled CPU / AUX1 / AUX2 TEMP monitored CPU / onboard sensors / external sensor	Intel® Core™ Ultra SoC + / - / + / + + / 0 ¹ / + + / + + / - / - / + + / + / + / + + / + / - / + + / - / + / + + / + / - + / + / -
SPECIAL FEATURES	COM interface support for RS-232 / RS-485 / RS-422 Silent Fan / System Guard Recovery BIOS / Flash Update / Multi Boot HDD Password / EraseDisk / TPM V2.0 onboard / optional TPM module BIOS POST- / BIOS Boot- / OS- HW Watchdog Operating Mode 24-7 / 8-5 (hrs per day - days per week) Motherboard operating temperature range (chassis inside) ³	+ / - / - + / + + / + / + + / + / + / - + / + / + + / - 0 °C ... +60 °C
INTERNAL CONNECTORS	50 DIMM Sockets (DDR5 5600) SATA-III / M.2 Key-M SSD / M.2 Key-B M.2 2230 (Key-E for WLAN/Bluetooth) Front Panel Audio (9-Pin, HD Audio) / S-PDIF Out (Digital Audio) USB 2.0 pin header (2 port) / USB 2.0 single port header / USB Stick socket USB 3.2 Gen1 pin header (2 ports) / USB 3.2 Gen2 Type A header Serial COM header / CCTalk header / Parallel Port header LVDS / LVDS Backlight / Embedded DisplayPort @ 4 lanes FAN PSU / CPU (PWM) / AUX1 (PWM) Intrusion (Case Open) / GPIO (8 Bit) / SMBus Stereo Speaker header / Digital Mic header Front Panel (Power Switch, Reset Switch, LEDs, Intel 10 pin header) ⁴ SATA Drive Power Connector (5 V/12 V) / DC-In Connector 9-24V (4 pin)	2 2 / 2 / 1 1 1 / 1 2 / 0 / 0 0 / 0 2 / 0 / - 1 / 1 / 1 - / 1 / 1 1 / 1 / 1 1 / - 1 1 / 1
EXTERNAL CONNECTORS	HDMI / DVI / VGA DisplayPort / USB Type-C Alternate Mode (DPoC) / Thunderbolt 4 Audio Mic. In / Line in / Line out (or driver configuration) LAN (RJ-45) / PS/2 Keyboard / Mouse USB 2.0 / USB 3.2 Gen1 / USB 3.2 Gen2 DC-In connector (external input) 9-24V, 100W max. Serial COM interface	- / - / - 2 / 1 / 1 1 / 0 / 1 2 / - / - 0 / 0 / 4 1 0

1) Multichannel audio only via S/PDIF or DPP
 2) Stereo speaker support; 2 W @4Ω
 3) Forced cooling required for high operating temperature range. See TechNotes document for details
 4) Header pin pitch is 2.0mm

Connector/Socket Diagram



ARTICLE	PART NO.	DESCRIPTION
K4021-U2	F5120-V252	Intel® Core™ Ultra 5 125U
K4021-U5	F5120-V255	Intel® Core™ Ultra 7 155U

Accessories

SLIM ACTIVE HEATSINK + BACKPLATE	F5000-C027	max. 28W TDP, designed for SMARTCASE™ S502
DRIVE POWER CABLE	S26361-F5000-K001	400 mm, power connector for 1x SATA and 1x slimline DVD
SERIAL PORT CABLE	S26361-F5000-K007	Short cable (120 mm), w/o slot bracket
SERIAL PORT CABLE	S26361-F5000-K010	400 mm, fullsize slot bracket
AC-ADAPTER 19V/65W	S26361-F5000-P006	For applications up to 35 W TDP (SoC)
AC-ADAPTER 20V/120W	S26361-F5000-P007	lockable connector
WLAN ANTENNA KIT	S26361-F5000-W005	WLAN antenna kit; left (grey)/right (black) antennas incl. cable for SMARTCASE™ S5xx. M.2 WLAN module not included!
WLAN ANTENNA KIT	F5000-W006	Box contains 10 dual antennas (incl. antenna cable) for SMARTCASE™ S5xx series. Additional support for WiFi 6E/WiFi 7; replaces F5000-W005
SMARTCASE™ S502	F5000-J015	Chassis kit solution, active cooling
WALL MOUNT BRACKETS	S26361-F5000-X001	Suitable for SMARTCASE™ S5xx, 2x Brackets per chassis incl. screws
VESA MOUNT KIT	S26361-F5000-X002	Suitable for SMARTCASE™ S5xx
DC-IN CONNECTOR LOCK	S26361-F5000-X003	Suitable for SMARTCASE™ S5xx, fits to AC-Adapter F5000-P006
CHASSIS INTRUSION KIT FOR SC-S5XX	F5000-K017	Contains 20x chassis intrusion cable plus 20x mounting bracket for Smartcase™ S5xx

Global Headquarters

Kontron Europe GmbH

Gutenbergstraße 2
 85737 Ismaning, Germany
 Tel.: + 49 821 4086-0
 info@kontron.com

www.kontron.com