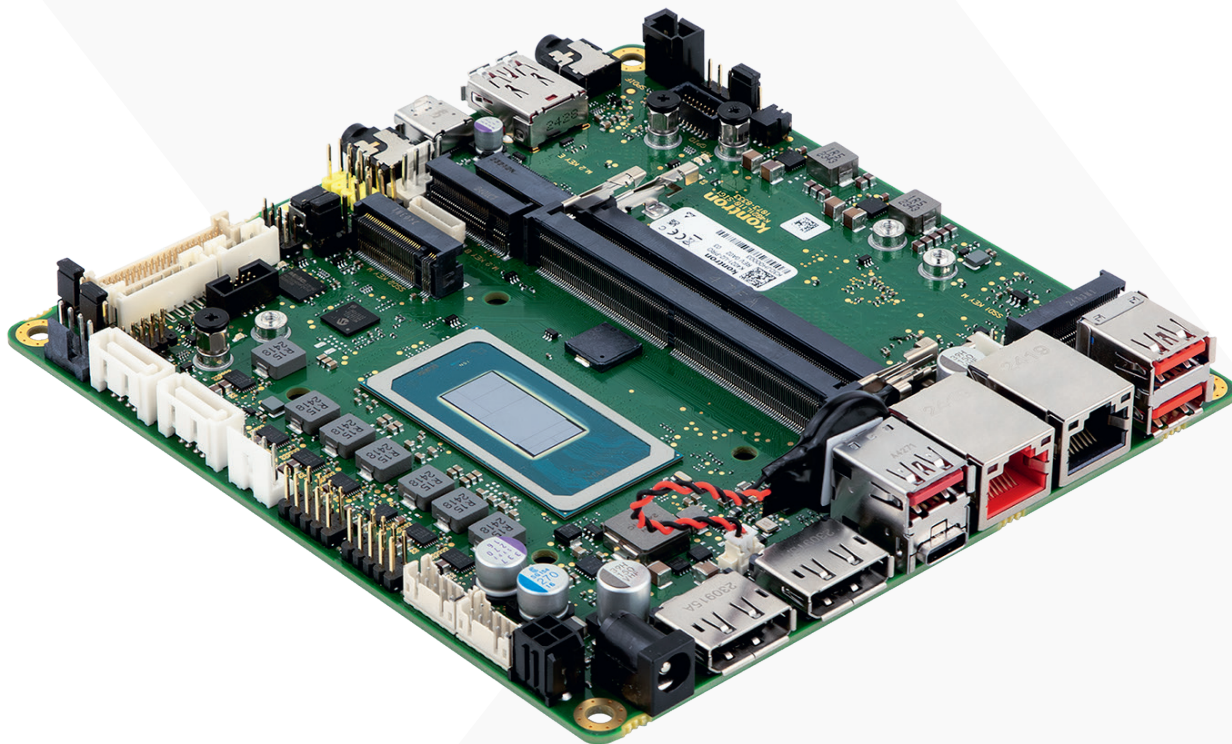


K4021-U mSTX

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® Xe architecture (within SoC)
- › Up to four concurrent 4K60 HDR displays or two 8K displays
- › Dual Channel LVDS (24 Bit) and eDP V1.4b (4K) onboard
- › New integrated NPU for dedicated AI acceleration with up to 20x performance/watt improvement

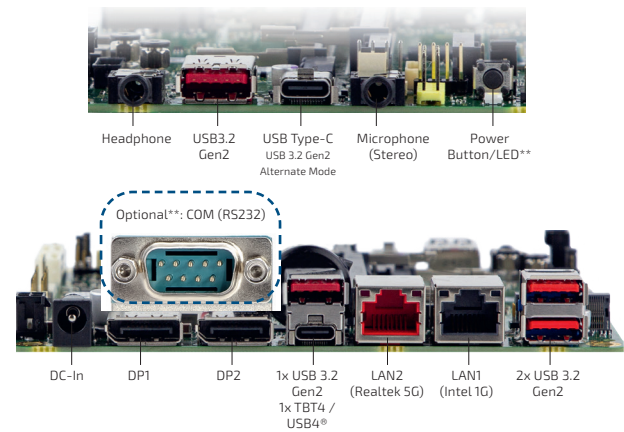
K4021-U mSTX Industrial Series

The Industrial Motherboard K4021-U mSTX is based on the latest Intel® Core™ Ultra Processor series 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.

- Intel® Core™ Ultra Processors
- DDR5-5600 SODIMM, max 96 GByte
- Intel® Graphics @ MTL-U, Xe LPG (within SoC)
- 2x DisplayPort™ V1.4a
- 1x USB Type-C with DP Alt mode
- 1x USB Type-C with Thunderbolt™ 4* / USB4® Support
- Dual Channel LVDS (24 bit) and eDP V1.4b
- 8 Bit GPIO & HD Audio onboard
- 4x USB3.2 Gen2
- 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

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.

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



*) Thunderbolt(TM) 4 certification planned
 **) Prepared for SMARTCASE™ 5502 chassis kit
 ***) Via optional COM port cable. Breakout feature SC5xx chassis rear I/O

Technical Information

SYSTEM	PROCESSOR	Intel® Core™ Ultra 7 155U Intel® Core™ Ultra 5 125U
	AI CO-PROCESSOR MEMORY	Intel® NPUI* integrated (up to 11 TOPS), Intel® GNA 3.5 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	Intel® i219LM with 10/100/1000 MBit/s, Wake-on-LAN (WoL) by interesting Packets, Link Status Change and Magic Packet™, PXE Support, BIOS MAC Address Display, Teaming Support
	ETHERNET 2	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	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
	SERIAL PORT OTHER I/Os	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

*) Neural Processing Unit; Dedicated Low Power AI Engine, integrated in Intel CPU
 **) DPoC: DisplayPort over USB-Type-C (Alternate Mode)
 ***) Thunderbolt™ 4 certification planned

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 WATCHDOG REAL TIME CLOCK TPM	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. No legacy OS support, no MBR installation (UEFI only) BIOS POST-/BIOS BOOT-/OS-HW Watchdog Integrated 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 IoT (LTSC), MS Windows® 11, MS Windows® 11 IoT (LTSC), 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

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 (Rear)	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

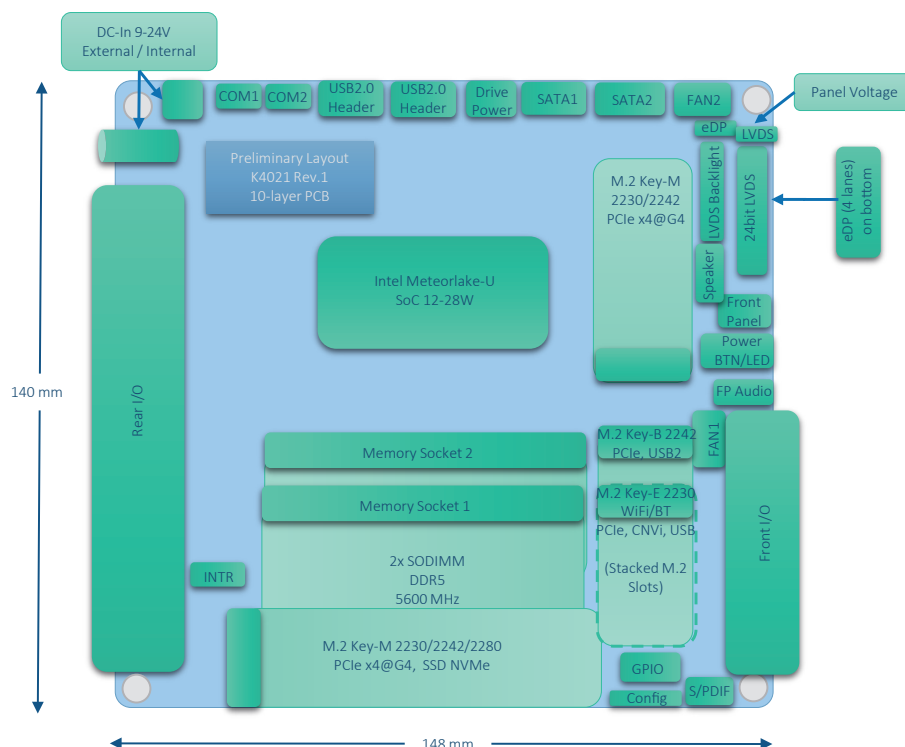
2) Motherboard incl. Memory, M.2, PCIe/M.2 PCIe devices, USB

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 + / - / + / + + / 0¹ / + + / + + / - / - / + + / + / + / + + / + / - / + + / - / + / + + / + / - + / + / -
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	SO 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 DisplayPort™
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

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