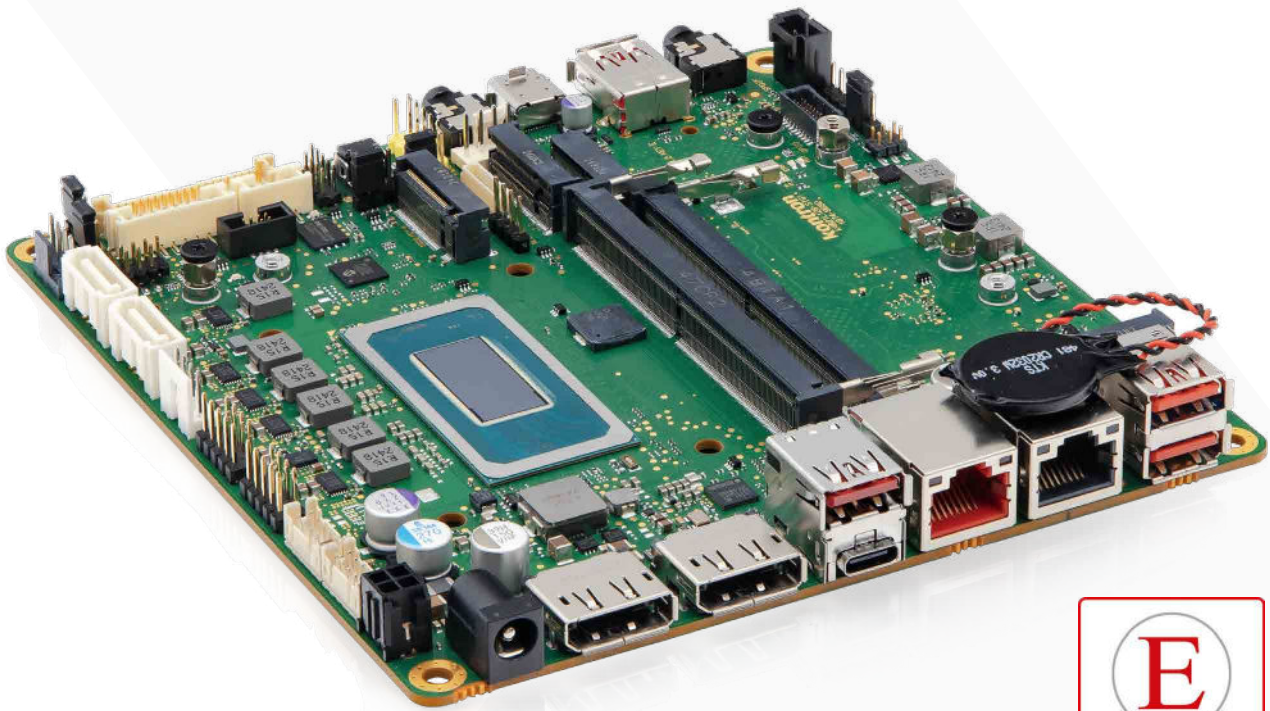


# K4021-U mSTX

## 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<sup>e</sup> 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

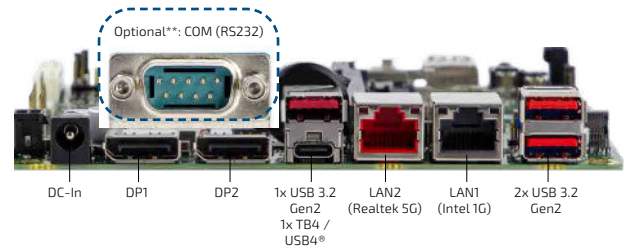
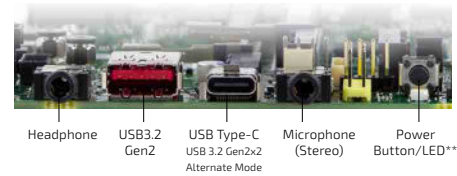
## K4021-U mSTX Industrial Series

The K4021-U mSTX Industrial Motherboard is a compact, high-performance platform engineered for demanding embedded and industrial applications. Powered by the latest Intel® Core™ Ultra Processor series, it delivers exceptional computing performance and advanced Intel® UHD Graphics Gen12 based on the Xe architecture. With support for up to four independent 4K displays or dual 8K outputs, the K4021-U offers outstanding visual capabilities through a versatile mix of DisplayPort™, USB Type-C with TB4\*/USB4®, embedded DisplayPort™ and dual-channel 24-bit LVDS interfaces.

Designed for flexibility and scalability, the board features four M.2 slots for storage and wireless connectivity, along with a rich set of I/O options including GPIO, dual COM ports, USB 3.2 Gen2 and TB4\*/USB4™. Built for 24/7 continuous operation and validated for enhanced temperature ranges up to 60 °C, the K4021-U is ideally suited for a wide range of vertical markets—from industrial automation to digital signage and medical systems.

- 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 / USB3.2 Gen2x2
- 1x USB Type-C with TB4\* / 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

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



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

## Technical Information

<b>SYSTEM</b>	<b>PROCESSOR</b> <b>AI CO-PROCESSOR</b> <b>MEMORY</b>	Intel® Core™ Ultra 7 155U Intel® Core™ Ultra 5 125U Intel® NPUs* integrated (up to 11 TOPS), Intel® GNA 3.5 DDR5 5600 SDRAM 2x SO DIMM socket, up to 96 GByte memory, non-ECC
<b>VIDEO</b>	<b>GRAPHICS</b>	Intel® Graphics driven by Intel® X <sup>e</sup> with up to 8 Xe-cores 1x TB4***/USB4® (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
<b>AUDIO</b>	<b>AUDIO CODEC</b> <b>AUDIO INTERFACE</b>	Realtek ALC256 Stereo, High Definition Audio Codec
<b>NETWORK CONNECTION</b>	<b>ETHERNET 1</b>  <b>ETHERNET 2</b>	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 Realtek RTL8126 with 10/100/1000/2500/5000 MBit/s, Wake-on-LAN (WoL) by interesting Packets, Link Status Change and Magic Packet™, PXE Support, BIOS MAC Address Display, Teaming Support
<b>PERIPHERAL CONNECTION</b>	<b>USB</b>  <b>SERIAL PORT</b> <b>OTHER I/Os</b>	4x USB 2.0 (by headers) 1x USB-C 3.2 Gen2x2 + 1x USB-C with TB4***/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

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

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<b>STORAGE &amp; EXPANSION</b>	<b>SATA PCIe/M.2 SLOTS</b>	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)
<b>POWER</b>	<b>CONNECTOR INPUT VOLTAGE</b>	External/Internal DC-In (DC Jack/4-Pin Micro-Fit) DC Input 9-24V, max. 5A/100W (external DC-In), max. 10A/120W (internal DC-In)
	<b>OUTPUT VOLTAGE</b>	USB-C Power Delivery (Sink, 20V, max. 100 W) USB-C Power Delivery 15W (5V, max. 3A)
<b>FIRMWARE</b>	<b>BIOS</b>	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.
	<b>WATCHDOG REAL TIME CLOCK TPM</b>	No legacy OS support, no MBR installation (UEFI only) Programmable 3-stage Watchdog to generate system reset event Integrated
<b>SYSTEM CONTROL</b>	<b>FP HEADER SECURITY</b>	TPM V2.0 (Intel® integrated) 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
<b>COOLING</b>	<b>FAN</b>	2x PWM fan (CPU/System)
<b>SOFTWARE</b>	<b>OS SUPPORT</b>	MS Windows® 10 IoT (LTSC), MS Windows® 11, MS Windows® 11 IoT (LTSC), Linux 64 No legacy OS support, no MBR installation (UEFI only)
<b>MECHANICAL</b>	<b>DIMENSION (L x W)</b>	Mini-STX: 5.5" x 5.8" (140 x 148 mm)
<b>ENVIRONMENTAL</b>	<b>OPERATION TEMPERATURE</b>	0 °C - 60 °C
<b>CERTIFICATION</b>	<b>EMC + SAFETY</b>	Planned: cTUVus acc. IEC62368-1, CE Class B incl. Industrial Immunity, UKCA, FCC-B verified

## Motherboard Versions

	<b>PROCESSOR (SoC)</b>	<b>GRAPHICS Intel® UHD Gen12 Gfx</b>	<b>MEMORY</b>
<b>K4021-U2</b>	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
<b>K4021-U5</b>	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

<b>SOURCE</b>	<b>VOLTAGE RANGE</b>	<b>MIN. PS LOAD</b>	<b>MAX. VOLTAGE TOLERANCE</b>	<b>TYP. MOTHERBOARD INPUT POWER<sup>1</sup></b>	<b>MAX. MOTHERBOARD INPUT POWER<sup>2</sup></b>
DC-IN (WideRange)	9-24V	0 A	-5%/+10%, max 28V	12W / 24W	120 W (external or internal DC-In)
USB-C (Rear)	20V PD Sink	0 A	20V: +-5%	12W / 24W	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

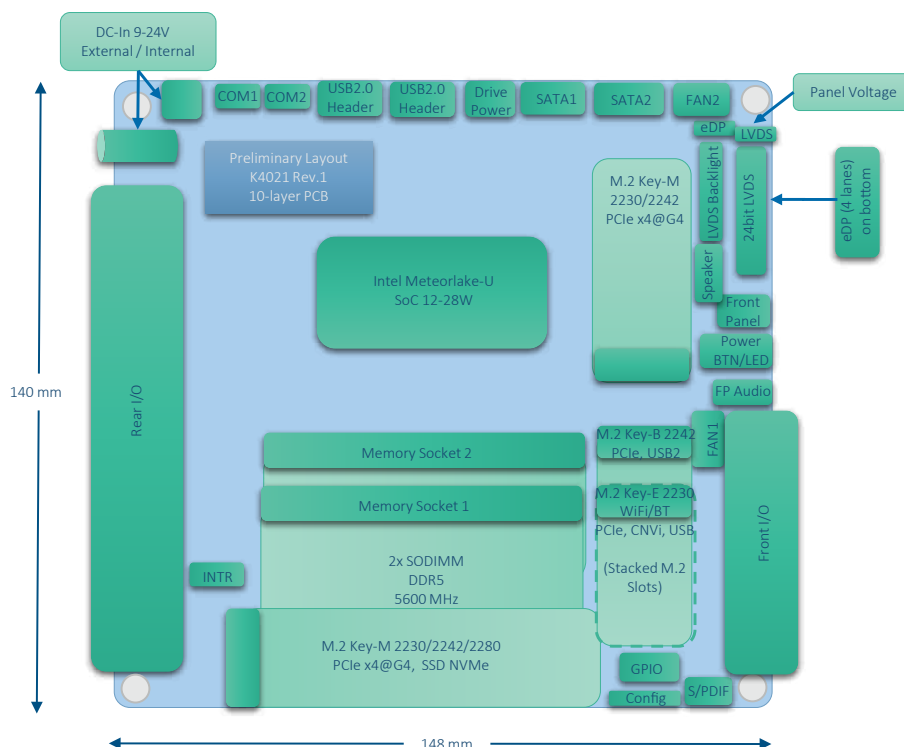
See TechNotes document for detailed power requirements

FEATURES	Chipset / SoC (APU) DP / HDMI / LVDS / eDP Stereo Audio / 5.1 Multichannel Audio / Front Panel Audio Buzzer /int. Speaker support (stereo) <sup>2</sup> 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 (Gen2x2) Type-C FAN monitored & controlled CPU / AUX1 / AUX2 TEMP monitored CPU / onboard sensors / external sensor	Intel® Core™ Ultra SoC + / - / + / + + / 0 <sup>1</sup> / + + / + + / - / - / + + / + / + / + + / + / - / + + / - / + / + + / + / - + / + / -
SPECIAL FEATURES	COM interface support for RS-232 / RS-485 / RS-422 Fan configuration / System Monitoring Recovery BIOS / Flash Update / Multi Boot HDD Password / EraseDisk / TPM V2.0 onboard / optional TPM module Multi Stage Watchdog Operating Mode 24-7 / 8-5 (hrs per day - days per week) Motherboard operating temperature range (chassis inside) <sup>3</sup>	+ / - / - + / + + / + / + + / + / - / - + + / - 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) <sup>4</sup> 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™ +USB4® 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

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## 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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