



XMC403 Dual SFP+ 10 Gigabit Ethernet XMC Module

User Guide, Rev. 1.0

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XMC403– User Guide

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NOTICE

You find the most recent version of the “General Safety Instructions” online in the download area of this product.

NOTICE

This product is not intended for use or suited for storage or operation in corrosive environments, in particular under exposure to sulfur and chlorine and their compounds. For information on how to harden electronics and mechanics against these stress conditions, contact Kontron Support.

Revision History

Revision	Brief Description of Changes	Date of Issue	Author
1.0	Initial version	20-May-2025	CW

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Symbols

The following symbols may be used in this user guide



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



NOTICE indicates a property damage message.



CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury

ATTENTION indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures ou modérées.



Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.



ESD Sensitive Device!

This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.



Caution: HOT Surface!

This symbol and title indicate a hot surface that must not be touched until cool.

Attention : Surface CHAUDE !

Ce symbole et ce titre indiquent une surface chaude qui ne doit pas être touchée avant d'avoir refroidi.



Caution: Laser!

This symbol and title inform of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.



High Sound Pressure!

This symbol and title inform of the risk of high sound pressure possible with headphones. There is a risk of hearing damage. Do not listen at high volume levels for long periods of time.

**Security**

This symbol indicates general information and guidelines regarding the product's cyber security to ensure secure installation, operation, maintenance and disposal of the product within the user's end environment.



This symbol indicates general information about the product and the user guide.



This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠ CAUTION

Warning

All operations on this product must be carried out by sufficiently skilled personnel only.

⚠ CAUTION



Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

NOTICE



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

⚠ CAUTION

Handling and operation of the product is permitted only for trained personnel within a work place that is access controlled. Follow the "General Safety Instructions" supplied with the product.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the lithium battery.

⚠ CAUTION

Risk of Explosion if the lithium Battery is replaced by an incorrect Type. Dispose of used lithium batteries According to the instructions.

Risque d'explosion si la pile au lithium est remplacée par une pile de type incorrect.

Éliminez les piles au lithium usagées conformément aux instructions.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present user guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Quality and Environmental Management

Kontron aims to deliver reliable high-end products designed and built for quality, and aims to comply with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit www.kontron.com/about-kontron/corporate-responsibility/quality-management.

Table of Contents

Disclaimer.....	3
Intended Use.....	4
Revision History.....	5
Symbols	6
For Your Safety.....	8
High Voltage Safety Instructions	8
Special Handling and Unpacking Instruction	8
Lithium Battery Precautions	9
General Instructions on Usage	9
Quality and Environmental Management	9
Table of Contents	10
List of Tables.....	11
List of Figures	11
1/ Introduction.....	12
1.1. Module Overview	12
1.2. Module Diagrams	13
1.2.1. Functional Block Diagram	13
1.2.2. Faceplate	13
1.2.3. Module Layout.....	14
1.3. Technical Specification	15
1.4. Environmental Specification.....	16
1.5. Compliance	17
1.6. Related Publications	18
2/ General Safety Instructions	19
2.1. Additional Safety Instructions for DC Power Supply Circuits	20
2.2. Instructions générales de sécurité	20
2.3. Electrostatic Discharge (ESD).....	21
2.4. Grounding Methods	22
3/ Shipment and Unpacking	23
3.1. Packaging.....	23
3.2. Unpacking.....	23
3.3. Scope of Delivery.....	23
3.4. Type Label and Product Identification.....	23
4/ Functional Description	24
4.1. 10 Gigabit Ethernet Controller.....	24
4.2. Memory.....	24
4.2.1. NVM/Flash	24
4.2.2. FRU EEPROM.....	24
4.3. Module Interfaces	25
4.3.1. SFP+ Interfaces	25
4.3.2. Ethernet Status LEDS	27
4.3.3. XMC Interface	28
5/ Installation.....	29
5.1. Hardware Installation	29
5.1.1. Safety Requirements	29
5.1.2. Installation Procedures	30
5.1.3. Removal Procedures.....	31
5.2. Installation/Removal of SFP+ Transceivers	32
6/ Configuration.....	34
7/ Power Considerations	35
7.1. Carrier Board Power Supply	35
7.1.1. Power Sequencing and Start-Up Requirements	35
7.1.2. Tolerance	35
7.1.3. Regulation.....	35
7.2. Power Consumption.....	36

8/	Technical Support.....	37
	8.1. Returning Defective Merchandise.....	37
9/	Storage and Transportation	38
	9.1. Storage	38
	9.2. Transportation.....	38
10/	Warranty	39
11/	Disposal	40
	11.1. Disposal	40
	11.2. WEEE Compliance.....	40
	11.3. Data Sanitization	40
	11.4. Statement of Memory Volatility.....	42
12/	Cyber Security	43
	12.1. Security Defense Strategy	43
	Appendix: List of Acronyms.....	44

List of Tables

Table 1: XMC403 Module Main Specification	15
Table 2: XMC403 Environmental Specification	16
Table 3: CE Compliance	17
Table 4: XMC403 Related Publications.....	18
Table 5: SFP+ Pinout (J3, J5)	25
Table 6: Reference SFP+ Transceivers	26
Table 7: Ethernet Status LEDs Function	27
Table 8: XMC Connector J1 Pinout of XMC403	28
Table 9: XMC Connector J1 Signal Description.....	28
Table 10: Carrier Voltages for XMC403	35
Table 11: Power Consumption - XMC403 Module with Windows Server	36
Table 12: Statement of Memory Volatility.....	42

List of Figures

Figure 1: XMC dual SFP+ 10 Gigabit Ethernet Module.....	12
Figure 2: XMC403 Functional Block Diagram	13
Figure 3: XMC403 Module Faceplate	13
Figure 4: XMC403 Module Layout (Top View)	14
Figure 5: SFP+ Cage and Connector (J4, J5 & J2, J3)	25
Figure 6: XMC Connector (J1).....	28
Figure 7: XMC403 Module Installation/Removal Diagrams.....	30
Figure 8: SFP+ Optical Transceiver and SFP+ Direct Attach Copper Cable	33

1/Introduction

1.1. Module Overview

The XMC403 dual SFP+ 10 Gigabit Ethernet module is an XMC mezzanine card designed for use with compliant carrier boards or CPU boards that support XMC modules with PCI Express 3.0 interconnection. The XMC403 incorporates a very flexible design that allows simple and easy integration of 10 Gigabit Ethernet functionality to any compliant system.

The XMC403 provides wire-speed, dual-port 10 Gigabit Ethernet throughput and is equipped with one dual-channel, 10 Gigabit Ethernet controller (Intel® X710-BM2) and two SFP+ cages on the faceplate for connection to SFP+ direct attach copper (DAC) cables or SFP+ optical transceivers.

The XMC connector provides the interface to the carrier board and supports PCI Express 3.0 (8 GT/s) with x8 lanes.



The SFP+ direct attach copper (DAC) cables or SFP+ optical transceivers are not part of the delivery and must be provided by the user.

Figure 1: XMC dual SFP+ 10 Gigabit Ethernet Module

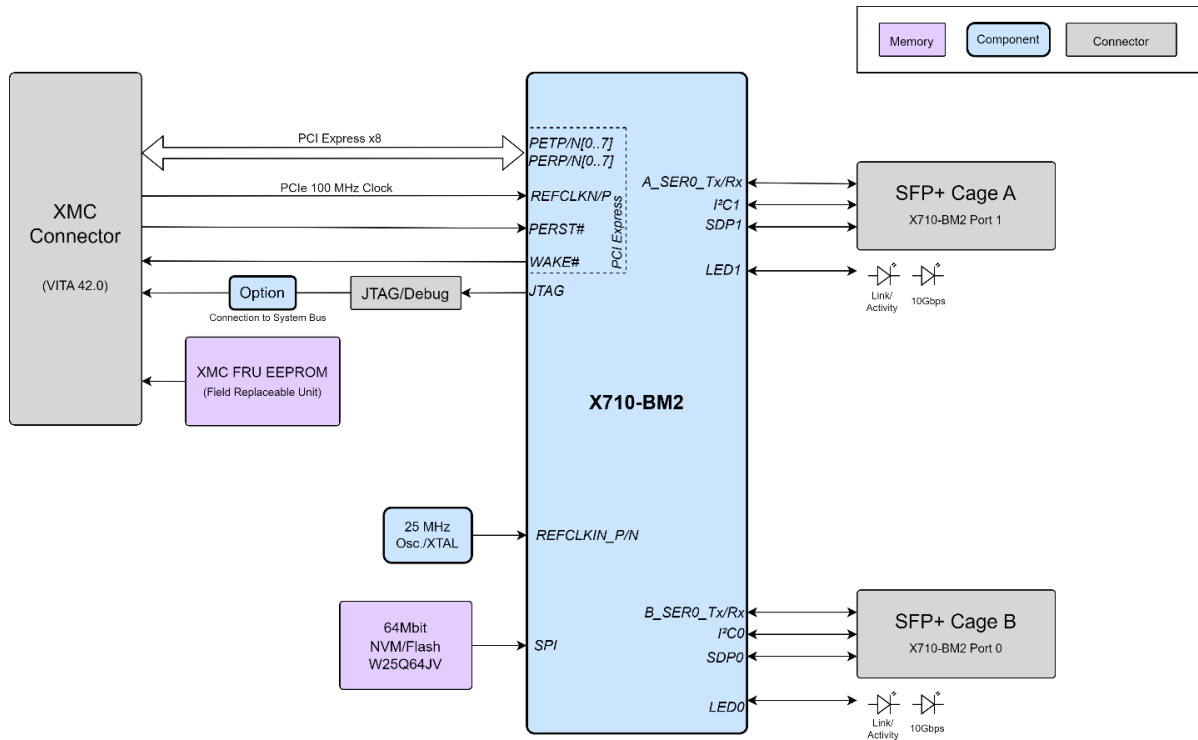


1.2. Module Diagrams

The following diagrams provide additional information concerning module functionality and component layout.

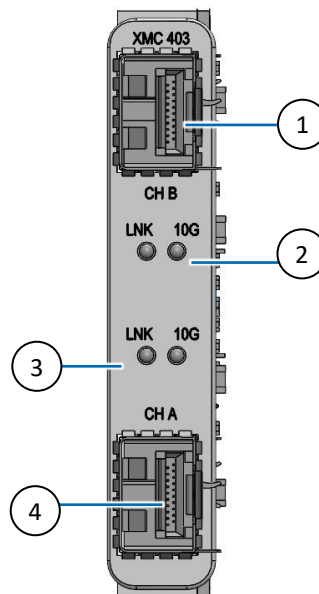
1.2.1. Functional Block Diagram

Figure 2: XMC403 Functional Block Diagram



1.2.2. Faceplate

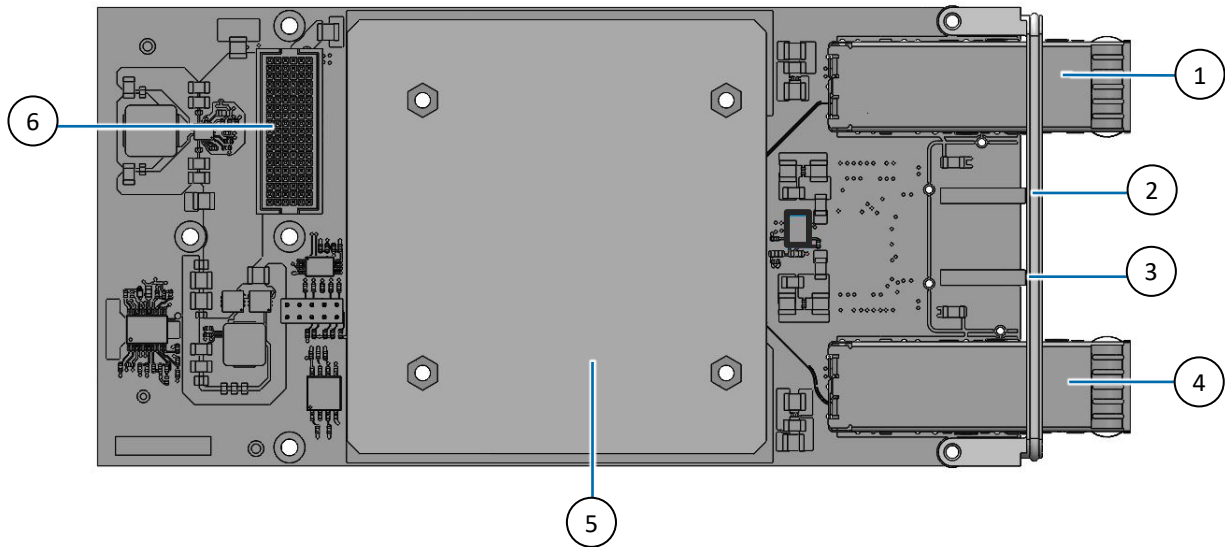
Figure 3: XMC403 Module Faceplate



- | | |
|-------------------------------|-------------------------------|
| 1. SFP+ port (CH B) | 3. LEDs (CH A) (Link & Speed) |
| 2. LEDs (CH B) (Link & Speed) | 4. SFP+ port (CH A) |

1.2.3. Module Layout

Figure 4: XMC403 Module Layout (Top View)



- | | |
|----------------------------|---|
| 1. SFP+ B port cage | 4. SFP+ A port cage |
| 2. SFP+ B port status LEDs | 5. Dual-channel, 10 GbE Ethernet controller (Intel® X710-BM2) with heatsink |
| 3. SFP+ A port status LEDs | 6. XMC connector |

1.3. Technical Specification

Table 1: XMC403 Module Main Specification

XMC403 Module Parts		Description
Controller	Intel® X710-BM2	Ethernet controller 10 Gigabits controller with PCI express 3.0 interface and two SFP+ ports
	NVM/Flash	64 Mbit, for Ethernet controller configuration and boot ROM
Connectors	FRU EEPROM	2 kbit EEPROM, for storing IPMI serial EEPROM FRU data
	SFP+	Two SFP+ cages on the faceplate for connection to SFP+ direct attach copper cables or SFP+ optical transceiver
LEDs	XMC	One XMC connector supporting PCI Express 3.0 (8 GT/s) with x8 lanes for connection to a carrier board
	Ethernet Status LEDs	Two Ethernet Status LEDs per port: <ul style="list-style-type: none"> ➤ LNK LED: On = link, Off = no link, Blinking = network activity ➤ 10G LED: On = 10 Gigabit or Off = 1 Gigabit connection
Software	Operating Systems	Linux Debian Windows Server 2022 Windows 11 IoT Enterprise 2024 LTSC (other drivers on request)
Power	Power Supply Voltage	XMC connector voltages: <ul style="list-style-type: none"> ➤ VPWR (5 VDC or 12 VDC) ➤ 3.3V (3.3 VDC)
Mechanical	Form Factor	XMC-compliant form factor
	Cooling	Heatsink
	Recommended Airflow	Volumetric Flow Rate: > 20 m ³ /h ^[1] Users must ensure sufficient airflow around the XMC403 module in the target application and take into consideration the SFP+ module's maximum operating temperature and additional power dissipation (carrier board dependent). For further information, refer to the carrier board's user guide.
	Dimensions	74 mm x 149 mm x single-height XMC card
	Weight	107 grams

^[1] **Reference Example:** Kontron CP6007-SA-2.60-64-4R-T carrier board with processor load of 23 W and SFP+ module with a maximum temperature of 70°C requires an airflow of at least 25 CFM or 43.5 m³/h at a system ambient temperature of 55°C.



For detailed mechanical dimensions, visit [Kontron's Customer Section](#).

1.4. Environmental Specification

Table 2: XMC403 Environmental Specification

Environmental		Description
Temperature (system ambient) ^[1]	Operating	0°C to +55°C (32°F to 131°F)
	Non-operating	-40°C to +85°C (-40°F to 185°F)
Relative Humidity	IEC 60068-2-78	93% RH at 40°C (104°F), non-condensing
Altitude		+4,000 m (max.) above sea level (13,000 ft.)
Shock	IEC60068-2-29 Permanent shock	Test parameters: 15 (g) acceleration 11 (ms) pulse duration 500 bumps per direction 6 directions 1 (s) recovery time
Shock	IEC60068-2-27 Single Shock	Test parameters: 30 (g) acceleration 9 (ms) pulse duration 3 shocks per direction 6 directions 5 (s) recovery time
Vibration	Operating	10–150 Hz, 1.0 g, Sinus, 3 axes
	EN 60068-2-6 Sinusoidal	Test parameters: 10-300 (Hz) frequency range 2 (g) acceleration 1 (oct/min) sweep rate 10 cycles/axis 3 axes
MTBF		929 996.25 hours @ 30°C (min. configuration) GB

^[1] **Reference Example:** Kontron CP6007-SA-2.60-64-4R-T carrier board with processor load of 23 W and SFP+ module with a maximum temperature of 70°C requires an airflow of at least 25 CFM or 43.5 m³/h at a system ambient temperature of 55°C.

1.5. Compliance

The XMC403 module complies with the relevant requirements and the approximation of the laws relating to the CE Mark and the standards, or later thereof, that are constitutional parts of the declaration.

Table 3: CE Compliance

CE & UKCA Mark	
Directives	<p>2014/30/EU Directive relating to electromagnetic compatibility</p> <p>2014/35/EU Directive relating to electrical equipment designed for use within certain voltage limits</p> <p>2011/65/EU Directive relating to the restriction of the use of certain hazardous substances in electrical and electronic equipment</p>
EMC	<p>EN 55032 Electromagnetic compatibility of multimedia equipment- Emission Requirements</p> <p>EN 61000-6-2 Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments</p> <p>EN 55035 Electromagnetic compatibility of multimedia equipment - Immunity requirements</p>
Safety	<p>EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements</p> <p>EN 61010-2-201 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-201: Particular requirements for control equipment</p>

The XMC403 module is prepared for the following:

- UL/IEC 61010-1
- UL/IEC 61010-2-201

Destructive Environmental Testing

Kontron performs comprehensive environmental testing of its products in accordance with applicable standards.

Customers desiring to perform further environmental testing of Kontron products must contact Kontron for assistance prior to performing any such testing. This is necessary, as it is possible that environmental testing can be destructive when not performed in accordance with the applicable specifications.

NOTICE

In particular, for example, modules without conformal coating must not be exposed to a change of temperature exceeding 1 K/minute, averaged over a period of not more than five minutes. Otherwise, condensation may cause irreversible damage, especially when the module is powered up again.

Kontron does not accept any responsibility for damage to products resulting from destructive environmental testing.



If the product is modified, the prerequisites for specific approvals may no longer apply.



Kontron is not responsible for any radio television interference caused by unauthorized modifications of the delivered product or the substitution or attachment of connecting cables and equipment other than those specified by Kontron. The correction of interference caused by unauthorized modification, substitution or attachment is the operator's responsibility.



For compliance reports, visit [Kontron's Customer Section](#).

1.6. Related Publications

The following publications contain information relating to this product.

Table 4: XMC403 Related Publications

Publication	Description
XMC	VITA 42.0: XMC ^[1] VITA 42.3: XMC PCI Express Protocol Layer Standard
SFP+	SFF-8431: Specification for SFP+ 10 Gb/s and Low Speed Electrical Interface Rev 4.1 July 6, 2009
All Kontron products	General Safety Instruction

^[1] IPMI FRU data (Board /Product Info) only reachable on Kontron 6U CPCI boards, due to compatibility reasons. XMC slots on these Kontron 6U CPCI boards historically implemented swapped GA[0..2] address signals.

2/General Safety Instructions

Please read this passage carefully and take careful note of the instructions, which have been compiled for your safety and to ensure to apply in accordance with intended regulations. If the following general safety instructions are not observed, it could lead to injuries to the operator and/or damage of the product; in cases of non-observance of the instructions Kontron Europe is exempt from accident liability, this also applies during the warranty period.

The product has been built and tested according to the basic safety requirements for low voltage (LVD) applications and has left the manufacturer in safety-related, flawless condition. To maintain this condition and to also ensure safe operation, the operator must not only observe the correct operating conditions for the product but also the following general safety instructions:

- The product must be used as specified in the product documentation, in which the instructions for safety for the product and for the operator are described. These contain guidelines for setting up, installation and assembly, maintenance, transport or storage.
- The on-site electrical installation must meet the requirements of the country's specific local regulations.
- If a power cable comes with the product, only this cable should be used. Do not use an extension cable to connect the product.
- To guarantee that sufficient air circulation is available to cool the product, please ensure that the ventilation openings are not covered or blocked. If a filter mat is provided, this should be cleaned regularly. Do not place the product close to heat sources or damp places. Make sure the product is well ventilated.
- Only connect the product to an external power supply providing the voltage type (AC or DC) and the input power (max. current) specified on the Kontron Product Label and meeting the requirements of the Limited Power Source (LPS) and Power Source (PS2) of UL/IEC 62368-1 .
- Only products or parts that meet the requirements for Power Source (PS1) of UL/IEC 62368-1 may be connected to the product's available interfaces (I/O).
- Before opening the product, make sure that the product is disconnected from the mains.
- Switching off the product by its power button does not disconnect it from the mains. Complete disconnection is only possible if the power cable is removed from the wall plug or from the product. Ensure that there is free and easy access to enable disconnection.
- The product may only be opened for the insertion or removal of add-on cards (depending on the configuration of the product). This may only be carried out by qualified operators.
- If extensions are being carried out, the following must be observed:
 - all effective legal regulations and all technical data are adhered to
 - the power consumption of any add-on card does not exceed the specified limitations
 - the current consumption of the product does not exceed the value stated on the product label
- Only original accessories that have been approved by Kontron Europe can be used.
- Please note: safe operation is no longer possible when any of the following applies:
 - the product has visible damages or
 - the product is no longer functioning
 In this case the product must be switched off and it must be ensured that the product can no longer be operated.
- Handling and operation of the product is permitted only for trained personnel within a work place that is access controlled.
- CAUTION: Risk of explosion if the lithium battery is replaced incorrectly (short-circuited, reverse-poled, wrong lithium battery type). Dispose of used lithium batteries according to the manufacturer's instructions.
- This product is not suitable for use in locations where children are likely to be present

2.1. Additional Safety Instructions for DC Power Supply Circuits

- To guarantee safe operation, please observe that:
 - the external DC power supply must meet the criteria for LPS and PS2 (UL/IEC 62368-1)
 - no cables or parts without insulation in electrical circuits with dangerous voltage or power should be touched directly or indirectly
 - a reliable functional earth connection is provided
 - a suitable, easily accessible disconnecting device is used in the application (e.g. overcurrent protective device), if the product itself is not disconnect able
 - a disconnect device, if provided in or as part of the product, shall disconnect both poles simultaneously
 - interconnecting power circuits of different products cause no electrical hazards
- A sufficient dimensioning of the power cable wires must be selected – according to the maximum electrical specifications on the product label – as stipulated by EN62368-1 or VDE0100 or EN60204 or UL61010-1 regulations.

For the General Safety Instruction in German or French, visit Kontron's product web page> Downloads> Manuals> General Safety Instructions.

2.2. Instructions générales de sécurité

Veillez lire attentivement ce passage et prendre bonne note des instructions, qui ont été compilées pour votre sécurité et pour assurer une application conforme aux réglementations prévues. Le non-respect des consignes de sécurité générales suivantes peut entraîner des blessures pour l'utilisateur et/ou des dommages pour le produit. En cas de non-respect des consignes, Kontron Europe est exonéré de la responsabilité en cas d'accident, ceci s'applique également pendant la période de garantie.

Le produit a été construit et testé conformément aux exigences de sécurité de base pour les applications basse tension (DBT) et a quitté le fabricant dans un état impeccable en matière de sécurité. Pour maintenir cet état et pour garantir également un fonctionnement sûr, l'opérateur doit non seulement respecter les conditions d'utilisation correctes du produit, mais aussi les consignes de sécurité générales suivantes :

- Le produit doit être utilisé conformément à la documentation du produit, dans laquelle sont décrites les instructions de sécurité pour le produit et pour l'opérateur. Celles-ci contiennent des directives pour la mise en place, l'installation et le montage, la maintenance, le transport ou le stockage.
- L'installation électrique sur place doit répondre aux exigences des réglementations locales spécifiques du pays.
- Si un câble d'alimentation est fourni avec le produit, seul ce câble doit être utilisé. N'utilisez pas de rallonge pour connecter le produit.
- Afin de garantir une circulation d'air suffisante pour refroidir le produit, veuillez vous assurer que les ouvertures de ventilation ne sont pas couvertes ou obstruées. Si un élément filtrant est fourni, celui-ci doit être nettoyé régulièrement. Ne placez pas le produit à proximité de sources de chaleur ou d'endroits humides. Veillez à ce que le produit soit bien ventilé.
- Ne connectez le produit qu'à une alimentation externe fournissant le type de tension (AC ou DC) et la puissance d'entrée (courant max.) spécifiés sur le Label Produit Kontron et répondant aux exigences de la source d'alimentation limitée (LPS) et de la source d'alimentation (PS2) de la norme UL/IEC 62368-1 .
- Seuls les produits ou les pièces qui répondent aux exigences de la source d'alimentation (PS1) de la norme UL/IEC 62368-1 peuvent être connectés aux interfaces (E/S) disponibles du produit.
- Avant d'ouvrir le produit, assurez-vous qu'il est bien débranché du secteur.
- Le fait d'éteindre le produit par son bouton de mise en marche ne le déconnecte pas du secteur. Une déconnexion complète n'est possible que si le câble d'alimentation est retiré de la prise murale ou du produit. Veillez à ce que l'accès soit libre et facile pour permettre la déconnexion.
- Le produit ne peut être ouvert que pour l'insertion ou le retrait de cartes supplémentaires (selon la configuration du produit). Cette opération ne peut être effectuée que par des opérateurs qualifiés.

- Si des extensions sont effectuées, les points suivants doivent être respectés :
 - toutes les réglementations légales en vigueur et toutes les données techniques sont respectées
 - la consommation électrique d'une carte supplémentaire ne dépasse pas les limites spécifiées
 - la consommation actuelle du produit ne dépasse pas la valeur indiquée sur l'étiquette du produit.
- Seuls les accessoires d'origine approuvés par Kontron Europe peuvent être utilisés.
- Veuillez noter que la sécurité des opérations n'est plus possible lorsque l'une des conditions suivantes s'applique.
 - le produit présente des dommages visibles ou
 - le produit ne fonctionne plus. Dans ce cas, le produit doit être éteint et il faut s'assurer que le produit ne puisse plus être utilisé.
- La manipulation et le fonctionnement du produit ne sont autorisés que pour le personnel formé dans un lieu de travail dont l'accès est contrôlé.
- ATTENTION: Risque d'explosion en cas de remplacement incorrect de la pile au lithium (court-circuit, inversion de polarité, mauvais type de pile au lithium). Éliminez les piles au lithium usagées conformément aux instructions du fabricant.
- Ce produit n'est pas adapté à une utilisation dans des endroits où des enfants sont susceptibles d'être présents
- Instructions de sécurité supplémentaires pour les circuits d'alimentation en courant continu
- Pour garantir un fonctionnement sûr, veuillez observer ce qui suit:
 - l'alimentation électrique externe en courant continu doit répondre aux critères des LPS et PS2 (UL/IEC 62368-1)
 - aucun câble ou pièce non isolée dans les circuits électriques ayant une tension ou une puissance dangereuse ne doit être touché directement ou indirectement
 - une connexion à la terre fonctionnelle fiable est fournie
 - un dispositif de déconnexion approprié et facilement accessible est utilisé dans l'application (par exemple, un dispositif de protection contre les surintensités), si le produit lui-même n'est pas en mesure d'être déconnecté.
 - un dispositif de déconnexion, s'il est prévu dans le produit ou s'il en fait partie, doit déconnecter les deux pôles simultanément
 - l'interconnexion des circuits électriques de différents produits ne présente aucun risque électrique
- Un dimensionnement suffisant des fils du câble d'alimentation doit être choisi - en fonction des spécifications électriques maximales figurant sur l'étiquette du produit - comme stipulé par les réglementations EN62368-1 ou VDE0100 ou EN60204 ou UL61010-1.

2.3. Electrostatic Discharge (ESD)

A sudden discharge of electrostatic electricity can destroy static-sensitive devices or micro-circuitry. Therefore, proper packaging and grounding techniques are necessary precautions to prevent damage.

Always take the following precautions:



ESD Sensitive Device!

Keep electrostatic sensitive parts in their containers until they arrive at the ESD-safe workplace. Always be properly grounded when touching a sensitive board, component, or assembly.

For more Information, see the Special Handling and Unpacking Instruction within this user guide and Chapter 2.4: Grounding Methods.

2.4. Grounding Methods

The following measures help to avoid electrostatic damage to the device:

- Cover workstations with approved antistatic material. Always wear a wrist strap connected to the workplace, as well as properly grounded tools and equipment.
- Use antistatic mats, heel straps, or air ionizers for more protection.
- Always handle electrostatically sensitive components by their edge or by their casing.
- Avoid contact with pins, leads, or circuitry.
- Switch off power and input signals before inserting and removing connectors or connecting test equipment.
- Keep the work area free of non-conductive materials such as ordinary plastic assembly aids and styrofoam.
- Use field service tools such as cutters, screwdrivers, and vacuum cleaners that are conductive.
- Always place drives and boards with the PCB-assembly-side down on the foam.

3/ Shipment and Unpacking

3.1. Packaging

The XMC403 module is packaged in a product specific cardboard package designed to provide adequate protection and absorb shock.

3.2. Unpacking

To unpack the XMC403 module perform the following:

1. Remove packaging.
2. Do not discard the original packaging. Keep the original packaging for future transportation or storage.
3. Check the delivery for completeness by comparing the delivery with the original order.
4. Keep the associated paperwork. It contains important information for handling the product.
5. Check the product for visible shipping damage.

If you notice shipping damage or inconsistencies between the contents and the original order, contact your dealer.

3.3. Scope of Delivery

This scope of delivery describes the parts included in your delivery. Check that the delivery is complete, and contains the items listed. If damaged or missing items are discovered, contact your dealer.

The XMC403 module is available as:

- XMC403 Standard version
- XMC403-C Standard version with coating

3.4. Type Label and Product Identification

The XMC403 module's type label contains important specific product identification information (part number and serial number) and technical information (electrical specification and compliance).

4/Functional Description

4.1. 10 Gigabit Ethernet Controller

The XMC403 module provides one dual-channel 10 Gigabit Ethernet controller (Intel® X710-BM2) optimized to deliver high performance with the lowest power consumption including independent transmit and receive queues as well as a PCI Express 3.0 (8 GT/s) interface that maximizes the use of bursts for efficient bus usage.

The Ethernet controller's main features are:

- 10 Gigabit/1 Gigabit Ethernet
- PCI Express 3.0 (8 GT/s)
- MSI-X support, minimizes the overhead of interrupts
- 802.3x flow control frames or 802.3bd priority-based flow control frames
- Virtual Machine Device queues 1 (VMDq)
- Max. receive and transmit frame size is MAC configured
- Jumbo frames support up to 9.5 kB
- Two 10 Gigabit Ethernet MAC compliant with IEEE 802.3
- Integrates support for IEEE Std. 802.3 Clause 73 Auto-Negotiation for Backplane Ethernet, including Clause 73 extensions for 40 Gb/s speed defined in IEEE Std. 802.3ba
- iSCSI Boot and Acceleration
- Full-duplex operation at all supported speeds

4.2. Memory

4.2.1. NVM/Flash

The XMC403 module has 64 Mbit NVM/Flash memory connected to the 10G Ethernet controller. Optionally, a driver for uEFI Network stack or iSCSI driver can be stored inside NVM.

4.2.2. FRU EEPROM

The Field Replaceable Unit (FRU) EEPROM is a 2 kbit EEPROM for storing IPMI Serial EEPROM FRU information.

4.3. Module Interfaces

4.3.1. SFP+ Interfaces

The XMC403 module provides two 10 Gigabit Ethernet ports implemented via two SFP+ cages on the faceplate with support for SFP+ direct attach copper cables or SFP+ optical transceivers. The SFP+ uplink ports comply with the SFF-8431 Specifications for Enhanced Small Form Factor Pluggable Module SFP+. Each Ethernet port supports two Ethernet Status LEDs.

Figure 5: SFP+ Cage and Connector (J4, J5 & J2, J3)

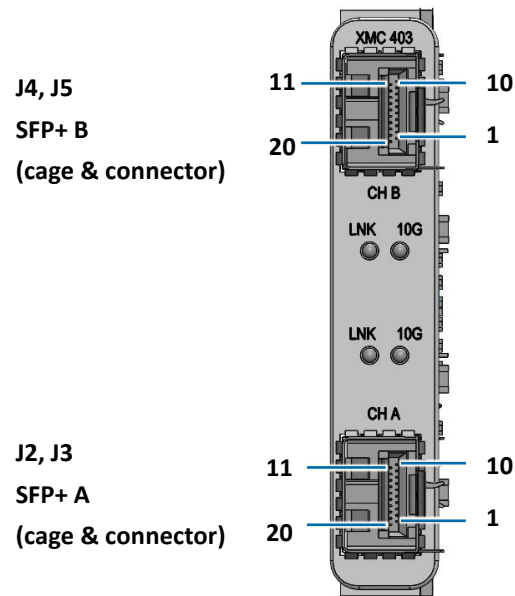


Table 5: SFP+ Pinout (J3, J5)

I/O	Function	Signal	Pin	Pin	Signal	Function	I/O
--	Transmitter ground	VeeT	20	1	VeeT	Transmitter ground	--
O	Transmitter inverted data input	TD-	19	2	Tx_Fault	Transmitter fault indication	I
O	Transmitter non-inverted data input	TD+	18	3	Tx_Disable	Transmitter disable	O
--	Transmitter ground	VeeT	17	4	SDA	2-wire Serial interface data line	I/O
--	Transmitter power 3.3 V	VccT	16	5	SCL	2-wire Serial interface clock	O
--	Receiver power 3.3 V	VccR	15	6	Mod_ABS	Module absent connected to VeeT or VeeR on the module	I/O
--	Receiver ground	VeeR	14	7	RS0	Rate select 0, controls SFP+ module receiver	O
I	Receiver non-inverted data output	RD+	13	8	Rx_LOS	Receiver loss of signal	--
I	Receiver inverted data output	RD-	12	9	RS1	Rate select 1, controls SFP+ module transmitter	--
--	Receiver ground	VeeR	11	10	VeeR	Receiver ground	--

The two SFP+ cages on the faceplate support SFP+ Direct Attach Copper cables or SFP+ transceivers. For a list of the tested reference transceivers, refer Table 6: Reference SFP+ Transceivers.

Table 6: Reference SFP+ Transceivers

Protocol	Model	Established Link
1000Base-SX	Avago AFBR-57M5APZ	1G link
	CISCO GLC-SX-MMD (SFBR-5716PZ)	1G link
	DLOCK 86186	1G link
1000Base-LX	Avago AFCT-5715LZ	1G link
2.5GBase-LX	Lantech LSFP-2500LX2 8330-26DE-V1	No link
10GBase-SR	Finisar FTLX8571D3BCL	10G link
	Fiberstore SFP-10GSR-85, Dual-Rate 1000BASE-SX and 10GBASE-SR (Intel branded)	10G link
10GBase-LR	Finisar FTLX1471D3BCL	10G link
	Fiberstore SFP-10GMLR-31, Dual-Rate 1000BASE-LX and 10GBASE-LR	10G link
10GBase-BX	Fiberstore SFP-10G-BX, Bidi module	10G link
10GBase-ER	OPLINK TPC1XGJER100020G	No link
1G DAC	Fiberstore SFP-1G-PC01, 1G SFP+ passive direct attach copper cable	1G link
10G DAC	Fiberstore SFPP-PC02, 10G SFP+ passive direct attach copper cable	10G link
	Molex P/N:74752-1101, 10G SFP+ passive direct attach copper cable	10G link
1000Base-T	Finisar FCLF-8521-3	1G link
	Finisar FCLF-8522	1G link
	Molex 74741-0001	1G link
	Cisco GLC-T	No link
	Method Elec. DM7041	No link
2.5GBase-T	Fiberstore SFP-2.5G-T	No link
10GBase-T	Fiberstore SFP-10G-T	10G link
	Fiberstore SFP-10G-T-30 (Intel® branded, Industrial Temperature Range)	10G link
	Fiberstore SFP-10G-T (Intel® branded)	10G link
	Ubiquiti UACC-CM-RJ45-10G	10G link



Caution: Laser!

Laser light can harm your eyesight. Do not look into an optical port! Refer to the SFP+ optical transceiver manufacturer's instructions regarding the use of eye protection when handling the SFP+ optical transceiver.



The module supports both SFP+ and SFP transceivers:

- SFP+ Interface supports a 10 Gigabit connection
- SFP interface supports a 1 Gigabit connection
- 2.5G or 5G connections are not supported



10G DAC cables and SFP+ modules are configured for 10G speed operation only. Some seldom dual-rate SFP+ modules might be operational with 1G speed.



Some 1000Base-T modules are operational, while others do not provide a network link. Link establishment with 1000Base-T SFP depends on the module's specific implementation of Auto-Negotiation and control of the LOS signal.



SFP+ transceivers are not Kontron accessories and must be purchased by the user. For a list of the reference SFP+ transceivers, refer to Table 6: Reference SFP+ Transceivers.

4.3.2. Ethernet Status LEDs

The Ethernet status LEDs (two per port) are located on the faceplate.

The LNK LED (green) monitors network connection and activity. The LED lights up when a valid link (cable connection) has been established and blinks when network packets are sent or received. When this LED remains off, a valid link has not been established due to a missing or a faulty cable connection.

The 10GB LED (green) lights up to indicate a successful connection. When green the LED indicates a 10 Gigabit connection and when Off the LED indicates a 1 Gigabit connection.

Table 7: Ethernet Status LEDs Function

Ethernet Status LED	Color	Function
LNK	Green	ON = Valid link
	Blinking	Blinking = Network Activity
	Off	Off = No valid Link
10GB	Green	ON = 10 Gigabit Ethernet speed
	Off	Off = 1 Gigabit

4.3.3. XMC Interface

The XMC403 module is equipped with one XMC connector (J1) for connection to a carrier board with a compatible XMC connector. The XMC connector provides the high-speed signals for an x8 PCI Express 3.0 (8 GT/s) interface.

Figure 6: XMC Connector (J1)

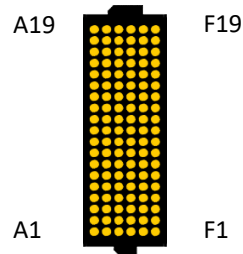


Table 8: XMC Connector J1 Pinout of XMC403

Pin	Row A	Row B	Row C	Row D	Row E	Row F	Pin
1	PET0p0	PET0n0	3.3V	PET0p1	PET0n1	VPWR	1
2	GND	GND	NC/TRST#[¹]	GND	GND	MRSTI#	2
3	PET0p2	PET0n2	3.3V	PET0p3	PET0n3	VPWR	3
4	GND	GND	NC/TCK[¹]	GND	GND	NC	4
5	PET0p4	PET0n4	3.3V	PET0p5	PET0n5	VPWR	5
6	GND	GND	NC/TMS[¹]	GND	GND	NC	6
7	PET0p6	PET0n6	3.3V	PET0p7	PET0n7	VPWR	7
8	GND	GND	TDI[¹]	GND	GND	NC	8
9	NC	NC	NC	NC	NC	VPWR	9
10	GND	GND	TDO[¹]	GND	GND	GA0	10
11	PER0p0	PER0n0	NC	PER0p1	PER0n1	VPWR	11
12	GND	GND	GA1	GND	GND	GND	12
13	PER0p2	PER0n2	NC	PER0p3	PER0n3	VPWR	13
14	GND	GND	GA2	GND	GND	MSDA	14
15	PER0p4	PER0n4	NC	PER0p5	PER0n5	VPWR	15
16	GND	GND	MVMRO	GND	GND	MSCL	16
17	PER0p6	PER0n6	NC	PER0p7	PER0n7	NC	17
18	GND	GND	NC	GND	GND	NC	18
19	CLK+0	CLK-0	NC	WAKE#	NC	NC	19

[¹] By default TDI is connected to TDO internally on the XMC403. The X710-BM2's JTAG interface is not connected to the system JTAG by default but can be connected via optional 0 ohm resistors.

Table 9: XMC Connector J1 Signal Description

Pin	Description
PER0p/n[0..7]	Differential receive: XMC403 module receives data from carrier board over PCI Express interface
PET0p/n[0..7]	Differential transmit: XMC403 module transmits data to carrier board over PCI Express interface
CLK+/-0	Differential reference clock for link 0 PCI Express interface
VPWR	Power pins: either 12 V or 5 V power from carrier board to the XMC403 module

5/Installation

The XMC403 module has been designed for easy installation. However, the following standard precautions, installation procedures, and general information must be observed to ensure proper installation and to avoid damage to the module, other system components, or injury to personnel.

5.1. Hardware Installation

The XMC403 module can be installed on any carrier board acting as a PCI Express root complex and compliant with the XMC PCI Express Protocol Layer Standard (ANSI/VITA 42.3-2006).



IPMI FRU data (Board /Product Info) is only reachable on Kontron 6U CPCI boards, due to compatibility reasons. XMC slots on these Kontron 6U CPCI boards historically implemented swapped GA[0..2] address signals.

5.1.1. Safety Requirements

The XMC403 module must be securely fastened to the carrier board using appropriate retaining screws and stand-offs to ensure proper grounding and avoid loosening caused by vibration or shock.

In addition, observe the following safety precautions when installing or operating the module. Kontron assumes no responsibility for any damage resulting from failure to comply with these requirements.

Handle Carefully to Avoid Damage when Mating/De-mating

NOTICE

DO NOT USE ANY FORCE when (de-)mating the module's bezel and the faceplate. The shielding tabs may snag on the carrier board and can be damaged if force is applied!

Handle Carefully to Avoid Damage when Mating/De-mating

NOTICE

The module has SFP+ cages with EMC shielding that can be damaged by improper handling during installation or removal.

Module is Not Hot Swappable

CAUTION

Ensure that the system power to the carrier board is removed prior to installing or removing the module. Ensure that there are no other external voltages or signals being applied to the module or other boards within the system. Failure to comply with the above could endanger your life or health and may cause damage to the module or other system components including process-side signal conditioning equipment.

ESD Sensitive Device!

The module contains electrostatically sensitive devices. Observe the following precautions to avoid damage to your module:



- Discharge your clothing before touching the assembly. Tools must be discharged before use.
- Do not touch components, connector-pins or traces.
- If working at an anti-static workbench with professional discharging equipment, please do not omit to use it.

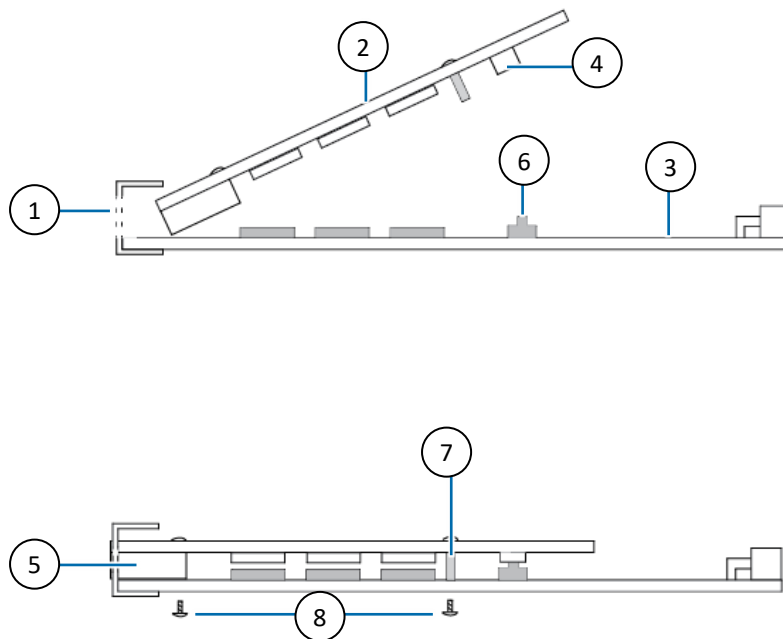
5.1.2. Installation Procedures

The following precautions must be observed before installing the XMC403 module on the carrier board to ensure proper installation and avoid damage to the XMC403 or carrier board. Take care when handling the XMC403, to ensure that neither the XMC403 nor the carrier board is physically damaged. Failure to comply with the installation instructions may damage the module or result in improper system operation.

NOTICE**Handle Carefully to Avoid Damage when Mating/De-mating**

DO NOT USE ANY FORCE when (de-)mating the module's bezel and the faceplate. The shielding tabs may snag on the carrier board and can be damaged if force is applied!

Figure 7: XMC403 Module Installation/Removal Diagrams



- | | |
|----------------------------|--------------------------------|
| 1. Carrier board faceplate | 5. XMC module bezel |
| 2. XMC module | 6. XMC connector carrier board |
| 3. Carrier board | 7. 10 mm stand-off |
| 4. XMC connector module | 8. 4x M2.5 x6 screws |

To install the XMC403 module on the carrier board, proceed as follows:

1. Ensure that the safety requirements indicated above are observed.
2. Ensure that the SFP+ direct attach copper cables and SFP+ optical transceivers are properly configured for operation before installing the XMC403 module.
3. To install the XMC403 module, Ensure that the carrier board (Figure 7, pos. 3) satisfies the application requirements and allows for proper installation of the XMC403 module (Figure 7, pos. 2).
4. Ensure that the following apply: connectors match, faceplate cutout matches, holes for mounting screws are available and match. Stand-offs (Figure 7, pos. 7) can be properly installed, except for required contact points there is no other contact between the carrier board and XMC403 module after mating occurs.
5. Carefully insert the XMC403 module into the faceplate cutout of the carrier board (Figure 7, pos. 1) ensuring that the EMC gasket is properly seated on the carrier board's faceplate.
6. Ensure that the XMC403 module's connector J1 is properly aligned with the carrier board's XMC connector and press the XMC403 module and carrier board together to completely engage the connectors.
7. Ensure that the XMC403 module is properly mated to the carrier board: e.g. XMC bezel flush (Figure 7, pos. 5) with the faceplate, no connector misalignment, no contact between the carrier board and the XMC403 module except where required.
8. Install the four retaining screws (Figure 7, pos. 8) to fasten the XMC403 module to the carrier board.
9. For installation of the carrier board with an installed XMC403 in a system, refer to the carrier board's installation procedures.

5.1.3. Removal Procedures

The following precautions must be observed before removing the XMC403 from the carrier board to ensure proper removal and avoid damage to the XMC403 or carrier board.

NOTICE

Failure to comply with the installation instructions may damage the module or result in improper system operation. Take care when handling the module, to ensure that neither the module nor the carrier board is physically damaged.

To remove the XMC403 module from the carrier board, proceed as follows:

1. Ensure that the safety requirements indicated above are observed.
2. If applicable, remove the carrier board from a system using the carrier board removal procedures.
3. To remove the XMC403 module perform the following:
4. Obtain the carrier board.
5. Remove the four retaining screws (Figure 7, pos. 8) fasten the XMC403 module (Figure 7, pos. 2) to the carrier board (Figure 7, pos. 3).
6. Disengage the XMC connector (J1) carefully from the carrier board's XMC connector, so that no force or movement is applied to the XMC403 bezel (Figure 7, pos. 5).
7. Ensure that the XMC403 bezel is not jammed or hung up on the carrier board. If necessary, partially disassemble the carrier board's front panel (Figure 7, pos. 1) to free the XMC403 bezel.
8. Slide the XMC403 module away from the carrier board's front panel.
9. Dispose of the XMC403 module as described within this user guide.
10. Dispose of the carrier board as described by the carrier board manufacturer.

5.2. Installation/Removal of SFP+ Transceivers

The following precautions must be observed before installing or removing SFP+ transceivers to avoid damage to the XMC403 module or the SFP+ transceivers and to ensure proper installation.

Both SFP+ optical transceiver and SFP+ direct attach copper cable transceivers may be attached to the XMC403 module. For SFP+ transceiver connection to the XMC403 module, refer to Table 6: Reference SFP+ Transceivers.

When inserting the SFP+ transceiver into the SFP+ cage port do not use force as this may damage the XMC403 module. The SFP+ transceiver makes a clicking sound when locked into the XMC403 modules SFP+ cage. For further information regarding the installation and removal of the SFP+ transceivers, refer to the manufacturer's instructions provided with the SFP+ transceiver.



Caution: Laser!

Laser light can harm your eyesight. Do not look into an optical port! Refer to the SFP+ optical transceiver manufacturer's instructions regarding the use of eye protection when handling the SFP+ optical transceiver.

NOTICE

SFP+ Cage EMC Shielding

The SFP+ cages provide EMC shielding that can be damaged by improper handling during installation or removal of SFP+ direct attach copper cables or SFP+ optical transceivers.

DO NOT USE ANY FORCE when installing or removing the SFP+ direct attach copper cables or the SFP+ optical transceivers.

Before removing a SFP+ transceiver from the SFP+ cage, lift the retaining clip slightly on the SFP+ cage. Removing the SFP+ transceiver without releasing the retention clip may result in damage to the SFP+ transceiver or the XMC403 module.



Hot-swappable

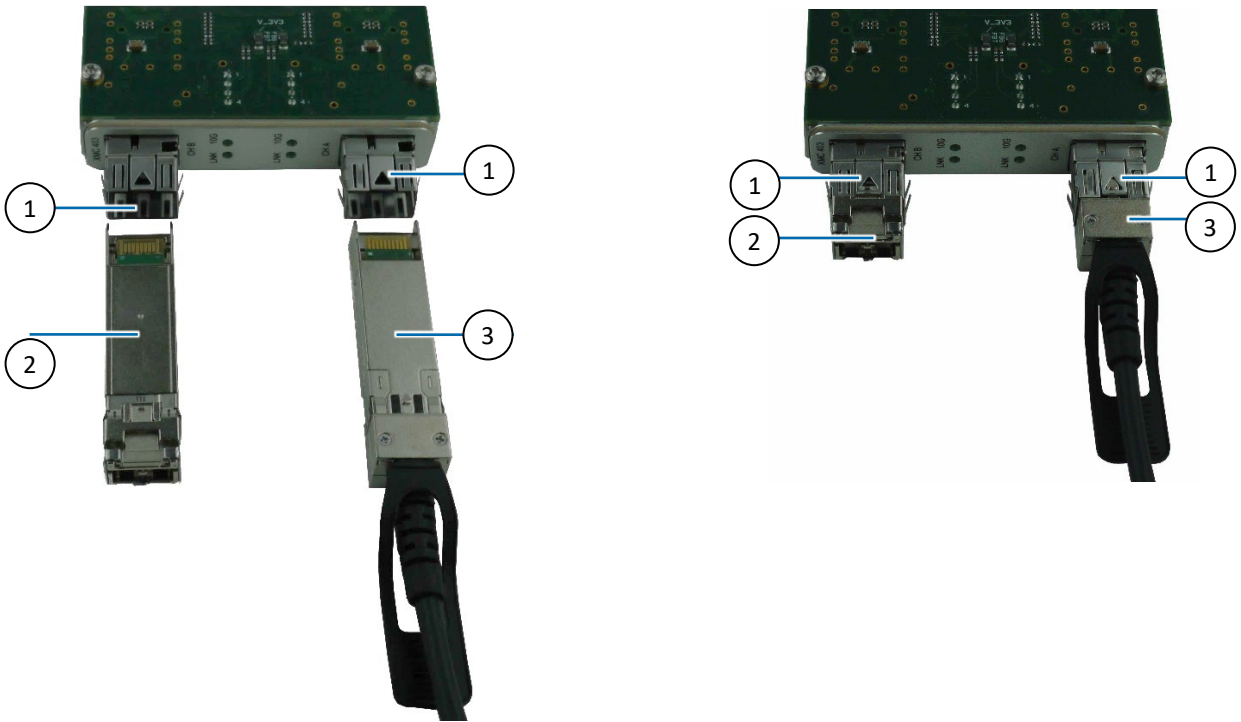
SFP and SFP+ transceivers are hot-swappable. The transceiver can be inserted or removed from the XMC403 module without shutting down the system.



SFP+ transceivers only fit into the SFP+ cage in one direction to avoid incorrect connection



The SFP+ transceiver makes a clicking sound when inserted correctly and locked into the XMC403 modules SFP+ cage.

Figure 8: SFP+ Optical Transceiver and SFP+ Direct Attach Copper Cable

1. Retaining clip(s)
2. SFP+ optical transceiver

3. SFP+ direct attach copper (DAC) cable

6/Configuration

The XMC403 module is designed for plug and play operation, and, as such, it does not have any user configurable module settings that are required for operation.

For application usage of module functionality, refer to the appropriate software documentation.

7/Power Considerations

The Power considerations presented within this chapter must be taken into account by system integrators when specifying the XMC403 system environment.

The XMC403 module is powered via the XMC connector. To power up the XMC403, the module must be installed on a carrier board. The XMC403 uses two power supplies from the XMC connector VPWR (5 VDC or 12 VDC) and 3.3V (3.3 VDC).

For instructions on how to install the module correctly, refer to Chapter 5/ Installation.

7.1. Carrier Board Power Supply

The XMC403 module's power supplies on the carrier board must be specified with enough reserve for the remaining system consumption. To guarantee a stable functionality of the system, it is recommended to provide more power than the system requires.

As the design of the XMC403 has been optimized for minimal power consumption. The carrier board's power supply must be stable even without minimum load.

7.1.1. Power Sequencing and Start-Up Requirements

VPWR and 3.3V should rise at approximately the same time. Both shall rise with a smooth and continuous ramp between 10 % and 90 % of the nominal voltage level. In addition, the turn-on waveform slope must be positive and have an almost linear voltage increase. Power shall be stable once all power supplies are within tolerances.

7.1.2. Tolerance

The XMC specification describes the tolerances of the voltage lines. The recommended measurement point for the voltage is the XMC connector on the carrier board. The following table provides information regarding the required characteristics for each board input voltage.

Table 10: Carrier Voltages for XMC403

Voltage Name	Volatge Level	Tolerance	Resulting Range
VPWR	+5 VDC	±5%	+4.75 VDC to +5.2 VDC
	+12 VDC	±5%	+11.4 VDC to +12.6 VDC
3.3 V	+3.3 VDC	±0.3%	+3 VDC to +3.6 VDC

7.1.3. Regulation

The carrier board power supply shall be unconditionally stable under line, load, unload and transient load conditions including capacitive loads. The operation of the carrier board power supply must be consistent even without the minimum load on all output lines.

Voltage Regulation

All of the input voltages must be functionally coupled to each other so that if one input voltage fails, all other input voltages must be regulated proportionately to the failed voltage. For example, if the VPWR decreases, all other input voltages must decrease accordingly to prevent cross currents within the module.

⚠ WARNING

Failure to regulate the voltage accordingly may result in module damage or improper system operation.



Voltage Discharge

If the main power input is switched off, the supply voltages do not enter the 0 VDC state instantly, as it takes a couple of seconds until the capacitors are discharged. If the voltage rises again before the voltage has gone below a certain level, the board's circuits may enter a latch-up state where even a hard RESET will not help any more. The system must be switched off for at least 3 seconds before it may be switched on again. If problems still occur, turn off the main power for 30 seconds before turning it on again.

7.2. Power Consumption

The power consumption measurements were performed under Windows 10 Pro at a temperature of 25 °C. The values represent the difference in power consumption between a carrier board (CP6007) in idle mode and a carrier board (CP6007) equipped with an XMC403. The XMC403 operates both ports at 10 Gbit/s in full duplex mode using a 100 m fiber optic cable.



The power consumption values vary depending on the ambient temperature or the system performance.

Table 11: Power Consumption - XMC403 Module with Windows Server

Power	XMC403 Power Consumption
VPWR (5 VDC)	11.5 W (2.3 A @ 5 VDC)

8/Technical Support

For technical support contact our Support Department:

- › E-mail: support@kontron.com
- › Phone: +49-821-4086-888

Make sure you have the following information available when you call:

- › Product ID Number (PN),
- › Serial Number (SN)



The serial number can be found on the module's Type Label.

Be ready to explain the nature of your problem to the service technician.

8.1. Returning Defective Merchandise

All equipment returned to Kontron must have a Return of Material Authorization (RMA) number assigned exclusively by Kontron. Kontron cannot be held responsible for any loss or damage caused to the equipment received without an RMA number. The buyer accepts responsibility for all freight charges for the return of goods to Kontron's designated facility. Kontron will pay the return freight charges back to the buyer's location in the event that the equipment is repaired or replaced within the stipulated warranty period. Follow these steps before returning any product to Kontron.

1. Visit the RMA Information website: <https://www.kontron.com/en/support/rma-information>
2. Download the RMA Request sheet for Kontron Europe GmbH and fill out the form. Take care to include a short detailed description of the observed problem or failure and to include the product identification Information (Name of product, Product number and Serial number). If a delivery includes more than one product, fill out the above information in the RMA Request form for each product. Send the completed RMA-Request form to the fax or email address given below at Kontron Europe GmbH. Kontron will provide an RMA-Number.
3. Kontron Europe GmbH
RMA Support
Phone: +49 (0) 821 4086-0
Fax: +49 (0) 821 4086 111
Email: service@kontron.com
4. The goods for repair must be packed properly for shipping, considering shock and ESD protection.



Goods returned to Kontron Europe GmbH in non-proper packaging will be considered as customer caused faults and cannot be accepted as warranty repairs

5. Include the RMA-Number with the shipping paperwork and send the product to the delivery address provided in the RMA form or received from Kontron RMA Support.

9/Storage and Transportation

9.1. Storage

If the product is not in use for an extended period time, disconnect the power plug from the power supply. If it is necessary to store the product then re-pack the product as originally delivered to avoid damage. The storage facility must meet the products environmental storage requirements as stated within this user guide. Kontron recommends keeping the original packaging material for future storage or warranty shipments.

9.2. Transportation

To ship the product use the original packaging, designed to withstand impact and adequately protect the product. When packing or unpacking products always take shock and ESD protection into consideration and use an EOS/ESD safe working area.

10/ Warranty

Due to their limited service-life, parts that by their nature are subject to a particularly high degree of wear (wearing parts) are excluded from the warranty beyond that provided by law. This applies to the lithium battery, for example.

11/ Disposal

11.1. Disposal

Dispose of the product in accordance with country, state, or local regulations and requirements as part of your disposal and decommissioning policies or recycle the product or parts of the product for re-use after performing data sanitization to erase sensitive data stored on the product's memory devices.

When disposing of the product

- › Remove any product labels from the product that could indicate ownership and provide a clue to the type of data stored on the memory device.
- › Comply with your company's environmental requirements and the requirements of Waste Electrical and Electronic Equipment (WEEE) directive.
- › Use data sanitization guidelines to ensure that data sensitive to your business and/or confidential or proprietary data and software is removed from the product using a data sanitization method that stops the data from being retrieved or reconstructed.

11.2. WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- › Reduce waste arising from electrical and electronic equipment (EEE).
- › Make producers of EEE responsible for the environmental impact of their products, especially when the product becomes waste.
- › Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE.
- › Improve the environmental performance of all those involved during the lifecycle of EEE.



Environmental protection is a high priority with Kontron.
Kontron follows the WEEE directive
You are encouraged to return our products for proper disposal.

11.3. Data Sanitization

Data sanitization is the process of permanently erasing or destroying sensitive data on the product's memory devices to prevent unauthorized access to data sensitive to your business and/or confidential/proprietary data stored on the memory devices.

When designing a system, the user must plan for data sanitization and design in memory devices that are easier to sanitize, memory devices from manufactures that provide an effective data erasure tool or a return to factory default command.

When performing data sanitization, the user must consider if the product's memory devices contain sensitive data and develop a data sanitization plan to erase all sensitive data in accordance with country, state, or local data sanitization regulations and requirements or as part of your disposal and decommissioning policies.



Data Sanitization

Users are responsible for erasing sensitive data on memory devices in accordance with country, state, or local data sanitization regulations and requirements, or as part of your disposal and decommissioning policies.

Kontron recommends performing data sanitization when reusing the product in a different user environment, sending the product in for repair, disposing of the product or decommissioning the product.

General guidelines when performing data sanitization on memory devices containing data sensitive to your business and/or confidential/proprietary data:

- Before powering down, consider if power is required to perform data sanitization on the product's memory devices.
- When disconnected from the power source, dismantle all removable memory devices from the product and erase sensitive data.
- Volatile memory devices only store data temporarily. Data on volatile memory can be erased easily by disconnecting the power/removing the battery for approximately 24 hours.
- Non-volatile memory devices store data permanently and retain information when disconnected from power. Data on non-volatile memory, and must be actively erased using one of the following methods:
 - Use an accredited third-party software tool that provides an audit trail, capable of performing a complete data clean including areas such as hidden data and bad blocks not accessed by general service-based utilities.
 - Use the physical destruction method on memory devices that cannot be securely erased using software. The aim of the destruction is to break the silicon die within the chips package to prevent reading data from the die. If this service is performed by a third-party obtain destruction certificates for confirmation.
 - Use the manufacturer's data erasure tool for sanitization or return to factory default command (if provided by the manufacturer). The manufacturer's tools and commands have been designed to fulfil the data sanitization requirement of the manufacturer's specific memory device(s).
- Always verify that all sensitive data has been effectively sanitized.



Dismantle Removable Memory

Dismantle all removable memory devices and erase sensitive data for reuse by using:

- An accredited third-party software tool.
- Manufacturer's data erasure tool' or 'return to factory default command' (if provided).

If the removable memory is not for reuse, physically destruct the memory according to data sanitization guidelines.



Erase Data

To ensure that forensic tools cannot be used to recover sensitive data:

- Use an accredited third-party software tool, with an audit trail, capable of performing a complete data clean including areas such as hidden data and bad blocks not accessed by general service-based utilities.
- Use the manufacturer's data erasure tool or return to factory default command designed to fulfil the data sanitization requirement of the manufacturer's specific memory device(s).



Physical Destruction

When physically destructing the memory:

- Follow proper safety protocols.
- Break the chip packaged silicon die into two or more parts, fragments ≤ 6 mm.
- Check both sides as memory devices may be positioned on the rear side.
- Use a third-party destruction company providing certificates for confirmation.

11.4. Statement of Memory Volatility

The product's statement of memory volatility provides the user with a detailed list of the product's memory devices and their volatility, to enable the user to develop a suitable data sanitization plan.



In some cases, special tools and/or software are necessary to access the memory

Table 12: Statement of Memory Volatility

Memory Non-Volatile	Ref. Design	Memory Size	Alterable in Field	Battery Backed Up	Data Type	Write Protection	Emergency Erase	Process to Clear
XMC FRU EEPROM: M24C02-R	U3	2 Kbit	No	No	Board information	No	No	No user data
Firmware Flash: W25Q64JV	U1	64 Mbit	No	No	Ethernet controller firmware	No	No	No user data

12/ Cyber Security

Cyber security is an important aspect to consider when installing, operating, maintaining and disposing of the product. This chapter provides cyber security guidelines for the user.



Security White Paper

For cyber security guidelines to protect your Kontron product from potential cyber security threats, refer the [Kontron Security Guideline Whitepaper](#).



Security Measures

Kontron is not aware of the final target end user environment in which the product operates. It is not possible for Kontron to provide precise instructions for your cyber security measures. Kontron strives to provide hints for considerations for your threat analysis and to point out particular security mechanisms implemented in Kontron products.

12.1. Security Defense Strategy

When developing your security defense strategy consider implementing the following guidelines to help you effectively secure the product:

- › Policies and procedures developed in association with the product's/end environment's security.
- › Instructions and recommendations for periodic security maintenance activities and reporting product security incidents.
- › Security network controls/setting such as firewall rules.
- › Third-party software tools that further protect the product.
- › Authentication to access the product, limit user privileges and managing user accounts.
- › Data encryption.
- › Reduced number of potential security entry points.
- › BIOS/OS and security updates that do not compromise the product's operation or defense in depth strategy.
- › User accounts with length and complexity requirements.
- › Supplied default passwords are changed.
- › Limited network access (IP address range).
- › Installation of anti-virus and malware software.
- › Network access requirements such as VPN.

Appendix: List of Acronyms

CE	Conformité Européenne
CFM	Cubic Feet per Minute
CPU	Central Processing Unit
DC	Direct Current
EEPROM	Electrical Erasable Programmable Read Only Memory
EMC	ElectroMagnetic compatibility
ESD	ElectroStatic Discharge
FCC	Federal Communications Commission
FRU	Field Replaceable Unit
GB	Ground Benign
Gb	Giga Bit
GbE	Giga Bit Ethernet
IOT	Internet of Things
IPMI	Intelligent Platform Management Interface
iSCSI	Internet Small Computer System Interface
LAN	Local Area Network
LED	Light Emitting Diode
LVD	Low Voltage Device
MDI	Media Dependent Interface
MTBF	Mean Time Before Failure
NVM	Non-volatile Memory
PCIe	Peripheral Component Interconnect Express
PS	Power Source
RMA	Return of Material Authorization
RoHS	Restriction of Hazardous Substances
SCSI	Small Computer System Interface
SFF	Small Form Factor
SFP	Small Form-factor Pluggable
SFP+	Enhanced Small Form-factor Pluggable
UEFI	Unified Extensible Firmware Interface
UL	Underwriters Laboratories
XMC	Switch Mezzanine Card



About Kontron

Kontron is a global leader in IoT/Embedded Computing Technology (ECT) and offers individual solutions in the areas of Internet of Things (IoT) and Industry 4.0 through a combined portfolio of hardware, software and services. With its standard and customized products based on highly reliable state-of-the-art technologies, Kontron provides secure and innovative applications for a wide variety of industries. As a result, customers benefit from accelerated time-to-market, lower total cost of ownership, extended product lifecycles and the best fully integrated applications.

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