

MK5 Link - User Manual

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Revision history

Version	Date	By	Description
0.1	06/05/2024	HCRN	Initial version
1.0	27/08/2024	HCRN	First version
1.1	14/10/2024	HCRN	Update remarks UL
1.2	21/10/2024	HCRN	Add wire cross section to external wiring requirements
1.3	20/11/2024	HCRN	Correction on safety standard paragraph 6.2
1.5	9/12/2024	GDBY2	Correction on Protection Grade paragraph 9.1
1.6	20/03/2025	GDBY2	Update Label
1.7	8/04/2025	GDBY2	Updated section 11.2.3 IC Compliance Statements

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1 Preface

1.1 General

This manual is written for the original equipment manufacturer (OEM) who plans to build industrial machines based on this Main Controller. It provides also deep hardware information for the system programmer. The manual contains interconnections, technical data and mounting requirements.

1.2 Markings and Symbols

The following symbols may be found on the product label or user manual:

	Danger for bodily injury
	Note or remark
	Warning, read the documentation
	Attention ESD sensitive part

1.3 Product Disposal



This electronic product is subject to the EU Directive 2012/19/EU for Waste Electrical and Electronic Equipment (WEEE). As such, this product must not be disposed of at a municipal waste collection point. Please refer to local regulations for directions on how to dispose of this product in an environmentally friendly manner.

1.4 Document Scope

This manual applies to the MK5 Link as part of the compressor control solution. MK5 Link is intended to be used only when operated with a MK5 main controller.

The MK5 Link in general contains:

- Mains input for 24V AC/DC power supply
- CAN-interface (SUB-D9 male)
- WiFi / Bluetooth antenna connector (RP-SMA)
- 3 status LEDs (RGB, green, orange)
- 2 push buttons

The product is branded as Atlas Copco or Original Parts unit.

- Atlas Copco part number: P1830117526
- Original Parts part number: P1830117527

2 Glossary

CPU	Control Process Unit.
PCB	Printed Circuit Board
CAN-Bus	C ontroller A rea N etwork. Standard field bus, that is used in automotive as well as in industrial applications.
IC	Integrated circuit.
EMC	Electromagnetic Compatibility
Sub-D	Subminiature D Connector.
LED	Light Emitting Diode
Flash EPROM	Erasable Programmable Read Only Memory. Flash types allows an electronic erase.
SDRAM	Synchronuous Dynamic Random Access Memory

3 Liability

Psicontrol cannot accept any liability if the client:

- has not installed the module conform this manual
- has modified or altered the controller in any way
- has replaced parts/components
- has combined the controller with other machines or work equipment than specified in this installation manual.

4 Product Description

4.1 Overview features

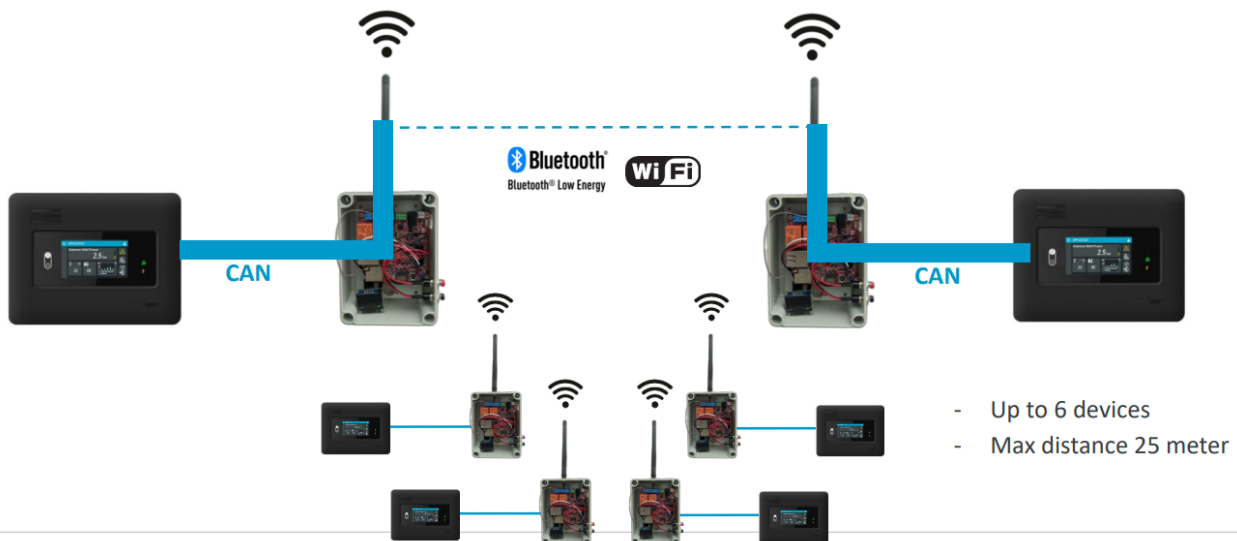
The Atlas Copco MK5 Link module is a wireless M2M module used to optimize machine communications in the compressor room. It is a cost-effective solution to replace the abundance of CAN cabling between different machines.

The module supports WiFi and BLE wireless communication integrated into a dedicated DIN-mounted housing.

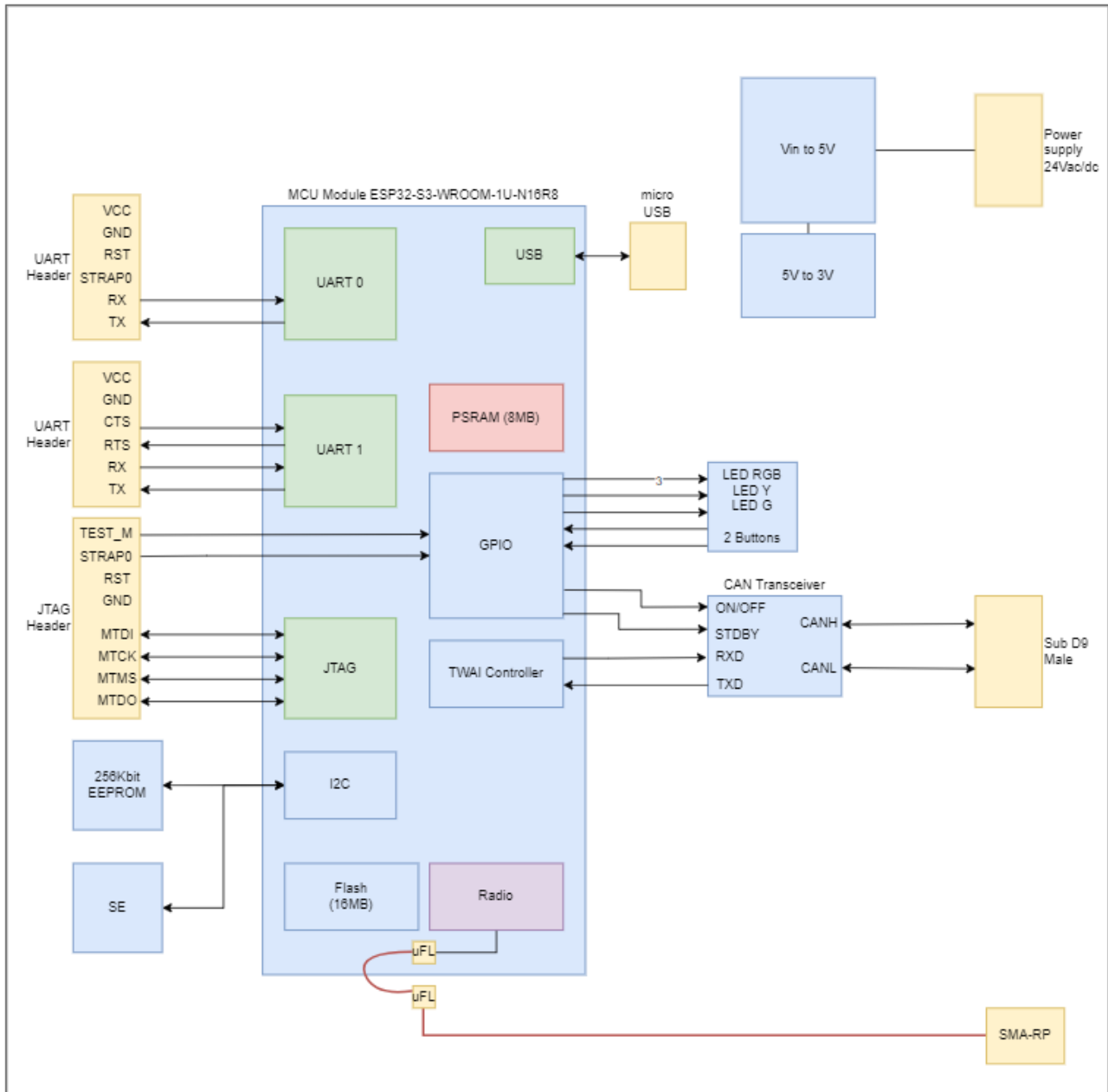
Current solution:



MK5 Link solution:



The MK5 Link module concept is illustrated in the diagram below.



5 Intended use.

5.1 Environmental conditions

The controller is designed to work in following conditions:

- **Operating environment:**
 - Minimum temperature: -10°C
 - Maximum temperature: 60°C
 - Maximum relative humidity: 90%RH @45°C; no condensation allowed.
 - **Storage/ transport environment:**
 - Minimum temperature: -20°C
 - Maximum temperature: 70°C
 - Maximum relative humidity: 90%RH @45°C; no condensation allowed.
- Maximum altitude of 2000 m

The MK5 Link is for indoor use only and should be mounted in an IP54 enclosure which guarantees pollution degree 2. (only non-conductive pollution, occasionally temporary condensation may be expected)



The MK5 Link shall be protected against direct sunlight. Direct sunlight may affect the visual appearance of the MK5 Link.

5.2 Care and Maintenance

The suggestion below will help you to enjoy this product for many years.

- Do not expose the module to any extreme environment where the temperature or humidity is high.
- Do not attempt to disassemble the module. There are no user serviceable parts inside.
- Do not expose the module to water, rain or spilt beverages. It is not waterproof.
- Do not abuse the module by dropping, knocking, or violent shaking. Rough handling can damage it.

6 Mounting and installation

6.1 Mechanical mounting

- The MK5 Link is NOT intended to use stand-alone or installed by an end-user.
- The MK5 Link will always be built-in in an external enclosure (e.g., cabinet). This enclosure shall be provided by another equipment. The external enclosure will provide fire, mechanical and electric shock protection according to the requirements of the standard EN 60950-1 and IEC60204-1. The equipment is intended to be installed in restricted access locations.



When installed in a cabinet, the inner temperature of the cabinet corresponds to the ambient temperature of the device.

- The MK5 Link shall be mounted vertically and upright on DIN-Rail. Mounting should safeguard against spillage of internal liquids.
- The control box in which the MK5 Link is mounted should contain following label and may only be opened by key or special tool.



This enclosure contains electrical equipment.



For optimal wireless performance, do not install the MK5 Link close to any metal objects.

6.2 Electrical installation

Once the mechanical installation is performed, the equipment can be electrically connected.



No serviceable parts inside. The module has not to be opened!



Installation of the equipment, earth connections and verifications shall be performed by a skilled person (according to IEC 61010-1)



It is not permitted to place the antenna outside the building where the MK5 Link is installed.

6.2.1 Supply requirements

The device has **no** internal disconnecting device or fuse in the power supply line.

The power supply conductor shall have a disconnecting device meeting the relevant requirements of IEC 60947-1 and IEC 60947-3 plus an external fuse **1,25A slow** (approval C22.2 No. 248 series, UL 248 series) shall be installed externally in the same cabinet within less than 3m supply cable.

The supply cable should be compliant with IEC60204-1 requirements. The disconnecting device must be provided with means to block it in the OFF position.

The placement and accessibility of the disconnecting device should meet the IEC60204-1 requirements. The disconnecting device must be provided with a means to block it in the OFF position.

An external fuse shall be installed externally in the same cabinet within less than 3m supply cable.

The supply cable should be compliant with IEC60204-1 requirements.

The supply connections are not accessible to the operator (the equipment is intended for built-in external enclosure).

The secondary circuit of the supplying transformer/adaptor should be separated from the primary circuit by at least reinforced insulation.

The supply voltage is:

- 24VDC +10% / -10%
- 24VAC +25/-25% (50/60Hz)

6.2.2 EMC information

This equipment has been evaluated against industrial immunity test levels and emission limits for residential environments.

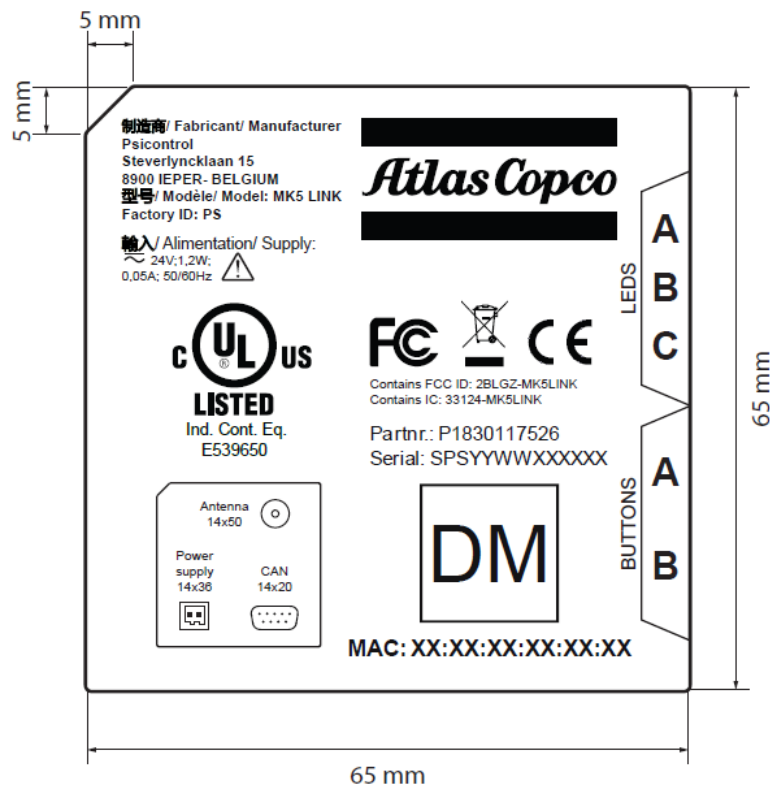
6.3 Connections

The MK5 Link product label contains all information necessary including the connections.

See chapter 4 Product Description and chapter 6 Mounting and installation for more details.



The sections of the externally connected wires shall be according to the rated-power defined in the chapter "Technical Data" and according to Table 6 of IEC60204-1.



7 Switching on the module

The MK5 Link is powered on when supplying with 24Vac, 50-60Hz or 24Vdc. The device state can be observed through the LED's.

The MK5 Link can connect to other MK5 Link devices, functioning as a CAN repeater/router to transmit received CAN messages to paired devices.

Power Verification

Before setup, ensure the device is powered by checking the middle LED (constantly lit or flickering).

Device Setup

1. **Activate Maintenance Mode:** Press and hold both buttons for three seconds, then release. The middle LED will blink periodically, indicating maintenance mode is active.
2. **Mode Selection:** Each device can be configured as either a master or slave. Change the mode by pressing the bottom button twice. The top LED indicates the mode:
 - a. **Master Mode:** Top LED off.
 - b. **Slave Mode:** Top LED on.
 - c. The installer should select the appropriate mode based on the compressor setup.
3. **Pairing Devices:** to pair MK5 Link devices:
 - a. **Enable Pairing Mode:** Press the top button. The bottom LED will blink blue, indicating pairing mode is active.
 - b. **Pairing Process:** Perform this action on each MK5 Link device to be paired. MK5 LINK will seek nearby devices to pair with. Every device is required to be in pairing mode.

Pairing mode will automatically disable after a secure connection is established, except on the master device. For the master device, disable pairing mode manually by pressing the top button. When pairing is disabled (either automatically or manually), the bottom LED will show the signal quality (see "Signal Quality Indication").

Maintenance mode will remain active for 1 hour. Maintenance mode can be deactivated manually by pressing and holding both buttons for three seconds, then release.

Signal Quality Indication

Devices not in pairing mode will display wireless signal quality on the bottom LED:

- **Green:** Good signal quality.
- **Red:** Poor signal quality.

CAN Transmission Indication

Devices not in maintenance mode will display CAN transmission on the middle LED:

- **Constantly lit:** device is powered on but not receiving any CAN messages.
Please verify CAN connection and CAN bus.
- **Flickering:** device is receiving CAN frames. CAN communication is OK.

If the middle LED is not lit up or flickering, the device is not functional. Please ensure the power is supplied. If power is supplied and the device is not functional, please replace the defective MK5 LINK device.

By following above steps, the installer can ensure reliable and secure wireless CAN communication between MK5 Link devices.

8 Maintenance during service

There are no serviceable parts inside. The controller should not be opened! If defect, please return the complete module.

9 Technical Data

9.1 General

- Power supply:
 - 24Vdc +10%/-10%
 - 24Vac +25%/-25% (50-60 Hz)
- Functional earth (FE): N/A
- PE over board: No
- Isolation Class Protection electrical shock: N/A (SELV Supply required)
- Overvoltage Category (OVC): II (on mains of AC/DC converter or AC/AC transformer)
- Pollution degree: 2
- Operating Altitude: < 2000m
- Max load: 1.2W
- Protection Grade (IP grade): IP20 (IEC Publication 529) / UL Open type device
- Temperature Range:
 - Operating: -10°C...+60°C
 - Storage: -20°C...+70°C
- Permissible humidity: Relative humidity 90%, no condensation
- Weight: 97 g
- Dimensions:
 - Width: 84 mm
 - Height: 118 mm (including RF antenna)
 - Depth: 25 mm
- Top:
 - Power and RP-SMA connector
- Bottom:
 - CAN connector
- Front:
 - 3x LEDs
 - 2x buttons

9.2 Processor

An Espressif ESP32-S3 module is acting as the logic processor and connectivity module. It offers the following minimum functionality:

- Wi-Fi
 - Protocol: 802.11n
- Bluetooth/Bluetooth Low Energy
 - Bluetooth 5.0
- Connector to external antenna connector
- Storage flash 16 MB
- PSRAM 8 MB

9.3 EEPROM

An external EEPROM is present to store counters/values as well as historical data. This is required to prevent the non-volatile memory on the ESP32 chip from being used too extensively and shorten the lifetime of the hardware. Periodical data is stored every 15 minutes.

9.4 RF

- Types of RF: Wifi 2.4GHz, Bluetooth LE
- Used modules and certifications: ESP32-S3-WROOM-1U [Datasheet](#)
- Used antennas or integrated into module: 2J0202-C75G [Datasheet](#)

9.5 User Interface

- Total number of buttons: 2
Two push buttons are present to allow interaction with the module (e.g., enter pairing mode, maintenance mode, ...).
- Total number of LEDs: 3
Three LEDs are present to show status and activity



- TOP_GREEN: single color LED (yellow)
 - o Used for mode indication (master/slave)
- MIDDLE YELLOW: single color LED (yellow)
 - o Used for CAN communication activity
- BOTTOM RGB: multicolor LED (three colors)
 - o Used for signal quality indication + wireless TX/RX
 - o Red: bad signal, yellow: medium, green: good

9.6 External Connections

- Power
connector: WAGO 2 pin
cable length: <1m
Wago connector 2 pins is delivered within the MK5Link package. Apply the following wiring guidelines :
 - Wiring shall be done strictly according to the connector layout and pin assignments as detailed in chapter 10. Confirm that all connections are correct.
 - Use proper wires that meet the applicable voltage and current requirements.
 - Use copper wires of 1mm² or 18AWG.
 - Only use electrical wires with a minimum temperature rating of 70°C.
 - Use stranded or solid copper conductor cables.
 - Verify that the wiring is suitable for the MK5Link operating conditions and installation environment.
 - Ensure that primary wiring is routed separately from secondary wiring in the machine cabinet.
- CAN interface
connector: D-SUB 9 male
cable length: <30m (no network)
Apply the following wiring guidelines :
 - Wiring shall be done strictly according to the connector layout and pin assignments as detailed in chapter 10. Confirm that all connections are correct.
 - Only use electrical wires with a minimum temperature rating of 70°C.
 - Use stranded or solid copper conductor cables.
 - Verify that the wiring is suitable for the MK5Link operating conditions and installation environment.
- Antenna interface
Connector: RP-SMA female

10 Pin assignments

Power supply

Wago 734-162

14X36



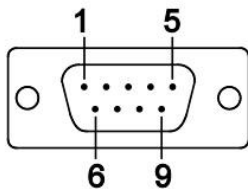
Pin	Function
1	24V AC/DC
2	24V AC/DC

Reference power cable connector: Wago 734-102

Pin Assignment CAN BUS

Type: Sub-D 9 pole male

14X2



Pin	Function
1	Reserved
2	CAN_LOW
3	CAN_GND
4	Reserved
5	Reserved
6	CAN_GND
7	CAN_HIGH
8	Reserved
9	Reserved

11 Certification and Approvals

11.1 European Union

This device has been assessed against the applicable CE marking directives and regulations and found compliant as indicated by the CE marking on the product label.

The CE Declaration of Conformity is available for the respective authorities upon request.

11.2 United States and Canada

11.2.1 UL Safety Approval

This device has been assessed and found compliant with the following product safety standards:

- UL61010-1 and UL61010-2-201, File Exxxxxxxxx
- CAN/CSA No.61010-1-12 and CAN/CSA C22.2 No.61010-2-201

11.2.2 FCC Compliance Statements

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with radio frequency exposure limits set forth by the FCC for an uncontrolled environment.

This device has been found to be compliant to the requirements set forth in CFR 47 Section 1.1307 addressing RF Exposure from radio frequency devices, as defined in Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields. To maintain compliance, the minimum separation distance from the antenna to general bystander is 20 cm (8,7 inches) or more.

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The Part 15 radio device operates on a non-interference basis with other devices operating at this frequency when using the supplied antenna. Any changes or modification to the product not expressly could void the user's authority to operate this device.

11.2.3 IC Compliance Statements

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This radio transmitter 33124-MK5LINK has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated.

Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio 33124-MK5LINK a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Parameter / Paramètre	Antenna / antenne
Antenna Name / Nom de l'antenne	2J0202-C75G
Antenna Type / Type d'antenne	2.4/5.0/6.0 GHz ISM Antenna
Max. antenna gain / Gain d'antenne max.	3.1 dBi
Impedance / Impédance	50 Ohm

11.3 United Kingdom

This device has been assessed against the applicable British standards (BS) and found compliant as by the CE marking on the product label.

This equipment should be installed and operated with minimum distance 20 cm (7.87 inches) between the radiator and your body

The CE Declaration of Conformity is also available for the respective authorities upon request.