

READ IN THE BEGINNING

MRS-101A-S 1ch-Strain Transmitter Firmware Ver.2.00 or later

Thank you for purchasing KYOWA's product MRS-101A-S (1ch-Strain Transmitter).
Read this manual carefully in order to make full use of the high performance capabilities of the product.
Do not use the product in methods other than described in this Manual.

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The contents of the manual are subjected to change without prior notice.

We assume no responsibility whatever for any damage resulting from the use of this product.

The instruction manual in other available languages can be found at

<https://www.kyowa-ei.com/eng/support/download/manual/acquisition/index.html>

●STANDARD ACCESSORIES

The following accessories are packed with the MRS-101A-S.

When unpacking, check the contents to ensure that all accessories are enclosed.

Adapter board (ADP-01)*	1
JCIS10-70 Miniature Screw (M2x4)*	1
Battery holder (AAA cell×2) for checking operation	1
ID label	1
Product Warranty	1

*Attached to the transmitter body

●OPTIONAL ACCESSORIES

Quarter-bridge 2-wire Adapter (120 ohm) (ADP-02-120)

●SAFETY PRECAUTIONS (Do not forget to read the safety precautions prior to use.)

The MRS-101A-S is designed to be used according to "SPECIFICATIONS". Do not use the product in an environment exceeding the specifications. Or, it may cause troubles.

• PRIOR TO USE

For safe use of the product, do not forget to read the "SAFETY PRECAUTIONS" prior to use.

KYOWA assumes no liability for any damage resulting from the user's failure to comply with the safety precautions.

For safety operation of the product, the following symbol marks are used in the manual.

	Indicates "PROTECTIVE GROUND TERMINAL". Be sure to connect the GND terminal to the ground.
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• SAFETY SYMBOLS

For safety operation of the product, the following symbol marks are used in the manual.

	WARNING	Improper operation of the system may result in death or severe injury of the operator.
	CAUTION	Improper operation of the system may result in injury of the operator and physical damage of the system.

WARNING

● Warning

Be sure to observe the safety precautions described in the MRS-101A-S READ IN THE BEGINNING.

● Power supply

To prevent a fire hazard, ensure that the power supply voltage specified for the product matches the local line voltage before connecting the system to the power supply.

● Avoid using in environment with inflammable gas, etc.

To prevent the risk of fire hazard or explosion, do not use the product in environment with inflammable gas, vapor, or dust.

● If any trouble occurs

To prevent a fire hazards, if smoke is emerging from the product, immediately disconnect the power source to terminate the system operation.

● Protective ground

Be sure to connect the GND terminal to the ground. Or, it may cause an electric shock hazard, lower the performance, and cause trouble.

● To avoid secondary system damage from product failure, always follow a maintenance plan with separate technical measures.

● Never use the product in medical facilities.

Doing so may interfere with medical devices, posing a life-threatening risk.

● Never use the product at airports or in aircrafts.

Doing so may cause airport equipment to malfunction, posing a life-threatening risk.

● Do not use the product where use of wireless devices, such as mobile phones, is prohibited.

CAUTION

● Caution

Be sure to observe the safety precautions described in the MRS-101A-S READ IN THE BEGINNING.

● Do not turn ON the power switch immediately after turning it OFF.

After turning OFF the power switch, wait (5 seconds) until the power supply is shut OFF before turning ON the power switch again.

● To disconnect the product, turn controls to off, then remove plug from wall outlet.

Use at temperatures exceeding the specified range may lower the performance and cause trouble.

● Use the product within the operating temperature range.

Use in a humid place exceeding the specified range or where it is exposed to splashing water may lower the performance and cause trouble.

● Use the product at the altitude up to 2,000m.

● Do not use the product immediately after the change in the environment.

Allow the product adequate time to adjust to the ambient environment prior to use.
In addition, abrupt changes in ambient temperature during transportation, etc. may cause condensation, which may result in lower performance and/or damage the system.

● Use the product under environment without excessive vibration or high impact.

Use the product in an area where vibration and impact can be kept within the scope of specifications.
Continuous vibration or severe impact may cause deteriorated performance and system failure.
In case of installing the product at high place, prepare enough measures for prevention of its drop.
Use the product in area where elevation is 2000m or below.

● This product operates on the 2.4 GHz band, which wireless LAN, Bluetooth®, and microwave ovens also use. Devices on the wireless LAN or on other radio waves may generate electromagnetic interference that causes wireless communication errors in this product.

Before using this product, check to confirm that there are no such devices nearby.

In addition, note that the wireless LAN and Bluetooth® functions of the computer on which the Setting Software for this product is installed may generate electromagnetic interference. When controlling this product via the computer, turn off the computer's wireless LAN and Bluetooth® functions.

● Do not use the product under poor conditions.

Operate the product within the range of power supply specs. The power supply used for the product should not experience an instantaneous power failure and be free from noise.

● Do not pull cords and cables.

Lay cords and cables with a certain allowance so that unreasonable force is not applied to the connections.

Or, it may interrupt the measurements, break the cables, and damage the connectors.

● Avoid installing sensors and products near a welding machine. Failure to do so will pose the risk of erroneous data, malfunction and failure.

● Do not disassemble or remodel the product. Or, it may cause electric shock hazards or damage the product. This warranty does not cover any damaged or defective parts that results from disassembling or remodeling.

● Do not use or strage the product under dusty or fine particles or corrosive gas environment.

Use or strage under these environment, may result in lower performance and troubles.

● Do not expose the product to the air if it is used and stored nearby sea. Air exposure nearby sea may cause lower performance and products failure.

● Take care when handling the CD-R.

Do not expose the CD-R to direct sun light, high temperature, or high humidity.

Do not apply pressure to the CD-R by laying object or bending.

Dust, scratches, and fingerprints on either side of the CD-R can cause write errors.

● Preheat the product before use.

After the power ON, always preheat the product for approximately 1 hour.

● Cleaning.

When the product gets dirty, clean the product with a dry soft cloth.

● Do not use the MRS-101A-S outside, in a humid place where it is exposed to splashing water without conducting the waterproof treatment to the transmitter, battery and wiring.

● Do not place the MRS-101A-S on an uneven surface.

● When installing the transmitter on a rotating body, install a safety cover to secure safety from blown parts.

●NOTATIONS USED IN THE MANUAL

The following notations are used in the manual for convenience.

• Names described on the panel surface

Names described on the panel surface are expressed in double quotation mark " ".

• Informational notes

Certain notations are used as necessary to attract your attention to information that requires special care when handling the product, and to information provided for reference purposes.

Examples of Notations

NOTE

Essential precautions required when handling the product.

MEMO

Reference items required when handling the product.

●SURFACE APPEARANCE

In manufacturing process, some products have a little uneven surface and rough coating.
They do not affect quality, performance and strength of the product.

●OUTLINE OF PRODUCT

■OUTLINE

Wireless measurements (telemeters) have long been desired to measure the torque of rotation shafts or to measure data at a place where wiring is difficult. The product is a telemeter to meet the strict system requirements and conditions (vibration resistance, impact resistance, centrifugal acceleration resistance, small size for narrow space, high stability over the wide operating temperature range, low current consumption to get long time battery usage, and high-speed sampling).

■FEATURES(1-ch strain transmitter: MRS-101A-S)

● Resin-molded (non-metallic case) mechanism

Range by the built-in antenna: Max. 50 m (Line of sight distance)

● Thin (5.5 mm) enough for narrow space

● 5-step measuring ranges

● High stability

Within 2.5×10^{-6} strain when the ambient temperature change is 50°C.

● Bridge-disconnection checking

● Minimum power supply: 2.2 VDC by two AAA size batteries (eneloop®)

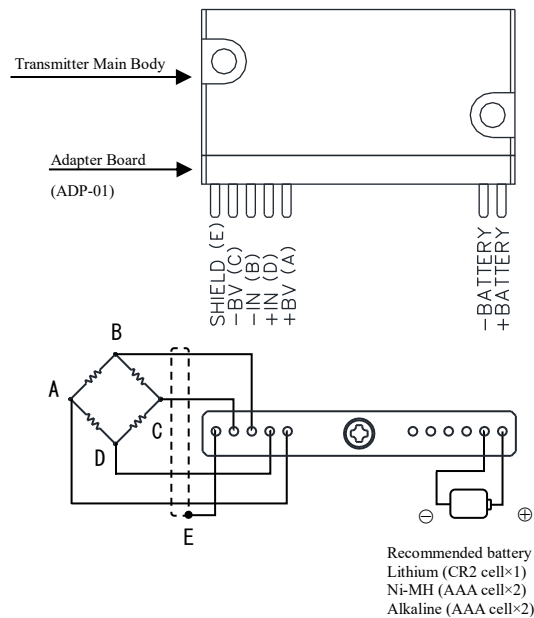
● Continuous operation time: Approx. 34 hours (23°C, bridge resistance 120 ohm) with the two AAA size batteries (alkaline)

● High-speed sampling: 4.8 kHz

● Centrifugal acceleration resistance: 3000 G

●CONNECTION

Wire as shown below.



NOTE

The Adapter Board can be removed for replacement. To reconnect it, solder the pins on the Adapter Board.
Avoid exposing the Adapter Board to excessive solder and heat from the soldering iron.

NOTE

Keep the sensor wire short. Long wiring may introduce noise into sensor signals and negatively affect signal transmission and reception.
Keep the battery wire short. Long wiring may negatively affect signal transmission and reception.
The included battery holder, which houses two AAA-cell batteries, is not designed to withstand vibration, impact, or centrifugal force. Use the batteries in the holder only for checking operation.

MEMO

The product is compatible with four-gage bridges.

●Preparation

For proper use of transmitter, frequency CH of transmitter and receiver should be same, and transmitter ID and transmitter information (range, bridge resistance and transmitter type etc.) should be registered in receiver.

For matching transmitter ID and frequency CH, [Pairing settings] should be done in Setting Software(MRS-10B) and transmitter information should be registered in receiver.

Registered information is saved in nonvolatile memory, so saved information can be kept even after power is off.

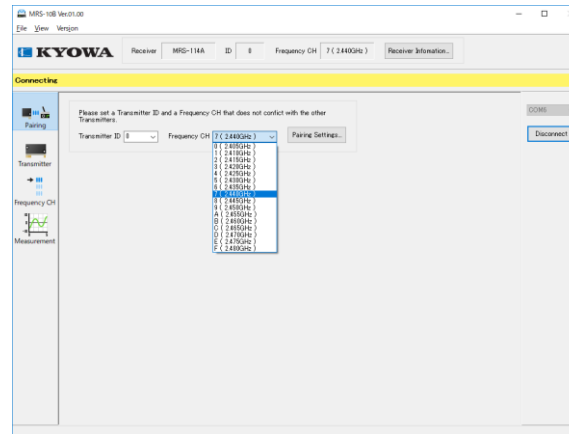
NOTE

For accurate [Pairing settings], distance of transmitter and receiver should be within 50cm.
[Pairing settings] must be performed by each pair of transceivers, when several pairs of them are used.

For detail, please refer to MRS-10B.

■Pairing settings

By selecting the [Pairing] tab from the tool bar and using the pull-down menu, the transmitter ID and Frequency CH can be set. The transmitter type can be registered at the same time.



NOTE

In the case of using multiple paring, transmitter ID and Frequency CH should not overlap with other pairing.

NOTE

Transmitter ID and Frequency CH is important information for signal communication.
So, Transmitter ID and Frequency CH shall be managed strictly.

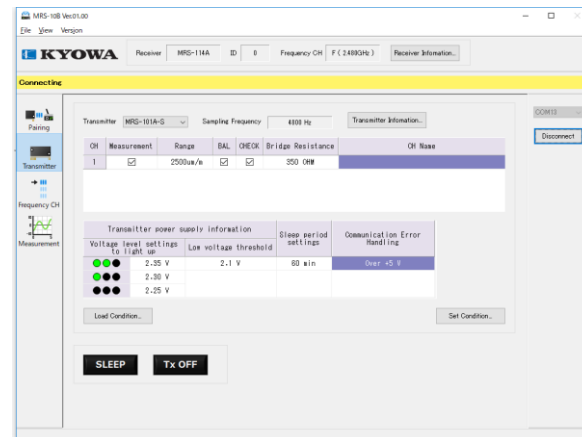
MEMO

Label is applied onto transmitter body to write ID.
Write ID on label with pen. Spare label is packed with transmitter.



■Measurement range, bridge resistance setting

By selecting the [Transmitter] tab from the tool bar, the number of measurement channels, measurement range and bridge resistance can be set.



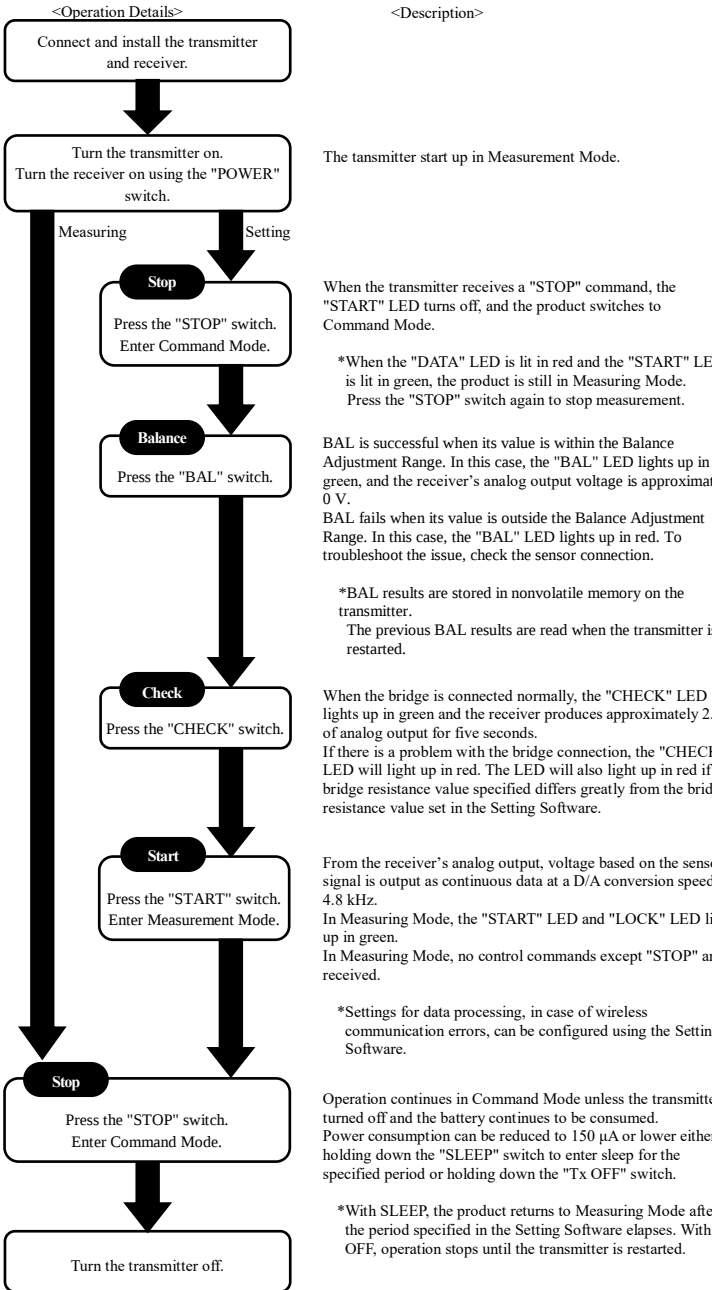
After preparation, computer with Setting software should disconnect from receiver. After wiring transmitter and setting receiving antenna, operation stated below enables transmitter's measurement data to be outputted from receiver as analog output. Analog output from receiver can be recorded with data logger prepared by users.

In this measurement, there are two different modes, 'Measuring Mode' and 'Command Mode'.

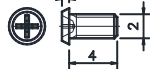
In 'Command Mode', measurement range can be set, and by using "BAL", "CHECK", "START" switch, every commands of receiver are operable.

In Measuring Mode, receiver outputs measurement data from transmitter with analog output. Except for "STOP" switch, any commands cannot be operated.

Command Mode and Measuring Mode can be switched by "START" and "STOP" switch.



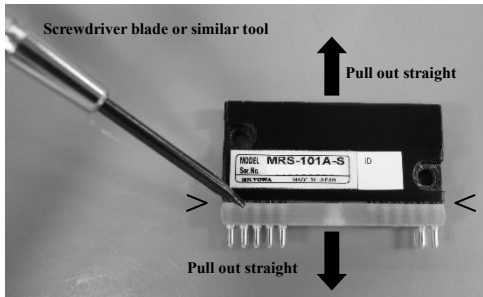
The transmitter body is attached to Adapter Board and fixing surface by the screws in the following table.

Mounting object		Adapter Board	fixing surface
Screw	Type	JCS10-70 Miniature Screw(M2)	Hexagon socket head cap Screw (M2.5)
	Material	SWCH	SCM435
	Finish	Black Trivalent Chromate	Black Trivalent Chromate
	Size	 (mm)	 (mm)
Max. Torque to the Transmitter Main Body		0.1N・m	0.45N・m
Mounting precautions		Exceeding the maximum torque or mounting the transmitter to a warped or uneven fixing surface may cause damage or cracking on the transmitter or prevent normal operation. Fix the MRS-101A-S on flat metal surface, etc. by the recommended screw in using it on rotating shafts, moving obstacles, etc.	

When removing the Adapter Board from the transmitter, after removing the small screw (M2), pull out the Adapter Board straight.

Be careful when handling the transmitter pins, as they can bend easily.

If the Adapter Board is difficult to pull out, insert a flat tool, such as a screwdriver blade, between the transmitter and Adapter Board and gradually separate both sides, one after the other.



If difficult to pull out,
insert a screwdriver
blade and gradually
separate both sides.

If the pins become bent, use tweezers or similar tool to straighten them before use.
Be careful, because inserting the Adapter Board when the pins are bent may damage the transmitter pins.

Hardware Specifications	
Measuring Targets	Strain gages (Full bridge system), Strain gage transducers
Number of Channels	1
Compatible Bridge Resistance	120 to 1000 ohm
Gage Factor	2.00 fixed
Bridge Excitation	1 VDC
Measuring Range	1000, 2500, 5000, 10000, 25000×10 ⁻⁶ Strain
Range Accuracy	Within ±0.15%FS
Balance Adjustment Range	Within ±10000×10 ⁻⁶ Strain
AD Resolution	16 bits
Sampling Frequencies	4.8 kHz
Stability Temperature	Zero point: Within ±0.05×10 ⁻⁶ Strain/°C Sensitivity: Within ±0.01 %/°C
Operating Temperature, Humidity	-25 to 75 °C, 20 to 85 % (Non condensing).
Vibration Resistance	294.2m/s ² (30G), 10 to 500Hz
Shock Resistance	980.7m/s ² (100G), 11ms
Centrifugal Acceleration limit	29420m/s ² (3000G)
Power Supply	2.2 to 4.4VDC
Current Consumption	Within 32mA (Test conditions: Power Supply 3.0V, Bridge resistance 120 ohm)
Hours of Continuous Use	Approx.28 hours (Lithium (CR2 manufactured by Panasonic)) Approx.24 hours (Ni-MH eneloop® (BK-4MCC, AAA cell×2)) Approx.34 hours (Alkaline EVOLTA (LR03EJ, AAA cell×2)) *Under the conditions of tests: +23 °C, Bridge resistance 120
Dimensions	35mm (W) × 5.5mm (H) × 19.5 mm (D) (Excluding protrusions)
Weight	Approx. 10g
Compliance	Directive 2014/53/EU (RED) Directive 2011/65/EU (6 restricted substances) (RoHS)
■RF Specifications	
Transceiver Frequency Channel	1CH (Choose 1 channel from 16 channels using Setting software)
Antenna	Built-in Antenna
Radio Communication Frequency	Band 2.4GHz Band
Radio System	Digital Modulation System
Radio Certification	MIC (Japan), FCC (U.S.), WPC ETA (India), RED (E.U.), NBTC (Thailand)
Radio Communications Distance	Maximum line of sight distance: 50m
Radio Environment of Usage	Environment where the wireless LAN and the Bluetooth®, etc. are not intermingling on the 2.4GHz

Frequency Channel	CH 0	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7
Central Frequency (GHz)	2.405	2.410	2.415	2.420	2.425	2.430	2.435	2.440

Frequency Channel	CH 8	CH 9	CH A	CH B	CH C	CH D	CH E	CH F
Central Frequency (GHz)	2.445	2.450	2.455	2.460	2.465	2.470	2.475	2.480

- | | |
|--|---|
| ■ Specifications in Combination with MRS-111A (1ch-Receiver) | |
| Analog Output Voltage | ±5V/ (Full Scale Range) |
| Measurement Accuracy | Within ±0.2%FS |
| Frequency Response Range | DC to 370Hz (Dev. +0.5, -1dB), -3±1dB (at 480 Hz) |
| Delay Time | 11.1±0.3ms (at DC to 480Hz) |

[illegible]

The diagram illustrates the setup for the MRS-111A receiver. The receiver is shown with its rear panel (ANTENNA, CH1, GND, MAIN) and front panel (AC IN, BAL, CHECK, START, STOP, TO OFF, SLEEP, and a USB port). It is connected to a data logger, an AC adapter, a laptop (for setting software), and two antennas. A callout box explains: "E-02(Extension cable for receiving antenna (3m)) or E-03(Extension cable for receiving antenna (6m)) can be used. *E-03 is an optional accessory. *E-03 cannot be used in Europe." The receiver is also connected to a 1ch-starin transmitter (MRS-101A-S) via a full bridge system of strain gauges or transducers. The transmitter is shown with a power source and a ground connection.

Computer with Setting software (MRS-10B) is necessary, if setting condition listed below need to be changed.

If the condition below do not need to be set, only receiver panel is necessary for operation.

- Set "Pairing"
- Set "frequency channel"
- Se "Measuring Range"
- Set "bridge resistance value"
- Set "Communication Error Handling"

NOTE

The product is for use only in Japan, India, Thailand, the United States and the European Union. Use in other countries or regions is prohibited.

IMPORTANT REGULATORY INFORMATION

JAPAN
Type certification
The product has been certified as a low-power data communications system in the 2.4 GHz band (Technical Regulations Conformity Certification System: Ordinance of MPT No. 37, 1981, Article 2, paragraph 1, item (19)) according to the Radio Law of Japan.
Accordingly, no radio equipment license is required to use this product.
When mounting the product in your system, please clearly indicate the following certification information of the product on the case or on the customer's instruction manual, package or container etc.
Futhermore, the following actions may be punishable under law:
• Disassembling or modifying the product.
• Removing the certification label on the product. Please notify following certified ID on your product.
Name of radio equipment: MR-2400M Number of type certification: 007-AE0235

FCC
COMPLIANCE WITH ELECTRIC DIRECTIVES & REGULATIONS
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.
[CAUTION]
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
When mounting the product in your system, please notify following certified ID on your product.
Contains Transmitter Module
FCC ID: 2AJE9, MR-2400MA

INDIA
REGULATORY NOTRICE FOR Radio Frequency module
• Notice for users in India
The name of RF module: MR-2400MA

THAILAND
REGULATORY INFORMATION in Thailand
เครื่องโทรคมนาคมและอุปกรณ์นี้ มีความสอดคล้องตามข้อกำหนดของ กสทช.



Hereby, Kyowa Electronic Instruments Co., Ltd., declares that each equipment of the MRS-100 series is in compliance with Directive 2014/53/EU in countries of the European Economic Area (EEA) and EFTA countries (Iceland, Norway, Liechtenstein, Switzerland) and Turkey.

English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.
Česky [Czech]:	Toto zařízení je v souladu se základními požadavky a ostatními odpovídajícími ustanoveními Směrnice 2014/53/EU.
Deutsch: [German]:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprecheneden Vorgaben der Richtlinie 2014/53/EU.
Dansk:	Denne udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Direktiv 2014/53/EU.
Español [Spain]:	Este equipo cumple con los requisitos esenciales así como con otras disposiciones de la Directiva 2014/53/EU.
Français [France]:	Cet appareil est conforme aux exigences essentielles et aux autres dispositions pertinentes de la Directive 2014/53/EU.
Ελληνική [Greek]:	Αυτός ο εξοπλισμός είναι σε συμμόρφωση με τις ουσώδειες απαιτήσεις και άλλες σχετικές διατάξεις της Οδηγίας 2014/53/ΕΕ
Italiano [Italian]:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 2014/53/UE.
Magyar [Hungarian]:	Ez a készülék teljesíti az alapvető követelményeket és más 2014/53/EU irányelvben meghatározott vonatkozó rendelkezéseket.
Nederlands [Dutch]:	Dit apparaat voldoet aan de essentiële eisen en andere van toepassing zijnde bepalingen van de Richtlijn 2014/53/EU.
Norsk [Norwegian]:	Denne utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-direktiv 2014/53/EU.
Português:	Este equipamento satisfaz os requisitos essenciais e outras provisões da Directiva 2014/53/EU.
Română [Romanian]:	Acest echipament este în conformitate cu cerintele esentiale si cu alte prevederi relevante ale Directivei 2014/53/UE.
Slovensko [Slovenian]:	Ta naprava je skladna z bistvenimi zahtevami in ostalimi relevantnimi pogoji Direktive 2014/53/EU.
Slovensky [Slovak]:	Toto zariadenie je v zhode so základnými požiadavkami a inými príslušnými nariadeniami direktív: 2014/53/EU.
Suomi [Finnish]:	Tämä laite täyttää direktiivin 2014/53/EU olennaiset vaatimukset ja on siinä asetettujen muiden laitetta koskevien määräysten mukainen.
Svenska [Swedish]:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 2014/53/EU.

The full declaration of conformity for this product can be found at http://www.kyowa-ei.com/eng/company/environment/eu_declaration.html.

The maximum RF power is below:
The band 2405 - 2480 MHz is 4.0dBm

When mounting the product in your system, it is required to proceed additional certification processes before placing on the market in EU member states to make your products fully comply with relative EU standards.

Kyowa can provide you the test reports of conducted measurement portion for the radio module. You can utilize the test reports for the certification processes of your system as it requires radio testing.