Move into the future with reliable measurements

KYOWA

# MRS-100 Series

## Digital Telemeter


# Making Measurement "Wireless"

## MRS-100 Series


Transmitter

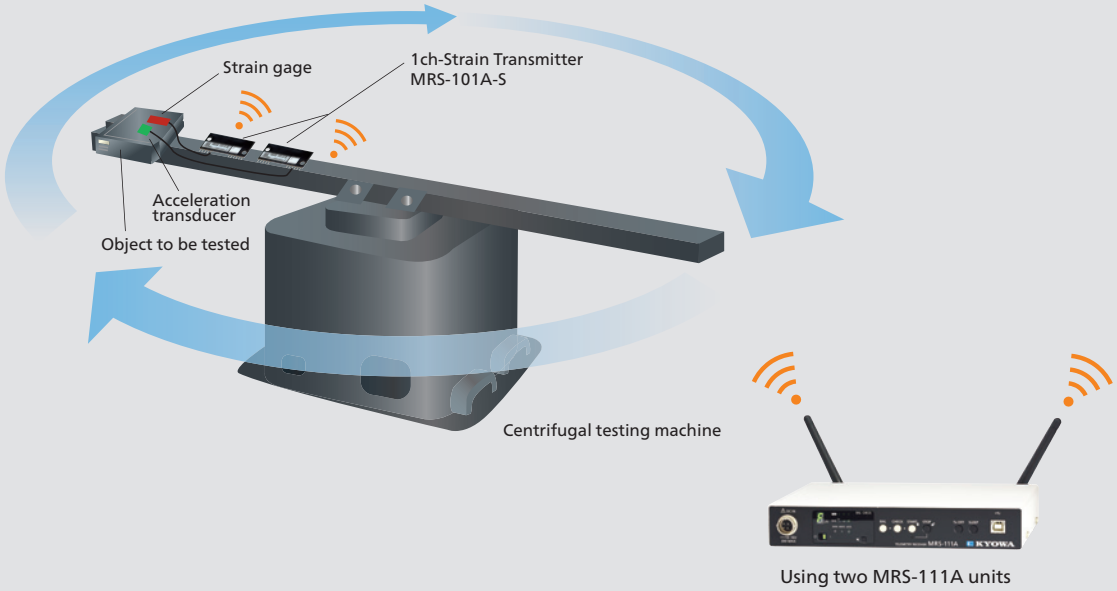
Receiver

The MRS-100 Series is a lineup of small wireless units that enable to achieve stable communication with digital modulation, and this series can be used to easily make a strain-gage sensor or voltage-output sensor wireless. The MRS-100 Series can therefore be used to respond to rapid events in the automobile-related and other experiment and research fields, and the testing data can be sent almost in real-time. In addition, because the unit can be incorporated into a production line to make the load, pressure, and other sensors used for quality control wireless, it is useful for improving productivity.

## Point 01 Even moving objects can be measured

When conducting tests involving moving objects or locations that cannot be wired, the MRS-100 Series elimination the need for a cable—which can inhibit the movement of an object to be measured—so the unit can be utilized in various fields.

### Centrifugal acceleration testing of equipment



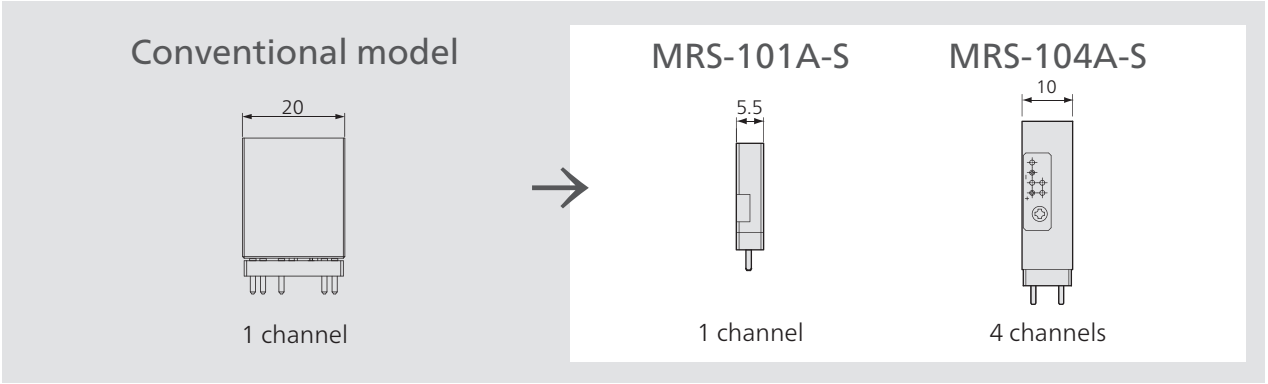

For details on the centrifugal acceleration resistance of 1-channel and 4-channel transmitters, see P. 5 and P. 6.

## Point 02 Multi-channel measurement

When using a combination of 4-channel transmitters and receivers, each set has 4 channels, and up to 16 sets can be used to measure with up to 64 channels.
However, in the case of a combination of 1-channel transmitters and receivers, the maximum is 16 sets with a total of 16 channels.

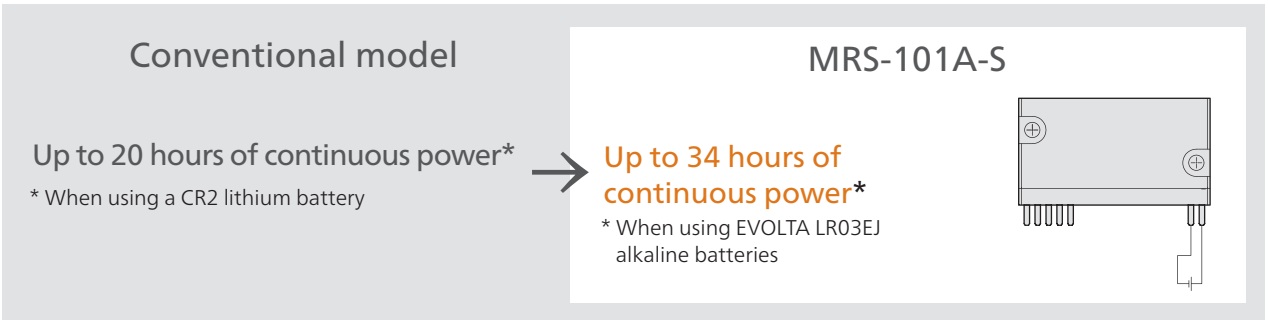

## Point 03 Installation in narrow space

Because the transmitter is small compared to the conventional model, the unit can be easily installed even in limited space.



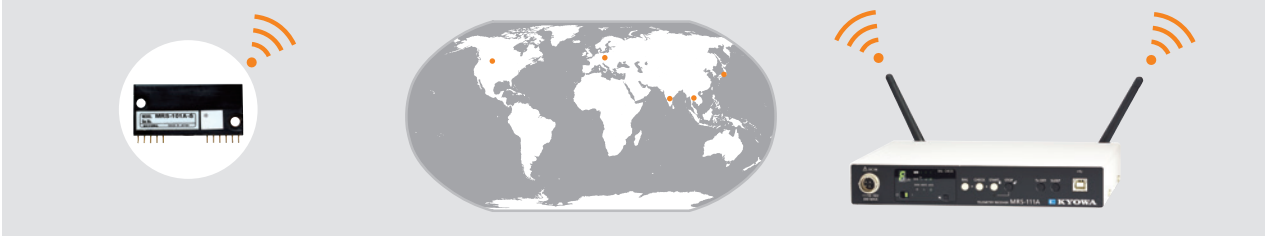

## Point 04 Battery-powered measurement

The transmitter is battery-powered and can be used continuously for up to 34 hours. This increases the range of possible measurement targets.




## Point 05 Usable even outside of Japan

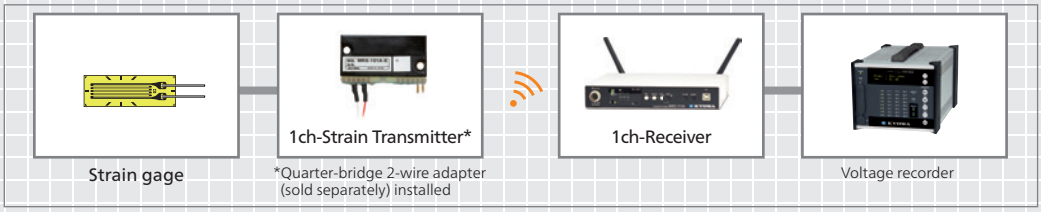
The MRS-100 Series has radio law certification in Japan, the USA, India, Thailand, and EU.

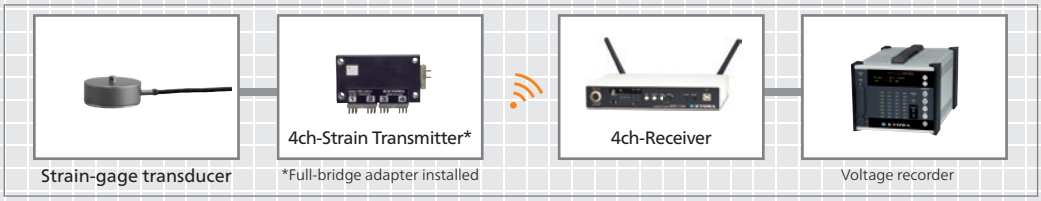


# Configuration Diagram

## Strain Measurement

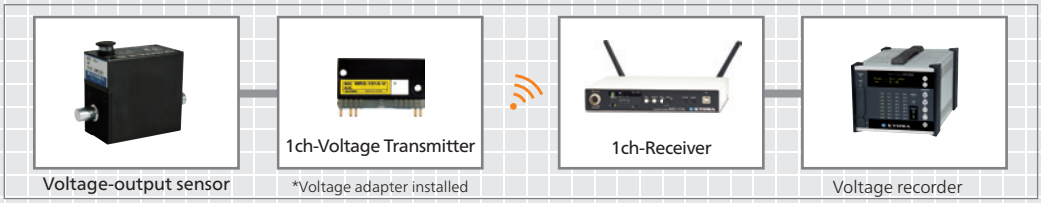
Wirelessly measured data is sent from the strain transmitter to the receiver. Both the strain and stress on the measuring object are measured. We offer a lineup of 1-channel and 4-channel models, both of which support strain gages and strain-gage transducers.




## Voltage Measurement

Wirelessly measured data is sent from the 1-channel voltage transmitter to the 1-channel receiver. The voltage of the voltage-output sensor attached to the measuring object is measured.

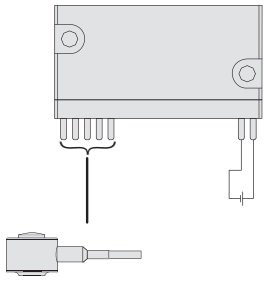



# System Map

### Transmitter

Strain measurement

1ch-Strain Transmitter
MRS-101A-S

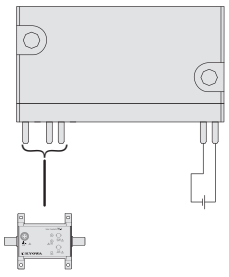


Strain-gage transducer

The MRS-104A-S is recommended for multi-channel strain measurement.

Voltage measurement

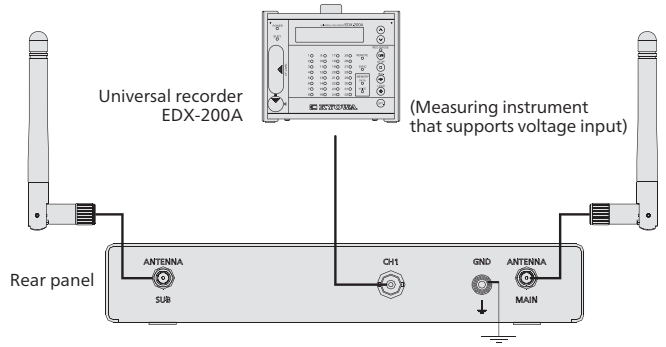
1ch-Voltage Transmitter
MRS-101A-V

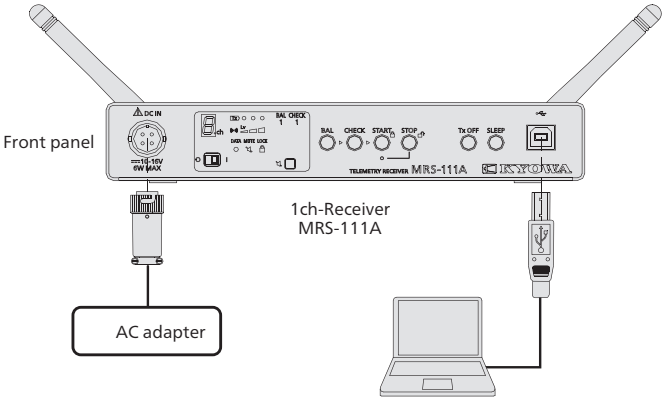


Voltage-output sensor
(Requires a separate power supply)

### Receiver

The same receiver is used for both strain and voltage measurements.



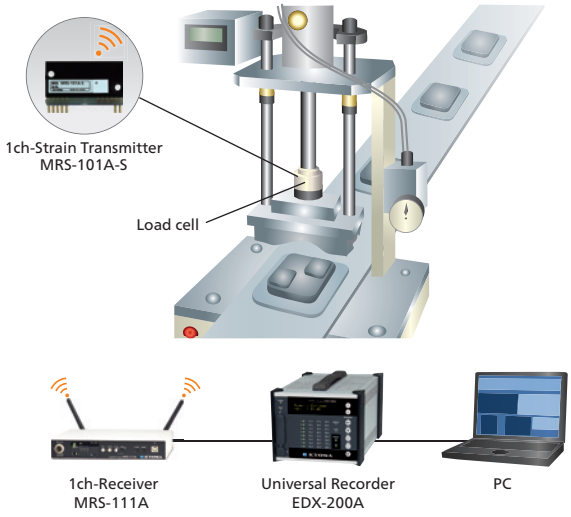

The MRS-114A is recommended for multi-channel strain measurement.

Setting software
MRS-10B

# Applications

Wireless measurement can be utilized for various fields, including experiments and research as well as industrial measurement.

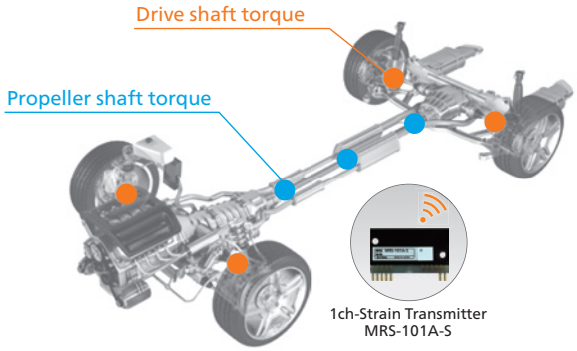
## Press load monitoring





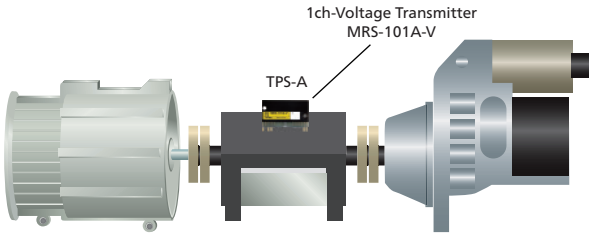


## Drivetrain performance testing





## Small-motor performance testing

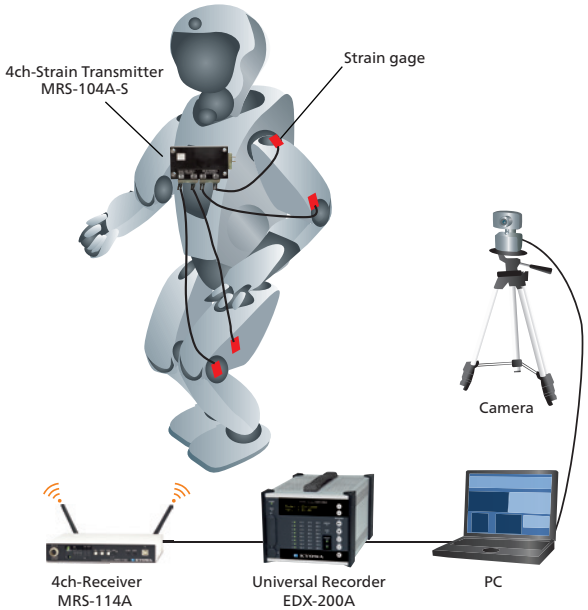



Measurement Room

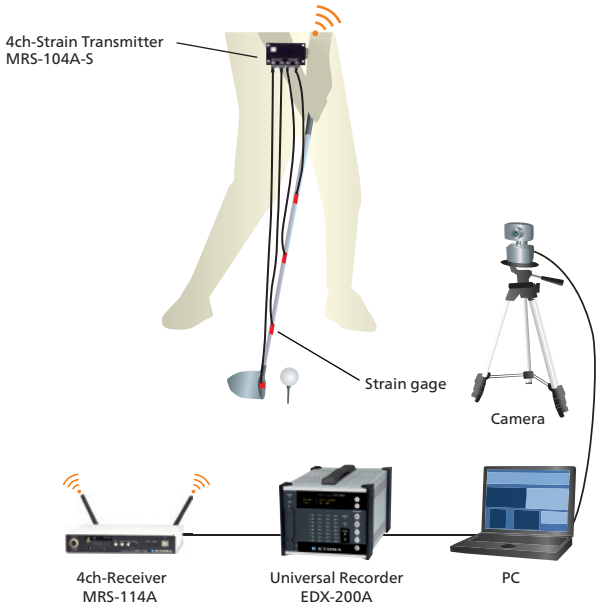

## Evaluation of steering stability during actual vehicle driving



## Stress measurement of the moving parts of robots




## Golf club impact testing



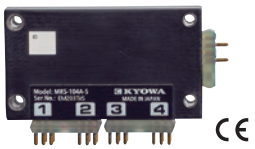

The number of receivers should be same as the number of transmitters to be used.

# Specifications

## Transmitter lineup

### 4ch-Strain Transmitter MRS-104A-S

●Multi-channel strain measurement



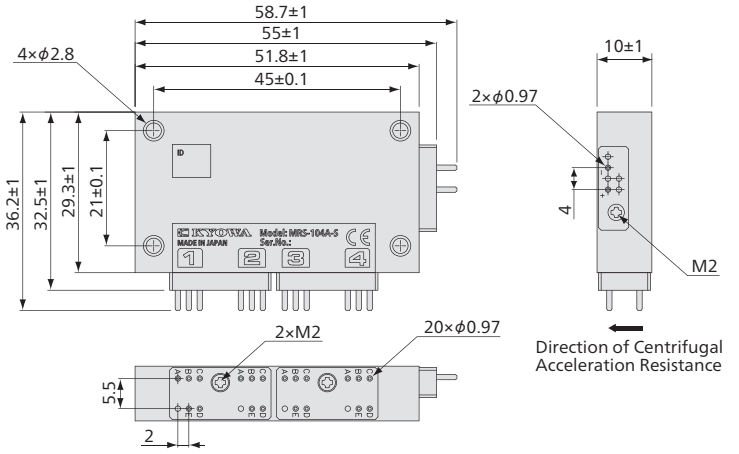
### 1ch-Strain Transmitter MRS-101A-S

●Moving object strain measurement

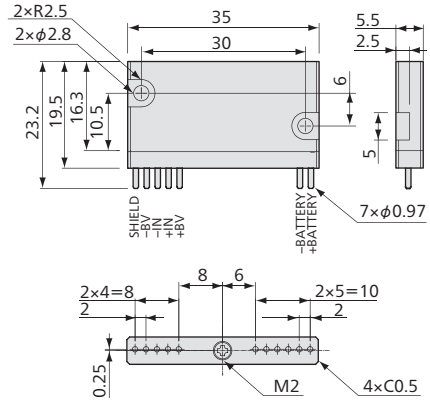
| | | |
|---|---|---|
| Measuring Targets | Strain gages (Quarter-bridge 2-wire system, 3-wire system, and full-bridge system), strain-gage transducers (For quarter bridge 2-wire system or 3-wire system, the adapter 1G2W or1G3W is required respectively) | Strain gages (Quarter-bridge 2-wire system, and full-bridge system), strain-gage transducer (For quarter bridge 2-wire system, the adapter 1G2W is required) |
| Channels | 4 | 1 |
| Input Resistance | – | |
| Compatible Bridge Resistance | 120 to 1000 Ω | |
| Gage Factor | 2.00 fixed | |
| Bridge Excitation | 1 VDC | |
| Absolute Input Voltage | – | |
| 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 | 1 channel: 4.8 kHz, 2 channels: 3.2 kHz, 3 channels: 2.4 kHz, 4 channels: 1.92 kHz | 4.8 kHz |
| Stability | Zero point: Within ±0.05 × $10^{-6}$ strain per ℃<br>Sensitivity: Within ±0.01%/℃ | |
| Operating Temperature | -25 to 75 ℃ | |
| Operating Humidity | 20 to 85% (Non-condensing) | |
| Vibration Resistance | 294.2 m/s² (30 G), 10 to 500 Hz | |
| Shock Resistance | 980.7 m/s² (100 G), 11 ms | |
| Centrifugal Acceleration Resistance*1 | 980.7 m/s² (100G) .<br>For the direction of centrifugal acceleration see Dimensions below. | 29420 m/s² (3000 G) |
| Power Supply | 2.2 to 4.4 VDC | |
| Current Consumption | Within 62 mA (Test conditions: Power supply 3.0 V, bridge resistance 120 Ω) | Within 32 mA (Test conditions: Power supply 3.0 V, bridge resistance 120 Ω) |
| Hours of Continuous Use | Approx. 12 h【Lithium (CR2 manufactured by Panasonic)】<br>Approx. 10 h【Ni-MH eneloop® (BK-4MCC, AAA cell × 2)】<br>Approx. 13 h【Alkaline EVOLTA (LR03EJ, AAA cell × 2)】<br>*Under the test conditions: 23 ℃, bridge resistance 120 Ω | Approx. 28 h【Lithium (CR2 manufactured by Panasonic)】<br>Approx. 24 h【Ni-MH eneloop® (BK-4MCC, AAA cell × 2)】<br>Approx. 34 h【Alkaline EVOLTA (LR03EJ, AAA cell × 2)】<br>*Under the test conditions: 23 ℃, bridge resistance 120 Ω |
| Weight | Approx. 32 g | Approx. 10 g |
| Compliance | Directive 2014/53/EU (RED)<br>Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS) | Directive 2014/53/EU (RED)<br>Directive 2011/65/EU (6 restricted substances) (RoHS) |

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

### 4ch-Strain Transmitter MRS-104A-S



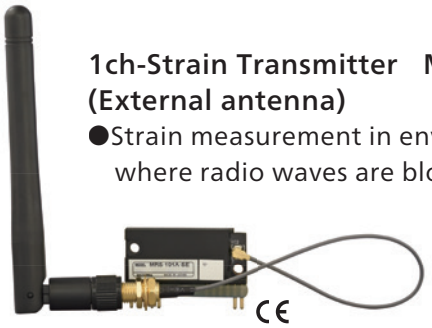

### 1ch-Strain Transmitter MRS-101A-S




**Standard Accessories**

MRS-104A-S: Full-bridge adapter ADP-401 × 2, JCIS10-70 miniature screw (M2 x 4) × 3, power adapter ADP-40P. The above are installed in the transmitter. Fastening bracket × 2, battery holder (AAA cell ×2) for checking operation, ID label

MRS-101A-S: Adapter board ADP-01, JCIS10-70 miniature screw (M2 x 4) × 1. The above are installed in the transmitter. Battery holder (AAA cell × 2) for checking operation, ID label



## 1ch-Strain Transmitter MRS-101A-SE (External antenna)

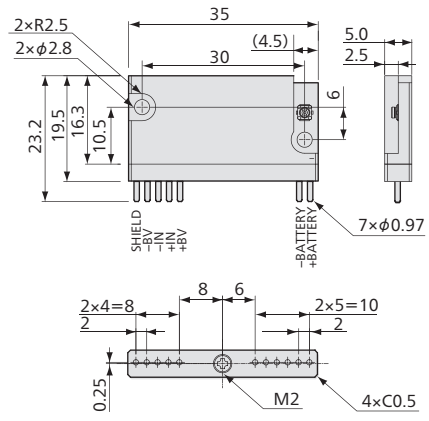
●Strain measurement in environments where radio waves are blocked

## 1ch-Voltage Transmitter MRS-101A-V

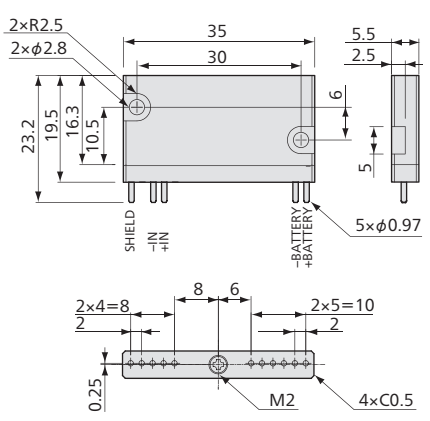
●Moving object voltage measurement

| | | |
|---|---|---|
| | Strain gages (Quarter-bridge 2-wire system, and full-bridge system), strain-gage transducer (For quarter bridge 2-wire system, the adapter 1G2W is required) | Voltage |
| | 1 | |
| | – | Approx. 1 MΩ +1 MΩ |
| | 120 to 1000 Ω | – |
| | 2.00 fixed | – |
| | 1 VDC | – |
| | – | Between D (+IN) and B (-IN): Within ±32 V<br>Between D and E (SHIELD): Within ±16 V<br>Between B and E: Within ±16 V<br>* Exceeding the Absolute Input Voltage may cause permanent damage to the product. |
| | 1000, 2500, 5000, 10000, 25000 × $10^{-6}$ strain | 5, 10 V |
| | Within ±0.15% FS | |
| | Within ±10000 × $10^{-6}$ strain | Within ±5 V |
| | 16 bits | |
| | 4.8 kHz | |
| | Zero point: Within ±0.05 × $10^{-6}$ strain per °C<br>Sensitivity: Within ±0.01%/°C | Zero point: Within ±0.01% FS per °C<br>Sensitivity: Within ±0.02%/°C |
| | -25 to 75 °C | |
| | 20 to 85% (Non-condensing) | |
| | 29.42 m/s² (3 G), 5 to 200 Hz | 294.2 m/s² (30 G), 10 to 500 Hz |
| | 294.2 m/s² (30 G), 11 ms | 980.7 m/s² (100 G), 11ms |
| | – | 29420 m/s² (3000 G) |
| | 2.2 to 4.4 VDC | |
| | Within 32 mA (Test conditions: Power supply 3.0 V, bridge resistance 120 Ω) | Within 22 mA |
| | Approx. 28 h【Lithium (CR2 manufactured by Panasonic)】<br>Approx. 24 h【Ni-MH eneloop® (BK-4MCC, AAA cell × 2)】<br>Approx. 34 h【Alkaline EVOLTA (LR03EJ, AAA cell × 2)】<br>*Under the test conditions: 23 °C, bridge resistance 120 Ω | Approx. 38 h【Lithium (CR2 manufactured by Panasonic)】<br>Approx. 33 h【Ni-MH eneloop® (BK-4MCC, AAA cell × 2)】<br>Approx. 49 h【Alkaline EVOLTA (LR03EJ, AAA cell × 2)】<br>*Under the test conditions: 23 °C |
| | Approx. 10 g | |
| | Directive 2014/53/EU (RED)<br>Directive 2011/65/EU (6 restricted substances) (RoHS) | |

### 1ch-Strain Transmitter MRS-101A-SE




### 1ch-Voltage Transmitter MRS-101A-V




**Standard Accessories**

MRS-101A-SE: Adapter board ADP-01, JCIS10-70 miniature screw (M2 x 4) × 1.
The above are installed in the transmitter. Battery holder (AAA cell × 2) for checking operation, ID label, receiving antenna W1030, antenna harness

MRS-101A-V: Voltage adapter ADP-03, JCIS10-70 miniature screw (M2 x 4) × 1.
The above are installed in the transmitter. Battery holder (AAA cell × 2) for checking operation, ID label

## Receiver lineup

### 4ch-Receiver MRS-114A

●Usable in EU
●Usable in Japan, the USA, India, and Thailand

MRS-114A

### 1ch-Receiver MRS-111A

●Usable in Japan, the USA, India, and Thailand

MRS-111A

### 1ch-Receiver MRS-111A-E

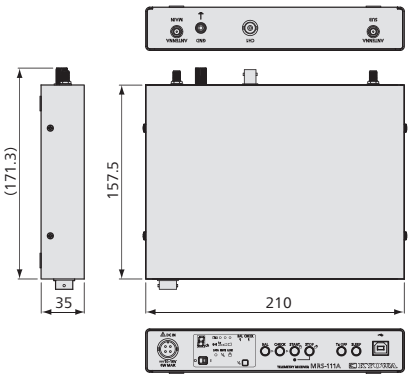
●Usable in EU
●Usable in Japan, the USA, India, and Thailand

MRS-111A-E

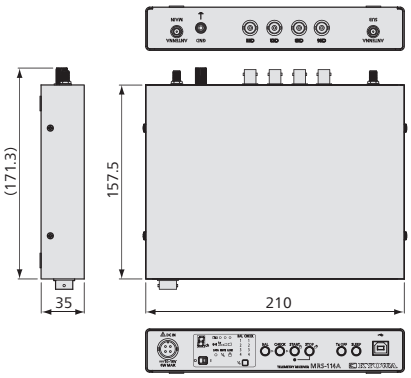
| | MRS-114A | MRS-111A, MRS-111A-E |
|---|---|---|
| Channels | 4 | 1 |
| Analog Output Accuracy | Within ±0.1% FS | |
| DA Resolution | 16 bits | |
| DA Conversion Speed | 1 channel: 4.8 kHz, 2 channels: 3.2 kHz, 3 channels: 2.4 kHz, 4 channels: 1.92 kHz | 4.8 kHz |
| Operating Temperature | 0 to 50 °C | |
| Operating Humidity | 20 to 80% (Non-condensing) | |
| Vibration Resistance | 29.42 m/s² (3G), 5 to 200 Hz | |
| Shock Resistance | 294.2 m/s² (30 G) , 11 ms | |
| Power Supply | 10 to 16 VDC | |
| Current Consumption | 280 mA or less | 250 mA or less |
| Operating Switch | MUTE: Turn buzzer on/off.<br>BAL: Execute balance adjustment.<br>CHECK: Check sensor connection.<br>START: Start measurement.<br>STOP: Stop measurement.<br>Tx OFF: Turn transmitter off.<br>SLEEP: Set transmitter to sleep, wake-up after the set time. | |
| Indicator | Monitor transmitter battery in 3 steps.<br>Monitor received signal strength in 3 steps.<br>7-segment LED: Indicate a frequency channel (0 to F)<br>DATA: Light up in response to radio communication error/non-error.<br>LOCK: Light up to indicate keys are locked. | |
| Weight | Approx. 600 g | |
| Compliance | MRS-114A, MRS-111A-E: Directive 2014/53/EU (RED)<br>MRS-114A: Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS)<br>MRS-111A, MRS-111A-E: Directive 2011/65/EU (6 restricted substances) (RoHS) | |

### 1ch-Receiver MRS-111A

MRS-111A-E is the same in dimension.




### 4ch-Receiver MRS-114A

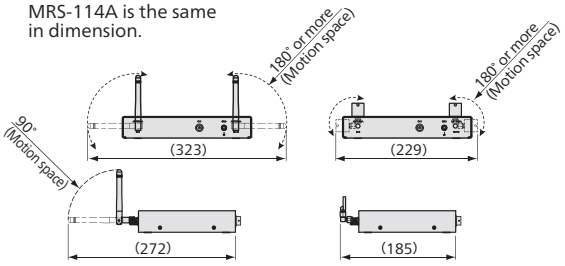



## RF Specifications

| | |
|---|---|
| Transceiver Frequency Channel | 1 (Choose 1 channel from 16 channels using Setting software) |
| Antennas | MRS-104A-S, MRS-101A-S, MRS-101A-V: Built-in<br>MRS-101A-SE, MRS-114A, MRS-111A, MRS-111A-E:Specified external (MAIN and SUB for diversity reception.) |
| Radio Communication Frequency Band | 2.4 GHz band |
| Radio System | Digital modulation system |
| Radio Certification | MRS-104A-S, MRS-101A-S, MRS-101A-SE,<br>MRS-101A-V, MRS-114A, MRS-111A-E：Japan, the USA, India, Thailand, EU<br>MRS-111A: Japan, the USA, India, Thailand |
| Communication Distance | 50 m (Max. line of sight distance)<br>For MRS-101A-SE, using attached receiving antennas W1030. |
| Environment of Usage | Environment where the wireless LAN is not intermingled on the 2.4 GHz. |

With antennas W1030
MRS-111A
MRS-114A is the same in dimension.

With antennas EXT-ANT1
MRS-111A-E




## Frequency Channel and Central Frequency

| 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 |

Communication is not possible if there are multiple transmitters with the same radio channels in the system.

## Standard Accessories

●MRS-114A, MRS-111A, MRS-111A-E
USB cable N-38 (1 m), BNC-BNC cable U-59 (Each channel, 1.5 m), ground wire P-72 (5 m), side hole suction cup (55 mm)× 2, extension cable for receiving antenna (2 m) E-02 × 2
●MRS-114A
Setting software MRS-10B, AC adapter (AC power cable sold separately. Select according to your country or region), receiving antenna W1030 × 2, high gain dipole antenna DA-DB-05RP-SMA-08 × 2
●MRS-111A:
Setting software MRS-10A, AC adapter UNI318-1215-EDS, receiving antenna W1030 × 2
●MRS-111A-E
Setting software MRS-10A, AC adapter UNI318-1215-EDS (for EU), small planar antenna EXT-ANT1 × 2, SMA straight connector (Reverse) × 2, SMA right angle connector (Reverse) × 2

## Specifications in Combination with Transmitter and Receiver

| | |
|---|---|
| Analog Output Voltage | ±5 V/Full scale range |
| Accuracy | Within ±0.2% FS |

## Frequency Response and Delay Time

| Measuring Channels | Sampling Frequencies | Frequency Response | Delay Time |
|---|---|---|---|
| 1 | 4.8 kHz | DC to 370 Hz (Deviation+0.5, -1 dB) -3±1 dB (at 480 Hz) | 11.1±0.3 ms (at DC to 480 Hz) |
| 2 | 3.2 kHz | DC to 320 Hz (Deviation+0.5, -1 dB) -3±1 dB (at 466 Hz) | 10.8±0.3 ms (at DC to 320 Hz) |
| 3 | 2.4 kHz | DC to 240 Hz (Deviation+0.5, -1 dB) -3±1 dB (at 424 Hz) | 9.8±0.3 ms (at DC to 240 Hz) |
| 4 | 1.92 kHz | DC to 192 Hz (Deviation+0.5, -1 dB) -3±1 dB (at 376 Hz) | 9.7±0.3 ms (at DC to 192 Hz) |

Only 1 transmitter can be used in combination with 1 receiver.
No MRS-104A-S be used in combination with a 1-channel Receiver.
2 or more measuring channels are for 4-channel transmitter and 4-channel receiver.
The frequency response is DC to 480 Hz for the combination 1-channel Transmitter with 1-channel Receiver.

## Setting Software MRS-10A, MRS-10B Specifications

| | | |
|---|---|---|
| ■Applicable Receivers | | |
| | | MRS-10A: MRS-111A, MRS-111A-E<br>MRS-10B: MRS-114A, MRS-111A, MRS-111A-E |
| ■Software Functions | | |
| | Setting Functions | Set the measuring range.<br>Set the LEDs lighting level for monitoring transmitter supply voltage.<br>Set the minimum voltage for operating transmitter.<br>Set frequency channel.<br>Set the sleep time of transmitter.<br>Set data processing at the time of radio communication error. |
| | Operation Functions | Execute balance adjustment.<br>Check sensor connection. Display graph. |
| | Inspection Function | Radio condition inspection |
| ■Operating Environment | | |
| | OS | Windows® 7, Windows® 8, 8.1, Windows® 10 (Japanese/English, 32/64 bit support) |
| | CPU | Core2Duo, 2 GHz or advanced |
| | Memory | 4 GB or more |
| | Interface | USB2.0 (Can also be operated in a USB3.0 port) |
| | Display | Resolution: 1024 × 768 or more |

There is no data acquisition function by this software.

## Optional Accessories

### Package for transmitter


MRS package kit

**MRS-P11A**

For MRS-101A-SE
It is easy to attach batteries, connect antennas, a sensor, and the power supply can be turned on and off.
Applicable batteries: 2 AAA nickel-metal hydride batteries, 2 AAA alkaline batteries

MRS transmitter unit (CR2)

**MRS-J11A**

For MRS-101A-S/SE/V
It is easy to attach a battery, connect antennas, a sensor, and the power supply can be turned on and off.
Applicable batteries: 1 lithium battery CR2

### Adapters

Full-bridge adapter

**ADP-401**

For MRS-104A-S
2 channels/pc
Connect to strain-gage transducers

Quarter-bridge 2-wire adapter (120 Ω)

**ADP-402-120**

For MRS-104A-S
2 channels/pc
Connect to quarter-bridge 2-wire 120 Ω strain gages

Quarter-bridge 3-wire adapter (120 Ω)

**ADP-403-120**

For MRS-104A-S
2 channels/pc
Connect to quarter-bridge 3-wire 120 Ω strain gages

### Adapters

Power adapter

**ADP-40P**

For MRS-104A-S
Connect to a DC power supply (2.2 to 4.4 VDC)

Adapter board

**ADP-01**

For MRS-101A-S/SE
Connect to a full-bridge strain gage or a strain-gage transducer

Quarter-bridge 2-wire adapter (120 Ω)

**ADP-02-120**

For MRS-101A-S/SE
Connect to a quarter-bridge 2-wire 120 Ω strain gage

Voltage adapter

**ADP-03**

For MRS-101A-V
Connect to voltage or a voltage-output sensor

### Antennas

High gain dipole antenna

**DA-DB-05RP-SMA-08**

For MRS-114A, MRS-111A
High sensitivity and improved communication stability

### Antennas

Small planar antenna

**EXT-ANT1**

For MRS-100 Series
Thin, high gain, and therefore effective for narrow spaces

Planar diversity antenna

**EXT-ANT2**

For MRS-114A, MRS-111A
Supports two orthogonal polarization planes—vertical and horizontal polarization—by using the polarization diversity method*

### Cables

Extension cable for receiving antenna (2 m)

**E-02**

For MRS-101A-SE, MRS-114A, MRS-111A (-E)
This approx. 2-m cable can be used to more flexibly position an antenna.

Extension cable for receiving antenna (6 m)

**E-03**

For MRS-101A-SE, MRS-114A, MRS-111A (-E)
This approx. 6-m cable can be used to more flexibly position an antenna.
However, the cable is not compliant with EU directives.

DC power cable

**P-76**

For power supply to MRS-114A or MRS-111A(-E)
Length: Approx. 2 m

This photo is P-38.

AC power cable

**P-38 to P-42**

P-38 (Japan), P-39 (the USA), P-40 (India), P-41 (EU), P-42 (Thailand)

* ・Diversity reception suitable for multi-path can be made with one antenna.
・This small, thin antenna is suitable for incorporation. Because the back of the main unit is hardly affected by structural objects, it can be directly attached to the wall or the like.
・Its waterproof structure allows the antenna to be installed outdoors. However, note that the connector is not waterproof.

# Optional Accessories Selection Chart

## For 4ch-Strain Transmitter MRS-104A-S

| Connect to 120-Ω quarter bridge 2-wire strain gages | Connect to 120-Ω quarter bridge 3-wire strain gages | Connect to strain-gage transducers | Connect to DC power supply |
|---|---|---|---|
| ADP-402-120  | ADP-403-120  | ADP-401  | ADP-40P  |

## For 1ch-Strain Transmitter MRS-101A-S

| Connect to a 120-Ω quarter bridge 2-wire strain gage | Connect to a strain-gage transducer | Unified battery, power supply switch, and connection terminals |
|---|---|---|
| ADP-02-120  | ADP-01  | MRS-J11A  |

## For 1ch-Strain Transmitter MRS-101A-SE

| Connect to a 120-Ω quarter bridge 2-wire strain gage | Connect to a strain-gage transducer | Unified batteries, power supply switch, TAJIMI connector and antennas | Unified battery, power supply switch, and connection terminals |
|---|---|---|---|
| ADP-02-120  | ADP-01  | MRS-P11A  | MRS-J11A  |

Extension cable for receiving antenna

- No → Receiving antenna → W1030 
- Yes
  - CE-compliant → 2 m → E-02  → Small planar antenna → EXT-ANT1 
  - Not CE-compliant → 6 m → E-03  → Receiving antenna → W1030 

## For 1ch-Voltage Transmitter MRS-101A-V

- Voltage signal → ADP-03

- Unified battery, power supply switch, and connection terminals → MRS-J11A

## For 4ch-Receiver MRS-114A / For 1ch-Receiver MRS-111A / For 1ch-Receiver MRS-111A-E

Extension cable for receiving antenna

- No
- Yes
  - CE-compliant (MRS-111A is not CE-compliant) → 2 m → E-02

  - Not CE-compliant → 6 m → E-03

- Small planar antenna → EXT-ANT1

- Receiving antenna → W1030

- High gain dipole antenna → DA-DB-05RP-SMA-08

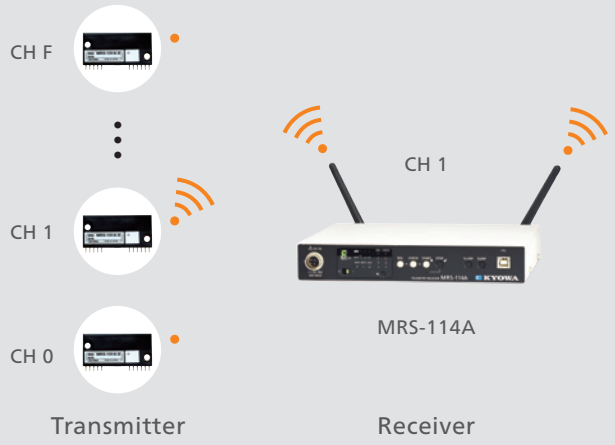
- Planar diversity antenna → EXT-ANT2

# Combine MRS-114A with Transmitters

1. Each receiver can only be combined with one transmitter.
2. Transmitters and receivers can only communicate at the same radio frequency.
3. Communication is not possible if there are multiple transmitters with the same radio channels in the system.

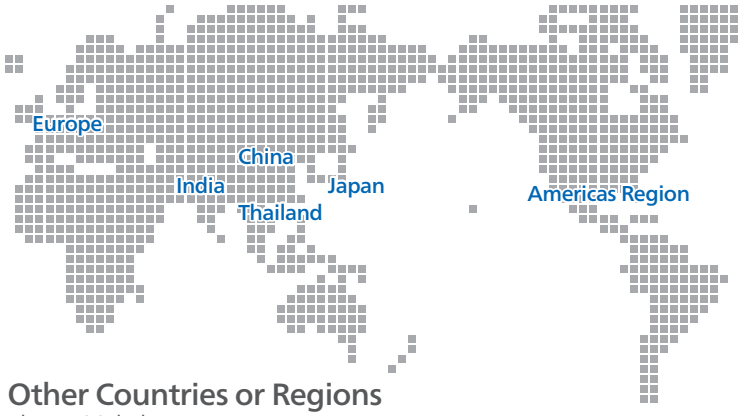
## Combination examples

Only communication using the same radio frequency channel (CH 1) is possible.




If multiple transmitters have the same radio frequency channel (CH F), a transmitter / receiver pair is not established, and communication cannot be made.


## Sales Network




### Other Countries or Regions

Please visit below URL.
Website: www.kyowa-ei.com

### Americas Region

KYOWA AMERICAS Inc.
TEL: +1-248-348-0348
E-mail: sales@kyowa-americas.com
Website: www.kyowa-ei.us

### China

KYOWA ELECTRONIC (SHANGHAI) TRADING CO., LTD.
TEL: +86-21-64477770
E-mail: support-cn@d1.kyowa-ei.co.jp
Website: www.kyowa-ei.cn

### Thailand

KYOWA DENGYO (THAILAND) CO., LTD.
TEL: +66-2-117-3760
E-mail: sales-thailand@kyowa-ei.co.th
Website: www.kyowa-ei.th

### India

KYOWA ELECTRONIC INSTRUMENTS CO.,LTD. (India Branch)
TEL: +91-124-427-7227
Website: www.kyowa-ei.com


**Kyowa Electronic Instruments Co., Ltd.**

Overseas Sales Department:
3-5-1, Chofugaoka, Chofu, Tokyo 182-8520 Japan
TEL; +81-42-489-7220 FAX: +81-42-488-1122
E-mail: kyowaoverseas.hp@d1.kyowa-ei.co.jp
Website: www.kyowa-ei.com


**⚠ Safety Precautions**

Be sure to observe the safety precautions given in the instruction manual, in order to ensure correct and safe operation.

• Specifications are subject to change without notice for improvement.

JQA-0821
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Manufacturer's Representative


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