Railway-04-A

Measurement application sheet

A&D Company, Limited

## - Stress measurements in strong electric fields -

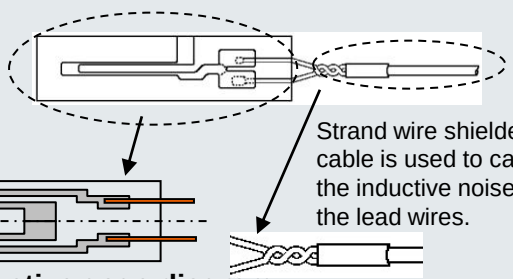
# Stress measurement by non-inductive gages

## Effective for stress measurement in environments with induction noise such as development and testing of high current AC motors and transformers for railway vehicles.

- During development and testing of high current AC motors and transformers for railway vehicle, stress measurements for installed equipment parts are carried out generating feedback to improve quality through strength analysis and product structure design.
- Strain gages used for stress measurement are sensitive to induced noise and require various noise countermeasures. Non-inductive gauges make efficient measurement possible in environments with inductive noise.
- We provide non-inductive gages suitable for stress measurement in environments with high current with AC strain amplifiers AS1803R

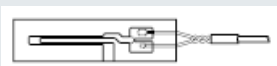
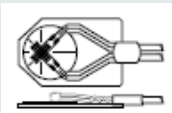
### Why non-inductive gauges are useful

By folding back over the center, the overlapping upper and lower resistive elements receive inductive noise in opposite phases. In this way the inductive noise is canceled.




Non-inductive gage diagram

### High-electrical environment: transformers and motors

| Gage patterns | Model name | Resistance value Ω | Gage factor | Grid (mm) | | Base (mm) | |
|---|---|---|---|---|---|---|---|
| | | | | Length | Width | Length | Width |
|  | M11-ME-5-120-11-SC1 | 120 | 2 | 5 | 0.6 | 12.5 | 3 |
|  | M22-ME-5-120-11-SC1 | 120 | 2 | 5 | 0.6 | 30 | 20 |

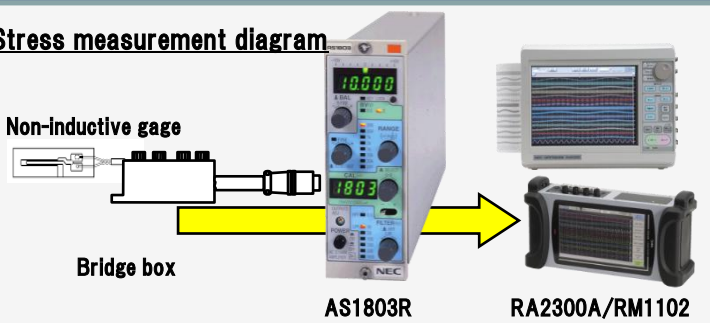
### Stress measurements in high current environments and countermeasures for inverter noise

The voltage output waveform from general use inverters (around 10Hz-100Hz) contains a high frequency component (hundreds kHz) accompanying use of pulse width modulation (PWM). It's important to reduce the influence of noise from high frequency inverters by strengthening anti-noise performance and to reduce the influence of various control noise generated by thyristors and power transistors to the high frequency range. In high current environments it is essential to ensure measurement system safety in addition to any anti-noise measurements. AC power source input systems are equipped with anti-surge components as use of strain amplifiers that can protect the measurement systems from surge voltage is required. We recommend our AS1803R AC strain amplifier.

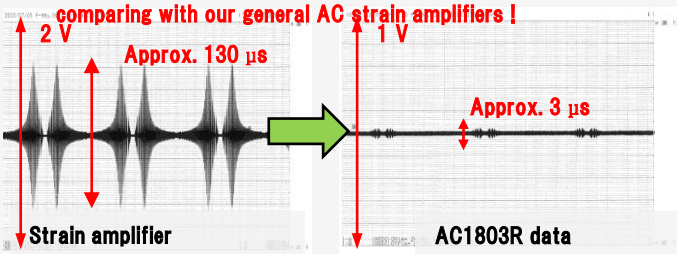
Noise-resistant stress measurement

# AS1803R AC Strain Amplifier

## Stress measurement diagram




The noise is approximately 1/40 or less comparing with our general AC strain amplifiers !




| Item | AS1803R |
|---|---|
| No. of Channels | 1ch/unit |
| Bridge resistance | 60-1,000Ω |
| Bridge power | AC0.5V、2V 5kHz sine wave |
| Bridge check function | ○ |
| Cable length compensation function | ○ |
| (Auto balance) | ○ |
| Maximum input range | ±200,000×$10^{-6}$strain |
| Voltage sensitivity | ±200×$10^{-6}$strain±10Voutput |
| Nonlinearity | ±0.1%／FS |
| Frequency response | DC-2kHz±10% |
| High-pass filter | 0.5Hz |
| Low-pass filter | 10、30、100、300、500Hz |
| Stability | Zero drift: Within ±0.1x$10^{-6}$strain/℃, Within ±0.5x$10^{-6}$strain/24h<br>Sensitivity:Within±0.05%/℃, Within ±0.2%/24h |
| Noise Level | 2.0×$10^{-6}$strain p-pRTI<br>(W/B, RANGE=200, Without FINE, BV=2V, 120Ω in bridge) |
| Output | OUTPUT1 ±10V ±5mA、OUTPUT2 ±10V ±10mA |
| Withstand Voltage (Insulation resistance) | 1 kVAC, 1 min, btw each input terminal (A, B, C, D, E), output and housing case<br>1.5 kVAC, 1 min, btw AC power input and input, output or housing case<br>1 kVAC, 1 min, between DC power input and input<br>500 VAC, 1 min, between DC power input and output or housing case |