2025-01
EC-Z217
Rev. 1

Strain Gauge Load Cell Interface Equipment

Helps You Make Full Use of Strain Gauge Load Cells!

MG CO., LTD.
www.mgco.jp

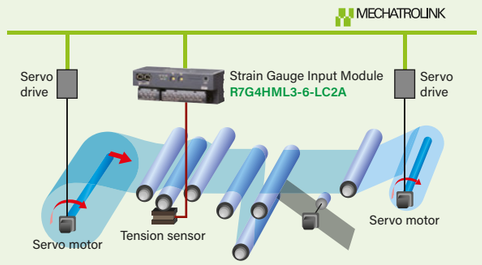
Your local representative:

MG CO., LTD.
www.mgco.jp

Make Greener automation

Compact, all-in-one remote I/O

[e.g.] Roll-to-roll control



Tension sensor signal is transmitted via MECHATROLINK to the servo drives, which control the servo motors to maintain adequate roll tension.

POINT Economical remote I/O with network - power - I/O in single palm-top size package

Compact, All-in-one Remote I/O
R7 Series

All-in-one construction
High cost performance

Remote I/O for MECHATROLINK-III
Strain Gauge Input Module
(isolated 2 points,
message transmission command)
Model: R7G4HML3-6-LC2

W130 x H55 x D57 mm
(5.12″ x 2.17″ x 2.44″)

Remote I/O for MECHATROLINK-I/II
Strain Gauge Input Module
(isolated 2 points, monitor output)
Model: R7ML-LC2

W115 x H50 x D54 mm
(4.53″ x 1.97″ x 2.13″)

Remote I/O for CC-Link IE Field
Strain Gauge Input Module
(isolated 2 points, monitor output,
screw terminal block)
Model: R7I4DCIE-LC2-9

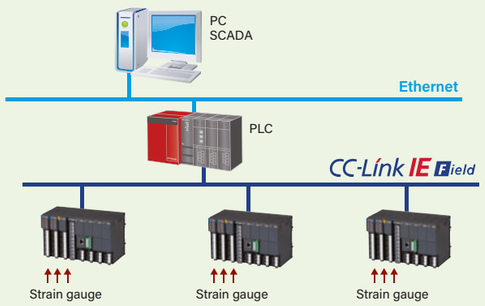
W165 x H50 x D64 mm
(6.50″ x 1.97″ x 2.52″)

Remote I/O for HLS (Hi-speed Link System)
Strain Gauge Input Module
(isolated 2 points, monitor output)
Model: R7HL-LC2

W115 x H50 x D54 mm
(4.53″ x 1.97″ x 2.13″)

Multi-channel, scalable remote I/O

[e.g.] Strain gauge input to a PLC



Strain gauge inputs are connected to the **R3-LC2** modules at multiple locations and collected seamlessly by a PLC or host PC (SCADA).

Multi-channel, Scalable Remote I/O
R3 Series

Wide selections of network protocols
Dual network
Wide selections of I/O
Dual power supply
High cost performance per point

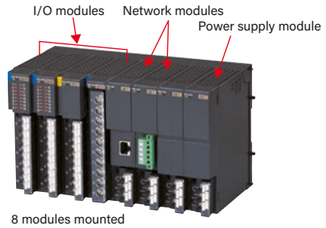
Strain Gauge Input Module
(isolated 2 points)
Model: R3-LC2

W27.5 x H130 x D109 mm
(1.08″ x 5.12″ x 4.29″)

POINT A R3 Series Remote I/O station consists of network modules, power supply modules and a wide variety of I/O modules. Redundant system configuration to countermeasure hardware failures or power loss is possible by introducing dual network and/or power supply modules.

Usable open networks for R3 Series

CC-Link
Modbus
LONWORKS
T-Link
FL-net
CC-Link IE Field
Modbus/TCP
MECHATROLINK
EtherNet/IP
DeviceNet
EtherCAT
PROFIBUS



8 modules mounted
on a backplane base

Strain gauge load cells combined with remote I/O

Compression Type

LCC-2R5-Z
LCC-5-Z

LCC-10-U
LCC-20-U
LCC-50-U

LCC-100-L
LCC-200-L

	Strain Gauge Load Cells for Compression Forces NEW						
Model	LCC-2R5-Z	LCC-5-Z	LCC-10-U	LCC-20-U	LCC-50-U	LCC-100-L	LCC-200-L
Rated capacity (R.C.)	2.5 N	5 N	10 N	20 N	50 N	100 N	200 N
Recommended excitation voltage	2.5 V	2.5 V	2.5 V	2.5 V	2.5 V	2.5 V	2.5 V
Maximum excitation voltage	5 V	5 V	5 V	5 V	5 V	5 V	5 V
Rated output (R.O.)	0.4 mV/V or more	0.4 mV/V or more	1 mV/V ±30%	1 mV/V ±30%	1 mV/V ±30%	1 mV/V ±10%	1 mV/V ±10%
Output terminal resistance	Approx. 350 Ω	Approx. 350 Ω	350 Ω ±10 Ω	350 Ω ±10 Ω	350 Ω ±10 Ω	350 Ω ±10 Ω	350 Ω ±10 Ω

When you select a strain gauge load cell suitable for your application, the rated output, the size and shape, and other conditions should be also considered, in addition to the combination with an interface device.

Tension and Compression Type

LCCT-1-1
LCCT-2-1
LCCT-5-1

LCCT-10-2
LCCT-20-2

LCCT-10K-5

	Strain Gauge Load Cells for Tension and Compression Forces NEW					
Model	LCCT-1-1	LCCT-2-1	LCCT-5-1	LCCT-10-2	LCCT-20-2	LCCT-10K-5
Rated capacity (R.C.)	1 N	2 N	5 N	10 N	20 N	10 kN
Recommended excitation voltage	5 V	5 V	5 V	2.5 V	2.5 V	5 V
Maximum excitation voltage	10 V	10 V	10 V	5 V	5 V	10 V
Rated output (R.O.)	0.5 mV/V to 1.5 mV/V	0.5 mV/V to 1.5 mV/V	1.5 mV/V to 2.5 mV/V	0.7 mV/V ±20%	1 mV/V ±20%	1.5 mV/V ±10%
Output terminal resistance	Approx. 1000 Ω	Approx. 1000 Ω	Approx. 1000 Ω	Approx. 350 Ω	Approx. 350 Ω	Approx. 350 Ω

When you select a strain gauge load cell suitable for your application, the rated output, the size and shape, and other conditions should be also considered, in addition to the combination with an interface device.

Beam Type

LCB-10
LCB-20
LCB-50
LCB-100

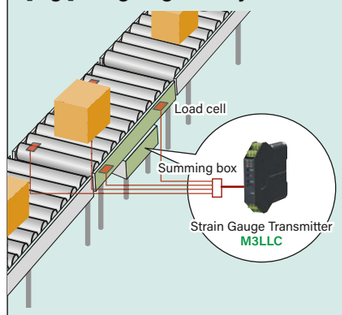
	Beam Type Strain Gauge Load Cells NEW			
Model	LCB-10	LCB-20	LCB-50	LCB-100
Rated capacity (R.C.)	10 N	20 N	50 N	100 N
Recommended excitation voltage	2.5 V	2.5 V	2.5 V	2.5 V
Maximum excitation voltage	5 V	5 V	5 V	5 V
Rated output (R.O.)	1.5 mV/V ±20%	1.5 mV/V ±20%	1.5 mV/V ±20%	1.5 mV/V ±20%
Output terminal resistance	Approx. 350 Ω	Approx. 350 Ω	Approx. 350 Ω	Approx. 350 Ω

When you select a strain gauge load cell suitable for your application, the rated output, the size and shape, and other conditions should be also considered, in addition to the combination with an interface device.

Signal Conditioner

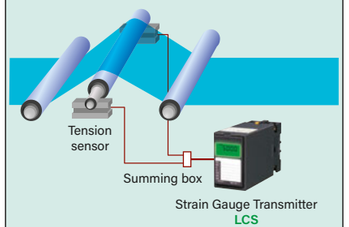
An extensive lineup of strain gauge load cell interface products including signal conditioners, are available.
The new strain gauge load cells are now available for one-step ordering along with existing interface products.

[e.g.] Weighing conveyor



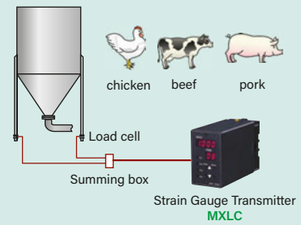
Slim type signal conditioners can be fit into a tight space of control panels of weighing conveyors.

[e.g.] Printing machine



Our products are not easily discontinued, and will still be in the market when a replacement is needed for large printing machines after a long time period.

[e.g.] Monitoring of feedstuffs



Weight of feedstuffs suitable for various livestock animals can be easily programmed and confirmed on site by LED display.

POINT Signal conditioners are designed for ease of installation: space-saving housing, plug-in socket mounted construction, etc. Our service policy "Continued Product Availability", in addition to "Fast and Precise Delivery" and "Special Repair Service", is an important reason why customers choose us.

Compact Plug-in Signal Conditioners
Mini-M Series

Plug-in | Space-saver | Wide selections

Strain Gauge Transmitter
Model: M2LCS

W29.5 x H76 x D124 mm
(1.16″ x 2.99″ x 4.88″)

Slim Signal Conditioners
M3 Series

Space-saver | Response ≤10 ms | One-Step-Cal calibration

Strain Gauge Transmitter
(one-step-cal calibration)
Model: M3LLC

W18 x H106 x D110.5 mm
(0.71″ x 4.17″ x 4.35″)

Front-configurable Signal Conditioners
MX-UNIT Series

Plug-in | Eng. unit display | Front panel configurable

Strain Gauge Transmitter
Model: MXLC

W50 x H80 x D132 mm
(1.97″ x 3.15″ x 5.20″)

Plug-in Signal Conditioners
M-UNIT Series

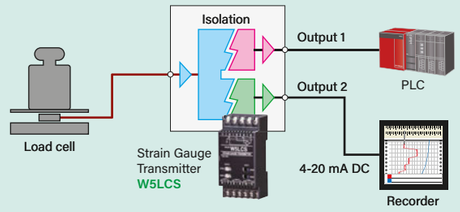
Plug-in | Eng. unit display | Loop test output

Strain Gauge Transmitter
Model: LCS

W50 x H80 x D136 mm
(1.97″ x 3.15″ x 5.35″)

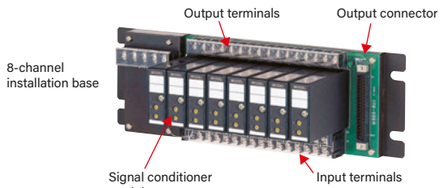
Signal Conditioner – dual isolated outputs

[e.g.] Adding an extra output for a PLC



An extra isolated output signal for a PLC can be safely added to an existing signal loop to a recorder by using the **W5LCS** providing two isolated outputs.

POINT The two outputs are isolated. A problem in the output 2 loop such as a shortcircuit or a ground loop does not affect the output 1 loop.



Dual Output Terminal Block Signal Conditioners
W5-UNIT Series

Isolated 2 outputs | Terminal block style | High cost performance

Strain Gauge Transmitter
Model: W5LCS

W45 x H94 x D41 mm
(1.77″ x 3.70″ x 1.61″)

Dual Output Super-mini Signal Conditioners
Pico-M Series

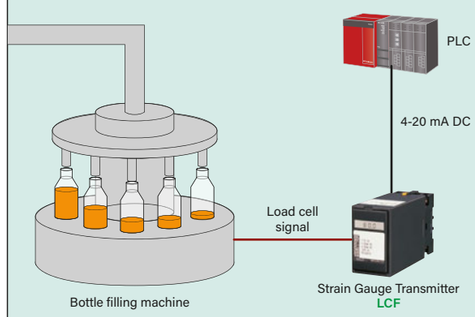
Isolated 2 outputs | Connector output | High density mounting

Strain Gauge Transmitter
Model: M8LCS

W17.5 x H48 x D75 mm
(0.69″ x 1.89″ x 2.95″)

Signal Conditioner – high speed response

[e.g.] Weight measurement for filling machines



To control a bottle filling machine that runs in high speed, liquid weight in each bottle must be measured with speed and accuracy.
The **LCF** converts minute load cell signal changes with speed and accuracy.

POINT Minute sensor signal deviation can be detected with speed and accuracy.

Plug-in Signal Conditioners
M-UNIT Series

High speed response ≤300 µs | Plug-in | Eng. unit display

Strain Gauge Transmitter
(remote sensing, excitation 10 V, 120 mA)
Model: LCF

W50 x H80 x D136 mm
(1.97″ x 3.15″ x 5.35″)

Front-configurable Signal Conditioners
MX-UNIT Series

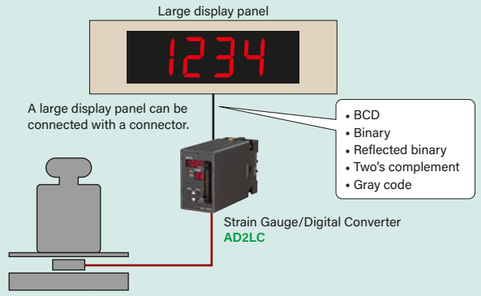
Response ≤10 ms | Plug-in | Front panel configurable | Loop test output

Strain Gauge Transmitter
(high speed response, excitation 12 V, 120 mA)
Model: MXLCF

W50 x H80 x D132 mm
(1.97″ x 3.15″ x 5.20″)

BCD Transducer

[e.g.] Large display panel



Plug-in Signal Conditioners
M-UNIT Series

W50 x H80 x D148 mm
(1.97″ x 3.15″ x 5.83″)

Plug-in | Eng. unit display
Front panel configurable

Strain Gauge/Digital Converter
Model: AD2LC

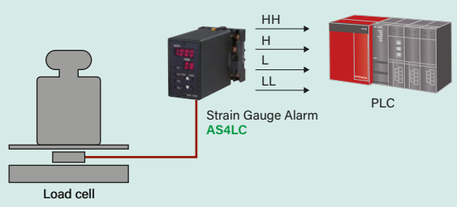
CE

POINT

Weight measurement signal (analog) is converted into digital signals such as BCD and gray code for PLC input.

Limit Alarm

[e.g.] Products' weight test results



Products' weight test may be conducted using a quad limit alarm.
Alarm setpoints can be changed at the front end of PLC, without needing to modify the PLC's ladder programs.

Plug-in Signal Conditioners
M-UNIT Series

W72 x H80 x D132 mm
(2.83″ x 3.15″ x 5.20″)

Plug-in | Eng. unit display
Front panel configurable
Adjustable deadband
Enclosed relay
ON-delay timer

Strain Gauge Alarm
Model: AS4LC

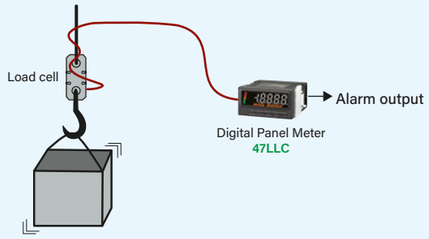
CE

POINT

Two or four alarm threshold points can be programmed by the front control buttons with a help of digital display.
Engineering unit values are indicated on the display.

Digital Panel Meter

[e.g.] Crane weighing system



Weight display gets fluctuated when a load is not steady.
The **47LLC** suppresses fluctuations by a function called "moving average".
In addition, an alarm output option is available to alert an overload.

Digital Panel Meters
47L Series

W96 x H48 x D98.5 mm
(3.78″ x 1.89″ x 3.88″)

High cost performance
Scaling
Tare adj. / Low-end cutout
Max/Min display

4 1/2 digit
Strain Gauge Input Meter
Model: 47LLC

IP66

POINT

High cost performance LED display.
Display color is selectable among six variations: red, orange, green, bluegreen, blue, and white.

Weighing Indicator

Weighing Indicators
W100 Series

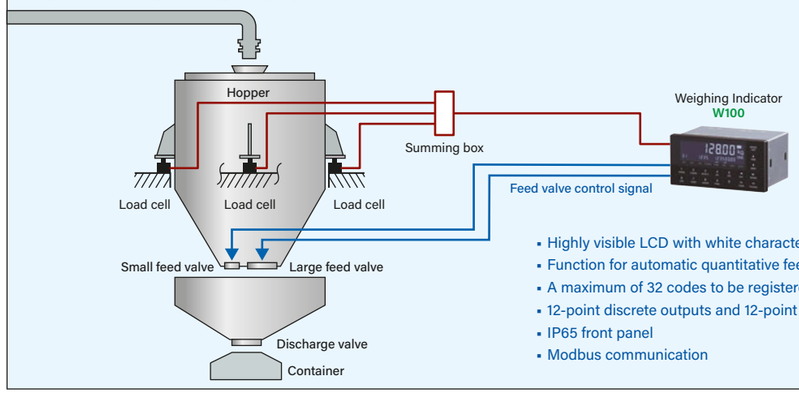
W144 x H72 x D99.6 mm
(5.67″ x 2.83″ x 3.92″)

Automatic quantitative feeding control
Max. 32 preset values

Weighing Indicator
Model: W100

CE IP65

[e.g.] Discharge-weighing system



- Highly visible LCD with white characters
- Function for automatic quantitative feeding control
- A maximum of 32 codes to be registered
- 12-point discrete outputs and 12-point discrete inputs
- IP65 front panel
- Modbus communication

POINT

A weighing indicator repeats precise and stable measurement of liquid or powder to perform a quantitative feeding control while displaying accurate weight values.
Setting features:

- **Weighing functions**: feeding and discharging selectable
- **Control functions**: simple comparison or sequence control
- **Weighing stability functions**: digital low pass filter, moving average, stability detection, stable state filter

FRONT PANEL

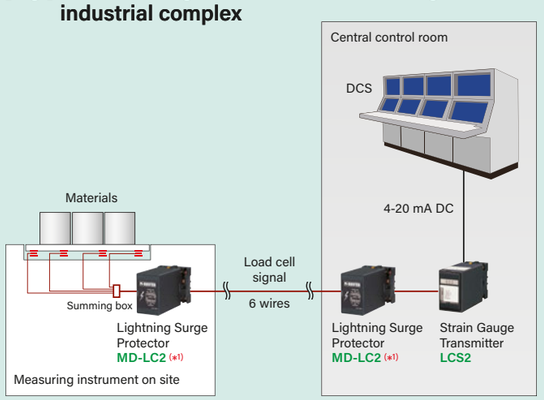
No.	Component	Functions
1	Main display	Shows the current value, set value, and status of equipment.
2	Sub display	Shows measurement data, various setting value, etc.
3	Status indicators	Shows ON/OFF status of output signals such as TARE, NET weight, etc.
4	Numeric buttons	Used to enter setting values.
5	1/4 scale division	Turns ON when the value is close to zero (0±1/4 scale division).
6	Engineering unit	Shows the set engineering unit (g / kg / t / none).
7	[STAB] indicator	Turns ON when the measurement value is stable.

No.	Component	Functions
8	[GROSS] / [NET] button	Switches between Gross weight and Net weight.
9	[TARE] button	Enables the tare function.
10	[ZERO] button	Executes the digital zero function to zero the gross weight.
11	[ENTER] button	Determines the set value at the cursor.
12	[ESC] button	Shifts to the previous setting menu or preceding digit.
13	[Function] button	Switches to SETTING mode.
14	[CODE] button	Shows the CODE information.

Note: Refer also to Users Manual (EM-9551-B) for details.

Signal Conditioner – remote sensing

[e.g.] Material weight measurement in a large industrial complex



In a large industrial complex around bay areas, a central control room may be far from measuring instrument sites.
Remote-sensing strain gauge transmitters can cancel leadwire resistance to provide an accurate measurement of load cell signals at remote locations.

(*1) Please see Page 9 for more information.

POINT The remote sensing type strain gauge transmitter provides an accurate weight value measured at a remote location.

Plug-in Signal Conditioners
M-UNIT Series

W50 x H80 x D136 mm
(1.97″ x 3.15″ x 5.35″)

Eng. unit display
Plug-in

Strain Gauge Transmitter
(remote sensing, isolated)
Model: LCS2

Plug-in Signal Conditioners
M-UNIT Series

W50 x H80 x D136 mm
(1.97″ x 3.15″ x 5.35″)

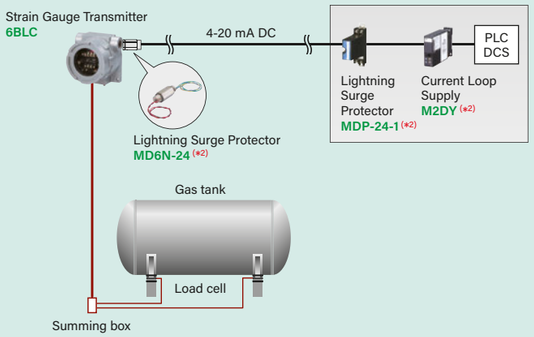
Eng. unit display
High speed response ≤300 µs
Plug-in

Strain Gauge Transmitter
(remote sensing,
excitation 10 V, 120 mA)
Model: LCF

CE

Two-wire Signal Conditioner

[e.g.] Gas tank weight measurement



Two-wire transmitters that do not need individual power supply are convenient for applications in a tank yard with no power source available on site.

(*2) Please visit our web site for more information on these products.

POINT A two-wire transmitter receives a driving power for its electrical circuit from the output loop, thus requiring no power supply wiring. The field-mounted type transmitters are in a robust enclosure of NEMA 4X or IP66/IP67 grade, suitable for outdoor installation.

Field-mounted Two-wire Signal Conditioners
6B-UNIT Series

W110 x H118 x D92 mm
(4.33″ x 4.65″ x 3.62″)

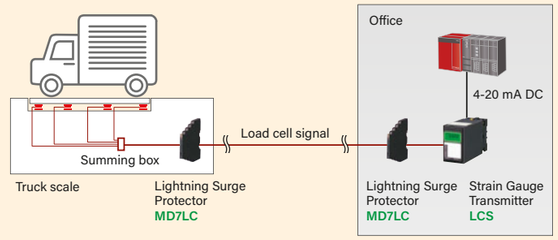
Outdoor installation

Strain Gauge Transmitter
Model: 6BLC

NEMA 4X
IP66/IP67

Lightning Surge Protector for strain gauge load cell

[e.g.] Protecting an existing truck scale from induced lightning surges



The ultra-slim **MD7LC** fits into a small space of control panel equipped for an existing truck scale.

Lightning Surge Protectors for Electronic Equipment
M-RESTER MD7 Series

W7 x H95 x D98 mm
(0.28″ x 3.74″ x 3.86″)

Ultra-slim design: 7 mm wide
High-density mounting
Discharge current: 20 kA @8/20 µs
1 kA @10/350 µs

Lightning Surge Protector
for Strain Gauge (ultra-slim design)
Model: MD7LC

CE Ex

POINT A lightning induced surge can be caused by a remote lightning strike or by a lightning discharge in the clouds with no direct strike to the earth.
The M-RESTER is designed specifically to protect a weight measurement system from lightning surges.

Lightning Surge Protectors for Electronic Equipment
M-RESTER Series

W50 x H80 x D50 mm
(1.97″ x 3.15″ x 1.97″)

Low-profile design: 50 mm deep

Lightning Surge Protector
for Strain Gauge (DIN rail mounting)
Model: MDK-LC

Lightning Surge Protectors for Electronic Equipment
M-RESTER Series

W23.5 x H100 x D80 mm
(0.93″ x 3.94″ x 3.15″)

Plug-in
No interruption of signals when discharge element is removed

Lightning Surge Protector
for Strain Gauge
Model: MDP-LC

Lightning Surge Protectors for Electronic Equipment
M-RESTER Series

W72 x H80 x D132 mm
(2.83″ x 3.15″ x 5.20″)

Plug-in
Protecting remote sensing strain gauge and transmitter

Lightning Surge Protector
for Strain Gauge (remote sensing)
Model: MD-LC2

Combination Example

Step-by-step explanations of how to choose the right input specifications of **Strain Gauge Input Module** (Model: **R7I4DCIE-LC2-9**) for combining with **Strain Gauge Load Cell** (Model: **LCC-100-L**, Rated capacity: **100 N (10.2 kgf)**)

Strain Gauge Load Cell
for Compression Forces
Model: LCC-100-L
Rated Capacity: 100 N (10.2 kgf)

Remote I/O for CC-Link IE Field
Strain Gauge Input Module
(isolated 2 points, monitor output, screw terminal block)
Model: R7I4DCIE-LC2-9

STEP 1 Check the excitation voltage of the strain gauge load cell and the input module

Check the recommended excitation voltage in the specification sheet: 2.5 V for **LCC-100-L**.

INPUT SPECIFICATIONS LCC-100-L
Rated capacity (R.C.): 100 N (10.2 kgf)
Safe overload: 150 % R.C.
Recommended excitation voltage: 2.5 V
Maximum excitation voltage: 5 V
Input terminal resistance: 350 Ω ±10 Ω

Check the excitation voltage in the specification sheet: 2.5 V or 5 V selectable for **R7I4DCIE-LC2-9**.

INPUT SPECIFICATIONS R7I4DCIE-LC2-9
• Excitation: 5 V ±10% or 2.5 V ±10%
(Input range doubled in the case of 2.5 V excitation)
Maximum current: max. 60 mA (Up to 4 strain gauges of 350 Ω can be connected in parallel-adding connection at 5 V excitation)
max. 100 mA (at 2.5 V excitation)

STEP 2 Check the rated output of the strain gauge load cell to select the input module range

The rated output of the **LCC-100-L** is 1 mV/V ±10%.

OUTPUT SPECIFICATIONS LCC-100-L
Rated output (R.O.): 1 mV/V ±10 %
Output terminal resistance: 350 Ω ±10 Ω

With the excitation voltage 2.5 V and the rated output 1 mV/V for the **LCC-100-L**, select Option code /R05, -1 to +1 mV/V (at 2.5 V excitation), among the three input range options for the **R7I4DCIE-LC2-9**.

INPUT SPECIFICATIONS R7I4DCIE-LC2-9
■Strain Gauge Input:
• Strain Gauge
Input range:
Option code /R20
-2 - +2 mV/V (at 5 V excitation)
-4 - +4 mV/V (at 2.5 V excitation)
Option code /R10
-1 - +1 mV/V (at 5 V excitation)
-2 - +2 mV/V (at 2.5 V excitation)
Option code /R05
-0.5 - +0.5 mV/V (at 5 V excitation)
-1 - +1 mV/V (at 2.5 V excitation)

STEP 3 Check how many load cells can be connected

With the excitation voltage 2.5 V and the output terminal resistance approx. 350 Ω for the **LCC-100-L**, the current flowing through single load cell is approx. 7.14 mA.

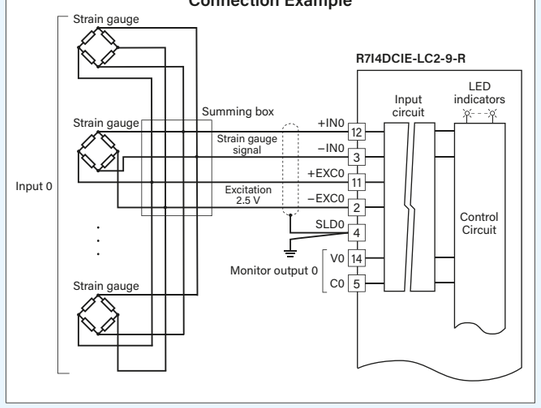
2.5 V / 350 Ω = 7.143 mA

OUTPUT SPECIFICATIONS LCC-100-L
Rated output (R.O.): 1 mV/V ±10 %
Output terminal resistance: 350 Ω ±10 Ω

The maximum current at the excitation voltage 2.5 V for the **R7I4DCIE-LC2-9** is 100 mA, which leads to **14 load cells connectible in parallel at the maximum.**

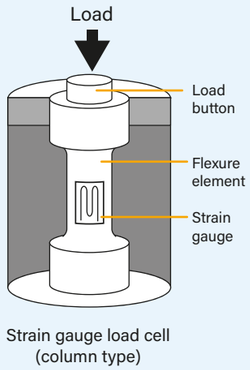
INPUT SPECIFICATIONS R7I4DCIE-LC2-9
• Excitation: 5 V ±10% or 2.5 V ±10%
(Input range doubled in the case of 2.5 V excitation)
Maximum current: max. 60 mA (Up to 4 strain gauges of 350 Ω can be connected in parallel-adding connection at 5 V excitation)
max. 100 mA (at 2.5 V excitation)

Connection Example



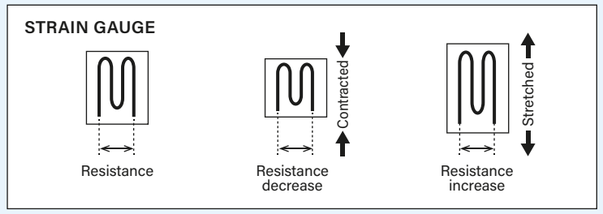
About Strain Gauge Load Cell

Principles of strain gauge load cells

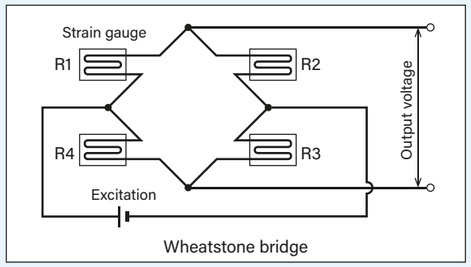


Strain gauge load cell
(column type)

A strain gauge load cell consists of a combination of a metal that deforms when a force is applied, and a sensor whose resistance changes when it deforms.
Metals that deform when a force is applied are called flexure elements, while sensors whose resistance changes when they deform are called strain gauges.
A strain gauge exhibits the following characteristics with respect to deformation.



Wheatstone bridge circuit and rated output

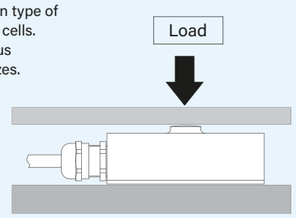


The resistance change in a strain gauge is so small that it is converted to a voltage using a Wheatstone bridge circuit.
When the resistance values of R1 × R3 and R2 × R4 are equal, the output voltage of the Wheatstone bridge circuit is 0 V.
When the resistance values are not equal, the output voltage changes accordingly.
The rated output values in the strain gauge load cell specification sheets represent the output voltages for an excitation voltage of 1 V when the strain gauge load cell is subjected to a force of the rated capacity.

Types of strain gauge load cells

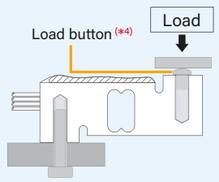
Compression type

The most common type of strain gauge load cells. Available in various capacities and sizes.



Beam type

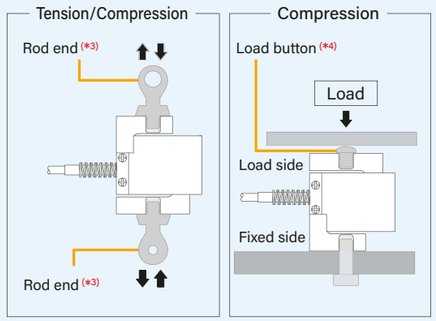
The beam type is used when the strain gauge load cell extends from the frame or housing. Typically, a set of three to four beams is used for weighing or the like.



(*4) Consult us for more information.

Tension and Compression type

Used by connecting rod ends (*3) or eyebolts at the top and bottom. When used for compression, care must be taken because there are two sides, the fixed side and the load side.

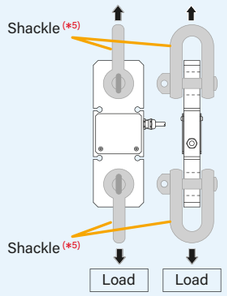


Rod end: A type of bearing consisting of a spherical ball enclosed within a housing. This construction allows for complex movement.

(*3) Prepared by user
(*4) Consult us for more information.

Tension type

Strain gauge load cells for cranes.
Used by connecting shackles (*5) or the like.



Shackle:
A metal fitting used to connect a wire rope or a sling with a load.
(*5) Prepared by user