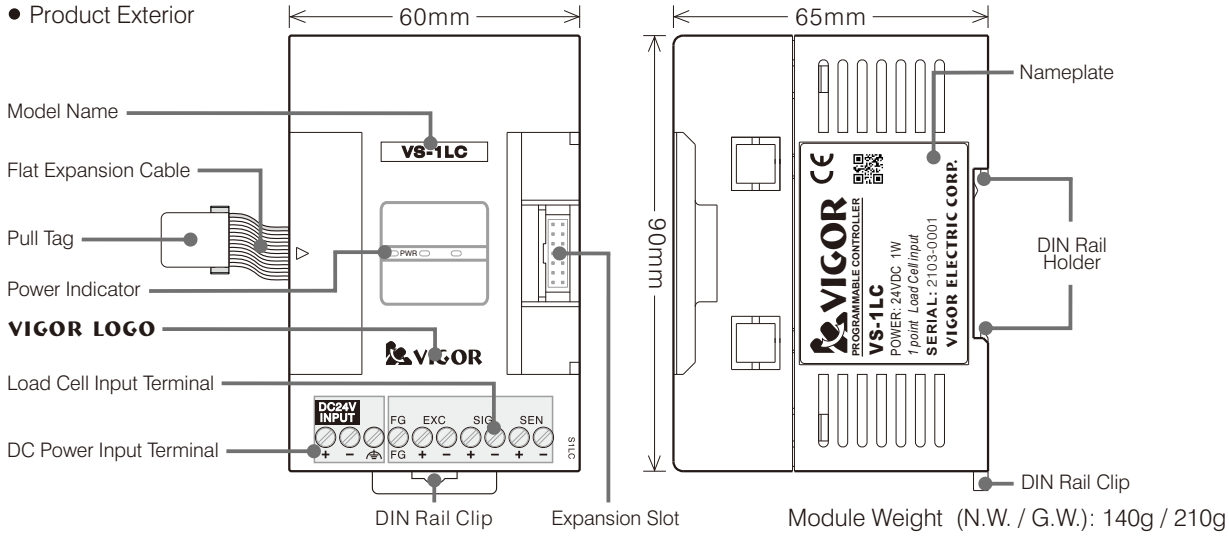
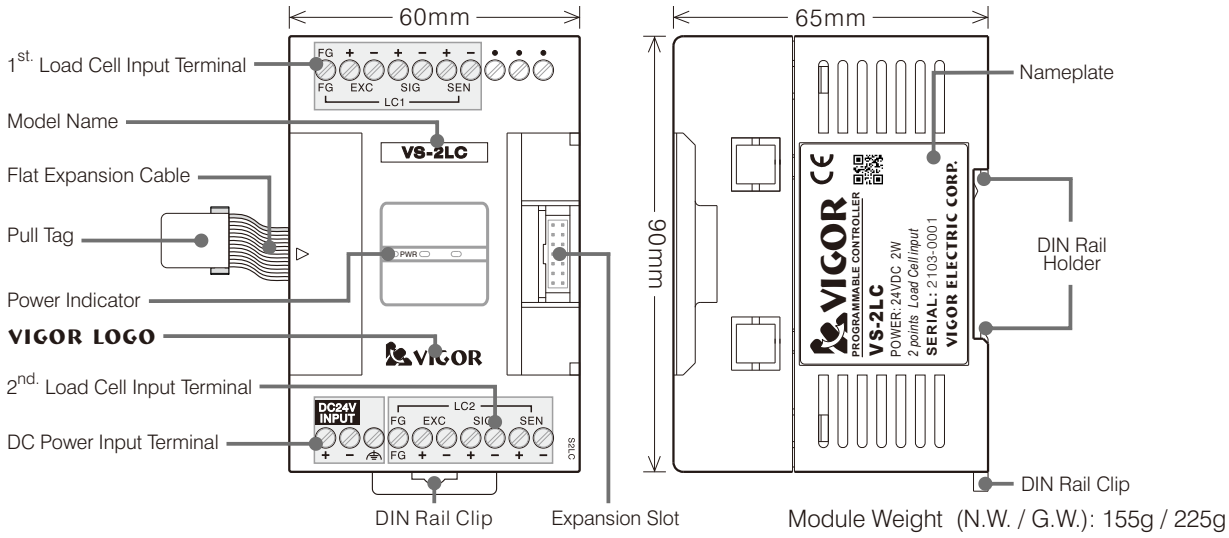
VS-1LC/2LC Weighing Module User's Guide

The VS-1LC / VS-2LC Weighing Module can convert 1 or 2 external load cell signals to get 1 or 2 weight related digital value(s). When the FROM instruction is executed, the VS Main Unit will read out the weight and related data from the module and store them in registers. Thus, it provides the reference data for digital monitoring or controls.

The VS-1LC / VS-2LC Weighing Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its A/D converters of load cells. Also, between the PLC inner circuit and the load cell converters are isolated by the Magnetic-coupler thus the module can get a stable weight conversion. Please read following instructions before use.

- Product Exterior





- Product Specification

Load Cell Input Specification

Item	Specification
A/D Conversion Method	24 bit Δ−∑ ADC
A/D Sampling Rate	400 / 200 / 100 / 60 / 50 / 20 / 16.6 / 10 / 2.5 ms.
Linearity Error	0.01% full scale @25℃
Temperature Drift	Zero Drift: ≤0.2 μ V/℃ ; Gain Drift: ≤10 ppm/℃
LC Excitation Power	Each load cell channel could provide DC 5V ±5% 60mA, allows to connect with 4 of 350Ω load cells in parallel
Eigenvalue of LC	1 ~ 1000 mV/V is acceptable

Basic Specification

Item		Specification
Isolation Method		The external DC 24V input through an isolated DC/DC power to provide inside load cell A/D converter circuits; Magnetic-coupler isolation between PLC and A/D circuits; no isolation between the VS-2LC's input channels.
Power Consumption	VS-1LC	DC 24V ± 20%, 40mA (Max.) from external + DC 5V 15mA from PLC's inner power
	VS-2LC	DC 24V ± 20%, 80mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-1LC / VS-2LC Module

The VS-1LC / VS-2LC module uses the BFM to communicate with the VS Main Unit for the parameter setting and converted value access.

The VS-1LC module can receive the LC1 load cell input; the VS-2LC can receive the LC1 and LC2 load cell inputs. The BFM#2～25 are specifically for the operation of the LC1, the BFM#32～55 are for the LC2.
Since the definitions of BFMs for the LC1 and LC2 are equal, at the list below only shows the BFMs of the LC1.

At the list below, a number with the " ■ " symbol means it is a read only BFM.
Besides, the " ▲ " mark represents that the BFM with the latch function.

BFM #	Component Description	Default Value
0	Input "3210" once will restore the factory default settings of the LC1 & LC2. Input "3211" once will restore the LC1's parameters. Input "3212" once will restore the LC2's parameters. After the restore process is finished, this value will return to "0".	0
▲2	The parameter of LC1's sampling time. The available range is 0～8, otherwise it is equivalent to 2. (100ms.) Set Value: 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 Sampling Time: 400 / 200 / 100 / 60 / 50 / 20 / 16.6 / 10 / 2.5 (unit: ms.) Usually, a longer sampling time could get a more stable measurement value.	2
▲3	The eigenvalue of the LC1 load cell unit. The available range is 1～1'000 (unit: mV / V), otherwise it is equivalent to 2 mV/V.	2
▲4	LC1's measurement average times. The available range is 1～50, otherwise it is equivalent to 5.	5
▲5	LC1's zero point identification area. The available range is 0～32'767, otherwise it is equivalent to 10. Identify by the ± value. If the measured value is within the ± range of this area, the BFM#25 b4 zero point flag will ON.	10
▲6	LC1's standstill range. The available range is 1～10'000, otherwise it is equivalent to 10. Identify by the ± value.	10
▲7	LC1's standstill waiting time. The available range is 1～100 (unit: 0.1 sec.), otherwise it is equivalent to 5.	5
▲8	LC1's zero point tracking range limitation. The available range is 0～30'000, otherwise it is equivalent to 1'000. Identify by the ± value.	1000
▲9	LC1's zero point tracking identification range. The available range is 0～10'000, otherwise it is equivalent to 1. Identify by the ± value.	1
▲10	LC1's zero point tracking time. The available range is 5～1'000 (unit: 0.1 sec.), otherwise it is equivalent to 5.	5
11	LC1's calibration step code.	0
13,12	Certified data of the calibration weight for the LC1. If the setting value ≤ 0, it is equivalent to 1'000.	1000
▲15,14	LC1's maximum weighing capacity. If the setting value ≤ 0, it is equivalent to 10'000. If the measured value exceeds this maximum capacity, the BFM#25 b3 overload flag will ON.	10000
16	LC1's zero adjustment command and the tare measurement function. b2 b1 b0 b0: Restore the measured weight value at the BFM#21, 20 to 0. b1: Measure and record the tare weight to the BFM#19, 18. b2: Clear the measured tare weight at the BFM#19, 18.	H0000
▲17	LC1's measured weight value is displayed by the Gross weight (0) or Net weight (1). The available number is 0 or 1, otherwise it is equivalent to 0. Gross weight = Net weight + Tare weight	0
▲19,18	LC1's tare weight value. The value could input by the DTO instruction or the tare measurement function (trigger the BFM#16 b1 ON).	0
■21,20	LC1's measured weight value. If the calibration is not completed, the value of this BFM is 0.	—
■23,22	LC1's raw A/D digital output value.	—
■25	LC1's status and error flags. b5 b4 b3 b2 b1 b0 b0: Module's external DC 24V supply is missing or has a hardware error. b1: The analog input exceeds the measurable range. b2: Calibration completion flag. b3: Overload flag, that measured value exceeds the limitation of the BFM#15,14. b4: Zero point flag, the measured value is within the ± range of BFM#5. b5: Standstill confirm flag. The variation of measured value meets the conditions of BFM#6 & BFM#7.	H0000
■30	Identification code: VS-1LC = K211; VS-2LC = K212. (can use the FROM instruction to check whether the place is this module or not)	—
■31	The version number of this module. (the content value □□ indicates Ver. □.□)	
▲32 ≀ ■55	Those BFMs are related to the LC2, please refer to the BFM#2～BFM#25. E.g. the measured weight value of the LC2 is in the BFM#51,50.	—

BFM#6 Standstill Range
BFM#7 Standstill Waiting Time

If the variation of measurement result is within the Standstill Range (BFM#6) and that is longer than the Standstill Waiting Time (BFM#7), then the Standstill Confirm Flag (BFM#25 b5) will ON. Therefore, the programmer could use this flag to identify the measurement is finished.

BFM#8 Zero Point Tracking Range Limitation
BFM#9 Zero Point Tracking Identification Range
BFM#10 Zero Point Tracking Time

The Zero Point Tracking function will adjust the zero point automatically, to improve the measuring accuracy. Since some situations may cause a tiny measurement error during the long-term operation, this function could adjust the offset when the measured value is close to the zero. However, if the standard operating procedure will restore the measured value to zero frequently, this tracking function is unnecessary.

The activation conditions and processing description about the Zero Point Tracking function:

The measured value is “0” and its duration reaches the Zero Point Tracking Time (BFM#10) After that, the measured value drifts a little be, but the variation is smaller than the Zero Point Tracking Identification Range (BFM#9). Therefore, that tiny drift will be regarded as the deviation. This tracking function will combine the deviation to the offset value. Hence, the measured value could be adjusted to “0” at the zero point.

However, when the accumulated adjustment offset value reaches the ± value of the Zero Point Tracking Range Limitation (BFM#8), the offset adjustment will equal to the ± limitation value and cannot be exceeded.

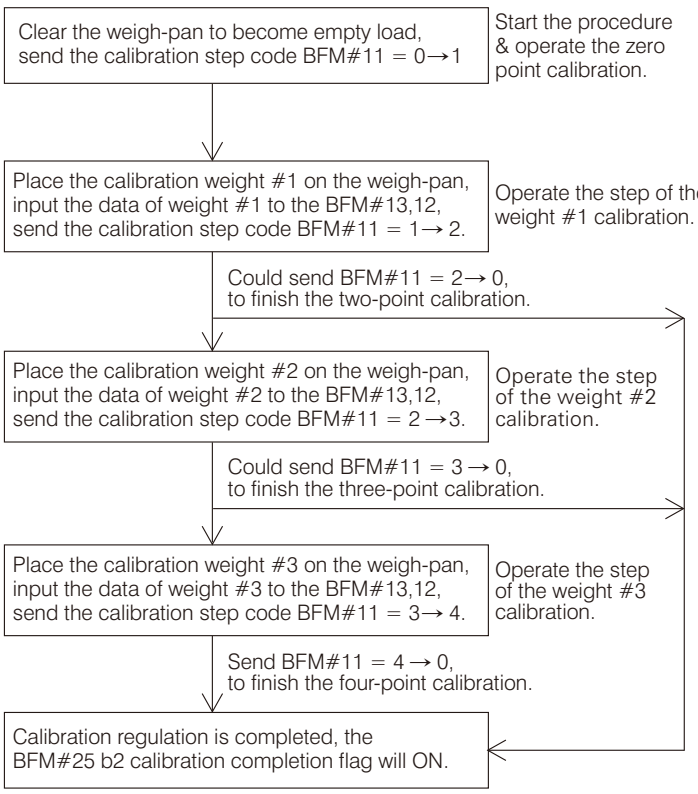
BFM#11 Calibration Step Code
BFM#13,12 Certified Data of the Calibration Weight

After assembling a load cell system, the system must perform the calibration procedure because it needs to create the conversion characteristic in order to convert the measured A/D value into the useful weight data.

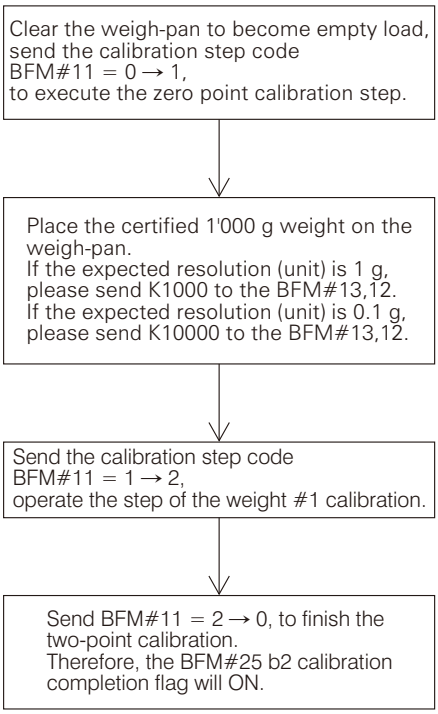
When the calibration is finished, the calibration completion flag (BFM#25 b2) will ON. Therefore, the system is ready for weighing measurement.

Usually the conversion characteristic of a load cell is linear, use the two-point calibration (only takes the empty load and one weight) is good enough. Even so, this module could use the second or third weights to do the three-point or four-point calibration. (If the following calibration weight is smaller, then this additional point is ineffective.)

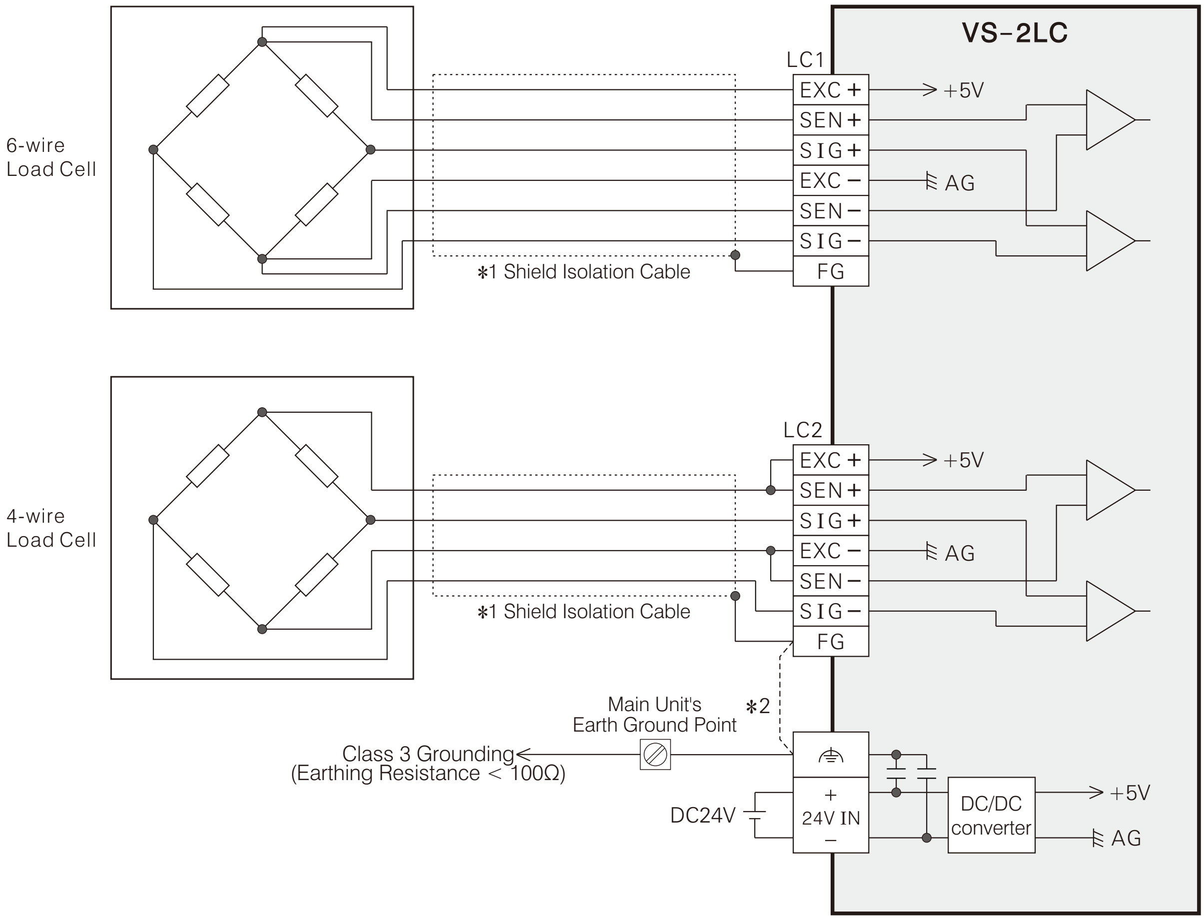
Calibration Procedure:



Two-point calibration example:
(only use the empty load and weight #1)



● External Wiring



*1 : Please use the shield isolation cable for the load cell. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

*2 : Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

● Example Program

The VS-2LC is installed next to the Main Unit and became the 1st. special module, the measured weight value of its LC1 is stored at the D1, D0 (32-bit).