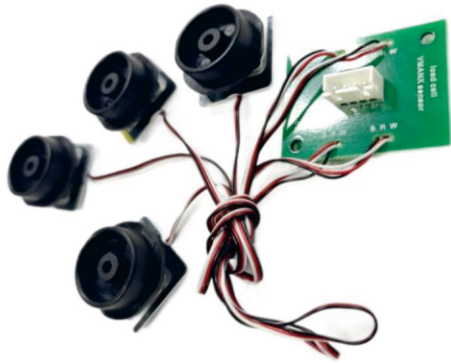


# Load Cell Specification Sheet



## 1. Product Overview

- Brand: VMANX
- Target Market: Europe & North America (For kitchen appliance weighing-blenders, coffee makers, food processors, smart cooking scales, etc.)
- Core Material: 65Mn Spring Steel (High elasticity, excellent fatigue strength)
- Models: LC-VM-1.0A: Elastic Element Thickness 1.0mm, Capacity 3kg LC-VM-1.5A: Elastic Element Thickness 1.5mm, Capacity 7.5kg



## 2. Principle & Mechanism

### 2.1 Resistive Strain Gauge Effect (Core Principle):

- ▶ When the 65Mn spring steel elastic element is subjected to a load and deforms, the bonded Constantan alloy foil strain gauges on its surface experience the same strain, causing a minute change in their electrical resistance ( $\Delta R/R = K * \epsilon$ ).
- ▶ K is the Gauge Factor of the strain gauge (Typical for Constantan  $\approx 2.0$ ).
- ▶  $\epsilon$  is the strain on the surface of the elastic element.

### 2.2 Wheatstone Bridge Measurement Principle

- ▶ Four strain gauges (typically two in tension, two in compression) are precisely connected to form a full Wheatstone bridge circuit.
- ▶ With no load applied, the bridge is balanced (output voltage  $\approx 0$ ).
- ▶ Under load, strain gauge resistance changes unbalance the bridge, producing a millivolt-level differential output voltage signal proportional to the applied load.
- ▶ Formula:  $V_{out} \approx (V_{in} * GF * \epsilon) / 4$  (Simplified ideal formula, where GF is the total sensor design gain)
- ▶ Advantages: High sensitivity, good temperature compensation, rejection of common-mode interference.

## 3. Electrical Specifications

Parameter	LC-VM-1.0A (3kg)	LC-VM-1.5A (7.5kg)	Unit / Notes
Rated Capacity	3	7.5	kg
Rated Output	1.5 ± 0.15	1.5 ± 0.15	mV/V (Typical Excitation 5V DC)
Nonlinearity	≤ ±0.03	≤ ±0.03	%F.S.
Hysteresis	≤ ±0.02	≤ ±0.02	%F.S.
Repeatability	≤ ±0.01	≤ ±0.01	%F.S.
Creep	≤ ±0.02 (30 minutes)	≤ ±0.02 (30 minutes)	%F.S.
Zero Balance	±1	±1	%F.S.
Input Resistance	350 ± 10	350 ± 10	Ω (Between Red-Black leads)
Output Resistance	350 ± 3	350 ± 3	Ω (Between White-Black leads)
Insulation Resistance	≥ 5000	≥ 5000	MΩ (500V DC, Leads-Elastomer)
Excitation Voltage	Recommended 5V DC, Max 10V DC	Recommended 5V DC, Max 10V DC	--
Compensated Temperature Range	-10°C to +60°C	-10°C to +60°C	--
Zero Temperature Effect	≤ ±0.01	≤ ±0.01	%F.S./°C
Span Temperature Effect	≤ ±0.01	≤ ±0.01	%F.S./°C
Safe Overload	150%	150%	of Rated Capacity
Ultimate Overload	300%	300%	of Rated Capacity (May cause permanent damage)
Cable Specification	Std. 300mm 3-conductor shielded	Std. 300mm 3-conductor shielded	Color Code: Red(Exc+), Black(Exc-), White(Sig+)

#### 4. Key Performance Calibration Parameters

- ▶ Sensitivity: A key parameter from factory calibration, equivalent to the Rated Output (mV/V). Ensure the measurement system uses this value for scaling.
- ▶ Input/Output Resistance: Used for matching amplifier input impedance and checking sensor status.
- ▶ Insulation Resistance: Indicates moisture sealing integrity, ensuring signal stability and safety.
- ▶ Temperature Coefficient (TC): Ensures accuracy stability within the operating temperature range of kitchen appliances.
- ▶ **Constantan Strain Gauge Considerations:**
  - ▶ Temperature Self-Compensation: Selected specifically for 65Mn steel (thermal expansion coefficient  $\approx 11 \times 10^{-6}/^{\circ}\text{C}$ ) to minimize temperature drift.
  - ▶ Precision Bonding Process: Critical for bond strength, adhesive uniformity, and alignment accuracy; directly affects linearity, hysteresis, and creep.
  - ▶ Protection: Coated with special protective sealant (e.g., polyurethane, silicone) for moisture, oil, and chemical resistance

#### 5. Measurement Accuracy

- ▶ Combined Error (Includes Nonlinearity, Hysteresis, Repeatability):  $\leq \pm 0.05\%$  F.S. (LC-VM-1.0A & LC-VM-1.5A)
- ▶ Resolution: Theoretically infinite, practically limited by the readout instrument (Typically better than 1:10,000 F.S.).
- ▶ Temperature Drift Effect: Within the  $-10^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  range, the maximum additional error due to temperature drift is  $\leq \pm 0.1\%$  F.S.

#### 6. Operating Environment & Reliability

Parameter	Specification	Notes
Operating Temperature Range	$-10^{\circ}\text{C}$ to $+60^{\circ}\text{C}$	--
Storage Temperature Range	$-20^{\circ}\text{C}$ to $+70^{\circ}\text{C}$	--
Relative Humidity	0 - 90% RH (Non-condensing)	--
IP Rating	IP65 (Default)	Dust-tight, protected against low-pressure water jets. Suitable for damp kitchen/cleaning environments.
Environmental Resistance	Good	Protective coating resists common kitchen moisture and mild cleaning
Shock & Vibration	Meets basic requirements of IEC 60068-2	Withstands typical shocks and vibrations in kitchen appliance operation.
Material Compatibility	Elastomer: 65Mn Steel (Nickel-plated or passivated surface)	Cable: PVC/PUR Shielded
EMC	Meets general EMC requirements for household appliances	(Requires appropriate circuit design and shielding)
Target Safety Certifications	CE, RoHS, REACH	Complies with EU & NA market access requirements.
Design Life	$> 1,000,000$ full-scale load cycles (Design)	Actual life depends on application conditions.

#### 7. Usage Precautions (Critical!)

##### 7.1 Mechanical Installation

- ▶ Ensure the load is applied along the sensor's designated primary axis. Avoid side loads and torsional moments.
- ▶ Mounting base and load application surfaces must be flat, clean, and sufficiently rigid.
- ▶ Use appropriate fasteners and tighten to the recommended torque. Overtightening can cause elastomer deformation or damage
- ▶ Do not drill, weld, or perform any machining on the elastomer!

### 7. 2 Electrical Connection

- ▶ Connect wires strictly according to the color code: Red (Exc+), Black (Exc-), White (Sig+). Signal negative (Sig-) is typically connected via the shield or common with Black wire (refer to specific wiring diagram).
- ▶ Use high-quality shielded cable. Connect the shield to earth ground at the instrument end only.
- ▶ Prevent cable from bearing tension. Keep away from strong electromagnetic interference sources.
- ▶ Ensure excitation voltage is stable with low ripple.

### 7. 3 Environmental Protection

- ▶ Keep the sensor clean and dry. Avoid prolonged immersion, high-pressure washing, or exposure to strong corrosive chemicals.
- ▶ IP65 rating suits kitchen environments but is not fully waterproof/oil-tight; additional protection may be needed for extreme conditions.

### 7. 4 Operation & Maintenance

- ▶ Do not exceed the rated capacity! Overload beyond Safe Overload may cause irreversible damage.
- ▶ Avoid severe impact or dropping.
- ▶ Periodically inspect the mounting condition, cable connections, and insulation resistance.

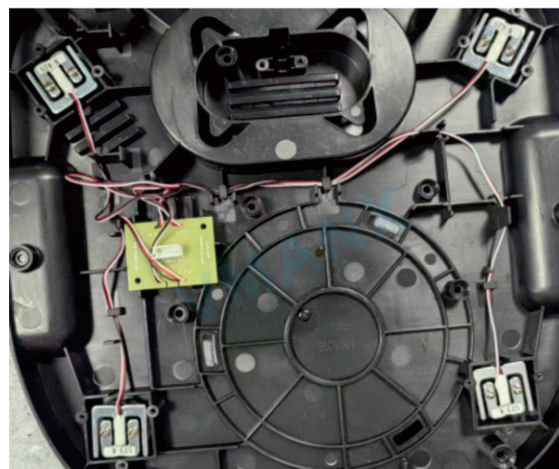
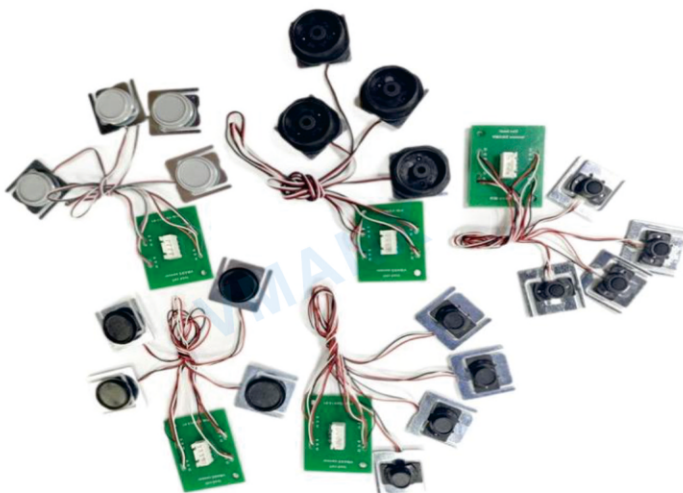
### 7. 5 Calibration

- ▶ On-site calibration after system integration is recommended to eliminate errors introduced by mounting.
- ▶ Temperature compensation should be considered for high-accuracy applications.

### 8. Primary Application Scenarios

- ▶ Kitchen Appliances: Blenders, Food Processors, Coffee Machines, Smart Cooking Pots/Pans, Built-in Oven Scales, Bread Makers, Smart Mugs/Cups, etc. - for precise ingredient and liquid weighing.
- ▶ Others: Small platform scales, micro-weighing in process control, force monitoring.

### 9. Product Diagram



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