GPS Speedometer

LC-8000 series

LC-8120 GPS Speedometer

LC-8220 GPS Vector Speedometer

LC-8300 Compact & High-sensitive GPS Speedometer

ONOSOKKI
LC-8000 series GPS speedometer measures vehicle speed and travel distance by using GPS, GLONASS and IMU with high accuracy and high response. Wide variety of optional software supports various vehicle tests and vehicle measurement fulfilling the needs of users.

**LC-8000 series Line up**

<table>
<thead>
<tr>
<th>LC-8120: Standard model</th>
<th>LC-8220: High-end model</th>
<th>LC-8300: Compact &amp; High-sensitive model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be upgraded by adding optional software to have the performance equivalent to the LC-8220.</td>
<td>Over 30 measurement items including forward speed, lateral speed and sideslip angle are allowed in a single unit. Meets the needs of every driving test.</td>
<td>Compact size (70% reduction in volume compared to the LC-8120), PC-less measurement type, touch panel display.</td>
</tr>
</tbody>
</table>

**1 High accuracy**

By the use of Doppler effect*1 of moving object and carrier wave transmitted from the satellites, the LC-8000 series enable highly accurate calculation of the moving object speed. Receiving plural satellite signals from GPS and GLONASS allows high sensitive, high response measurement.

*1: The Doppler effect is the change in frequency of acoustic/electromagnetic radiation emitted by a source when there is speed difference between an observer and its source. The shift is perceived to higher frequencies when the source approaches and to lower frequencies when it recedes.

**2 Stable and high sensitivity**

Using IMU (Inertial Measurement Unit)*2 and plural satellite signals (GPS and GLONASS), the LC-8000 series enable stable measurement which is not affected by its satellite acquisition state. High precision IMU (linearity ±0.03%/F.S. or less) is provided as an option. Capable of high-response vehicle behavior measurement for the ESC evaluation test.

*2: IMU is the sensor unit which detects the angle speed and acceleration in each direction by the gyro sensor and accelerometer placed in orthogonal three axes.

**3 Supports various kinds of vehicle tests**

Optional software allows to increase the number of vehicle tests to be supported.

- **White line detecting function (LC-0856):** Detection of white lines at measurement start point and stop point. Can be used for tire test based on UN-ECE R117 regulation.
- **Jerk measurement function (LC-0871):** Calculation, display and recording X,Y, and Z axes deviation value. Helpful for evaluating riding comfortableness.
- **Average deceleration calculation (Supports wet grip performance test) (Added to LC-0831):** “Average deceleration (AD)” which is useful for tire wet grip performance test based on UN-ECE R117 regulation is added to the LC-0831.
**LC-8120 GPS Speedometer**

Basic model of GPS Speedometer. Enables highly accurate measurement of various driving tests.

**Features common to LC-8000 series**
- Using GPS enables stable measurement which is not affected by weather or road surface conditions.
- Highly accurate and fast response measurement by original algorithm using GPS, GLONASS and IMU.
- Various vehicle measurements can be conducted by adding optional software.
- Data import of CAN-OBD II is optionally available.

**Specific features**
- With excellent performance of a delay time within 5 ms, useful for acceleration tests or brake tests.
- The LC-8120 can be upgraded by adding optional software to have the performance equivalent to the LC-8220.

**Product configuration**

**Standard system configuration**
- **LC-0087 Compact IMU** (Inertial Measurement Unit)
  Measurement of tri-axial acceleration data. Interpolating velocity using IMU when satellites cannot be captured.
- **LC-0721 GPS/GLONASS antenna**
  Easily attached via magnet.
- **LC-0083 Remote box**
  Remote control of start/stop command, selecting measurement mode.

**Standard software**
(The CD is attached to the main unit.)

**Software option** (sold separately)
- **LC-0831**: Acceleration/deceleration Test
- **LC-0832**: Fuel Consumption Test
- **LC-0833**: Track Display

**CAN**
- Communication data such as engine rotation, torque and air pressure
- Supports CANdb file format

**LC-0823 Vector measurement function** (option)
Forward speed, lateral speed, and side slip angle measurement available. LC-0721 antenna is provided as standard.

**LC-0084 Display unit: Large size** (option)
Satellite acquisition state can be checked on the LED screen. Easy visible with large display. Equivalent function to the LC-0080.

**LC-0080 Display unit: Small size** (option)
Display of vehicle speed, distance and the number of satellites. Enables operations of the display when testing.

**LC-0850A General purpose I/O unit** (option)
A single unit can be mounted on the main unit. 8ch analog input, 5ch pulse input, and 16ch analog output.

**LC-0855 High precision IMU** (option)
Highly accurate acceleration measurement of X, Y, and Z axis directions.

**DPU-414 Printer** (option)
Direct printing of measurement data.

**PC** (sold separately)
Setting of measurement condition, logging for measurement data of speed/distance etc.
**LC-8220 GPS Vector Speedometer**

High-end model featuring the measurement of sideslip angle and 16ch analog output

---

### Features common to LC-8000 series
- Using GPS enables stable measurement which is not affected by weather or road surface conditions.
- Highly accurate and fast response measurement by original algorithm using GPS, GLONASS and IMU.
- Various vehicle measurements can be conducted by adding optional software.
- Data import of CAN-OBD II is optionally available.

### Specific features
- Measurement of over 30 items including forward speed, lateral speed and sideslip angle are allowed in a single unit.
- Analog output up to 16ch selected from acquired data, such as forward/backward acceleration, gradient angle.
- 8ch of analog input, 5ch of pulse input.

---

**Product configuration**

**Standard system configuration**

- **LC-0721 GPS/GLONASS antenna**
  Vector measurement with two antennas.
- **LC-0071 Compact IMU (Inertial Measurement Unit)**
  Measurement of tri-axial acceleration data. Interpolating velocity using IMU when satellites cannot be captured.
- **LC-0084 Display unit: Large size (option)**
  Satellite acquisition state can be checked on LED. Sideslip angle can be displayed.
- **LC-0083 Remote box**
  Remote control of start/stop command, selecting measurement mode.

**Standard software**

(The CD is attached to the main unit.)

**Software option (sold separately)**
- **LC-0831: Acceleration/deceleration Test**
- **LC-0832: Fuel Consumption Test**
- **LC-0833: Track Display**

**CAN**

- Communication data such as engine rotation, torque and air pressure
- Supports CANdb file format

**PC (sold separately)**

Setting of measurement condition, logging for measurement data of speed/distance etc.

**DPU-414 Printer (option)**

Direct printing of measurement data.

**LC-0855 High precision IMU (option)**

Highly accurate acceleration measurement of X, Y, and Z axis directions.

**LC-0815 INPUT CONNECTOR BOX (option)**

Cable connection to the rear of the LC-0850A or the LC-8220. Conversion unit of the D-sub connector to BNC connector.

**LC-0819 OUTPUT CONNECTOR BOX (option)**

Cable connection to the rear of the LC-0850A or the LC-8220. Conversion unit of the D-sub connector to BNC connector.
**LC-8300** Compact & High-sensitive GPS Speedometer

Compact & high-sensitive, PC-less measurement type

**Features common to LC-8000 series**
- Using GPS enables stable measurement which is not affected by weather or road surface conditions.
- Highly accurate and fast response measurement by original algorithm using GPS, GLONASS and IMU.
- Various vehicle measurements can be conducted by adding optional software.
- Data import of CAN-OBD II is available.

**Specific features**
- Compact size (70% reduction in volume compared to the LC-8120) Easily installed even in a limited space such as two-wheel vehicles.
- Data logging without a PC: Data can be stored in an attached USB memory or internal storage memory.
- Easy to operate with a touch panel: The touch panel display improves visibility and ease of operation.
- Analog 4ch, pulse 1ch, CAN 64ch input as standard.

**Product configuration**

**Standard system configuration**

- **LC-0088 GPS/GLONASS antenna**
  - Compact, easy installation on a dashboard.
- **LC-0853 USB memory**
  - USB memory for measurement data logging.
- **LC-0089 Touch panel type display unit**
  - Test mode selection or test condition setup as well as test start/stop can easily be operated on a touch panel.
- **LC-0083 Remote box**
  - Remote control of start/stop command, selecting measurement mode.

**Software option (sold separately)**
- **LC-0831**: Acceleration/deceleration Test
- **LC-0832**: Fuel Consumption Test
- **LC-0833**: Track Display

**CAN**
- Communication data such as engine rotation, torque and air pressure
- Supports CANdb file format

**PC (sold separately)**
- Setting of measurement condition, logging for measurement data of speed/distance etc.

**Compact IMU**
- (option, provided as standard with LC-0825)
  - External compact IMU is a standard accessory of LC-0825 IMU data output function. Speed, acceleration, and angle speed are measured based on the external compact IMU as a measurement origin. Internal IMU of LC-8300 is not activated when an external compact IMU is used. The data output from the internal IMU is not available.

**DPU-414 Printer (option)**
- Direct printing of measurement data.

---

**Features common to LC-8000 series**

- Using GPS enables stable measurement which is not affected by weather or road surface conditions.
- Highly accurate and fast response measurement by original algorithm using GPS, GLONASS and IMU.
- Various vehicle measurements can be conducted by adding optional software.
- Data import of CAN-OBD II is available.

**Specific features**

- Compact size (70% reduction in volume compared to the LC-8120) Easily installed even in a limited space such as two-wheel vehicles.
- Data logging without a PC: Data can be stored in an attached USB memory or internal storage memory.
- Easy to operate with a touch panel: The touch panel display improves visibility and ease of operation.
- Analog 4ch, pulse 1ch, CAN 64ch input as standard.
Feature

- Displays of measurement data and CAN/OBD II data, and settings of measurement items.
- Screen display with good visibility such as a floating meter function.
- Data transfer to the OS-2000 series (Time series data analysis software) by [OS-2000] button.
- Docking Window enables various layout building.
- Language selection of Japanese or English is available.

"Meter" display as a window

Meter display can be set as a separate-frame window. Displaying meter items are selectable to make various layout.

"Docking Window" enables various layout building

The dockable locations are displayed by dragging the central window. Screen layout can be changed according to the measurement scene.

Example of a graph display in large image by setting to hide items other than the central graph window. It can also display only a single window without using docking.

Easy data transfer to OS-2000 series by just one click operation

One click operation of data transfer to OS-2000 (time-series data analysis software).

Time-series data analysis software OS-2000 series can perform flexible data edit from huge amount of data which Microsoft® Excel® cannot handle. OS-2000 can handle various data format including CSV or WAV files, as well as the recorded data of LC-8000 series.

It can freely perform overwriting of different waveforms, waveform division, movement, enlargement, and the reduction. Various filters, video replay function, FFT Analysis function, and sound quality evaluation are also provided.

OS-2000 series is automatically activated for data transfer by clicking this button.
Optional Software

Various optional functions are able to be added: Multiple test function, orientation detection function, divided coasting test function, vehicle path/ driving direction display function, CAN input/ output function etc.

- **LC-0831: Acceleration/deceleration Test**
  - Display of elapsed time in acceleration test.
  - (0 to 400 m / 0 to 1000 m)
  - AD (average deceleration) calculation in braking test.
  - MFDD (Mean Fully Developed Deceleration) calculation in braking test.
  - Display of deceleration speed and elapsed time in ABS test.
  - Data display in V-STEP/ D-STEP/ T-STEP modes.

- **LC-0832: Fuel Consumption Test**
  - Input of the pulse signal from the DF-210B Flow Meter.
  - Calculation and display of fuel consumption, fuel consumption rate, and accumulated fuel consumption, etc.
  - Data output in D-STEP/ T-STEP modes.

- **LC-0833: Track Display**
  - Display of vehicle path.
  - Measurement of drift amount.
  - Measurement of minimum turning radius.

<Example: When LC-0831, LC-0833 options are installed>

Vehicle path of the test is also measured and displayed

Track display software is able to be used with the other test function (optional software) at the same time. For example, drift amount can be measured at the same time when MFDD at the brake test is measured.

---

Major Functions

*Multiple test function*

- The multiple test results are collectively managed in data manager.
- This function allows easily to verify the difference of each test result.
- *One item of data is created with the Ready → Start → Stop measurement sequence.

*Orientation detection function*

- Function available for multiple test.
- Used when reciprocal running tests are required.
- By setting the driving direction of the vehicle, measurement data is respectively recorded to course A and course B.
- Useful for rearranging result, and displaying average value for each course.

Results of multiple test
### Major Functions

#### CAN input function
- Enables input of CAN data.
- Up to 100 Hz of input sampling.
- Easy setup of measurement and recording channel, CANdb format file can be read.

#### CAN output function
- Data output measuring in the main unit as CAN data.
- Up to 100 Hz of output sampling.
- CANdb format file generation function makes it easy to use with CAN recording device.

#### Divided coasting test function
- A function available when the orientation detection function is set in coasting test and multiple test.
- Test is started and finished automatically by setting the number of divisions and the test start speed.
- Multiple recorded data are merged to see in one table.

#### Vehicle path/ driving direction display
- Driving direction, travel orientation of the vehicle can be displayed as well as the vehicle path.
  * The LC-8220, or the LC-0823 Vector Measurement is required to display the driving direction.
  * The LC-8300 cannot display the driving direction.
**Specification of Options**

**LC-8120/8220**

- **High precision IMU (LC-0855)**
  - X, Y, Z acceleration
    - Measurement range: -49.0 to 49.0 m/s²
    - Linearity: ±0.1 % F.S. (Reference accuracy)
  - X, Y, Z angular speed
    - Measurement range: -150.0 to 150.0 °/s
    - Linearity: ±0.03 % F.S. (Reference accuracy)
  - Update cycle
    - 100 Hz / 500 Hz / 500 Hz is only for analog output
  - Cable
    - Approx. 5 m
  - Operating temperature range
    - 0 to 50°C (Humidity: 20 to 95 % RH, with no condensation)
  - Storage temperature range
    - -10 to 60°C (Humidity: 20 to 95 % RH, with no condensation)
  - Protection class
    - IP43
  - Outer dimensions (Weight)
    - Approx. 72 (W) x 72 (D) x 43 (H) mm (not including protruded section)

- **External input/output unit (LC-0850A)**
  - Arbitrary analog output item
    - Selectable 16ch from Horizontal speed, Forward speed, Lateral speed, Vertical speed, Number of satellites, Travel orientation, North speed, East speed, Sideslip angle, Yaw angle, Pitch angle, Roll angle, IMU coordinate axis XYZ2 acceleration, IMU coordinate axis XYZ2 angular speed, Slope angle, Satellite lost flag, Vehicle coordinate axis XYZ2 acceleration, Vehicle coordinate axis XYZ2 angular speed, Vehicle attitude angle, IMU coordinate axis XYZ2 jerk.
  - Output voltage
    - ±10.0 to 10.0 V (Can be changed by PC software.)
  - Offset
    - ±5 mV or less
  - Output accuracy
    - ±0.1 % / F.S.
  - Temperature stability
    - ±0.02 % / °F.S./°C
  - Update frequency
    - 100 Hz
  - Load resistance
    - 10 kΩ or more
  - Output delay
    - 5 ms or less
  - External synchronous output function
    - Synchronous pulse output / Asynchronous clock output
  - Duty
    - At synchronous pulse output: Hi approx. 100 µs
    - At asynchronous clock output: 50% ±10 %
  - Output frequency
    - 100 Hz
  - Load resistance
    - 10 kΩ or more
  - Analog input
    - Number of channels: 8ch
    - Voltage range: ±10 V / 20 V
    - Offset: ±20 mV or less
    - Measurement accuracy: ±0.5 % / F.S.
  - Pulse input
    - Number of channels: 4ch
    - Conversion: 4ch TTL pulse 1ch: SIN input
  - Frequency range (4ch TTL)
    - Pulse: DC to 60 kHz
    - Frequency: 1 Hz to 50 kHz
    - Duty: 1 Hz to 10 kHz
  - Accuracy (4ch TTL)
    - Pulse count: ±1 count or less
    - Frequency input: frequency x 0.02 % ±1 % or less
    - Duty conversion: 1 kHz or less; ±2 % or less, 1 kHz or more; ±8 % or less
  - Power source output
    - 12 ±2 VDC (approx. 48 W or less) x 10ch
  - Outer dimensions (weight)
    - Approx. 269 (W) x 180 (D) x 43 (H) mm (not including protruded section)

**External input/output unit (LC-0850A)**

- **IMU unit (LC-0857)**
  - X, Y, Z acceleration
    - Measurement range: -98.0 to 98.0 m/s²
    - Linearity: ±0.2 % F.S. (Reference accuracy)
  - X, Y, Z angular speed
    - Measurement range: -150.0 to 150.0 °/s
    - Linearity: ±0.1 % F.S. (Reference accuracy)
  - Cable
    - Approx. 5 m
  - Protection class
    - IP43
  - Outer dimensions (weight)
    - Approx. 56 (W) x 56 (D) x 35 (H) mm (not including protruded section)

- **CAN output function (LC-0811A, LC-0854)**
  - Standard
    - Conforms to Ver. 2.0B
  - Update frequency
    - Selectable from OFF, 1 Hz, 5 Hz, 10 Hz, 20 Hz or 100 Hz
  - Baud rate
    - Selectable from 125, 250, 500 or 1000 kbps
  - Format
    - Supports standard ID / extended ID
  - Data
    - CAN input: Up to 32ch can be acquired. Can be acquired up to 16 items of specified measured values by OBD II protocol.
  - Accessory
    - D-Sub 9 pin connector

- **GPS Speedometer PC software ver. 3.1 operating environment**
  - CPU
    - Intel® Core™ 2 Duo / 2 GHz or more
  - OS
    - Windows7 / 8 / 10 (32 bit) or 64 bit
  - Memory
    - 512 MB or more
  - HDD
    - 80 GB or more
  - Display
    - Can be displayed XGA (1024 x 768) or more
  - USB
    - USB 2.0 (High Speed) 1 port or more
### Specification of LC-8000 Series

<table>
<thead>
<tr>
<th>Item</th>
<th>LC-8120 GPS Speedometer</th>
<th>LC-8220 GPS Vector Speedometer</th>
<th>LC-8300 Compact &amp; High-Sensitive GPS Speedometer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Horizontal speed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>0.1 to 500.0 km/h</td>
<td>±0.2 km/h</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1 km/h</td>
<td>±0.2 km/h</td>
<td></td>
</tr>
<tr>
<td><strong>Horizontal distance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>-500.0 to 500.0 km/h</td>
<td>±0.2 km/h</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1 km/h</td>
<td>±0.2 km/h</td>
<td></td>
</tr>
<tr>
<td><strong>Forward speed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>-20.0 to 20.0 m/s</td>
<td>±0.05 %</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.2 km/h</td>
<td>±0.15 %</td>
<td></td>
</tr>
<tr>
<td><strong>Lateral distance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>-25.0 to +25.0°</td>
<td>±0.10 %</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.10 %</td>
<td>±0.15 %</td>
<td></td>
</tr>
<tr>
<td><strong>Vehicle attitude angle</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>-180.0 to +180.0°</td>
<td>±0.08 %</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.10 %</td>
<td>±0.15 %</td>
<td></td>
</tr>
<tr>
<td><strong>Yaw angle</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>-180.0 to +180.0°</td>
<td>±0.10 %</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.10 %</td>
<td>±0.15 %</td>
<td></td>
</tr>
<tr>
<td><strong>X, Y, Z angular speed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>-98.0 to 98.0 m/s</td>
<td>±0.2 % / F.S. (Reference accuracy)¹¹</td>
<td>-98.0 to 98.0 m/s</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.2 % / F.S. (Reference accuracy)¹¹</td>
<td>±0.2 % / F.S. (Reference accuracy)¹¹</td>
<td></td>
</tr>
<tr>
<td><strong>Input coupling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency range (4ch SII)</td>
<td>1 Hz to 50 kHz</td>
<td>±5 %</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2 % or less</td>
<td>±6 % or less</td>
<td></td>
</tr>
<tr>
<td><strong>Input voltage</strong></td>
<td>4ch: TTL pulse</td>
<td>±0.2 % or less</td>
<td></td>
</tr>
<tr>
<td><strong>Input voltage range</strong></td>
<td>±0.2 V</td>
<td>±5 %</td>
<td></td>
</tr>
<tr>
<td><strong>Input waveform</strong></td>
<td>4ch: TTL</td>
<td>±5 %</td>
<td></td>
</tr>
<tr>
<td><strong>Frequency range (DC selected)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Frequency range (AC selected)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Measurement range (DUTY)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. pulse width (DUTY)</td>
<td>10 to 90 %</td>
<td>±5 %</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2 % or less</td>
<td>±6 % or less</td>
<td></td>
</tr>
<tr>
<td><strong>Power supply output</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Available by LC-0850A)</td>
<td>12 ± 2 VDC (Approx. 4 VA or less) x 1ch</td>
<td>±5 %</td>
<td>12 ± 2 VDC (Approx. 260 mA or less) x 1ch</td>
</tr>
<tr>
<td>remarks</td>
<td>Switch with the analog output section</td>
<td>Switch with the analog output section</td>
<td></td>
</tr>
<tr>
<td><strong>Analog (speed) output</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage range</td>
<td>0 to 10 V/ 0 to 500 km/h</td>
<td>±0.2 % F.S.</td>
<td></td>
</tr>
<tr>
<td>Load resistance</td>
<td>100 kΩ or more</td>
<td>±0.2 % / F.S. (Reference accuracy)¹¹</td>
<td>10 kΩ or more</td>
</tr>
<tr>
<td>Temperature stability</td>
<td>±0.05 % / F.S.</td>
<td>±0.10 % / F.S. (Reference accuracy)¹¹</td>
<td>±0.10 % / F.S. (Reference accuracy)¹¹</td>
</tr>
<tr>
<td>Output delay</td>
<td>5 ms or less</td>
<td>±0.05 % / F.S. (Reference accuracy)¹¹</td>
<td>10 ms or less</td>
</tr>
<tr>
<td><strong>External synchronous output</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output level</td>
<td>Synchronous pulse output</td>
<td>±10 ms or less</td>
<td>±10 ms or less</td>
</tr>
<tr>
<td>Output frequency</td>
<td>100 Hz</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Load resistance</td>
<td>10 kΩ or more</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td><strong>Analogue Input</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>8ch</td>
<td>±0.02 % / F.S. (Reference accuracy)¹¹</td>
<td>±0.02 % / F.S. (Reference accuracy)¹¹</td>
</tr>
<tr>
<td>Sampling frequency</td>
<td>100 Hz</td>
<td>±10 % or ±20 % or less</td>
<td>±10 % or ±20 % or less</td>
</tr>
<tr>
<td>Offset error</td>
<td>±0.02 % / F.S.</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td><strong>Pulse input</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Frequency range (4ch TTL)</td>
<td>1 Hz to 50 kHz</td>
<td>±10 % or ±20 % or less</td>
<td>±10 % or ±20 % or less</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td><strong>Input voltage range (AC)</strong></td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Input voltage range (DC)</td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Input waveform</td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Frequency range (DC selected)</td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Frequency range (AC selected)</td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Measurement range (DUTY)</td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Min. pulse width (DUTY)</td>
<td>10 to 90 %</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td><strong>Remarks</strong></td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
<tr>
<td><strong>Remarks</strong></td>
<td></td>
<td>±2 % or less</td>
<td>±2 % or less</td>
</tr>
</tbody>
</table>

*Note: All specifications are subject to change without notice.*
**Comparison Table of Measurement Items**

**Main item**

<table>
<thead>
<tr>
<th></th>
<th>LC-8120</th>
<th>LC-8220</th>
<th>LC-8300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal speed</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Horizontal distance</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Forward speed</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Forward distance</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Lateral speed</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Lateral distance</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Vertical speed</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Vertical distance</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Slope</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Number of satellites</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Travel orientation</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Latitude/longitude/altitude</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sidestep angle</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Yaw, pitch, roll angles</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>XYZ acceleration/angular speed (IMU coordinate axes)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>XYZ acceleration/angular speed (Vehicle coordinate axes)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Vehicle attitude angle</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>[High precision IMU]</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>XYZ acceleration/angular speed (IMU coordinate axes)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>XYZ jerk</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**External trigger input/output**

<table>
<thead>
<tr>
<th>Input</th>
<th>LC-8120 GPS Speedometer</th>
<th>LC-8220 GPS Vector Speedometer</th>
<th>LC-8300 Compact &amp; High-Sensitive GPS Speedometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Gate output: 1ch</td>
<td>Gate ON/OFF. Square wave pulse output. Load resistance 39 kΩ or more</td>
<td>Gate signal or speed judgment output signal</td>
</tr>
</tbody>
</table>

**PC interface**

- USB 2.0

**General specification**

- Power supply: 10 to 28 VDC/100 to 240 VAC (AC adapter: option)
- Power consumption: Max. 30 VA
- Operating temperature range: -5 to 50 °C
- Storage temperature range: -10 to 60 °C

**Accessory**

- Antenna (LC-0721), Remote box (LC-0083), IMU (LC-0087) and connection cables, DC power supply cable, USB cable, PC standard software, IMU mounting jig
- Antenna (LC-0721) x 2, Large display unit (LC-0844), Remote box (LC-0083), IMU (LC-0087) and connection cables, DC power cable, USB cable, PC standard software, Antenna & IMU mounting jig
- Antenna, Remote box, Touch panel display unit and connection cables, Power cable for cigarette lighter socket, USB memory, PC standard software, Mount adapter for display unit, Carrying case

**Outer dimensions (weight)**

- Approx. 269 (W) x 180 (D) x 43 (H) mm (not including protruded section) (Approx. 1.4 kg)
- Approx. 269 (W) x 180 (D) x 71 (H) mm (not including protruded section) (Approx. 2.2 kg)
- Approx. 170 (W) x 120 (D) x 40 (H) mm (not including protruded section) (Approx. 0.75 kg)

**Software & Hardware**

- Comparison Table of Measurement Items

**List of optional functions**

- LC-0851, LC-0871: Jerk measurement function
- LC-0826: Vertical direction measurement function
- LC-0856: White line detection sensor input
- LC-0871: High precision IMU
- LC-0821: IMU data output function
- LC-0824: CAN output
- LC-0825: IMU data output

**Additional notes**

- Time-series data cannot be recorded on the main unit of the LC-8120/8220. However, one of the data displayed on the display unit or a simple test result at the moment can be recorded. In total 32 items of data can be recorded.
- The reference position of all measurement items is the place where IMU is. Even if the vehicle gravity center position is different from the position where IMU is fixed, forward speed, lateral speed, vertical speed and sideway angle of an arbitrary position are calculated and output by setting the distance from the arbitrary position to IMU. Four arbitrary positions can be set.

The following options are required:

- 1: LC-0823 Vector measurement function
- 2: LC-0822 Vertical direction measurement function
- 3: LC-0821 IMU data output function
- 4: LC-0821 IMU data output function and LC-0823 Vector measurement function
- 5: LC-0855 High precision IMU
- 6: Two or more antennas are required
- 7: LC-0826 Vertical direction measurement function
- 8: LC-0825 IMU data output function
- 9: LC-0871 Jerk measurement function
- 10: Distance calculation is available with double integral of the IMU lateral acceleration. Adding the LC-0825 IMU data output function is required

**List of optional functions**

- LC-0831: Acceleration/deceleration test
- LC-0832: Fuel consumption test
- LC-0833: Track display
- LC-0801: Display unit: small size
- LC-0821: Power cable
- LC-0802: Remote box
- LC-0804: Display unit: large size
- LC-0807: Compact IMU
- LC-0808: GPS/GLONASS antenna
- LC-0809: Touch panel display unit
- LC-0821: GPS/GLONASS antenna
- LC-0811A: CAN output
- LC-0815: INPUT connector box
- LC-0819: OUTPUT connector box
- LC-0851: CAN input
- LC-0853: USB memory
- LC-0854: CAN output
- LC-0855: High precision IMU
- LC-0856: White line detection sensor input
- LC-0870: High response IMU
- LC-0871: Jerk measurement function

- Provided as standard: ○
- Available as an option: ○
- Not supported: –

**LC-8000 series**

- LC-8120: GPS Speedometer
- LC-8220: GPS Vector Speedometer
- LC-8300: Compact & High-Sensitive GPS Speedometer

**Software**

- LC-0831: Acceleration/deceleration test
- LC-0832: Fuel consumption test
- LC-0833: Track display
- LC-0801: Display unit: small size
- LC-0821: Power cable
- LC-0802: Remote box
- LC-0804: Display unit: large size
- LC-0807: Compact IMU
- LC-0808: GPS/GLONASS antenna
- LC-0809: Touch panel display unit
- LC-0821: GPS/GLONASS antenna
- LC-0811A: CAN output
- LC-0815: INPUT connector box
- LC-0819: OUTPUT connector box
- LC-0851: CAN input
- LC-0853: USB memory
- LC-0854: CAN output
- LC-0855: High precision IMU
- LC-0856: White line detection sensor input
- LC-0870: High response IMU
- LC-0871: Jerk measurement function

- Provided as standard: ○
- Available as an option: ○
- Not supported: –

**LC-8000 series**

- LC-8000: GPS Speedometer

**LC-8120 GPS Speedometer**

- Non-voltage contact input: 1ch contact (Switching logic is available)
- Voltage input: 5 to 24 V (Switching logic is available)
- White line detection sensor input

**LC-8220 GPS Vector Speedometer**

- Non-voltage contact input: 1ch contact (Switching logic is available)
- Voltage input: 5 to 24 V (Switching logic is available)
- IMU mounting jig

**LC-8300 Compact & High-Sensitive GPS Speedometer**

- Start, stop signals (non-voltage/voltage contacts)
Ono Sokki Technology Inc.
2171 Executive Drive, Suite 400,
Addison, IL. 60101, U.S.A.
Phone : +1-630-627-9700
Fax : +1-630-627-0004
E-mail : info@onosokki.net
http://www.onosokki.net

Ono Sokki Shanghai Technology Co., Ltd.
Room 506, No.47 Zhengyi Road, Yangpu
District, Shanghai, 200433, P.R.C.
Phone : +86-21-6503-2656
Fax : +86-21-6506-0327
E-mail : admin@shonosokki.com

Ono Sokki India Private Ltd.
Plot No.20, Ground Floor, Sector-3,
IMT Manesar Gurgaon-122050,
Haryana, INDIA
Phone : +91-124-421-1807
Fax : +91-124-421-1809
E-mail : osid@onosokki.co.in

Ono Sokki (Thailand) Co., Ltd.
1/293-4 Moo.9 T.Bangphud A.Pakkred,
Nonthaburi 11120, Thailand
Phone : +66-2-584-6735
Fax : +66-2-584-6740
E-mail : sales@onosokki.co.th

URL: http://www.onosokki.co.jp/English/english.htm

Outer appearance and specifications are subject to change without prior notice.

Recycled Paper

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

ONOSOKKI CO., LTD.
1-16-1 Hakusan, Midori-ku, Yokohama, 226-8507, Japan
Phone : +81-45-935-3918   Fax : +81-45-930-1808
E-mail : overseas@onosokki.co.jp

UNIT (mm)

CAT. NO. 1436-01E   Printed in Japan 174 (SUN) 0.5K

WORLDWIDE

ONOSOKKI CO., LTD.
1-16-1 Hakusan, Midori-ku, Yokohama, 226-8507, Japan
Phone : +81-45-935-3918   Fax : +81-45-930-1808
E-mail : overseas@onosokki.co.jp

URL: http://www.onosokki.co.jp/English/english.htm

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

• Outer appearance and specifications are subject to change without prior notice.

Recycled Paper

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

WORLDWIDE

ONOSOKKI CO., LTD.
1-16-1 Hakusan, Midori-ku, Yokohama, 226-8507, Japan
Phone : +81-45-935-3918   Fax : +81-45-930-1808
E-mail : overseas@onosokki.co.jp

URL: http://www.onosokki.co.jp/English/english.htm

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

• Outer appearance and specifications are subject to change without prior notice.

Recycled Paper

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

WORLDWIDE

ONOSOKKI CO., LTD.
1-16-1 Hakusan, Midori-ku, Yokohama, 226-8507, Japan
Phone : +81-45-935-3918   Fax : +81-45-930-1808
E-mail : overseas@onosokki.co.jp

URL: http://www.onosokki.co.jp/English/english.htm

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

• Outer appearance and specifications are subject to change without prior notice.

Recycled Paper

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

WORLDWIDE

ONOSOKKI CO., LTD.
1-16-1 Hakusan, Midori-ku, Yokohama, 226-8507, Japan
Phone : +81-45-935-3918   Fax : +81-45-930-1808
E-mail : overseas@onosokki.co.jp

URL: http://www.onosokki.co.jp/English/english.htm

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.

• Outer appearance and specifications are subject to change without prior notice.

Recycled Paper

Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and other countries.

Other product names and model names are trademarks or registered trademarks of each individual company.

The copyrights are reserved by each individual company.