

SPECIFICATIONS
PARTICLE COUNTER
KL-30A



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Outline

The Particle Counter KL-30A is designed to measure the size and number concentration of particles in pure water, using the light scattering method. It is a standalone unit comprising the sensor, processing section, control section, display, flow control section, and a printer.

The count for up to ten particle sizes can be determined in a single measurement.

It is possible to freely specify the size ranges 0.05 μm to 0.2 μm for particle detection.

The factory default setting is four channels ($\geq 0.05 \mu\text{m}$, $\geq 0.1 \mu\text{m}$, $\geq 0.15 \mu\text{m}$, $\geq 0.2 \mu\text{m}$).

The rated flow rate is 20 mL/min, and counting efficiency is 10%. The effective flow rate at which particles are detected and measured is the rated flow rate multiplied by the counting efficiency, i.e. 2 mL/min. The technology employed by the unit minimizes the dependence of counting efficiency on particle size.

The display is a touch panel, so that buttons on the display can be selected and operated using the touch pen, or another suitable implement.

The unit incorporates a leak sensor. If a leak is detected within the unit, an alarm output can be activated.

Printout of measurement results on an internal thermal printer is also possible.

An internal serial interface allows for communication with a computer.

The unit can output the measurement results converted into an analog signal with a range of 4 mA to 20 mA using an internal D/A converter interface, so it can be connected directly to an instrumentation system.

Adding an optional CF card allows automatic saving measurement data in text format (as Tab-Separated Values (TSV)).

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Specifications

Optical system	90° sideway light scattering method
Light source	Diode pumped solid state laser (rated output 500 mW; wave length 532 nm)
Laser product class	Class 1, IEC 60825-1:2014 Internal particle detection mechanism uses Class 4 laser
Collecting optics	Spherical lens
Light detector	Silicon photodiode
Measurable sample types	Pure water (For cleaning purposes, fluids which do not corrode the fluid-contacting parts may be passed through the system.)
Calibration	By polystyrene latex (PSL) particles with refractive index 1.6 in pure water The particles for calibration are traceable to the NIST (National Institute of Standards and Technology) standard
Minimum detectable particle size	0.05 µm (with PSL particles of refractive index 1.6 in pure water)
Measurable particle size range	0.05 µm to 0.2 µm (with PSL particles of refractive index 1.6 in pure water)
Setting range	Freely settable to 0.05 µm to 0.2 µm (Up to 10 channels in 0.01 µm steps can be set. Upper limit for smallest particle size channel (CH 1) is 0.08 µm)
Size range	The factory default setting is four channels (≥0.05 µm, ≥0.1 µm, ≥0.15 µm, ≥0.2 µm)
Flow rate	20 mL/min The total flow rate to be poured into the particle counter is the flow rate (20 mL/min) plus the purge flow rate (0.1 L/min to 1 L/min) Purge flow rate fluctuates with sample pressure
Sensor flow rate control	Diaphragm type flow controller keeps flow rate constant, regardless of sample pressure fluctuations (20 mL/min, tolerance ±5%) Flow controller equipped with bypass open/close valve

Bypass connection (purge flow)	Sensor bypass flow can be set by needle valve to 0.1 L/min to 1 L/min (fluctuates with sample pressure)
Sample inlet (INLET) / sample outlet (OUTLET)	4 mm × 6 mm dia. or 3.96 mm × 6.35 mm dia. flared tube joint
Sample pressure range	100 kPa to 500 kPa (gauge pressure)
Sample temperature range	+15°C to +35°C (no moisture condensation on flow cell)
Materials of parts exposed to sample	Synthetic quartz, fluororubber, fluororesin, polyvinyl chloride, Pyrex glass, SUS304/316 and polyacetal
Counting efficiency	10% ±3% (measuring PSL particles in the range of 0.15 µm for comparison with standard unit)
Effective flow rate	2 mL/min ±0.6 mL/min (measuring PSL particles in the range of 0.15 µm for comparison with standard unit)
Size resolution	10% or less (in the vicinity of 0.15 µm PSL particles)
Maximum particle number concentration	7,000 particles/mL (coincidence loss is 5% or less) 15,000 particles/mL (coincidence loss is 10% or less)
False count rate	Average 0.01 particles/mL or less (measured with light source off, in order to limit measurement to noise from sources other than particles)
Warm-up time	15 minutes or less (after power-on) 5 minutes or less (from receiving laser-on command in measurement pause/laser off condition)
Display	
Display	640 × 480 pixel color LCD (with backlight)
Display language	English

Display items

Measurement screen

This screen displays particle counts (up to 8 digits (one decimal place), one channel or up to ten channels on simultaneous display), date and time, remaining measurement time, error information, measurement parameter setting and display, etc.

System Configuration screen

Date, time, communication parameters, auto print and other system settings

LASER icon

Lit green during normal operation

Lit red when light source temperature is out of range

Flashing red when light source output is out of range

Flashing green when laser current has increased above a certain threshold (light source nearing end of service life; maintenance within 1 month recommended)

Off when light source is off

CELL icon

Lit green during normal operation

Lit red when particle detector assembly is contaminated, condensation occurs or particle number concentration in sample exceeded maximum particle number concentration

Off when light source is off

LED indicators

START

Lights green to indicate measurement operation

Lights when measurement starts

Flashes when periodic measurement or preset-time measurement is paused (during measurement operation)

Otherwise, switched off

STOP

Lights green to indicate that measurement has stopped

Lights when measurement has stopped

Otherwise, switched off

Controls

Touch panel

Resistance sensitive

Buttons

START

Starts measurement

STOP

Stops measurement

Measurement time

10 seconds to 2 hours, and manual

In Remote status, 1 minute or 10 minutes can be selected, in addition to the above

Measurement modes

Manual measurement Measurement controlled with START and STOP buttons

Automatic measurement

Averaging measurement

Repeated measurement of preset time or volume, up to 99 times, with average value of results (when function for cancelling erroneous count is invalid)

Periodic measurement

Repeated measurement can be performed automatically, specifying the time intervals (10 seconds to 24 hours)

Moving average measurement

During periodic measurement, moving average for 10, 60, or 100 measurements is calculated and results are output via printer, serial link, and D/A converter

Processing results are not shown on the screen

Preset-time measurement

Starts/Stops measurement at the set time

Function for cancelling erroneous count

During automatic measurement, cancelling erroneous count is processed on the measurement ends and results are output via printer, serial link, and D/A converter

Processing results are not shown on the screen

(Selectable valid (factory default setting) or invalid)

Count display modes Cumulative value, differential value, number concentration (units: /mL, /L)

Alarm

Count alarm

Buzzer sounds and ALARM terminals are closed by relay when particle count in the specified particle size range exceeds the specified alarm level

When moving average measurement is carried out, buzzer sounds and ALARM terminals are closed by relay at end of measurement

Alarm level

1 to 9999999, or alarm is off

0.1 to 9999999.0, or alarm is off (at the time of moving average calculation)

Additional settings in remote mode: Select from 10, 100, 1,000, 10,000, 100,000

Maximum load

30 V DC, 1 A

Clock	Auto calendar for year, month, day, hour, minute, second (adjusts for leap years until 2037) - Accuracy: ± 2 minutes/month or better (at normal temperature)
Inputs/outputs	
SERIAL	Connect a control equipment compatible with the internal interface.
ALARM	Alarm output terminals
LIQUID LEAK ALARM	Shorted during normal operation, open when internal leak is detected Maximum load: 30 V DC, 1 A
D/A converter interface output terminals	Converts the particle count in a selected channel into 4 mA to 20 mA DC current ALARM, LIQUID LEAK ALARM, and D/A converter interface output terminals are M3 screw terminal board, accepts either electric wire with a 1.25 mm ² cross section or spade (Y-type) terminals
Internal interfaces	
Serial interface	
Communications parameters	
Electrical characteristics	Conforming to JIS X 5101:1982 (JIS X 5101 corresponds to TIA/EIA-232)
Transmission configuration	Full-duplex, asynchronous
Baud rate	4,800 bps
Data word length	7 bits
Parity	Even
Stop bits	2 bits
Terminator	<CR> <LF>
Connector type	9-pin male D-sub connector
D/A converter interface	Converts the particle count in a selected channel into 4 mA to 20 mA DC current
Output range	0 to 1, 0 to 10, 0 to 100, 0 to 1,000, 0 to 10,000, 0 to 100,000, 0 to 16, 0 to 256, 0 to 4,096, 0 to 40,960, 0 to 409,600 (selectable) Load resistance 0 Ω to 500 Ω (including the resistance of the connection cable) Output precision $\pm 1\%$

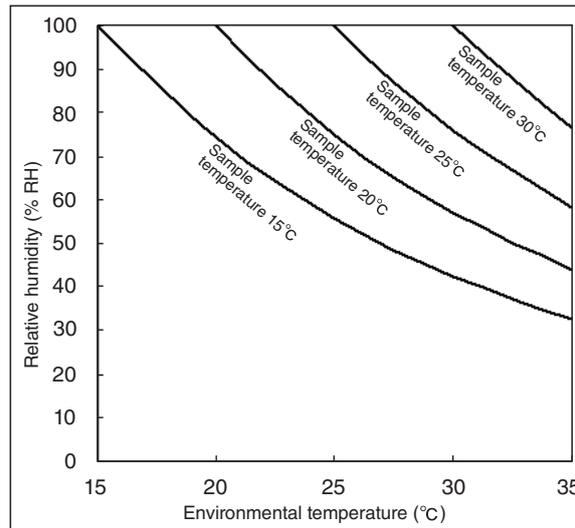
Internal printer	
Printout content	Measurement results, date and time, etc.
Printing method	Thermal printer, 48 mm print width
Printer paper	Thermal paper TP-08 or lint-free thermal paper TP-10
Memory functions	Measurement data or others are automatically saved to CF cards in text (TSV) form
PURGE	<p>Purge air port, one-touch type for dia. 6 mm tube</p> <p>In the cases listed below, the interior of the unit should be cleaned with purge gas to prevent adverse effects on the optical system and electrical circuitry</p> <p>If the purge air unit (factory option) is installed, the PURGE air port is not equipped</p> <ul style="list-style-type: none"> - If the cleanliness of usage environment is lower than classification of air cleanliness class 6 defined by ISO 14644-1 - If the temperature of the sample is lower than the environmental temperature, so that moisture condensation may occur on the flow cell - If there is the possibility that corrosive gases in the vicinity may intrude into the unit
Purge gas requirements	<p>Clean dry air: CDA</p> <ul style="list-style-type: none"> - Temperature +15°C to +35°C - Relative humidity not causing condensation - Flow rate 5 L/min to 10 L/min - Other: Under special conditions, nitrogen gas or other gases may also be used
Installation inclination angle	Max. 2° (range for normal operation of internal leak sensor)

Environmental conditions for operation

+15°C to +35°C, 80% RH max. (no condensation)

Must be in the range 30% to 80% RH when using the printer

The graph below plots environmental temperature and relative humidity for different sample temperatures. In the region to the top right of the respective curve, condensation on the flow cell may occur



Environmental conditions for storage

-10°C to +50°C, 90% RH max. (no condensation and no freezing in internal piping)

Power 100 V to 240 V AC, 50/60 Hz
Approx. 130 VA

Environmental Requirements

Operation Environments

Indoor Use Only

Altitude Up to 2000 m

Supply Voltage Fluctuations

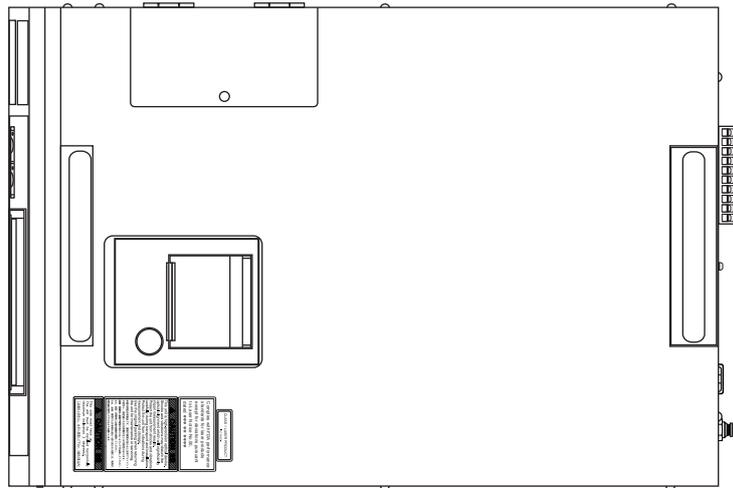
100 V to 240 V AC $\pm 10\%$

Overvoltage Category II

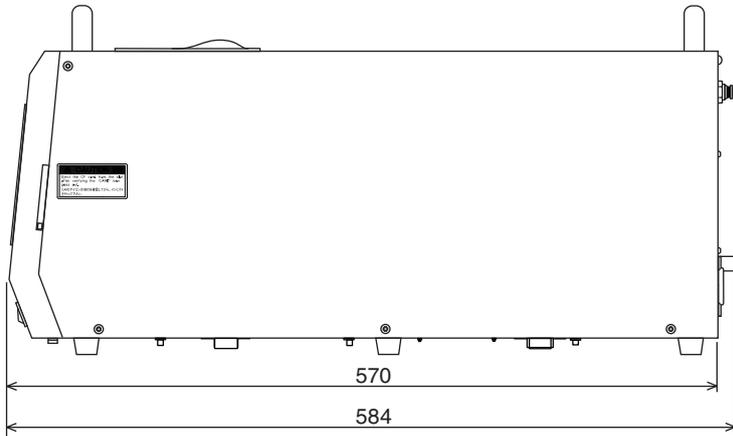
Pollution Degree 2

Protection Class I

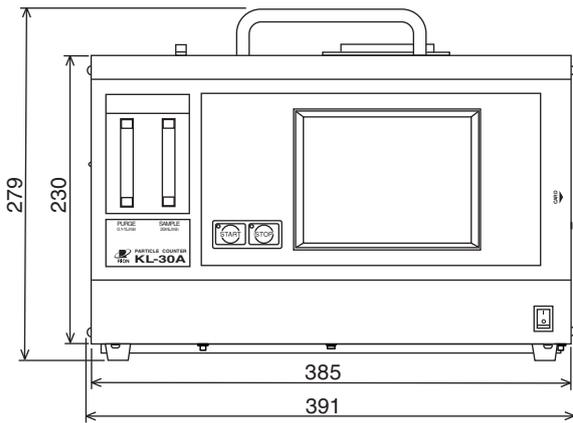
Dimensions	Approx. 279 mm (H) × 391 mm (W) × 584 mm (D) (maximum dimensions) Approx. 230 mm (H) × 385 mm (W) × 570 mm (D) (without protruding parts)
Weight	Approx. 24.8 kg
Supplied Accessories	Power cord 1 Thermal paper TP-08 2 CF dummy card 1 Instruction manual 1 Liquid-borne particle counter usage precautions 1 Instruction sheet for “Transport and Installation” 1 Inspection certificate 1
Factory option	Purge air unit (installed) KL-30-S21 (Uses a built in unit to send filtered air to the sensor in order to prevent contamination of the sensor section by particles in the atmosphere.) Purge air switching unit (installed) KL-30-S23
Options	Communication cable CC-61A/CC-63A (For connection to DTE with 9-pin male D-sub connector) Thermal paper (6 rolls set) TP-08 Lint-free thermal paper (6 rolls set) TP-10 Sampling tube 5 m (4 mm × 6 mm dia. both ends flared) KL-30-S16 Sampling tube 10 m (4 mm × 6 mm dia. both ends flared) KL-30-S15 Compact Flash card (formatted) MC-25CF2: 256 MB Compact Flash-PCMCIA adapter CFC-ADP03 RP monitor EVO (monitoring software) K0505
Consumables	Laser, Flow cell, Air packing for the case of the sensor unit, Purge air unit filter, Purge air unit pump
Calibration interval	One year



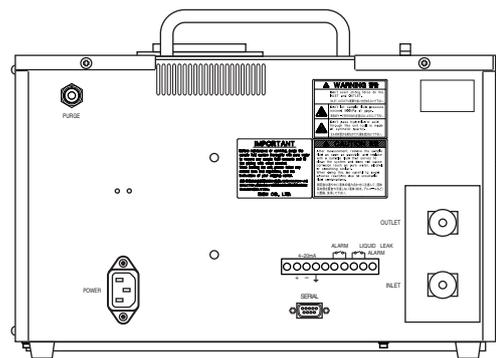
Top view



Right side view



Front view



Rear view

Unit: mm

Dimensional drawings

Specifications subject to change without notice