KONICA MINOLTA

NEW

Display Color Analyzer

CA-410

1

Broad measurement support for today's ever-evolving displays CA-310 successor with major improvements

The Standard in Measuring Color & Light

Giving Shape to Ideas

4 improvements for display

1 Accuracy guaranteed from ultra-low to high brightness

With more and more displays becoming HDR (High Dynamic Range), the pressure is mounting for color analyzers to improve their measurement performance at both high and low brightnesses.
By using new sensors and circuitry, the CA-410 realizes an accuracy-guaranteed brightness range 25x wider than its predecessor (compared to the CA-310 when using Normal Probe CA-P427).
This gives users the means to accurately measure and adjust the chromaticity and gamma characteristics of HDR displays across a wide brightness range from ultra-low to high.

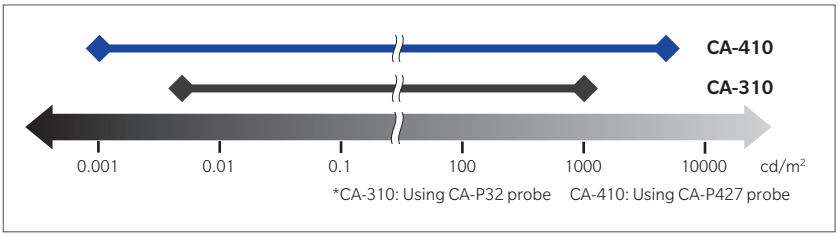
Earlier model display: 0.01 to 500 cd/m²

Display brightness measurement example

HDR display: 0.001 to more than 1,000 cd/m²

CA-310 (Using CA-P32 probe)
Accuracy guaranteed range for luminance:
0.005 to 1,000 cd/m²

CA-410 (Using CA-P427 probe)
Accuracy guaranteed range for luminance:
0.001 to 5,000 cd/m²

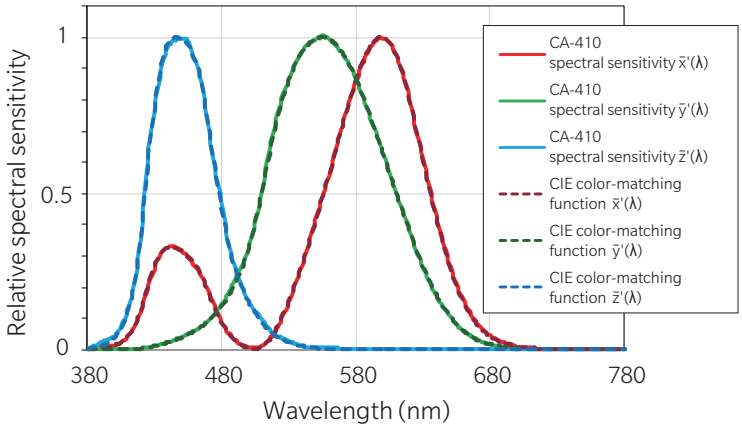


2 Improved chromaticity measurement accuracy

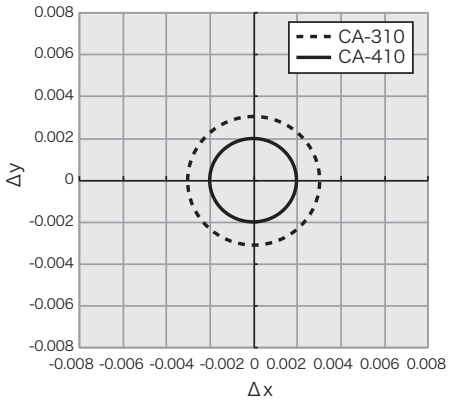
The greater intensity and wider color gamut of newer displays require color analyzers that can measure chromaticity to a higher degree of precision. Thanks to the enhanced accuracy of the XYZ filters, the CA-410 pushes its spectral sensitivity even closer to the color-matching functions of CIE 1931 (compared to the CA-310). Moreover, the accuracy of chromaticity measurements has been further improved by calibrating the analyzer with reference that replicates the optical spectrum of an LED light source for displays. As such, users can more accurately measure and adjust the chromaticity and white balance of displays that have a wide color gamut.

	Guaranteed accuracy (xy; when measuring standard light source)
CA-310	White: ±0.003 RGB: ±0.004
CA-410	White: ±0.002 RGB: ±0.003

CA-410 spectral sensitivity vs. CIE 1931 color-matching functions



• High Sensitivity Probe CA-VP410's spectral sensitivities are shown above as typical.



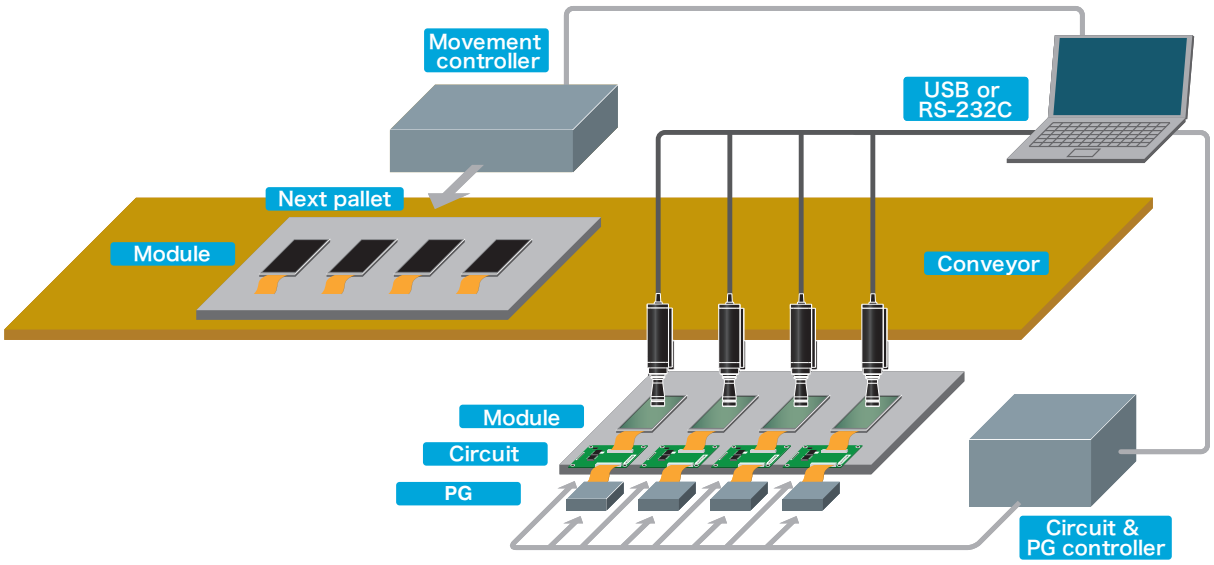
CA-310: Based on Konica Minolta's reference LCD
CA-410: Based on Konica Minolta's reference light source

measurement support

3 Optimized specifications for integration as a sensor

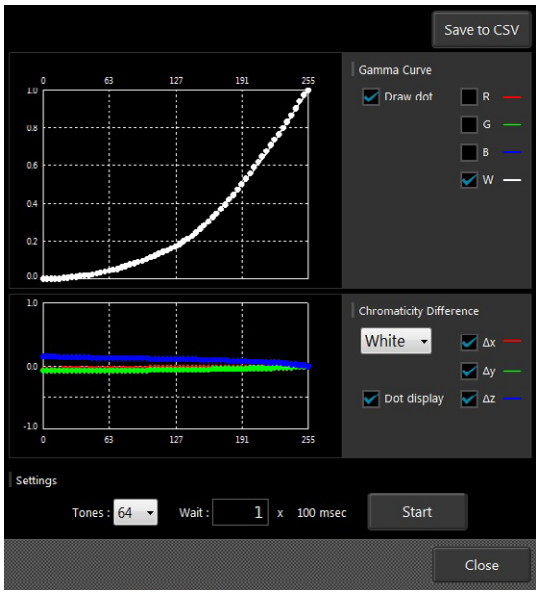
Since the launch of the first model, Konica Minolta's CA series display color analyzers have been incorporated by many customers into automatic measurement systems as color sensors due to their high accuracy.
The CA-410 is optimized for even better integration as a sensor with a motorized zero-point calibration shutter for automatic unmanned support and direct connection between probes and a computer for a more compact installation. At the same time, it maintains compatibility with its predecessor model by including the same basic commands in the CA-SDK2 as were available in the software development kit (SDK) of the previous model and locating the threaded probe installation holes in the same positions as on the predecessor model (excluding Mini Probe CA-MP410).

Example system configuration

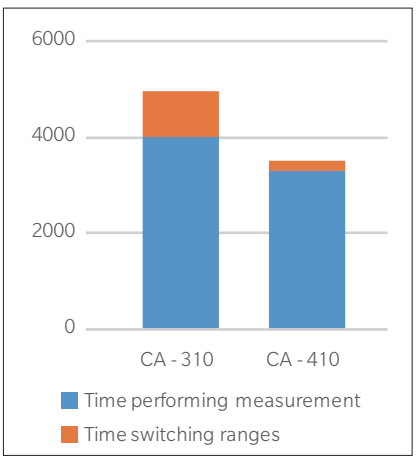


4 Wider measurement application support

Continuing to work with long-standing CA-series customers and respond to their needs, we developed the CA-410 to deliver higher reliability for a wider range of measurement targets and applications; when measuring gamma, for example, the CA-410 provides reduced between-range errors, shorter range switching time, and support for low-frequency-drive displays.



Measurement time simulation for gamma measurement



* Probe used: CA-310: CA-P32; CA-410: CA-P427
Measurement sync mode: NTSC
Measurement speed mode: CA-310: AUTO; CA-410: LTD. AUTO
For 64-step gamma measurement at 0.01 - 500 cd/m²
Not including wait time or display drive time.

Lineup of probes for diverse measurement needs

High Sensitivity Probes

① CA-VP410 (Measurement area: ø10 mm)
② CA-VP427 (Measurement area: ø27 mm)

- This model is suited for measuring high-end OLED displays across a wide brightness range from ultra-low to high at high speed.
  Use for: Measuring, inspecting and adjusting chromaticity and gamma characteristics of OLED displays for TVs and smartphones across a wide brightness range from ultra-low to high

Normal Probes

③ CA-P410 (Measurement area: ø10 mm)
④ CA-P427 (Measurement area: ø27 mm)

- This model is suited for measuring a wide range of displays, and is also compatible with the CA-310.

* Available also in high-brightness models capable of measurements up to 30,000 cd/m² (CA-P410H: ø10 mm measurement area; CA-P427H: ø27 mm measurement area)

Mini Probe

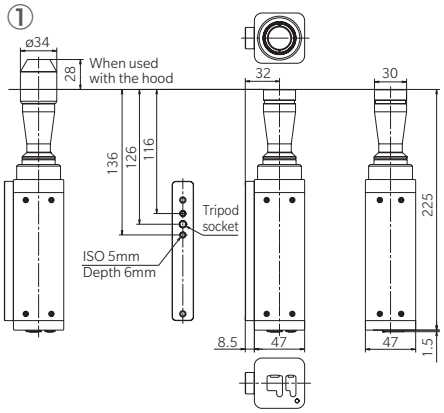
⑤ CA-MP410 (Measurement area: ø10 mm)

- This model is designed to render the same level of performance as the CA-310 but in an even smaller package.
  Use for: Applications that require small-sized probes or portability, i.e., color sensor for automatic measurement systems used in small display production processes, calibration of professional monitors and other applications that require space-saving design

* Available also in a high-brightness model capable of measurements up to 30,000 cd/m² (CA-MP410H: ø10 mm measurement area)

Probe dimensions (Units : mm)

①



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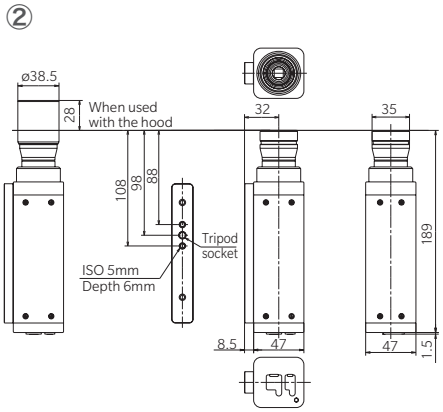

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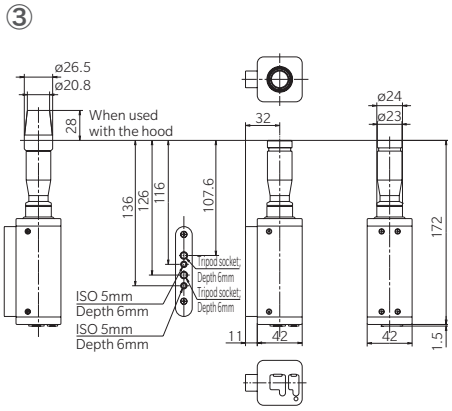

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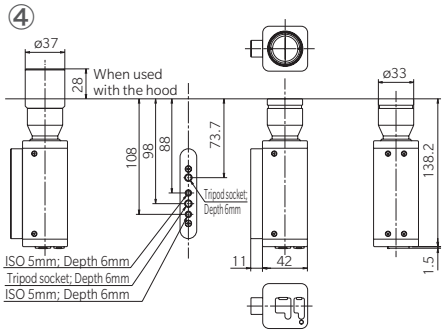
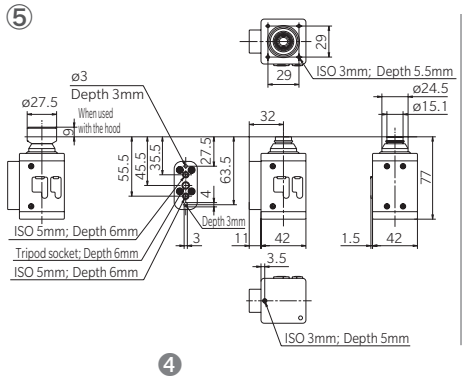


⑤

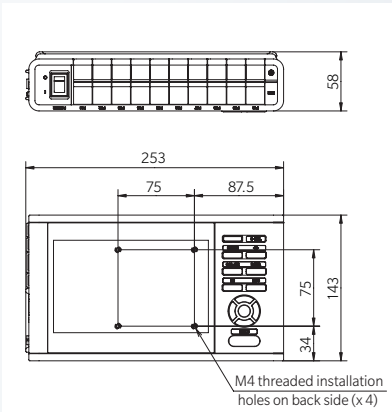


Easy-to-operate CA-DP40 data processor

CA-DP40

Data processor dimensions

(Units : mm)



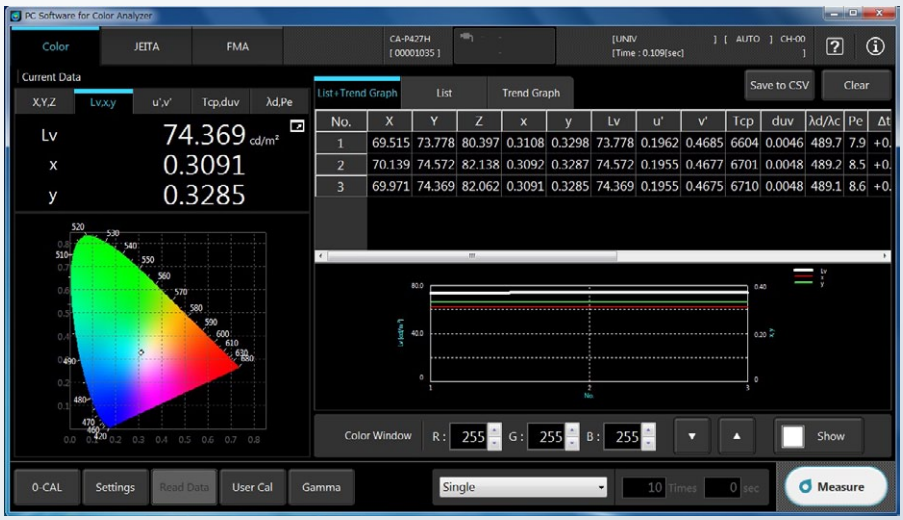
Data processor

Because of the fast pace at which products and technologies evolve, speed is of the essence when it comes to R & D activities in the display industry.
That is why the CA-DP40 data processor takes the "easy-to-operate" feature of the CA-310 to new heights.
With automatic zero-point calibration that allows measurement to start immediately after the power is turned ON, an easy-to-view 7-inch color display multilingual support and a lithium ion battery (sold separately) that makes the unit portable, the CA-DP40 obtains measurement data quickly and reliably, making it convenient for on-the-spot for R & D applications.
Moreover, the CA-DP40 can connect to a maximum of 10 probes, which gives users the support they need for multipoint measurements.

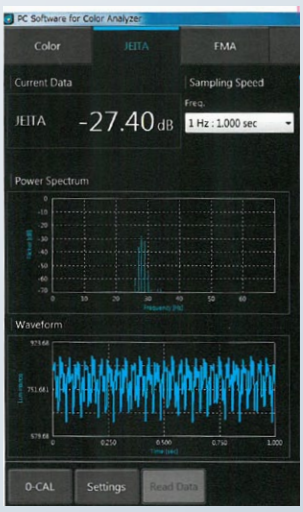
Carrying Case CA-A01 (Sold separately)

Software for Color Analyzer included

PC Software for Color Analyzer CA-S40 and Software Development Kit CA-SDK2 give users even wider versatility in terms of applications and set up, by making it possible for probes to be directly connected to the computer measurements. Both CA-S40 and CA-SDK2 come standard with all CA-410 probes and support Windows® 7/10 as well as macOS® .



Chromaticity measurement



JEITA flicker measurement

Main Specifications of CA-410 Probes

* Regarding specifications of CA-P410H and CA-P427H Probes for high luminance, please contact the nearest Konica Minolta's sales representative.

				High Sensitivity Probe		Normal Probe
				CA-VP410	CA-VP427	CA-P410
Measurement area				ø10 mm	ø27 mm	ø10 mm
Acceptance angle				±8.5°	±2.5°	±5°
Accuracy guaranteed measurement distance				30±5 mm	30±10 mm	30±5 mm
Display range	Luminance			0.0001 to 3,000 cd/m²	0.0001 to 3,000 cd/m²	0.0001 to 5,000 cd/m²
	Chromaticity			Displayed in 4 digits	Displayed in 4 digits	Displayed in 4 digits
Luminance	Accuracy guaranteed range			0.001 to 3,000 cd/m²	0.001 to 3,000 cd/m²	0.01 to 5,000 cd/m²
	Accuracy (for white)*1, *3		> 0.001 cd/m²	±9%	±9%	---
			> 0.01 cd/m²	±2.5%	±2%	±2.5%
			> 0.1 cd/m²	±2%	±1.5%	±2%
			> 1 cd/m²	±2%	±1.5%	±2%
			> 10 cd/m²	±1.5%	±1.5%	±1.5%
			> 100 cd/m²	±1.5%	±1.5%	±1.5%
	Repeatability (2σ)*1	AUTO	> 0.001 cd/m²	7%	10%	---
			> 0.01 cd/m²	1%	1%	2%
			> 0.1 cd/m²	0.25%	0.25%	0.60%
			> 1 cd/m²	0.10%	0.10%	0.20%
			> 10 cd/m²	0.10%	0.10%	0.10%
			> 100 cd/m²	0.10%	0.10%	0.10%
Chromaticity	Accuracy guaranteed luminance range			0.01 to 3,000 cd/m²	0.01 to 3,000 cd/m²	0.01 to 5,000 cd/m²
	Accuracy (for white) *1, *3		> 0.01 cd/m²	±0.003	±0.003	±0.006
			> 0.1 cd/m²	±0.002	±0.002	±0.002
			> 1 cd/m²	±0.002	±0.002	±0.002
			> 10 cd/m²	±0.002	±0.002	±0.002
			> 100 cd/m²	±0.002	±0.002	±0.002
		At 100 cd/m² (for monochrome) *2	100 cd/m²	±0.003	±0.003	±0.003
	Repeatability (2σ)*1	AUTO	> 0.01 cd/m²	0.0020	0.0030	0.0070
			> 0.1 cd/m²	0.0008	0.0008	0.0020
			> 1 cd/m²	0.0003	0.0003	0.0008
			> 10 cd/m²	0.0002	0.0002	0.0005
			> 100 cd/m²	0.0002	0.0002	0.0003
Flicker (Contrast)		Measurement luminance range		---	---	15 cd/m² or higher
		Accuracy	30 Hz, AC/DC 10% sine wave	---	---	±0.4%
			60 Hz, AC/DC 10% sine wave	---	---	±0.7%
		Repeatability (2σ)	20-65 Hz, AC/DC 10% sine wave	---	---	0.3%
Flicker (JEITA)		Measurement luminance range		---	---	15 cd/m² or higher
		Accuracy	30 Hz, AC/DC 4% sine wave	---	---	±0.35dB
			30 Hz, AC/DC 1.2% sine wave	---	---	±0.35dB
		Repeatability (2σ)	30 Hz, AC/DC 4% sine wave	---	---	0.1dB
			30 Hz, AC/DC 1.2% sine wave	---	---	0.3dB
Accuracy guaranteed measurement speed *4	L_vxy	AUTO	> From minimum luminance cd/m²	1 time/sec	1 time/sec	1 time/sec
			> 0.15 cd/m²	5 times/sec	5 times/sec	5 times/sec
			> 2 cd/m²	20 times/sec	20 times/sec	20 times/sec
	Flicker (Contrast)			---	---	20 times/sec
	Flicker (JEITA)			---	---	0.5 times/sec (at 1 Hz pitch) 2.5 times/sec (at 10 Hz pitch)
Measurement synchronization mode				NTSC, PAL, EXT, UNIV, INT, MANU (4 ms to 4 s)	NTSC, PAL, EXT, UNIV, INT, MANU (4 ms to 4 s)	NTSC, PAL, EXT, UNIV, INT, MANU (4 ms to 4 s)
Measurement speed mode				AUTO, LTD.AUTO, SLOW, FAST	AUTO, LTD.AUTO, SLOW, FAST	AUTO, LTD.AUTO, SLOW, FAST
Supported range to be measured (frequency)				0.5 to 240 Hz (luminance and chromaticity)	0.5 to 240 Hz (luminance and chromaticity)	0.5 to 240 Hz (luminance and chromaticity) 0.5 to 130 Hz (flicker)
User calibration memory channel				99 channels	99 channels	99 channels
Interface	Communication			USB 2.0, RS-232C	USB 2.0, RS-232C	USB 2.0, RS-232C
	Trigger			In and Out [5 V]	In and Out [5 V]	In and Out [5 V]
Size (mm)				47 x 47 x 226.5	47 x 47 x 190.5	42 x 42 x 173.5
Weight				570 g (including mount)	510 g (including mount)	280 g (including mount)
Power supply				DC 5 V (input from USB bus power line or RS communication connector)	DC 5 V (input from USB bus power line or RS communication connector)	DC 5 V (input from USB bus power line or RS communication connector)
Operation temperature/humidity range*5				10 to 35°C, relative humidity 85% or less with no condensation		
Storage temperature/humidity range				0 to 45°C, relative humidity 85% or less (at 35°C)with no condensation		
Accessories	Standard			PC Software for Color Analyzer Ver.1.0 CA-S40, SDK for Color Analyzer CA-SDK2, USB Cable for Probe-PC (2 m) IF-A28, Hood		
	Optional			Conversion Cable IF-A29, BNC Conversion Cable IF-A35		

• Measured with Konica Minolta's specified PC and probe connected directly, using the supplied measurement software.

*1: Measured under Konica Minolta's standard light source (6,500K).

*2: Luminance for monochrome is measured when reading of luminance for white is 100 cd/m².

*3: Temperature 23°C/±2°C, relative humidity 40%±10%

*4: In NTSC synchronization mode using USB with one probe

*5: Reading variation within range (compared to reference reading at 23°C, 40% RH): Luminance: ±2% for white; Chromaticity (at 100 cd/m²): ±0.002 for white, ±0.003 for monochrome

	Mini Probe
CA-P427	CA-MP410
ø27 mm	ø10 mm
±2.5°	±5°
30±10 mm	10±5 mm
0.0001 to 5,000 cd/m²	0.0001 to 5,000 cd/m²
Displayed in 4 digits	Displayed in 4 digits
0.001 to 5,000 cd/m²	0.01 to 5,000 cd/m²
±9%	---
±2%	±2.5%
±1.5%	±2%
±1.5%	±2%
±1.5%	±1.5%
±1.5%	±1.5%
10%	---
1%	2.40%
0.40%	0.70%
0.10%	0.25%
0.10%	0.12%
0.10%	0.10%
0.01 to 5,000 cd/m²	0.01 to 5,000 cd/m²
±0.003	±0.006
±0.002	±0.002
±0.002	±0.002
±0.002	±0.002
±0.002	±0.002
±0.003	±0.003
0.0035	0.0085
0.0015	0.0025
0.0004	0.0010
0.0003	0.0006
0.0002	0.0004
5 cd/m² or higher	15 cd/m² or higher
±0.4%	±0.4%
±0.7%	±0.7%
0.3%	0.3%
5 cd/m² or higher	15 cd/m² or higher
±0.35dB	±0.35dB
±0.35dB	±0.35dB
0.1dB	0.1dB
0.3dB	0.3dB
1 time/sec	1 time/sec
5 times/sec	5 times/sec
20 times/sec	20 times/sec
20 times/sec	20 times/sec
0.5 times/sec (at 1 Hz pitch) 2.5 times/sec (at 10 Hz pitch)	0.5 times/sec (at 1 Hz pitch) 2.5 times/sec (at 10 Hz pitch)
NTSC, PAL, EXT, UNIV, INT, MANU (4 ms to 4 s)	NTSC, PAL, EXT, UNIV, INT, MANU (4 ms to 4 s)
AUTO, LTD.AUTO, SLOW, FAST	AUTO, LTD.AUTO, SLOW, FAST
0.5 to 240 Hz (luminance and chromaticity) 0.5 to 130 Hz (flicker)	0.5 to 240 Hz (luminance and chromaticity) 0.5 to 130 Hz (flicker)
99 channels	99 channels
USB 2.0, RS-232C	USB 2.0, RS-232C
In and Out [5 V]	In and Out [5 V]
42 x 42 x 139.7	42 x 42 x 77
270 g (including mount)	200 g (including mount)
DC 5 V (input from USB bus power line or RS communication connector)	DC 5 V (input from USB bus power line or RS communication connector)

for Probe, Lens Cap for Probe

Main Specifications of Data Processor CA-DP40

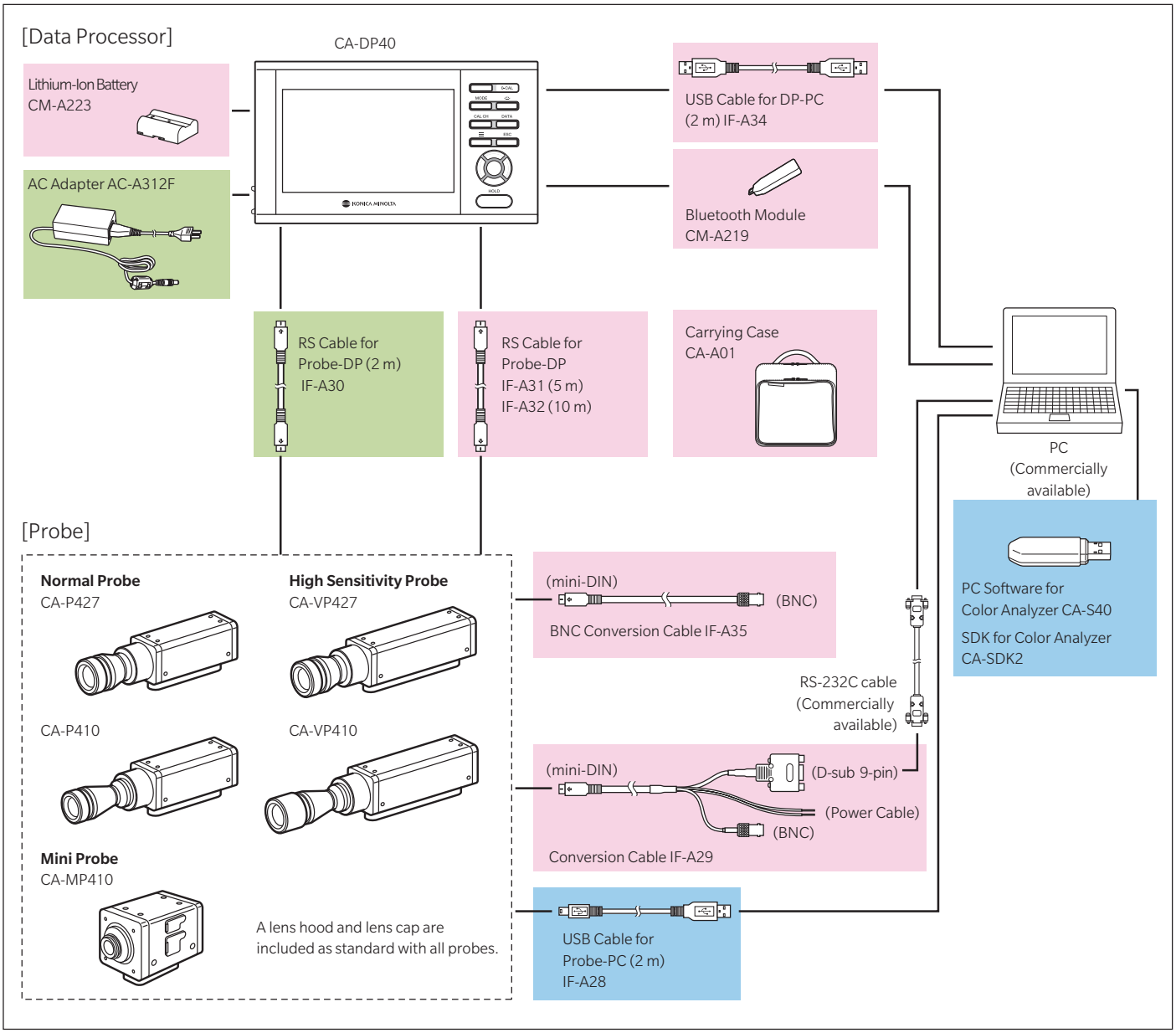
Display range	Luminance		0.0001 to 30,000 cd/m²
	Chromaticity		Displayed in 4 digits
	Flicker	(Contrast)	0.00 to 999.99 %
		(JEITA)	To 2 decimal places
Display			7-inch color LCD WVGA
Display items			L_v x y (ΔL_v Δx Δy) L_v u' v' (ΔL_v Δu' Δv') L_v Tcp duv (ΔL_v ΔTcp duv) X Y Z (ΔX ΔY ΔZ) L_v λd Pe (ΔL_v $\Delta\lambda$d ΔPe) Flicker (Contrast) Flicker (JEITA)
Measurement data storage channels			100 CH
Data logging function			Available
Display languages			English, Simplified Chinese, Traditional Chinese, Korean, Japanese
Interface	For computer, etc.		USB 2.0 RS-232C Ethernet *[Optional] Bluetooth® (module required)
	For probes		Mini-DIN 8-pin cable (for RS communication) USB (for USB communication)
	Sync signal input		BNC connector (with trigger input)
Multi probe connection			10 probes (maximum)
Operation temperature/ humidity range			10 to 35°C, relative humidity 85% or less with no condensation
Storage temperature/ humidity range			0 to 45°C, relative humidity 85% or less (at 35°C)with no condensation
Power			AC Adapter *[Optional] Lithium-Ion Battery (removable)
Battery life			3 hours (when one probe is connected)
Size			253 (W) x 58 (H) x 143 (D) mm
Weight			1.6 kg
Accessories	Standard		AC Cable RS Cable for Probe-DP (2 m) IF-A30 AC Adapter AC-A312F
	Optional		USB Cable for DP-PC (2 m) IF-A34 RS Cable for Probe-DP IF-A31 (5 m), IF-A32 (10 m) Lithium-Ion Battery CM-A223 Bluetooth Module CM-A219 Carrying Case CA-A01

Main Specifications of PC Software CA-S40

<System requirements>	
OS	Windows® 7 Professional 32-bit Windows® 7 Professional 64-bit Windows® 10 Pro 32-bit Windows® 10 Pro 64-bit macOS® Sierra •The hardware of the computer system to be used must meet or exceed the greater of the recommended system requirements for the compatible OS being used or the following specifications.
CPU	Intel® Core™ i series or equivalent
Memory	4 GB or more
Hard disk drive	Needs free space of at least 100 MB, and at least 50 MB on system drive where OS is installed
Display	Capable of at least 1,280 × 768 dots/ High color, 16-bit
Others	USB port for installing from flash drive USB port (2.0 or higher) for connecting measuring instruments
<Controllable instruments>	
CA-410 Data Processor	CA-DP40
CA-410 Probes	CA-P427 / P427H / P410 / P410H / MP410 / MP410H / VP427 / VP410
<Languages>	
Display language	English

System Diagram

Data Processor standard accessory | Probe standard accessory | Optional accessory



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- Bluetooth® is a registered trademark of Bluetooth SIG, Inc. and is used under license agreement.
- Screens shown are for illustration purposes only.
- The specifications and appearance shown herein are subject to change without notice.

SAFETY PRECAUTIONS

For correct use and for your safety, be sure to read the instruction manual before using the instrument.

- Always connect the instrument to the specified power supply voltage. Improper connection may cause a fire or electric shock.

Certificate No : LRQ 0960094/A
Registration Date : March 3, 1995

Certificate No : JQA-E-80027
Registration Date : March 12, 1997

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