



KONICA MINOLTA

NEW

Display Color Analyzer

CA-410

1

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



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



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

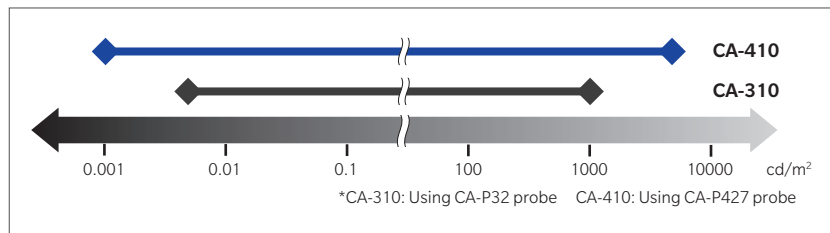
Display brightness measurement example



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



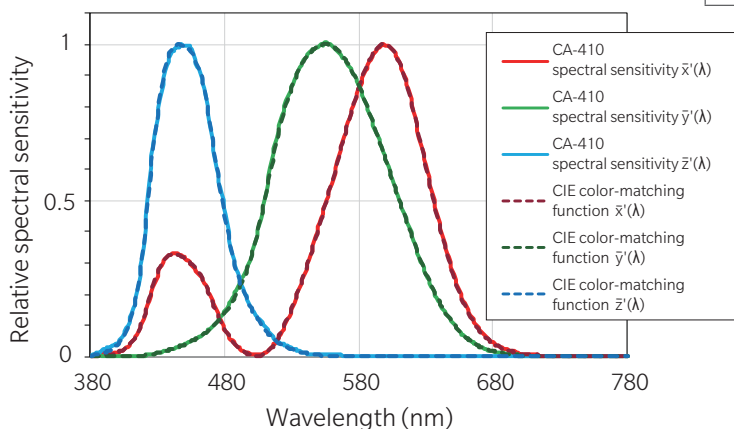
CA-410 (Using CA-P427 probe)
Accuracy guaranteed range for luminance:
0.001 to 5,000 cd/m²



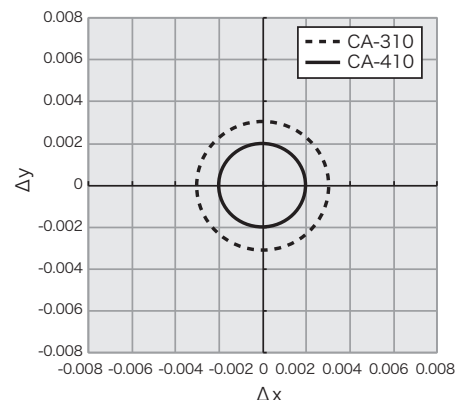
2 Improved chromaticity measurement accuracy

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.

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



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



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

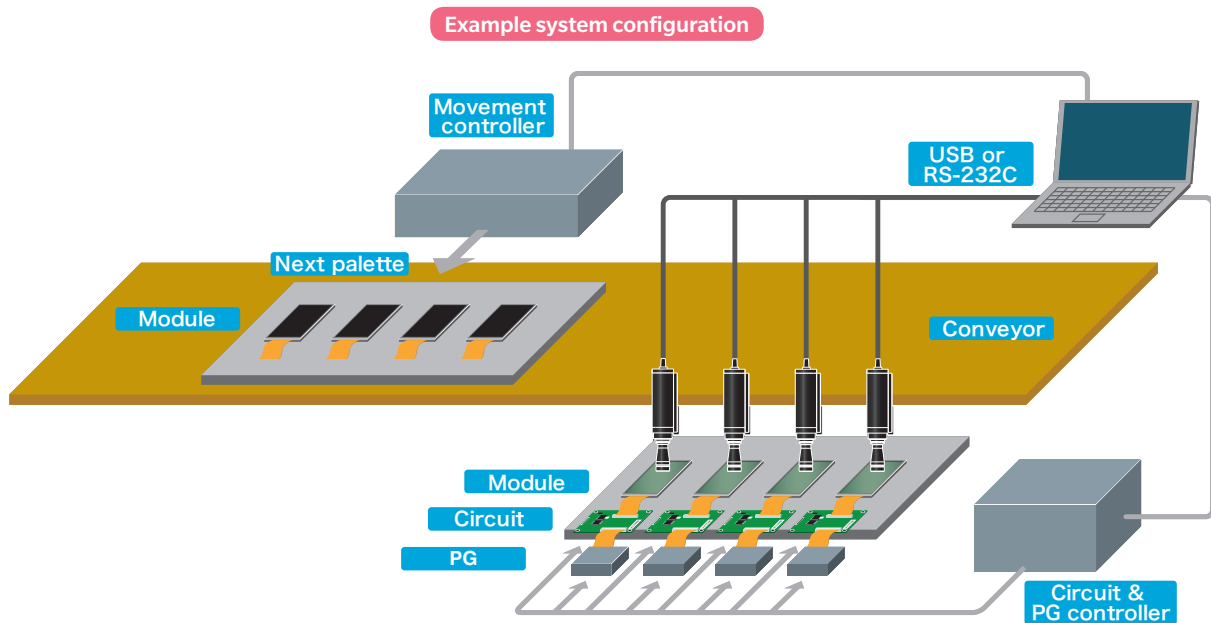
CA-310: Based on Konica Minolta's reference LCD
CA-410: Based on Konica Minolta's reference light source

measurement support

3 Optimized specifications for integration as a sensor

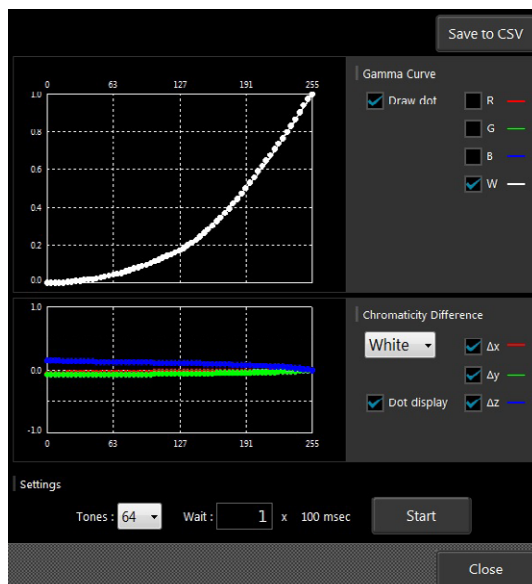
Since the launch of the first model, Konica Minolta's CA series display color analyzers have been incorporated by many customers into automatic measurement systems as color sensors due to their high accuracy.

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).

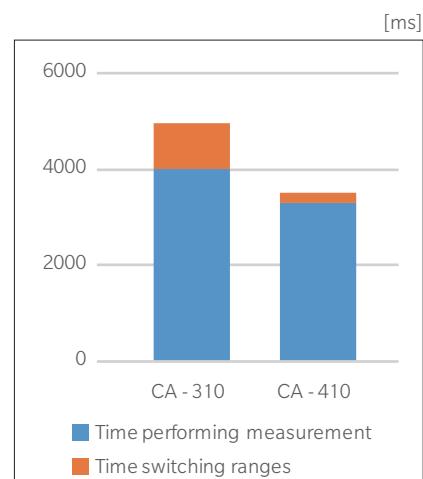


4 Wider measurement application support

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: $\varnothing 10$ mm)
- ② CA-VP427 (Measurement area: $\varnothing 27$ 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

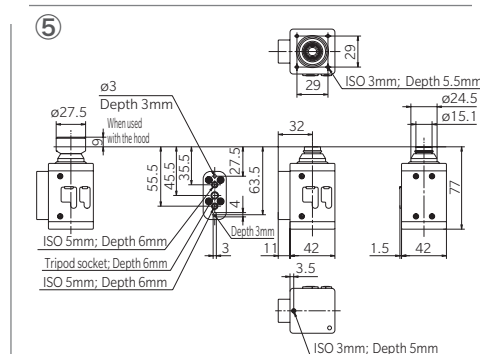
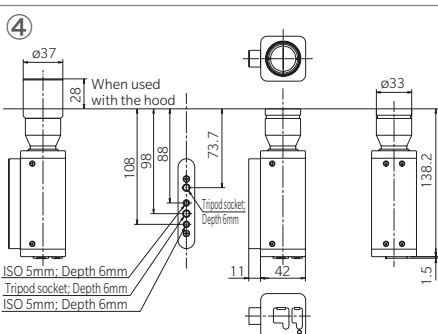
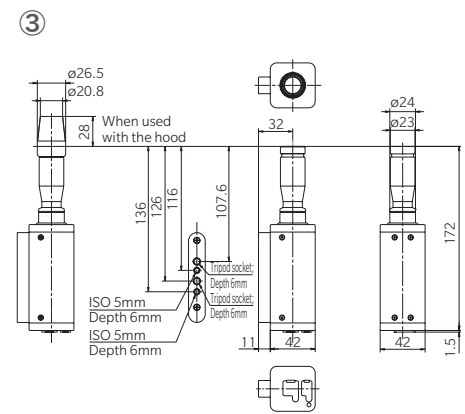
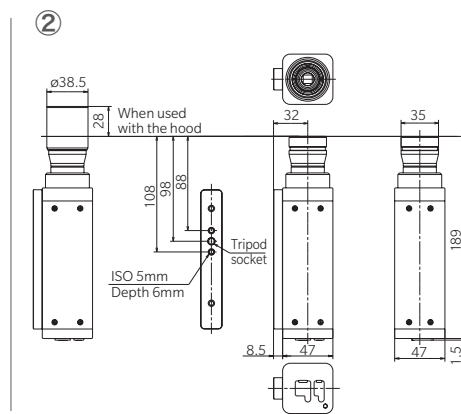
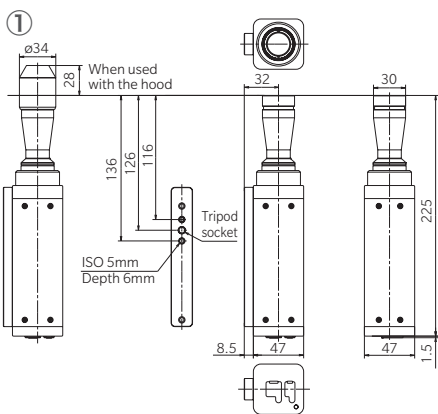
Normal Probes

- ③ CA-P410 (Measurement area: $\varnothing 10$ mm)
- ④ CA-P427 (Measurement area: $\varnothing 27$ 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: $\varnothing 10$ mm measurement area; CA-P427H: $\varnothing 27$ mm measurement area)

Mini Probe

- ⑤ CA-MP410 (Measurement area: $\varnothing 10$ 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: $\varnothing 10$ mm measurement area)

Probe dimensions (Units : mm)

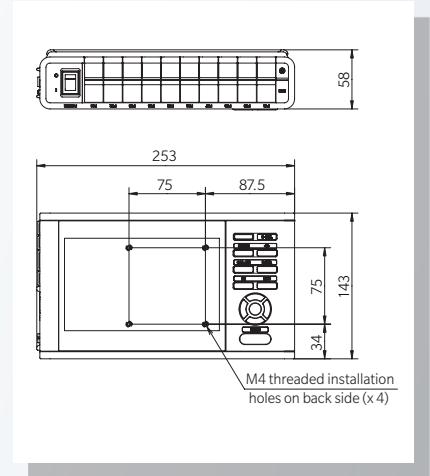


Easy-to-operate CA-DP40 data processor



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.

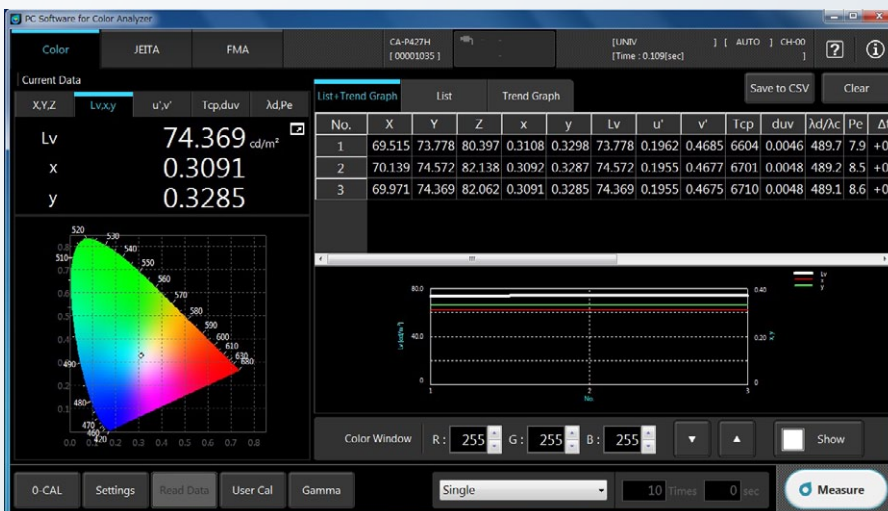
Moreover, the CA-DP40 can connect to a maximum of 10 probes, which gives users the support they need for multipoint measurements.



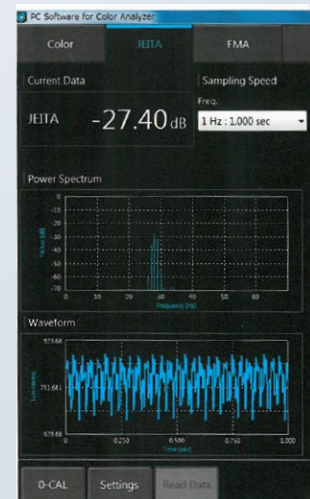
Carrying Case CA-A01 (Sold separately)

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/m ²	0.0001 to 3,000 cd/m ²	0.0001 to 5,000 cd/m ²	
	Chromaticity	Displayed in 4 digits	Displayed in 4 digits	Displayed in 4 digits	
Luminance	Accuracy guaranteed range		0.001 to 3,000 cd/m ²	0.001 to 3,000 cd/m ²	0.01 to 5,000 cd/m ²
	Accuracy (for white) ^{*1,*3}	> 0.001 cd/m ²	±9%	±9%	---
		> 0.01 cd/m ²	±2.5%	±2%	±2.5%
		> 0.1 cd/m ²	±2%	±1.5%	±2%
		> 1 cd/m ²	±2%	±1.5%	±2%
		> 10 cd/m ²	±1.5%	±1.5%	±1.5%
	Repeatability (2σ) ^{*1}	AUTO			
		> 0.001 cd/m ²	7%	10%	---
		> 0.01 cd/m ²	1%	1%	2%
		> 0.1 cd/m ²	0.25%	0.25%	0.60%
> 1 cd/m ²		0.10%	0.10%	0.20%	
> 10 cd/m ²	0.10%	0.10%	0.10%		
> 100 cd/m ²	0.10%	0.10%	0.10%		
Chromaticity	Accuracy guaranteed luminance range		0.01 to 3,000 cd/m ²	0.01 to 3,000 cd/m ²	0.01 to 5,000 cd/m ²
	Accuracy (for white) ^{*1,*3}	> 0.01 cd/m ²	±0.003	±0.003	±0.006
		> 0.1 cd/m ²	±0.002	±0.002	±0.002
		> 1 cd/m ²	±0.002	±0.002	±0.002
		> 10 cd/m ²	±0.002	±0.002	±0.002
		> 100 cd/m ²	±0.002	±0.002	±0.002
	Repeatability (2σ) ^{*1}	AUTO			
		At 100 cd/m ² (for monochrome) ^{*2}	100 cd/m ²	±0.003	±0.003
		> 0.01 cd/m ²	0.0020	0.0030	0.0070
		> 0.1 cd/m ²	0.0008	0.0008	0.0020
> 1 cd/m ²		0.0003	0.0003	0.0008	
> 10 cd/m ²	0.0002	0.0002	0.0005		
> 100 cd/m ²	0.0002	0.0002	0.0003		
Flicker (Contrast)	Measurement luminance range		---	---	15 cd/m ² 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/m ² 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 _{x,y}	AUTO			
		> From minimum luminance cd/m ²	1 time/sec	1 time/sec	1 time/sec
		> 0.15 cd/m ²	5 times/sec	5 times/sec	5 times/sec
	Flicker (Contrast)	> 2 cd/m ²	20 times/sec	20 times/sec	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

CA-P427	Mini Probe CA-MP410
	
ø27 mm	ø10 mm
±2.5°	±5°
30±10 mm	10±5 mm
0.0001 to 5,000 cd/m ²	0.0001 to 5,000 cd/m ²
Displayed in 4 digits	Displayed in 4 digits
0.001 to 5,000 cd/m ²	0.01 to 5,000 cd/m ²
±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/m ²	0.01 to 5,000 cd/m ²
±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/m ² or higher	15 cd/m ² or higher
±0.4%	±0.4%
±0.7%	±0.7%
0.3%	0.3%
5 cd/m ² or higher	15 cd/m ² 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)	0.5 times/sec (at 1 Hz pitch)
2.5 times/sec (at 10 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 240 Hz (luminance and chromaticity)
0.5 to 130 Hz (flicker)	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

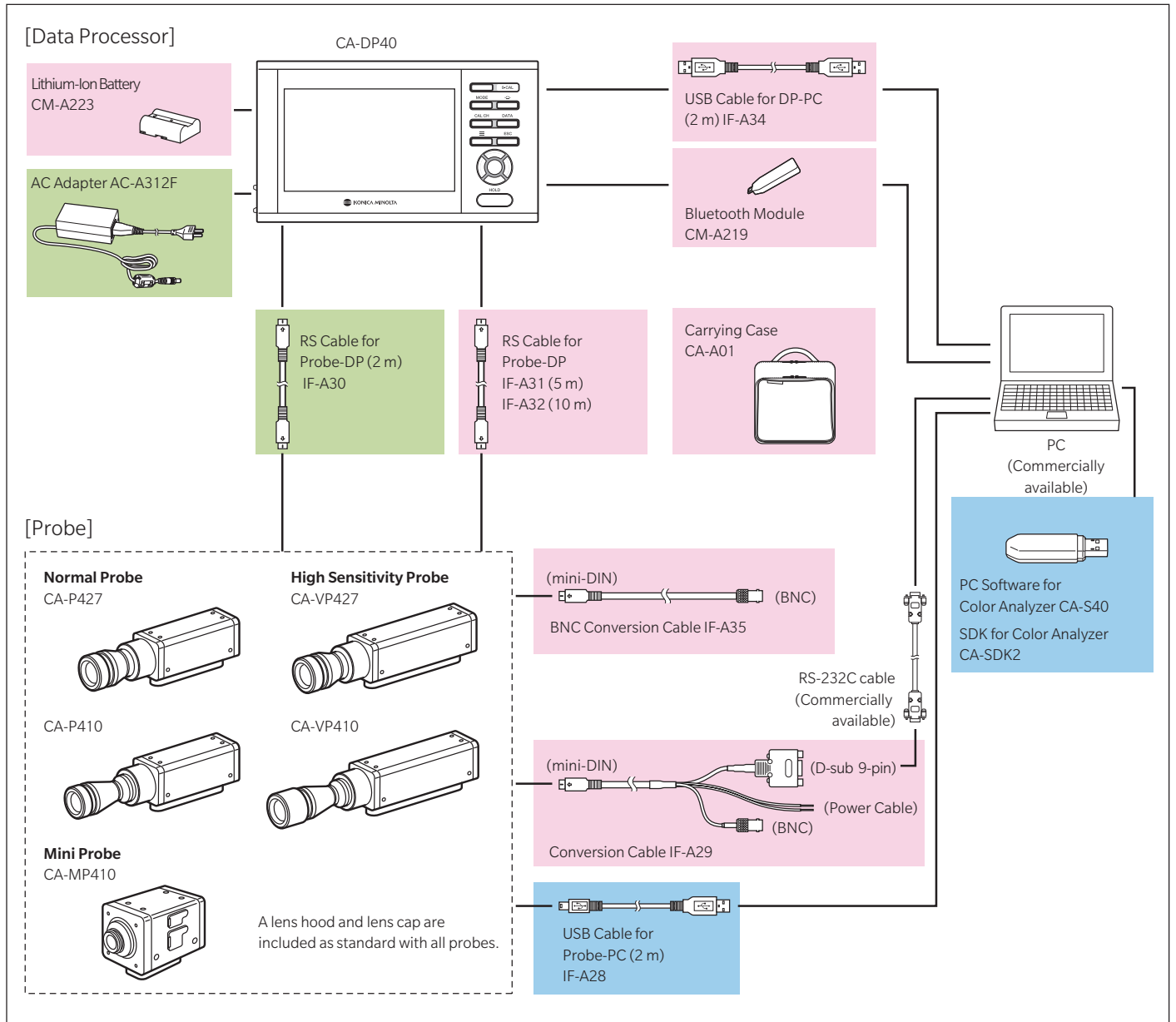
		
Display range	Luminance	0.0001 to 30,000 cd/m ²
	Chromaticity	Displayed in 4 digits
	Flicker (Contrast) (JEITA)	0.00 to 999.99 % To 2 decimal places
Display	7-inch color LCD WVGA	
Display items	$L_v \times Y$ ($\Delta L_v \Delta X \Delta Y$) $L_v u' v'$ ($\Delta L_v \Delta u' \Delta v'$) $L_v T_{cp} duv$ ($\Delta L_v \Delta T_{cp} duv$) $X Y Z$ ($\Delta X \Delta Y \Delta Z$) $L_v \lambda d Pe$ ($\Delta L_v \Delta \lambda d \Delta Pe$) 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



- Windows® is a trademark or registered trademark of Microsoft Corporation in the USA and other countries.
- macOS® Sierra is a registered trademark of Apple Inc. in the USA and other countries.
- Intel® Core is a trademark or registered trademark of Intel Corporation in the USA and other countries.
- Other company names and product names used herein are trademarks or registered trademarks of their respective companies.
- 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 : LRO 0960094/A
Registration Date : March 3, 1995



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

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UK Office
Italian Office
Swiss Office
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Polish Office
Turkish Office
SE Sales Division
Beijing Office
Guangzhou Office
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