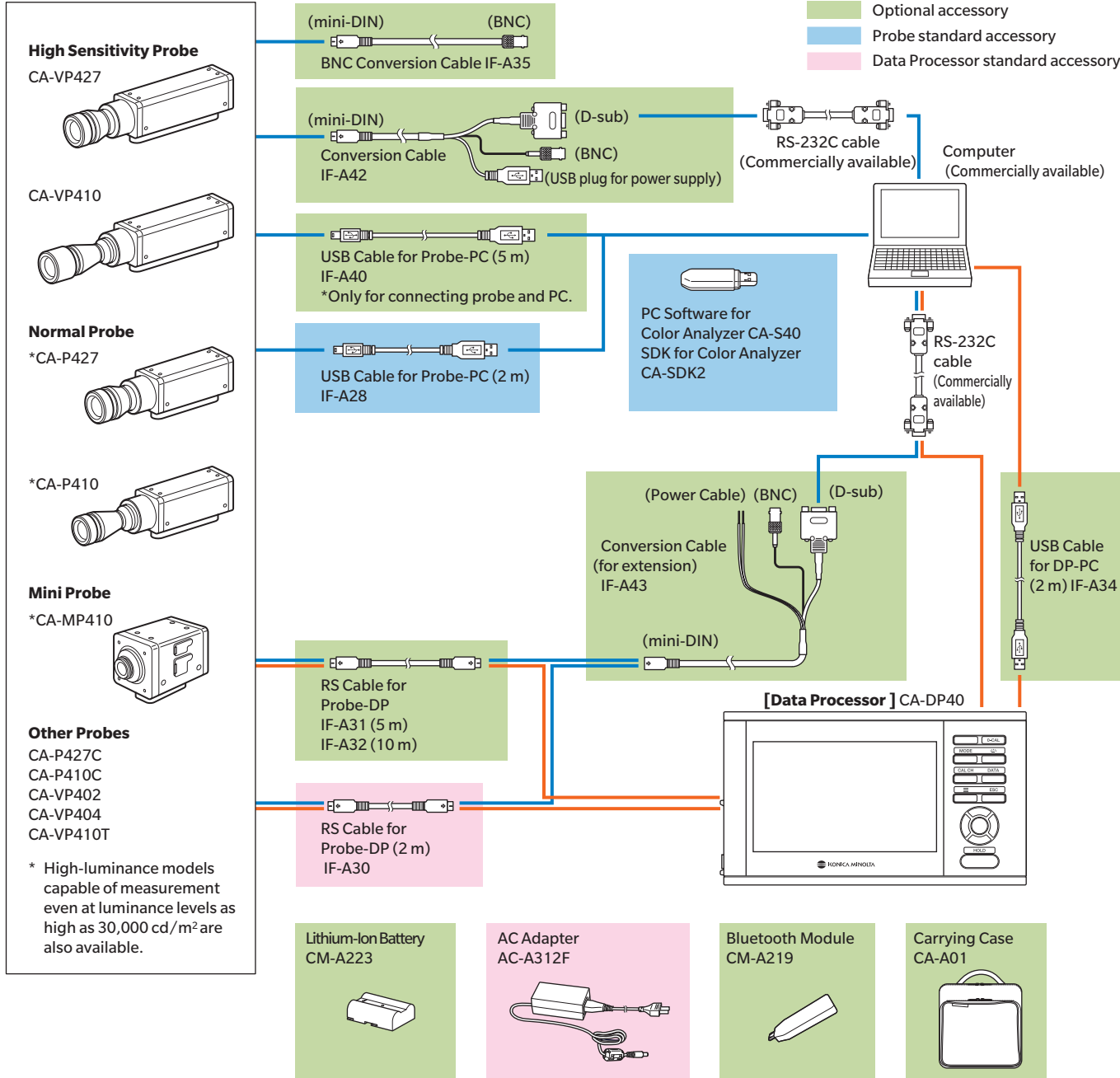


System Diagram
[Probe]



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• macOS® is a registered trademark of Apple Inc. in the USA and other countries.
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• 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.

ISO 9001
JQA-QMA15888
Design, development, manufacture/
manufacturing management, calibration, and
service of measuring instruments

ISO 14001
JQA-E-80027
Design, development,
manufacture, service and sales
of measuring instruments

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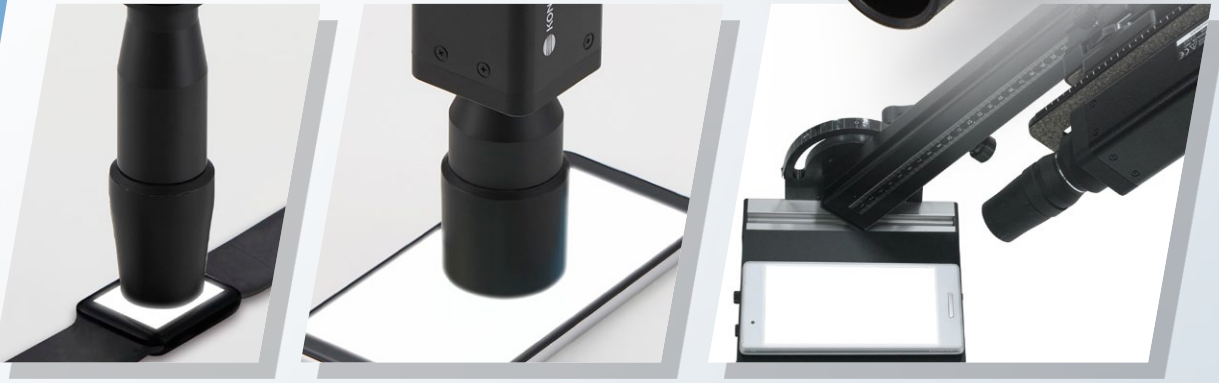
<https://konicaminolta.com/instruments/network>

9242-AA1J-41 CADPK



Display Color Analyzer
CA-410

High-speed, high-accuracy color analyzer that meets the measurement needs of today's ever-evolving displays



The Standard in Measuring Color & Light

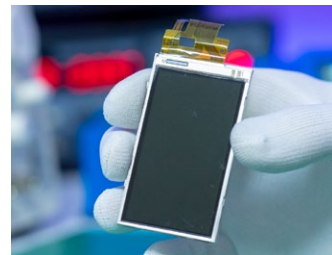
Giving Shape to Ideas

4 key features for measuring the latest displays

1 Accuracy guaranteed from low to high luminance

High-performance sensors and circuitry design combine to realize a wide accuracy-guaranteed luminance range that stretches from super-low to high emissions. This enables the CA-410 to meet the requirements for accurate measurement and tuning of chromaticity and gamma characteristics of OLED and HDR displays which require super-low luminance measurements. Moreover, the CA-410 can be paired with a lineup of high-luminance probes for measuring backlit modules equipped with new technologies like Mini-LEDs.

Measurable luminance range examples



OLED for mobile device: 0.001 - 500 cd/m²

Ø27 CA-VP427 high-sensitivity probe

Accuracy-guaranteed luminance measurement range
0.001 - 3,000 cd/m²



HDR display 0.01 - 2,000 cd/m²

Ø27 CA-P427 probe

Accuracy-guaranteed luminance measurement range
0.001 - 5,000 cd/m²



Backlight module: 20,000 cd/m²

Ø27 CA-P427H high-luminance probe

Accuracy-guaranteed luminance measurement range
0.01 - 30,000 cd/m²

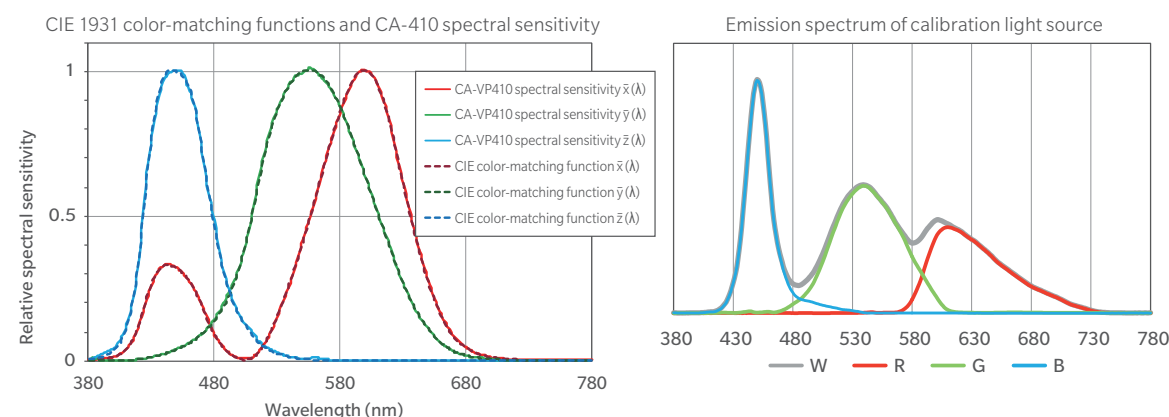
Main probe lineup



2 High accuracy comparable to spectroradiometers in chromaticity measurements

The CA-410 features highly accurate XYZ filters that push its spectral sensitivity close to the CIE 1931 color-matching functions. Moreover, because the calibration light source replicates the emission spectrum of LED displays, tristimulus chromaticity measurements can yield a high level of accuracy comparable to a spectroradiometer. This allows users to more accurately measure and tune the chromaticity and white balance of displays that have a wide color gamut.

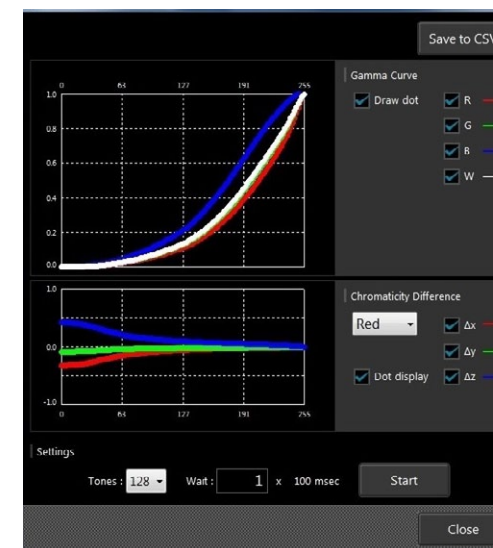
Spectral sensitivity of the CA-410 and calibration light source emission spectrum



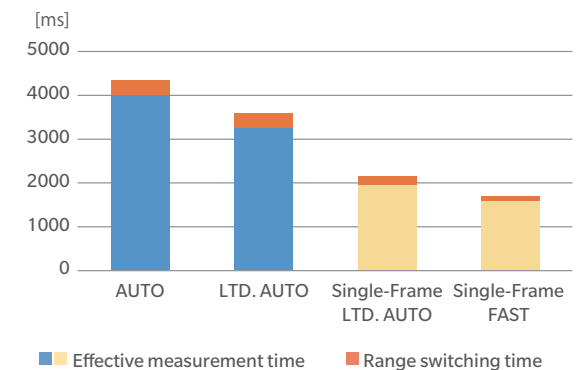
* Example using the CA-VP410 high-sensitivity probe.

3 High-speed measurements for enhanced productivity

Owing to high sensor sensitivity and high-speed computing, measurements with the CA-410 are fast in a way that shortens the time needed to conduct multiple measurements for luminance and chromaticity evaluation and adjustment such as for gamma testing. For even faster speed performance, the CA-410 offers LTD. AUTO mode that increases measurement speed while keeping the same or better accuracy than the predecessor CA-310. Also, Single-Frame mode which allows users to set the shortest integration time for synchronized measurements has been added. It is designed to improve productivity in processes where measurement speed is critical, such as inline color adjustments of OLEDs.



Gamma measurement time simulation



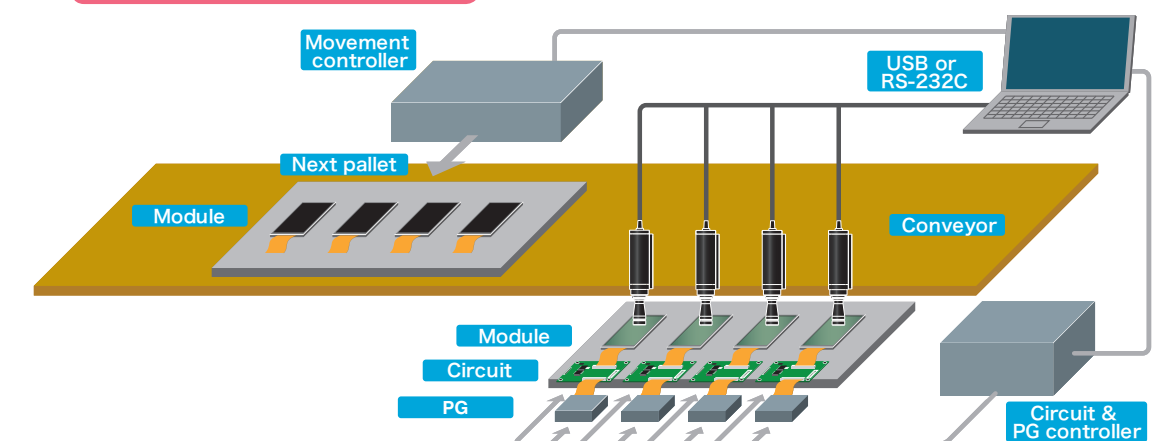
Probe: CA-P427
Measurement synchronization: NTSC
Integration time: Double-Frame, Single-Frame*
Gamma measurement (64 tones) at 0.01 - 500 cd/m²
Display drive time excluded
* Accuracy and repeatability may be reduced when using Single-Frame in some cases.

4 Designed for incorporation into automatic systems

The CA-410 is designed for incorporation and use in automatic systems. This includes a motorized zero-calibration shutter, synchronization detection function, and probe-PC direct connection which allows full functionality with USB bus power. Both RS-232C and USB ports are provided, and when using USB, the virtual COM port allows quick and easy connections to probes without the need to install drivers. For convenience when incorporating the CA-410 into automatic systems developed for predecessor models CA-210/310, the basic communication commands of CA-410 are kept the same. Also, CA-SDK2* includes as standard a COM registration tool which makes it possible to easily use the CA-410 with programs created for CA-210/310 using the previous CA-SDK. And various cables for incorporation into systems are available as optional accessories.

*Software development kit of the CA-410

Example system configuration

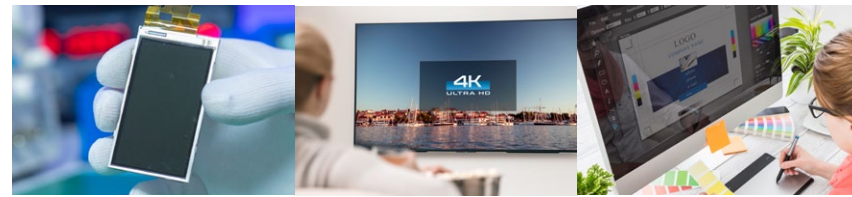


Probes for measuring various kinds of displays

Ø27 mm measurement area

Applicable display size:

5 inches and above



The measurement area of these probes is suited for measuring large smartphones, in-vehicle displays, PC monitors, TVs, etc. 3 models are available: CA-VP427 high-sensitivity probe for high-speed measurements from extremely low luminance, CA-P427 Normal Probe with its wide accuracy-guaranteed luminance range, and CA-P427H high-luminance probe that can measure luminance up to 30,000 cd/m².

<Specifications>

Measurement area: Ø27 mm

Acceptance angle: ± 2.5°

Accuracy guaranteed measurement distance:

30 mm ± 10 mm

Accuracy guaranteed range

for luminance measurements

CA-VP427 0.001 - 3,000 cd/m²

CA-P427 0.001 - 5,000 cd/m²

CA-P427H 0.01 - 30,000 cd/m²

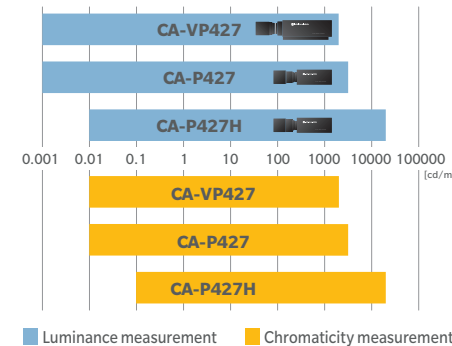
Accuracy guaranteed luminance range

for chromaticity measurements

CA-VP427 0.01 - 3,000 cd/m²

CA-P427 0.01 - 5,000 cd/m²

CA-P427H 0.1 - 30,000 cd/m²



Ø10 mm measurement area

Applicable display size:

Approx. 2 - 10 inches



These probes have a measurement area suited for measuring smart watches, small smartphones, in-vehicle displays, etc. 5 models are available: CA-VP410 high-sensitivity probe for high-speed measurements from low luminance, CA-P410 Normal Probe with its wide accuracy guaranteed luminance range, CA-P410H high-luminance probe that can measure luminance up to 30,000 cd/m² and CA-MP410/MP410H Mini Probe which aims for the smallest size and best cost performance.

<Specifications>

Measurement area: Ø10 mm

Acceptance angle: ± 5° (CA-VP410 only ± 8.5°)

Accuracy guaranteed measurement distance:

30 mm ± 5 mm (CA-MP410/MP410H 10 mm ± 5 mm)

Accuracy guaranteed range

for luminance measurements

CA-VP410 0.001 - 3,000 cd/m²

CA-P410/MP410 0.01 - 5,000 cd/m²

CA-P410H/MP410H 0.1 - 30,000 cd/m²

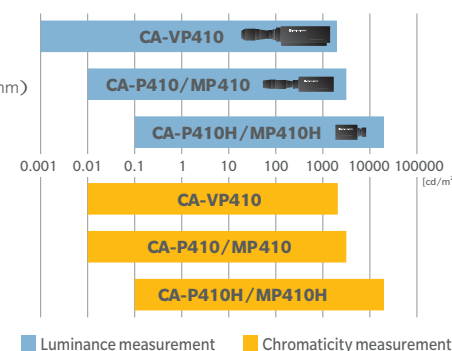
Accuracy guaranteed luminance range

for chromaticity measurements

CA-VP410 0.01 - 3,000 cd/m²

CA-P410/MP410 0.01 - 5,000 cd/m²

CA-P410H/MP410H 0.1 - 30,000 cd/m²



Detailed probe specifications are available on Konica Minolta's website.
<https://www.konicaminolta.com/instruments/download/catalog/display/index.html>



Ø2, Ø4 mm measurement area

Applicable display size:

2 inches and below



These probes have small measurement areas which are suitable for measurement of micro OLEDs, smart watches, etc. Though measurement area is small, the probes can take display measurements from low luminance levels at high speed and high accuracy, suitable for applications like gamma adjustments. The lineup consists of 2 models: CA-VP402 Small Spot Probe with Ø2 mm measurement area and CA-VP404 Small Spot Probe with Ø4 mm measurement area.

* Since CA-VP402 has an imaging optical system, when measuring devices with large pixel pitch, interference between the sensor fiber and the display pixels may adversely affect measurement repeatability.

* Zero calibration time and low luminance integration time is longer than conventional CA-410 probes.

<Specifications>

Measurement area: CA-VP402 Ø2.1 mm; CA-VP404 Ø4 mm

Acceptance angle: CA-VP402 ± 10°; CA-VP404 ± 8.5°

Accuracy guaranteed measurement distance:

CA-VP402 28 mm ± 2 mm

CA-VP404 30 mm ± 2 mm

Accuracy guaranteed range

for luminance measurements

CA-VP402 0.002 - 6,000 cd/m²

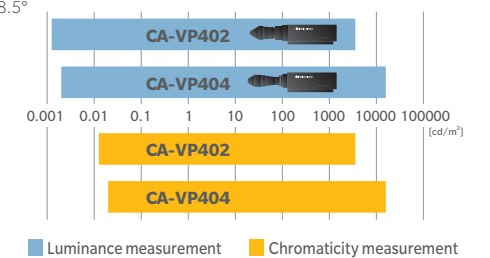
CA-VP404 0.004 - 12,000 cd/m²

Accuracy guaranteed luminance range

for chromaticity measurements

CA-VP402 0.02 - 6,000 cd/m²

CA-VP404 0.04 - 12,000 cd/m²



Long working distance probe

Multiple angle measurements, evaluation of angular viewing characteristics



CA-VP410T Ø10 mm LWD probe (200mm) is suitable for multi-angle measurements of OLED for smartphones and in-vehicle displays, and also evaluation of viewing angle characteristics of curved displays. It is also a viable choice when distances must be kept from measurement targets to avoid collisions in automatic measuring systems.

<Specifications>

Measurement area: Ø10 mm

Acceptance angle: ± 4°

Accuracy guaranteed measurement distance:

200 mm ± 2 mm

Accuracy guaranteed range

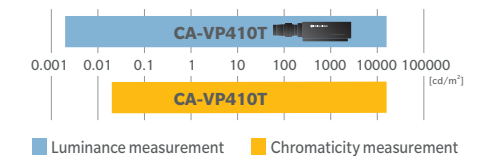
for luminance measurements:

0.004 - 12,000 cd/m²

Accuracy guaranteed luminance range

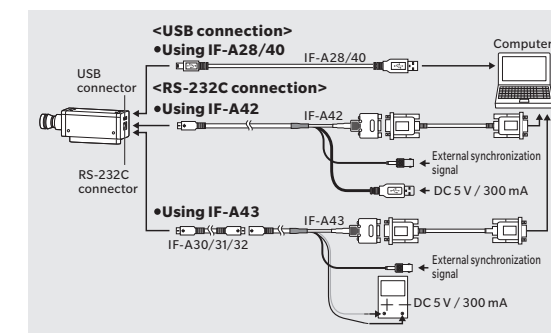
for chromaticity measurements:

0.04 - 12,000 cd/m²



Cables

Cables for connecting probes with PC are available as accessories.



<USB connections>

USB cable (2 m)

USB cable (5 m)

BNC conversion cable

<RS-232C connections>

Conversion cable

Conversion cable (Extension)

IF-A28 (Communication + Power) Included with probe as a standard accessory

IF-A40 (Communication + Power)

IF-A35 (External synchronization signal)

IF-A42 (Communication + USB Power + External synchronization signal)

IF-A43 (Communication + Power line + External synchronization signal)

IF-A43 is used together with RS cable for probe-DP connection

IF-A30 (2m) / IF-A31 (5m) / IF-A32 (10m)

CA-S40 software included with the probe

CA-S40 software is included as standard with probes. CA-S40 supports both Windows10 and Mac OS, and allows users to connect the probe to a computer and perform measurements from there. In addition to basic operations like conducting luminance, chromaticity and flicker measurements and saving results, logging live data of emission fluctuations via a waveform function is also possible. Moreover, the application incorporates other features that users will find useful in various measurement operations, including automatic detection of the display's emission frequency and using it for internal synchronization.

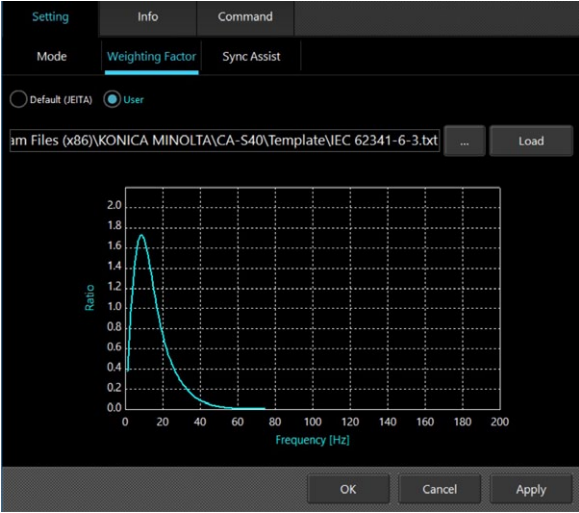


(Luminance/Chromaticity measurement)

(JEITA flicker measurement)



(Waveform window)



(Frequency sensitivity characteristic setting)

<Supported products>

All models of CA-410 probes, Data Processor CA-DP40

<Measurement items>

Luminance
Chromaticity (xy, u'v', Tduv, dominant wavelength, excitation purity)
Waveform
Flicker (JEITA, VESA), user-settable frequency sensitivity (IEC62341-6-3 sensitivity sample included)
Source: IEC 62341-6-3:2017/COR1:2019

<Other features>

Automatic frequency detection of measurement target
Setting of the shortest integration time (Single-Frame) for synchronized measurement
* CA-S40 software and probe firmware can be downloaded for free from Konica Minolta's website.
For more information, visit the below webpage.
<https://www.konicaminolta.com/instruments/download/software/display/index.html>

Easy-to-operate Data Processor CA-DP40

Data Processor CA-DP40 takes the "easy-to-operate" feature of the CA Series to new heights. With automatic zero 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 measurements for R & D applications. Moreover, a maximum of 10 probes can be connected for multi probe measurements.



CA-DP40

CA-DP40 dimensions
(Units : mm)

Main Specifications of PC Software CA-S40

<System requirements>	
OS	Windows® 10 Pro 32-bit Windows® 10 Pro 64-bit macOS® Sierra / High Sierra / Mojave • 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	At least 100 MB of available hard disk space, including 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 / P427C / P410 / P410H / P410C / MP410 / MP410H / VP427 / VP410 / VP402 / VP404 / VP410T
<Languages>	
Display language	English

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 _y x y (ΔL _y Δx Δy)	
	L _y u' v' (ΔL _y Δu' Δv')	
	L _y Tcp duv (ΔL _y ΔTcp duv)	
	X Y Z (ΔX ΔY ΔZ)	
	L _y λd Pe (ΔL _y Δλd 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