TITAN

IMAGING COLORIMETER
WITH INTEGRATED SPOT METER

Specification

ADMESY

colorimeters | spectroradiometers | lightmeters

CONTENTS

ADMESY

TITAN

The Titan is the ultimate 2D imaging CMOS sensor combined with a high end spotmeter (colorimeter). The Titan combines two fundamentally different devices in one solution giving it unprecedented capabilities and flexibility.

HIGHLIGHTS

- Luminance & colour uniformity measurements
- Flicker measurements
- Self-calibrating 2D part due to the spotmeter
- High accuracy due to the accurate spotmeter
- 2D and spotmeter, auto-range measure function
- Dark current compensated
- Flat Field calibrated
- OD0 and OD1 filter integrated for high dynamic range

SPECIFICATIONS

Interface	
USB	USBMTC compliant, SCPI command set, high speed device
Ethernet	GIGE Ethernet interface (should support jumbo packets)
12 V power	12 V DC regulated (supplied in package)

Power ratings				
	Min. voltage	Typical voltage	Max. voltage	Max. current
12 V power	11 V	12 V	13 V	3000 mA

General	
Temperature	15°C to +35°C
Humidity	10 % to 70 % non-condensing
Weight	5.5kg
Optics	f/2.0, 35mm

Spotmeter configuration

colorimeter part	
Model	Hyperion
Photo detector	3 silicon photo diode using XYZ interference filter
Spectral response	Approximates CIE 1931 color matching functions
Luminance accuracy	± 2%
Chromaticity accuracy	± 0.001
Integration time	0.5ms – 1s
Data processing time	6 ms

Camera configuration

12.3MP camera	
Resolution	4096 x 3000
Sensor	IMX304 RGB Sony
Output format	12bit
Integration time	1 ms – 10 s (can be longer)
Dynamic range	60 dB

SPOTMETER PART SPECIFICATION

Measurement system	
FOV	±1.25 degrees
Measurement spot size	See chapter spot size and FOV
Flicker measurement speed (sample mode)	Luminance 2000 samples / second, XYZ 2000 samples / second Minimum frequency for correct frequency detection: 1 Hz
Colour measurement speed	22 ms or higher, depending on luminance level (integration time, including communication). Example: 150 cd/m² with DC level light @ 16ms integration time. PWM requires longer integration (multiple frames)

Sample mode signal frequency response	
Parameter	F3db
Gain 1	DC – 500 Hz
Gain 2	DC – 500 Hz
Gain 3	DC – 500 Hz

Colorimeter specification			
Parameter	Range	Accuracy	Repeatability
Resolution	16 bit for X, Y and Z	>80 dB without averaging	
Luminance (Y)	0.007 cd/m² - 24,000 cd/m² integration time between 0.5ms – 1s	±2% of measured value, measured at white image of LCD display, Luminance of app. 150 cd/m², x=0.300 y= 0.325	Y ± 0.6% @ 0.1 cd/m² [1] Y ± 0.3% @ 1 cd/m² [1] Y ± 0.18% @ 5 cd/m² [1] Y ± 0.1% @ 150 cd/m² [1]
Chromaticity (x,y)		± 0.001 after calibration, measured at white image of LCD display, Luminance of app. 150 cd/m², x=0.300 y= 0.325	x,y ± 0.0012 for Y @ 0.1 cd/m² [1] x,y ± 0.0003 for Y @ 1 cd/m² [1] x,y ± 0.0002 for Y @ 5 cd/m² [1] x,y ± 0.0002 for Y @ 150 cd/m² [1]
Measurement speed for Y			4-10 samples / s @ 0.1 cd/m² [1] 10-20 samples / s @ 1 cd/m² [1] 40 samples / s @ 5 cd/m² [1] 40 samples / s @ 150 cd/m² [1]
Flicker (contrast method)	6 cd/m² or higher	± 0.3% flicker frequency 30Hz AC/DC 10% sine wave. Sine wave @ 10 cd/m²	± 0.2%
Flicker (JEITA method)	6 cd/m² or higher	± 0.3dB flicker frequency 30Hz AC/DC 10% sine wave. Sine wave @ 10 cd/m²	± 0.2dB

1 All measurements are performed 20 times on a LED display with sufficient signal noise ratio, value is based on 2 sigma. Sample speed depends on the measured sample.
If the sample uses PWM, it will take longer. Use of lower rated values is strongly recommended to ensure repeatability.
2 Operating temperature reaches from 0 to 40 degrees. Dark level compensation is optimized for operating in temperatures between 10 and 35 degrees.
Other temperature ranges can be calibrated using the mechanical shutter if necessary.

SPOTMETER PART MEASUREMENT DATA

Specifications			Auto-range condition 1		Auto-range condition 2	
	Range		~0.005 to ~15000 Cd/m2 (special mode available for higher luminance levels – up to 30k)			
Luminance			Spec	Max int time [µs]	Spec	Max int time [µs]
	Accuracy(white)	~ 0.007 cd/m²	+/-9%	1 000 000	—	
		~ 0.012 cd/m²	+/-5%	1 000 000		
		~ 0.12 cd/m²	+/-3%	100 000		
		~ 1 cd/m²	+/-1.5%	3 3333		
		~ 10 cd/m²				
		~ 100 cd/m²				
	Repeatability auto-range on (2σ) *1	~ 0.007 cd/m²	4%	1 000 000	4%	1 000 000
		~ 0.012 cd/m²	1%	1 000 000	4%	250 000
		~ 0.12 cd/m²	1%	100 000	2%	50 000
		~ 1 cd/m²	0.2%	3 3333	0.2%	3 3333
		~ 10 cd/m²				
		~ 100 cd/m²				
Chromaticity	Performance guarantee range		~0.01 to ~12 000 Cd/m2			
	Accuracy (white)	~ 0.012 cd/m²	+/- 0.006	1 000 000	—	
		~ 0.12 cd/m²	+/- 0.002	1 000 000		
		~ 1 cd/m²	+/- 0.0015	3 3333		
		~ 10 cd/m²				
		~ 100 cd/m²				
	Repeatability auto-range on (2σ) *1	~ 0.012 cd/m²	0.0025	1 000 000	0.0025	1 000 000
		~ 0.12 cd/m²	0.0003	1 000 000	0.0025	100 000
		~ 1 cd/m²	0.0003	100 000	0.0004	3 3333
		~ 10 cd/m²	0.0002	3 3333	0.0002	3 3333
		~ 100 cd/m²				
Flicker Wave-form	Sampling frequency		2000			
	Memory for saving sampling data		30000 samples			
	Max measurement time		15 seconds			
	Dynamic range - luminance		1 - ~15 000			
	Dynamic range - frequency		0.5 - 250			
Synchronization mode			ARFREQ			
Object under measurement （frequency）			0.5 - 250			

1 Measured with internal Admesy reference display.

CAMERA PART SPECIFICATION

Measurement system	
FOV	±14 degree
Measurement spot size	See chapter spot size and FOV
Lens	35mm lens with fixed aperture of *f*/2
OD filter	OD0 and OD1
Resolution	4096x3000
AD converter	12 bit ADC converter
Working range	400mm to 2000mm

Camera specification		
Parameter	Range	Accuracy
Non-uniformity after flat field calibration	±0.45%	—
AD converter	12 bit ADC converter	—
Luminance (Y)	0.005 cd/m² - ~17,000 cd/m² integration time between 1ms – 10sec[2]	± 1% relative to spotmeter [1]
Chromaticity (x,y)	—	± 0.0015 relative to spotmeter[1]
Measurement speed	0.5s per image, including spotmeter at white image	—

1) *Typical deviation with a 9p measurement on a white image of an OLED display versus a reference instrument. This is intended as an indication of the performance. These values are DUT (display) dependent.*

2) *Camera can integrate longer than 10s*

CAMERA PART MEASUREMENT DATA

Speed

Measurement	From [cd/m²]	To [cd/m²]	#1 times / sec
Lv, xy	1 100	— 17000	0.66 2

Speed includes spot measurement and image processing time

Chromaticity

Measurement Range	From [cd/m²]	To [cd/m²]	Int time camera [µs]	xy
Accuracy[1]	1 100	— 17000	1000000 16666	± 0.003 ± 0.002
Repeatability[2] (2 sigma)	1 100	— 17000	1000000 16666	± 0.0003 ± 0.0002

1) accuracy data is determined on 9p measurement comparison with an internal reference device and an internal reference display, values are determined on **greyscales**. This is intended as an indication of the performance. These values are DUT (display) dependent.

2) repeatability is determined on the sum of the ROI used in the 9p measurement

Luminance

Measurement Range	From [cd/m²]	To [cd/m²]	Int time camera [µs]	Level [%]
Accuracy[1]	1 100	— 17000	1000000 16666	2 2
Repeatability[2] (2 sigma)	1 100	— 17000	1000000 16666	0.3 0.15

1) accuracy data is determined on 9p measurement comparison with an internal reference device and an internal reference display, values are determined on **greyscales**. This is intended as an indication of the performance. These values are DUT (display) dependent.

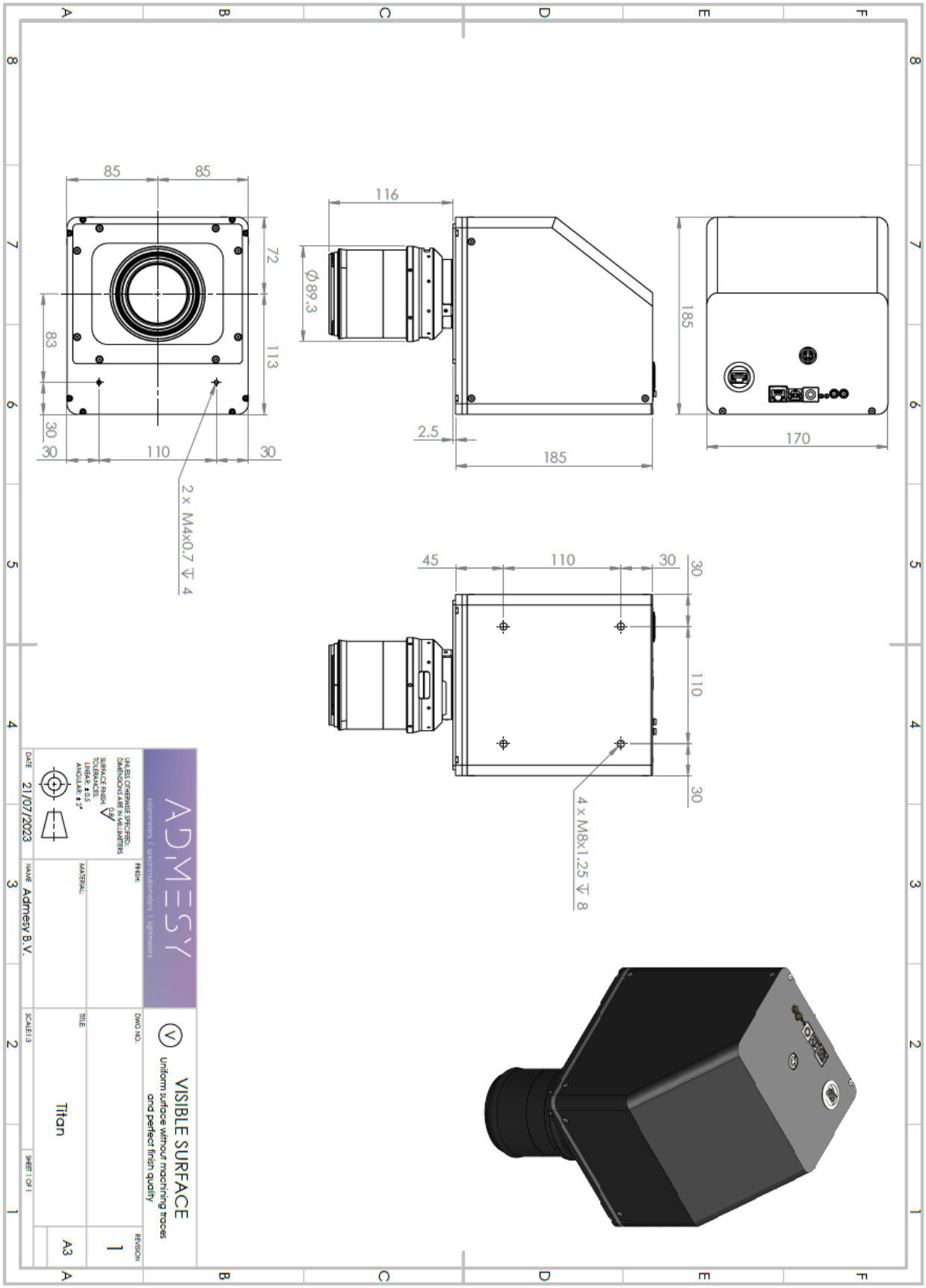
2) repeatability is determined on the sum of the ROI used in the 9p measurement

SPOT SIZE AND FOV

Spotmeter spot size and camera FOV									
Working distance best [mm] - best focus	400	600	800	840	1000	1140	1400	1650	2000
Spot diameter [mm] [1]	14.4	22.5	30.6	32.3	38.9	44.5	55.2	65.4	79.6
Field of view [mm] [1]	144x105	225x165	307x224	323x236	388x284	445x325	551x403	605x477	795x582
Field of view diagonal [inch] [1]	7.1	11.0	15.0	15.8	19.0	21.8	26.9	31.9	38.9

1) values can slightly differ

MECHANICAL SPECIFICATION



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