admesy
ADVANCED MEASUREMENT SYSTEMS

Specification

MSE Series General Specification

Version 1.04


admesy
ADVANCED MEASUREMENT SYSTEMS
MSE+ 20MM

1. About this specification

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2. General introduction to the MSE series

The MSE Series colorimeter offers a unique combination of high speed and accurate colour measurement capabilities packed in a robust jacket. The MSE colorimeter is available in a regular MSE 10mm version or MSE+ version (with Wide Dynamic Range) available with 10mm and 20mm lens system. Both MSE types are also available with a fiber connection.

The MSE series colorimeters are predominantly found inline in display production facilities, their customers or adjacent R&D departments to handle white point adjustment, uniformity, flicker, response time and general colour quality control.

2.1. MSE series highlights

- Absolute colour measurement according to the human eye (CIE1931).
- Fast colour measurement and high speed luminance measurements
- Measure colour and luminance in various colour spaces (XYZ, Yxy, Yuv etc...).
- Trigger input and output for in line applications.
- Windows, Linux and MAC OSX compatible.
- Mechanical shutter for accurate dark level measurements.
- SCPI command interface for easy integration in other applications.
- Directly supported in Labview / Labwindows / Visual Studio via VISA library. Other programming languages that support VISA can be used.
- USBTMC standard compliant.

2.2. MSE series: available versions

- MSE 10mm
- MSE 5mm
- MSE F with fiber and 5mm lens
- MSE+ 10mm
- MSE+ 20 mm
- MSE+ F with Fiber 5mm lens

2.3. Standards

The MSE is compliant to the USBTMC standard and can be used in

combination with external provided USBTMC compliant drivers. Currently it has been tested on Windows, Linux and Apple OSX using NI VISA (http://ww.ni.com/visa) and using the open source drivers on Linux (i686, x86_64 and ARM). Refer to the Admesy support site for a more detailed description and free source code.

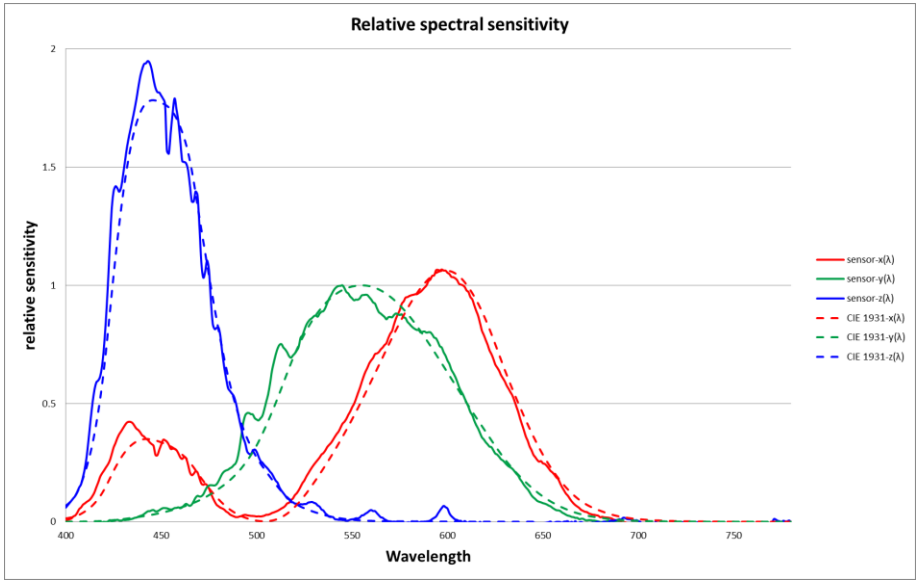
3. MSE General specification

Interfaces	
USB 2.0	USBTMC compliant, SCPI command set, Full speed device
RS232	For PC and embedded purposes, using the same command set as USB.
Trigger input and Trigger output	5V compliant

Power ratings				
	Min voltage	Typical voltage	Max voltage	Consumption
USB powered – no shutter operation	4.75V	5.00V	5.25V	Typically 120mA
USB powered – shutter operation	4.75V	5.00V	5.25V	Typically 225mA

Measurement system	
Photo detector	Silicon Photo diode using XYZ interference filter
Spectral response	Approximates CIE 1931 colour matching functions
Measurement parameters	XYZ, Yxy, Yuv, Correlated Colour Temperature, Dominant wavelength, Flicker, Response time.

Mechanical dimensions	
Height, Width, depth	63x24x65 mm (not including lens).
Mounting	12xM3 threat holes spread over all sides



MSE 10mm & 5mm & MSE F 5mm specifications

5. MSE 10mm: specification

Measurement system	
Optical system	Acceptance angle is 5 degrees (±2.5)
Measurement spot size	10mm spot size at 50mm, 12mm spot size at 100mm distance
Measurement speed	Luminance at 22,000 samples/second , Colour measurement at 7ms or higher, depending on luminance level. 150Cd/m² with DC level light at 50ms. PWM requires longer integration (multiple frames). Correct detected frequency = 1kHz

Colorimeter specification			
Parameter	Range	Accuracy	Repeatability
Resolution	15bit for X, Y and Z	>78dB without averaging	
Luminance (Y)	0.05cd/m^2–3,000 cd/m^2 Integration time between 1ms and 5sec.	±4% of measured value Measured at white image of CCFL LCD display. Luminance ~150 cd/m^2; x,y = 0.325 0.355	Y: ±0.3% for Y at 0.1cd/m^2 (1) Y: ±0.15% for Y at 1cd/m^2 (1) Y: ±0.08% for Y at 5cd/m^2 (1) Y: ±0.06% for Y at 150cd/m^2 (1)
Chromaticity: x,y		±0.001 (after calibration) Measured at white image of CCFL LCD display. Luminance ~150 cd/m^2; x,y = 0.325 0.355	x,y: ±0.003 for Y at 0.1cd/m^2 (1) x,y: ±0.001 for Y at 1cd/m^2 (1) x,y: ±0.0005 for Y at 5cd/m^2 (1) x,y: ±0.0002 for Y at 150cd/m^2 (1)
Measurement speed			1 sample per sec. for Y at 0.1cd/m^2 (1) 2-5 samples per sec. for Y at 1cd/m^2 (1) 5-10 samples per sec. for Y at 5cd/m^2 (1) 10-50 samples per sec. for Y at 150cd/m^2 (1)
CR measurement	>200,000	±5% (depending on lowest Y value)	±5% (depending on lowest Y value)
Flicker (contrast Method)	10 cd/m^2 or higher	±2% Flicker frequency:30Hz AC/DC 10% sine wave	±1%
Flicker (Jeita Method)	10 cd/m^2 or higher	±2dB Flicker frequency:30Hz AC/DC 10% sine wave	±1dB
Operating temperature	10-35°C (2)		
Shutter lifetime	More than 1 Million		
Shutter speed	250ms-300ms Close or open time	Depending on temperature and lifetime	

(1) All measurements are performed 20 times on a CCFL LCD screen with sufficient signal noise ratio, value is based on 2 sigma. Sample speed depends on the measured sample as well : If the sample uses PWM it will take longer so use the lower rated values.
(2) Operating temperature reaches from 0- 40 degrees, but dark level compensation works best between 10-35 degrees. Other temperature ranges can be calibrated using the mechanical shutter if necessary.

6. MSE 5mm: specification

Measurement system	
Optical system	Acceptance angle is 5 degrees (±2.5)
Measurement spot size	6.4 mm spot size at 50mm distance, 4.7 mm spot size at 100mm distance
Measurement speed	Luminance at 22,000 samples/second , Colour measurement at 7ms or higher, depending on luminance level. 150Cd/m² with DC level light at 50ms. PWM requires longer integration (multiple frames). Correct detected frequency = 1kHz

Colorimeter specification			
Parameter	Range	Accuracy	Repeatability
Resolution	15bit for X, Y and Z	>78dB without averaging	
Luminance (Y)	0.07cd/m^2–3,000 cd/m^2 Integration time between 1ms and 5sec.	±4% of measured value Measured at white image of CCFL LCD display. Luminance ~150 cd/m^2; x,y = 0.325 0.355	Y: ±1% for Y at 0.1cd/m^2 (1)
			Y: ±0.4% for Y at 1cd/m^2 (1)
			Y: ±0.2% for Y at 5cd/m^2 (1)
			Y: ±0.1% for Y at 150cd/m^2 (1)
Chromaticity: x,y		±0.001 (after calibration) Measured at white image of CCFL LCD display. Luminance ~150 cd/m^2; x,y = 0.325 0.355	x,y: ±0.003 for Y at 0.1cd/m^2 (1)
			x,y: ±0.003 for Y at 1cd/m^2 (1)
			x,y: ±0.001 for Y at 5cd/m^2 (1)
			x,y: ±0.0002 for Y at 150cd/m^2 (1)
Measurement speed			0.4 sample per sec. for Y at 0.1cd/m^2 (1)
			1-2 samples per sec. for Y at 1cd/m^2 (1)
			2-4 samples per sec. for Y at 5cd/m^2 (1)
			5-20 samples per sec. for Y at 150cd/m^2 (1)
CR measurement	>200,000	±5% (depending on lowest Y value)	±5% (depending on lowest Y value)
Flicker (contrast Method)	15 cd/m^2 or higher	±2% Flicker frequency:30Hz AC/DC 10% sine wave	±1%
Flicker (Jeita Method)	15 cd/m^2 or higher	±2dB Flicker frequency:30Hz AC/DC 10% sine wave	±1dB
Operating temperature	10-35°C (2)		
Shutter lifetime	More than 1 Million		
Shutter speed	250ms-300ms Close or open time	Depending on temperature and lifetime	

(1) All measurements are performed 20 times on a CCFL LCD screen with sufficient signal noise ratio, value is based on 2 sigma. Sample speed depends on the measured sample as well : If the sample uses PWM it will take longer so use the lower rated values.
(2) Operating temperature reaches from 0- 40 degrees, but dark level compensation works best between 10-35 degrees. Other temperature ranges can be calibrated using the mechanical shutter if necessary.

7. MSE F Fiber with 5mm lens: specification

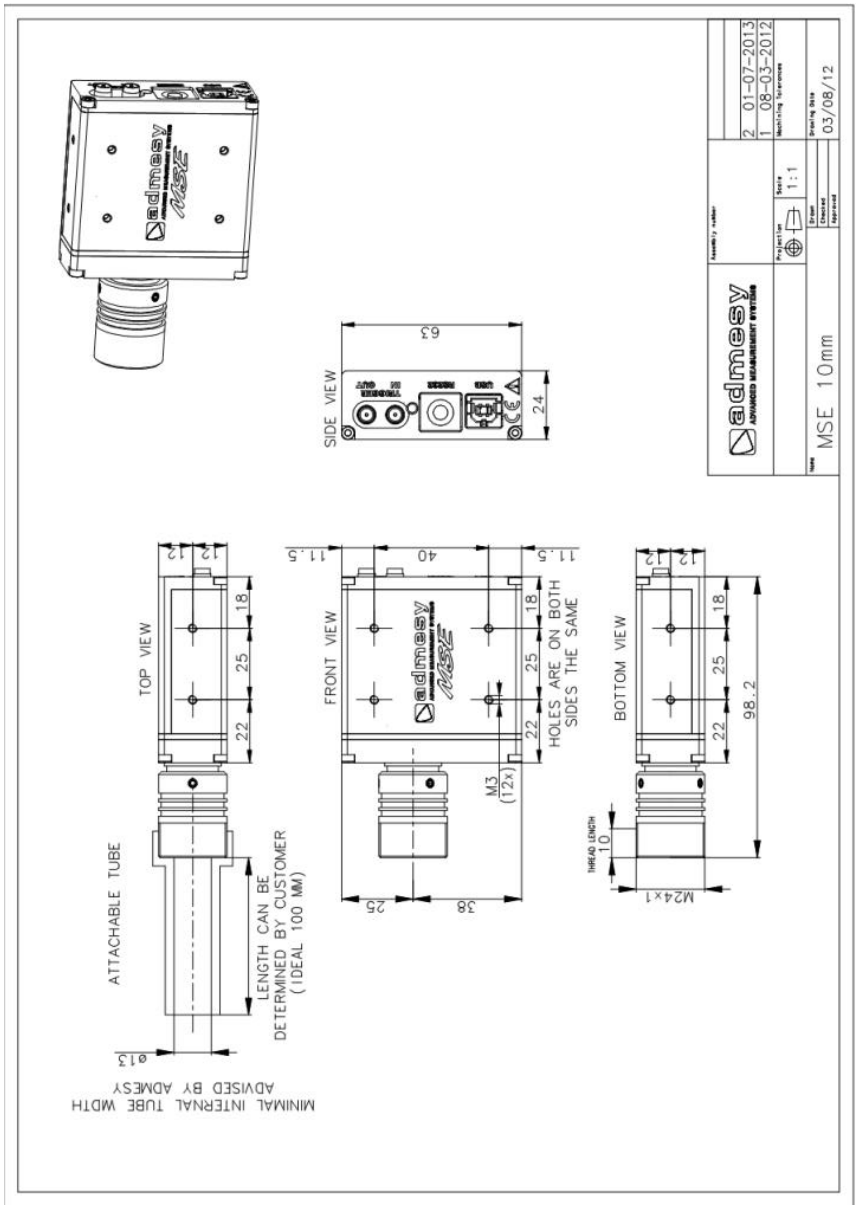
Measurement system	
Optical system	Acceptance angle is 5 (±2.5) degrees
Fiber	800um fiber with metal jacket
Measurement speed	Luminance sample rate at 22,000 samples/second , Colour measurement at 7ms or higher, depending on luminance level. 150Cd/m² with DC level light at 100ms. PWM requires longer integration (multiple frames).
Measurement distance	30 mm: 5,15 mm spot size 40 mm: 5,18 mm spot size 50 mm: 5,36 mm spot size

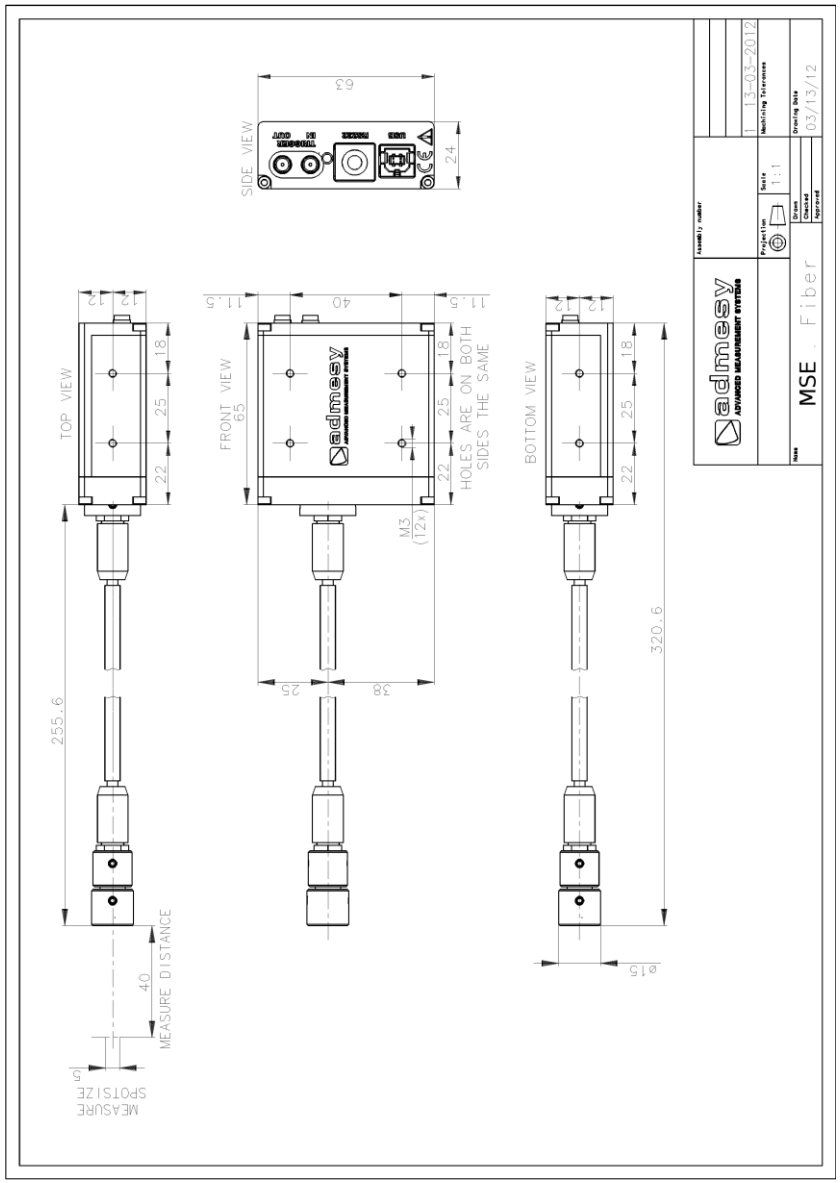
Colorimeter specification			
Parameter	Range	Accuracy	Repeatability
Resolution	15bit for X, Y and Z	>78dB without averaging for X, Y, Z	
Luminance (Y)	0.1 cd/m²–5,000 cd/m² integration time between 100µs and 5 seconds	±4% of measured value Measured at white image of CCFL LCD display Luminance ~150 cd/m2; x,y = 0.325 0.355	Y : ±1% for Y at 0.1 cd/m² (1) Y : ±0.5% for Y at 1 cd/m² (1) Y : ±0.1% for Y at 5 cd/m² (1) Y : ±0.08% for Y at 150 cd/m² (1)
Chromaticity : x,y	Approximates CIE1931 colour matching functions	±0.001 (after calibration) Measured at white image of CCFL LCD display Luminance ~150 cd/m2; x,y = 0.325 0.355	x,y : ±0.003 for Y at 0.1 cd/m² (1) x,y : ±0.002 for Y at 1 cd/m² (1) x,y : ±0.0008for Y at 5 cd/m² (1) x,y : ±0.0002 for Y at 150 cd/m² (1)
Measurement speed			0.2 samples per sec. for Y at 0.1 cd/m²(1) 1 samples per sec. for Y at 1 cd/m² (1) 5 samples per sec. for Y at 5 cd/m² (1) 10-20 samples per sec. for Y at 150 cd/m² (1)
CR measurement	> 200,000	±5%(depending on lowest Y value)	±5%(depending on lowest Y value)
Flicker (Contrast Method)	20 cd/m2 or higher	±3% Flicker frequency:30Hz AC/DC 10% sine wave	±2%
Flicker (JEITA method)	20 cd/m2 or higher	±3dB Flicker frequency:30Hz AC/DC 10% sine wave	±2dB
Operating Temperature	10-35°C (2)		
Shutter lifetime	More then 1 Million		
Shutter speed	250ms-300ms close or open time.	Depending on temperature and lifetime	

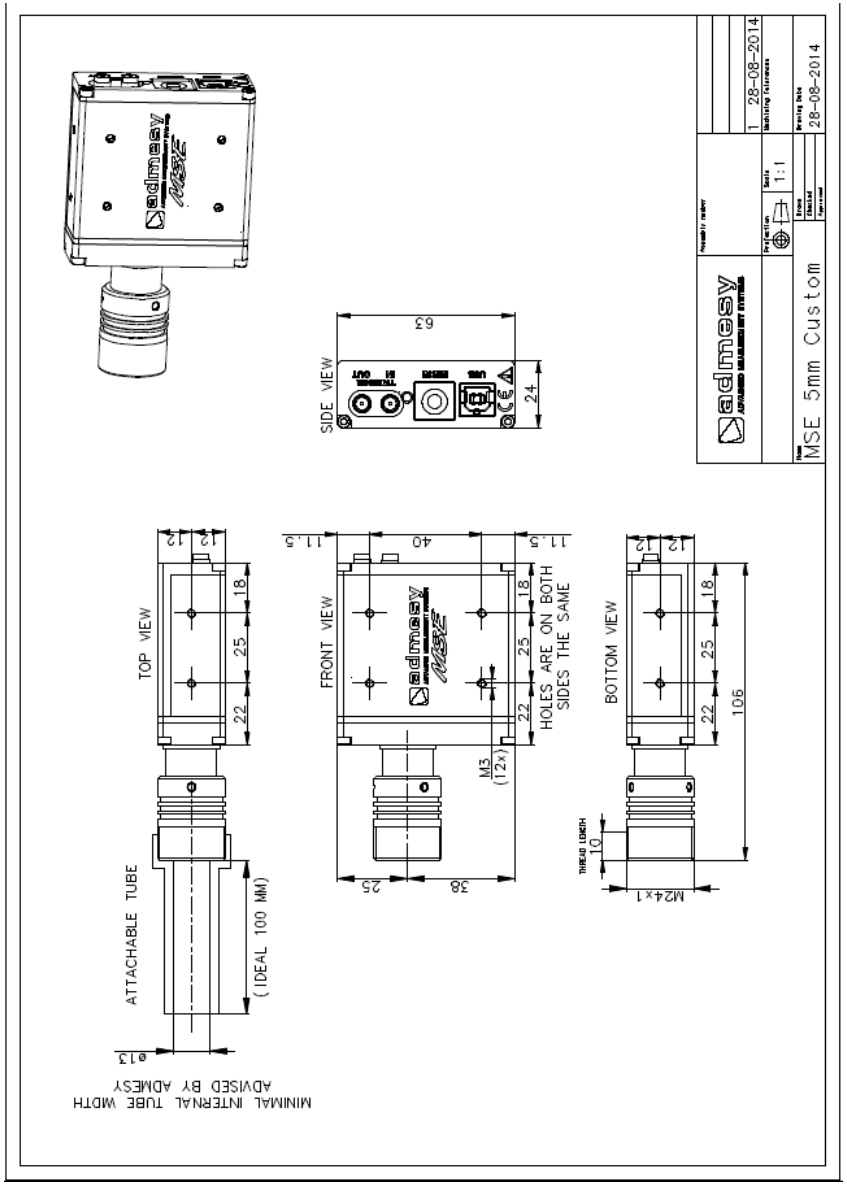
(1) All measurements are performed 20 times on a CCFL LCD screen with sufficient signal noise ratio, value is based on 2 sigma.Sample speed depends on the measured sample as well : If the sample uses PWM it will take longer so use the lower rated values.

(2) Operating temperature reaches from 0- 40degrees, but dark level compensation works best between 10-35 degrees.

8. MSE 10mm and MSE F: Mechanical dimensions






admesy
MSE 5mm Custom
28-08-2014
1:1
SIDE VIEW
63
24
TOP VIEW
FRONT VIEW
BOTTOM VIEW
HOLES ARE ON BOTH SIDES THE SAME
M3 (12x)
M24x1
106
ATTACHABLE TUBE
(IDEAL 100 MM)
MINIMAL INTERNAL TUBE WIDTH ADVISED BY ADMESY

MSE+ 10mm, MSE+ 20mm & MSE+ F 5mm specifications

9. MSE+ 20 mm: specification

Measurement system	
Optical system	Acceptance angle is 5 (±2.5) degrees.
Measurement spot size	20 mm spot size at 100mm distance. For other distances and spot sizes see table below
Measurement speed	Luminance at 22,000 samples/second , Colour measurement at 1ms or higher, depending on luminance level. 150Cd/m² with DC level light at 30ms. 0.3Cd/m² at 0.2s. PWM mode not supported.
Measurement distance	50 mm: 18,4 mm spot size 75 mm: 19 mm spot size 100 mm: 20 mm spot size 150 mm: 21,4 mm spot size 200 mm: 23,4 mm spot size

Colorimeter specification			
Parameter	Range	Accuracy	Repeatability
Resolution	15bit for X, Y and Z	>78dB without averaging for X, Y, Z	
Luminance (Y)	0.008 cd/m²–15,000 cd/m² integration time between 1ms and 5 seconds	±4% of measured value Measured at white image of CCFL LCD display Luminance ~150cd/m2; x,y = 0,325 0,355	Y : ±0.3% for Y at 0.1 cd/m² (1) Y : ±0.10% for Y at 1 cd/m² (1) Y : ±0.05% for Y at 5 cd/m² (1) Y : ±0.03% for Y at 150 cd/m² (1)
Chromaticity : x,y	Approximates CIE1931 colour matching functions	±0,001 (after calibration) Measured at white image of CCFL LCD display Luminance ~ 150cd/m2; x,y = 0,325 0,355	x,y : ±0.002 for Y at 0.1 cd/m² (1) x,y : ±0.001 for Y at 1 cd/m² (1) x,y : ±0.0005 for Y at 5 cd/m² (1) x,y : ±0.0002 for Y at 150 cd/m² (1)
Measurement speed			1-2 sample per sec. for Y at 0.1 cd/m²(1) 4-10 samples per sec. for Y at 1 cd/m² (1) 10-20 samples per sec. for Y at 5 cd/m² (1) 20-100 samples per sec. for Y >= 150 cd/m² (1)
CR measurement	> 200,000	±5%(depending on lowest Y value)	±5%(depending on lowest Y value)
Flicker (Contrast Method)	10 cd/m2 or higher	±2% Flicker frequency:30Hz AC/DC 10% sine wave	±1%
Flicker (JEITA method)	10 cd/m2 or higher	±2dB Flicker frequency:30Hz AC/DC 10% sine wave	±1dB
Operating Temperature	10-35°C (2)		
Shutter lifetime	More then 1 Million		
Shutter speed	250ms-300ms close or open time.	Depending on temperature and lifetime	

(1) All measurements are performed 20 times on a CCFL LCD screen with sufficient signal noise ratio, value is based on 2 sigma. Luminance and chromaticity values are based on best performance possible, while measurement speed is determined by Admesy with a signal noise ratio which is still acceptable according Admesy. Sample speed depends on the measured sample as well : If the sample uses PWM it will take longer so use the lower rated values. Detailed measurement data is available upon request

(2) Operating temperature reaches from 0- 40 degrees, but dark level compensation works best between 10-35 degrees. Other temperature ranges can be calibrated using the mechanical shutter if necessary.

General remark: All values are determined as realistic as possible and can slightly differ from device to device.

10. MSE+ 10mm: specification

Measurement system	
Optical system	Acceptance angle is 5 degrees (±2.5)
Measurement spot size	10mm spot size at 50mm, 12mm spot size at 100mm distance
Measurement speed	Luminance at 22,000 samples/second , Colour measurement at 7ms or higher, depending on luminance level. 150Cd/m² with DC level light at 50ms. PWM requires longer integration (multiple frames). Correct detected frequency = 1kHz
Measurement distance	100 mm: 10mm spot size

Colorimeter specification			
Parameter	Range	Accuracy	Repeatability
Resolution	15bit for X, Y and Z	>78dB without averaging	
Luminance (Y)	0.05cd/m^2–30,000 cd/m^2 Integration time between 1ms and 5sec.	±4% of measured value Measured at white image of CCFL LCD display. Luminance ~150 cd/m^2; x,y = 0.325 0.355	Y: ±0.3% for Y at 0.1cd/m^2 (1) Y: ±0.15% for Y at 1cd/m^2 (1) Y: ±0.08% for Y at 5cd/m^2 (1) Y: ±0.06% for Y at 150cd/m^2 (1)
Chromaticity: x,y		±0.001 (after calibration) Measured at white image of CCFL LCD display. Luminance ~150 cd/m^2; x,y = 0.325 0.355	x,y: ±0.003 for Y at 0.1cd/m^2 (1) x,y: ±0.001 for Y at 1cd/m^2 (1) x,y: ±0.0005 for Y at 5cd/m^2 (1) x,y: ±0.0002 for Y at 150cd/m^2 (1)
Measurement speed			1 sample per sec. for Y at 0.1cd/m^2 (1) 2-5 samples per sec. for Y at 1cd/m^2 (1) 5-10 samples per sec. for Y at 5cd/m^2 (1) 10-50 samples per sec. for Y at 150cd/m^2 (1)
CR measurement	>200,000	±5% (depending on lowest Y value)	±5% (depending on lowest Y value)
Flicker (contrast Method)	10 cd/m^2 or higher	±2% Flicker frequency:30Hz AC/DC 10% sine wave	±1%
Flicker (Jeita Method)	10 cd/m^2 or higher	±2dB Flicker frequency:30Hz AC/DC 10% sine wave	±1dB
Operating temperature	10-35°C (2)		
Shutter lifetime	More than 1 Million		
Shutter speed	250ms-300ms Close or open time	Depending on temperature and lifetime	

(1) All measurements are performed 20 times on a CCFL LCD screen with sufficient signal noise ratio, value is based on 2 sigma. Sample speed depends on the measured sample as well : If the sample uses PWM it will take longer so use the lower rated values.

(2) Operating temperature reaches from 0- 40 degrees, but dark level compensation works best between 10-35 degrees. Other temperature ranges can be calibrated using the mechanical shutter if necessary.

11. MSE+ F Fiber with 5mm lens: specification

Measurement system	
Optical system	Acceptance angle is 5 (±2.5) degrees
Fiber	800um fiber with metal jacket
Measurement speed	Luminance sample rate at 22,000 samples/second , Colour measurement at 7ms or higher, depending on luminance level. 150Cd/m² with DC level light at 100ms. PWM requires longer integration (multiple frames).
Measurement distance	30 mm: 5,15 mm spot size 40 mm: 5,18 mm spot size (optimal distance) 50 mm: 5,36 mm spot size

Colorimeter specification			
Parameter	Range	Accuracy	Repeatability
Resolution	15bit for X, Y and Z	>78dB without averaging for X, Y, Z	
Luminance (Y)	0.1 cd/m²–60,000 cd/m² integration time between 100µs and 5 seconds	±4% of measured value Measured at white image of CCFL LCD display Luminance ~150 cd/m2; x,y = 0.325 0.355	Y : ±1% for Y at 0.1 cd/m² (1) Y : ±0.5% for Y at 1 cd/m² (1) Y : ±0.1% for Y at 5 cd/m² (1) Y : ±0.08% for Y at 150 cd/m² (1)
Chromaticity : x,y	Approximates CIE1931 colour matching functions	±0.001 (after calibration) Measured at white image of CCFL LCD display Luminance ~150 cd/m2; x,y = 0.325 0.355	x,y : ±0.003 for Y at 0.1 cd/m² (1) x,y : ±0.002 for Y at 1 cd/m² (1) x,y : ±0.0008for Y at 5 cd/m² (1) x,y : ±0.0002 for Y at 150 cd/m² (1)
Measurement speed			0.2 samples per sec. for Y at 0.1 cd/m²(1) 1 samples per sec. for Y at 1 cd/m² (1) 5 samples per sec. for Y at 5 cd/m² (1) 10-20 samples per sec. for Y at 150 cd/m² (1)
CR measurement	> 200,000	±5%(depending on lowest Y value)	±5%(depending on lowest Y value)
Flicker (Contrast Method)	20 cd/m2 or higher	±3% Flicker frequency:30Hz AC/DC 10% sine wave	±2%
Flicker (JEITA method)	20 cd/m2 or higher	±3dB Flicker frequency:30Hz AC/DC 10% sine wave	±2dB
Operating Temperature	10-35°C (2)		
Shutter lifetime	More then 1 Million		
Shutter speed	250ms-300ms close or open time.	Depending on temperature and lifetime	

(1) All measurements are performed 20 times on a CCFL LCD screen with sufficient signal noise ratio, value is based on 2 sigma.Sample speed depends on the measured sample as well : If the sample uses PWM it will take longer so use the lower rated values.

(2) Operating temperature reaches from 0- 40degrees, but dark level compensation works best between 10-35 degrees.

12. MSE+ 20mm: Mechanical dimensions

MSE+ 10mm and MSE+ F identical to MSE 10mm and MSE F