

specification



**hyperion**  
colorimeter





## Contents

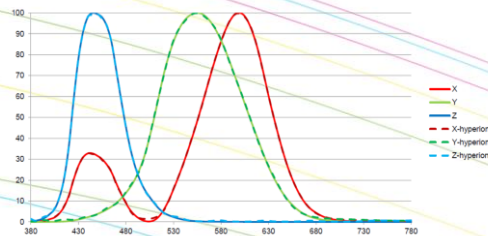
|   |                                       |   |
|---|---------------------------------------|---|
| 1 | Hyperion .....                        | 3 |
| 2 | Highlights .....                      | 3 |
| 3 | General specifications .....          | 4 |
| 4 | Typical spectral sensitivity .....    | 4 |
| 5 | 10mm measurement specifications ..... | 5 |
| 6 | Real measurement data .....           | 6 |
| 7 | Hyperion 10mm dimensions .....        | 8 |
| 8 | Hyperion M8 fiber dimensions .....    | 9 |



## 1 Hyperion

The Hyperion colorimeter offers a unique combination of high speed and accurate colour measurement capabilities packed in a robust package.

The improvement compared to the previous colorimeters is that the Hyperion has a significant improvement on filter characteristics and an incredible speed upgrade. It is actually 4x times faster than our previous models making accurate colour measurements possible in 50ms at 0.3cd/m<sup>2</sup>.



The Hyperion colorimeter is available with a 10mm spot size. A fiber version is also available with several optics, custom optics can be applied on request. Added to the filter characteristics the high sensitivity, ultra-low noise electronics and a huge dynamic range make it the ideal device for display measurements even at low levels.



## 2 Highlights

- Highly accurate colour measurement according to human eye (CIE1931)
- Fast colour measurement even at low luminance level
- Flicker luminance (Y) function: 2000 samples/second
- Auto-range function
- Powerful MCU enables internal JEITA flicker calculation
- Mechanical shutter
- USBMTC standard compliant
- Windows, Linux and MAC OSX compatible
- Directly supported in Labview, Labwindows, Visual Studio via VISA library





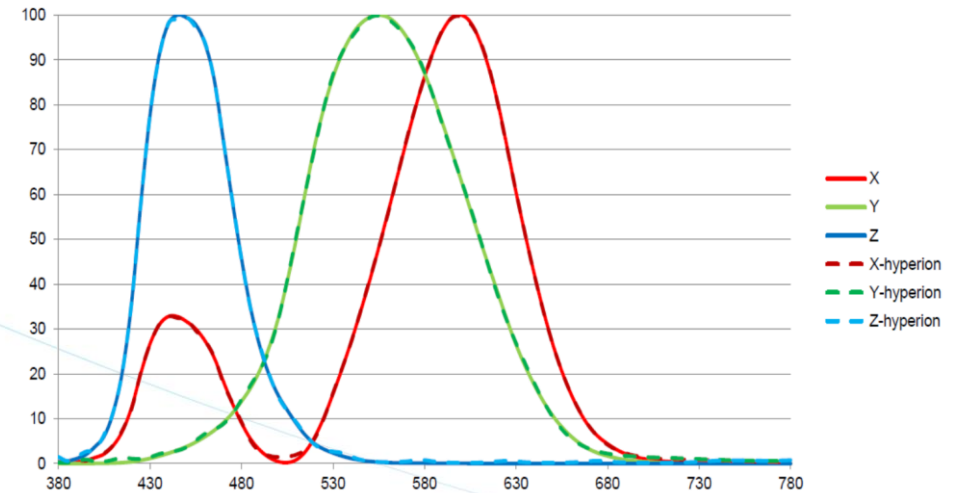
### 3 General specifications

| Interfaces       |   |
|------------------|---|
| USB 2.0          | USBMTC compliant, SCPI command set, high speed device       |
| RS 232           | For PC and embedded purposes, using same command set as USB |
| Trigger in & out | 5V compliant  |

| Power ratings |             |                 |             |             |
|---------------|-------------|-----------------|-------------|-------------|
|               | Min voltage | Typical voltage | Max voltage | Max current |
| USB power     | 4.75V       | 5.00V           | 5.25V       | 300mA       |
| 9V power      | 8.75V       | 9.00V           | 9.25V       | 300mA       |

| Measurement system     |  |
|------------------------|--|
| Photo detector         | 3 silicon photo diode using XYZ interference filter  |
| Spectral response      | Approximates CIE 1931 colour matching functions  |
| Measurement parameters | XYZ, Yxy, Yuv, correlated color temperature (CCT), dominant wavelength DWL, Flicker, Response time |
| Size (HxWxD)           | 53x70x147 mm (without lens system)   |
| Weight                 | 670 gram   |
| Mounting               | 12 M3 threat holes spread over four sides  |

### 4 Typical spectral sensitivity





## 5 10mm measurement specifications

| Measurement system                      |   |  |   |
|---|---|--|---|
| Optical system                          | Acceptance angle 5° (+/- 2.5)   |  |   |
| Measurement spot size                   | 13.5 mm at 50 mm distance   | 18 mm at 100 mm distance   |   |
| Flicker measurement speed (sample mode) | Luminance 2000 samples / second, XYZ 2000 samples / second<br>Correct detected frequency of at least 1 Hz   |  |   |
| Colour measurement speed                | Colour 22 ms or higher, depending on luminance level (including communication)<br>150 cd/m² with DC level light at 16 ms. PWM requires longer integration (multiple frames) |  |   |
| Sample mode signal frequency response   |   |  |   |
| Parameter                               | F <sub>3db</sub> <sup>a</sup>   |  |   |
| 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)                           | 0.005 cd/m² - 20,000 cd/m²<br>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 +/- 0.5% at 0.1 cd/m² <sup>1</sup><br>Y +/- 0.2% at 1 cd/m² <sup>1</sup><br>Y +/- 0.15% at 5 cd/m² <sup>1</sup><br>Y +/- 0.1% at 150 cd/m² <sup>1</sup>   |
| 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 +/- 0.001 for Y at 0.1 cd/m² <sup>1</sup><br>x,y +/- 0.0005 for Y at 1 cd/m² <sup>1</sup><br>x,y +/- 0.0005 for Y at 5 cd/m² <sup>1</sup><br>x,y +/- 0.0002 for Y at 150 cd/m² <sup>1</sup>       |
| Measurement speed                       |   |  | 4-10 samples / s for Y at 0.1 cd/m² <sup>1</sup><br>10-20 samples / s for Y at 1 cd/m² <sup>1</sup><br>40 samples / s for Y at 5 cd/m² <sup>1</sup><br>40 samples / s for Y at 150 cd/m² <sup>1</sup> |
| Flicker (contrast method)               | 5 cd/m² or higher   | +/- 0.3% flicker frequency 30Hz AC/DC 10% sine wave. Sine wave at 10 cd/m²   | +/- 0.2%  |
| Flicker (JEITA method)                  | 5 cd/m² or higher   | +/- 0.3dB flicker frequency 30Hz AC/DC 10% sine wave. Sine wave at 10 cd/m²  | +/- 0.2dB   |
| Operating temperature                   | 10-35°C <sup>2</sup>  |  |   |
| Shutter lifetime                        | >1000000  |  |   |
| Shutter speed                           | 250-300 ms depending on temperature and lifetime  |  |   |

<sup>1</sup> 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.

<sup>2</sup> Operating temperature reaches from 0 to 40 degrees. Dark level compensation is optimized for operating in temperatures between 10 and 35 degrees.



## 6 Real measurement data

| Luminance                  | Setting 1: max integration time 100ms |                            |              |                               | Setting 3: max integration time 240ms |                            |              |                               | Setting 2: max integration time 1000ms |                            |              |                               |
|----------------------------|---------------------------------------|----------------------------|--------------|-------------------------------|---------------------------------------|----------------------------|--------------|-------------------------------|--|----------------------------|--------------|-------------------------------|
| Measurement range          | from<br>(cd/m <sup>2</sup> )          | to<br>(cd/m <sup>2</sup> ) | level<br>(%) | level<br>(cd/m <sup>2</sup> ) | from<br>(cd/m <sup>2</sup> )          | to<br>(cd/m <sup>2</sup> ) | level<br>(%) | level<br>(cd/m <sup>2</sup> ) | from<br>(cd/m <sup>2</sup> )           | to<br>(cd/m <sup>2</sup> ) | level<br>(%) | level<br>(cd/m <sup>2</sup> ) |
|                            | 0.005                                 | 20000                      |              |                               | 0.005                                 | 20000                      |              |                               | 0.005                                  | 20000                      |              |                               |
| Accuracy (for white)       | 0.01                                  | -                          | +/-5%        | -                             | 0.01                                  | -                          | +/-5%        | -                             | 0.01                                   | -                          | +/-5%        | -                             |
|                            | 0.1                                   | -                          | +/-5%        | -                             | 0.1                                   | -                          | +/-5%        | -                             | 0.1                                    | -                          | +/-5%        | -                             |
|                            | 0.3                                   | -                          | +/-4%        | -                             | 0.3                                   | -                          | +/-4%        | -                             | 0.3                                    | -                          | +/-4%        | -                             |
|                            | 1                                     | -                          | +/-3%        | -                             | 1                                     | -                          | +/-3%        | -                             | 1                                      | -                          | +/-3%        | -                             |
|                            | 5                                     | -                          | +/-3%        | -                             | 5                                     | -                          | +/-3%        | -                             | 5                                      | -                          | +/-3%        | -                             |
|                            | 15                                    | -                          | +/-2%        | -                             | 15                                    | -                          | +/-2%        | -                             | 15                                     | -                          | +/-2%        | -                             |
|                            | 50                                    | -                          | +/-2%        | -                             | 50                                    | -                          | +/-2%        | -                             | 50                                     | -                          | +/-2%        | -                             |
|                            | 100                                   | 20000                      | +/-2%        | -                             | 100                                   | 20000                      | +/-2%        | -                             | 100                                    | 20000                      | +/-2%        | -                             |
| Repeatability<br>(2 sigma) | 0.01                                  | -                          | +/-5%        | 0.0009                        | 0.01                                  | -                          | +/-3%        | 0.0006                        | 0.01                                   | -                          | +/-1%        | 0.0001                        |
|                            | 0.1                                   | -                          | +/-1%        | 0.002                         | 0.1                                   | -                          | +/-0.6%      | 0.0012                        | 0.1                                    | -                          | +/-0.5%      | 0.0009                        |
|                            | 0.3                                   | -                          | +/-1.2%      | 0.0036                        | 0.3                                   | -                          | +/-0.5%      | 0.003                         | 0.3                                    | -                          | +/-0.2%      | 0.0024                        |
|                            | 1                                     | -                          | +/-0.6%      | 0.011                         | 1                                     | -                          | +/-0.5%      | 0.016                         | 1                                      | -                          | +/-0.2%      | 0.014                         |
|                            | 5                                     | -                          | +/-0.3%      | 0.04                          | 5                                     | -                          | +/-0.3%      | 0.042                         | 5                                      | -                          | +/-0.15%     | 0.031                         |
|                            | 15                                    | -                          | +/-0.3%      | 0.06                          | 15                                    | -                          | +/-0.3%      | 0.068                         | 15                                     | -                          | +/-0.13%     | 0.062                         |
|                            | 50                                    | -                          | +/-0.2%      | 0.14                          | 50                                    | -                          | +/-0.12%     | 0.14                          | 50                                     | -                          | +/-0.07%     | 0.16                          |
|                            | 100                                   | 20000                      | +/-0.3%      | 0.34                          | 100                                   | 20000                      | +/-0.08%     | 0.23                          | 100                                    | 20000                      | +/-0.07%     | 0.25                          |



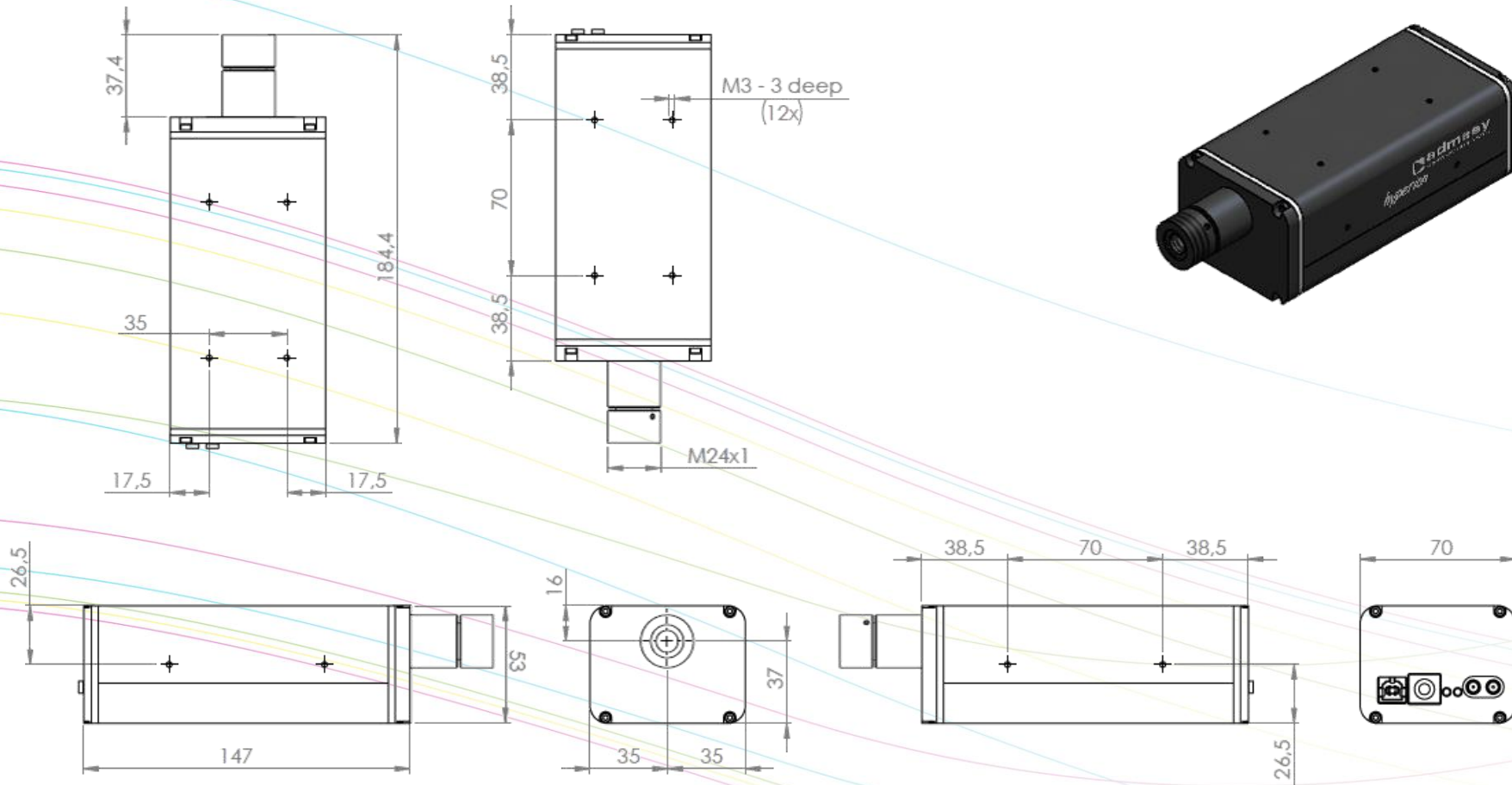
| Chromaticity               | Setting 1: max integration time 100ms |                            |           | Setting 3: max integration time 240ms |                            |           | Setting 2: max integration time 1000ms |                            |           |
|----------------------------|---------------------------------------|----------------------------|-----------|---------------------------------------|----------------------------|-----------|--|----------------------------|-----------|
| Measurement range          | from<br>(cd/m <sup>2</sup> )          | to<br>(cd/m <sup>2</sup> ) | level     | from<br>(cd/m <sup>2</sup> )          | to<br>(cd/m <sup>2</sup> ) | level     | from<br>(cd/m <sup>2</sup> )           | to<br>(cd/m <sup>2</sup> ) | level     |
|                            | 0.1                                   | 20000                      |           | 0.1                                   | 20000                      |           | 0.1                                    | 20000                      |           |
| Accuracy (for white)       | 0.1                                   | -                          | +/-0.005  | 0.1                                   | -                          | +/-0.005  | 0.1                                    | -                          | +/-0.003  |
|                            | 0.3                                   | -                          | +/-0.0025 | 0.3                                   | -                          | +/-0.0025 | 0.3                                    | -                          | +/-0.002  |
|                            | 1                                     | -                          | +/-0.002  | 1                                     | -                          | +/-0.0015 | 1                                      | -                          | +/-0.0015 |
|                            | 5                                     | -                          | +/-0.0015 | 5                                     | -                          | +/-0.0015 | 5                                      | -                          | +/-0.0015 |
|                            | 15                                    | -                          | +/-0.0015 | 15                                    | -                          | +/-0.0015 | 15                                     | -                          | +/-0.0015 |
|                            | 50                                    | -                          | +/-0.0015 | 50                                    | -                          | +/-0.0015 | 50                                     | -                          | +/-0.0015 |
|                            | 100                                   | 20000                      | +/-0.0015 | 100                                   | 20000                      | +/-0.0015 | 100                                    | 20000                      | +/-0.0015 |
| Repeatability<br>(2 sigma) | 0.1                                   | -                          | 0.006     | 0.1                                   | -                          | 0.0037    | 0.1                                    | -                          | 0.001     |
|                            | 0.3                                   | -                          | 0.0026    | 0.3                                   | -                          | 0.0014    | 0.3                                    | -                          | 0.00022   |
|                            | 1                                     | -                          | 0.00056   | 1                                     | -                          | 0.00061   | 1                                      | -                          | 0.00033   |
|                            | 5                                     | -                          | 0.00066   | 5                                     | -                          | 0.00067   | 5                                      | -                          | 0.00066   |
|                            | 15                                    | -                          | 0.00035   | 15                                    | -                          | 0.00028   | 15                                     | -                          | 0.00033   |
|                            | 50                                    | -                          | 0.00017   | 50                                    | -                          | 0.00012   | 50                                     | -                          | 0.00022   |
|                            | 100                                   | 20000                      | 0.00014   | 100                                   | 20000                      | 0.00012   | 100                                    | 20000                      | 0.0001    |

| Speed | Setting 1: max integration time 100ms |                            |           | Setting 3: max integration time 240ms |                            |           | Setting 2: max integration time 1000ms |                            |           |
|-------|---------------------------------------|----------------------------|-----------|---------------------------------------|----------------------------|-----------|--|----------------------------|-----------|
|       | from<br>(cd/m <sup>2</sup> )          | to<br>(cd/m <sup>2</sup> ) | times/sec | from<br>(cd/m <sup>2</sup> )          | to<br>(cd/m <sup>2</sup> ) | times/sec | from<br>(cd/m <sup>2</sup> )           | to<br>(cd/m <sup>2</sup> ) | times/sec |
| xyLv  | 0.1                                   | -                          | 8         | 0.1                                   | -                          | 3.7       | 0.1                                    | -                          | 0.6 – 0.9 |
|       | 0.3                                   | -                          | 8         | 0.3                                   | -                          | 3.7       | 0.3                                    | -                          | 0.6 – 0.9 |
|       | 1                                     | -                          | 10        | 1                                     | -                          | 10        | 1                                      | -                          | 10        |
|       | 5                                     | -                          | 40        | 5                                     | -                          | 40        | 5                                      | -                          | 40        |
|       | 15                                    | -                          | 40        | 15                                    | -                          | 40        | 15                                     | -                          | 40        |
|       | 50                                    | -                          | 40        | 50                                    | -                          | 40        | 50                                     | -                          | 40        |
|       | 100                                   | 3000                       | 40        | 100                                   | 3000                       | 40        | 100                                    | 3000                       | 40        |





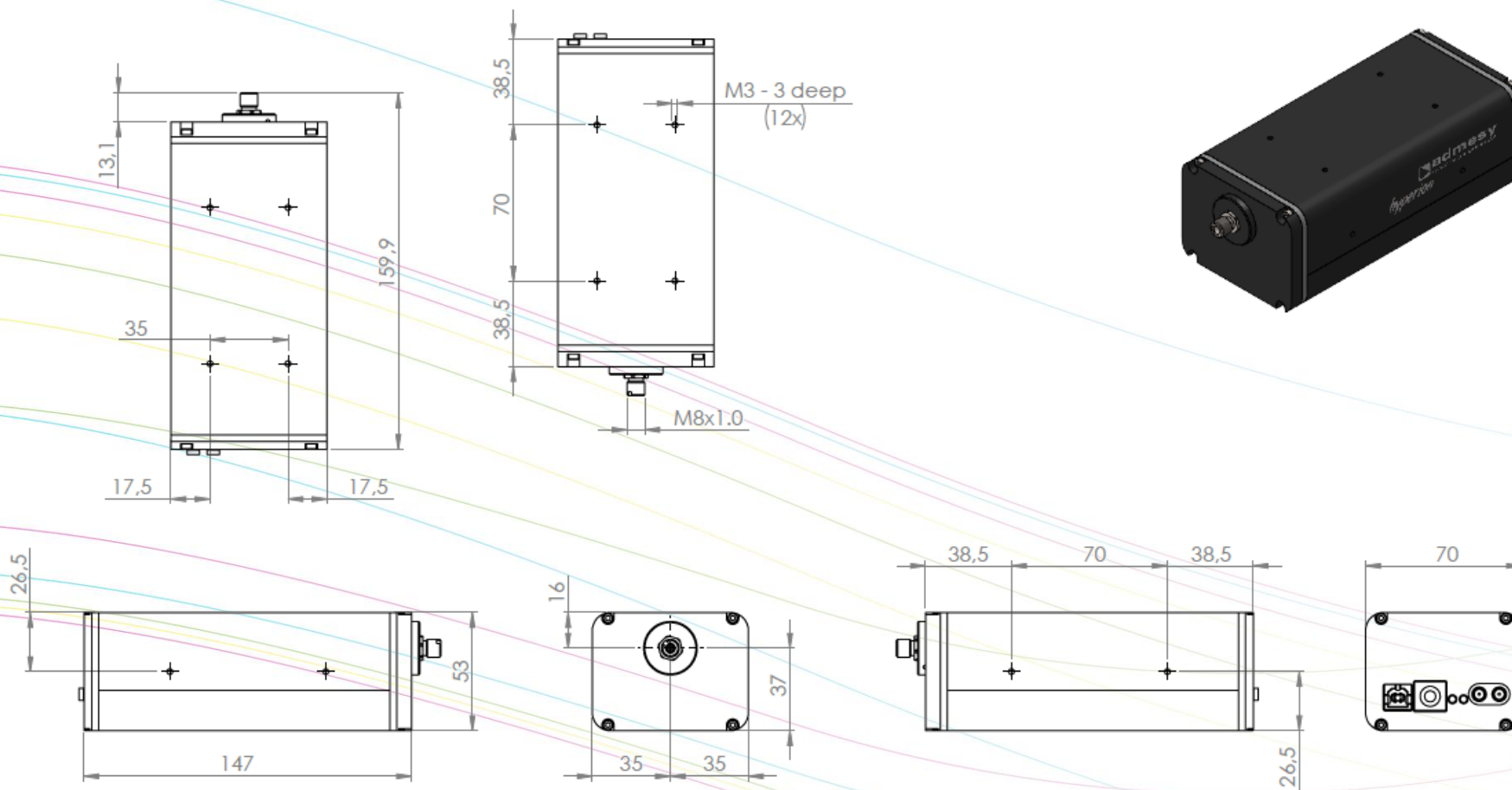
## 7 Hyperion 10mm dimensions







## 8 Hyperion M8 fiber dimensions





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