

MR-E-3 Development kit

The MR-E-3 driver is the next-generation, fully integrated driving solution for the Optotune MR-series 2D fast steering mirrors. It provides access to the full functionality of the mirrors, including open and closed loop control, with an increased control bandwidth, reduced dead- and settling time, and efficient PWM driving compared to the previous-generation driver MR-E-2. The MR-E-3 Development kit offers a plug-and-play solution for straightforward testing and device implementation.



Main features:

- Graphic user interface *Optotune Cockpit* for control via USB
- Communication interfaces:
 - USB
 - SPI, UART, I²C
 - Analog input (0 – 10 V)
- Software SDKs for Python and C# available
- RoHS, REACH and CE certified

Included in the MR-E-3 Development kit are the following parts

- MR-E-3 Base unit (MR-E-3 with international power supply, USB cable, and DIN rail kit)
- MR-E-3 Head unit (MR-series 2D mirror with MR-E-3 proxy board, base unit to proxy board cable and protective cover)



Mechanical specifications – base unit

Dimensions (L x W x H)	64 x 105 x 28.7	mm
Weight	226	g
USB connector	USB C	
Accepted DC barrel plug	2.1 I.D. x 5.5 O.D. x 10.0	mm

Mechanical specifications – head unit¹

Diameter	45	mm
Height	31.3	mm
Cable length x diameter	1000 x 4.5	mm
Weight	420	g

Electrical specifications

Number of current output channels	2	
Supply voltage	24 - 48 ($\pm 10\%$)	V
Current source type	Class - D	
Continuous output current per channel	0.5	A
Continuous Power consumption (MR-15-30)	10	W
Peak output current per channel	1	A
Max. peak power consumption	35	W
DAC resolution	16	bit
DAC sampling rate	40	kHz
Digital logic level	3.3 (5 V not tolerant)	V

Position feedback

Control loop frequency	40	kHz
Sampling rate	160	kHz
Proxy SPI clock frequency	25	MHz
Position readout jitter	500	ns
Controller dead-time	100	μ s
Analog input sampling rate (16 bit)	40	kHz

Environmental specifications

Operating temperature Base Unit	0 to +40	$^{\circ}$ C
Operating temperature Proxy Board	-20 to +85	$^{\circ}$ C
Storage temperature	-40 to +85	$^{\circ}$ C

¹ For more specifications of the MR-series 2D mirror that is incorporated in the head unit, please refer to the corresponding MR datasheet (e.g. [MR-15-30](#), [MR-10-30](#)).

Overview of available standard products

Standard Product	Mirror type included	Components included
MR-E-3 Base unit	N/A	MR-E-3 Base unit controller box International power supply USB cable DIN rail kit
MR-E-3 Mirror head unit (gold)	MR-15-30-G-25x25D	Mirror head (incl. mirror and cable) MR-E-3 proxy board Base unit to proxy board cable Protection cover
MR-E-3 Mirror head unit (silver)	MR-15-30-PS-25x25D	Same as for MR-E-3 Mirror head unit (gold)
MR-E-3 Mirror head unit (DVIS)	MR-15-30-DVIS-25x25D	Same as for MR-E-3 Mirror head unit (gold)
MR-E-3 Custom mirror head unit	MR-C-15-30 MR-10-30-G MR-10-30-PS MR-15-30-6x6D-E MR-8-30	Same as for MR-E-3 Mirror head unit (gold)

Mechanical layout

The mechanical drawings of the MR-E-3 base unit is shown in Figure 1.

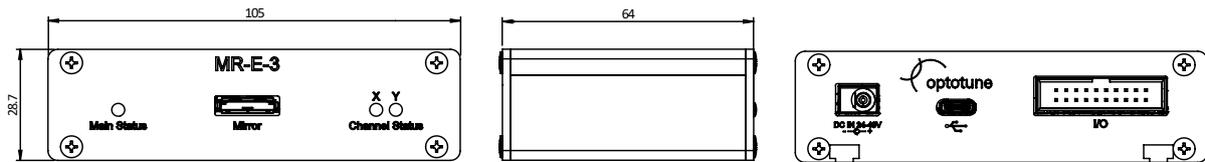


Figure 1: Mechanical drawing of the MR-E-3 base unit (unit: mm).

The mechanical drawings of the MR-E-3 head unit, cable, and assembly together are shown in Fig. 2:

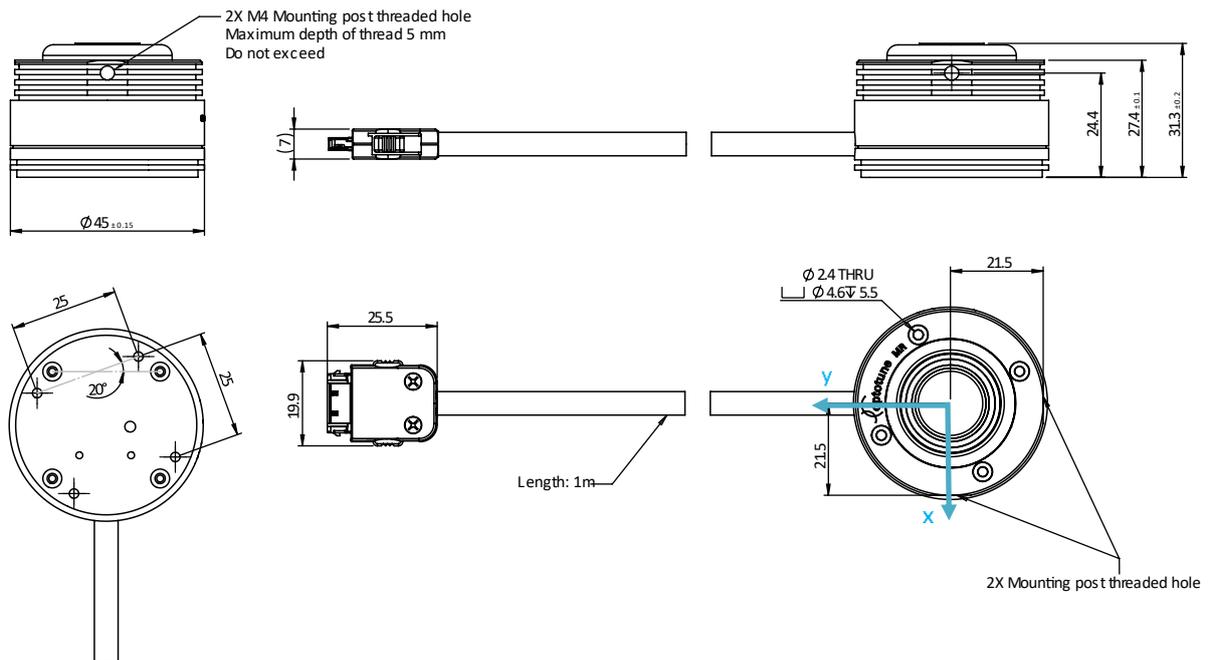


Figure 2: Mechanical drawing of the MR-E-3 head unit and cable assembly (unit: mm).

Electrical layout

Fig. 3 shows the back and front panel of MR-E-3 base unit. The back panel has three connectors. In addition to the power connector, it features a USB Type-C connector for control through Optotune Cockpit software, software development kits, and for simple and pro mode serial communication. The I/O connector offers miscellaneous features and provides connections for communication interfaces such as SPI, UART, I²C, or analog voltage operation. The pin-out is given in Table 1. The front panel has only mirror connector.



Figure 3: Back and front panel of MR-E-3 base unit with pin assignment.

Table 1. I/O Connector pin-out.

Position	Function	Description
1	AI_X	Analog Input for X axis
2	AI_Y	Analog Input for Y axis
3	Signal GND	Digital and analog ground
4	External VCC Enable	Enable signal for external power supply (connect to Power GND to activate)
5	NRST	Reset signal for driver (connect to GND to activate)
6	SYNC_Y	Trigger Input/Output for Y axis ¹
7	UART TX/ I2C SCL	Serial interface transmitter line / I2C clock line ²
8	SYNC_X	Trigger Input/Output for X axis ¹
9	UART RX/ I2C SDA	Serial interface receiver line / I2C data line ²
10	SPI_DATA_NRDY	SPI Data Not Ready
11	Proxy SPI_CLK	Proxy Board SPI CLK output ³
12	SPI_MOSI	SPI Master Output Slave input
13	Proxy SPI_CS	Proxy Board SPI Chip Select output – conversion start signal
14	SPI_MISO	SPI Master Input Slave output
15	Proxy SPI_MOSI	Proxy Board SPI MOSI output ³
16	SPI_CS	SPI Chip select
17	STABILITY	Mirror stable
18	SPI_CLK	SPI Clock
19	External VCC	External power supply input ¹
20	Power GND	Power GND of driver

¹ configurable input/output

² configurable external serial interface UART or I2C

³ Proxy Board SPI digital output with raw data

Thermal management

Heat in mirror is generated as a function of actuation current flowing through the coils and is conducted away through the backside. MR-E-3 proxy board has very low power consumption compared to previous generation MR-E-2.

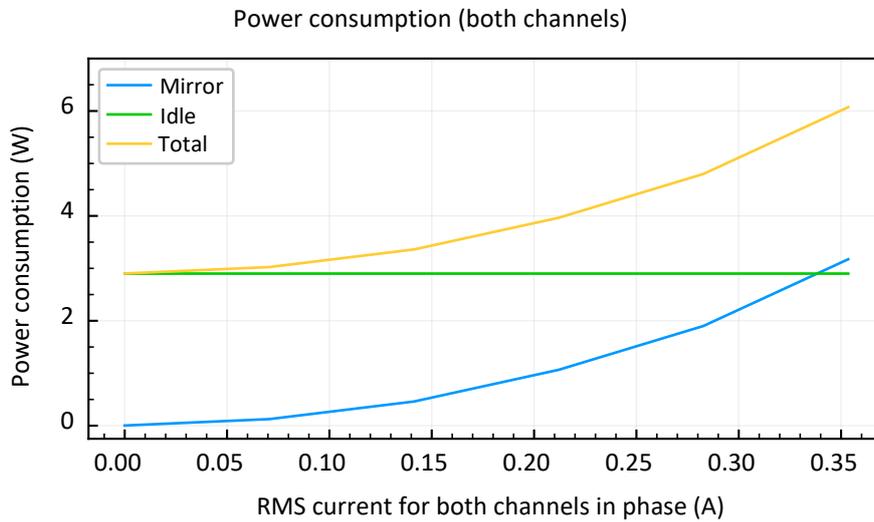


Figure 4: Power consumption dependencies.

Safety and compliance

The product fulfills the RoHS and REACH compliance standards. The customer is solely responsible for complying with all relevant safety regulations for integration and operation.

For more information on optical, mechanical, and electrical parameters, please contact sales@optotune.com.