7 Technical Specifications

7.1 Controller OFV-3001

7.1.1 General Data

Mains voltage:	100/115/230 VAC ±10%, 50/60 Hz, adjustable at the back panel
Power consumption:	max. 150 VA
Fuses:	1.0 A/slow-blow for 230 V 2.0 A/slow-blow for 100/115 V
Protection class:	I (protective grounding)
Operating temperature:	+5°C...+40°C (41°F...104°F)
Storage temperature:	−15°C...+65°C (5°F...149°F)
Relative humidity:	max. 80%, non-condensing
Dimensions:	450 mm × 355 mm × 135 mm
Weight:	10.8 kg
Calibration recommended:	every 2 years

Standards Applied

Electrical safety:	EN 60950 (IEC 950), EN 61010 (IEC 1010)
EMC:	Emission: EN 50081-1 (FCC Class B) Immunity: EN 50082-1, EN 50082-2 (IEC 801-1...-5)
Laser safety:	EN 60825-1 (CFR 1040.10, CFR 1040.11)

7.1.2 Interfaces

RS-232:	8 data bits, no parity, baud rate 4,800 or 9,600 9-pin female D-SUB cable, 1:1 wired
IEEE-488/GPIB:	according to IEEE-488.1
REMOTE FOCUS:	special interface for the hand terminal OFV-310
PC-FR.CTR.:	special interface for the PC-based displacement decoder OFV-600
SIGNAL:	0 V...3 V DC, proportional to the logarithm of the optical signal level, load resistance ≥ 10 kΩ

7.1.3 Low Pass Filter

For typical amplitude and phase frequency response, refer to section 4.2.2.

Filter type:	Bessel 3rd order
Cutoff frequencies:	5 kHz, 20 kHz, 100 kHz, adjustable
Frequency roll-off:	−60 dB/dec = −18 dB/oct
Stop band rejection:	>70 dB

7.1.4 Signal Voltage Output VELOCITY OUTPUT

General Data

Output swing: $20\,V_{p\text{-}p}$

Output impedance: $50\,\Omega$

Minimum load resistance: $10\,k\Omega$ (−0.5% additional error)

Overrange indicator threshold: typ. 95% of full scale

Maximum DC offset: ±20 mV

Measurement Ranges

Velocity decoder	Measurement range (scaling factor) $\frac{mm}{s}/V$	Full scale output (peak-peak) $\frac{mm}{s}$	Resolution[1] $\frac{\mu m}{s}$	Maximum frequency[2] kHz	Maximum acceleration g
OVD-01	1	20	0.3	20	150
	5	100	0.6	50	1,600
	25	500	0.8	50	8,000
	125	2,500	1.0	50	25,000
	1,000	20,000	2.0	50	200,000
OVD-02	5	100	0.5	250	8,000
	25	500	1.5	1,500	240,000
	125	2,500	2.0	1,500	1,200,000
	1,000	20,000	5.0	1,500	9,600,000

[1] Resolution is defined as the signal amplitude (rms) at which the signal-to-noise ratio is 0 dB in a 10 Hz spectral bandwidth (RBW), measured at 3M Scotchlite Tape®.

[2] -1 dB maximum error

Calibration Accuracy

Velocity decoder	Measurement range $\frac{mm}{s}/V$	Amplitude error @ T = (25 ±5) °C (T = (77 ±9) °F) % of rms reading	Amplitude error in the temperature range 5°C…40°C (41°F…104°F) % of rms reading
OVD-01	1…1,000	±1.0	±1.2
OVD-02	5	±1.0	±1.5
	25	±1.0	±2.0
	125 and 1,000	±1.0	±2.5

Conditions: sinusoidal vibration, f = 1 kHz, amplitude 70% of full scale range, load resistance ≥ 1 MΩ

Amplitude Linearity

Velocity decoder	Maximum linearity error[1]	
	One particular range % of rms reading	Overall % of rms reading
OVD-01	±0.5	±1.0
OVD-02	±1.0	±2.5

[1] Linearity error is defined as the amplitude-dependent, relative deviation of the scale factor referred to the scale factor under calibration conditions.

Amplitude Frequency Response (Flatness)

Velocity decoder	Measurement range $\frac{mm}{s}/V$	Max. additional error referred to f = 1kHz
OVD-01	1	0.5 Hz - 10 Hz : ±0.5dB 10 Hz - 15 kHz : ±0.1dB 15 kHz - 20 kHz : +0.1dB/−0.25dB
	5 and 25	0.5 Hz - 10 Hz : ±0.5dB 10 Hz - 20 kHz : ±0.1dB 20 kHz - 50 kHz : ±0.2dB
	125 and 1,000[1]	0 Hz - 20 kHz : ±0.1dB 20 kHz - 50 kHz : ±0.2dB
OVD-02	5	0.5 Hz - 10 Hz : ±0.5dB 10 Hz - 100 kHz : ±0.1dB 100 kHz - 250 kHz : +0.1dB/−1dB
	25; 125 and 1,000	0.5 Hz - 10 Hz : ±0.5dB 10 Hz - 250 kHz : ±0.1dB 250 kHz - 1.5 MHz: +0.5dB/−1dB

[1] These two measurement ranges can be used from the frequency 0Hz (full DC capability).

Phase Frequency Response

With the low pass filter switched off, the vibrometer behaves as a system of constant time delay i.e. the phase shift is proportional to the frequency. The phase shift depends, however, on the measurement range set. .

Velocity decoder	Measurement range $\frac{mm}{s}/V$	Time delay t_d (typ.) µs	Specific phase roll-off p_d (typ.) °/kHz
OVD-01	1	23.9	−8.6
	5	7.1	−2.56
	25 and 125	6.0	−2.15
	1,000	5.2	−1.9
OVD-02	5	6.4	−2.3
	25 and 125	1.9	−0.7
	1,000	0.9	−0.33

Harmonic Distortions

Velocity decoder	Measurement range $\frac{mm}{s}/V$	THD @ f = 1 kHz 10%...90% of full scale range
OVD-01	1	< 0.25% (< −52 dB)
	5; 25; 125 and 1,000	< 0.10% (< −60 dB)
OVD-02	5 and 25	< 0.20% (< −54 dB)
	125 and 1,000	< 0.30% (< −50 dB)

7.1.5 Signal Voltage Output DISPLACEMENT OUTPUT (optional)

General Data

Voltage swing: $16\,V_{p\text{-}p}$

Output impedance: $50\,\Omega$

Minimum load resistance: $10\,k\Omega$ (−0.5% additional error)

Measurement Ranges

Displacement decoder	Measurement range (scaling factor) µm/V	Full scale output (peak-peak) µm	Resolution[1] µm	Maximum velocity m/s	Bandwidth kHz	Max. frequency for specified accuracy kHz
OVD-10	20	320	0.08	2.5	0...250	100
	80	1,280	0.32	10	0...250	100
	320	5,120	1.3	10	0...250	100
	1,280	20,480	5.0	10	0...250	100
	5,120	81,920	20	10	0...250	100
OVD-20	0.5	8	0.002	0.06	0...25	10
and	2	32	0.008	0.25	0...75	15
OVD-40	8	128	0.032	1	0...75	25
	20	320	0.08	2.5	0...250	100
	80	1,280	0.32	10	0...250	100
	320	5,120	1.3	10	0...250	100
	1,280	20,480	5.0	10	0...250	100
	5,120	81,920	20	10	0...250	100

[1] The resolution is defined as 1 increment of the fringe counter output which is equivalent to a 4 mV output voltage step.

Calibration Accuracy

Amplitude error: ±1% of rms reading ±1 increment

Conditions: Sinusoidal vibration, f = 100 Hz, amplitude 50% of full scale range, load resistance ≥ 1 MΩ

Amplitude Linearity

Maximum linearity error: Ranges 20 µm/V...5,120 µm/V: ±1 increment

Ranges 0.5 µm/V...8 µm/V: ±2 increments

Trigger (CLEAR Input)

Threshold: +10 mV (typ.), rising edge

Hysteresis: 5 mV (typ.)

Maximum input voltage: ±14 V

Pulse rate: 40 Hz...16 kHz

Input impedance: > 0.5 kΩ (depending on the pulse frequency)

7.2 Sensor Head OFV-303/-353

7.2.1 General Data

Laser type:	helium neon
Wavelength:	633 nm
Cavity length:	205 mm
Laser safety class:	II
Laser output power:	< 1 mW
Power consumption:	ca. 15 W
Output center frequency:	40 MHz
Operating temperature:	+0°C ... +40°C (32°F ... 104°F)
Storage temperature:	−15°C ... +65°C (5°F ... 149°F)
Relative humidity:	max. 80%, non-condensing
Dimensions:	refer to figure 7.1
Weight:	3.5 kg

7.2.2 Optics

Front lens[1]		Long range (QR)	Mid range (MR)	Short range (SR)
Focal length	mm	100	60	30
Minimum stand-off distance[2]	mm	450	175	65
Aperture diameter ($1/e^2$)	mm	12	7	3.5
Spot size (typ.)	µm			
@ 175 mm		-	10	30
@ 450 mm		15	33	75
@ 1,000 mm		42	79	170
each additional meter		50	84	167
Maxima of visibility[3]		232 mm + n · 205 mm, n = 0; 1; 2; ...		

[1] A label on the side of the sensor head shows the front lens model which is fitted.

[2] The maximum stand-off distance depends on the back scattering properties of the object. It can range up to 250 m for the sensor head OFV-303 and a surface with reflective coating.

[3] Measured from the front panel of the sensor head.

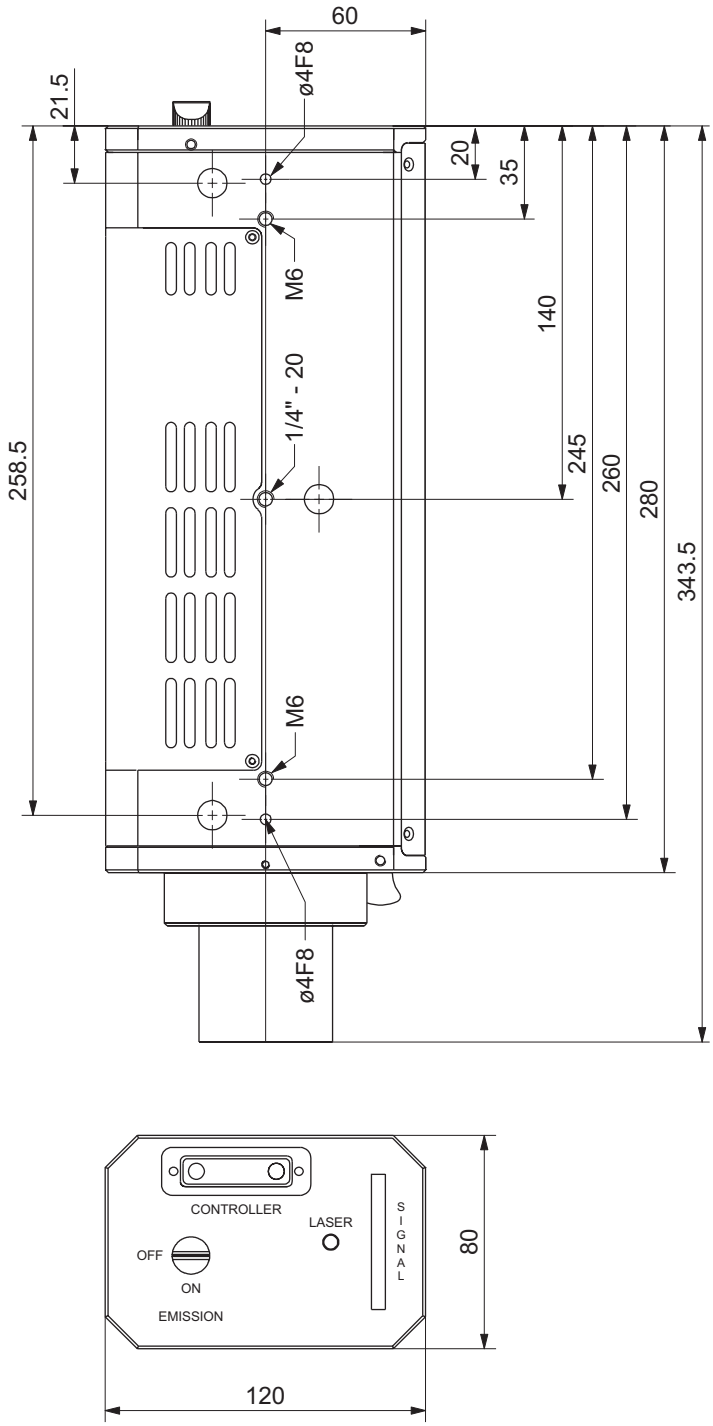

Figure 7.1: Rear view and bottom view of the sensor head OFV-303/-353 (dimensions not specified are given in mm)

7.3 Sensor Head OFV-511/-512

7.3.1 General Data

Laser type:	helium neon
Wavelength:	633 nm
Cavity length:	205 mm
Laser safety class:	II
Laser output power:	< 1 mW
Power consumption:	ca. 15 W
Output center frequency:	40 MHz
Operating temperature:	+0°C ... +40°C (32°F ... 104°F)
Storage temperature:	−15°C ... +65°C (5°F ... 149°F)
Relative humidity:	max. 80%, non-condensing
Minimum bending radius:	50 mm
Dimensions without cable:	235 mm × 355 mm × 140 mm
Weight:	approx. 8.0 kg
OFV-511	
Length of fiber cable:	2,000 mm (3,000 mm for option OFV-C-11)
OFV-512	
Length of fiber cable from	
- housing to Y-junction:	1,500 mm (2,400 mm for option OFV-C-21)
- Y-junction to fiber head:	500 mm (600 mm for option OFV-C-21)

7.3.2 Optics

		Mini sensor	Fiber head				
			OFV-101	OFV-102	OFV-200	OFV-130-3	OFV-130-5
Focal length	mm	16	20	20	50[1]	60	80
Minimum stand-off distance[2]	mm	60	80	80	600	55 ±2	76 ±2
Aperture diameter (1/e²)	mm	3.2	4	4	10	16	16
Spot size (typ.)	µm						
@ 55 mm		15	-	-	-	3	-
@ 76 mm		20	-	-	-	-	5
@ 100 mm		27	27	27	-	-	-
@ 300 mm		90	75	75	-	-	-
@ 1,000 mm		320	250	250	100	-	-
@ each additional meter		320	250	250	100	-	-

[1] With standard objective (Nikon)

[2] The maximum stand-off distance depends on the back scattering properties of the object.

Maxima of Visibility

Sensor head	Maxima of visibility
OFV-511[1]	135 mm + n · 205 mm, n = 0; 1; 2; ...
OFV-512[2] (two point measurement)	0 mm + n · 205 mm, n = 0; 1; 2; ...
OFV-512[1] (single point measurement with the reference head OFV-151)	63 mm + n · 205 mm, n = 0; 1; 2; ...

[1] Measured from the shoulder of the connector for the mini sensor or the fiber head

[2] Difference between the stand-off distances of both arms

Focusing motion

A circular motion of the laser beam is visible during focusing. At 1 m stand-off distance, the maximum diameter of the circle is:

for the mini sensor: 5 mm

for the fiber head OFV-101: 1 mm

for the fiber head OFV-102: 0.25 mm

Dimensions of the Fiber Heads

OFV-101

Length: ca. 43 mm

Diameter: 20 mm

Diameter of the focusing ring: 22.5 mm

OFV-102

Length: 57 mm

Diameter: 20 mm

Diameter of the focusing ring: 24 mm

OFV-130-3, OFV-130-5

Length: ca. 105 mm

Diameter: 20 mm

Diameter of the focusing ring: 24 mm

OFV-200

Dimensions incl. objective: 165 mm x 79 mm x 68 mm

Dimensions of the Side Exit Heads

OFV-C-102

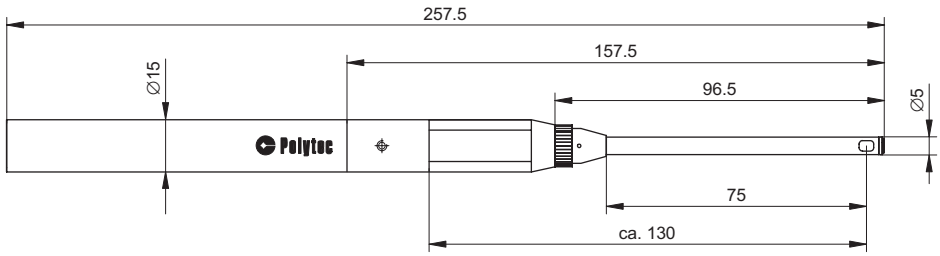

Figure 7.2: View of the side exit head OFV-C-102 (dimensions not specified are given in mm)

OFV-C-110

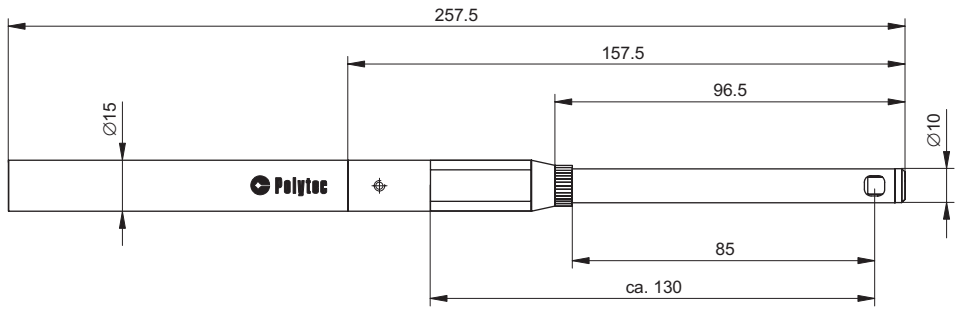

Figure 7.3: View of the side exit head OFV-C-110 (dimensions not specified are given in mm)

Dimensions of the Reference Heads

OFV-151

Length:	ca. 70 mm
Diameter:	20 mm
Diameter of the focusing ring:	22.5 mm

OFV-152 (refer also to figure B.1)

Length:	ca. 310.5 mm
Diameter:	20 mm