

# 2022

## CUSTOMIZED SOLUTIONS (OEM) 1.4

SENSORS



## 1.4 Customized Solutions (OEM)

### 1.4.1 Introduction

#### Ophir – The World Leading Source for Custom Designed Laser Measurement Solutions

**Many laser systems manufacturers need to have a measuring capability built into their systems.**

Ophir is the world's leading supplier of Customized Solutions (OEM) laser power/energy measurement instrumentation which can be built into host systems (such as medical, industrial, etc.). With extensive experience accumulated in the field, Ophir offers the largest variety of Customized Solutions (OEM) products and is therefore best able to satisfy customer requirements.

#### Many configurations possible

A Customized Solutions (OEM) product is usually needed to monitor laser performance in the system, and possibly to provide fast feedback for system control. Depending on your application, various configurations can be used, such as:

- Just a sensor, with raw analog output
- Sensor with electronics providing an amplified analog or digital output
- Complete instrument, including numeric display and/or PC interface
- Custom designed solution for special requirements

In the following pages, you will see a range of "standard" Customized Solutions (OEM) sensors available; these are actually families of existing Customized Solutions (OEM) sensors with typical specifications shown. They can be tailored as needed to fit your specific requirements.

In addition to the products described below, Ophir has developed hundreds of other Customized Solutions (OEM) products. Simply contact your Ophir representative and specify your needs.

## 1.4.2 Thermal and Photodiode Customized Solutions (OEM) Sensors

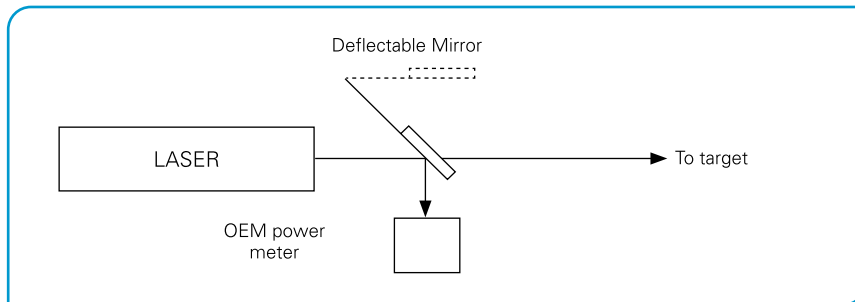
### 1.4.2.1 Sensor Usage

Ophir pioneered compact self-contained laser power meter sensors with built-in amplifiers. These sensors are easy to install and give a calibrated voltage proportional to power. They contain all the electronics needed including a speed up circuit to increase the speed of response of the sensor to the order of 1s, 0-95%. Connections to the sensors are simple, with the host providing DC power and the sensor providing a voltage or digital output proportional to power.

In most cases, the sensor is used in one of three ways:

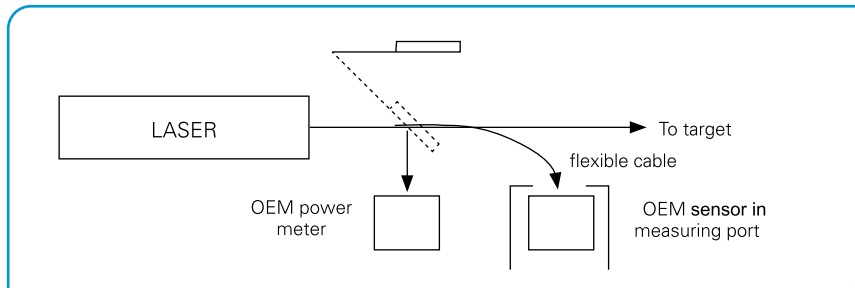
#### 1. Beam Dump Mode

For lasers, such as surgical lasers, which are used in short bursts, the sensor is a beam dump with full power on it at all times except for the short periods of beam use when the beam is deflected to the work area.



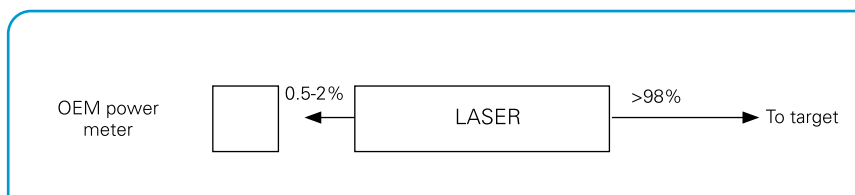
#### 2. Sampling Mode

In this mode, the laser is usually available to the user and is only deflected to the monitor for short times when the beam is sampled by the sensor. Sampling is performed with a deflection mirror or with an output fiber optic cable which is inserted into the measuring port from time to time.



#### 3. Rear Leak Mode

In this mode, a small fraction (0.5-2%) of the laser beam "leaks" out of the rear mirror of the laser and is constantly monitored by the sensor.



## 1.4.2.2 Advantages of Ophir Thermal and Photodiode Customized Solutions (OEM) Sensors

### Compactness

Available in various sizes down to 38x38x25mm as described here and in addition even more compact designs for applications with more limited space.

### Versatility

Ophir offers OEM sensors for almost any type of laser, for any power or configuration. These sensors can measure from pW or  $\mu\text{J}$  to Kilowatts or hundreds of Joules, and can be cooled with water, air or conduction. Ophir offers a large selection of standard OEM sensors at competitive prices and with excellent delivery times. If required, the package, including the connectors, can be customized to customer specifications.

### Reliability and accuracy

Ophir's thermal measuring sensors use the reliable and accurate thermopile disc principle: the output is a low impedance voltage proportional to power. Suitable absorbers which will not burn out or change reading with high power density lasers are available for any application. Ophir photodiode OEM sensors have very wide dynamic range and with software switchable ranges, one can easily cover 5 decades of intensity.

### Calibration

Ophir is an accredited calibration laboratory per ISO/IEC 17025. With a wide variety of calibration sources, Ophir sensors can be factory calibrated at most user required wavelengths.

In addition to the sensors described below, Ophir offers a number of other OEM sensors with larger aperture, diffusers in front, special absorbers and other special features. Ophir also offers an OEM measuring set consisting of a sensor and smart meter.

### Possible configurations of thermal or photodiode Customized Solutions (OEM) products include:

- **Sensor with amplified analog output** – purchasing a sensor mounted into a housing with amplifier reduces noise and allows you to get a factory calibrated unit with optimized response time acceleration
- **Sensor with RS232 interface** – for direct RS232 interface of the Customized Solutions (OEM) sensor with the host computer
- **Sensor with USB interface** – for direct USB interface of the Customized Solutions (OEM) sensor with the host computer
- **Sensor with Ethernet interface** – for direct Ethernet interface of the Customized Solutions (OEM) sensor with the host computer. Requires separate power supply connection from rear of sensor
- **Complete solution including sensor and meter** – this provides a visual display for the operator (numeric, Go/No Go, etc.). This can also be in addition to the RS232 or USB output
- **Disc with raw analog output** – the lowest cost solution when there is no need for an amplified signal, and a relative measurement is enough. Typical output voltage is on the order of mV/W
- **Disc with separate amplifier board** – when space is critical, and amplified analog output is needed

## 1.4.2.3 Standard Customized Solutions (OEM) Thermal and Photodiode Sensors

### 100pW to 3W

#### Features

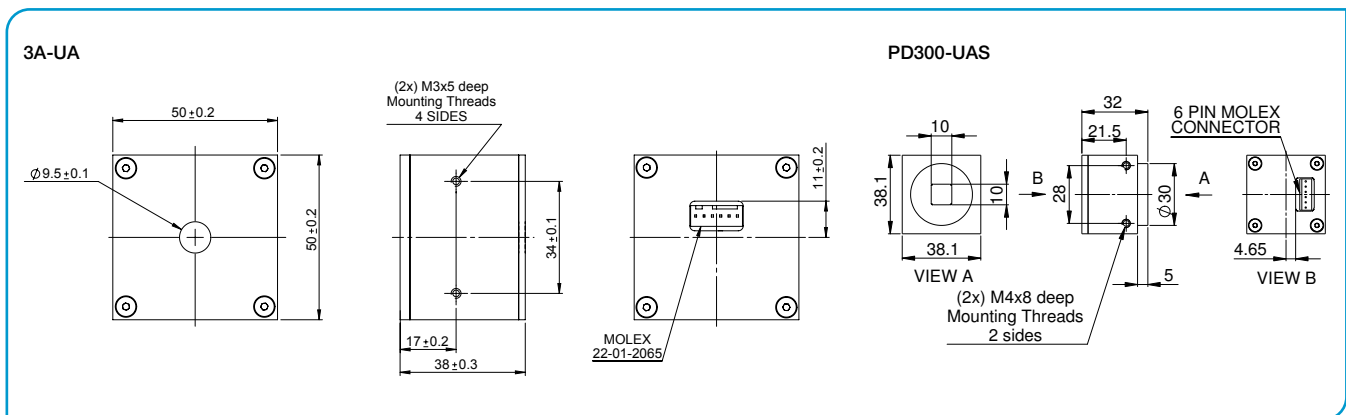
- Conduction cooled
- Thermal sensors are spectrally flat
- Analog or RS232 output
- Wide dynamic range, switchable ranges
- Selectable wavelengths



These specifications refer to standard OEM sensors, and are to be understood as generic, describing sensor families. Ophir will be happy to help you with a specific solution for your particular application.

Model	3A-UA	PD300-UAS
Type	RS232 or Analog output	RS232 or Analog output
Features	Measures very low power, built in amplifier	Small size, built in amplifier, wide dynamic range, detector can be flush with top
Absorber Type	Broadband	Photodiode
Spectral Range $\mu\text{m}$	0.19 – 20 <sup>(c)</sup>	0.2 – 1.1 <sup>(c)</sup>
Aperture mm	$\varnothing 9.5$	10x10
Maximum Power <sup>(a)</sup>	3W	Up to 50mW
Power Mode		
Minimum Power	100 $\mu\text{W}$	As low as 100pW
Power Noise Level	<8 $\mu\text{W RMS}$ <sup>(d)</sup>	As low as 1pW
Thermal Drift (over 30 minutes)	< $\pm 10\mu\text{W}$ <sup>(d)</sup>	
Maximum Average Power Density W/cm <sup>2</sup>	1000	~ 50
Response Time (0-95%), typ. (sec)	1.8	0.2
Calibration Uncertainty	$\pm 1.9\%$	$\pm 1.1\%$ 430-1000nm <sup>(e)</sup>
Power Accuracy $\pm\%$ at Calibrated Wavelength	3	3
Linearity with Power $\pm\%$	1.5	1
Amplifier Power Supply (UA, UAS, UAE versions)	+6V to +24V	+6V to +24V
Energy Mode		
Maximum Energy	2J	NA
Minimum Energy	20 $\mu\text{J}$	NA
Energy Accuracy $\pm\%$ at calibrated wavelength	5	NA
Maximum Energy Density J/cm <sup>2</sup>		
<100ns	0.3	NA
0.5ms	1	NA
2ms	2	NA
10ms	4	NA
Cooling	Conduction	Conduction
Connections	6 pin Molex <sup>(b)</sup>	6 pin Molex <sup>(b)</sup>
Dimensions	50x50x38mm	38x38x32mm
Compliance	RoHS, China RoHS	RoHS, China RoHS
Part number	Consult Ophir Representative	Consult Ophir Representative

Notes: (a) With analog "UA/UAS" version, maximum power is also limited by maximum output voltage where output voltage is at most 2V less than input voltage  
 (b) 6 pin Molex connections: RS232 input, Ground, +Voltage, Analog signal out, high/low voltage or switch input when used, RS232 output  
 (c) Calibrated at customer selected wavelength or wavelengths  
 (d) In a quiet thermal environment with FOV limiting  
 (e) For calibration uncertainty of wavelengths outside of this range see table on page 24



## 1.4.2.3 Standard Customized Solutions (OEM) Thermal Sensors

### 10mW to 20W

#### Features

- Conduction cooled
- Thermal sensors are spectrally flat
- Analog, RS232, USB compatible and Ethernet output



These specifications refer to standard OEM sensors, and are to be understood as generic, describing sensor families. Ophir will be happy to help you with a specific solution for your particular application.

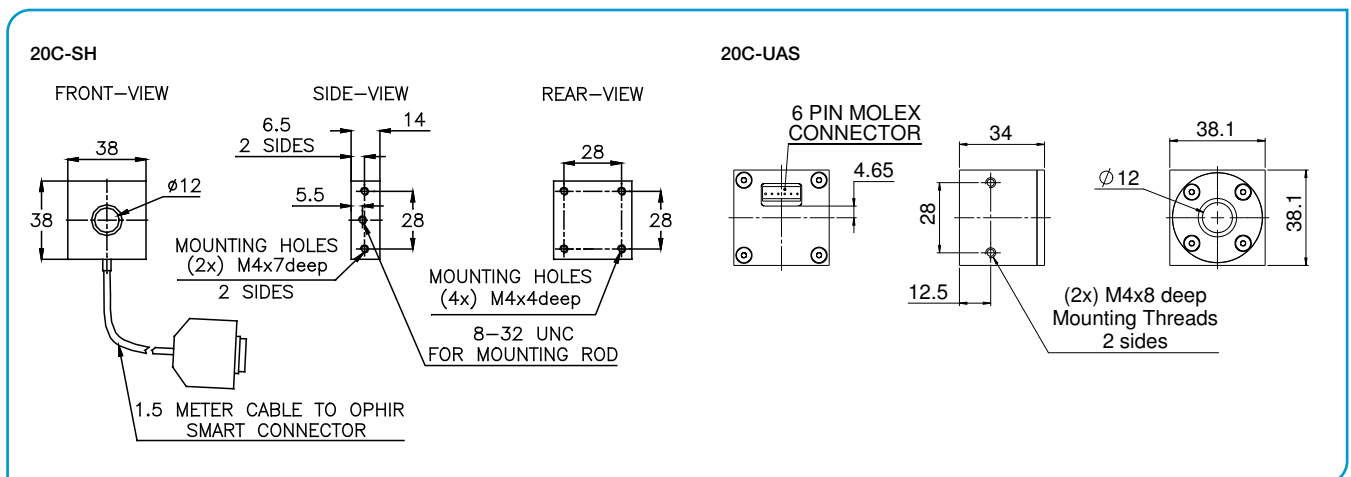
Model	20C-SH	20C-UAS	20C-UAU / 20C-UAE
Type	Smart sensor	RS232 or Analog output	UAU – USB compatible output UAE – Ethernet output
Features	Compact smart sensor	Small size, built in amplifier	Small size, external amplifier
Absorber Type	Broadband	Broadband	Broadband
Spectral Range $\mu\text{m}$	0.19 - 20	0.19 - 20 <sup>(c)</sup>	0.19 - 20 <sup>(c)</sup>
Absorption	~88%	~88%	~88%
Aperture mm	$\varnothing 12$	$\varnothing 12$	$\varnothing 12$
Power Mode			
Maximum power <sup>(a)</sup> free standing	4W continuous, 20W for 1.8 min	4W continuous, 20W for 1.8 min	4W continuous, 20W for 1.8 min
heat sinked	20W	20W	20W
Minimum power	10mW	10mW	10mW
Power Noise Level	0.2mW	0.2mW	0.2mW
Maximum Average Power Density kW/cm <sup>2</sup>	23 at 20W 35 at 4W	23 at 20W 35 at 4W	23 at 20W 35 at 4W
Response Time (0-95%), typ. (sec)	0.8	0.8	0.8
Calibration Uncertainty $\pm\%$	1.9	1.9	1.9
Power Accuracy $\pm\%$ at calibrated wavelength	3	3	3
Linearity with Power $\pm\%$	1	1	1
Amplifier power supply	NA	+6V to +24V	UAU - Via Host USB UAE +6V to +24V
Energy Mode			
Maximum Energy	10J	10J	10J
Minimum Energy	6mJ	6mJ	6mJ
Energy Accuracy $\pm\%$ at calibrated wavelength	5	5	5
Maximum Energy Density J/cm <sup>2</sup>			
<100ns	0.3	0.3	0.3
0.5ms	5	5	5
2ms	10	10	10
10ms	30	30	30
Cooling	Conduction	Conduction	Conduction
Connections	Ophir smart plug	6 pin Molex <sup>(b)</sup>	UAU - Mini B USB connector UAE - Ethernet for communication M12 5 pin for power
Dimensions	38x38x14mm	38x38x34mm	38x38x14mm
Compliance	CE, UKCA, China RoHS	RoHS, China RoHS	RoHS, China RoHS
Part number	7Z02602	Consult Ophir Representative	Consult Ophir Representative

Note: (a) With analog \*UA/UAS\* version, maximum power is also limited by maximum output voltage where output voltage is at most 2V less than input voltage

Note: (b) 6 pin Molex connections: RS232 input, Ground, +Voltage, Analog signal out, high/low voltage or switch input when used, RS232 output

Note: (c) Calibrated at customer selected wavelength

\* For UAE & UAU drawings please see pages 125-126



## 1.4.2.3 Standard Customized Solutions (OEM) Thermal Sensors

### 300mW to 100W

#### Features

- Conduction cooled
- UAF version can give analog voltage output or digital RS232 output and can measure power or energy. Can also have multiple switchable ranges and/or multiple switchable wavelengths
- UAU and UAE versions are similar to the UFA version but UAU operates via the USB terminal of the PC and UAE via an Ethernet connection

L30C-SH / UAF /  
UAU / UAE



L30C-LP2-26-SH



These specifications refer to standard OEM sensors, and are to be understood as generic, describing sensor families. Ophir will be happy to help you with a specific solution for your particular application.

Model	L30C-SH	L30C-LP2-26-SH	L30C-UAF	L30C-UAU / L30C-UAE
Type	Smart sensor	Smart sensor for high powers and energies	RS232 or Analog output	UAU – USB compatible output UAE – Ethernet output
Features	Medium aperture smart sensor	High pulse energy and intermittent power	Medium aperture, built in amplifier	Medium aperture, built in amplifier
Absorber Type	Broadband	LP2	Broadband	Broadband
Spectral Range $\mu\text{m}$	0.19 - 20	0.25 – 2.2	0.19 - 20 <sup>(c)</sup>	0.19 - 20 <sup>(c)</sup>
Absorption	~88%	>94% from 0.25 to 1.1 $\mu\text{m}$	~88%	~88%
Aperture mm	Ø26	Ø26	Ø26	Ø26
Power Mode				
Maximum power <sup>(a)</sup>	free standing heat sunked			
	10W continuous, 100W for 2 min 100W	10W continuous, 100W for 2 min 100W	10W continuous, 100W for 2 min 100W	10W continuous, 100W for 2 min 100W
Minimum power	300mW	300mW	300mW	300mW
Power Noise Level	15mW	15mW	15mW	15mW
Maximum Average Power Density kW/cm <sup>2</sup>	14 at 100W 28 at 10W	42 at 100W	14 at 100W 28 at 10W	14 at 100W 28 at 10W
Response Time (0-95%), typ. (sec)	1.5	1.5	1.5	1.5
Calibration Uncertainty $\pm\%$	1.9	1.9	1.9	1.9
Power Accuracy $\pm\%$ at calibrated wavelength	3	3 <sup>(d)</sup>	3	3
Linearity with Power $\pm\%$	1.5	1.5	1.5	1.5
Amplifier power supply	NA	NA	+6V to +24V	UAU - Via Host USB UAE +6V to +24V
Energy Mode				
Maximum Energy	100J	2000J	100J	100J
Minimum Energy	30mJ	30mJ	30mJ	30mJ
Energy Accuracy $\pm\%$ at calibrated wavelength	5	5 <sup>(e)</sup>	5	5
Maximum Energy Density J/cm <sup>2</sup>				
<100ns	0.3	0.1	0.3	0.3
0.5ms	5	50	5	5
2ms	10	130	10	10
10ms	30	400	30	30
>300ms	NA	See below <sup>(f, g)</sup>	NA	NA
Cooling	Conduction	Conduction	Conduction	Conduction
Connections	Ophir smart plug	Ophir smart plug	6 pin Molex <sup>(b)</sup>	UAU - Mini B USB connector UAE - Ethernet for communication M12 5 pin for power
Dimensions	60x60x38mm	60x60x38mm	60x60x38mm	60x60x38mm
Compliance	CE, UKCA, China RoHS	CE, UKCA, China RoHS	RoHS, China RoHS	RoHS, China RoHS
Part number	<b>773434</b>	<b>7Z02775</b>	<b>Consult Ophir Representative</b>	<b>Consult Ophir Representative</b>

Note: (a) With analog "UAF" versions, sensor voltage output is accurate up to 2v below lowest level of supply voltage, taking into account supply voltage ripple

Note: (b) 6 pin Molex connections: RS232 input, Ground, +Voltage, Analog signal out, high/low voltage or switch input when used, RS232 output

Note: (c) Calibrated at customer selected wavelength

Note: (d) Above 1.1 $\mu\text{m}$  there is an additional calibration uncertainty of up to 2%

Note: (e) From 20J to 2000J

Note: (f) Long pulses (0.5 – 4s) can be used to measure power of high power lasers by measuring the energy of a short exposure. The StarBright, Juno, Juno+ and Centauri meters have a Pulsed Power mode where the user may specify the pulse width and get a reading directly in units of power for this short exposure energy measurement. See also page 79

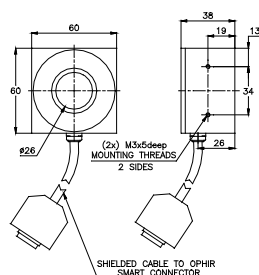
Note: (g) Recommended exposure times and 1/e<sup>2</sup> Gaussian beam diameters for very long pulses.

Laser Power W	Recommended Exposure s	Number of shots before cooling down	Min 1/e <sup>2</sup> beam dia. mm
100	4	20	9
500	1	20	9
1000	1	10	13
2000	1	5	17
4000	0.5	5	22

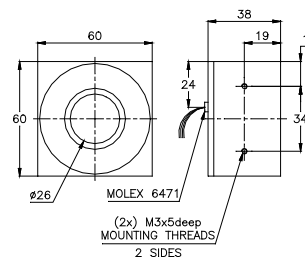
Total energy for a series of measurements should not exceed 2kJ.  
Recommended time between shots 12s.

\* For UAE & UAU drawings please see pages 125-126

L30C-SH / L30C-LP2-26-SH



L30C-UAF





## 1.4.2.3 Standard Customized Solutions (OEM) Thermal Sensors

### 60mW to 100W

#### Features

- Conduction cooled
- Spectrally flat
- UAF axial thermopile has very fast response time – 50ms
- Standard UAF version can give analog voltage output or digital RS232 output and can measure power or single shot energy. Can also have multiple switchable ranges and/or multiple switchable wavelengths
- UAU and UAE versions are similar to the UAF version but UAU operates via the USB terminal of the PC and UAE via an Ethernet connection

100C-SH / 100C-UAF /  
100C-UAU / 100C-UAE



100W-AXL-UAF



These specifications refer to standard OEM sensors, and are to be understood as generic, describing sensor families. Ophir will be happy to help you with a specific solution for your particular application.

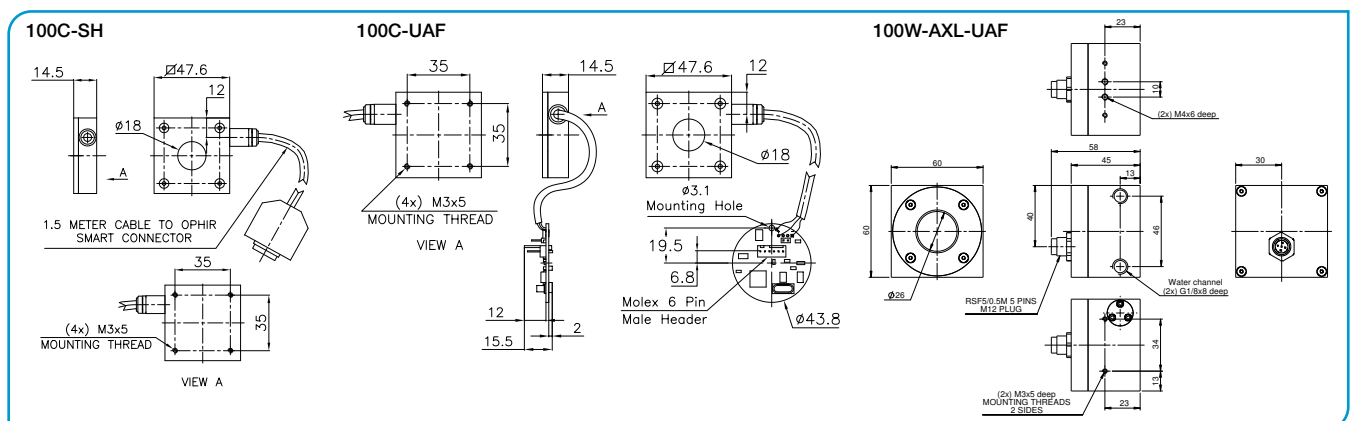
Model	100C-SH	100C-UAF / 100C-UAU / 100C-UAE	100W-AXL-UAF
Type	Smart sensor	UAF – Analog or RS232 output UAU – USB compatible output UAE – Ethernet output	RS232 or Analog output
Features	Low profile, smart sensor	Low profile, various outputs	Very fast response ~50ms
Absorber Type	Broadband	Broadband	PF
Spectral Range $\mu\text{m}$	0.19 - 20	0.19 - 20 <sup>(c)</sup>	0.19 - 20 <sup>(c)</sup>
Absorption	~88%	>94% from 0.25 to 1.1 $\mu\text{m}$	~88%
Aperture mm	$\varnothing$ 18	$\varnothing$ 18	$\varnothing$ 26
Power Mode			
Maximum power <sup>(a)</sup>	free standing 4W continuous, 20W for 1.8 min heat sinked 100W	4W continuous, 20W for 1.8 min 100W	100W water cooled only
Minimum power	60mW	60mW	400mW
Power Noise Level	3mW	3mW	20mW
Maximum Average Power Density kW/cm <sup>2</sup>	30 at 4W 14 at 100W	30 at 4W 14 at 100W	0.4
Response Time (0-95%), typ. (sec)	1.2s	1.2s	50ms 0-90%
Calibration Uncertainty $\pm\%$	1.9	1.9	1.9
Power Accuracy $\pm\%$ at calibration wavelength	3	3	3 for beam diameter >8mm
Linearity with Power $\pm\%$	1	1	2
Amplifier power supply	NA	UAF +6V to +24V UAU - Via Host USB UAE +6V to +24V via separate connector	+12V to +24V
Energy Mode			
Maximum Energy	NA	NA	NA
Minimum Energy	NA	NA	NA
Maximum Energy Density J/cm <sup>2</sup>			
<100ns	0.3	0.3	1.5
0.5ms	5	5	7
2ms	10	10	15
10ms	30	30	40
Cooling	Conduction	Conduction	Water
Connections	Ophir smart plug	UAF - 6 pin Molex <sup>(b)</sup> UAU - Mini B USB connector UAE - Ethernet for communications and 5 pin for power	6 pin Molex <sup>(b)</sup>
Dimensions	48x48x14.5mm	48x48x14.5mm	60x60x45mm
Compliance	CE, UKCA, China RoHS	RoHS, China RoHS	RoHS, China RoHS
Part number	7Z02680	Consult Ophir Representative	Consult Ophir Representative

Note: (a) With analog "UAF" versions, sensor voltage output is accurate up to 2v below lowest level of supply voltage, taking into account supply voltage ripple

Note: (b) 6 pin Molex connections: RS232 input, Ground, +Voltage, Analog signal out, high/low voltage or switch input when used, RS232 output

Note: (c) Calibrated at customer selected wavelength

\* For UAE & UAU drawings please see pages 125-126





## 1.4.2.3 Standard Customized Solutions (OEM) Thermal Sensors

### 60mW to 150W

#### Features

- Conduction or water cooled
- Spectrally flat
- UAF version can give analog voltage output or digital RS232 output and can measure power or energy. Can also have multiple switchable ranges and/or multiple switchable wavelengths
- UAU and UAE versions are similar to the UAF version but UAU operates via the USB terminal of the PC and UAE via an Ethernet connection



These specifications refer to standard OEM sensors, and are to be understood as generic, describing sensor families. Ophir will be happy to help you with a specific solution for your particular application.

Model	150C-SH	150C-UAF	150W-UAF	150C-UAU / UAE 150W-UAU / UAE
Type	Smart sensor	RS232 or Analog output	RS232 or Analog output	Same as UAF but with: UAU – USB compatible output UAE – Ethernet output
Features	High power, smart sensor	High power, built-in amplifier	High power, built-in amplifier, water cooled	High power, built-in amplifier, water cooled
Absorber Type	Broadband	Broadband	Broadband	
Spectral Range $\mu\text{m}$	0.19 - 20	0.19 - 20 <sup>(c)</sup>	0.19 - 20 <sup>(c)</sup>	
Absorption	~88%	~88%	~88%	
Aperture mm	$\varnothing 18$	$\varnothing 18$	$\varnothing 18$	
Power Mode				
Maximum power <sup>(a)</sup> free standing	5W continuous, 150W for 1 min	5W continuous, 150W for 1 min	150W water cooled	
heat sinked	100W	100W	NA	
Minimum power	60mW	60mW	100mW	
Power Noise Level	3mW	3mW	5mW	
Maximum Average Power Density $\text{kW}/\text{cm}^2$	30 at 5W 20 at 60W	30 at 5W 20 at 60W	12 at 150W	
Response Time (0-95%), typ. (sec)	1.2	1.2	1.2	
Calibration Uncertainty $\pm\%$	1.9	1.9	1.9	
Power Accuracy $\pm\%$ at calibration wavelength	3	3	3	
Linearity with Power $\pm\%$	1	1	1	
Amplifier power supply	NA	+6V to +24V	+6V to +24V	UAU - Via Host USB UAE +6V to +24V
Energy Mode				
Maximum Energy	100J	100J	100J	
Minimum Energy	20mJ	20mJ	50mJ	
Energy Accuracy $\pm\%$ at calibrated Wavelength	5	5	5	
Maximum Energy Density $\text{J}/\text{cm}^2$				
<100ns	0.3	0.3	0.3	
0.5ms	5	5	5	
2ms	10	10	10	
10ms	30	30	30	
Cooling	Conduction	Conduction	Water	
Connections	Ophir smart plug	6 pin Molex <sup>(b)</sup>	6 pin Molex <sup>(b)</sup>	UAU - Mini B USB connector UAE - Ethernet for communication M12 5 pin for power
Dimensions	50.8x50.8x33mm	50x50x38mm	50x50x38mm	
Compliance	CE, UKCA, China RoHS	RoHS, China RoHS	RoHS, China RoHS	RoHS, China RoHS
Part number	7N77023 <sup>(d)</sup>	Consult Ophir Representative	Consult Ophir Representative	Consult Ophir Representative

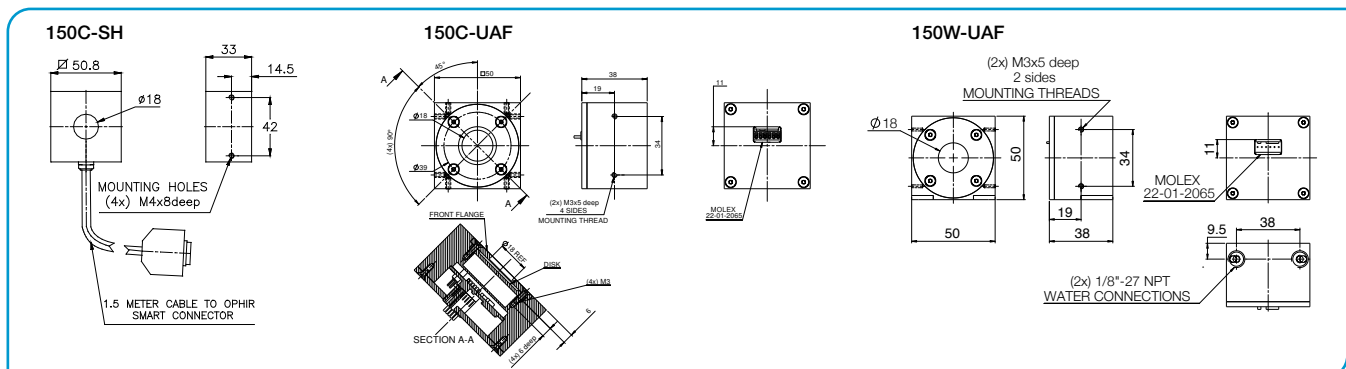
Note: (a) With analog "UAF" versions, sensor voltage output is accurate up to 2v below lowest level of supply voltage, taking into account supply voltage ripple

Note: (b) 6 pin Molex connections: RS232 input, Ground, +Voltage, Analog signal out, high/low voltage or switch input when used, RS232 output

Note: (c) Calibrated at customer selected wavelength

Note: (d) P/N 7N77023 replaces P/N 77023

\* For UAE & UAU drawings please see pages 125-126



# 1.4.2.3 Standard Customized Solutions (OEM) Thermal Sensors

## 0.2W to 600W

### Features

- Conduction and water cooled
- Spectrally flat
- UAF version can give analog voltage output or digital RS232 output and can measure power or energy. Can also have multiple switchable ranges and/or multiple switchable wavelengths
- UAU and UAE versions are similar to the UAF version but UAU operates via the USB terminal of the PC and UAE via an Ethernet connection

L150C-UAF / UAU / UAE

L250W-UAF / UAU / UAE  
L300W-UAF / UAU / UAE

600W-UAF / UAU / UAE



These specifications refer to standard OEM sensors, and are to be understood as generic, describing sensor families. Ophir will be happy to help you with a specific solution for your particular application.

Model	L150C-UAF	L250W-UAF / L300W-UAF	600W-UAF	UAU / UAE versions
Type	RS232 or Analog output	RS232 or Analog output	RS232 or Analog output	Same as UAF but with: UAU - USB compatible output UAE - Ethernet output
Features	Large aperture, built-in amplifier	Large aperture, built-in amplifier, water cooled	High power, built-in amplifier, water cooled	
Absorber Type	Broadband	Broadband	LP2	
Spectral Range $\mu\text{m}$	0.19 - 20 <sup>(c)</sup>	0.19 - 20 <sup>(c)</sup>	0.35 - 2.2	
Absorption	~88%	~88%	>94% from 0.35 to 1.1 $\mu\text{m}$	
Aperture mm	$\varnothing 50$	$\varnothing 50$	$\varnothing 26$	
Power Mode				
Maximum power <sup>(a)</sup> free standing	20W for 3 minutes	250W / 300W water cooled	600W water cooled	
heat sinked	150W	60W	NA	
Minimum power	0.2W	0.3W / 0.5W	5W	
Power Noise Level	10mW	15mW / 25mW	200mW	
Maximum Average Power Density kW/cm <sup>2</sup>	27 at 20W 12 at 150W	10 / 9 at max power	11 at max power	
Response Time (0-95%), typ. (sec)	2.5	2.5	2.5	
Calibration Uncertainty $\pm\%$	1.9	1.9	1.9	
Power Accuracy $\pm\%$ at calibration wavelength	3	3	3	
Linearity with Power $\pm\%$	1	2	2	
Amplifier power supply	+6V to +24V	+6V to +24V	+6V to +24V	UAU - Via Host USB UAE +6V to +24V
Energy Mode				
Maximum Energy	100J	200J / 300J	300J	
Minimum Energy	80mJ	120mJ / 200mJ	500mJ	
Energy Accuracy $\pm\%$ at calibrated wavelength	5	5	5	
Maximum Energy Density J/cm <sup>2</sup>				
<100ns	0.3	0.3	0.1	
0.5ms	5	5	50	
2ms	10	10	130	
10ms	30	30	400	
Cooling	Conduction	Water	Water	
Minimum and Recommended water flow at full power <sup>(d)</sup>	NA	3 liter/min	3 liter/min 4.5 liter/min	
Connections	6 pin Molex <sup>(b)</sup>	5 pin Round connector	6 pin Molex <sup>(b)</sup>	UAU - Mini B USB connector UAE - Ethernet for communication M12 5 pin for power
Dimensions	80x80x45mm	80x80x58mm	65x65x49mm	
Compliance	RoHS, China RoHS	RoHS, China RoHS	RoHS, China RoHS	RoHS, China RoHS
Part number	Consult Ophir Representative	Consult Ophir Representative	Consult Ophir Representative	Consult Ophir Representative

Note: (a) With analog "UAF" versions, sensor voltage output is accurate up to 2v below lowest level of supply voltage, taking into account supply voltage ripple

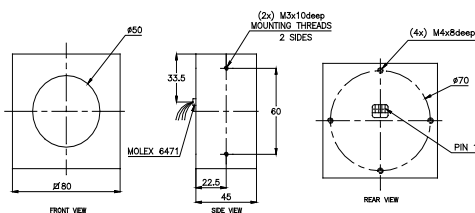
Note: (b) 6 pin Molex connections: RS232 input, Ground, +Voltage, Analog signal out, high/low voltage or switch input when used, RS232 output

Note: (c) Calibrated at customer selected wavelength

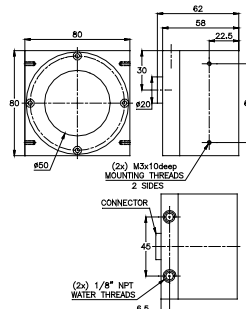
Note: (d) Water temperature range 18-30°C. Water temperature rate of change <1°C/min. Pressure drop across sensor 0.03MPa. The recommended flow rate can be lowered proportionately at lower than full power but should not be below the minimum. When used at full power with substantially below the recommended flow rate, the damage threshold may be as much as 20% lower and the response time may not be optimum

\* For UAE & UAU drawings please see pages 125-126

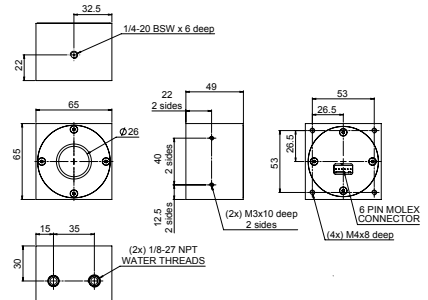
L150C-UAF



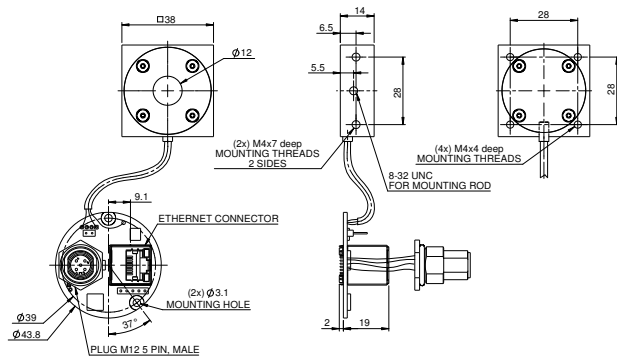
L250W-UAF / L300W-UAF



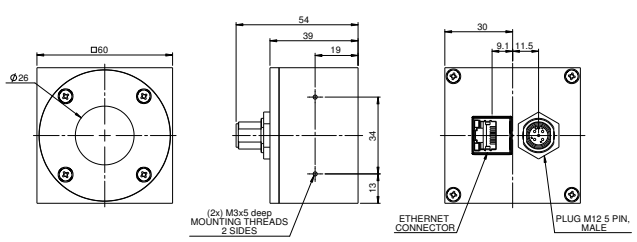
600W-UAF



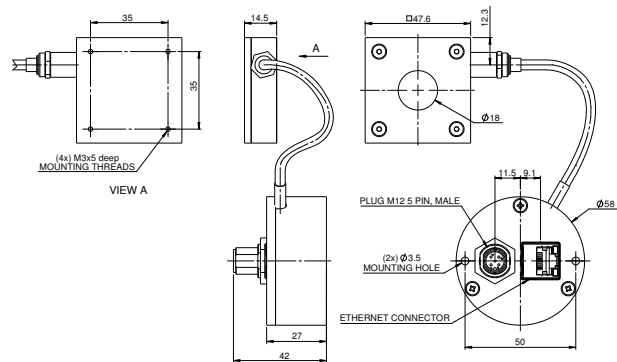
20C-UAE



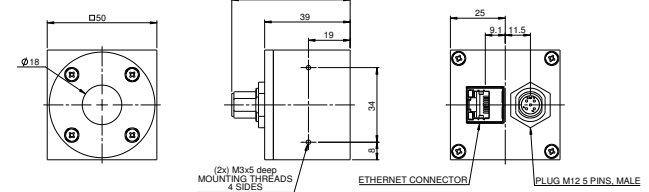
L30C-UAE



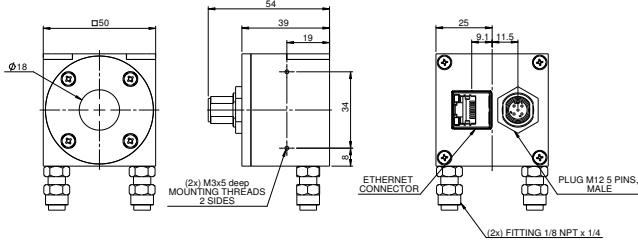
100C-UAE



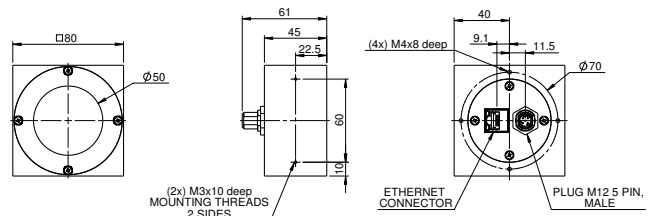
150C-UAE



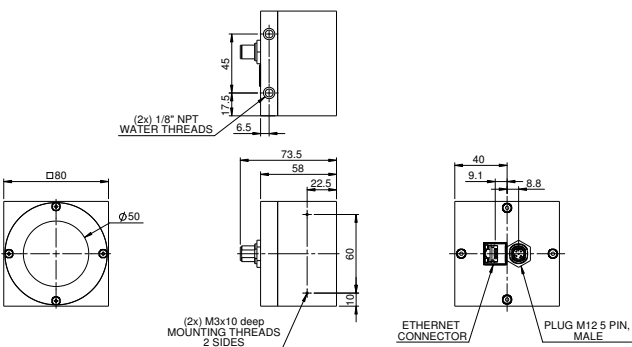
150W-UAE



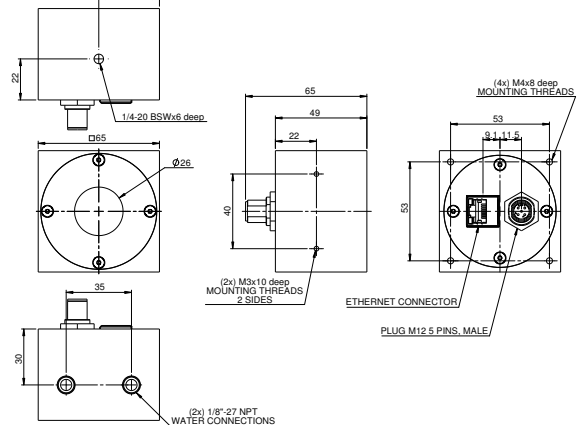
L150C-UAE



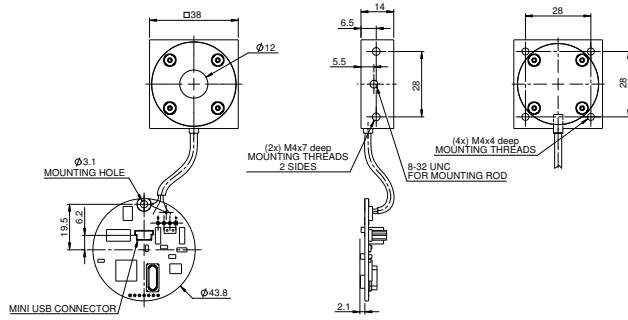
L250W-UAE / L300W-UAE



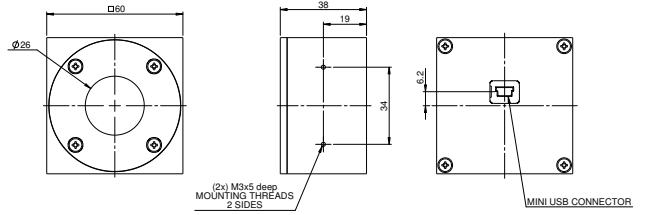
600W-UAE



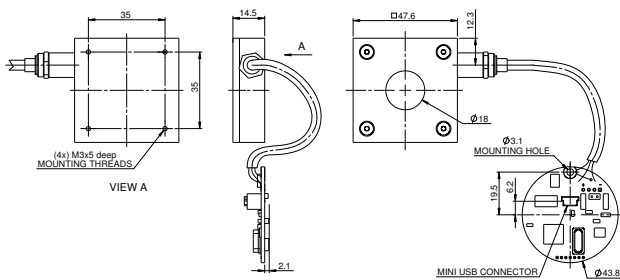
20C-UAU



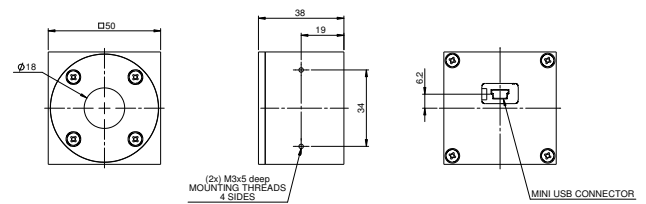
L30C-UAU



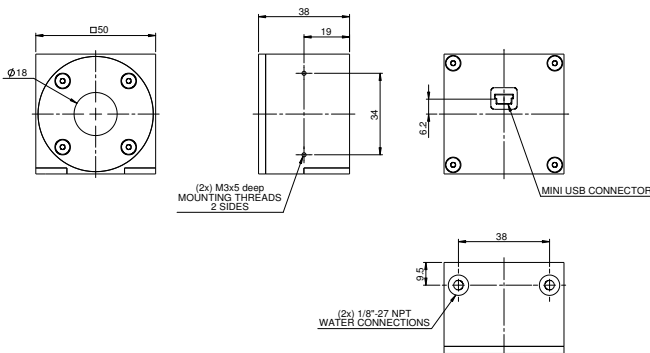
100C-UAU



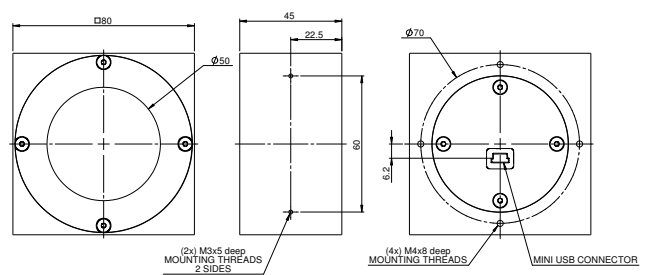
150C-UAU



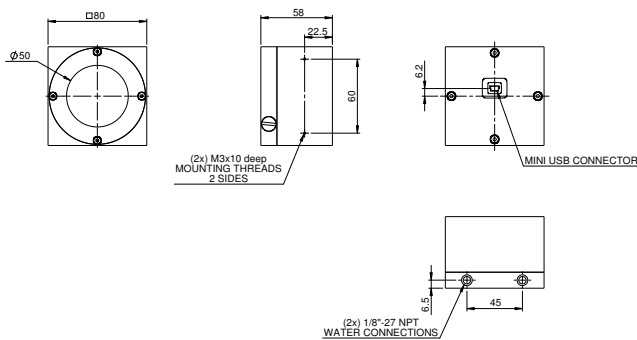
150W-UAU



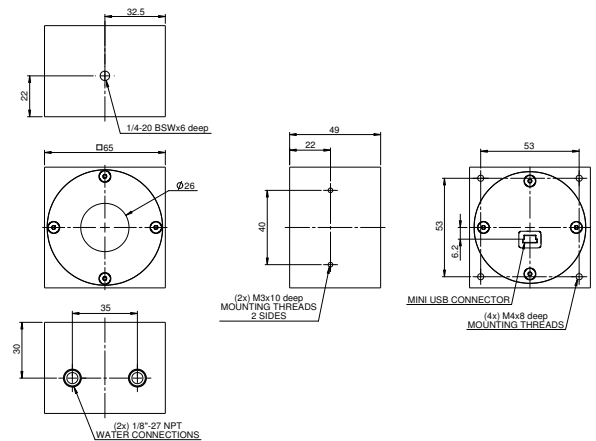
L150C-UAU



L250W-UAU / L300W-UAU



600W-UAU



## 1.4.2.4 Examples of Custom OEM Thermal and Photodiode Sensor Solutions

In addition to the standard OEM products described above, Ophir has accumulated over 25 years of experience in developing products which are tailored to precise physical configurations provided by the OEM customer. These products include custom discs (with or without electronics), specially configured thermal or photodiode-based power sensors, and much more. A number of these special OEM products are shown below.

### Flat Profile Thermal Sensor

This sensor with 50mm aperture is used as an exposure detector for photolithography and is only 10mm thick.



### Super Compact Thermal Sensor

Thermal Customized Solutions (OEM) sensor designed to be cemented into user system. Dimensions are under 10mm x 20mm footprint and 4mm height. The sensor can be connected to an Ophir smart meter to measure power or energy or can be used directly with voltage output.



### Compact, hand held thermal Smart Sensor

This thermal sensor is only 20mm thick to enable probing in hard to reach locations. It can measure up to 25W. It is designed specifically to be hand held, and works with any Ophir Smart Meter.



### High Power OEM Sensors

Ophir offers OEM sensors for higher powers than listed above up to 5000W and above. The sensors have a built in electronics module on the rear of the sensor and can be configured to give RS232, USB or Ethernet output.



### Special Requirements and Mechanical Designs

Ophir can design made to order mechanical designs to fit the customer's requirements. In addition the design can include clean room requirements, vacuum requirements and special connectors.



### OEM BeamTrack or Quad sensor with RS232 output

The BeamTrack sensor showing power, X position, Y position as well as size or Quad showing power, X position and Y position is now available as an OEM version with RS232 of all parameters.



### Industrial Type Designs – Ethernet IP/Profinet

Ophir offers industrial designs with industrial type connectors as well as industrial interface protocols such as Ethernet IP/Profinet

### Ordering Information:

The products shown above are examples of OEM solutions products developed for specific customer applications. Please consult with your Ophir representative who will be happy to help you with any requirements you may have.