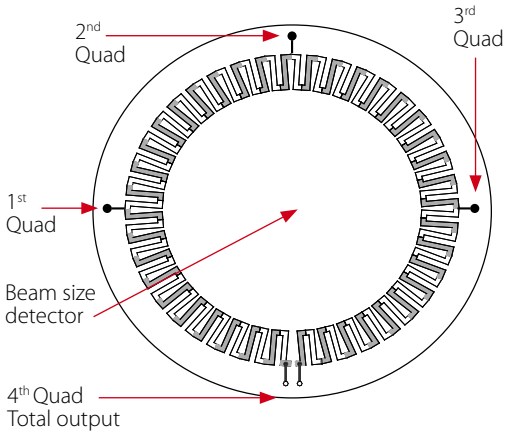
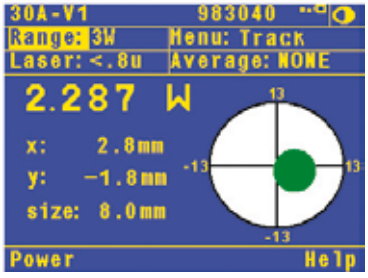
1.2 BeamTrack Power / Position / Size Sensors

Ophir now has the new BeamTrack line of thermal sensors that can measure beam position and beam size while measuring power. This innovative device will provide an additional wealth of information on your laser beam – centering, beam position, beam wander, beam position and wander, beam size as well as power and single shot energy. The BeamTrack sensor is illustrated schematically here and works as follows: the signal coming from the sensor is divided into 4 quadrants so by measuring and comparing the output from the 4 sections we can determine the position of the center of the beam to a high degree of accuracy. In addition to the 4 quadrants, there is now a special patented beam size detector. After processing outputs from these various detectors, the user is presented with the beam position as well as beam size. Note that the beam size is calibrated only for Gaussian beams but for other beams it will give relative size information and will indicate if the beam is changing size.



Operation of BeamTrack Sensors

BeamTrack sensors look similar to Ophir thermal sensors of the same type except that there is a small electronics module on the cable from the sensor head to the smart plug. When BeamTrack sensors are plugged into compatible displays or PC interfaces (Nova II, Vega, StarLite and Juno), along with the power measurement, there is a visual display of the beam position and beam size. The beam position can be accurately tracked and logged for beam wander measurements.



The beam size is calibrated only for Gaussian beams but other beams may be measured and the sensor will give a repeatable measurement of the relative beam size for tracking changes in the size of the beam over time.

1.2.1 BeamTrack-Power / Position / Size Sensors

100µW to 10W

Features

- All the features of standard power sensors plus...
- Accurate tracking of beam position to fractions of a mm
- Monitoring of the laser beam size

3A-QUAD / 3A-P-QUAD

10A-PPS

Model	3A-QUAD [a]	3A-P-QUAD [a]	10A-PPS [a]
Use	**General purpose**	**Short pulses**	**Low power**
Functions	Power / Energy / Position	Power / Energy / Position	Power / Energy / Position / Size
Absorber Type	Broadband	P type	Broadband
Spectral Range µm	0.19 - 20	0.15 - 8	0.19 - 20
Aperture mm	φ 9.5mm	φ 12mm	φ 16mm
Power Mode			
Power Range	100µW - 3W	160µW - 3W	20mW - 10W
Power Scales	3W to 300µW	3W to 300µW	10W / 5W / 0.5W
Power Noise Level	5µW	10µW	1mW
Thermal Drift (30min)%	10 - 40µW[b]	10 - 40 µW [b]	NA
Maximum Average Power Density kW/cm²	0.2	0.05	28
Response Time with Display (0-95%) typ. s	1.8	2.5	0.8
Power Accuracy +/-%	3	3	3
Linearity with Power +/-%	1	1	1
Energy Mode			
Energy Range	20µJ - 2J	30µJ - 2J	6mJ - 2J
Energy Scales	2J to 200µJ	2J to 200µJ	2J / 200mJ
Minimum Energy	20µJ	30µJ	6mJ
Maximum Energy Density J/cm²			
<100ns	0.3	1[e]	0.3
0.5ms	1	1[e]	2
2ms	2	1[e]	2
10ms	4	1[e]	2
Beam Tracking Mode			
Position			
Beam Position Accuracy mm [c]	0.15	0.15	0.1
Beam Position Resolution mm	0.02	0.02	0.02
Min Power for Position Measurement	300µW	400µW	50mW
Size [d]			
Size Accuracy mm	NA	NA	±(5%+50µm) for centered beam
Size Range mm (4σ beam diameter)	NA	NA	1.5 - 10
Min Power for Size Measurement	NA	NA	50mW
Cooling	convection	convection	convection
Weight kg	0.3	0.3	0.3
Fiber Adapter Available (see page 44)	ST, FC, SMA, SC	ST, FC, SMA, SC	ST, FC, SMA, SC
Part number: Standard Sensor	**7Z07934**	**7Z07935**	**7Z07904**
StarLink Sensor: Direct USB link to PC (p. 42)	**787203**		**787202**

Notes: (a) The BeamTrack features are supported by Nova II, Vega and StarLite meters , Juno interface and StarLab application.

Notes: (b) Depending on room airflow and temperature variations.

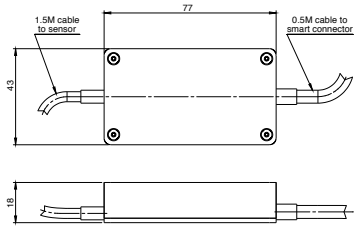
Notes: (c) For position within inner 30% of aperture.

Notes: (d) Assumes laser beam with Gaussian (TEM_{00}) distribution. For other modes, size measurement is relative.

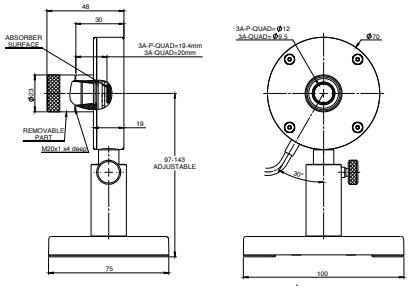
Notes: (e) For P type and shorter wavelengths derate maximum energy density as follows:

Wavelength	Derate to value
1064nm	not derated
532nm	not derated
355nm	40% of stated value
266nm	10% of stated value
193nm	10% of stated value

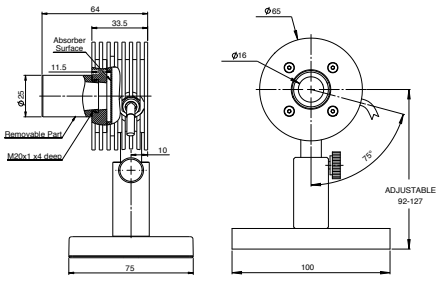
Interface Module on cable



3A-QUAD / 3A-P-QUAD



10A-PPS



OPHIR Photonics A Newport Corporation Brand

For latest updates please visit our website: **www.ophiropt.com/photonics**

1.2.2 BeamTrack-Power / Position / Size Sensors

40mW to 150W

Features

- All the features of standard power sensors plus...
- Accurate tracking of beam position to fractions of a mm
- Monitoring of the laser beam size

50(150)A-BB-26-PPS

F150A-BB-26-PPS

Model	**50(150)A-BB-26-PPS** [a]	**F150A-BB-26-PPS** [a]
Use	**General purpose**	**General purpose**
Absorber Type	Broadband	Broadband
Spectral Range µm	0.19 - 20	0.19 - 20
Aperture mm	φ 26mm	φ 26mm
Power Mode		
Power Range	40mW - 150W	50mW - 150W [b]
Maximum Intermittent Power	150W for 1.5min, 100W for 2.2min, 50W continuous	NA
Power Scales	150W / 50W / 5W	150W / 30W / 3W
Power Noise Level	2mW	8mW [b]
Maximum Average Power Density kW/cm²	12 at 150W, 17 at 50W	12 at 150W, 17 at 50W
Response Time with Display (0-95%) typ. s	1.5	1.5
Power Accuracy +/-%	3	3
Linearity with Power +/-%	1.5	1
Energy Mode		
Energy Range	20mJ - 100J	20mJ - 100J
Energy Scales	100J / 30J / 3J / 300mJ	100J / 30J / 3J / 300mJ
Minimum Energy mJ	20	20 [b]
Maximum Energy Density J/cm²		
<100ns	0.3	0.3
0.5ms	5	5
2ms	10	10
10ms	30	30
Beam Tracking Mode		
Position		
Beam Position Accuracy mm [c]	0.1	0.1
Beam Position Resolution mm	2.5% of beam size	2.5% of beam size
Min Power for Position Measurement	100mW	100mW
Size [d]		
Size Accuracy mm [e]	±5% for centered beam	±5% for centered beam
Size Range mm (4σ beam diameter)	φ3 - 20	φ3 - 20
Min Power Density for Size Measurement	1 W/cm²	1 W/cm²
Cooling	convection	fan
Fiber Adapter Available (see page 44)	ST, FC, SMA, SC	ST, FC, SMA, SC
Weight Kg	0.4	0.45
Version		
Part number: Standard Sensor	**7Z07900**	**7Z07901**
StarLink Sensor: Direct USB link to PC (p. 42)	**787200**	

Notes: (a) The BeamTrack features are supported by Nova II, Vega and StarLite meters , Juno interface and StarLab application.

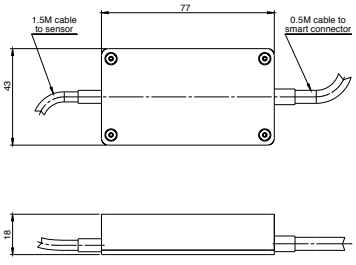
Notes: (b) For powers up to 30W it is recommended to work with the fan off and then the noise level is ~3 times lower. It is also recommended to measure energy with the fan off.

Notes: (c) Position accuracy for the central 10mm of the aperture as limited by beam position resolution. Position can be tracked with ±1mm accuracy over the entire aperture. Accuracy is reduced by a factor of 3 at minimum power.

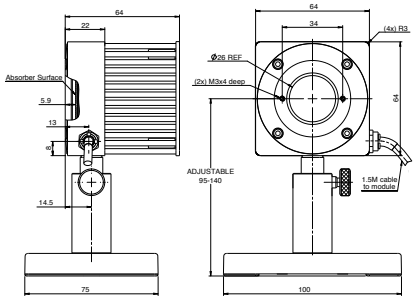
Notes: (d) Assumes laser beam with Gaussian (TEM_{00}) distribution. For other modes, size measurement is relative.

Notes: (e) Accuracy spec will be maintained for beams from 3.5 to 17mm not deviating from center more than 15% of beam diameter. For beams below 8mm in size and powers above 75W error in size can reach ±10%.

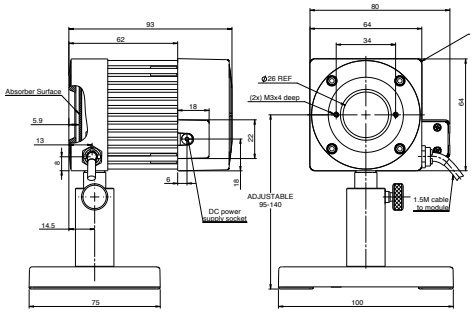
Interface Module on cable



50(150)A-BB-26-PPS



F150A-BB-26-PPS



1.2.3 BeamTrack-Power / Position / Size Sensors

150mW to 250W

Features

- All the features of standard power sensors plus...
- Accurate tracking of beam position to fractions of a mm
- Monitoring of the laser beam size

FL250A-BB-50-PPS

Model	**FL250A-BB-50-PPS** [a,b]
Use	**General purpose**
Absorber Type	Broadband
Spectral Range µm	0.19 - 20
Aperture mm	φ 50mm
Power Mode	
Power Range [c]	150mW - 250W
Power Scales	250W / 30W
Power Noise Level	15mW
Maximum Average Power Density kW/cm²	10 at 250W, 12 at 150W
Response Time with Display (0-95%) typ. s	2.5
Power Accuracy +/-%	3
Linearity with Power +/-%	1
Energy Mode	
Energy Range	80mJ - 300J
Energy Scales	300J / 30J / 3J
Minimum Energy mJ	80
Maximum Energy Density J/cm²	
<100ns	0.3
0.5ms	5
2ms	10
10ms	30
Beam Tracking Mode	
Position	
Beam Position Accuracy mm [d]	0.2
Beam Position Resolution mm	0.1
Min Power for Position Measurement	500mW
Size [e]	
Size Accuracy mm [f]	±5% for centered beam
Size Range mm (4σ beam diameter)	Ø 5-40
Min Power Density for Size Measurement	1 W/cm²
Cooling	fan
Fiber Adapter Available (see page 44)	ST, FC, SMA, SC
Weight Kg	0.8
Version	
Part number: Standard Sensor	**7Z07902**
StarLink Sensor: Direct USB link to PC (p. 42)	**787201**

Notes: (a) The BeamTrack features are supported by Nova II, Vega and StarLite meters, Juno interface and StarLab application.

Notes: (b) Expected release: Q2 of 2013.

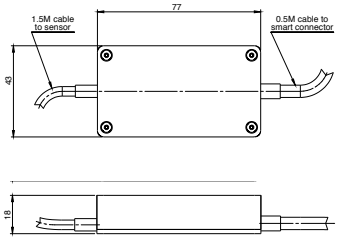
Notes: (c) For powers up to 50W it is recommended to work with the fan off and then the noise level is ~3 times lower. It is also recommended to measure energy with the fan off.

Notes: (d) Position accuracy for the central 20mm of the aperture as limited by beam position resolution. Position can be tracked with ±1mm accuracy over the entire aperture. Accuracy is reduced by a factor of 3 at minimum power.

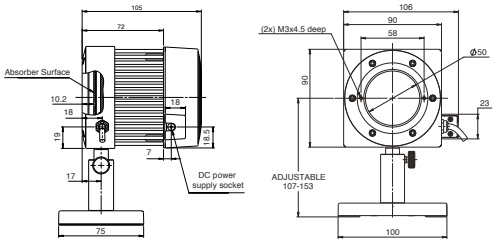
Notes: (e) Assumes laser beam with Gaussian (TEM_{00}) distribution. For other modes, size measurement is relative.

Notes: (f) Accuracy spec will be maintained for beams from 6 to 35mm not deviating from center more than 15% of beam diameter.

Interface Module on cable



FL250A-BB-50-PPS

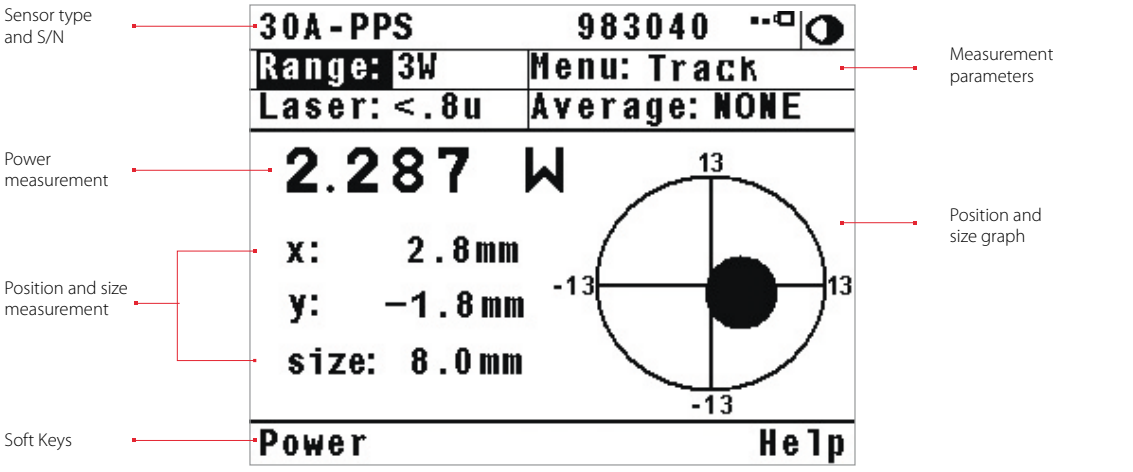


1.2.4 BeamTrack-Power / Position / Size Sensors

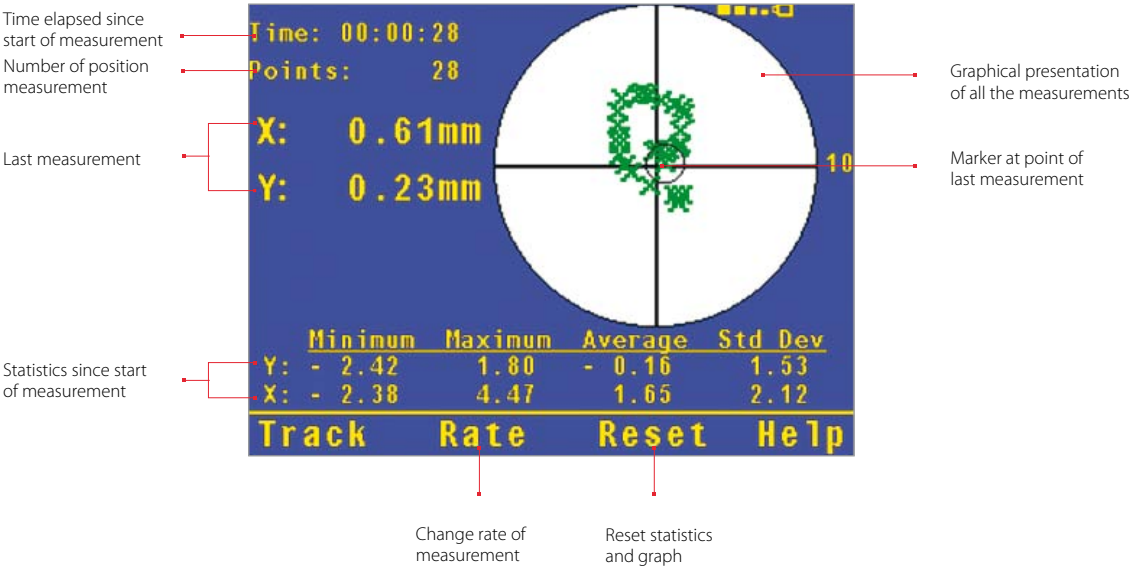
Device Software Support

- BeamTrack sensors are fully supported by the Vega, Nova-II, StarLite and Juno devices
- Attach the sensor to the meter. On startup, it will be recognized as a BeamTrack sensor and tracking options will be enabled
- Use the Track screen to measure power, position and size simultaneously
- Use the Stability screen to measure pointing stability (also known as beam wander) over time

Track Screen on Nova II



Pointing Stability Screen of Vega



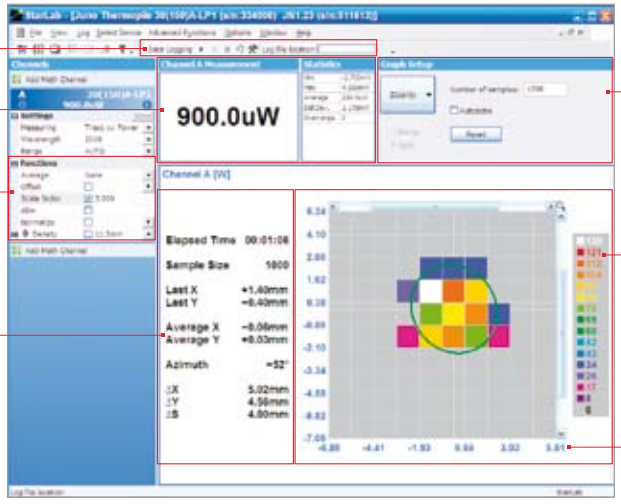
1.2.4 BeamTrack-Power / Position / Size Sensors

PC Software Support

- StarLab
- COM Object for System Integrators including demo applications in VB, VC+ and MatLab
  the Track screen to measure power, position and size simultaneously
- LabVIEW Demo Application

Examples of some StarLab Screens

Stability Screen



Position & SizeScreen