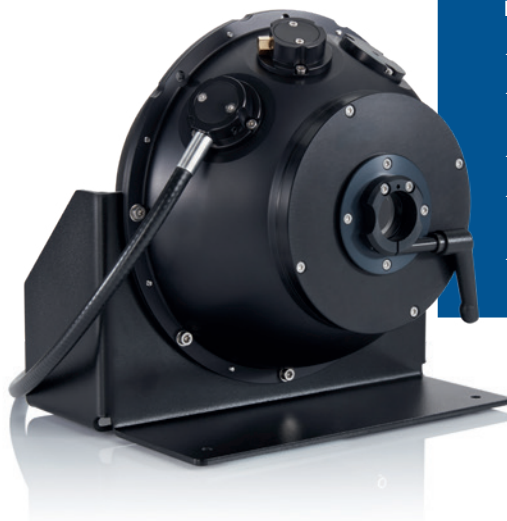


PTFE Integrating Spheres

UV and IR Measurement for Laboratory and Production



We bring quality to light.



Key features at a glance

- ▲ Complete UV measurement solutions
- ▲ High sensitivity measurements for UV radiation from 200 nm
- ▲ Integrating spheres suitable up to 2500 nm (IR)
- ▲ New PTFE material with permanently negligible fluorescence
- ▲ PTB traceable calibration

01 \\ Solutions for UV and IR measurement

Instrument Systems offers complete measurement solutions for UV and IR radiation from 200 to 1700 nm. The operation of the proven Instrument Systems CAS series spectroradiometers, in combination

with PTFE (Polytetrafluoroethylene) integrating spheres, enables high sensitivity measurements of UV and IR radiant flux. The absolute values can be audited and monitored with the Instrument Systems ACS

calibration standards, available for UV-A/B/C wavelengths as well as for 850 and 940 nm (see figure 1). The new generation of PTFE integrating spheres features a black outer surface to minimize reflections.

Normalized spectra of UV-LED and IR-LED standards

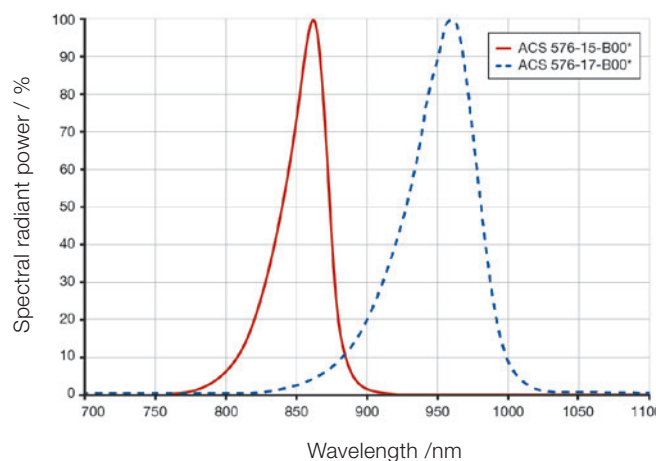
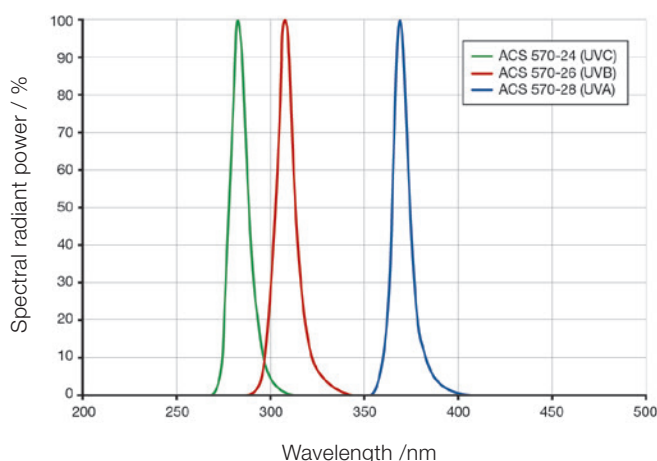


Figure 1. Normalized spectra of the UV-LED and IR-LED calibration standards (ACS 570 series) with their typical peak wavelengths (measured with CAS 140D spectroradiometer and PTFE integrating sphere).

To ensure optimal performance, we recommend applying a specialized pretreatment to the integrating sphere when used with UV radiation. This enhances stability in the UV range from 200 nm and reduces fluorescence effects. Please contact us for more information.

02 \\ High throughput and sensitivity for UV and IR

Instrument Systems' integrating spheres for UV measurements of radiant flux utilize PTFE (Polytetrafluoroethylene) as the reflective material. PTFE coatings are highly reflective in both the UV and IR ranges and offer enhanced temperature stability up to 150 °C.

While BaSO₄ coatings are highly effective in many applications, they

experience a decrease in reflectivity around 260 nm, which may introduce some measurement uncertainties in the UV range.

On the other hand, PTFE coatings maintain stable reflectivity even for challenging UV-B and UV-C emitters down to 200 nm, minimizing measurement uncertainties in the UV spectrum.

In the IR range, BaSO₄ coatings are effective, but their throughput starts to drop below 300 nm. For applications involving weak emitters, PTFE spheres are recommended to ensure high throughput and improve measurement quality.

03 \\ Improvement of calibration precision with SAC

The middle port of the three ports on the PTFE integrating spheres (ISP PTFE) provides the option to couple an external auxiliary light source for performing a **Self-Absorption Correction (SAC)**. SAC is recommended to account for measurement errors caused by differences in reflectivity values between the calibration process and device testing.

The auxiliary light source illuminates the integrating sphere under two conditions:

- ▶ with the measurement port open (or in any other calibration configuration) and
- ▶ with the device under test positioned at the measurement port.

The ratio of the obtained spectra is calculated using SpecWin Pro software or CAS.dll to correct the actual measurement results of the device under test.

Self-Absorption Correction test setup



04 \\ Flexible optical ports and equipment design

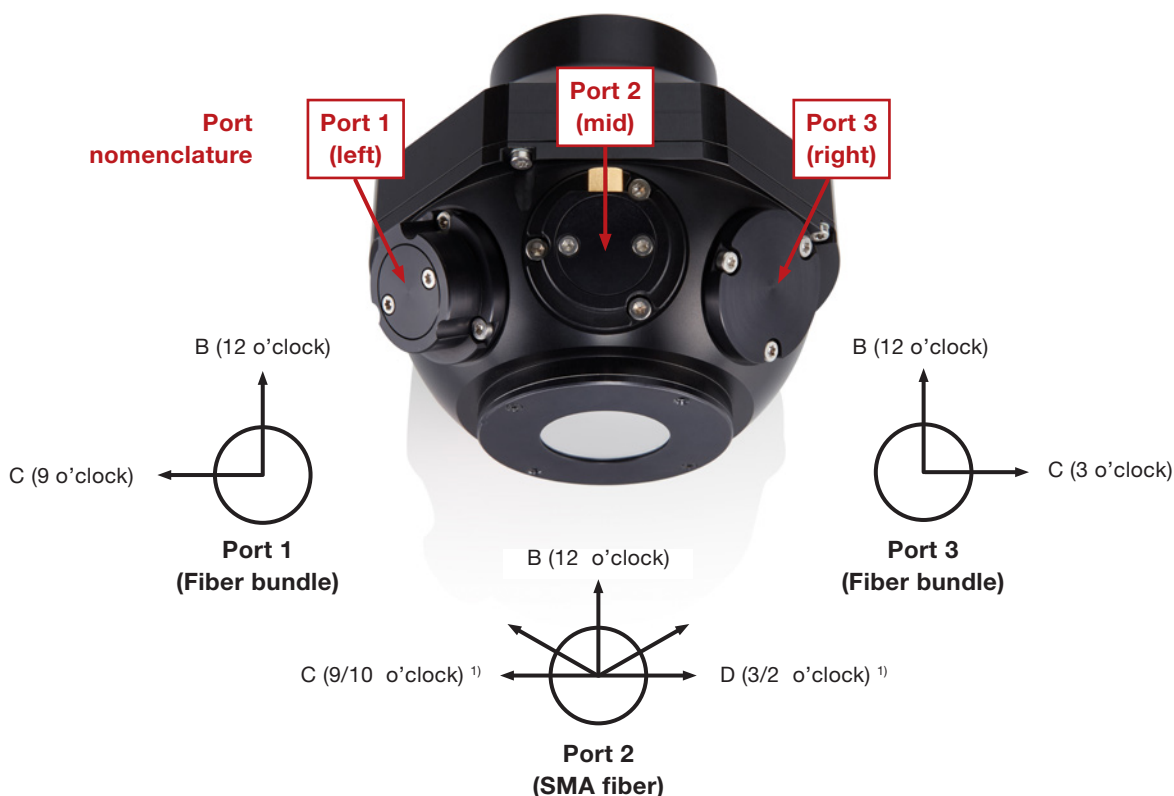
The Instrument Systems PTFE integrating spheres (sizes 75 mm to 250 mm inner diameter) are provided with three customizable adapter ports. They can be equipped individually with a fiber bundle adapter on ports 1 and 3 (see image below) for an Instrument Systems spectroradiometer, or an SMA fiber adapter on port 2 (see image below) for an auxiliary light source (e.g. Instrument Systems' LS 500, combined deuterium and halogen

lamp to cover entire spectral range, for self absorption correction). Positioning of all ports on one sphere side away from equator improves measurement accuracy. The adapters can be aligned either perpendicular (12 o'clock position) or parallel (3¹⁾ or 9¹⁾ o'clock position) to the measuring plane as desired. The customer has an assortment of measurement port accessories at his disposal to suit all respective applications in laboratory and

production. Flat protective windows and protective domes prevent contamination in the integrating sphere ²⁾ and can be expanded with adapter plates for a variety of LED test sockets.

The ISP 50-PTFE is equipped with a quartz protective window and one connector for fiber bundle as standard. It provides high optical throughput for fast production testing.

Port nomenclature for PTFE spheres with sizes 75 mm to 250 mm:




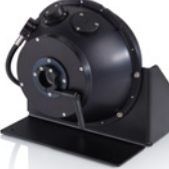
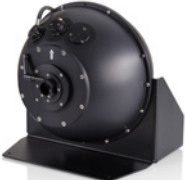


















For PTFE ISPs with size 75 mm to 150 mm, the fiber bundle and SMA adapters can be oriented either perpendicular (12 o'clock position) or parallel (9 or 3 o'clock) to the measuring plane as displayed above. For the ISP 250-PTFE SMA adapter, 10 and 2 o'clock are available in addition to the perpendicular orientation (12 o'clock).

¹⁾ For the SMA port of ISP 250-PTFE, 2 and 10 o'clock is available (instead of 3 and 9).

²⁾ For PTFE integrating spheres, it is strongly recommended to use either a protective window or dome to avoid contamination.

05 \\ Technical specifications

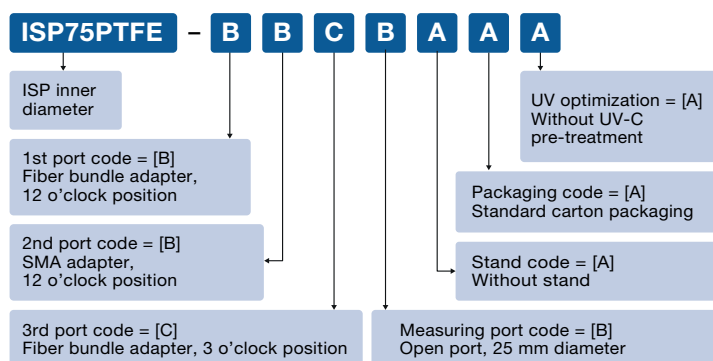
Model	ISP 50-PTFE	ISP 75-PTFE ³⁾	ISP 100-PTFE	ISP 150-PTFE	ISP 250-PTFE
Integrating sphere main unit					
Inner diameter	50 mm	75 mm	100 mm	150 mm	250 mm
Usable wavelength	200 - 2500 nm	200 - 2500 nm	200 - 2500 nm	200 - 2500 nm	200 - 2500 nm
Application	Production (e.g. wafer probing, chip testing)	Production (e.g. wafer probing, chip testing)	Production (e.g. wafer probing, chip testing)	Laboratory and production (e.g. single- / multi-chip testing)	Laboratory and production (e.g. multi-die / -chip testing)
Fiber bundle/SMA fiber ports					
Possible rotations* See explanatory graphic, page 4	-	Port 1 (fiber bundle adapter): 12 or 9 o'clock Port 2 (SMA connector): 12, 9 or 3 o'clock Port 3 (fiber bundle adapter): 12 or 3 o'clock	Port 1 (fiber bundle adapter): 12 or 9 o'clock Port 2 (SMA connector): 12, 9 or 3 o'clock Port 3 (fiber bundle adapter): 12 or 3 o'clock	Port 1 (fiber bundle adapter): 12 or 9 o'clock Port 2 (SMA connector): 12, 9 or 3 o'clock Port 3 (fiber bundle adapter): 12 or 3 o'clock	Port 1 (fiber bundle adapter): 12 or 9 o'clock Port 2 (SMA connector): 12, 10 ¹⁾ or 2 ¹⁾ o'clock Port 3 (fiber bundle adapter): 12 or 3 o'clock
Entrance port adapters					
Protective flat window (front side view)	Always included				
Port diameter	15 mm	25 mm	33 mm	50 mm	72 mm / 45 mm
Protective dome (back side view)	-				
Port diameter		20 mm	26 mm	45 mm	45 mm
LED adapter plate for LED test sockets with 25 mm diameter including protective dome and aperture set					
Port diameter		Without aperture: 25 mm With aperture: 7, 10, 15, 20 mm ³⁾	Without aperture: 25 mm With aperture: 7, 10, 15, 20 mm	Without aperture: 25 mm With aperture: 7, 10, 15, 20 mm	Without aperture: 25 mm With aperture: 7, 10, 15, 20 mm
Base					
Base		Optional 	Optional 	Optional 	Always included 

³⁾ Note: Use of ACS-570-24 (~280 nm) and ACS-570-26 (~305 nm) not possible with the ISP75PTFE.

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06 \\ Ordering information

Fixed model						
Order number		ISP50PTFE-100				
Description		Integrating sphere with 50 mm internal diameter; PTFE reflection material; measurement port with 15 mm diam., with protective quartz window; incl. connector for fiber bundle				
Configurable models						
Order number		ISP75PTFE-	ISP100PTFE-	ISP150PTFE-	ISP250PTFE-	Config. letter
Port 1 (Fiber bundle adapter)		No fiber bundle adapter (blind cap)				[A]
		12 o'clock position				[B]
		9 o'clock position				[C]
		Prepared for PD 100 photodiode				[D]
Port 2 (SMA connector for SAC)		No SMA adapter (blind cap)				[A]
		12 o'clock position			12 o'clock position	[B]
		9 o'clock position			10 o'clock position	[C]
		3 o'clock position			2 o'clock position	[D]
Port 3 (Fiber bundle adapter)		No fiber bundle adapter (blind cap)				[A]
		12 o'clock position				[B]
		3 o'clock position				[C]
		Prepared for PD100 photodiode				[D]
Measuring port for ISP75/100/150 PTFE	Open port	Ø 25 mm	Ø 33 mm	Ø 50 mm	-	[A]
	With protective window	Ø 25 mm	Ø 33 mm	Ø 50 mm	-	[B]
	With protective dome	Ø 20 mm	Ø 26 mm	Ø 45 mm	-	[C]
	With adapter plate	With adapter plate ISP*PTFE-211 and open port			-	[D]
	With adapter plate	With adapter plate ISP*PTFE-211 and protective window			-	[E]
	With adapter plate	With adapter plate ISP*PTFE-211 and protective dome			-	[F]
Measuring port for ISP 250 PTFE	Open port	-	-	-	Ø 72 mm	[A]
	Open port	-	-	-	Ø 45 mm	[B]
	With protective window	-	-	-	Ø 72 mm	[C]
	With protective window	-	-	-	Ø 45 mm	[D]
	With protective dome	-	-	-	Ø 45 mm	[E]
	With adapter plate	With adapter plate ISP*PTFE-211 and open port Ø 45 mm				[F]
	With adapter plate	With adapter plate ISP*PTFE-211 and protective window Ø 45 mm				[G]
	With adapter plate	With adapter plate ISP*PTFE-211 and protective dome Ø 45 mm				[H]
Stand included		Without stand	Without stand	Without stand	No config. letter: Always with stand	[A]
		With stand	With stand	With stand		[B]
Packaging		Industrial packaging (carton)				[A]
		Hard shell case (for lab re-use)				[B]
UV optimization		Without UV-C pre-treatment				[A]
		With UV-C pre-treatment: Enhanced UV stability				[B]



Configuration example

Integrating sphere accessories	
ISP75PTFE-140	Protective window for measurement port of ISP75PTFE; quartz window, 25 mm diameter
ISP75PTFE-143	Protective dome for measurement port of ISP75PTFE; quartz dome; 20 mm diameter
ISP75PTFE-211 ³⁾	Adapter plate for LED test sockets with 25 mm diameter for measurement port of ISP75PTFE; incl. baffles with 7, 10, 15 and 20 mm; for version w/ or w/o protective window or dome
ISP75PTFE-901	Base for ISP75PTFE
ISP100PTFE-140	Protective window for measurement port of ISP100PTFE; quartz window, 33 mm diameter
ISP100PTFE-143	Protective dome for measurement port of ISP100PTFE; quartz dome; 26 mm diameter
ISP100PTFE-211	Adapter plate for LED test sockets with 25 mm diameter for measurement port of ISP100PTFE; incl. baffles with 7, 10, 15 and 20 mm; for version w/ or w/o protective window or dome
ISP100PTFE-901	Base for ISP100PTFE
ISP150PTFE-140	Protective window for measurement port of ISP150PTFE; quartz window, 50 mm diameter
ISP150PTFE-143	Protective dome for measurement port of ISP150PTFE; quartz dome; 45 mm diameter
ISP150PTFE-211	Adapter plate for LED test sockets with 25 mm diameter for measurement port of ISP150PTFE; incl. baffles with 7, 10, 15 and 20 mm; for version w/ or w/o protective window or dome
ISP150PTFE-901	Base for ISP150PTFE
ISP250PTFE-140	Protective window for measurement port of ISP250PTFE; quartz window, 72 mm diameter; incl. PTFE inlay
ISP250PTFE-141	Protective window for measurement port of ISP250PTFE; quartz window, 45 mm diameter; incl. PTFE inlay
ISP250PTFE-143	Protective dome for measurement port of ISP250PTFE; quartz dome; 45 mm diameter; incl. PTFE inlay
ISP250PTFE-145	Adapter for open version of ISP250PTFE measuring port; diameter 72 mm; incl. PTFE inlay
ISP250PTFE-146	Adapter for open version of ISP250PTFE measuring port; diameter 45 mm; incl. PTFE inlay
ISP250PTFE-211	Adapter plate for LED test sockets with 25 mm diameter for measurement port of ISP250PTFE; incl. baffles with 7, 10, 15 and 20 mm; for open version of ISP250PTFE with 45 mm measuring port diameter or protective window/dome with 45 mm diameter
Fibers, connectors and auxiliary light source	
OFG-323	Optical fiber guide with SMA plug; 1000 µm diameter; 2 m length; quartz; spectral range 190 to 1350 nm; e.g. for connection of LS500-110
OFG-361	Optical fiber guide, 2.5 mm diam., 2 m long, spectral range 380 to 1600 nm, one side with ferrule and one with SMA connector
OFG-424	Fiber bundle; 1.5 mm diameter; 2 m length; quartz; spectral range 190 to 1350 nm
LS100-130	Tungsten halogen lamp with broadband reflector, 100 watt; spectral range 350 to 2200 nm, needs fiber connector and power supply
LS100-200	SMA connector for LS100-130
LS100-201	Fiber bundle connector for LS100-130
LS500-110	Dual light source with tungsten 20 W halogen lamp and 26 W deuterium lamp; incl. power supply; SMA connector; spectral range 210 to 1700 nm
PS-120	Highly stabilized, compact power supply for tungsten halogen lamp LS100-130 (115–230 V); digital display; 0–30 V, 0–10 A
Calibrations and stray light correction	
CAL-140	Factory calibration of luminous flux/radiant flux for integrating spheres (absolute value with standard LED at the measurement port of the sphere); wavelength range VIS/IR (from 360 nm); with final test and test certificate according to DIN EN ISO 17025
CAL-141	Factory calibration of luminous flux for integrating spheres (absolute value with standard LED at the measurement port of the sphere); wavelength range UV and VIS/NIR; with final test and test certificate according to DIN EN ISO 17025
CAL-144	Factory calibration of integrating spheres to irradiance with conversion to luminous flux/radiant flux; wavelength range VIS/NIR (depending on device type and accessories). With final test and test certificate according to DIN EN ISO 17025
CAL-147	Factory calibration of integrating spheres to irradiance with conversion to radiant flux; only for high resolution array spectrometer; with final test and test certificate according to DIN EN ISO 17025



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