



Starna Scientific The Spectroscopy Specialists

Cell/Cuvettes for all
Spectrophotometer
Fluorimeter and
Laser applications



Starna scientific

Introduction to Starna®

The wide variety of Starna® products in this catalogue are manufactured in the Starna Scientific Ltd (formerly Optiglass Ltd) factory founded in 1964, whose lineage of optical expertise is traceable to the early part of the last century.

Starna Scientific is the manufacturing division of the international group of Starna® companies, who have a recognised world-wide reputation for quality, service, innovation and co-operation in the production and supply of spectrophotometer cells, optical components and certified reference materials.

During the 1950s, the founding members of the company developed and perfected the technique of fully fusing optically polished component parts by heat alone, without distortion. This major advance transformed the design and production of spectrophotometer cells and associated products. Continual development and improvement is reflected in the high quality world class Starna® products.

All manufacturing processes are carried out in an ISO 9000 certified production facility, from design and development of product to customised production machinery. The unique blend of skills including: cutting, slicing, grinding, polishing, conventional drilling, ultrasonic drilling and fusing as well as metallic, multi-layer and anti-reflection coating in one of many coating plants, achieves a complete vertically integrated manufacturing process.

During manufacture of all component parts, special care is taken to avoid contamination by the use of stringent cleaning processes. Together with mandatory inspection procedures these stringent cleaning processes ensure all products leave the factory in a pristine contamination-free condition, with an unconditional guarantee against faulty workmanship. This special treatment of cells together with internally profiled cells reduces bubble adhesion, particularly important in flow cell applications. In addition to the **ISO 9001** certified manufacturing facility, the **Starna Reference Material Calibration Laboratory** which has been **UKAS** accredited to **ISO 17025** since 2001, also achieved **ISO guide 34** in 2006, the highest level of accreditation, recognised world-wide. The unique combination of manufacturing, application and laboratory skills, permits full traceability throughout the whole production process, making Starna Scientific a unique partner to instrument manufacturers, dealers and retail customers worldwide who require completely independent guaranteed validation reference materials for analytical equipment.

Cell specifications

Starna® spectrophotometer cells and other quartz and glass assemblies, unless precluded by design, are assembled using a fully fused method of construction. This technique, pioneered and used by Starna Scientific since the mid 1950s, ensures that cells are fused into a single homogeneous entity using heat alone, without intermediate bonding materials. All cells are then carefully annealed to remove any residual strain from the fusing process. This ensures maximum physical strength as well as resistance to solvents. With few exceptions, most cells can be used safely with pressure differentials of up to 3 x 10⁵Pa (3 Bar) and some up to 10 x 10⁵Pa (10 Bar).

General specifications

Windows parallel to: better than 3 minutes of arc
 Window flatness to: better than 4 Newton fringes
 Window polish, standard: 60/40 scratch/dig
 Window polish, laser: 20/10 scratch/dig

Material	Path lengths	Tolerance
Glass	less than 10mm	± 0.02mm
Glass	10 to 30mm	± 0.1mm
Glass	40 to 100mm	± 0.2mm
Special Optical Glass	up to 20mm	± 0.01mm
Special Optical Glass	30 to 100mm	± 0.02mm
Quartz	0.01 to 0.05mm	± 0.002mm
Quartz	0.1 to 0.4mm	± 0.005mm
Quartz	0.5 to 30mm	± 0.01mm
Quartz	40 to 100mm	± 0.02mm

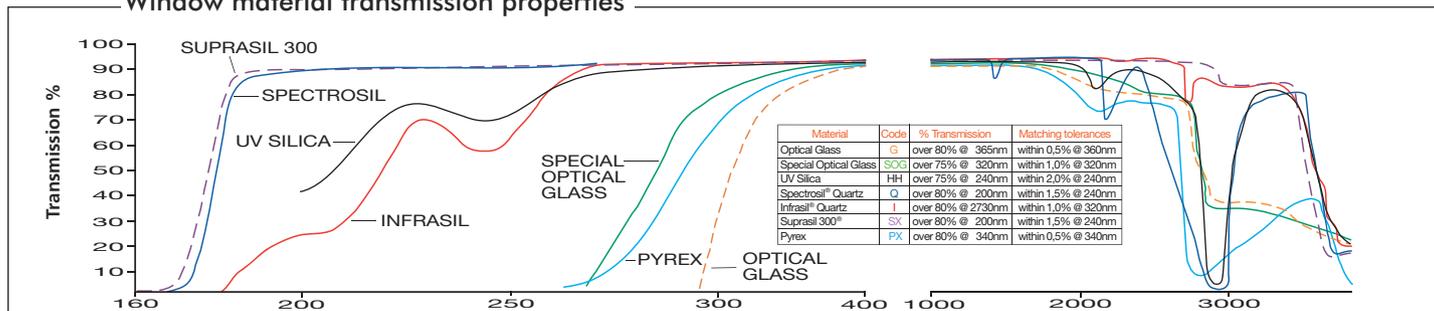
Standard window thickness is 1.25mm, polished to better than 4 Newton Fringes per centimetre in the viewing area, typically flat to better than 1 micron (0.001mm) over the window area.

Although cells can be used with most solvents and acidic solutions, fluorinated acids such as Hydrofluoric Acid (HF) in all concentrations should be avoided as they will attack the quartz itself. Strong basic solutions (pH 9.0 and above) will also degrade the surface of the windows and shorten the useful life of the cells.

Flow cells with path lengths of less than 0.5mm are measured by an interference method both before and after final fusing. Calculation on this measurement provides an uncertainty of path length better than 0.2 microns (0.0002mm). Path length certification can be supplied for individual cells for a small additional charge. This should be requested at the time of ordering.

Water absorption band OH content ppm (mg/g) Infrasil ≤ 8, Suprasil 300 ≤ 1.

Window material transmission properties



Registered Trade Marks: INFRASIL® & SUPRASIL 300® Heraeus Quarzglas GmbH, Hanau Germany. SPECTROSIL®, Vitreosil® & TSC3® Heraeus Quartz UK Ltd, Wallsend, England. BOROFLOAT® Corning Glass Works, U.S.A.

The above information illustrates the approximate transmission ranges of the guaranteed materials used in the production of Starna cells. The spectra does not take into account reflective losses from optical window surfaces which may vary depending on the material measured, resulting in actual measured transmission between 80%T and 90%T. Windows are normally 1.25mm thick and therefore the absorption of the windows themselves can be disregarded for normal analytical purposes.

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How to order

Essential ordering information is shown under the **Blue column headings** throughout the catalogue. Detail shown under the black headings is additional descriptive and dimensional information and need not be included. eg. to order Type **1/I/10** (Standard Rectangular, Infrasil, 10mm Path length)

Type No.	Window Materials	Path Length	Internal Width	External L	External W	External H	Nominal Vol. ml
1	G, SOG, PX, HH, Q, I, SX	10	10	12.5	12.5	45	3.500

eg. to order Type **19.01/Q/1/Z8.5** (Ultra-micro, Spectrosil, 1mm path length, 8.5mm Z dimension)

Type No.	Window Materials	Path Length	Z Height	Sample chamber W	Sample chamber H	External L	External W	External H	Nominal Vol. ml
19.01	SOG, Q	1	8.5, 15, 20	5	1	12.5	12.5	40.5	0.0050

Material specifications

Starna Scientific offer the following window materials: Optical Glass (G), Special Optical Glass (SOG), & Borofloat® (PX) for the Visible range; UV Silica Quartz(HH) for UV; Spectrosil® Quartz (Q) or equivalent for FarUV & Visible, Infrasil® Quartz (I) or equivalent for UV through Near Infra-red (IR); Suprasil 300® Quartz (SX) or equivalent for FarUV through Near IR

If a specific window material is required and is not shown in this catalogue please contact us for availability. The following table shows the Usable Range (UR) and the range over which the transmission guaranteed better than 80%.

Material		UR From	>80% From	Nm
Optical Glass	G	334 nm	360 through	2500 nm
Special Optical Glass	SOG	320 nm	320 through	2500 nm
Borofloat	PX	325 nm	330 through	2500 nm
UV Silica	HH	220 nm	260 through	2500 nm
Spectrosil® Quartz	Q	190 nm	200 through	2500 nm
Infrasil® Quartz	I	220 nm	220 through	3800 nm
Suprasil 300® Quartz	SX	190 nm	200 through	3500 nm

For fluorescent applications Spectrosil® is the recommended window material, as it does not exhibit any background fluorescence. Some other materials, especially glass and lower grades of quartz may have some background fluorescence.

The meticulous care taken in the quality of the polishing and unique construction of regular Starna® quartz fluorescent cells brings them within tolerances which are sufficiently stringent for them to be used in laser applications. These techniques are particularly relevant in the manufacture of much larger Ultra High Vacuum (UHV) cells.

Cell matching

Modern production and fusing techniques, together with consistent raw materials, have virtually eliminated the need for transmission matching in regular standard high grade quartz cells.

The extremely accurate physical path length tolerances used in production, stated on page 2, are essential especially on very short path lengths, for instance in dissolution measurements where multiple short path length cells may be used. Such flow cells Types 73, 74, 75, 583, 584 and 585 each have a unique fully traceable serial number engraved on the window. Cells with path lengths less than 0.5mm are measured using an interference method both before and after final fusing to provide a path length uncertainty calculation better than 0.2 microns (0.0002 mm). A certificate of path length and full production traceability can be provided for each individual cell on request, for a small additional charge.

Cells manufactured for **Circular Dichroism(CD)** must have strain-free oriented windows and the complete cell carefully annealed. This process incurs an additional charge for each cell. Cells required for **CD** must have this suffix **CD** added to the part number e.g. 34/Q/50/CD.

Z Height dimension - IMPORTANT!

The 'Z' height is the distance from the bottom of the cell holder cavity to the centre of the incident light beam profile, which can be round, rectangular or curved. For the most efficient use of energy and sample volume the sample chamber aperture should ideally encompass the light beam with a small extra margin to avoid beam clipping.

The 'Z' height of the cell, the distance from the centre of the cell sample chamber aperture to the base of the cell, should match to that of the instrument.

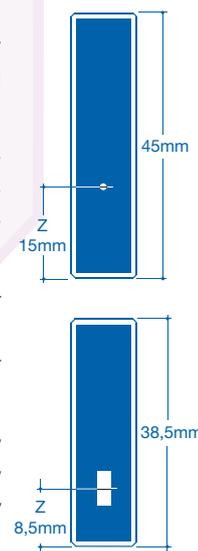
Manufacturers have generally designed their instruments with 'Z' dimensions ranging from 5 to 20mm with 8.5 or 15mm being the most popular.

Choosing the correct cell 'Z' height is very important when the aperture in the cell is very small, as in sub-micro cells and micro flow cells.

The standard 'Z' heights for any cell, where this information is critical, are shown in a separate column in the information tables, headed 'Z' Height. Other 'Z' dimensions can be supplied on request.

The correct 'Z' height should be added to the part number e.g. if 8.5mm is required it should be shown as follows 73.4/SOG/10/Z8.5. As a double check at the time of ordering, it is beneficial to state the instrument make and model number for which the cell is required.

ALL dimensions stated in this catalogue are in millimetres unless otherwise indicated



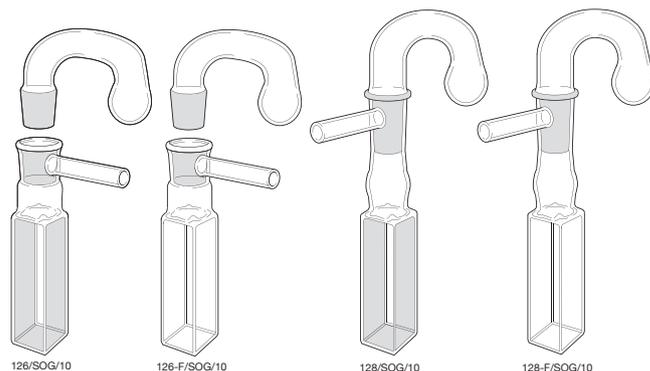
When cells matched for transmission are required, mainly but not exclusively for less consistent materials such as Glass and Special Optical Glass where transmission characteristics from melt to melt differ, each measured cell is given a match code relative to its transmission at a given wavelength as measured on a spectrophotometer. The transmission matching tolerances at measured wavelengths are shown as follows:

Window Material	Matching Tolerance	Measured at Wavelength
Optical Glass	0.5%	350nm
Special Optical Glass	1.0%	320nm
Borofloat	1.0%	320nm
UV Silica	1.5%	240nm
Spectrosil® Quartz	1.5%	200nm
Infrasil® Quartz	1.5%	240nm
Suprasil 300®	1.5%	240nm

The matching codes are only of real value when comparing new cells as transmission characteristics change during use because of surface contamination or wear due to cleaning processes. Therefore a brand new cell may not identically match an older used cell of the same match code.

Type 126 & 128. Anaerobic. Standard Rectangular 126-F & 128-F Fluorimeter

- Two polished windows except 126-F and 128-F have four windows and base polished.
- Reservoir has ground cone with evacuation hole to line up with socket outlet tube.
- Reservoir volume \approx .5ml.
- **Type 126** Evacuation tube is 3mm I.D., 5mm O.D. and 30mm long.
- **Type 128** Evacuation tube is 4mm I.D., 6mm O.D. and 30mm long.
- Socket assembly can be fused to other rectangular cells on request.

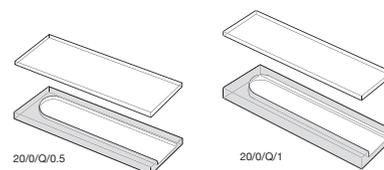


Type No.	Window Materials	Path Length	Internal Width		External			Nominal Vol. ml	Remarks
			W	H	L	W	H		
126 & 126-F	SOG, Q, I	2	2	4.5	12.5	70	0.700	Macro/Standard Rectangular. Short socket. Fluorimeter	
126 & 126-F	SOG, Q, I	5	5	7.5	12.5	70	1.750	Macro/Standard Rectangular. Short socket. Fluorimeter	
126 & 126-F	SOG, Q, I	10	10	12.5	12.5	70	3.500	Macro/Standard Rectangular. Short socket. Fluorimeter	
128 & 128-F	SOG, Q, I	2	2	4.5	12.5	120	0.700	Macro/Standard Rectangular. Extended socket. Fluorimeter	
128 & 128-F	SOG, Q, I	5	5	7.5	12.5	120	1.750	Macro/Standard Rectangular. Extended socket. Fluorimeter	
128 & 128-F	SOG, Q, I	10	10	12.5	12.5	120	3.500	Macro/Standard Rectangular. Extended socket. Fluorimeter	

Type 20/O. Short path length. Demountable, open-ended

- One end open when assembled.
- Two polished windows.
- Intended for use with Type CH/2049 cell holder. (see page 28)

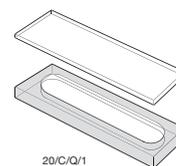
Type No.	Window Materials	Path Length	Internal W	H	L	External W	H	Nominal Vol. ml
20/O	Q, I	0.01	10	43.5	2.5	12.5	45	0.004
20/O	Q, I	0.05	10	43.5	2.5	12.5	45	0.020
20/O	Q, I	0.1	10	43.5	2.6	12.5	45	0.040
20/O	Q, I	0.2	10	43.5	2.7	12.5	45	0.080
20/O	Q, I	0.5	10	43.5	3.0	12.5	45	0.190
20/O	G, SOG, Q, I	1	10	43.5	3.5	12.5	45	0.390



Type 20/C & Type 30. Short path length. Demountable, closed

- Totally enclosed when assembled.
- Two polished windows.
- **Type 20/C** intended for use with **Type CH/2049** cell holder. (see page 28)

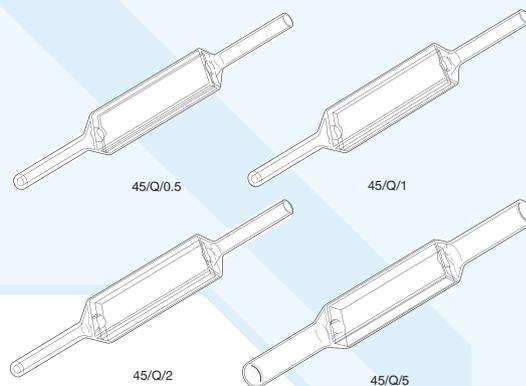
Type No.	Window Materials	Path Length	Internal W	H	External L	W	H	O.D.	I.D.	Thickness	Nominal Vol. ml
20/C	Q	0.008	8	38	2.5	12.5	45				0.002
20/C	Q, I	0.01	8	38	2.5	12.5	45				0.003
20/C	Q, I	0.05	8	38	2.5	12.5	45				0.015
20/C	Q, I	0.1	8	38	2.6	12.5	45				0.030
20/C	Q, I	0.2	8	38	2.7	12.5	45				0.060
20/C	Q, I	0.5	8	38	3.0	12.5	45				0.150
20/C	G, SOG, Q, I	1	8	38	3.5	12.5	45				0.310
30	Q	0.01						22	16	2.5	0.002
30	Q	0.1						22	16	2.6	0.020
30	Q	0.2						22	16	2.7	0.040
30	Q	0.5						22	16	3.0	0.100



Type 45 & 45-F. Flow cells. In-line or microscope analysis

- **Type 45** two polished windows. **Type 45-F** has four polished windows.
- Tubes may be bent at angles to sample compartment if required.
- Up to 2mm Path length. Inlet/Outlet tubes - 2mm I.D., 4mm O.D. x 25mm long.
- Up to 5mm Path length. Inlet/Outlet tubes - 5mm I.D., 7mm O.D. x 25mm long.

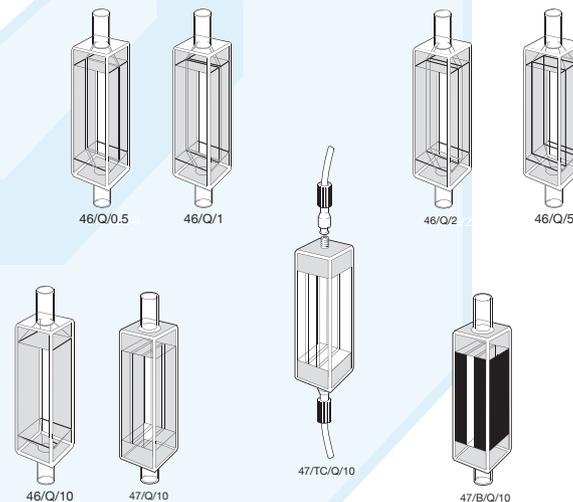
Type No.	Window Material	Path Length	Internal Width	External L	W	H	Nominal Vol. ml
45 & 45-F	Q	0.1	10	2.6	12.5	40 + tubes	0.040
45 & 45-F	Q	0.2	10	2.7	12.5	40 + tubes	0.080
45 & 45-F	Q	0.5	10	3.0	12.5	40 + tubes	0.200
45 & 45-F	Q	1.0	10	3.5	12.5	40 + tubes	0.400
45 & 45-F	Q	2.0	10	4.5	12.5	40 + tubes	0.800
45 & 45-F	Q	5.0	10	7.5	12.5	40 + tubes	4.000



Type 46, 46-F Fluorimeter & 47 Flow cells. In-line

- Two polished windows. Type 46-F have 4 windows and base polished.
- Tubulations intended for push-on flexible tubing.
- Profiled inlet and outlet
- Inlet/outlet tubes - 2mm I.D., 4mm O.D. and 10mm long.
- TYPE 47/TC Screw-on connections

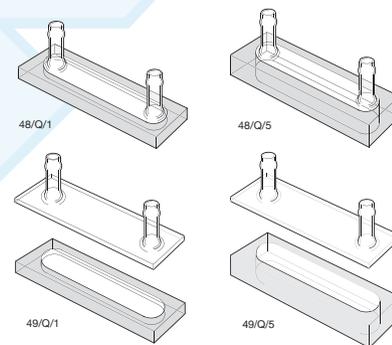
Type No.	Window Materials	Path Length	Internal Width	External L	External W	External H	Nominal Vol. ml
Clear walls							
46 & 46-F	Q	0.5	10	12.5	12.5	65	0.185
46 & 46-F	Q	1	10	12.5	12.5	65	0.370
46 & 46-F	Q	2	10	12.5	12.5	65	0.740
46 & 46-F	Q	5	10	12.5	12.5	65	1.850
46 & 46-F	G, SOG, Q	10	10	12.5	12.5	65	3.700
Semi-micro. Clear walls							
47	G, SOG, Q	10	4	12.5	12.5	65	1.480
47/TC	Q	10	4	12.5	12.5	65	1.480
Semi-micro. Self-masking. Black walls							
47/B	Q	10	4	12.5	12.5	65	1.480



Type 48 Flow cells & Type 49 demountable Flow cells. Short path length

- Two polished windows.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 16mm long intended for push-on flexible tubing.
- Intended for use with Type CH/2049 cell holder. (see page 28)

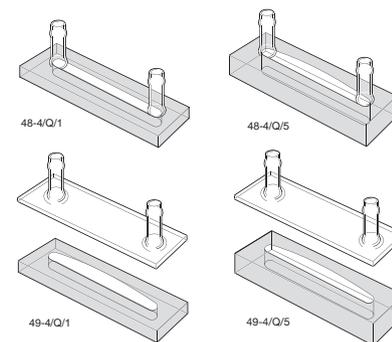
Type No.	Window Materials	Path Length	Internal W	Internal H	External L	External W	External H	Nominal Vol. ml
48 or 49	Q, I	0.01	8	38	2.6	12.5	45	0.003
48 or 49	Q, I	0.1	8	38	2.6	12.5	45	0.030
48 or 49	Q, I	0.2	8	38	2.7	12.5	45	0.060
48 or 49	Q, I	0.5	8	38	3.0	12.5	45	0.150
48 or 49	G, SOG, Q, I	1	8	38	3.5	12.5	45	0.300
48 or 49	G, SOG, Q, I	2	8	38	4.5	12.5	45	0.600
48 or 49	G, SOG, Q, I	5	8	38	7.5	12.5	45	1.560



Type 48-4 Flow cells & Type 49-4 demountable Flow cells. Short path length

- Two polished windows.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 16mm long intended for push-on flexible tubing.
- Intended for use with Type CH/2049 cell holder. (see page 28)

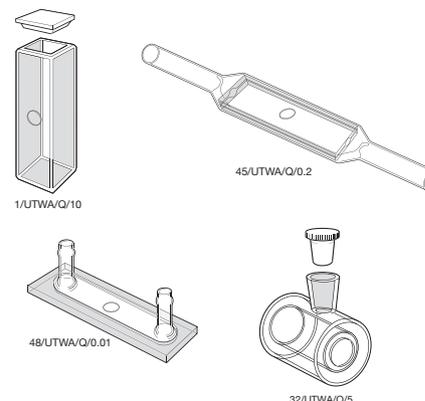
Type No.	Window Materials	Path Length	Internal W	Internal H	External L	External W	External H	Nominal Vol. ml
48-4 or 49-4	Q, I	0.01	4	38	2.6	12.5	45	0.002
48-4 or 49-4	Q, I	0.1	4	38	2.6	12.5	45	0.015
48-4 or 49-4	Q, I	0.2	4	38	2.7	12.5	45	0.030
48-4 or 49-4	Q, I	0.5	4	38	3.0	12.5	45	0.075
48-4 or 49-4	G, SOG, Q, I	1	4	38	3.5	12.5	45	0.150
48-4 or 49-4	G, SOG, Q, I	2	4	38	4.5	12.5	45	0.300
48-4 or 49-4	G, SOG, Q, I	5	4	38	7.5	12.5	45	0.780



Types UTWA & UTWA2. Ultra thin wall aperture cells

- Two polished windows.
- Aperture window - 0.2mm (200 microns)
- For use with high magnification systems
- UTWA/2 has two thin window apertures, one in each window.

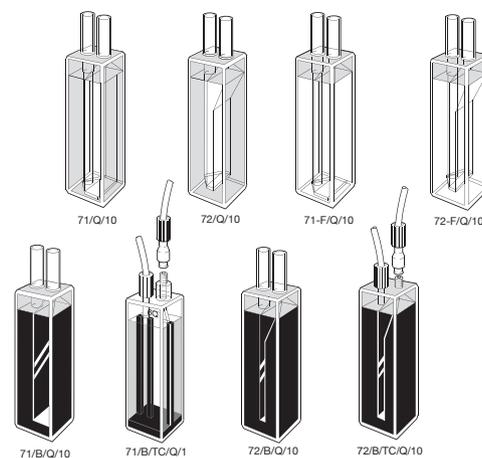
Type No.	Window Materials	Path Length	Internal Width	External L	External W	Internal HDia.	External Dia.
1/UTWA	Q	All	10	12.5	12.5	45	-
1/UTWA2	Q		10	12.5	12.5	45	-
45/UTWA	Q	Path	10	12.5	12.5	45	-
45/UTWA2	Q		10	12.5	12.5	45	-
48/UTWA	Q		10	2.6	12.5	45	-
48/UTWA2	Q		10	2.6	12.5	45	-
32/UTWA	Q	Lengths	-	22.5	-	-	15
32/UTWA2	Q		-	22.5	-	-	15



Type 71, 71B, 71F, 72, 72B & 72F Flow cells. Standard and semi-micro

- 71, 71B, 72 & 72B have two polished windows.
- Long sample compartment suitable for all Z dimensions.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 16mm long intended for push-on flexible tubing.
- Also available with TC threaded connectors.
- 71-F & 72-F fluorescence cells have three polished windows.

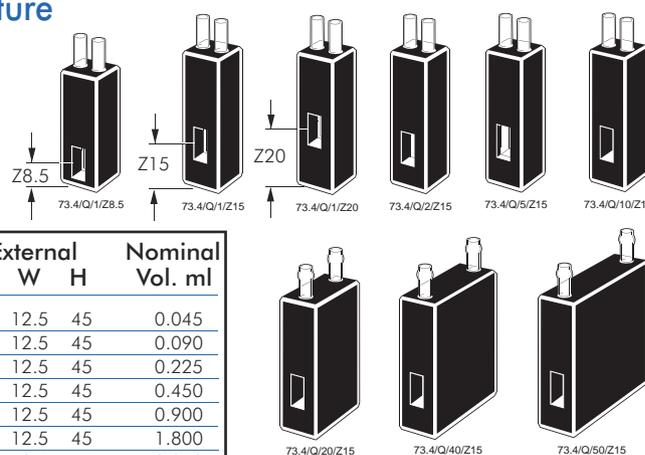
Type No.	Window Materials	Path Length	Internal		External			Nominal Vol. ml
			W	H	L	W	H	
Clear walls								
71	Q	10	7	37.5	12.5	12.5	48	3.000
71-F	Q	10	7	37.5	12.5	12.5	48	3.000
72	Q	10	4	37.5	12.5	12.5	48	1.800
72-F	Q	10	4	37.5	12.5	12.5	48	1.800
Self masking. Black walls								
71/B	Q	1	7	37.5	12.5	12.5	48	0.300
71/B	Q	10	7	37.5	12.5	12.5	48	3.000
72/B	Q	1	4	37.5	12.5	12.5	48	0.180
72/B	Q	10	4	37.5	12.5	12.5	48	1.800



Type 73.4. Flow cells. Dissolution, medium aperture

- Two polished windows.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 10mm long intended for push-on flexible tubing.
- Cells with a Z height of 8.5mm have an overall height of 38.5mm.

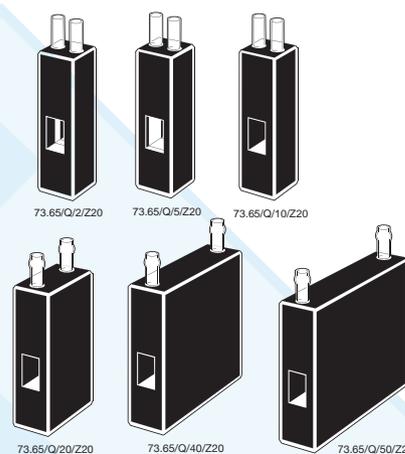
Type No.	Window Material	Path Length	Z Height	Internal		External			Nominal Vol. ml
				W	H	L	W	H	
73.4	Q	1	8.5, 15, 20	4	11	12.5	12.5	45	0.045
73.4	Q	2	8.5, 15, 20	4	11	12.5	12.5	45	0.090
73.4	Q	5	8.5, 15, 20	4	11	12.5	12.5	45	0.225
73.4	SOG, Q, SX	10	8.5, 15, 20	4	11	12.5	12.5	45	0.450
73.4	Q	20	8.5, 15, 20	4	11	22.5	12.5	45	0.900
73.4	Q	40	8.5, 15, 20	4	11	42.5	12.5	45	1.800
73.4	Q	50	8.5, 15, 20	4	11	52.5	12.5	45	2.250



Type 73.65 Flow cells. Dissolution, wide aperture

- Two polished windows.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 10mm long intended for push-on flexible tubing.
- Cells with a Z height of 8.5mm have an overall height of 38.5mm.

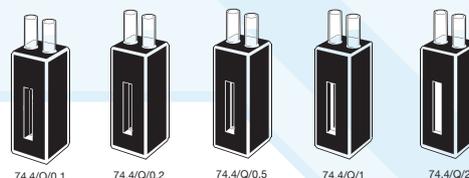
Type No.	Window Material	Path Length	Z Height	Internal		External			Nominal Vol. ml
				W	H	L	W	H	
73.65	Q	1	8.5, 15, 20	6.5	11	12.5	12.5	45	0.072
73.65	Q	2	8.5, 15, 20	6.5	11	12.5	12.5	45	0.144
73.65	Q	5	8.5, 15, 20	6.5	11	12.5	12.5	45	0.360
73.65	Q	10	8.5, 15, 20	6.5	11	12.5	12.5	45	0.720
73.65	Q	20	8.5, 15, 20	6.5	11	22.5	12.5	45	1.440
73.65	Q	40	8.5, 15, 20	6.5	11	42.5	12.5	45	2.880
73.65	Q	50	8.5, 15, 20	6.5	11	52.5	12.5	45	3.600



Type 74.4 Flow cells. Dissolution. Short path length, long aperture

- Two polished windows.
- Path lengths of 0.5mm or less incorporate by-pass tubes to avoid back pressure and assist laminar flow through the sample compartment. Profiled sample compartment to optimise flow characteristics, reduces carry-over and bubble retention.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 10mm long intended for push-on flexible tubing.

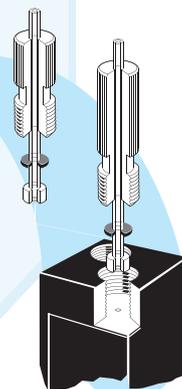
Type No.	Window Material	Path Length	Z Height	Internal		External			Nominal Vol. ml
				W	H	L	W	H	
74.4	Q	0.1	15	4	17.5	12.5	12.5	35	0.042
74.4	Q	0.2	15	4	17.5	12.5	12.5	35	0.049
74.4	Q	0.5	15	4	17.5	12.5	12.5	35	0.100
74.4	Q	1	15	4	17.5	12.5	12.5	35	0.135
74.4	Q	2	15	4	17.5	12.5	12.5	35	0.200



Advantages of Starna® Type 583, 584, 576, 577 & 585 series flow cells

(for 576, 577 & 583 see page 20)

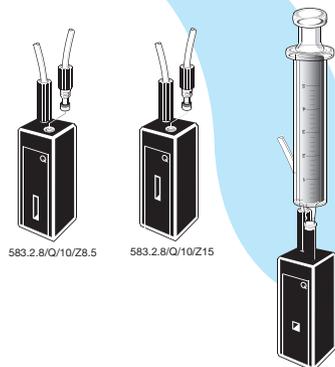
- Fully fused body, accurately located in precisely formed extruded CNC drilled enclosure.
- Superior design, firm and accurate positioning of screw-in M6 gripper fittings with PTFE tubing, without reliance on the shear strength of intermediate bonding material.
- Polished top surface of the cell creates a positive seal with the PTFE face of the M6 gripper fitting, (see illustration), ensures a leak proof seal without dislodging the cell body or damaging the cell surface.
- A gap of ≈300 microns between the top of the cell body and the enclosure allows confirmation of a positive seal before use.
- Internally profiled inlet and outlet to each sample chamber optimises flow characteristic and performance, providing a smooth laminar flow wherever possible and reduces bubble retention.
- All cells are pressure tested to more than 5 bar after final assembly.
- Each cell is engraved with the path length and a unique identifying number, for full traceability throughout the manufacturing process.
- Cells with path lengths of less than 0.5mm or less are checked on a reference spectrophotometer before and after final assembly using an interference method. The path length is determined to an uncertainty better than 0.2 microns (0.0002mm). Path lengths of 0.5mm or greater are verified by physical measurement during the production processes.
- Flanged fittings, FEP tubing, and special adaptors Type TJ/G/038 for use with normal silicone tubing are available, see page 29.
- Short path length flow cells may be used as static short path length using a syringe and luer lock adaptor (see illustration).



Type 583.2.8 Flow cells. Dissolution. Micro aperture

- Two polished windows.
- M6 Screw-in connections.
- Profiled sample compartment to optimise flow characteristics, reduces carry-over and bubble retention.

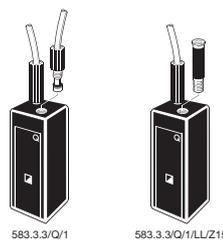
Type No.	Window Material	Path Length	Z Height	Internal W	Internal H	External L	External W	External H	Nominal Vol. ml
583.2.8	Q	10	8.5, 15	2	8	12.5	12.5	35	0.160



Type 583.3.3. Flow cells. Sub-micro. Small aperture

- Two polished windows.
- Overflow tube attached to outlet side of cell.
- M6 fittings as described, included with cell.
- Also designed for use with luer lock fitting and syringe for introduction and extraction of sample.

Type No.	Window Materials	Path Length	Z Height	Internal W	Internal H	External W	External H	Nominal Vol. ml
583.3.3	Q	1	15	3	3	12.5	35	0.009
583.3.3	Q	2	15	3	3	12.5	35	0.018
583.3.3	Q	5	15	3	3	12.5	35	0.045

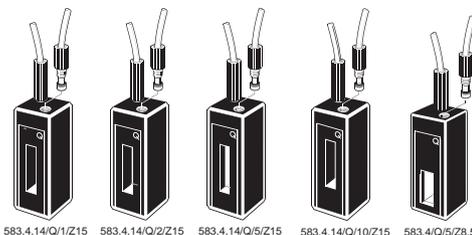


Z Dimension per instrument

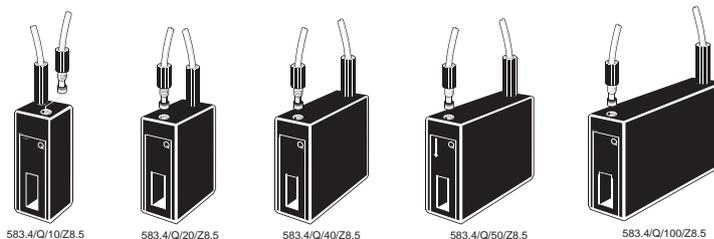
Manufacturer	Z Dimension
Agilent®	15mm
Beckman®	8.5mm
Bio-Rad®	8.5mm
Eppendorf®	8.5mm
GBC®	15mm
Hewlett-Packard®	15mm
Hitachi®	8.5mm
Jasco®	12mm
Perkin-Elmer®	15mm
Pharmacia®	15mm
Scinco®	15mm
Shimadzu®	15mm
Spectronics®	8.5mm
Turner®	8.5mm
Varian® (Cary®/Agilent®)	20mm

Type 583.4 & 583.4.14 Flow cells. Dissolution. Medium Aperture

- Two polished windows.
- M6 Screw-in connections.
- Profiled sample compartment to optimise flow characteristics, reduces carry-over and bubble retention.

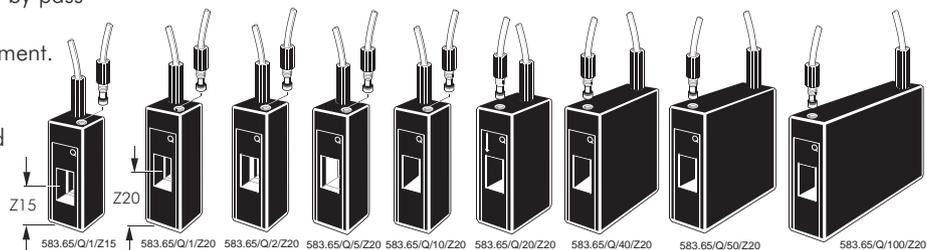


Type No.	Window Materials	Path Length	Z Height	Internal W	Internal H	External W	External H	Nominal Vol. ml
583.4.14	Q	1	15, 20	4	14	12.5	35	0.056
583.4.14	Q	2	15, 20	4	14	12.5	35	0.112
583.4.14	Q	5	15, 20	4	14	12.5	35	0.280
583.4.14	Q	10	15, 20	4	14	12.5	35	0.560
583.4	Q	5	8.5, 15, 20	4	11	12.5	35	0.225
583.4	Q	10	8.5, 15, 20	4	11	12.5	35	0.450
583.4	Q	20	8.5, 15, 20	4	11	12.5	35	0.900
583.4	Q	40	8.5, 15, 20	4	11	12.5	35	1.800
583.4	Q	50	8.5, 15, 20	4	11	12.5	35	2.250
583.4	Q	100	8.5, 15, 20	4	11	12.5	35	4.500



Type 583.65 Flow cells. Dissolution. Wide aperture

- Two polished windows.
- Cells with a Z height of 20mm have overall an height of 40mm.
- Path lengths of 0.5mm or less incorporate by-pass tubes to avoid back pressure and assist laminar flow through the sample compartment.
- M6 Screw-in connections.
- Profiled sample compartment to optimise flow characteristics, reduce carry-over and bubble retention.



Type No.	Window Material	Path Length	Z Height	Internal		External			Nominal Vol. ml
				W	H	L	W	H	
583.65	Q	0.1	15, 20	6.5	11	12.5	12.5	35	0.029
583.65	Q	0.2	15, 20	6.5	11	12.5	12.5	35	0.036
583.65	Q	0.5	15, 20	6.5	11	12.5	12.5	35	0.072
583.65	Q	1	15, 20	6.5	11	12.5	12.5	35	0.072
583.65	Q	2	15, 20	6.5	11	12.5	12.5	35	0.290
583.65	Q	5	15, 20	6.5	11	12.5	12.5	35	0.360
583.65	Q	10	15, 20	6.5	11	12.5	12.5	35	0.720
583.65	Q	20	15, 20	6.5	11	22.5	12.5	35	1.400
583.65	Q	40	15, 20	6.5	11	42.5	12.5	35	2.900
583.65	Q	50	15, 20	6.5	11	52.5	12.5	35	3.600
583.65	Q	100	15, 20	6.5	11	102.5	12.5	35	7.200



Type 583.65.65 Flow cells. Dissolution. Wide square aperture

- Two polished windows.
- Cells with a Z height of 20mm have overall an height of 40mm.
- M6 Screw-in connections.
- Profiled sample compartment to optimise flow characteristics, reduces carry over and bubble retention.
- Aperture with reduced height and volume for specific instruments such as Agilent 8453 and Varian Cary 50.

Type No.	Window Material	Path Length	Z Height	Internal		External			Nominal Vol. ml
				W	H	L	W	H	
583.65.65	Q	1	15, 20*	6.5	6.5	12.5	12.5	35	0.076
583.65.65	Q	2	15, 20*	6.5	6.5	12.5	12.5	35	0.160
583.65.65	Q	5	15, 20*	6.5	6.5	12.5	12.5	35	0.210
583.65.65	Q	10	15, 20*	6.5	6.5	12.5	12.5	35	0.420

* When Z height is 20mm, external height is 40mm

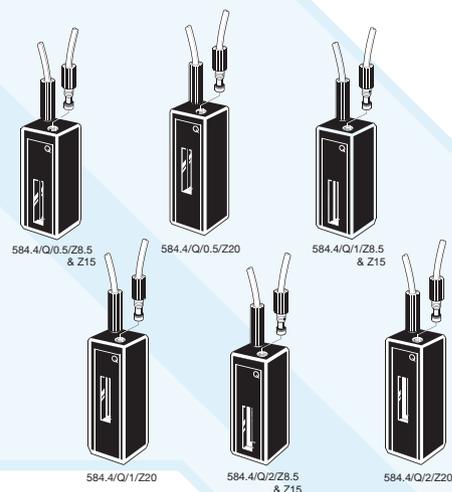


Type 584.4 Flow cells. Dissolution. Short path length, long aperture

- Two polished windows.
- Long aperture.
- Path lengths of 0.5mm or less incorporate by-pass tubes to avoid back pressure and assist laminar flow through the sample compartment.
- M6 Screw-in connections.
- Profiled sample compartment to optimise flow characteristics, reduces carry over and bubble retention.

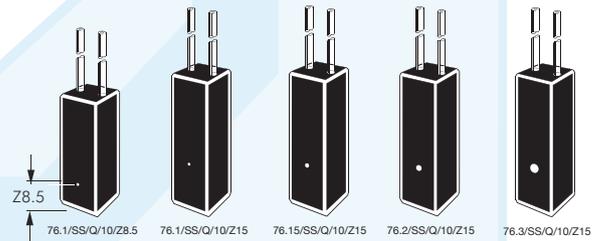
Type No.	Window Material	Path Length	Z Height	Internal		External			Nominal Vol. ml
				W	H	L	W	H	
584.4	Q	0.01	8.5, 15, 20*	4	17.5	12.5	12.5	35	0.036
584.4	Q	0.05	8.5, 15, 20*	4	17.5	12.5	12.5	35	0.039
584.4	Q	0.1	8.5, 15, 20*	4	17.5	12.5	12.5	35	0.041
584.4	Q	0.2	8.5, 15, 20*	4	17.5	12.5	12.5	35	0.047
584.4	Q	0.5	8.5, 15, 20*	4	17.5	12.5	12.5	35	0.095
584.4	Q	1	8.5, 15, 20*	4	17.5	12.5	12.5	35	0.120
584.4	Q	2	8.5, 15, 20*	4	17.5	12.5	12.5	35	0.240

* When Z height is 20mm, external height is 40mm



Type 76. Flow cells HPLC, round aperture with stainless steel tubes

- Two polished windows.
- Stainless steel inlet/outlet tubes.
- Cells with a Z height of 8.5mm have an overall height of 38.5mm.



Type No.	Window Materials	Path Length	Z Height	Internal Dia.	External			Nominal Vol. ml	Stainless steel tubes				
					L	W	H		Inlet I.D.	O.D.	Outlet I.D.	O.D.	Length
76.1	Q	10	8.5, 15	1	12.5	12.5	45	0.008	0.25	1.6	0.5	1.6	100
76.15	SOG, Q	10	8.5, 15	1.5	12.5	12.5	45	0.018	1.0	1.6	1.0	1.6	100
76.2	SOG, Q	10	8.5, 15	2	12.5	12.5	45	0.040	1.0	1.6	1.0	1.6	100
76.3	SOG, Q	10	8.5, 15	3	12.5	12.5	45	0.080	1.0	1.6	1.0	1.6	100

Type 15. Micro aspiration

- Two polished windows.
- Open top.
- Filling and emptying with a pipette is recommended.



Type No.	Window Material	Path Length	Z Height	Internal W	Internal H	External L	External W	External H	Nominal Vol. ml
15.50A	Q	10	8.5	-	13.5	12.5	12.5	15	0.050

Type 25. Micro & semi-micro. Vacuum suction/aspiration

- Two polished windows.
- Inlet/outlet tubes - 2 I.D., 4 O.D., 10mm long intended for push-on flexible tubing.
- Funnel supplied with cell.

Type No.	Window Materials	Path Length	Internal W	External L	External W	External H	Base to Block (BB)	Nominal Vol. ml
Micro. Clear walls								
25.2	SOG, Q	10	2	12.5	12.5	45	26	0.500
Micro. Black walls. Self-masking								
25.2/B	SOG, Q	10	2	12.5	12.5	45	26	0.500
Semi-micro. Clear walls								
25.4	SOG, Q	10	4	12.5	12.5	45	26	1.000
Semi-micro. Black walls. Self-masking								
25.4/B	SOG, Q	10	4	12.5	12.5	45	26	1.000
25.4.18/B	SOG, Q	10	4	12.5	12.5	64	44	0.750



Type 28-AS. Micro, suction outlet

Type 29-AS. Semi-micro, suction outlet

- Two polished windows.
- Inlet/outlet tubes - 2 I.D., 4 O.D., 10mm long intended for push-on flexible tubing.
- Funnel supplied with cell.

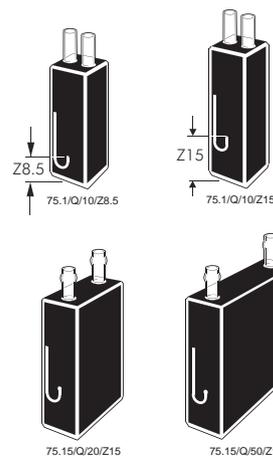
Type No.	Window Materials	Path Length	Internal W	External L	External W	External H	Base to Tube (BT)	Nominal Vol. ml
Micro. Clear walls								
28-AS	SOG, Q	10	2	12.5	12.5	48	31	0.500
Micro. Black walls. Self-masking								
28-AS/B	SOG, Q	10	2	12.5	12.5	48	31	0.500
Semi-micro. Clear walls								
29-AS	SOG, Q	10	4	12.5	12.5	48	31	1.000
Semi-micro. Black walls. Self-masking								
29-AS/B	SOG, Q	10	4	12.5	12.5	48	31	1.000
29/AS60/B	Q	10	4	12.5	12.5	60	46.5	1.200
29/AS70/B	SOG, Q	10	4	12.5	12.5	70	55	1.800



Type 75.1, 75.15 Flow cells. Ultra-micro, round aperture

- Two polished windows.
- Cells with a Z height of 8.5mm have an overall height of 38.5mm.
- Bore specially treated to reduce bubble formation and/or retention.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 10mm long intended for push-on flexible tubing.

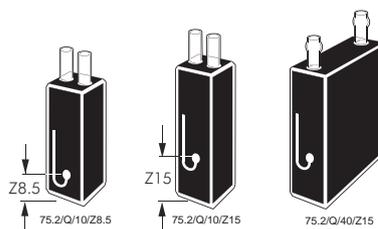
Type No.	Window Material	Path Length	Z Height	Internal Dia.	External L	External W	External H	Nominal Vol. ml
75.1	Q, SX	5	8.5,15	1	12.5	12.5	35	0.036
75.1	SOG, Q, SX	10	8.5,15	1	12.5	12.5	35	0.039
75.15	Q, SX	1	8.5,15	1.5	12.5	12.5	35	0.041
75.15	Q, SX	2	8.5,15	1.5	12.5	12.5	35	0.047
75.15	Q, SX	5	8.5,15	1.5	12.5	12.5	35	0.095
75.15	SOG, Q, SX	10	8.5,15	1.5	12.5	12.5	35	0.120
75.15	Q, SX	20	8.5,15	1.5	22.5	12.5	35	0.240
75.15	Q, SX	50	8.5,15	1.5	52.5	12.5	35	0.600



Type 75.2 Flow cells. Sub-micro, round aperture

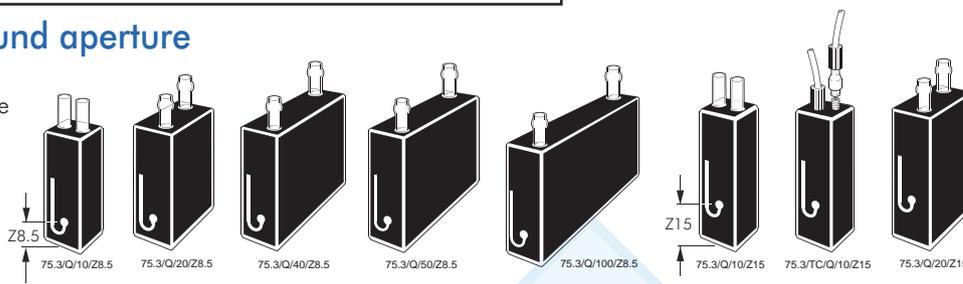
- Two polished windows.
- Cells with a Z height of 8.5mm have an overall height of 38.5mm.
- Bore specially treated to reduce bubble formation and/or retention.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 10mm long intended for push-on flexible tubing.

Type No.	Window Material	Path Length	Z Height	Internal Dia.	External L	External W	External H	Nominal Vol. ml
75.2	SOG, Q, SX	2	8.5,15	2	12.5	12.5	45	0.007
75.2	SOG, Q, SX	5	8.5,15	2	12.5	12.5	45	0.016
75.2	SOG, Q, SX	10	8.5,15	2	12.5	12.5	45	0.032
75.2	SOG, Q, SX	40	8.5,15	2	42.5	12.5	45	0.128



Type 75.3 Flow cells. Round aperture

- Two polished windows.
- Cells with a Z height of 8.5mm have an overall height of 38.5mm.
- Bore specially treated to reduce bubble formation and/or retention.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 10mm long intended for push-on flexible tubing.

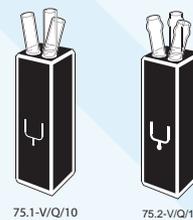


Type No.	Window Material	Path Length	Z Height	Internal W	Internal H	External L	External W	External H	Nominal Vol. ml	Remarks
75.3	SOG, Q	1	8.5,15	3	1	12.5	12.5	45	0.007	
75.3	SOG, Q	2	8.5,15	3	2	12.5	12.5	45	0.014	
75.3	SOG, Q	5	8.5,15	3	5	12.5	12.5	45	0.035	
75.3	SOG, Q, SX	10	8.5,15	3	10	12.5	12.5	45	0.070	
75.3/TC	Q	10	15, 20	3	10	12.5	12.5	45	0.070	Screw-on connections
75.3	SOG, Q	20	8.5,15	3	20	22.5	12.5	45	0.140	
75.3	SOG, Q	40	8.5,15	3	40	42.5	12.5	45	0.280	
75.3	SOG, Q	50	8.5,15	3	50	52.5	12.5	45	0.350	
75.3	SOG, Q	100	8.5,15	3	100	102.5	12.5	45	0.700	

Type 75.1-V Flow cells. Ultra-micro, sub-micro, round aperture vacuum/debubbler

- Two polished windows.
- Cells with a Z height of 8.5mm have an overall height of 38.5mm.
- Bore specially treated to reduce bubble formation and/or retention.
- Inlet/outlet tubes - 2 I.D, 4 O.D, 10mm long intended for push-on flexible tubing.
- Third outlet debubbler tube - 2 I.D, 4 O.D, 10mm long.

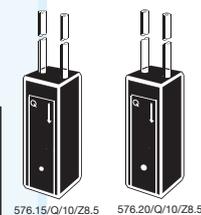
Type No.	Window Material	Path Length	Z Height	Internal Dia.	External L	External W	External H	Nominal Vol. ml
75.1-V	Q	10	8.5,15	1	12.5	12.5	45	0.008
75.2-V	Q	10	8.5,15	2	12.5	12.5	45	0.040



Type 576 Ultra micro, round aperture with stainless steel tubes

- Two polished windows.
- Bore specially treated to reduce bubble formation and/or retention.
- Stainless steel inlet/outlet tubes. Nominal length 100mm.

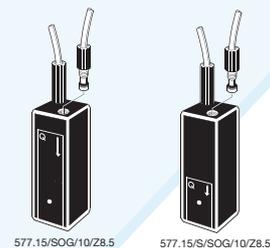
Type No.	Window Material	Path Length	Z Height	Internal Dia.	External			Nominal Vol. ml	Stainless steel tubes				
					L	W	H		Inlet I.D.	O.D.	Outlet I.D.	O.D. L	
576.15	SOG, Q	10	8.5	1,5	12.5	12.5	35	0.018	1.0	1.6	1.0	1.6	100
576.20	SOG, Q	10	8.5	2,0	12.5	12.5	35	0.032	1.0	1.6	1.0	1.6	100



Type 577 Ultra micro round aperture

- Two polished windows.
- Bore specially treated to reduce bubble formation and/or retention.
- M6 screw-in connections.
- Long body or short body 576.15/S.

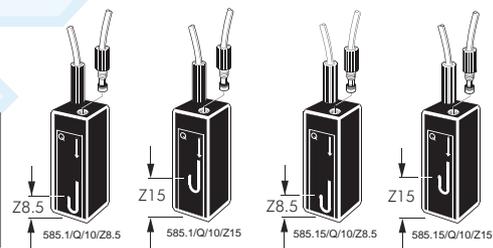
Type No.	Window Material	Path Length	Z Height	Internal Dia.	External			Nominal Vol. ml
					L	W	H	
577.15	SOG	10	8.5	1,5	12.5	12.5	35	0.018
577.15/S	SOG	10	8.5	1,5	12.5	12.5	35	0.018



Type 585.1, 585.15 Flow cells. Ultra-micro, round aperture

- Two polished windows.
- Bore specially treated to reduce bubble formation and/or retention.
- M6 screw-in connections.

Type No.	Window Material	Path Length	Z Height	Internal Dia.	External			Nominal Vol. ml
					L	W	H	
585.1	SOG, Q	10	8.5,15, 20*	1	12.5	12.5	35	0.008
585.15	SOG, Q	10	8.5,15, 20*	1.5	12.5	12.5	35	0.018

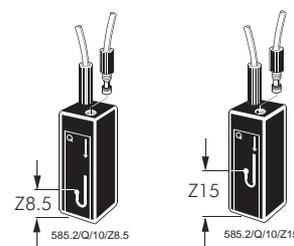


* When Z height is 20mm, external height is 40mm

Type 585.2 Flow cells. Sub-micro, round aperture

- Two polished windows.
- Bore specially treated to reduce bubble formation and/or retention.
- M6 screw-in connections.

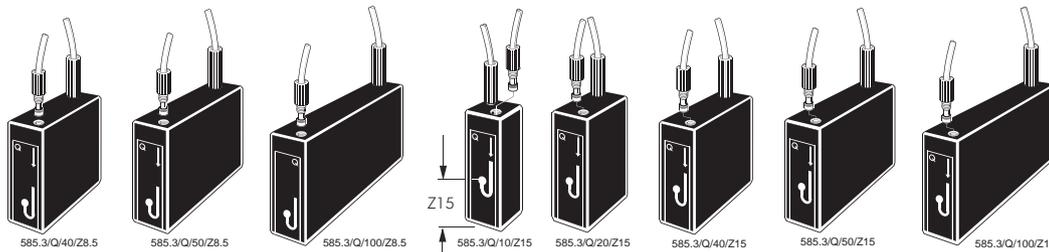
Type No.	Window Material	Path Length	Z Height	Internal Dia.	External			Nominal Vol. ml
					L	W	H	
585.2	SOG, Q, SX	10	8.5,15, 20*	2	12.5	12.5	35	0.032



* When Z height is 20mm, external height is 40mm

Type 585.3 Flow cells, round aperture

- Two polished windows.
- Bore specially treated to reduce bubble formation and/or retention.
- M6 screw-in connections.



Type No.	Window Material	Path Length	Z Height	Internal Dia.	External			Nominal Vol. ml
					L	W	H	
585.3	SOG, Q	10	8.5,15, 20*	3	12.5	12.5	35	0.070
585.3	SOG, Q	20	8.5,15, 20*	3	22.5	12.5	35	0.140
585.3	SOG, Q	40	8.5,15, 20*	3	42.5	12.5	35	0.280
585.3	SOG, Q	50	8.5,15, 20*	3	52.5	12.5	35	0.350
585.3	SOG, Q	100	8.5,15, 20*	3	102.5	12.5	35	0.700

* When Z height is 20mm, external height is 40mm

Z Dimension per instrument

Manufacturer	Z Dimension
Agilent®	15mm
Beckman®	8.5mm
Bio-Rad®	8.5mm
Eppendorf®	8.5mm
GBC®	15mm
Hewlett-Packard®	15mm
Hitachi®	8.5mm
Jasco®	12mm
Perkin-Elmer®	15mm
Pharmacia®	15mm
Scinco®	15mm
Shimadzu®	15mm
Spectronics®	8.5mm
Turner®	8.5mm
Varian® (Cary®/Agilent®)	20mm

Instrument validation

NIST Traceable Glass & Liquid References

* **Starna** are a world leading manufacturer and supplier of **Certified Reference Materials [CRMs]** for UV, Visible and Near Infrared photometer applications. All CRMs are manufactured to **ISO 17025 & ISO Guide 34** in the **Starna UKAS accredited laboratory**.

* **Starna** CRMs meet all current international regulatory validation requirements for UV, Visible and Near Infrared spectrophotometer instruments.

* Glass filter CRMs are manufactured to the exacting standards required by **National Metrology Institutes [NMIs]**.

* All Starna liquid references are heat fusion-sealed, eliminating both contamination and leakage issues. Starna has forty years experience in the production of heat fusion - sealed references.

* A **Lifetime Guarantee** covers all Starna UKAS Certified references, provided the CRMs are re-certified at least every two years and are used in compliance with the conditions of use, stated in the documentation enclosed with each set.

* **Re-calibration service** with a guaranteed five working day turn-round is available from the Starna Calibration Laboratory, for all references. Some third party references can also be certified to ISO 17025 standard.



Below are some typical set designations to meet various regulatory requirements.

Full details of all references are available from Starna.

European Pharmacopoeia - RM-0660HLKCTX

Potassium Dichromate 60 & 600mg/l, Holmium Perchlorate, Potassium Chloride, Toluene/Hexane

Full Pharmacopoeia - RM-0660HLKCSITX

Potassium Dichromate 60 & 600mg/l, Holmium Perchlorate, Potassium Chloride, Sodium Iodide, Toluene/Hexane

United States Pharmacopoeia (USP) - RM-06HLKITX

Potassium Dichromate 60mg/l, Holmium Perchlorate, Potassium Iodide, Toluene/Hexane

RM-06 Potassium Dichromate 60mg/l

RM-HL Holmium Perchlorate

RM-1N2N3N Neutral Density Filter 10, 20 & 30%T

RM-N1N35N Neutral Density Filter 1, 3 & 50%T

RM-NIR TS5 Reference



Absorbance & Linearity



Wavelength



Stray Light



Instrument Resolution

Terms of Sale

Normal terms of sale are net 30 days, FOB Hainault to authorised accounts. Under our terms of sale 'Title of ownership of any goods shipped does not transfer until the goods have been paid for in full'.

Product Warranty

Starna® Spectrophotometer and Fluorimeter cells are warranted to meet the specifications shown on page 2 of this catalogue and be equal to or better than the dimensional tolerance for each cell listed. Stringent quality control is exercised throughout production with only guaranteed and brand named raw materials used, so that cells will perform to the highest specification for any given design.

Any goods to be returned under warranty require a Return of Merchandise Authorisation (RMA) number, which can be obtained by calling our Customer Service Department.

We reserve the right to change the design or specification of any product without prior notification.

Technical Information

Technical staff are available to assist in the selection of cell material or physical configuration to satisfy individual applications.

Method of shipment

Prices do not include shipping costs, duty or tax. Normal shipment, unless otherwise specified, is by recorded letter or parcel post. Overnight service is available via Courier or Data Post. Overseas shipments utilise Air parcel or letter post, UPS, TNT, DHL, FedEx or regular air freight. Unless specified otherwise all shipping charges are prepaid and added to the sales invoice.

Stock items

Great efforts are made to stock the widest possible range of products for immediate shipping.

Any item temporarily out of stock will be back ordered to our own production facility and shipped at the earliest possible opportunity unless otherwise instructed.

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