

TOFWERK icpTOF Specifications

icpTOF S2, icpTOF R and icpTOF 2R

Sample Introduction

Parameter	unit	value icpTOF S2	Value icpTOF R	value icpTOF 2R
Access	-	Bench height, torch axis parallel to bench, minimized distances		
Peristaltic pump	-	Software controlled 12 roller, 4 channel mini-pump, inert rollers, low pulsation		
Peristaltic pump tubing	-	Three stop flared PVC pump tubing as standard		
Nebulizer	-	Concentric borosilicate glass with 400 $\mu\text{L}/\text{min}$ flow rate; PFA and high TDS optional		
Spray chamber	-	Baffled cyclonic, high purity quartz; PFA optional		
Spray chamber compatibility	-	Compatibility with all 6 mm OD nebulizers		
Peltier Cooling	-	Software control in range $-10\text{ }^{\circ}\text{C}$ to $+20\text{ }^{\circ}\text{C}$		
Injector	-	Screw-in, self-aligning		
Injector sealing	-	No O-rings required		
Injector size	-	Wide 2.5 mm internal diameter as standard. Optional diameters available.		
Injector material	-	Quartz as standard. Optional materials available.		

Plasma Ion Source

Parameter	unit	value icpTOF S2	value icpTOF R	value icpTOF 2R
Torch	-	Push-in, single piece, quartz		
RF generator	-	Digital, solid state RF generator		
RF generator	-	Dynamic swing frequency matching		
RF generator	-	No plasma shield required		
RF generator power range	W	400-1600 (default 1550)		
Load coil	-	Water-cooled, silver coated, copper load coil		
Ar gas flow controllers	-	Coolant, auxiliary, nebulizer (Ar)		
Additional gas flow controllers	-	Two further MFCs for gas dilution, oxygen addition, laser ablation etc.		
Plasma TV	-	HD camera for remote monitoring of plasma status		

Interface

Parameter	unit	value icpTOF S2	value icpTOF R	Value icpTOF 2R
Interface access	-	Drop-down door		
Sample cone	-	Solid Ni, 1.1 mm diameter (Pt tipped optional)		
Skimmer cone	-	Ni, 0.5 mm diameter (Pt tipped optional)		
Skimmer inserts	-	High sensitive as standard (High matrix and robust as options)		
Interface pump	-	External, high performance rotary pump		
Extraction lens	-	Single, low voltage, conical		
Slide valve	-	PC controlled		

Primary Ion Beam Optics

Parameter	unit	value icpTOF S2	value icpTOF R	value icpTOF 2R
RAPID lens	-	90° ion lens operating at a single fixed voltage		
Electrical connections to primary ion beam	-	Cable free, fixed position, spring mounted gold contacts		
Collision / Reaction Cell (Qcell)	-	Qcell flatapole design		
Qcell MFCs	-	2 MFCs for pure He and reaction gas mixtures: O ₂ , NH ₃ /He, H ₂ /He		
ion blanking	-	notch filter		

TOF Mass Analyzer

Parameter	unit	Value icpTOF S2	value icpTOF R	value icpTOF 2R
Extractions per s	#	83000	33000	21700
Mass Res Power ²³⁸ U *	Th/Th	>900	> 3000	> 6000
Abund Sens (high mass side)	#	¹¹⁵ In +1Th 3.0E-03	²³⁸ U +1Th 3.0E-04	²³⁸ U +1Th 3.0E-05
Abund Sens (low mass side)	#	¹¹⁵ In -1Th 3.0E-03	²³⁸ U -1Th 4.0E-04	²³⁸ U -1Th 3.0E-04
Mass Range	Th	6-280	6-280	6-280

TOFMS Ion Detection System

Parameter	unit	value icpTOF S2	value icpTOF R	value icpTOF 2R
Detector type	-	MCP		
Integration time minimum	ms	0.012	0.030	0.046
Max. time resolution cont. *	ms	0.5	2	3
sampling rate	GS/s	1.6	1.6	1.6
Linear Dynamic Signal Range	cps	1 - > 1.0E+06	1 - > 1.0E+06	1 - > 1.0E+06

Performance

Parameter	unit	value icpTOF S2	value icpTOF R	value icpTOF 2R
Sensitivity in liquid ⁵⁹ Co *	cps/ppb	(He CCT) 25000	10000	5000
Sensitivity in liquid ¹¹⁵ In *	cps/ppb	(He CCT) 80000	20000	15000
Sensitivity in liquid ²³⁸ U *	cps/ppb	(He CCT) 300000	50000	30000
Oxides from liq sample ¹⁴⁰ Ce ¹⁶ O/ ¹⁴⁰ Ce *	%	(He CCT) < 8	< 2.5	< 2.5
Double charged ¹³⁷ Ba ⁺⁺ / ¹³⁷ Ba ⁺ *	%	(He CCT) < 5	< 5	< 5
Short term stability 10 min ²³⁸ U *	%	2	2	2
Long term stability 6h ²³⁸ U	%	5	5	5
Bkg at 220Th	cps	(He CCT) < 20	< 10	< 10
Mass accuracy ²³⁸ U *	mTh	< 10	< 5	< 5

Vacuum System

Parameter	unit	value icpTOF S2	value icpTOF R	value icpTOF 2R
Configuration	-	Three stage, differential pumping	Three stage, differential pumping	Four stage differential pumping
Turbo pump for primary ion beam	-	Split flow turbo molecular pump		
Second turbo pump	-	no	no	yes
Fore Vacuum	-	External backing rotary pump (common to interface)		
Venting	-	Vent valve operated with Ar for fast pumpdown		
MS switch for service	-	30 min to switch between TOF and Q operation plus overnight pumpdown		

QMS mode (e.g. for service)

Quadrupole Mass Analyzer

Parameter	unit	value
Field	-	Virtual hyperbolic
Frequency	MHz	2
Mass range	Th	2-290
Scan speed (Li to U with 40 interval masses)	Th/s	> 3700
Mass stability	Th/day	< +/- 0.025
Abundance sensitivity at m-1 (m= 238U)	ppm	< 0.5
Resolution	-	User definable

QMS Ion Detection System

Parameter	unit	value
Detector		Dual mode discrete dynode electron multiplier
Minimum dwell time, in pulse and analog	µs	100
Dynamic range	cps	1 - > 1.0E+09

* demonstrated on installation

Comment

Th = Thomson, unit for mass to charge ratio

1 Th = 1 u/e = 1 Da/e = 1.036426 x 10e-8 C⁻¹