Specification: 2019 RGA-01

16 January, 2019

HIDEN RGA SERIES

QUADRUPOLE MASS SPECTROMETERS

The Hiden RGA series includes three specification levels:

HALO - for residual gas analysis.

- Vacuum fingerprint – compare and analyse vacuum chamber residual gas/vapour species.
- Trend Analysis – Monitor multiple species partial pressure values in real time.
- Leak detection – Hiden residual gas analysers have excellent sensitivity for Helium.
- 200 and 300 AMU mass range options and partial pressure measurement to $2x10^{-13}$ mbar.

3F - Triple filter mass spectrometers for analytical applications.

- 3F Triple filter technology provides extended mass range, and mass resolution capability, enhanced sensitivity for high mass species, and improved contamination resistance.
- 300 and 510 AMU mass range options and partial pressure measurement to $2x10^{-14}$ mbar

3F- PIC Pulse ion counting detection for fast event studies.

- Pulse ion counting detection provides seven decades continuous dynamic range with full analytical capability up to 12 decades.
- 300 and 510 AMU mass range options, and partial pressure measurement to $5x10^{-15}$ mbar

RGA Series standard features:

- Fast access for Histogram, Trend Analysis and Analog peak displays.
- Mixed mode scanning, Trend Analysis, Histogram and Analog peaks in a multi-window display for example.
- Real time background subtract.
- *New* Vacuum species identification with automated analysis.
- Simultaneous real time display of graphical and tabular trend analysis data.
- Data acquisition from multiple systems via Ethernet.
- Automatic mass scale alignment.
- Integral mass spectral library with full editing facilities.
- Data export facility to ASCII format and to all Windows® devices for printing/plotting.
- Socket Interface for application control and dynamic data link with Windows® compliant aplications.
- Embedded web server with *net*MASsoft Professional. *net*MASsoft Professional is a Java applet enabling simplified RGA operation in a Web browser, Explorer, Safari, or Firefox for example.

Software

MASsoft Professional PC software is included, providing comprehensive data acquisition and system control.

RGA Series Operating Modes include:

- '*Easy Scans'*, pre-set modes for Leak detection, Trend analysis, Histogram scan and Profile peak scan.

- Histogram spectra for mass scanning any mass window within the mass range.

- Profile mode for mass scanning with 0.01 amu increment over a user selectable mass window.

- Trend analysis with real time plotting of peak intensities on a time axis, with tabular and graphical data views plotted simultaneously. Up to 100 mass channels can be programmed.

- Each mass channel in a trend analysis can have its own mass spectrometer parameter set for optimising the acquisition for each species.

- Trend analysis channels for monitoring specific gas/ vapour species are automatically set up by a simple double click selection on the required species names from the on board library list, or they can be manually edited.

- *New* Automated spectral analysis providing peak identification and composition analysis.

- *New* Spectral simulation mode to compare predicted analysis spectrum with the recorded spectrum.

- HDR mode, High dynamic range mode. 8 decade dynamic range in a single scan.

- Background subtraction, providing subtraction of a user designated spectrum from real time acquired data.

- Map mode for continuous display of mass selected ion intensity as a function of selected ion source parameters. Ion source control option required for this function.

- Electron energy scanning of a mass selected ion intensity for determination of appearance potentials and differentiation of radicals from a parent stable neutral molecule. *New* 3D data plot for viewing mass vs. electron energy and intensity. Ion source control option required for this function.

- Mixed mode scanning. A user editable scan generator enables customisable data acquisition and multi window data displays including user-selected views of profile peak, trend analysis (tabular and graphical), and histogram data simultaneously.

- User control of mass spectrometer operating parameters including scanning, setting, automatic tuning and in-scantuning/adjustment of all ion source parameters. Ion source control option required for this function.

- Review and compare historical data simultaneously with real time data.

- Socket Interface for application control and dynamic data link with Windows® compliant applications.

- Data export facilities including cut and paste to ASCII files and to Windows® applications.

- *New* E-mail data file handler to enable easy file sharing.

- User configurable alarm outputs in the event of threshold level detected high or low.

The mass spectrometer control interface includes an embedded web server. *net*MASsoft Professional is a Java applet that is included to enable simplified operation on a web browser.

Specification

Mass Range	:	200 amu, 300 or 510 amu.
Maximum Operating Pressure:		
HALO and HAL/3F	:	1×10^{-4} mbar with Faraday detector.
HAL3F/PIC	:	5×10^{-6} mbar with pulse ion counting detector.
Resolution:		
HALO and HAL/3F, HAL/3F PIC 510 amu	:	10% Valley between adjacent peaks of equal height throughout the mass range. Software adjustable.
HAL/3F, HAL/3F PIC 300 amu	:	5% Valley between adjacent peaks of equal height throughout the mass range. Software adjustable.
Detector:		
HALO and HAL/3F	:	Twin detector: Faraday cup and electron multiplier detector
HAL/3F PIC	:	PIC: Pulse ion counting single channel electron multiplier
Minimum Detectable Partial Pressure		
HALO	:	1×10^{-11} mbar with Faraday detector
	:	2×10^{-13} mbar with Channelplate detector
HAL/3F	:	2×10^{-12} mbar with Faraday detector
	:	2×10^{-14} mbar with Channeltron detector
HAL/3F PIC	:	5×10^{-15} mbar with Channeltron detector
Measurement speed:		
Maximum measurement speed	:	650 measurements per second.
Trend Analysis	:	Typically up to 250 measurements per second.
Ion Source:		
HALO and HAL/3F	:	Radially symmetric, UHV compatible ion source.
HAL/3F PIC	:	Low profile ion source, UHV compatible.
Filament	:	Twin filament. Oxide coated iridium is standard.
Ion Source control	:	Option for HALO. Standard for 3F and 3F/PIC
Electron emission		Software variable 1 μA to 2 mA.
Electron energy	:	Software variable 0 to 150 eV
Ion energy	:	Software variable 0 to 10 eV
PC Software	:	MASsoft Professional and *net*MASsoft
Communications to PC:	:	RS232, USB 2.0, 10/100 Base-T LAN
RC interface unit I/O	:	5 configurable I/O TTL lines, 2 analog inputs, 2 trip relay outputs, external trip input and over-pressure trip output.
	:	3 RS485 (multi protocol) to interface with a wide range of external devices, MFC's for example.
		8 digital inputs compatible with 5 V and 24 V logic levels. 8 open collector digital outputs (30 V, 500 mA max)
		4, or 8 channel analog outputs, 0-10 V,14 bit (optional).
Power requirement	:	100-240 V AC, 50-60 Hz, 250 VA..

RGA Series Dimensions

Analyser mounting flange

HALO	:	DN-35-CF (2¾"/70 mm O.D. Conflat-type).
HAL/3F and HAL 3F/PIC	:	DN-63-CF (4½"/114 mm O.D. Conflat-type).

Analyser insertion length from : HALO : 204 mm
mounting flange face   HAL/3F : 307 mm
         HAL/3F PIC : 308 mm

RF head dimensions:
HALO
HAL/3F and HAL/3F PIC

: Height   - 117 mm, Width – 104 mm, Depth – 195 mm
: Height   - 137 mm, Width – 335 mm, Depth – 216 mm.
   Depth is distance from vacuum face of analyser mounting flange.
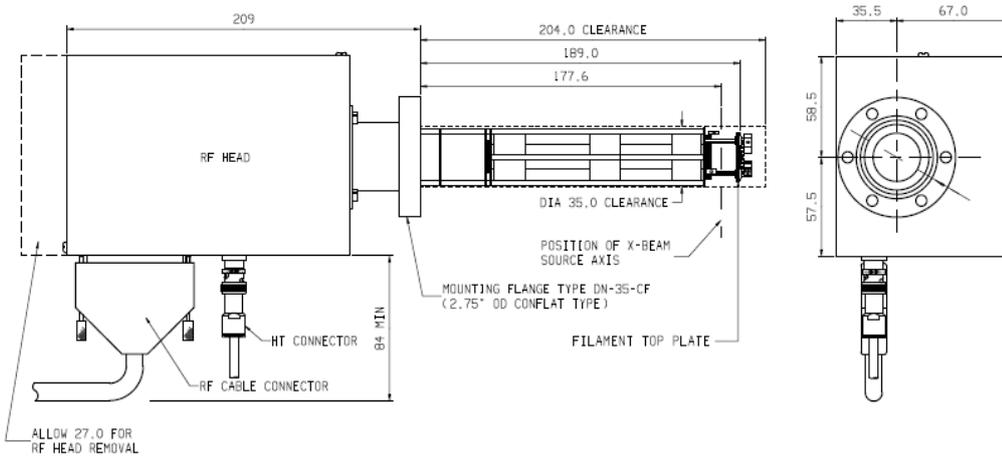
RC interface unit dimensions   Height: 90 mm. Width:19" rack mounting. Depth: 240 mm
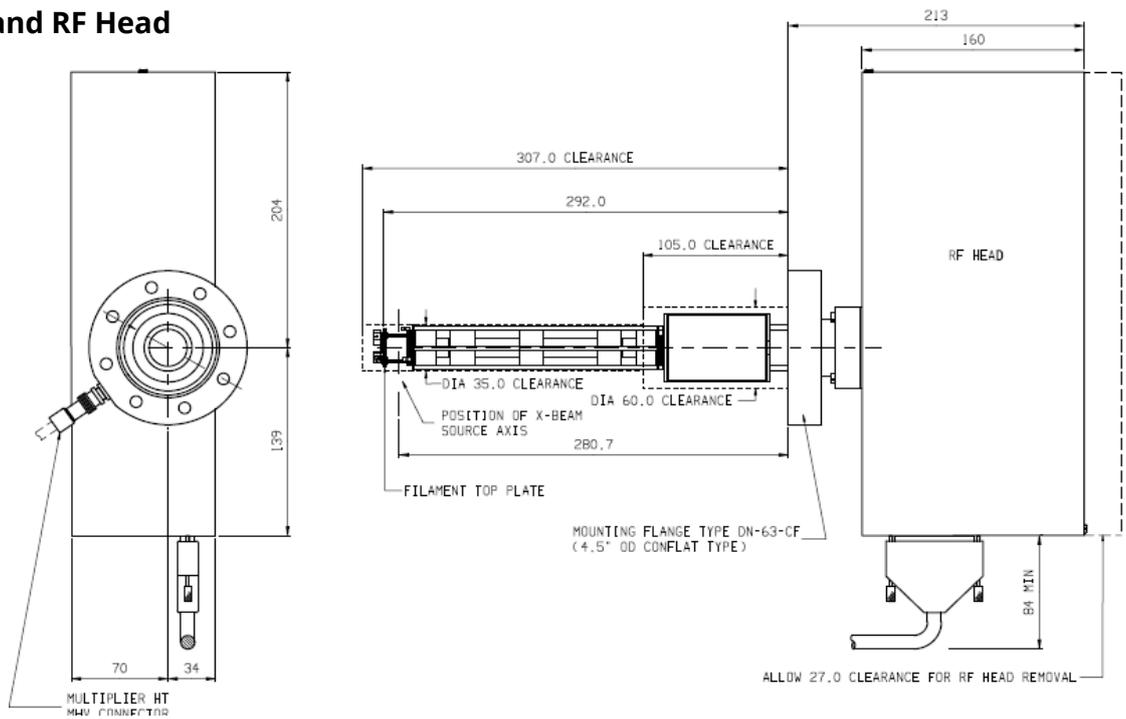
Cable lengths

RC interface to RF head : 3 m standard.
      Longer lengths to 40 m available

RC interface to PC : Up to 15 metres with RS232 link.
      Up to 750 metres with unbridged Ethernet link.
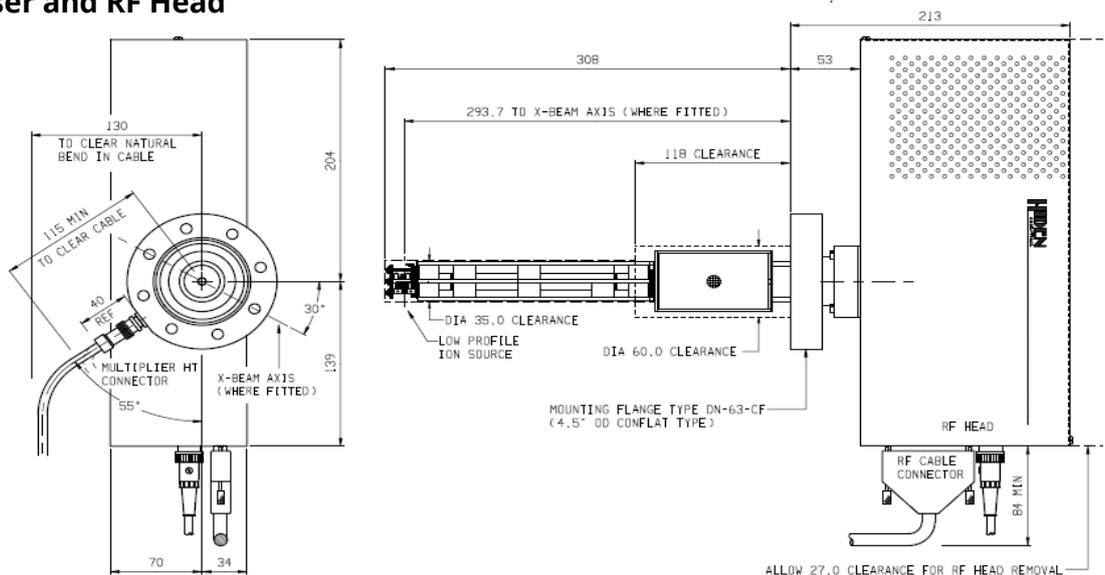   USB cable, 5 m Ethernet and 5 m RS 232 cables included.

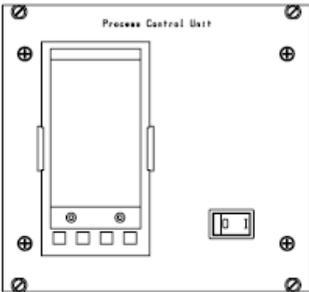## HALO Analyser and RF Head

HAL/3F Analyser and RF Head

HAL/3F PIC Analyser and RF Head

ITEM	SECTION 1.0 THE MASS SPECTROMETER
	Hiden RGA Series system comprises: - RC control interface unit with embedded web server for *net*MASsoft. - RF generator with preamplifier. - Analyser with integral electron bombardment ion source, precision mass filter and detector. - Connecting cables. - MASsoft Professional- PC Software. The system requires a PC for operation, not included in this item. **HALO Residual Gas Analyser**
RCO 1.2	Hiden HALO 201-RC system, type 142100, with mass range to 200 amu and with dual Faraday/Channelplate electron multiplier detector. Radially symmetric, UHV compatible ion source is standard.
RCO 1.3	Hiden HALO 301-RC system, type 142300, with mass range to 300 amu and with dual Faraday/Channelplate electron multiplier detector. Radially symmetric, UHV compatible ion source is standard. **HAL/3F Triple Filter System**
RCF 1.2	Hiden HAL/3F 301 RC system, type 553010, with mass range to 300 amu and with dual Faraday/Single Channel Electron Multiplier detector. Radially symmetric, UHV compatible ion source is standard.
RCF 1.3	Hiden HAL/3F 501 RC system, type 555010, with mass range to 510 amu and with dual Faraday/Single Channel Electron Multiplier detector. Radially symmetric, UHV compatible ion source is standard. **HAL/3F PIC Triple Filter System with Pulse Ion Counting Detector**
PIC 1.2	Hiden HAL/3F RC 301 PIC system, type 553021, with mass range to 300 amu and with pulse ion counting Single Channel Electron Multiplier detector. UHV Low profile ion source is standard.
PIC 1.3	Hiden HAL/3F RC 501 PIC system, type 555021, with mass range to 510 amu and with pulse ion counting Single Channel Electron Multiplier detector. UHV Low profile ion source is standard.

ITEM	SECTION 2.0 ION SOURCE OPTIONS
	The Mass spectrometers detailed in section 1.0 include an electron bombardment ion source. The ion sources offered in this section are for applications requiring a special ion source configuration.
RIS 2.1	Ion Source UHV Low Profile, type 205011.
RIS 2.1.1	Ion Source Cross Beam 3.0mm aperture for condensable gases, requires UHV analyser shroud, type 205020.
RIS 2.3	Ion Source Cross Beam +/- 12.5° acceptance for condensable gases, requires UHV analyser shroud, type 205030.
RIS 2.4	Ion Source Cross Beam 8mm dia acceptance aperture for non-aggressive gases, type 205050.
RIS 2.5	Ion Source Laser Cross Beam, two orthogonal cross beam axes, 2.0 mm diameter, type 205060.
RIS 2.6	Ion Source Platinum version, available for all ion source types. The platinum source is recommended to minimise source outgassing, suited for applications where total pressure is $< 5 \times 10^{-10}$ Torr, type 205100.
	CATEGORY OPTIONS
RC 01	Ion source control option for HALO, ITEMS RCO 1.2, RCO1.3, allowing the user the control to set and scan the emission, ion energy and electron energy of the mass spectrometer ion source. Ion Source control is standard for HAL/3F and HAL/3F PIC.
CC 01	Calibration of Hiden Analytical RGA mass spectrometer with dual Faraday detector against externally calibrated pressure gauge. Traceable to NAMAS standards Includes calibration certificate.
CC 02	Calibration of Hiden Analytical RGA mass spectrometer with dual Faraday and electron multiplier detector against externally calibrated pressure gauge. Traceable to NAMAS standards Includes calibration certificate.
RIS 2.2	Faraday detector option for HAL/3F PIC, ITEMS PIC 1.2 and PIC 1.3. The Faraday detector option extends the range of the PIC system to 5×10^{10}c/s. The maximum pressure for PIC system operation using the Faraday option is 1×10^{-4} Torr.
	SECTION 3.0 VACUUM GAUGE HEAD UHV SHROUDS
RSH 3.1	UHV compatible, cylindrical shroud with apertures to suit ion source configuration, type 440103.
RSH 3.2	Liquid Nitrogen cooled UHV compatible shroud with apertures to suit ion source configuration, type 440101.

ITEM	SECTION 4.0 PC CONTROL & DATA I/O OPTIONS
PC 4.1	PC computer with Windows®- MASsoft Professional installed tested and ready for use. - x64 class processor - Windows 10 Pro edition - ≥8GB RAM - ≥1TB hard disc - LAN 100Mbps RJ45 port - Full HD monitor - Keyboard and mouse - DVD+/-RW drive
PC 4.1.3	Mass Spectral Database software. Windows® version of the NIST/EPA/NIH Mass Spectral Database. An easy-to-use, full-featured program. The world's most widely used mass spectral library, with access to more than 100,000 compounds. Including: - Over 200,000 selected spectra. - Spectrum-Matching Algorithms. - Any peak Search. - Incremental Name Search. - Context-Sensitive Help. MASsoft Professional PC software includes export of data into the NIST library.
PC 4.2	External signals, temperature for example, can be simultaneously logged and displayed with mass spectrometer data. Two channels, ±10 V user labelled and user scalable in units of user choice are included. Thermocouple signal conditioning modules are offered with optional PID temperature ramp control for TPD studies. Matching for type K thermocouples is standard.
PC 4.2.2	Signal conditioning module only, type 800409. The module provides a thermocouple input for simultaneous data acquisition and display of temperature data with mass spectrometer data. **PID output is not included** Input: Type K thermocouple is standard. Alternatives may be specified. Output for mass spectrometer: 0 – 10 V Power requirement: 110/120 V 60 Hz. 220/240 V ,50 Hz.0.1 kVA

ITEM	SECTION 4.0 cont. PC CONTROL AND DATA I/O OPTIONS
PCU 4.2.2	Process Control Unit (PCU) with integrated PID temperature control, type 800406. The module provides a thermocouple input for simultaneous data acquisition and display of temperature data with mass spectrometer data and includes programmable PID temperature ramp output. Allows manual or automatic software control (MASsoft Professional or TPDsoft) of ramp rate and set point parameters. Providing Input: Type K thermocouple is standard. Alternatives may be specified. Output for mass spectrometer: RS485 PID programmable ramp output: 0 – 5 V
PC 4.3	Analog output module options to provide partial pressure trend data as 0-10 volt, 14 bit analog outputs from MID channels:
PC 4.3.1	4 Channel analog outputs, type 304904
PC 4.3.2	8 Channel analog outputs, type 304908
PC 4.4	8 channel analog input module 0 -10 V, 16 bit inputs, for data logging of external signals and process parameters simultaneously with data acquisition, type 800518. Up to 10 modules can be connected to a single instrument.
PC 4.7	Multichannel scalar PC card, 100 nanosecond resolution, type 800405, provides for time of flight data acquisition with data presented against time on a µsecond scale.
	SECTION 5.0 VACUUM GAUGE HEADS
	Additional residual gas analyser gauge heads provide a low cost additional RGA facility at an alternative location and provide a convenient interchangeable service backup for critical applications. Additional Quadrupole gauge heads can be used with the RC controller, RF head and cable set of the HALO Residual Gas Analysers detailed in Section 1.0. Gauge head only. Mounted on DN-35-CF/70 mm OD conflat flange for:
RA 5.1.2	HALO 201, type 106200
RA 5.1.3	HALO 301, type 106300

ITEM	SECTION 6.0 SPARES AND ACCESSORIES
	Spare filaments:
	ITEM 6.1.2 Oxide coated iridium, type 201200 is the standard replacement twin filament for the HALO and HAL/3F mass spectrometer system fitted with the radially symmetric, UHV compatible ion source.
	ITEM 6.3.2 is the standard replacement filament for HAL/3F PIC fitted with low profile ion source.
	ITEM 6.1.4 is the standard filament kit for the HALO and HAL/3F mass spectrometer system fitted with the radially symmetric, UHV compatible ion source.
	ITEM 6.3.4 is the standard filament kit for the HAL/3F PIC system fitted with the low profile ion source.
	Filament kits include the following: a) Three off filament pairs b) Tweezers c) Eyeglass d) Gloves e) Screwdriver
	Other filament materials and mounting configurations are offered for special applications, and for alternative ion sources.
RS 6.1.2	Twin Filament for radially symmetric, UHV compatible ion source - oxide coated iridium, type 201200
RS 6.1.4	Filament changing kit for std. source - with 3 oxide coated iridium filaments, type 201600
RS 6.2.2	Twin Filament for cross beam source - oxide coated iridium, type 201800
RS 6.2.4	Filament changing kit for cross beam source - with 3 oxide coated iridium filaments, type 201801
RS 6.3.2	Twin Filament side mounting for low profile source - oxide coated iridium, type 201400
RS 6.3.4	Filament changing kit, side mounting for low profile source - with 3 pairs oxide coated iridium filaments and tools, type 201401
RS 6.5.1	UHV Gauge head flange adaptor -for HAL/3F and HAL/3F PICsystems. DN-63-CF (114 mm OD) to DN-35-CF (70 mm OD). Provides for 3F analyser gauge mounting on a DN-35-CF (70 mm OD) conflat type flange. Analyser insertion from the DN-35-CF mounting flange face is 150 mm.

ITEM	SECTION 7.0 RGA SYSTEM CABLES
	The RGA systems detailed in Section 1.0 include 3 m cables as standard, longer length cables may be substituted or purchased in addition to the cable set included.
	Gauge head/RF to Controller Cable Length Options
RCB 7.1.1	RF/Controller Cable – 3 m, type 250103
RCB 7.1.2	RF/Controller Cable – 6 m, type 250106
RCB 7.1.3	RF/Controller Cable – 8 m, type 250108
RCB 7.1.xx	RF/Controller Cable - longer length cable to 40 m, type 2501xx
RCB 7.2.1	Multiplier supply cable for HAL/3F, HAL/3F PIC systems – 3 m, type 270003
RCB 7.2.2	Multiplier supply cable for HAL/3F, HAL/3F PIC systems – 6 m, type 270006
RCB 7.2.3	Multiplier supply cable for HAL/3F, HAL/3F PIC systems – 8 m, type 270008
RCB 7.2.xx	Multiplier supply cable for HAL/3F, HAL/3F PIC systems - longer length cable to 40 m, type 2700xx
RCB 7.3.1	Multiplier supply cable for HALO systems – 3 m, type 270103
RCB 7.3.2	Multiplier supply cable for HALO systems – 6 m, type 270106
RCB 7.3.3	Multiplier supply cable for HALO systems – 8 m, type 270108
RCB 7.3.xx	Multiplier supply cable for HALO systems - longer length cable to 40 m, type 270100

ITEM PRICES

ITEM	SECTION 1.0 THE MASS SPECTROMETER	PRICE EURO
	HALO Residual Gas Analyser	
RCO 1.2	Hiden HALO 201-RC system, type 142100, with mass range to 200 amu and with dual Faraday/Channelplate electron multiplier detector.	**12,155.00**
	Radially symmetric, UHV compatible ion source is standard.	
RCO 1.3	Hiden HALO 301-RC system, type 142300, with mass range to 300 amu and with dual Faraday/Channelplate electron multiplier detector.	**15,230.00**
	Radially symmetric, UHV compatible ion source is standard.	
	HAL/3F Triple Filter System	
RCF 1.2	Hiden HAL/3F 301 RC system, type 553010, with mass range to 300 amu and with dual Faraday/single channel electron multiplier detector.	**21,885.00**
RCF 1.3	Hiden HAL/3F 501 RC system, type 555010, with mass range to 510 amu and with dual Faraday/single channel electron multiplier detector.	**24,955.00**
	HAL/3F PIC Triple Filter System with Pulse Ion Counting Detector	
PIC 1.2	Hiden HAL/3F RC 301 PIC system, type 553021, with mass range to 300 amu and with pulse ion counting single channel electron multiplier detector.	**29,275.00**
PIC 1.3	Hiden HAL/3F RC 501 PIC system, type 555021, with mass range to 510 amu and with pulse ion counting single channel electron multiplier detector.	**33,570.00**
	SECTION 2.0 ION SOURCE OPTIONS	
RIS 2.1	Ion Source UHV Low Profile, type 205011.	**1,125.00**
RIS 2.1.1	Ion Source Cross Beam 3.0 mm aperture for condensable gases, requires UHV analyser shroud, type 205020.	**1,485.00**
RIS 2.3	Ion Source Cross Beam +/- 12.5° acceptance for condensable gases, requires UHV analyser shroud, type 205030.	**1,780.00**
RIS 2.4	Ion Source Cross Beam 8 mm dia acceptance aperture for non-aggressive gases, type 205050.	**1,485.00**
RIS 2.5	Ion Source Laser Cross Beam, two orthogonal cross beam axes, 2.0 mm diameter, type 205060.	**1,960.00**
RIS 2.6	Ion Source Platinum version, available for all ion source types. The platinum source is recommended to minimise source outgassing, suited for applications where total pressure is < 5 x 10^{-10} Torr, type 205100.	**1,010.00**

ITEM	SECTION 2.0 Cont. CATEGORY OPTIONS	PRICE EURO
RC 01	Ion source control option for HALO, ITEMS RCO 1.2, RCO1.3, allowing the user the control to set and scan the emission, ion energy and electron energy of the mass spectrometer ion source. Ion Source control is standard for HAL/3F and HAL/3F PIC, type 304800.	1,280.00
CC 01	Calibration of Hiden Analytical RGA mass spectrometer with dual Faraday detector against externally calibrated pressure gauge. Traceable to NAMAS standards Includes calibration certificate.	546.00
CC 02	Calibration of Hiden Analytical RGA mass spectrometer with dual Faraday and electron multiplier detector against externally calibrated pressure gauge. Traceable to NAMAS standards Includes calibration certificate.	686.00
RIS 2.2	Faraday detector option for HAL/3F PIC, ITEMS PIC 1.2 and PIC 1.3. The Faraday detector option extends the range of the PIC system to 5×10^{10}c/s, type 443020. The maximum pressure for PIC system operation using the Faraday option is 1×10^{-4} Torr.	4,290.00
	SECTION 3.0 VACUUM GAUGE HEAD UHV SHROUDS	
RSH 3.1	UHV compatible, cylindrical shroud with apertures to suit ion source configuration, type 440103.	1,220.00
RSH 3.2	Liquid Nitrogen cooled UHV compatible shroud with apertures to suit ion source configuration, type 440101.	6,440.00
	SECTION 4.0 PC CONTROL & DATA I/O OPTIONS	
PC 4.1	x64 computer configured for Ethernet operation, type 800624. A PC with an x86 or x64 processor is required for system operation	p.o.a
PC 4.1.3	Windows® version of the NIST/EPA/NIH Mass Spectral Database, type 800500.	3,605.00
PC 4.2	Signal conditioning /heater control output modules.	
PC 4.2.2	Signal conditioning T/C input (Retrans), type 800409.	2,175.00
PCU 4.2.2	Signal conditioning T/C input (Program/Retrans), type 800406.	4,095.00
PC 4.3	**Analog output options**	
PC 4.3.1	4 Channel analog outputs, type 304904	1,510.00
PC 4.3.2	8 Channel analog outputs, type 304908	2,095.00
PC 4.4	8 channel analog input module, 0-10 V, 16 bit inputs, type 800518	3,515.00
PC 4.7	Multichannel scaler PC card, 100 nanosecond resolution, type 800405	10,705.00
	SECTION 5.0 VACUUM GAUGE HEADS	
RA 5.1.2	Vacuum Gauge Head for: HALO 201, type 106200	4,260.00
RA 5.1.3	HALO 301, type 106300	5,285.00

ITEM PRICES (cont)

ITEM	SECTION 6.0 SPARES AND ACCESSORIES	PRICE EURO
RS 6.1.2	Twin Filament for std. Source - oxide coated iridium, type 201200	295.00
RS 6.1.4	Filament changing kit for std. source - with 3 oxide coated iridium filaments, type 201600	890.00
RS 6.2.2	Twin Filament for cross beam source - oxide coated iridium, type 201800	295.00
RS 6.2.4	Filament changing kit for cross beam source - with 3 oxide coated iridium filaments, type 201801	890.00
RS 6.3.2	Twin Filament side mounting for low profile source - oxide coated iridium, type 201400	295.00
RS 6.3.4	Filament changing kit, side mounting for low profile source - with 3 pairs oxide coated iridium filaments and tools, type 201401	890.00
	SECTION 7.0 RGA SYSTEM CABLES	
	Gauge head/RF to Controller Cable Length Options	
RCB 7.1.1	RF/Controller Cable – 3 m, type 250103	310.00
RCB 7.1.2	RF/Controller Cable – 6 m, type 250106	450.00
RCB 7.1.3	RF/Controller Cable – 8 m, type 250108	600.00
RCB 7.1.xx	RF/Controller Cable - longer length cable to 40 m, type 2501xx	500.00+ 35.00/m
RCB 7.2.1	Multiplier supply cable for HAL/3F, HAL/3F PIC systems – 3 m, type 270003	145.00
RCB 7.2.2	Multiplier supply cable for HAL/3F, HAL/3F PIC systems – 6 m, type 270006	200.00
RCB 7.2.3	Multiplier supply cable for HAL/3F, HAL/3F PIC systems – 8 m, type 270008	260.00
RCB 7.2.xx	Multiplier supply cable for HAL/3F, HAL/3F PIC systems - longer length cable to 40M, type 2700xx	80.00+ 20.00/m
RCB 7.3.1	Multiplier supply cable for HALO systems – 3 m, type 270103	145.00
RCB 7.3.2	Multiplier supply cable for HALO systems – 6 m, type 270106	210.00
RCB 7.3.3	Multiplier supply cable for HALO systems – 8 m, type 270108	260.00
RCB 7.3.xx	Multiplier supply cable for HALO systems - longer length cable to 40 m, type 270100	260.00+ 20.00/m