

HELIOX

Heliox™

^3He systems to suit all applications



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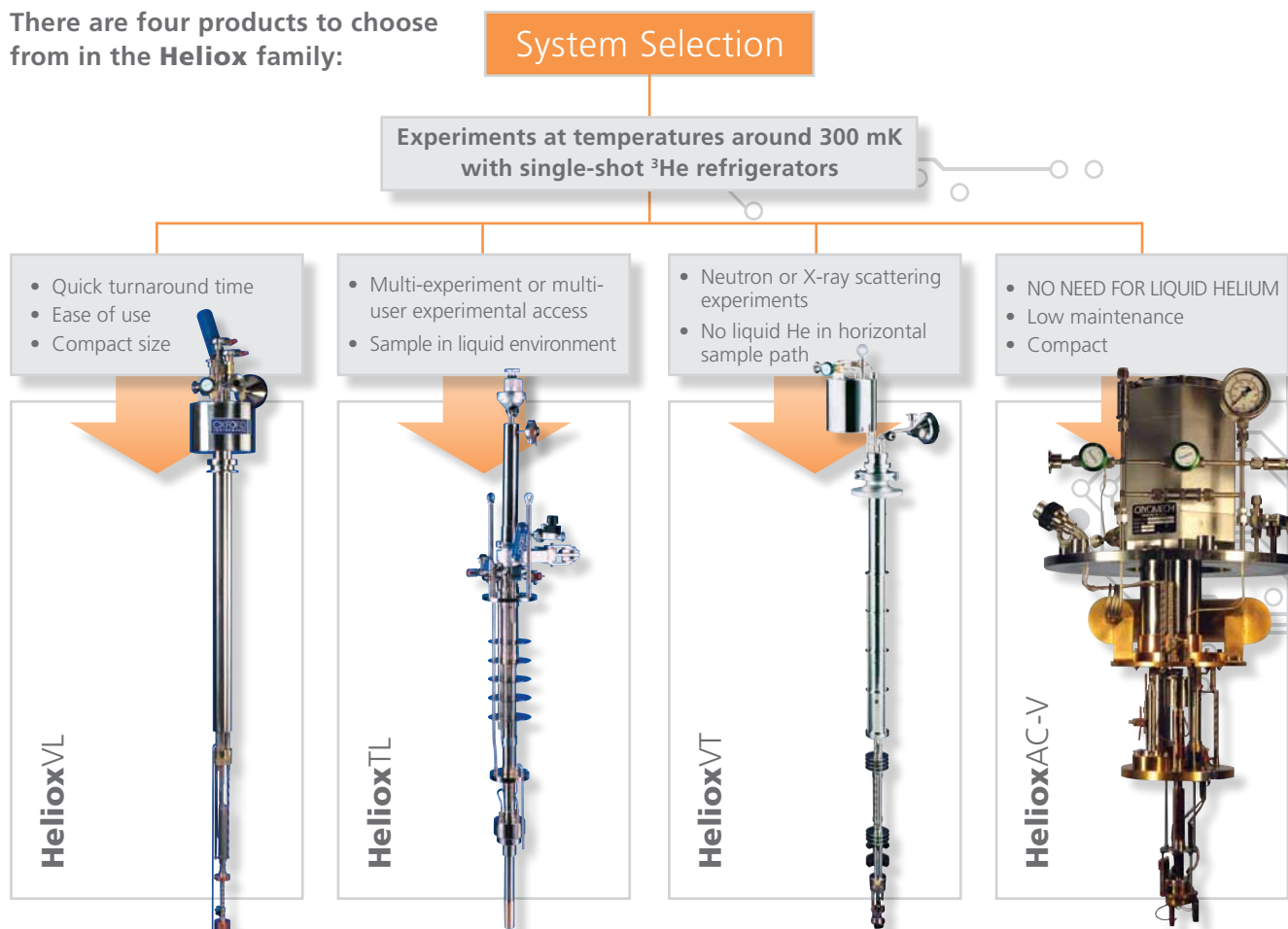
Which **Heliox** is right for you?

When choosing a **Heliox** system, there are technical parameters that you need to consider in order to achieve the desired instrumentation for your research.

The **Heliox** range of single shot ^3He refrigerators offers the best combination of specification, experimental access and flexibility. Advances in sorption pump technology reduce base temperature and helium consumption and increase cooling power.

In addition, Oxford Instruments can design tailored ^3He refrigerators to suit your particular experimental requirements. All models include a control system which can be operated stand-alone or integrated into a PC controlled measurement system via LabVIEW™.

There are four products to choose from in the **Heliox** family:



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Base temperature

The base temperature, quoted in mK, is achieved with no heat load applied.

Cooling power

Cooling power is dictated by the ^3He evaporation rate and consequently the pumping speed of the system. The cryogenic sorption pump technology used in the Heliox family provides an extremely high pumping speed in a much reduced system size. The cooling power is quoted at 300 mK.

Hold time

Expressed in hours, hold time is governed by the total heat load on the ^3He pot and the total charge of ^3He condensed inside the pot.

Regeneration time

This parameter indicates the preparation time required before being able to restart the experiment.

Sample environment options

- In vacuum environment, the sample is accessed by removing the insert from the cryostat, warming to room temperature and removing the inner vacuum chamber (IVC) tail.
- In liquid environment, the sample or experimental setup is mounted on a measurement probe. The probe can be loaded or removed from the insert whilst the main insert remains cold. This design flexibility reduces turnaround time and enables multi-user capability.

Experimental access

Inserts are provided with spare ports to give additional access, featuring either line of sight access to ^3He pot, IVC, or spare ports for additional wiring to the insert/experimental probes.

Inserts can be utilized with a range of wiring options and sample positioning devices. Optical access is also available, plus interfaces with SPM heads and pressure cells.

Research Areas	Applications	Experimental Techniques
Semiconductors	Quantum Hall effect Quantum dots Single electron tunneling Quantum computing	Magneto-resistance Hall effect RF transport High frequency conductivity
Solid state physics	Heavy fermion systems Metal insulator transition Spin glass Mesoscopic systems Giant magnetic resistance	Specific heat De Haas-van Alphen oscillations Solid state NMR Electrical resistivity Magneto-resistance Neutron scattering
Superconductivity	Low T_c superconductors Quantum computing Josephson junctions Flux vortices Quantum initial phenomena	Electrical resistivity Scanning spectroscopy (STM/AFM) Squids AC susceptibility
Astrophysics & cosmology	Low temperature detectors Superconducting tunnel junctions Ge bolometers	Electrothermal measurements Voltage biased measurements Low energy photon detection
Metrology	Quantum hall effect Voltage standards Current standards	Magneto-resistance DC & AC low frequency transport and magnetic measurements Single electron tunneling

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HelioxVL

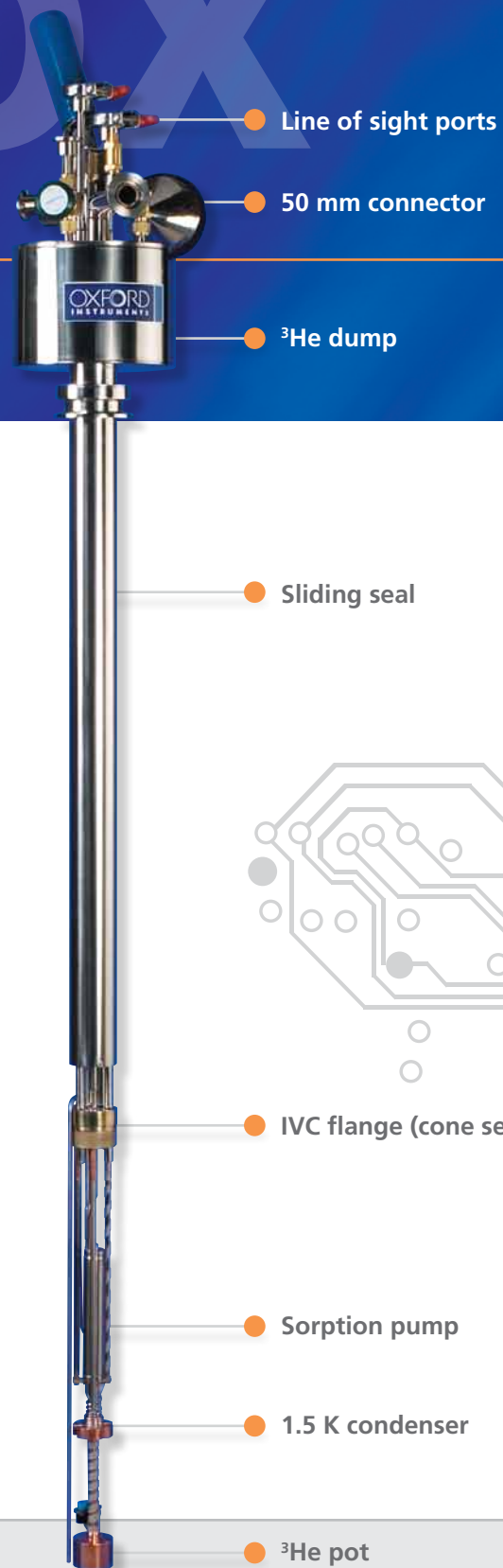
Sample in vacuum

- Performance unrivalled by any other ^3He system: ≤ 245 mK for more than 90 hours (with no applied heat load). Achieved using advanced sorption pump technology combined with the specially engineered 1K condenser and ^3He pot
- More than $40 \mu\text{W}$ cooling power at 290 mK for over 10 hours
- Quick sample change: the insert is compact allowing rapid thermal cycling when changing samples, making it ideal for fast sample characterisation
- High temperature option available: the integrated sliding seal enables operation at temperatures close to 300 K (100 K when the system is used with a superconducting magnet)
- Compact design: Self-contained dump and ^3He pumping system reduce footprint, meaning less laboratory space is required
- Low maintenance: In-built cryopump technology traps contaminants so no blockages occur during operation
- Low intrinsic vibration: The combination of the cryogenic pump and the 1 K coil type of condenser provides an excellent environment for vibration-sensitive techniques
- Compatible with liquid helium storage vessels or dewars with neck diameter of ≥ 52 mm
- Greased cone sealing for the IVC and the integrated ^3He dump mean the system is easy to use

Magnetic field configurations

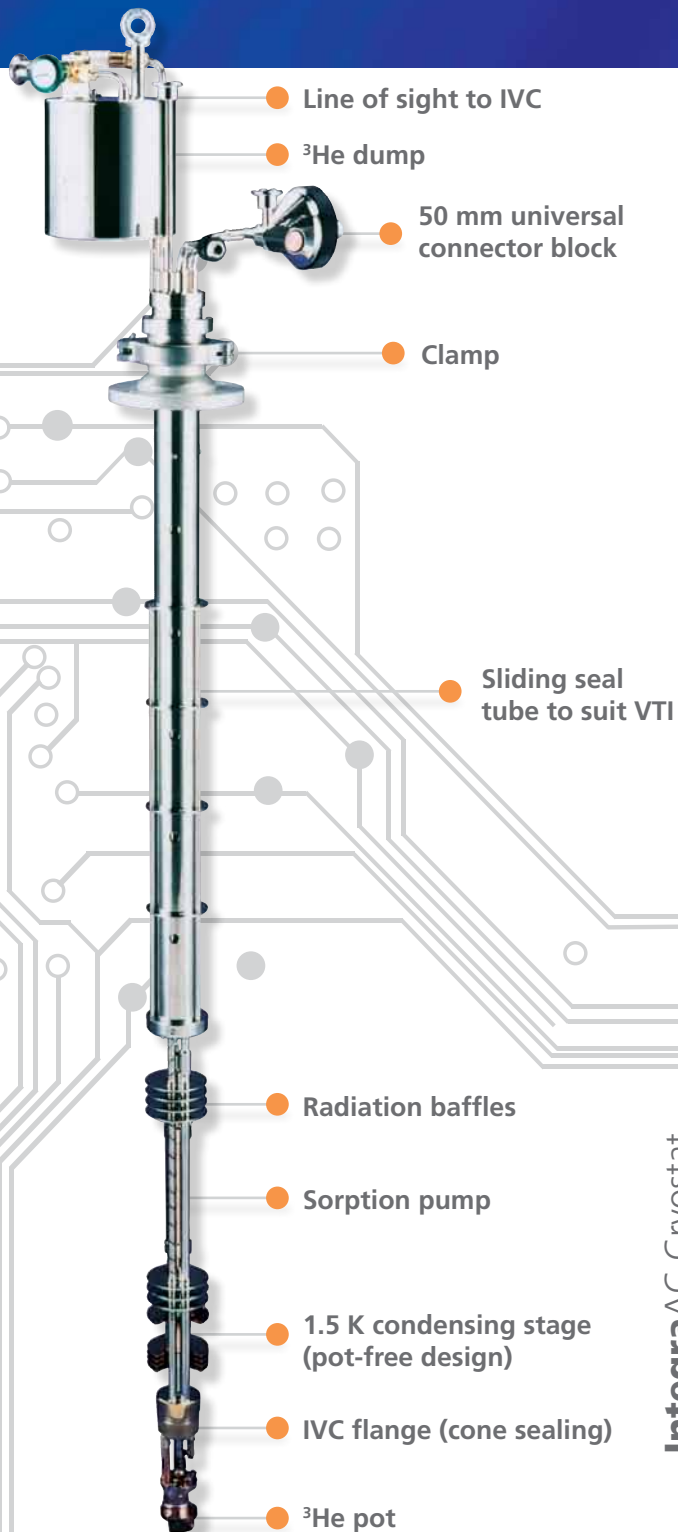
For magnetic fields over 6 T: the **HelioxVL** is combined with magnetic environments within the **Integra™** product range. This range uniquely integrates environments together under software control and provides magnetic

fields up to 21 T. For magnetic fields below 6 T and when the cryostat is used in a transport dewar: a small magnet is mounted onto the IVC tube and provides magnet operation in persistent mode (not suitable for sustained field ramping).



HelioxVT

Sample in vacuum, no 1K pot



- ≤ 300 mK for more than 40 hours (with no applied heat load)
- $50 \mu\text{W}$ cooling power at 350 mK for over 6 hours
- Extension of the temperature range below 300 mK of existing or new Variable Temperature Insert (VTI) with 30 or 50 mm access
- No liquid helium in the sample horizontal path as it operates in the cold environment of a VTI. This is ideal for neutron or X-ray scattering applications

To find out more about the **Heliox** range of products, including applications and modes of operation please visit our website at www.oxford-instruments.com

IntegraAC Cryostat

Magnet and support

HelioxVL

HelioxTL

VTI

HelioxTL

Top-loading into liquid

- 260 mK for more than 50 hours (with no applied heat load)
- 400 μ W cooling power at 300 mK for over 6 hours
- Top loading into the mixture ensures good thermalisation and high stability of the thermal environment
- Quick and easy sample change: the sample fitted on the top loading probe can be removed quickly while the insert remains cold. A vacuum lock mechanism ensures there is no loss of ^3He or entry of air into the sample space
- Multi-service access provides a unique platform that can be used with a range of sample probes, such as Swedish rotators and high frequency coaxial lines
- Extremely compact design fitting the standard and extended length dewars of the Oxford Instruments range
- Minimum room height requirements are 3.7 m with SMD10/15VS cryostat and 4.1 m with SMD10/15VSEX cryostat

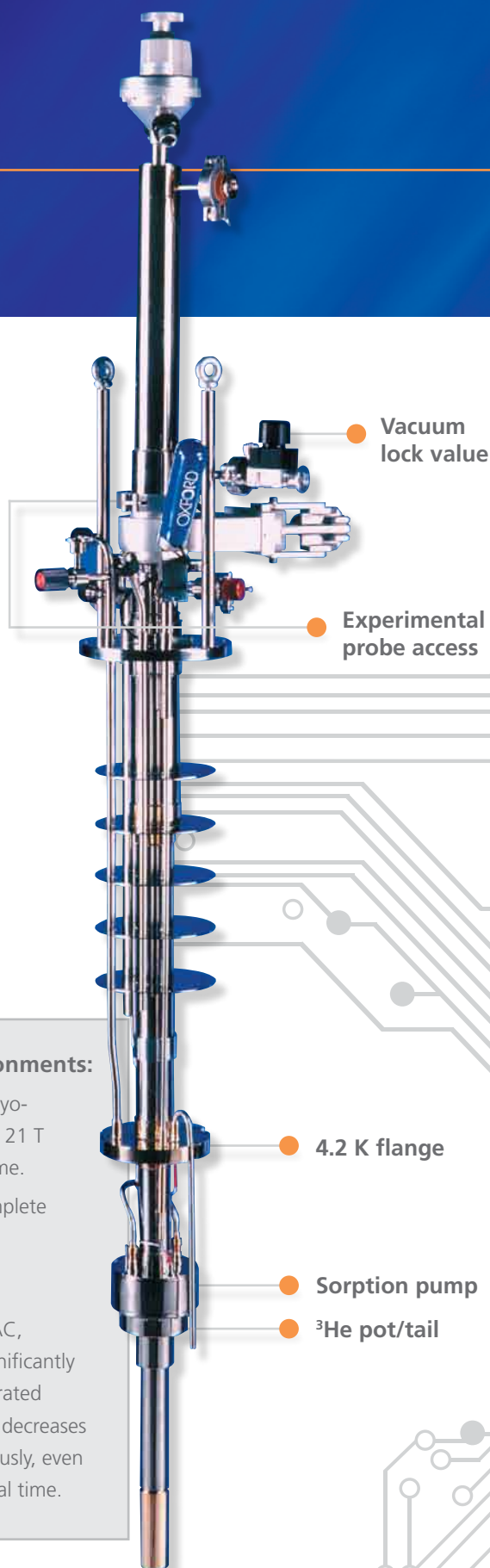
Combined low temperature and magnetic field sample environments:

The **HelioxVL**, **HelioxTL** and **HelioxVT** can be integrated into complete cryo-magnetic systems. Magnet configurations provide fields from 8 T at 4.2 K to 21 T at 2.2 K, field homogeneity of 0.1 % over a 10 mm diameter spherical volume.

The **HelioxAC-V** can be integrated with Cryofree magnet options for a complete Cryofree solution.

Solution to helium rising costs:

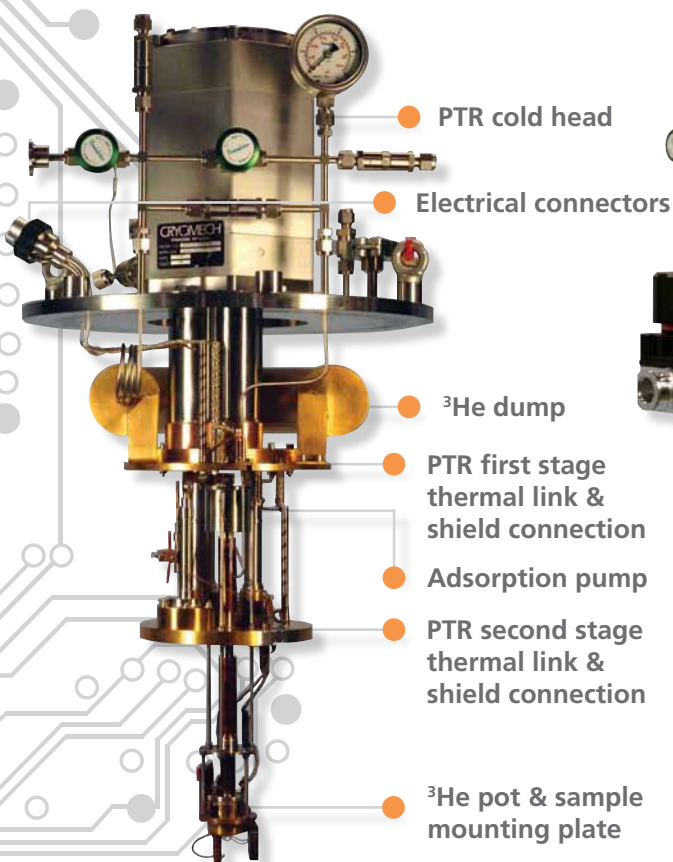
The **HelioxVL**, **HelioxTL** and **HelioxVT** are compatible with the **IntegraAC**, recondensing liquid helium cryostat. This product has been developed to significantly reduce the consumption of liquid helium by recondensing helium gas evaporated within the system, which would otherwise be vented from the cryostat. This decreases the frequency of helium refills. Cryogenic systems can be kept cold continuously, even when in stand-by mode, leading to greater freedom to schedule experimental time.



HelioxAC-V

Cryofree®

- **Achieves 300 mK without the need for liquid helium!**
Enables operation in laboratory which would not normally support cryogenic equipment
- **Hold time of more than 50 hours** enabled by patented adiabatic multi-expansion ^3He refrigeration technology (US patent 6782712, European patent application 1387133 and Japanese patent application 2004163089)
- High temperature stability (± 3 mK at < 2 K) provides an extremely stable temperature environment
- Small footprint enables use in virtually any laboratory environment. (0.4 m diameter by 0.85 m height)
- Large sample environment enabling integration of complex experimental set-ups
- Built in cryogenic pump technology traps contaminants, so no blockages occur during operation
- Wide temperature range: 300 mK to 300 K as standard making this an extremely versatile instrument
- Can be integrated into a Cryofree magnet for a complete Cryofree solution



Dr Enrique Diez of the University of Salamanca in Spain is using a special **HelioxAC-V** with a 12 T Cryofree magnet for magneto-transport of nanoelectric devices.



A global reach

By choosing Oxford Instruments as the supplier of your next ³He system, not only are you getting a reliable product but also access to a service support team.

This includes:

- Our team of more than ten expert service engineers have more than 100 years of experience, based on the successful installation of hundreds of magnet and low temperature systems
- Five people dedicated to helpdesk
- Bespoke Cryospares service

ServiceWise extended warranty

Oxford Instruments offers a standard 12-month warranty on all products. You can also upgrade this cover and purchase extended warranty. Warranty covers parts, labour, return from the factory and third-party items and on-site service if required. We can also loan control electronics and pumps, subject to availability.

ServiceWise service contract for complete peace of mind

The **Heliox**AC-V uses a pulse tube refrigerator, a compressor and a circulation pump which require regular maintenance to ensure optimum performance. Oxford Instruments offers support packages which can take care of this for you.



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