Heraeus

Stable Analytical Lamps for Precise Analysis

Contents

Heraeus, the precious metals and technology group headquartered in Hanau, Germany, is a global, private company with nearly 160 years of tradition. Our businesses include precious metals, sensors, dental products, biomaterials, quartz glass and specialty lighting sources.

Heraeus Noblelight, a business segment of the Heraeus Group, counts itself among the market and technology leaders worldwide with the widest spectrum of specialty lamps from ultraviolet to infrared for industrial, scientific and medical applications. With locations in Germany, UK, China and USA, we manufacture lamps for the printing industry, industrial heating processes, laser pumping, water disinfection and oxidation as well as analytical instrumentation.

Developing high-quality analytical instrumentation requires light sources that match the performance of the instrument. Deuterium lamps, hollow cathode lamps and other specialty light sources from Heraeus' instrument-specific ranges are not only engineered for a long lifetime, which supports the lowest Cost-of-Ownership in your system, but also for the highest repeatable precision so users benefit from the most consistent and sensitive analysis.

For more information about Heraeus Noblelight's lamps for optical and analytical instrumentation please go to www.heraeus-noblelight.com.

Deuterium Lamps

Over the years, Heraeus has developed a lamp technology that meets the ever increasing demands of instrument manufacturers in terms of extremely low detection limits and high sensitivity.

Applications

- High Pressure Liquid Chromatography (HPLC + UHPLC)
- UV-Vis Spectrophotometry
- Atomic Absorption Spectroscopy (AAS)
- High Performance Capillary Electrophoresis (HPCE)
- Thin Layer Chromatography (TLC)
- Pollution Monitors
- Solar simulation (MgF_2 window)
- Photoionising light source (MgF_2 window)
- Film Thickness measurements
- Semiconductor inspection
- Fluorescence Spectrophotometry
- Removal of electrostatic charges from semiconductor wafers etc.

D_2^{plus}

D_2^{plus} Deuterium lamp
with UV glass envelope

D_2^{plus} Deuterium lamp
with quartz envelope

Latest Deuterium lamp generation provides: highest stability, long-life and highest intensity.

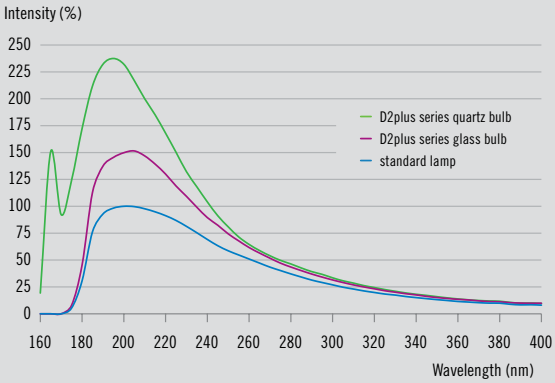
High Stability Long-Life and High Intensity Deuterium Lamps
Using the latest material and process technologies, Heraeus new D_2^{plus} lamps combine lifetime more than 2,000 hours with unmatched output stability and intensity over their entire life. This sets them apart from other long-life lamps on the market and makes them the ideal choice for high-end (U) HPLC instruments or UV-Vis Spektrophotometer.

35 W Deuterium lamps – the perfect fit
Heraeus latest generation D_2^{plus} deuterium lamps serve different needs and applications:

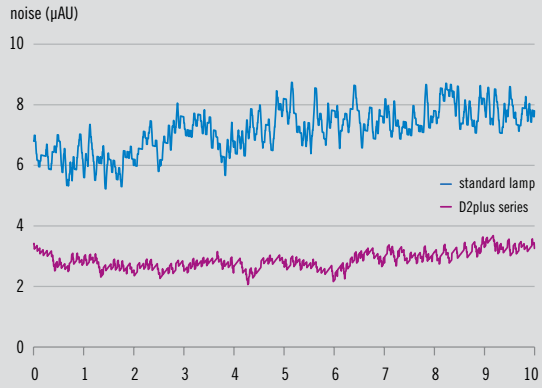
- **The "Enhanced Lifetime Performance (ELP)"** technology for Heraeus D_2^{plus} with a high transmissive synthetic quartz envelope, maintain twice the residual intensity compared to standard D2 lamps at the end of life. The patented ELP coating protects the light emitting part against degradation caused by VUV radiation and reactive plasma components.
- **See-Through versions of all D_2^{plus} lamps available**
  See-through lamps offer a straight-line arrangement of a tungsten halogen lamp and a deuterium lamp in an optical system. Simplification and cost reduction of UV-Vis spectrophotometers can be achieved using this approach, for example, by elimination of a moveable mirror or a semi transmissive beam splitter. See-through lamps offer the same unmatched high stability and are available with the same diversity of heater voltages and aperture sizes.
- **Different spectral ranges available:**
  D_2^{plus} lamps are available either with UV-Glass envelope (cutting edge 185 nm) or with high transmissive Quarz envelope (cutting edge 160 nm), providing maximum performance depending on your applications or instrument design.

Vacuum UV (VUV) Deuterium Lamps
VUV lamps are deuterium lamps with a MgF_2 or a Synthetic Silica window allowing the transmission of VUV radiation down to 115 nm. Heraeus offers end emitting and side emitting lamps with 30 W as well as the 200 W type is water-cooled high power version, which is also available with flanges for mounting on a vacuum chamber.

Spectral Comparison D_2^{plus} Deuterium Lamp



Optical Stability at 254 nm



Hollow Cathode Lamps (HCL)

Hollow cathode lamps (HCL) are discharge lamps designed for use in Atomic Absorption (AA) instruments. They consist of a cathode made from the element of interest, an anode and an inert filler gas contained in a glass envelope.

Heraeus offers the widest selection of single- and multi-element coded/non-coded in low and high-current, 37 mm and 50 mm lamps in the industry. They are designed for optimum performance by combining:

- Good chemical sensitivity
- High spectral response
- Stable light output
- Low noise characteristics
- Long operating and shelf life

Applications

- Atomic Absorption Spectroscopy
- Atomic Fluorescence Spectroscopy
- Multi wavelength laser tuning
- Laser output stabilisation (Optogalvanic effect)
- Multi component analysers
- Medical analysers

Heraeus hollow cathode lamps are available both for OEMs and as a replacement lamp by discerning users the world over. The range includes standard lamps and data-coded versions for PerkinElmer and ThermoFisher atomic absorption spectrometers. Lamps for use with Smith-Hieftje background correction can also be offered.

Single-Element Lamps
The Heraeus catalogue includes 70 single-element lamps in standard 37 mm (1½ inch) and 50 mm (2 inch) diameters to fit almost any AA instrument. All cathode materials are selected from the highest purity available – usually 99.99 % or better – to ensure high spectral line intensity, stability and low noise with good analytical sensitivity. The window material is selected to achieve the optimum transmission of the primary spectral lines of the cathode element. Borosilicate glass is used for wavelengths over 350 nm, and high quality quartz for shorter wavelengths.

Multi-Element Lamps
Heraeus manufactures the largest range of multielement lamps offering only those combinations which provide sufficient energy and an acceptable lifetime for each element with no spectral interference. Multielement hollow cathode lamps are available with two to seven different element combinations. These are particularly useful for carrying out routine analysis on a number of different elements in the same sample, such as alloys.

See-Through Hollow Cathode Lamps
Heraeus also manufactures optogalvanic (See-through) hollow cathode lamps, designed to act as a frequency stable reference for high intensity tuneable monochromatic light sources, particularly lasers. Most of the cathode materials used in standard Heraeus hollow cathode lamps may be used in the “see through” design.

Hollow Cathode Lamp 37 mm

Hollow Cathode Lamp 37 mm

Hollow Cathode Lamp 50 mm

See-Trough Hollow Cathode Lamp

Photoionisation Detector Lamps (PID)

Photoionisation detector lamps (PID) are most commonly used in gas chromatography (GC), trace gas monitoring and sample ionisation for mass spectrometry. The PID technique uses a lamp with known photon energies in the vacuum ultraviolet (VUV) region. The output from the lamp is used to photoionise gaseous molecules with ionisation potentials lower than the photon energy emitted. Typical photoionisation detectors measure volatile organic compounds (VOCs) and other gases in concentrations from the ppm to ppb level.

Heraeus offers a complete range of PID lamps with the highest quality in terms of intensity, spectral purity and long life. Both DC and RF excited lamps are available with a variety of gas fills and window materials.

Customers can also benefit from our design expertise, as the Heraeus Technical Team works with OEMs to design and build products to meet their specific dimensional and performance requirements.

Applications

- Gas Chromatography (GC)
- Mass Spectrometry (MS)
- Field monitoring of air and soil
- Emergency first response
- Jar headspace screening
- Leak detection
- Personnel safety in confined spaces

PID, DC excited
20 mm diameter

PID, DC excited
35 mm diameter

PID, RF excited
6×14 mm diameter

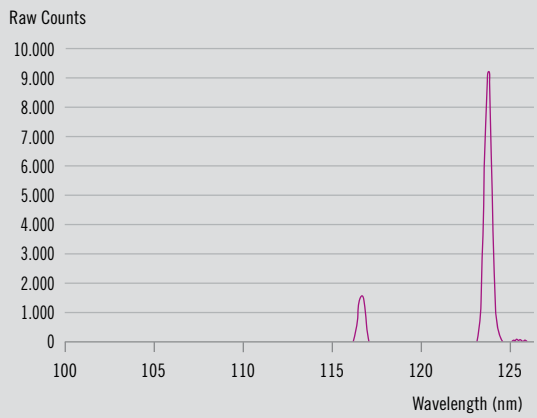
PID, RF excited
6×30 mm diameter

PID, RF excited
12 mm diameter

PID photon energies and window materials

Gas fill	Photon energy (eV)	Wavelength (nm)	Window material	Detectable compounds (amongst others)
Xenon	9.6/8.4	129/147	MgF_2	Butene, Benzene, Toluene
Xenon	8.4	147	Sapphire (Al_2O_3)	Aniline, Styrene
Krypton	10.6/10.0	117/124	MgF_2	Ethylene, n-Octane
Krypton	10.0	125	CaF_2	BTEX
Argon	11.7	105	LiF	Methanol, Freon Formaldehyde

Spectral distribution of a Krypton PID Lamp



FiberLight® – Miniature UV-Vis Light Source and Electrodeless Discharge Lamps (EDL)

FiberLight Miniature UV-Vis Light Source
Compact dimensions and ease of operation open up new possibilities for instrument designers.

FiberLight is a compact UV-Vis light source designed for mobile spectroscopy applications and all types of handheld devices that require a low power consumption UV-Vis light source. FiberLight has a continuous spectrum covering the whole range from vacuum UV to near Infrared. The FiberLight System is a complete UV-Vis light source with a shine-through design deuterium lamp, a 0.25 Watt tungsten lamp, shutter, optical system and SMA 905 connector. All elements are mounted on a printed circuit board driven by an external 12 Vdc/600 mA power supply. Both lamps and the shutter can be separately controlled by a TTL signal. The spectral emission covers the entire range from 200 nm to 1,100 nm; optional extended range from 185 nm to 1,100 nm.

FiberLight is powered from an external supply; this makes it an ideal light source for applications with limited space in the instrument, portable instruments or battery-operated equipment.

FiberLight is available in different versions: standard or extended wavelength range and either focused (with an optical fibre connection) or quasi-parallel light output. Different PCB layouts to fit any compact instrument design can be built to your specific dimensional requirements.

HighPower FiberLight 10W High Power FiberLight version is now available, offering double UV light output and similar compact size. Higher power means shorter integration time for faster response and lower detection limits; while still small size suitable for portable operation.

Applications
- Laboratory: UV-Vis Spectroscopy
- Environment: water quality monitoring, waste water analysis, marine chemistry, biological measurements
- Process control
- Marine chemistry
- Stand-alone light source
- Calibration

HighPower FiberLight DTM 10/50

FiberLight DTM 6/10

NOx Lamp
An EDL lamp with N_2, O_2 (nitrogen, oxygen) gas fill that emits a spectrum in the wavelength range between 200 nm to 600 nm. Spectral lines in the 200 nm region can be used for the detection of NO and NO_2, H_2S, NH_3 and others.

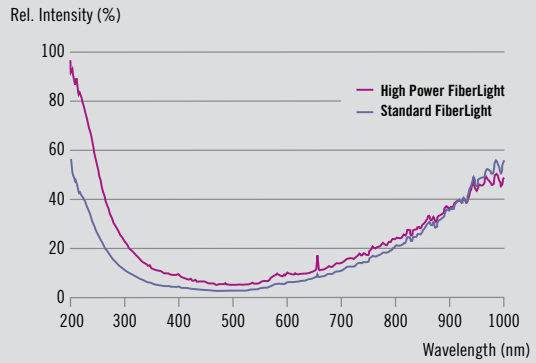
Applications
- Combustion chemistry
- Exhaust monitoring

Excimer Lamps
Excimer lamps are mercury-free UV lamps that emit a narrow band, single line spectrum. The capability to choose specific wavelengths make them ideal for use in specific applications. In addition there is no unwanted heating effect, as excimer EDLs produce no infrared radiation. The specific wavelengths available are: 172 nm, 222 nm, 282 nm and 308 nm.

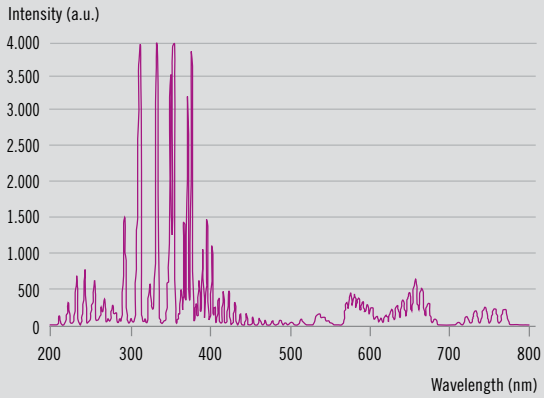
Applications
- Chemistry
- Petroleum industry
- Biology

Heraeus has many years of experience in making such UV light sources and is pleased to collaborate with OEMs working in the fields of environmental monitoring and process gas control.

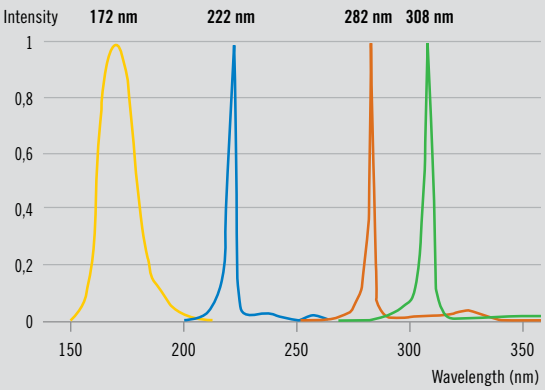
Spectrum FiberLight



Spectrum NOx Lamp



Spectrum Excimer Lamps



Tungsten Halogen and Mercury Lamps

Tungsten Halogen Lamps
Heraeus has designed a series of tungsten halogen lamps (TH) specifically for use in analytical applications. Special quartz envelopes enable high transmission below 380 nm and the position of the tungsten filament is closely controlled through precise alignment. The lamps offer high colour temperature, luminous efficacy and long life.

Heraeus TH lamps generate a continuous spectrum between 300–3000 nm. Used in conjunction with deuterium lamps, they provide the wide spectral range required by UV-Vis spectrophotometers. Alone, they are suitable light sources for simple visible spectrophotometers used in analytical and medical markets.

TH lamps are filled with a halogen gas mixture specific to their final application and range from 5 W–200 W, with typical lifetimes of more than 2,000 hours. Lamps can be designed and built according to OEMs specific requirements, such as colour temperature, voltage, wattage and mechanical tolerances. Each lamp fit for purpose, ready finished to drop into the instrument. No pre-selection required.

Heraeus can build, design and specify lamps to individual requirements.

Applications
- HPLC
- UV-Vis Spectroscopy
- Thin film measurements
- Medical Analysers

Tungsten Halogen Lamps

HPK 125W

ST43

HG2

NK 4/4

High Pressure Hg Lamps

Heraeus manufactures the ST- and HPK-series of high pressure Hg lamps for use in scientific instrumentation and other applications requiring high stability UV radiation combined with an accurate position of the arc. These arc stabilized lamps have narrow band emission lines at well reproducible wavelengths. The lamps have a power range of 30–125 Watt and provide maximum energy at 365 nm with substantial radiation at 254, 313, 405 and 435 nm. In addition there is a continuum from 200 to 600 nm peaking at 260 nm with approximately 20 % of the maximum energy measured in the line spectrum.

Applications

- Photochemical processing
- Mercury analysers
- Environmental monitoring
- Fluorimeters
- Polarimeters

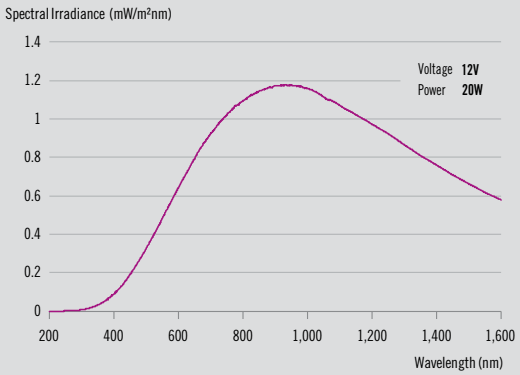
Low Pressure Hg Lamps

Heraeus has developed a series of cold cathode and oxide cathode mercury lamps for analytical applications. Heraeus mercury lamps of the NK-Series are low pressure, cold cathode UV lamps with a power input of 3.5 – 6 W. They mainly emit the monochromatic mercury resonance line at 254 nm. Heraeus NK lamps have been optimized for high radiance of the 254 nm line. This feature is particular useful for light sources in optical instruments such like photometer.
The Heraeus HG-2 lamp has a highly stable output also predominantly at 254 nm. When used with the Heraeus C430 power supply the line output is much higher than that of a Deuterium lamp, but with comparable stability. Therefore the HG-2 is the ideal choice for high stability applications such as mercury analysers. Other lines, which total 20 % of the output, are at 313 nm, 365 nm, 405 nm and 435 nm.

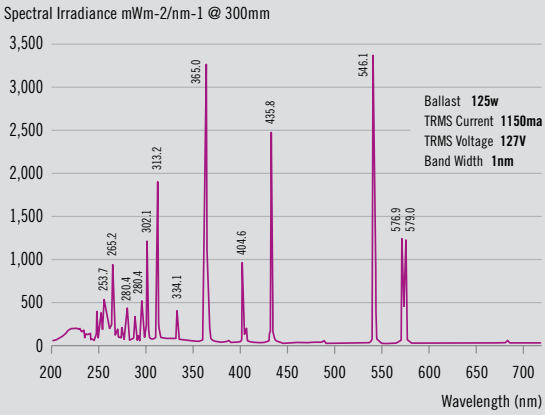
Applications

- Instrument calibration
- Mercury analysers
- Fluorescence analysers
- Environmental monitoring

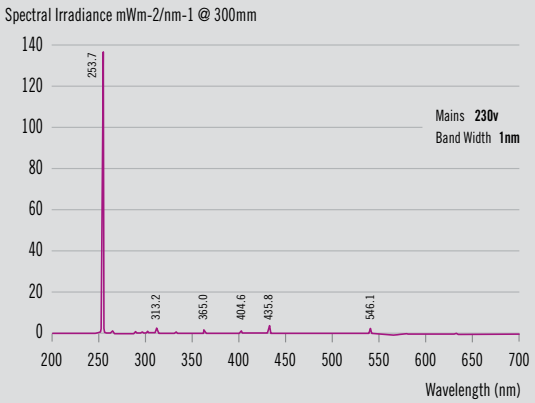
Spectrum TH Lamp (CT020T01)



Spectrum High Pressure Mercury Lamp (HPK 125 W)



Low Pressure Mercury Lamp (NK-Lamp)



Power Supplies

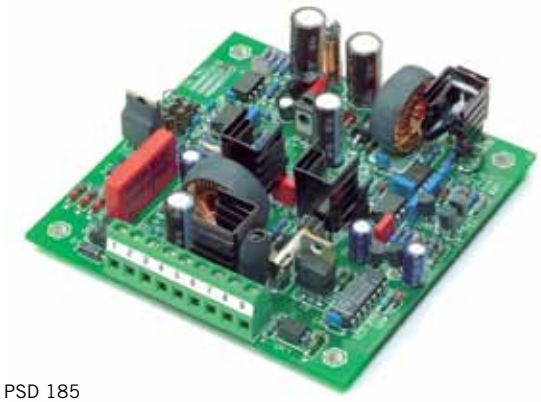
Modern deuterium lamps meet strict requirements with regard to noise, long term stability and operating life. Power supplies should in no way limit or reduce the performance of the lamp.

Consequently, Heraeus offers its own power supplies, which have been specifically developed based on our technical expertise in deuterium lamps. Heraeus uses a large number of its own power supplies while testing new lamps, and field operation is guaranteed as a result.

Heraeus power supplies distinguish themselves by the stability of their electrical parameters and excellent igniton circuitry, which protect the lamps, improve the operating life and ensure reliable starting. As a consequence OEMs can save the cost of developing their own power supplies and benefit from the experience of the lamp manufacturer that is dedicated to ensuring the optimum performance of deuterium lamps. Both bench top laboratory and OEM versions are available.

Power supplies for other lamp types apart from D2 are also available upon request.

PSD 184



PSD 185

PSD 186

Technical data for power supplies

Type	PSD 184 OEM version	PSD 185 OEM version	PSD 186 Bench top version
Input voltage	85-264 Vac	24 Vdc	85-264 Vac
Anode voltage	55-115 Vdc	55-110 Vdc	55-115 Vdc
Anode current	300 mAdc fixed	300 mAdc fixed	300 mAdc fixed and 100-400 mA adjustable
Anode current stability	≤ 5x10-6 p-p (300 mA)	≤ 5x10-6 p-p (300 mA)	≤ 5x10-6 p-p (300 mA)
Strike voltage	600 V	600 V	600 V
Heater voltage (warm-up/ operation)	2.5/0 V or 2.5/1 V	See below	2; 2.5; 3; 6; 9; 10; 12 V

Heater voltage PSD 185

Type	Warm-up (Vdc)	Operation (Vdc)
PSD 185 (2 V)	2.0	0
	2.0	1.0
PSD 185 (2.5 V)	2.5	0
	2.5	1.0
PSD 185 (3 V)	3.0	0
	3.0	1.0
PSD 185 (10 V)	10	6
PSD 185 (12 V)	12	0
	12	3
PSD 185 (15 V)	15	0

The Optics and Analytics division of Heraeus Noblelight (business segment specialty lighting sources) develops and manufactures lamps and power supplies for a broad spectrum of analytical applications. Using our advanced capabilities, we have developed lamp technologies that combine maximum stability with long operating life. At 2×10^{-5} AU, the noise characteristics of our deuterium lamps are significantly better than conventional ones.

Our new ELP (Enhanced Lifetime Performance) technology guarantees twice the intensity of conventional deuterium lamps at the end of lamp life. This means that the results of your analysis will be more consistent and will benefit from a higher degree of confidence in chemical detection. Profit from the acknowledged Heraeus quality.

The patented miniature deuterium lamp, FiberLight, is ideal for small, portable, battery-powered instruments designed for in-field and on-line analysis. At only 6 W, it has the lowest power consumption in the world and is the only deuterium lamp with instant-on and no reduction in life from multiple ignitions.

The advantage to you: lower Cost-of-Ownership through more analyses per battery set and no unproductive down-time. Comprehensive testing of all our light sources ensures they meet specifications, for example in terms of intensity, ignition voltage and life-time. This gives you total functional security and reliability for your analysis. Uniquely positioned with the widest range of specialist analytical lamps, Heraeus can supply high quality lamps for all leading instrument brands.

For example, our hollow cathode lamps include more than 70 single- and 120 multi-element lamps in low- and high-current 37 mm and 50 mm versions.

Our worldwide sales and dealer network ensures that lamps are easily available with quick delivery. Benefit from Heraeus – reduce your Cost-of-Ownership, extend your service intervals and simplify your supply-chain.

HNG OAO7E / 02.14 / wsp

Europe, Middle East, Africa, Rest of World*
Heraeus Noblelight GmbH
Heraeusstrasse 12-14
63450 Hanau, Germany
Phone +49 6181 35 5086
Fax +49 6181 35 7970
hng-analyticallamps@heraeus.com
www.heraeus-noblelight.com

America*
Heraeus Noblelight LLC
1520C Broadmoor Blvd.
Buford 30518, GA, USA
Phone +1 678 835 5681
Fax +1 678 835 5766
sales.hni@heraeus.com
www.heraeus-noblelight.com

Asia-Pacific, Oceania*
Heraeus Noblelight (Shenyang) Ltd.
Room 502, 5F, 16th building
No. 99 Tianzhou Road
200233 Shanghai, PR China
Phone +86 21 5445 2255
Fax +86 21 5445 2410
info.hns@heraeus.com
www.heraeus-noblelight.cn

*For local contacts please visit also our website http://www.heraeus-noblelight.com/en/contact/worldmap.aspx