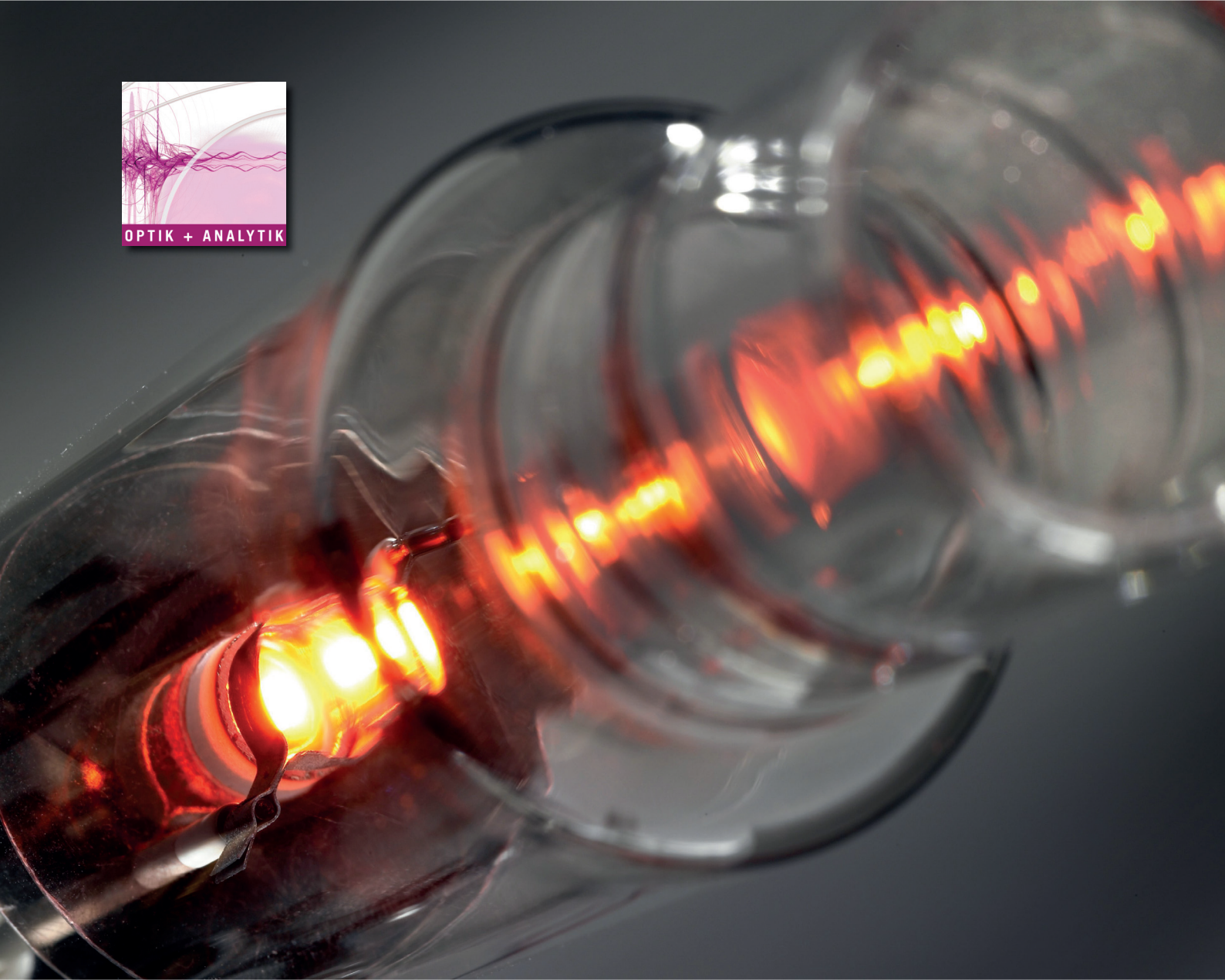


Heraeus



**Hollow Cathode Lamps**  
High Quality Lamps for all Instrument Brands

# Hollow Cathode Lamps

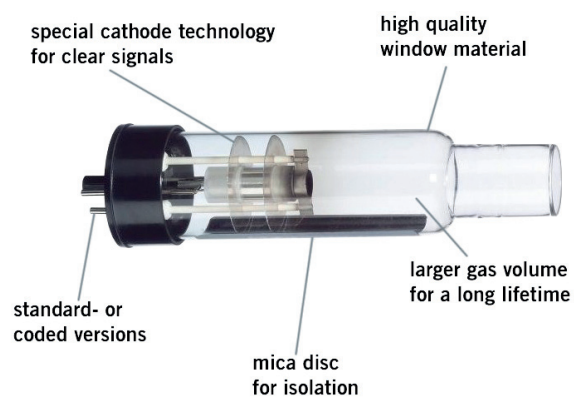
## High Quality Lamps for all Instrument Brands



Heraeus hollow cathode lamps are primarily used in instruments for atomic absorption spectroscopy (AAS).

Heraeus hollow cathode lamps are designed for optimal performance and characterised by good chemical sensitivity and spectral response, combined with stable light output and low noise.

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.



Hollow cathode lamps consist of a cathode made from the element of interest, an anode and an inert filler gas contained in a glass envelope. In addition various mica discs, ceramic sheaths and glass shields assist in alignment and insulation.

#### Heraeus Hollow Cathode Lamp range includes:

- 70 single-element lamps
- More than 120 multi-element lamps with up to seven combined elements
- 1.5" (37 mm) and 2" (50 mm) diameters
- Low-Current and High-Current versions for optimum performance in all OEM systems
- Standard and coded lamps
- Available for OEMs and end users
- High stability, low noise and long service life due to advanced cathode technology
- Special power supply available



#### Applications of Hollow Cathode Lamps:

Hollow cathode lamps are gas discharge devices in which the discharge is highly constrained within the cathode of a specific metal. The resultant output is a unique line spectrum, the most intense of which are suitable for highly specific and sensitive metals analysis. Further derivatives of the fundamental technology extend the applications to include:

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



# Single-Element Lamps

## Single-Element Lamps

The Heraeus catalogue includes 70 single-element lamps in standard 37 mm (1.5 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.

### Standard 37 mm Lamps

37 mm hollow cathode lamps are suitable for most commercial atomic absorption instruments. Standard lamps may also be used in computer controlled spectrophotometers which are designed to take coded lamps as these instruments normally have the facility to be set up manually. Manual setting up of lamp current, wavelength, slit width, gas conditions and burner height takes only a few moments and allows the operator to set the optimum conditions for each particular analysis, which can be stored and recalled when required. Indeed in many cases the instrument will set default conditions for these parameters on entry of the element. Whilst these parameters are generally suitable for a particular element, they may need fine tuning to suit the specific analysis being carried out.

### Standard 50 mm Lamps

Perkin Elmer Instruments are unique in requiring hollow cathode lamps with a 2" (50 mm) diameter, and a dedicated electrical connector. Heraeus has developed a full range of such lamps for direct use in Perkin Elmer instruments utilising the long established features of our standard range but making the necessary processing changes to ensure they are entirely compatible to these instruments.

### Data Coded Hollow Cathode Lamps

Heraeus manufacture and supply a complete range of data coded hollow cathode lamps for Perkin Elmer and Thermo instruments.



37 mm Hollow Cathode Lamp



50 mm Hollow Cathode Lamp

Data coded hollow cathode lamps incorporate a unique electronic configuration in the base or plug which the instrument recognizes and sets default operating conditions for the routine analysis of that element. The parameters may be overridden by the operator if desired to suit the specific requirements of the analysis. The electronic configuration of the data coding is also specific to each instrument manufacturer and not interchangeable i.e. a Varian coded lamp will not register in a Thermo instrument. Heraeus offers a full range of coded lamps for each manufacturer, the exact range being governed by the software embedded in the instrument.

#### **Self Reversal (Smith-Hieftje) Background Correction lamps**

Background correction in atomic absorption spectroscopy commonly uses a Deuterium continuum lamp and on certain instruments the Zeeman method utilising magnetic field polarisation. However, both of these methods have limitations regarding the correction of uniformly distributed background. An alternative method of background correction is the self reversal (Smith-Hieftje) technique in which a high current is momentarily passed through the cathode producing a dense cloud of neutral atoms in front of the cathode, effectively cutting off the stream of photons produced during normal lamp operating low current. This momentarily stops absorption in the flame, the spectrophotometer now reading the background absorption only. At normal operating current the instrument records the sum of the absorption of the element and the background. The spectrophotometer can then electronically subtract the background from the sample signal to solve the analytical problems that may be encountered with other methods of background correction. Heraeus has developed a range of lamps specifically designed to be used at the currents recommended by the manufacturers of instruments where the self reversal or "Smith-Hieftje" method of background correction is available. These lamps have enhanced insulation to cope with the high voltage pulse used by this background correction method, but may also be used in normal atomic absorption applications. Not all elements are suitable for use with this technique; the available range is included in the lamp listing.

# Multi-Element Lamps and See-Through Hollow Cathode Lamps

## Multi-Element Lamps

Heraeus manufactures the largest range of multi-element lamps offering only those combinations which provide sufficient intensity and an acceptable lifetime for each element with no spectral interference.

Multi-element 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. Multi element lamps are inevitably a compromise in which energy levels will be lower than single element lamps and hence noise levels may be higher. This may limit ultimate detection levels, single element lamps being preferred wherever sensitivity is an issue.

## 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.



See-Through Hollow Cathode Lamp

# Getting the best from your Hollow Cathode Lamps

## Operating Current

Each hollow cathode lamp has a maximum current which should not be exceeded. Exceeding the limit will considerably reduce the usable life of the lamp and may damage the cathode by sputtering off excess material or even melting some of the more volatile alloys and elements.

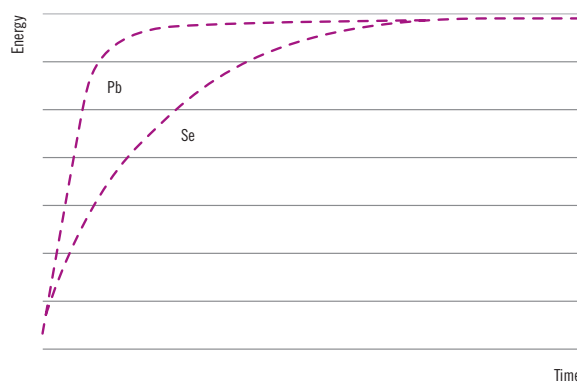
The current indicated on a 37 mm hollow cathode lamp is the maximum current at which the lamp should be run in an instrument using a modulated power supply typical of most manufacturers.

The current shown on a 50 mm lamp is the maximum current at which the lamp should be used in an instrument with a continuous power supply typical of most Perkin Elmer instruments. It is possible, with the correct adapters, to run a 37 mm lamp in a Perkin Elmer instrument with a continuous power supply in which instance the current recommended for 50 mm lamps should be used. Some Perkin Elmer models have a modulated power supply, reference to the instrument user manual will indicate the type of power supply in the instrument. If a modulated supply is present then the lamp should be operated at the current recommended for a 37 mm lamp.

In general lamps should be run at 75% of their maximum current to achieve best precision and 65–75% to achieve their maximum sensitivity. However, the performance of some elements is not materially affected by operation anywhere between 65 and 100%. Lamps should not be operated below 50% maximum current as, in all but a few cases, stability and noise levels deteriorate significantly. Indeed elements with naturally low outputs such as Arsenic, Tin, Antimony, Bismuth and Selenium would be too noisy for analysis at the detection limit at anything other than maximum current.

## Stabilisation

After striking the lamp or following a change in operating current most lamps will require a warm-up period before full stability is obtained. Depending upon the element, the warm-up time can be between 5 and 30 minutes. If lamps have not been used for a considerable time or have been stored before initial use they may require somewhat longer than usual to stabilise. This period will normally be around 2 hours but an overnight run may prove to be the most efficient way of restoring full stability. Softer elements with lower melting points such as lead especially benefit from this practise. For optimum performance, on receipt of a new lamp it is also good practice to run it in the instrument to acclimatize the lamp to the particular power supply.



Typical warm up curves

## Alignment

A hollow cathode lamp produces a very narrow beam of light; if not aligned correctly the output from the lamp will not fill the entrance slit and there will be an apparent loss in signal and the noise levels will increase. Low output and high noise may indicate that the lamp is misaligned. The lamp should then be re-aligned until maximum signal output is achieved.

# Getting the best from your Hollow Cathode Lamps

## Output

Low output is often cited when lamps are returned or discarded despite otherwise working well for chemical analysis. It is in fact common for an old lamp to have a slightly higher fundamental output than the new lamp. This increase in output comes about from a combination of two mechanisms, one of which is a decrease in the internal pressure of the lamp caused by the gradual usage of the fill gas. In addition material movement within the lamp may increase the output by closing the hole in the hollow cathode and concentrating the beam. The same material movement may also cause an opposing effect through a diminution of the transmittance of the window.

## Chemical Sensitivity

Sensitivity is defined as the concentration of the element in mg/ml in aqueous solution which gives an absorbance of 0.0044 (1% absorption). It is useful for calculating the calibration range of the instrument, which is usually in the range of 20-200 times the sensitivity value. It should be noted that the chemical sensitivity is dependant on the instrument and the set up such as burner height, flame chemistry and nebuliser positioning. For this reason reference should be made to the instrument manual for the recommended conditions and expected resultant sensitivity.

## Detection Limit

The detection limit is defined as the concentration of the element in mg/ml which gives a signal equal to three times the standard deviation of a series of at least 10 determinations at or near the blank level (95% confidence). In practical terms concentrations of less than 10 times the detection limit cannot be measured with any accuracy. The determination of this limit is particularly sensitive to noise levels so optimisation of output is essential in ensuring as low a detection limit as possible.

## Lifetime

Service life is an important factor in AAS. Heraeus hollow cathode lamps have a larger internal gas volume than many other products. All hollow-cathode lamps produced by Heraeus have a guaranteed service life of 5000 mA hours, including for elements such as As or Hg. The milliampere usage is calculated by multiplying the hours of lamp operation by the lamp operating current.

All Heraeus hollow cathode lamps are manufactured to the highest standards and are warranted free from electrical and mechanical defect caused either by workmanship or materials. The lamps provide satisfactory service when used within the limits of our written specification and when used in equipment of standard manufacture.

## Current VS Output VS Chemical Sensitivity

For optimum use of the lamp for its end purpose, chemical analysis, Heraeus aims to provide the best ratio of output : chemical sensitivity : life : noise and stability. The general relationship between these factors demonstrates that lower current gives increased chemical sensitivity but also increased noise levels and decreased output. Higher current will conversely reduce the noise, increase the output but will also reduce the chemical sensitivity. Each element and its matrix presents a unique problem, requiring the analyst to determine the optimal conditions for each particular analysis. The result will inevitably be a compromise in which some output has to be sacrificed in favour of other factors considered more important to the analysis.



# Heraeus Hollow Cathode Lamps

## Different Socket Versions



37 mm Thermo Coded



37 mm Varian Coded



37 mm Standard, 37 mm Self Reversal



50 mm Standard



50 mm PE coded Analyst

A variety of base designs is available for Heraeus Hollow Cathode lamps.

# Hollow Cathode Lamps

## Single Elements

| Single Elements |        |                      |                                    |     |              |             |             |                    |
|-----------------|--------|----------------------|------------------------------------|-----|--------------|-------------|-------------|--------------------|
| Element         | Symbol | Lamp Type            | Version                            | Gas | Window       | Max Current | Rec Current | W/Length Principle |
| Aluminium       | Al     | 3QNYAL-LC            | 37 mm low current                  | Ne  | Quartz       | 10          | 6           | 309,3              |
|                 |        | 3QNYAL               | 37 mm Standard                     | Ne  | Quartz       | 10          | 8           |                    |
|                 |        | 3QNYAL-V             | 37 mm Varian Coded                 | Ne  | Quartz       | 10          | 8           |                    |
|                 |        | 3QNYAL-U             | 37 mm Thermo Coded                 | Ne  | Quartz       | 10          | 8           |                    |
|                 |        | 3QNYAL-Self Reversal | 37 mm Self Reversal                | Ne  | Quartz       |             |             |                    |
|                 |        | 5QNAL                | 50 mm Standard 9 pin               | Ne  | Quartz       | 30          | 25          |                    |
|                 |        | 5QNAL-A              | 50 mm PE coded AAnalyst (Lumina)   | Ne  | Quartz       | 30          | 25          |                    |
| Antimony        | Sb     | 3QNYSB-LC            | 37 mm low current                  | Ne  | Quartz       | 10          | 4           | 217,6              |
|                 |        | 3QNYSB               | 37 mm Standard                     | Ne  | Quartz       | 15          | 12          |                    |
|                 |        | 3QNYSB-V             | 37 mm Varian Coded                 | Ne  | Quartz       | 15          | 12          |                    |
|                 |        | 3QNYSB-U             | 37 mm Thermo Coded                 | Ne  | Quartz       | 15          | 12          |                    |
|                 |        | 3QNYSB-Self Reversal | 37 mm Self Reversal                | Ne  | Quartz       |             |             |                    |
|                 |        | 5QNSB                | 50 mm Standard 9 pin               | Ne  | Quartz       | 25          | 20          |                    |
|                 |        | 5QNSB-A              | 50 mm PE coded AAnalyst (Lumina)   | Ne  | Quartz       | 25          | 20          |                    |
| Arsenic         | As     | 3QNYAS-LC            | 37 mm low current                  | Ne  | Quartz       | 10          | 6           | 193,7              |
|                 |        | 3QNYAS               | 37 mm Standard                     | Ne  | Quartz       | 12          | 10          |                    |
|                 |        | 3QNYAS-V             | 37 mm Varian Coded                 | Ne  | Quartz       | 12          | 10          |                    |
|                 |        | 3QNYAS-U             | 37 mm Thermo Coded                 | Ne  | Quartz       | 12          | 10          |                    |
|                 |        | 3QNYAS-Self Reversal | 37 mm Self Reversal                | Ne  | Quartz       |             |             |                    |
|                 |        | 5QNAS                | 50 mm Standard 9 pin               | Ne  | Quartz       | 18          | 18          |                    |
|                 |        | 5QNAS-A              | 50 mm PE coded AAnalyst (Lumina)   | Ne  | Quartz       | 18          | 18          |                    |
| Barium          | Ba     | 3BAXBA-LC            | 37 mm low current                  | Ne  | Borosilicate | 15          | 6           | 553,5              |
|                 |        | 3BAXBA               | 37 mm Standard                     | Ar  | Borosilicate | 15          | 12          |                    |
|                 |        | 3BAXBA-V             | 37 mm Varian Coded                 | Ar  | Borosilicate | 15          | 12          |                    |
|                 |        | 3BAXBA-U             | 37 mm Thermo Coded                 | Ar  | Borosilicate | 15          | 12          |                    |
|                 |        | 3BAXBA-Self Reversal | 37 mm Self Reversal                | Ar  | Borosilicate |             |             |                    |
|                 |        | 5QABA                | 50 mm Standard 9 pin               | Ar  | Quartz       | 30          | 25          |                    |
|                 |        | 5QABA-A              | 50 mm PE coded tAAAnalyst (Lumina) | Ar  | Quartz       | 30          | 25          |                    |
| Beryllium       | Be     | 3QNYBE-LC            | 37 mm low current                  | Ne  | Quartz       | 15          | 6           | 234,9              |
|                 |        | 3QNYBE               | 37 mm Standard                     | Ne  | Quartz       | 15          | 12          |                    |
|                 |        | 3QNYBE-V             | 37 mm Varian Coded                 | Ne  | Quartz       | 15          | 12          |                    |
|                 |        | 3QNYBE-U             | 37 mm Thermo Coded                 | Ne  | Quartz       | 15          | 12          |                    |
|                 |        | 3QNYBE-Self Reversal | 37 mm Self Reversal                | Ne  | Quartz       |             |             |                    |
|                 |        | 5QNBE                | 50 mm Standard 9 pin               | Ne  | Quartz       | 30          | 20          |                    |
|                 |        | 5QNBE-A              | 50 mm PE coded AAnalyst (Lumina)   | Ne  | Quartz       | 30          | 20          |                    |

## Single Elements

| Element | Symbol | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|---------|--------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Bismuth | Bi     | 3QNYBI-LC            | 37 mm low current                | Ne  | Quartz       | 15          | 3           | 223,1              |
|         |        | 3QNYBI               | 37 mm Standard                   | Ne  | Quartz       | 12          | 10          |                    |
|         |        | 3QNYBI-V             | 37 mm Varian Coded               | Ne  | Quartz       | 12          | 10          |                    |
|         |        | 3QNYBI-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 12          | 10          |                    |
|         |        | 3QNYBI-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|         |        | 5QNB                 | 50 mm Standard 9 pin             | Ne  | Quartz       | 15          | 12          |                    |
|         |        | 5QNB-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 15          | 12          |                    |
| Boron   | B      | 3QNYB-LC             | 37 mm low current                | Ne  | Quartz       | 15          | 8           | 249,8              |
|         |        | 3QNYB                | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|         |        | 3QNYB-V              | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|         |        | 3QNYB-U              | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|         |        | 3QNYB-Self Reversal  | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|         |        | 5QNB                 | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|         |        | 5QNB-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |
| Cadmium | Cd     | 3QNYCD-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 2           | 228,8              |
|         |        | 3QNYCD               | 37 mm Standard                   | Ne  | Quartz       | 8           | 6           |                    |
|         |        | 3QNYCD-V             | 37 mm Varian Coded               | Ne  | Quartz       | 8           | 6           |                    |
|         |        | 3QNYCD-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 8           | 6           |                    |
|         |        | 3QNYCD-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|         |        | 5QNC                 | 50 mm Standard 9 pin             | Ne  | Quartz       | 10          | 6           |                    |
|         |        | 5QNC-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 10          | 6           |                    |
| Caesium | Cs     | 3BNXCS-LC            | 37 mm low current                | Ne  | Borosilicate | 8           | 6           | 852,1              |
|         |        | 3QNYCS               | 37 mm Standard                   | Ne  | Borosilicate | 10          | 8           |                    |
|         |        | 3QNYCS-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 10          | 8           |                    |
|         |        | 3QNYCS-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 10          | 8           |                    |
|         |        | 3QNYCS-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|         |        | 5QNCS                | 50 mm Standard 9 pin             | Ne  | Quartz       | 10          | 8           |                    |
| Calcium | Ca     | 3BNXCA-LC            | 37 mm low current                | Ne  | Borosilicate | 10          | 3           | 422,7              |
|         |        | 3QNYCA               | 37 mm Standard                   | Ne  | Quartz       | 6           | 5           |                    |
|         |        | 3QNYCA-V             | 37 mm Varian Coded               | Ne  | Quartz       | 6           | 5           |                    |
|         |        | 3QNYCA-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 6           | 5           |                    |
|         |        | 3QNYCA-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|         |        | 5QNCA                | 50 mm Standard 9 pin             | Ne  | Quartz       | 10          | 8           |                    |
|         |        | 5QNCA-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 10          | 8           |                    |

## Single Elements

| Element    | Symbol | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|------------|--------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Cerium**   | Ce     | 3QNYCE               | 37 mm Standard                   | Ne  | Quartz       | 15          | 15          | 520,0              |
|            |        | 3QNYCE-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 15          |                    |
|            |        | 3QNYCE-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 15          |                    |
|            |        | 3QNYCE-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNCE                | 50 mm Standard 9 pin             | Ne  | Quartz       | 20          | 20          |                    |
| Chromium   | Cr     | 3BNXCR-LC            | 37 mm low current                | Ne  | Borosilicate | 10          | 4           | 357,9              |
|            |        | 3QNYCR               | 37 mm Standard                   | Ne  | Quartz       | 12          | 10          |                    |
|            |        | 3QNYCR-V             | 37 mm Varian Coded               | Ne  | Quartz       | 12          | 10          |                    |
|            |        | 3QNYCR-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 12          | 10          |                    |
|            |        | 3QNYCR-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNCR                | 50 mm Standard 9 pin             | Ne  | Quartz       | 12          | 10          |                    |
|            |        | 5QNCR-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 12          | 10          |                    |
| Cobalt     | Co     | 3QNYCO-LC            | 37 mm low current                | Ne  | Quartz       | 15          | 4           | 240,7              |
|            |        | 3QNYCO               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|            |        | 3QNYCO-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |        | 3QNYCO-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |        | 3QNYCO-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNCO                | 50 mm Standard 9 pin             | Ne  | Quartz       | 40          | 30          |                    |
|            |        | 5QNCO-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 40          | 30          |                    |
| Copper     | Cu     | 3QNYCU-LC            | 37 mm low current                | Ne  | Quartz       | 8           | 3           | 324,8              |
|            |        | 3QNYCU               | 37 mm Standard                   | Ne  | Quartz       | 5           | 4           |                    |
|            |        | 3QNYCU-V             | 37 mm Varian Coded               | Ne  | Quartz       | 5           | 4           |                    |
|            |        | 3QNYCU-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 5           | 4           |                    |
|            |        | 3QNYCU-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNCU                | 50 mm Standard 9 pin             | Ne  | Quartz       | 20          | 15          |                    |
|            |        | 5QNCU-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 20          | 15          |                    |
| Dysprosium | Dy     | 3BNXDY               | 37 mm Standard                   | Ne  | Borosilicate | 15          | 12          | 421,2              |
|            |        | 3BNXDY-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|            |        | 3BNXDY-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|            |        | 3BNXDY-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|            |        | 5QNDY                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|            |        | 5QNDY-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |

## Single Elements

| Element    | Symbol                           | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|------------|----------------------------------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Erbium     | Er                               | 3BNXER               | 37 mm Standard                   | Ne  | Borosilicate | 15          | 12          | 400,8              |
|            |                                  | 3BNXER-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|            |                                  | 3BNXER-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|            |                                  | 3BNXER-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|            |                                  | 5QNER                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|            |                                  | 5QNER-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |
| Europium   | Eu                               | 3BAXEU               | 37 mm Standard                   | Ar  | Borosilicate | 12          | 10          | 459,4              |
|            |                                  | 3BAXEU-V             | 37 mm Varian Coded               | Ar  | Borosilicate | 12          | 10          |                    |
|            |                                  | 3BAXEU-U             | 37 mm Thermo Coded               | Ar  | Borosilicate | 12          | 10          |                    |
|            |                                  | 3BAXEU-Self Reversal | 37 mm Self Reversal              | Ar  | Borosilicate |             |             |                    |
|            |                                  | 5QAEU                | 50 mm Standard 9 pin             | Ar  | Quartz       | 30          | 25          |                    |
|            |                                  | 5QAEU-A              | 50 mm PE coded AAnalyst (Lumina) | Ar  | Quartz       | 30          | 25          |                    |
| Gadolinium | Gd                               | 3QNYGD               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          | 368,4              |
|            |                                  | 3QNYGD-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGD-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGD-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |                                  | 5QNGD                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|            |                                  | 5QNGD-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |
| Gallium    | Ga                               | 3QNYGA-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 6           | 287,4              |
|            |                                  | 3QNYGA               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGA-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGA-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGA-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |                                  | 5QNGA                | 50 mm Standard 9 pin             | Ne  | Quartz       | 20          | 15          |                    |
| 5QNGA-A    | 50 mm PE coded AAnalyst (Lumina) | Ne                   | Quartz                           | 20  | 15           |             |             |                    |
| Germanium  | Ge                               | 3QNYGE-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 6           | 265,2              |
|            |                                  | 3QNYGE               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGE-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGE-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |                                  | 3QNYGE-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |                                  | 5QNGE                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
| 5QNGE-A    | 50 mm PE coded AAnalyst (Lumina) | Ne                   | Quartz                           | 30  | 25           |             |             |                    |

### Single Elements

| Element | Symbol | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|---------|--------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Gold    | Au     | 3QNYAU-LC            | 37 mm low current                | Ne  | Quartz       | 8           | 4           | 242,8              |
|         |        | 3QNYAU               | 37 mm Standard                   | Ne  | Quartz       | 10          | 8           |                    |
|         |        | 3QNYAU-V             | 37 mm Varian Coded               | Ne  | Quartz       | 10          | 8           |                    |
|         |        | 3QNYAU-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 10          | 8           |                    |
|         |        | 3QNYAU-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|         |        | 5QNAU                | 50 mm Standard 9 pin             | Ne  | Quartz       | 20          | 10          |                    |
|         |        | 5QNAU-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 20          | 10          |                    |
| Hafnium | Hf     | 3QAYHF               | 37 mm Standard                   | Ar  | Quartz       | 15          | 12          | 307,3              |
|         |        | 3QAYHF-V             | 37 mm Varian Coded               | Ar  | Quartz       | 15          | 12          |                    |
|         |        | 3QAYHF-U             | 37 mm Thermo Coded               | Ar  | Quartz       | 15          | 12          |                    |
|         |        | 3QAYHF-Self Reversal | 37 mm Self Reversal              | Ar  | Quartz       |             |             |                    |
|         |        | 5QAHF                | 50 mm Standard 9 pin             | Ar  | Quartz       | 30          | 25          |                    |
|         |        | 5QAHF-A              | 50 mm PE coded AAnalyst (Lumina) | Ar  | Quartz       | 30          | 25          |                    |
| Holmium | Ho     | 3BNXHO               | 37 mm Standard                   | Ne  | Borosilicate | 15          | 12          | 410,4              |
|         |        | 3BNXHO-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|         |        | 3BNXHO-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|         |        | 3BNXHO-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|         |        | 5QNH0                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|         |        | 5QNH0-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |
| Indium  | In     | 3QNYIN-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 5           | 303,9              |
|         |        | 3QNYIN               | 37 mm Standard                   | Ne  | Quartz       | 10          | 8           |                    |
|         |        | 3QNYIN-V             | 37 mm Varian Coded               | Ne  | Quartz       | 10          | 8           |                    |
|         |        | 3QNYIN-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 10          | 8           |                    |
|         |        | 3QNYIN-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|         |        | 5QNIN                | 50 mm Standard 9 pin             | Ne  | Quartz       | 25          | 20          |                    |
|         |        | 5QNIN-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 25          | 20          |                    |
| Iridium | Ir     | 3QNYIR-LC            | 37 mm low current                | Ne  | Quartz       | 15          | 8           | 208,9              |
|         |        | 3QNYIR               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|         |        | 3QNYIR-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|         |        | 3QNYIR-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|         |        | 3QNYIR-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|         |        | 5QNIR                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|         |        | 5QNIR-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |

## Single Elements

| Element     | Symbol | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|-------------|--------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Iron        | Fe     | 3QNYFE-LC            | 37 mm low current                | Ne  | Quartz       | 15          | 4           | 248,3              |
|             |        | 3QNYFE               | 37 mm Standard                   | Ne  | Quartz       | 15          | 1t2         |                    |
|             |        | 3QNYFE-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |        | 3QNYFE-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |        | 3QNYFE-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|             |        | 5QNF-E               | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 30          |                    |
|             |        | 5QNF-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 30          |                    |
| Lanthanum   | La     | 3QAYLA-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 6           | 550,1              |
|             |        | 3QAYLA               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|             |        | 3QAYLA-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |        | 3QAYLA-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |        | 3QAYLA-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|             |        | 5QALA                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|             |        | 5QALA-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |
| Lead        | Pb     | 3QNYPB-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 2           | 217,0              |
|             |        | 3QNYPB               | 37 mm Standard                   | Ne  | Quartz       | 10          | 8           |                    |
|             |        | 3QNYPB-V             | 37 mm Varian Coded               | Ne  | Quartz       | 10          | 8           |                    |
|             |        | 3QNYPB-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 10          | 8           |                    |
|             |        | 3QNYPB-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|             |        | 5QNPB                | 50 mm Standard 9 pin             | Ne  | Quartz       | 15          | 12          |                    |
|             |        | 5QNPB-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 15          | 12          |                    |
| Lithium     | Li     | 3BAXLI-LC            | 37 mm low current                | Ne  | Borosilicate | 10          | 2           | 670,8              |
|             |        | 3BAXLI               | 37 mm Standard                   | Ne  | Borosilicate | 10          | 8           |                    |
|             |        | 3BAXLI-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 10          | 8           |                    |
|             |        | 3BAXLI-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 10          | 8           |                    |
|             |        | 3BAXLI-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|             |        | 5QALI                | 50 mm Standard 9 pin             | Ne  | Quartz       | 20          | 15          |                    |
|             |        | 5QALI-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 20          | 15          |                    |
| Lutetium ** | Lu     | 3QAYLU               | 37 mm Standard                   | Ar  | Quartz       | 8           | 6           | 336,0              |
|             |        | 3QAYLU-V             | 37 mm Varian Coded               | Ar  | Quartz       | 8           | 6           |                    |
|             |        | 3QAYLU-U             | 37 mm Thermo Coded               | Ar  | Quartz       | 8           | 6           |                    |
|             |        | 3QAYLU-Self Reversal | 37 mm Self Reversal              | Ar  | Quartz       |             |             |                    |
|             |        | 5QALU                | 50 mm Standard 9 pin             | Ar  | Quartz       | 20          | 15          |                    |

### Single Elements

| Element    | Symbol | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|------------|--------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Magnesium  | Mg     | 3QNYMG-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 2           | 285,2              |
|            |        | 3QNYMG               | 37 mm Standard                   | Ne  | Quartz       | 6           | 5           |                    |
|            |        | 3QNYMG-V             | 37 mm Varian Coded               | Ne  | Quartz       | 6           | 5           |                    |
|            |        | 3QNYMG-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 6           | 5           |                    |
|            |        | 3QNYMG-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNMG                | 50 mm Standard 9 pin             | Ne  | Quartz       | 10          | 6           |                    |
|            |        | 5QNMG-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 10          | 6           |                    |
| Manganese  | Mn     | 3QNYMN-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 3           | 279,5              |
|            |        | 3QNYMN               | 37 mm Standard                   | Ne  | Quartz       | 12          | 10          |                    |
|            |        | 3QNYMN-V             | 37 mm Varian Coded               | Ne  | Quartz       | 12          | 10          |                    |
|            |        | 3QNYMN-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 12          | 10          |                    |
|            |        | 3QNYMN-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNMN                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 20          |                    |
|            |        | 5QNMN-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 20          |                    |
| Mercury    | Hg     | 3QNXHG               | 37 mm low current                | Ne  | Quartz       | 10          | 3           | 253,6              |
|            |        | 3QNYHG               | 37 mm Standard                   | Ne  | Quartz       | 6           | 5           |                    |
|            |        | 3QNYHG-V             | 37 mm Varian Coded               | Ne  | Quartz       | 6           | 5           |                    |
|            |        | 3QNYHG-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 6           | 5           |                    |
|            |        | 3QNYHG-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNHG                | 50 mm Standard 9 pin             | Ne  | Quartz       | 8           | 6           |                    |
|            |        | 5QNHG-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 8           | 6           |                    |
| Molybdenum | Mo     | 3QNYMO-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 6           | 313,3              |
|            |        | 3QNYMO               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|            |        | 3QNYMO-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |        | 3QNYMO-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|            |        | 3QNYMO-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|            |        | 5QNMO                | 50 mm Standard 9 pin             | Ne  | Quartz       | 40          | 30          |                    |
|            |        | 5QNMO-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 40          | 30          |                    |
| Neodymium  | Nd     | 3BAXND-LC            | 37 mm low current                | Ne  | Borosilicate | 10          | 8           | 492,5              |
|            |        | 3BAXND               | 37 mm Standard                   | Ne  | Borosilicate | 15          | 12          |                    |
|            |        | 3BAXND-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|            |        | 3BAXND-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|            |        | 3BAXND-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|            |        | 5QAND                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|            |        | 5QAND-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |



## Single Elements

| Element     | Symbol | Lamp Type            | Version                          | Gas | Window | Max Current | Rec Current | W/Length Principle |
|-------------|--------|----------------------|----------------------------------|-----|--------|-------------|-------------|--------------------|
| Nickel      | Ni     | 3QNYNI-LC            | 37 mm low current                | Ne  | Quartz | 10          | 4           | 232,0              |
|             |        | 3QNYNI               | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |                    |
|             |        | 3QNYNI-V             | 37 mm Varian Coded               | Ne  | Quartz | 15          | 12          |                    |
|             |        | 3QNYNI-U             | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |                    |
|             |        | 3QNYNI-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|             |        | 5QNNI                | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |                    |
|             |        | 5QNNI-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 30          | 25          |                    |
| Niobium     | Nb     | 3QAYNB               | 37 mm Standard                   | Ar  | Quartz | 15          | 12          | 334,4              |
|             |        | 3QAYNB-V             | 37 mm Varian Coded               | Ar  | Quartz | 15          | 12          |                    |
|             |        | 3QAYNB-U             | 37 mm Thermo Coded               | Ar  | Quartz | 15          | 12          |                    |
|             |        | 3QAYNB-Self Reversal | 37 mm Self Reversal              | Ar  | Quartz |             |             |                    |
|             |        | 5QANB                | 50 mm Standard 9 pin             | Ar  | Quartz | 40          | 40          |                    |
|             |        | 5QANB-A              | 50 mm PE coded AAnalyst (Lumina) | Ar  | Quartz | 40          | 40          |                    |
| Osmium **   | Os     | 3QNYOS               | 37 mm Standard                   | Ne  | Quartz | 10          | 8           | 290,9              |
|             |        | 3QNYOS-V             | 37 mm Varian Coded               | Ne  | Quartz | 10          | 8           |                    |
|             |        | 3QNYOS-U             | 37 mm Thermo Coded               | Ne  | Quartz | 10          | 8           |                    |
|             |        | 3QNYOS-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|             |        | 5QNOS                | 50 mm Standard 9 pin             | Ne  | Quartz | 10          | 8           |                    |
| Palladium   | Pd     | 3QNYPD-LC            | 37 mm low current                | Ne  | Quartz | 10          | 6           | 247,6              |
|             |        | 3QNYPD               | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |                    |
|             |        | 3QNYPD-V             | 37 mm Varian Coded               | Ne  | Quartz | 15          | 12          |                    |
|             |        | 3QNYPD-U             | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |                    |
|             |        | 3QNYPD-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|             |        | 5QNP                 | 50 mm Standard 9 pin             | Ne  | Quartz | 25          | 20          |                    |
|             |        | 5QNP-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 25          | 20          |                    |
| Phosphorous | P      | 3QNYP-LC             | 37 mm low current                | Ne  | Quartz | 15          | 6           | 213,6              |
|             |        | 3QNYP                | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |                    |
|             |        | 3QNYP-V              | 37 mm Varian Coded               | Ne  | Quartz | 10          | 8           |                    |
|             |        | 3QNYP-U              | 37 mm Thermo Coded               | Ne  | Quartz | 10          | 8           |                    |
|             |        | 3QNYP-Self Reversal  | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|             |        | 5QNP                 | 50 mm Standard 9 pin             | Ne  | Quartz | 25          | 20          |                    |
|             |        | 5QNP-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 25          | 20          |                    |

### Single Elements

| Element      | Symbol                           | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|--------------|----------------------------------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Platinum     | Pt                               | 3QNYPT-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 5           | 265,9              |
|              |                                  | 3QNYPT               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QNYPT-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QNYPT-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QNYPT-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|              |                                  | 5QNPT                | 50 mm Standard 9 pin             | Ne  | Quartz       | 25          | 20          |                    |
|              |                                  | 5QNPT-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 25          | 20          |                    |
| Potassium    | K                                | 3BNXK-LC             | 37 mm low current                | Ne  | Borosilicate | 8           | 2           | 766,5              |
|              |                                  | 3BNXK                | 37 mm Standard                   | Ne  | Borosilicate | 8           | 6           |                    |
|              |                                  | 3BNXK-V              | 37 mm Varian Coded               | Ne  | Borosilicate | 8           | 6           |                    |
|              |                                  | 3BNXK-U              | 37 mm Thermo Coded               | Ne  | Borosilicate | 8           | 6           |                    |
|              |                                  | 3BNXK-Self Reversal  | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|              |                                  | 5QNK                 | 50 mm Standard 9 pin             | Ne  | Quartz       | 12          | 10          |                    |
|              |                                  | 5QNK-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 12          | 10          |                    |
| Praseodymium | Pr                               | 3BNXPR-LC            | 37 mm Standard                   | Ne  | Borosilicate | 15          | 12          | 495,1              |
|              |                                  | 3BNXPR-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|              |                                  | 3BNXPR-P             | 37 mm Thermo Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|              |                                  | 3BNXPR-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|              |                                  | 5QNPR                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
| 5QNPR-A      | 50 mm PE coded AAnalyst (Lumina) | Ne                   | Quartz                           | 30  | 25           |             |             |                    |
| Rhenium      | Re                               | 3QAYRE               | 37 mm Standard                   | Ar  | Quartz       | 15          | 12          | 346,1              |
|              |                                  | 3QAYRE-V             | 37 mm Varian Coded               | Ar  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QAYRE-U             | 37 mm Thermo Coded               | Ar  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QAYRE-Self Reversal | 37 mm Self Reversal              | Ar  | Quartz       |             |             |                    |
|              |                                  | 5QARE                | 50 mm Standard 9 pin             | Ar  | Quartz       | 30          | 25          |                    |
| 5QARE-A      | 50 mm PE coded AAnalyst (Lumina) | Ar                   | Quartz                           | 30  | 25           |             |             |                    |
| Rhodium      | Rh                               | 3QAYRH-LC            | 37 mm low current                | Ne  | Quartz       | 6           | 6           | 343,5              |
|              |                                  | 3QAYRH               | 37 mm Standard                   | Ar  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QAYRH-V             | 37 mm Varian Coded               | Ar  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QAYRH-U             | 37 mm Thermo Coded               | Ar  | Quartz       | 15          | 12          |                    |
|              |                                  | 3QAYRH-Self Reversal | 37 mm Self Reversal              | Ar  | Quartz       |             |             |                    |
|              |                                  | 5QARH                | 50 mm Standard 9 pin             | Ar  | Quartz       | 30          | 25          |                    |
| 5QARH-A      | 50 mm PE coded AAnalyst (Lumina) | Ar                   | Quartz                           | 30  | 25           |             |             |                    |

## Single Elements

| Element     | Symbol                           | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|-------------|----------------------------------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Rubidium ** | Rb                               | 3BNXRБ-LC            | 37 mm low current                | Ne  | Borosilicate | 6           | 4           | 780,0              |
|             |                                  | 3BNXRБ               | 37 mm Standard                   | Ne  | Borosilicate | 10          | 8           |                    |
|             |                                  | 3BNXRБ-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 10          | 8           |                    |
|             |                                  | 3BNXRБ-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 10          | 8           |                    |
|             |                                  | 3BNXRБ-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|             |                                  | 5QNRБ                | 50 mm Standard 9 pin             | Ne  | Quartz       | 10          | 8           |                    |
| Ruthenium   | Ru                               | 3QAYRU-LC            | 37 mm low current                | Ne  | Quartz       | 8           | 5           | 349,9              |
|             |                                  | 3QAYRU               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|             |                                  | 3QAYRU-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |                                  | 3QAYRU-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |                                  | 3QAYRU-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|             |                                  | 5QARU                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
| 5QARU-V     | 50 mm PE coded AAnalyst (Lumina) | Ne                   | Quartz                           | 30  | 25           |             |             |                    |
| Samarium    | Sm                               | 3QNYSM               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          | 429,7              |
|             |                                  | 3QNYSM-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |                                  | 3QNYSM-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |                                  | 3QNYSM-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|             |                                  | 5QNSM                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|             |                                  | 5QNSM-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |
| Scandium    | Sc                               | 3QNYSC               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          | 391,2              |
|             |                                  | 3QNYSC-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |                                  | 3QNYSC-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|             |                                  | 3QNYSC-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|             |                                  | 5QNSC                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|             |                                  | 5QNSC-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       |             |             |                    |
| Selenium    | Se                               | 3QNYSE-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 5           | 196,0              |
|             |                                  | 3QNYSE               | 37 mm Standard                   | Ne  | Quartz       | 15          | 15          |                    |
|             |                                  | 3QNYSE-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 15          |                    |
|             |                                  | 3QNYSE-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 15          |                    |
|             |                                  | 3QNYSE-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|             |                                  | 5QNSE                | 50 mm Standard 9 pin             | Ne  | Quartz       | 15          | 15          |                    |
| 5QNSE-A     | 50 mm PE coded AAnalyst (Lumina) | Ne                   | Quartz                           | 15  | 15           |             |             |                    |

### Single Elements

| Element   | Symbol | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|-----------|--------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Silicon   | Si     | 3QNYSI-LC            | 37 mm low current                | Ne  | Quartz       | 15          | 8           | 251,6              |
|           |        | 3QNYSI               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYSI-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYSI-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYSI-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|           |        | 5QNSI                | 50 mm Standard 9 pin             | Ne  | Quartz       | 40          | 35          |                    |
|           |        | 5QNSI-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 40          | 35          |                    |
| Silver    | Ag     | 3QAYAG-LC            | 37 mm low current                | Ne  | Quartz       | 5           | 2           | 328,1              |
|           |        | 3QAYAG               | 37 mm Standard                   | Ar  | Quartz       | 4           | 3           |                    |
|           |        | 3QAYAG-V             | 37 mm Varian Coded               | Ar  | Quartz       | 4           | 3           |                    |
|           |        | 3QAYAG-U             | 37 mm Thermo Coded               | Ar  | Quartz       | 4           | 3           |                    |
|           |        | 3QAYAG-Self Reversal | 37 mm Self Reversal              | Ar  | Quartz       |             |             |                    |
|           |        | 5QAAG                | 50 mm Standard 9 pin             | Ar  | Quartz       | 10          | 5           |                    |
|           |        | 5QAAG-A              | 50 mm PE coded AAnalyst (Lumina) | Ar  | Quartz       | 10          | 5           |                    |
| Sodium    | Na     | 3QNYNA               | 37 mm low current                | Ne  | Borosilicate | 10          | 2           | 589,0              |
|           |        | 3QNYNA               | 37 mm Standard                   | Ne  | Quartz       | 8           | 6           |                    |
|           |        | 3QNYNA-V             | 37 mm Varian Coded               | Ne  | Quartz       | 8           | 6           |                    |
|           |        | 3QNYNA-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 8           | 6           |                    |
|           |        | 3QNYNA-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|           |        | 5QNNA                | 50 mm Standard 9 pin             | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 5QNNA-U              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 10          | 8           |                    |
| Strontium | Sr     | 3BAXSR-LC            | 37 mm low current                | Ne  | Borosilicate | 10          | 4           | 460,7              |
|           |        | 3BAXSR               | 37 mm Standard                   | Ar  | Borosilicate | 12          | 12          |                    |
|           |        | 3BAXSR-V             | 37 mm Varian Coded               | Ar  | Borosilicate | 12          | 12          |                    |
|           |        | 3BAXSR-U             | 37 mm Thermo Coded               | Ar  | Borosilicate | 12          | 12          |                    |
|           |        | 3BAXSR-Self Reversal | 37 mm Self Reversal              | Ar  | Borosilicate |             |             |                    |
|           |        | 5QASR                | 50 mm Standard 9 pin             | Ar  | Borosilicate | 20          | 15          |                    |
|           |        | 5QASR-A              | 50 mm PE coded AAnalyst (Lumina) | Ar  | Borosilicate | 20          | 15          |                    |
| Tantalum  | Ta     | 3QNYTA-LC            | 37 mm low current                | Ne  | Quartz       | 15          | 8           | 271,5              |
|           |        | 3QNYTA               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYTA-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYTA-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYTA-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|           |        | 5QNTA                | 50 mm Standard 9 pin             | Ne  | Quartz       | 40          | 30          |                    |
|           |        | 5QNTA-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 40          | 30          |                    |

## Single Elements

| Element   | Symbol | Lamp Type            | Version                          | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|-----------|--------|----------------------|----------------------------------|-----|--------------|-------------|-------------|--------------------|
| Tellurium | Te     | 3QNYTE-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 4           | 214,3              |
|           |        | 3QNYTE               | 37 mm Standard                   | Ne  | Quartz       | 15          | 15          |                    |
|           |        | 3QNYTE-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 15          |                    |
|           |        | 3QNYTE-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 15          |                    |
|           |        | 3QNYTE-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|           |        | 5QNTE                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 30          |                    |
|           |        | 5QNTE-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 30          |                    |
| Terbium   | Tb     | 3BNXTB               | 37 mm Standard                   | Ne  | Borosilicate | 15          | 12          | 432,7              |
|           |        | 3BNXTB-V             | 37 mm Varian Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|           |        | 3BNXTB-U             | 37 mm Thermo Coded               | Ne  | Borosilicate | 15          | 12          |                    |
|           |        | 3BNXTB-Self Reversal | 37 mm Self Reversal              | Ne  | Borosilicate |             |             |                    |
|           |        | 5QNTB                | 50 mm Standard 9 pin             | Ne  | Borosilicate | 30          | 25          |                    |
|           |        | 5QNTB-U              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Borosilicate | 30          | 25          |                    |
| Thallium  | Tl     | 3QNYTL-LC            | 37 mm low current                | Ne  | Quartz       | 10          | 3           | 276,8              |
|           |        | 3QNYTL               | 37 mm Standard                   | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 3QNYTL-V             | 37 mm Varian Coded               | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 3QNYTL-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 3QNYTL-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|           |        | 5QNYTL               | 50 mm Standard 9 pin             | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 5QNYTL-A             | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 10          | 8           |                    |
| Thulium   | Tm     | 3QNYTM               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          | 371,8              |
|           |        | 3QNYTM-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYTM-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYTM-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|           |        | 5QNTM                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 25          |                    |
|           |        | 5QNTM-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 25          |                    |
| Tin       | Sn     | 3QNYSN-LC            | 37 mm low current                | Ne  | Quartz       | 15          | 6           | 224,6              |
|           |        | 3QNYSN               | 37 mm Standard                   | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYSN-V             | 37 mm Varian Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYSN-U             | 37 mm Thermo Coded               | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYSN-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz       |             |             |                    |
|           |        | 5QNSN                | 50 mm Standard 9 pin             | Ne  | Quartz       | 30          | 30          |                    |
|           |        | 5QNSN-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz       | 30          | 30          |                    |

## Single Elements

| Element   | Symbol | Lamp Type            | Version                          | Gas | Window | Max Current | Rec Current | W/Length Principle |
|-----------|--------|----------------------|----------------------------------|-----|--------|-------------|-------------|--------------------|
| Titanium  | Ti     | 3QNYTI-LC            | 37 mm low current                | Ne  | Quartz | 8           | 6           | 365,4              |
|           |        | 3QNYTI               | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYTI-V             | 37 mm Varian Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYTI-U             | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYTI-Self Reversal | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|           |        | 5QNTI                | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |                    |
|           |        | 5QNTI-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 30          | 25          |                    |
| Tungsten  | W      | 3QNYW-LC             | 37 mm low current                | Ne  | Quartz | 15          | 8           | 255,1              |
|           |        | 3QNYW                | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYW-V              | 37 mm Varian Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYW-U              | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYW-Self Reversal  | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|           |        | 5QNW                 | 50 mm Standard 9 pin             | Ne  | Quartz | 40          | 30          |                    |
|           |        | 5QNW-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 40          | 30          |                    |
| Vanadium  | V      | 3QNYV-LC             | 37 mm low current                | Ne  | Quartz | 8           | 6           | 318,5              |
|           |        | 3QNYV                | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYV-V              | 37 mm Varian Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYV-U              | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYV-Self Reversal  | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|           |        | 5QNV                 | 50 mm Standard 9 pin             | Ne  | Quartz | 40          | 30          |                    |
|           |        | 5QNV-A               | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 40          | 30          |                    |
| Ytterbium | Yb     | 3QNYB                | 37 mm Standard                   | Ne  | Quartz | 15          | 12          | 398,8              |
|           |        | 3QNYB-V              | 37 mm Varian Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYB-U              | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |                    |
|           |        | 3QNYB-Self Reversal  | 37 mm Self Reversal              | Ne  | Quartz |             |             |                    |
|           |        | 5QNYB                | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |                    |
|           |        | 5QNYB-A              | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 30          | 25          |                    |

## Single Elements

| Element   | Symbol | Lamp Type            | Version                               | Gas | Window       | Max Current | Rec Current | W/Length Principle |
|-----------|--------|----------------------|---------------------------------------|-----|--------------|-------------|-------------|--------------------|
| Yttrium   | Y      | 3QNY                 | 37 mm Standard                        | Ne  | Borosilicate | 15          | 12          | 410,2              |
|           |        | 3QNY-V               | 37 mm Varian Coded                    | Ne  | Borosilicate | 15          | 12          |                    |
|           |        | 3QNY-U               | 37 mm Thermo Coded                    | Ne  | Borosilicate | 15          | 12          |                    |
|           |        | 3QNY-Self Reversal   | 37 mm Self Reversal                   | Ne  | Borosilicate |             |             |                    |
|           |        | 5QNY                 | 50 mm Standard 9 pin                  | Ne  | Quartz       | 30          | 25          |                    |
|           |        | 5QNY-A               | 50 mm PE coded AAnalyst (Lumina)      | Ne  | Quartz       | 30          | 25          |                    |
| Zinc      | Zn     | 3QNYZ-LC             | 37 mm low current                     | Ne  | Quartz       | 8           | 3           | 213,9              |
|           |        | 3QNYZ                | 37 mm Standard                        | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 3QNYZ-V              | 37 mm Varian Coded                    | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 3QNYZ-U              | 37 mm Thermo Coded                    | Ne  | Quartz       | 10          | 8           |                    |
|           |        | 3QNYZ-Self Reversal  | 37 mm Self Reversal                   | Ne  | Quartz       |             |             |                    |
|           |        | 5QNZ                 | 50 mm Standard 9 pin                  | Ne  | Quartz       | 20          | 15          |                    |
|           |        | 5QNZ-A               | 50 mm PE coded AAnalyst (Lumina)      | Ne  | Quartz       | 20          | 15          |                    |
| Zirconium | Zr     | 3QNYZR-LC            | 37 mm low current                     | Ne  | Quartz       | 10          | 8           | 360,1              |
|           |        | 3QNYZR               | 37 mm Standard                        | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYZR-V             | 37 mm Varian Coded                    | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYZR-U             | 37 mm Thermo Coded                    | Ne  | Quartz       | 15          | 12          |                    |
|           |        | 3QNYZR-Self Reversal | 37 mm Self Reversal                   | Ne  | Quartz       |             |             |                    |
|           |        | 5QNZR                | 50 mm Standard 9 pin                  | Ne  | Quartz       | 40          | 30          |                    |
|           |        | 5QNZR-A              | 50 mm PE coded AAnalyst (Lumina)      | Ne  | Quartz       | 40          | 30          |                    |
| Deuterium | D2     | 3QDYD2               | 37 mm Standard, Kontinuum (180-380nm) | D2  | Quartz       | 25          |             | Continuum          |
|           |        | 3QDYD2-U             | 37 mm Thermo Coded                    | D2  | Quartz       | 25          |             |                    |
|           |        | 3QDYD2-V             | 37 mm Varian Coded                    | D2  | Quartz       | 25          |             |                    |

# Hollow Cathode Lamps

## Multi Elements

### Two Elements

| Element      | Additional Element | Lamp Type                        | Version                          | Gas            | Window | Max Current | Rec Current |
|--------------|--------------------|----------------------------------|----------------------------------|----------------|--------|-------------|-------------|
| Aluminium Al | Ca                 | 3QNYALCA                         | 37 mm Standard                   | Ne             | Quartz | 10          | 8           |
|              |                    | 5QNALCA                          | 50 mm Standard 9 pin             | Ne             | Quartz | 20          | 15          |
|              | Mg                 | 3QNYALMG                         | 37 mm Standard                   | Ne             | Quartz | 10          | 8           |
|              |                    | 3QNYALMG-U                       | 37 mm Thermo Coded               | Ne             | Quartz | 10          | 8           |
|              |                    | 5QNALMG                          | 50 mm Standard 9 pin             | Ne             | Quartz | 20          | 15          |
|              |                    | Si                               | 3QNYALSI                         | 37 mm Standard | Ne     | Quartz      | 15          |
|              | 3QNYALSI-U         |                                  | 37 mm Thermo Coded               | Ne             | Quartz | 15          | 12          |
|              |                    | 5QNALSI                          | 50 mm Standard 9 pin             | Ne             | Quartz | 20          | 16          |
|              |                    | Ti                               | 3QNYALTI                         | 37 mm Standard | Ne     | Quartz      | 15          |
|              | 3QNYALTI-U         |                                  | 37 mm Thermo Coded               | Ne             | Quartz | 15          | 12          |
|              | 5QNALTI            | 50 mm Standard 9 pin             | Ne                               | Quartz         | 20     | 16          |             |
|              | Barium Ba          | Sr                               | 3QNYBASR                         | 37 mm Standard | Ne     | Quartz      | 15          |
| 3QNYBASR-U   |                    |                                  | 37 mm Thermo Coded               | Ne             | Quartz | 15          | 12          |
| 5QNBASR      |                    |                                  | 50 mm Standard 9 pin             | Ne             | Quartz | 15          | 12          |
| Cadmium Cd   | Zn                 | 3QNYCDZN                         | 37 mm Standard                   | Ne             | Quartz | 8           | 6           |
|              |                    | 3QNYCDZN-U                       | 37 mm Thermo Coded               | Ne             | Quartz | 8           | 6           |
|              |                    | 5QNCZDN                          | 50 mm Standard 9 pin             | Ne             | Quartz | 8           | 6           |
| Calcium Ca   | Ba                 | 3QNYCABA                         | 37 mm Standard                   | Ne             | Quartz | 15          | 12          |
|              |                    | 3QNYCABA-U                       | 37 mm Thermo Coded               | Ne             | Quartz | 15          | 12          |
|              |                    | 5QNBACA                          | 50 mm Standard 9 pin             | Ne             | Quartz | 15          | 12          |
|              | Mg                 | 3QNYCAMG                         | 37 mm Standard                   | Ne             | Quartz | 6           | 5           |
|              |                    | 3QNYCAMG-U                       | 37 mm Thermo Coded               | Ne             | Quartz | 6           | 5           |
|              |                    | 3QNYCAMG-V                       | 37 mm Varian Coded               | Ne             | Quartz | 6           | 5           |
|              |                    | 5QNCAMG                          | 50 mm Standard 9 pin             | Ne             | Quartz | 20          | 15          |
|              | 5QNCAMG-A          | 50 mm PE coded AAnalyst (Lumina) | Ne                               | Quartz         | 20     | 15          |             |
|              | Si                 | 3QNYCASI                         | 37 mm Standard                   | Ne             | Quartz | 15          | 12          |
|              |                    | 3QNYCASI-U                       | 37 mm Thermo Coded               | Ne             | Quartz | 15          | 12          |
|              | Sr                 | 5QNCASI                          | 50 mm Standard 9 pin             | Ne             | Quartz | 20          | 15          |
|              |                    | 3QNYCASR                         | 37 mm Standard                   | Ne             | Quartz | 15          | 12          |
|              |                    | 3QNYCASR-U                       | 37 mm Thermo Coded               | Ne             | Quartz | 15          | 12          |
|              | Zn                 | 5QNCASR                          | 50 mm Standard 9 pin             | Ne             | Quartz | 15          | 12          |
|              |                    | 3QNYCAZN                         | 37 mm Standard                   | Ne             | Quartz | 10          | 8           |
|              |                    | 3QNYCAZN-U                       | 37 mm Thermo Coded               | Ne             | Quartz | 10          | 8           |
|              |                    | 5QNCASN                          | 50 mm Standard 9 pin             | Ne             | Quartz | 20          | 15          |
|              |                    | 5QNCASN-A                        | 50 mm PE coded AAnalyst (Lumina) | Ne             | Quartz | 20          | 15          |



## Two Elements

| Element     | Additional Element | Lamp Type          | Version              | Gas            | Window | Max Current | Rec Current |
|-------------|--------------------|--------------------|----------------------|----------------|--------|-------------|-------------|
| Chromium Cr | Co                 | 3QNYCRCO           | 37 mm Standard       | Ne             | Quartz | 10          | 8           |
|             |                    | 5QNYCRCO           | 50 mm Standard 9 pin | Ne             | Quartz | 30          | 25          |
|             | Cu                 | 3QNYCRCU           | 37 mm Standard       | Ne             | Quartz | 10          | 8           |
| 3QNYCRCU-U  |                    | 37 mm Thermo Coded | Ne                   | Quartz         | 10     | 8           |             |
|             |                    | 5QNYCRCU           | 50 mm Standard 9 pin | Ne             | Quartz | 30          | 25          |
|             |                    | Fe                 | 3QNYCRFE             | 37 mm Standard | Ne     | Quartz      | 10          |
|             | 5QNYCRFE           |                    | 50 mm Standard 9 pin | Ne             | Quartz | 30          | 25          |
| Mn          |                    | 3QNYCRMN           | 37 mm Standard       | Ne             | Quartz | 10          | 8           |
|             |                    | 3QNYCRMN-U         | 37 mm Thermo Coded   | Ne             | Quartz | 10          | 8           |
|             |                    | 5QNYCRMN           | 50 mm Standard 9 pin | Ne             | Quartz | 30          | 25          |
| Mo          |                    | 3QNYCRMO           | 37 mm Standard       | Ne             | Quartz | 15          | 12          |
|             |                    | 3QNYCRMO-U         | 37 mm Thermo Coded   | Ne             | Quartz | 15          | 12          |
|             |                    | 5QNYCRMO           | 50 mm Standard 9 pin | Ne             | Quartz | 30          | 25          |
| Ni          |                    | 3QNYCRNI           | 37 mm Standard       | Ne             | Quartz | 10          | 8           |
|             |                    | 3QNYCRNI-U         | 37 mm Thermo Coded   | Ne             | Quartz | 10          | 8           |
|             |                    | 5QNYCRNI           | 50 mm Standard 9 pin | Ne             | Quartz | 30          | 25          |

|           |    |            |                      |    |        |    |    |
|-----------|----|------------|----------------------|----|--------|----|----|
| Cobalt Co | Cu | 3QNYCOCU   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |    | 3QNYCOCU-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |    | 5QNYCOCU   | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
| Fe        |    | 3QNYCOFE   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |    | 3QNYCOFE-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |    | 5QNYCOFE   | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
| Mn        |    | 3QNYCOMN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |    | 3QNYCOMN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |    | 5QNYCOMN   | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
| Mo        |    | 3QNYCOMO   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |    | 3QNYCOMO-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |    | 5QNYCOMO   | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
| Ni        |    | 3QNYCONI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |    | 3QNYCONI-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |    | 5QNYCONI   | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |

## Two Elements

| Element   | Additional Element | Lamp Type  | Version              | Gas | Window | Max Current | Rec Current |
|-----------|--------------------|------------|----------------------|-----|--------|-------------|-------------|
| Copper Cu | Fe                 | 3QNYCUFE   | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|           |                    | 3QNYCUFE-U | 37 mm Thermo Coded   | Ne  | Quartz | 10          | 8           |
|           |                    | 5QNCUFE    | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|           | Mn                 | 3QNYCUMN   | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|           |                    | 3QNYCUMN-U | 37 mm Thermo Coded   | Ne  | Quartz | 10          | 8           |
|           |                    | 5QNCUMN    | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|           | Mo                 | 3QNYCUMO   | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|           |                    | 5QNCUMO    | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|           | Ni                 | 3QNYCUNI   | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|           |                    | 3QNYCUNI-U | 37 mm Thermo Coded   | Ne  | Quartz | 10          | 8           |
|           |                    | 5QNCUNI    | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|           | Zn                 | 3QNYCUZN   | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|           |                    | 3QNYCUZN-V | 37 mm Varian Coded   | Ne  | Quartz | 10          | 8           |
|           |                    | 3QNYCUZN-U | 37 mm Thermo Coded   | Ne  | Quartz | 10          | 8           |
|           |                    | 5QNCUZN    | 50 mm Standard 9 pin | Ne  | Quartz | 20          | 15          |

|         |    |            |                                  |    |        |    |    |
|---------|----|------------|----------------------------------|----|--------|----|----|
| Gold Au | Cu | 3QNYAUCU   | 37 mm Standard                   | Ne | Quartz | 10 | 8  |
|         |    | 3QNYAUCU-U | 37 mm Thermo Coded               | Ne | Quartz | 10 | 8  |
|         |    | 5QNAUCU    | 50 mm Standard 9 pin             | Ne | Quartz | 15 | 12 |
|         | Ni | 3QNYAUNI   | 37 mm Standard                   | Ne | Quartz | 10 | 8  |
|         |    | 3QNYAUNI-U | 37 mm Thermo Coded               | Ne | Quartz | 10 | 8  |
|         |    | 5QNAUNI    | 50 mm Standard 9 pin             | Ne | Quartz | 15 | 12 |
|         | Pt | 3QNYAUPT   | 37 mm Standard                   | Ne | Quartz | 10 | 8  |
|         |    | 3QNYAUPT-U | 37 mm Thermo Coded               | Ne | Quartz | 10 | 8  |
|         |    | 5QNAUPT    | 50 mm Standard 9 pin             | Ne | Quartz | 15 | 12 |
|         | Ag | 3QNYAUAG   | 37 mm Standard                   | Ne | Quartz | 10 | 8  |
|         |    | 3QNYAUAG-U | 37 mm Thermo Coded               | Ne | Quartz | 10 | 8  |
|         |    | 5QNAUAG    | 50 mm Standard 9 pin             | Ne | Quartz | 20 | 15 |
|         |    | 5QNAUAG-A  | 50 mm PE coded AAnalyst (Lumina) | Ne | Quartz | 20 | 15 |

|         |    |            |                      |    |        |    |    |
|---------|----|------------|----------------------|----|--------|----|----|
| Iron Fe | Mn | 3QNYFEMN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|         |    | 3QNYFEMN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|         |    | 5QNFEMN    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|         | Mo | 3QNYFEMO   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|         |    | 5QNFEMO    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|         | Ni | 3QNYFENI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|         |    | 3QNYFENI-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|         |    | 5QNFENI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|         | Zn | 3QNYFEZN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|         |    | 3QNYFEZN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|         |    | 5QNFZFN    | 50 mm Standard 9 pin | Ne | Quartz | 20 | 15 |

## Two Elements

| Element      | Additional Element | Lamp Type            | Version                          | Gas                | Window | Max Current | Rec Current |   |
|--------------|--------------------|----------------------|----------------------------------|--------------------|--------|-------------|-------------|---|
| Magnesium Mg | Si                 | 3QNYMGSI             | 37 mm Standard                   | Ne                 | Quartz | 15          | 12          |   |
|              |                    | 3QNYMGSI-U           | 37 mm Thermo Coded               | Ne                 | Quartz | 15          | 12          |   |
|              |                    | 5QNMGSI              | 50 mm Standard 9 pin             | Ne                 | Quartz | 20          | 15          |   |
|              | Zn                 | 3QNYMGZN             | 37 mm Standard                   | Ne                 | Quartz | 15          | 12          |   |
|              |                    | 5QNMGZN              | 50 mm Standard 9 pin             | Ne                 | Quartz | 20          | 15          |   |
| Manganese Mn | Mo                 | 3QNYMNM0             | 37 mm Standard                   | Ne                 | Quartz | 10          | 8           |   |
|              |                    | 5QNMNM0              | 50 mm Standard 9 pin             | Ne                 | Quartz | 30          | 25          |   |
|              |                    | Ni                   | 3QNYMNNI                         | 37 mm Standard     | Ne     | Quartz      | 10          | 8 |
|              | 3QNYMNNI-U         |                      | 37 mm Thermo Coded               | Ne                 | Quartz | 10          | 8           |   |
|              | Zn                 | 5QNMNNI              | 50 mm Standard 9 pin             | Ne                 | Quartz | 30          | 25          |   |
|              |                    | 3QNYMNZN             | 37 mm Standard                   | Ne                 | Quartz | 10          | 8           |   |
|              | 3QNYMNZN-U         | 37 mm Thermo Coded   | Ne                               | Quartz             | 10     | 8           |             |   |
|              | 5QNMNZN            | 50 mm Standard 9 pin | Ne                               | Quartz             | 20     | 15          |             |   |
|              | Platinum Pt        | Ag                   | 3QNYPTAG                         | 37 mm Standard     | Ne     | Quartz      | 10          | 8 |
| 3QNYPTAG-U   |                    |                      | 37 mm Thermo Coded               | Ne                 | Quartz | 10          | 8           |   |
| 5QNPTAG      |                    |                      | 50 mm Standard 9 pin             | Ne                 | Quartz | 15          | 12          |   |
| Silicon Si   | Ti                 | 3QNSITI              | 37 mm Standard                   | Ne                 | Quartz | 15          | 12          |   |
|              |                    | 3QNSITI-U            | 37 mm Thermo Coded               | Ne                 | Quartz | 15          | 12          |   |
|              |                    | 5QNSITI              | 50 mm Standard 9 pin             | Ne                 | Quartz | 20          | 16          |   |
| Silver Ag    | Cr                 | 3QNYAGCR             | 37 mm Standard                   | Ne                 | Quartz | 10          | 8           |   |
|              |                    | 3QNYAGCR-U           | 37 mm Thermo Coded               | Ne                 | Quartz | 10          | 8           |   |
|              |                    | 5QNAGCR              | 50 mm Standard 9 pin             | Ne                 | Quartz | 20          | 16          |   |
|              | Cu                 | 3QNYAGCU             | 37 mm Standard                   | Ne                 | Quartz | 10          | 8           |   |
|              |                    | 3QNYAGCU-U           | 37 mm Thermo Coded               | Ne                 | Quartz | 10          | 8           |   |
|              |                    | 5QNAGCU              | 50 mm Standard 9 pin             | Ne                 | Quartz | 25          | 16          |   |
|              | Cd                 | 3QNYAGCD             | 37 mm Standard                   | Ne                 | Quartz | 10          | 8           |   |
|              | Sodium Na          | K                    | 3QNXNAK                          | 37 mm Standard     | Ne     | Quartz      | 8           | 6 |
|              |                    |                      | 3QNXNAK-U                        | 37 mm Thermo Coded | Ne     | Quartz      | 8           | 6 |
| 3QNXNAK-V    |                    |                      | 37 mm Varian Coded               | Ne                 | Quartz | 8           | 6           |   |
| 5QNNAK       |                    |                      | 50 mm Standard 9 pin             | Ne                 | Quartz | 12          | 10          |   |
| 5QNNAK-A     |                    |                      | 50 mm PE coded AAnalyst (Lumina) | Ne                 | Quartz | 12          | 10          |   |

### Three Elements

| Element      | Additional Element | Lamp Type    | Version                          | Gas | Window | Max Current | Rec Current |
|--------------|--------------------|--------------|----------------------------------|-----|--------|-------------|-------------|
| Aluminium Al | Ca+Mg              | 3QNYALCAMG   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNALCAMG    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 15          |
|              |                    | 5QNALCAMG-A  | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 20          | 15          |
|              | Si+Ti              | 3QNYALSITI   | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |
|              |                    | 3QNYALSITI-U | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |
|              |                    | 5QNALSI      | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 16          |
| Antimony Sb  | As+Bi              | 3QNYSBASBI   | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |
|              |                    | 5QNSBASBI    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 16          |
| Calcium Ca   | Ba+Sr              | 3QNYCABASR   | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |
|              |                    | 3QNYCABASR-U | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |
|              |                    | 5QNCABASR    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 15          |
|              | Mg+Si              | 3QNYCAMGSI   | 37 mm Standard                   | Ne  | Quartz | 15          | 12          |
|              |                    | 3QNYCAMGSI-U | 37 mm Thermo Coded               | Ne  | Quartz | 15          | 12          |
|              |                    | 5QNCAMGSI    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 15          |
|              | Mg+Zn              | 3QNYCAMGZN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNCAMGZN    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 20          |
|              |                    | 5QNCAMGZN-A  | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 20          | 20          |
| Chromium Cr  | Cu+Co              | 3QNYCRCUCO   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNYCRCUCO   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              | Co+Fe              | 3QNYCRCOFE   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNYCRCOFE   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              | Co+Mn              | 3QNYCRCOMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              | Co+Ni              | 3QNYCRCONI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNYCRCONI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              | Cu+Fe              | 3QNYCRCUFE   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNYCRCUFE   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              | Cu+Mn              | 3QNYCRCUMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNYCRCUMN   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              | Cu+Ni              | 3QNYCRCUNI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              |                    | 3QNYCRCUNI-U | 37 mm Thermo Coded               | Ne  | Quartz | 10          | 8           |
|              | Fe+Mn              | 5QNYCRCUNI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              |                    | 3QNYCRFEMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              | Fe+Ni              | 5QNYCRFEMN   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              |                    | 3QNYCRFENI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|              | Mn+Ni              | 5QNYCRFENI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              |                    | 3QNYCRMNI    | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |

### Three Elements

| Element | Additional Element | Lamp Type    | Version              | Gas | Window | Max Current | Rec Current |
|---------|--------------------|--------------|----------------------|-----|--------|-------------|-------------|
| Gold Au | Cu+Ni              | 3QNYAUCUNI   | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|         |                    | 3QNYAUCUNI-U | 37 mm Thermo Coded   | Ne  | Quartz | 10          | 8           |
|         |                    | 5QNAUCUNI    | 50 mm Standard 9 pin | Ne  | Quartz | 15          | 12          |
|         | Pt+Ag              | 3QNYAUPTAG   | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|         |                    | 3QNYAUPTAG-U | 37 mm Thermo Coded   | Ne  | Quartz | 10          | 8           |
|         |                    | 5QNAUPTAG    | 50 mm Standard 9 pin | Ne  | Quartz | 15          | 12          |

|           |       |              |                      |    |        |    |    |
|-----------|-------|--------------|----------------------|----|--------|----|----|
| Cobalt Co | Cu+Fe | 3QNYCOCUFE   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 3QNYCOCUFE-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |       | 5QNCOCUFE    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|           | Cu+Mn | 3QNYCOCUMN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 5QNCOCUMN    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|           | Mn+Ni | 3QNYCOMNNI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 3QNYCOMNNI-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |       | 5QNCOMNNI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |

|           |       |              |                      |    |        |    |    |
|-----------|-------|--------------|----------------------|----|--------|----|----|
| Copper Cu | Fe+Mn | 3QNYCUFEMN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 3QNYCUFEMN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |       | 5QNCUFEMN    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|           | Fe+Mo | 3QNYCUFEMO   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 5QNCUFEMO    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|           | Fe+Ni | 3QNYCUFENI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 5QNCUFENI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|           |       | 3QNYCUFEZN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           | Fe+Zn | 3QNYCUFEZN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |       | 5QNCUFEZN    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|           |       | 3QNYCUMNNI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           | Mn+Ni | 3QNYCUMNNI-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |       | 5QNCUMNNI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|           |       | 3QNYCUMNZN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           | Mn+Zn | 3QNYCUMNZN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |       | 5QNCUMNZN    | 50 mm Standard 9 pin | Ne | Quartz | 20 | 15 |

|         |       |              |                      |    |        |    |    |
|---------|-------|--------------|----------------------|----|--------|----|----|
| Iron Fe | Mn+Ni | 3QNYFEMNNI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|         |       | 3QNYFEMNNI-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|         |       | 5QNFEMNNI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
|         | Mn+Zn | 3QNYFEMNZN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|         |       | 3QNYFEMNZN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|         |       | 5QNFEMNZN    | 50 mm Standard 9 pin | Ne | Quartz | 20 | 15 |

### Three Elements

| Element       | Additional Element | Lamp Type  | Version              | Gas | Window | Max Current | Rec Current |
|---------------|--------------------|------------|----------------------|-----|--------|-------------|-------------|
| Molybdenum Mo | Cr+Co              | 3QNYMOCRCO | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCRCO | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Cr+Cu              | 3QNYMOCRCU | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCRCU | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Cr+Fe              | 3QNYMOCRFE | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCRFE | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Cr+Mn              | 3QNYMOCRMN | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCRMN | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Co+Cu              | 3QNYMOCOCU | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCOCU | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Co+Mn              | 3QNYMOCOMN | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCOMN | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Co+Fe              | 3QNYMOCOFE | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCOFE | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Cu+Fe              | 3QNYMOCUFE | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCUFE | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Cu+Mn              | 3QNYMOCUMN | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCUMN | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |
|               | Fe+Mn              | 3QNYMOCUMN | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNYMOCUMN | 50 mm Standard 9 pin | Ne  | Quartz | 30          | 25          |

|           |       |              |                      |    |        |    |    |
|-----------|-------|--------------|----------------------|----|--------|----|----|
| Silver Ag | Cr+Cu | 3QNYAGRCRU   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 3QNYAGRCRU-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |       | 5QNYAGRCRU   | 50 mm Standard 9 pin | Ne | Quartz | 25 | 20 |
|           | Cu+Ni | 3QNYAGCUNI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |       | 5QNYAGCUNI   | 50 mm Standard 9 pin | Ne | Quartz | 25 | 20 |

### Four Elements

| Element      | Additional Element | Lamp Type    | Version              | Gas | Window | Max Current | Rec Current |
|--------------|--------------------|--------------|----------------------|-----|--------|-------------|-------------|
| Aluminium Al | Ca+Fe+Mg           | 3QNYALCAFEMG | 37 mm Standard       | Ne  | Quartz | 15          | 12          |
|              |                    | 5QNYALCAFEMG | 50 mm Standard 9 pin | Ne  | Quartz | 20          | 16          |
|              | Ca+Li+Mg           | 3QNYALCALIMG | 37 mm Standard       | Ne  | Quartz | 10          | 8           |
|              |                    | 5QNYALCALIMG | 50 mm Standard 9 pin | Ne  | Quartz | 20          | 16          |
|              | Ca+Fe+Ti           | 5QNYALCAFETI | 50 mm Standard 9 pin | Ne  | Quartz | 20          | 16          |
| Barium Ba    | Ca+Mg+Sr           | 3QNYBACAMGSR | 37 mm Standard       | Ne  | Quartz | 15          | 12          |
|              |                    | 5QNYBACAMGSR | 50 mm Standard 9 pin | Ne  | Quartz | 20          | 15          |

## Four Elements

| Element    | Additional Element | Lamp Type      | Version                          | Gas | Window | Max Current | Rec Current |
|------------|--------------------|----------------|----------------------------------|-----|--------|-------------|-------------|
| ChromiumCr | Co+Cu+Fe           | 3QNYCRCOCUFE   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCOCUFE    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Co+Cu+Mn   | Co+Cu+Mn           | 3QNYCRCOCUMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCOCUMN    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Co+Cu+Ni   | Co+Cu+Ni           | 3QNYCRCOCUNI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCOCUNI    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Co+Fe+Mn   | Co+Fe+Mn           | 3QNYCRCOFEMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCOFEMN    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Co+Fe+Ni   | Co+Fe+Ni           | 3QNYCRCOFENI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCOFENI    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Co+Mn+Ni   | Co+Mn+Ni           | 3QNYRCOMNNI    | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCOMNNI    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Cu+Fe+Mn   | Cu+Fe+Mn           | 3QNYCRCUFEMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCUFEMN    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Cu+Fe+Ni   | Cu+Fe+Ni           | 3QNYCRCUFENI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCUFENI    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Cu+Mn+Ni   | Cu+Mn+Ni           | 3QNYCRCUMNNI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 3QNYCRCUMNNI-U | 37 mm Thermo Coded               | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCUMNNI    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
| Cu+Ni+Ag   | Cu+Ni+Ag           | 3QNYRCUNIAG    | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRCUNIAG    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 16          |
|            |                    | 5QNCRCUNIAG-A  | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 20          | 16          |
| Fe+Mn+Ni   | Fe+Mn+Ni           | 3QNYCRFEMNNI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|            |                    | 5QNCRFEMNNI    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |

|           |          |                |                      |    |        |    |    |
|-----------|----------|----------------|----------------------|----|--------|----|----|
| Cobalt Co | Cu+Fe+Mn | 3QNYCOCUFEMN   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |          | 3QNYCOCUFEMN-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |          | 5QNCOCUFEMN    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
| Cu+Fe+Ni  | Cu+Fe+Ni | 3QNYCOCUFENI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |          | 5QNCOCUFENI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
| Cu+Mn+Ni  | Cu+Mn+Ni | 3QNYCOCUMNNI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |          | 3QNYCOCUMNNI-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |          | 5QNCOCUMNNI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |
| Fe+Mn+Ni  | Fe+Mn+Ni | 3QNYCOFEMNNI   | 37 mm Standard       | Ne | Quartz | 10 | 8  |
|           |          | 3QNYCOFEMNNI-U | 37 mm Thermo Coded   | Ne | Quartz | 10 | 8  |
|           |          | 5QNCOFEMNNI    | 50 mm Standard 9 pin | Ne | Quartz | 30 | 25 |

#### Four Elements

| Element       | Additional Element | Lamp Type      | Version                          | Gas | Window | Max Current | Rec Current |
|---------------|--------------------|----------------|----------------------------------|-----|--------|-------------|-------------|
| Copper Cu     | Fe+Mn+Ni           | 3QNYCUFEMNNI   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|               |                    | 3QNYCUFEMNNI-U | 37 mm Thermo Coded               | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNCUFEMNNI    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|               | Fe+Mn+Zn           | 3QNYCUFEMNZN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|               |                    | 3QNYCUFEMNZN-U | 37 mm Thermo Coded               | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNCUFEMNZN    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 15          |
|               | Fe+Ni+Ag           | 5QNCUFEMNZN-A  | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 20          | 15          |
|               |                    | 3QNYCUFENIAG   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNCUFENIAG    | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 16          |
| Molybdenum Mo | Co+Cu+Fe           | 3QNYMOCOCUFE   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNMOCOCUFE    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|               | Co+Cu+Mn           | 3QNYMOCOCUMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNMOCOCUMN    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|               | Co+Fe+Mn           | 3QNYMOCOFEMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNMOCOFEMN    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|               | Cu+Fe+Mn           | 3QNYMOCUFEMN   | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|               |                    | 5QNMOCUFEMN    | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |

#### Five Elements

| Element     | Additional Element | Lamp Type       | Version                          | Gas | Window | Max Current | Rec Current |
|-------------|--------------------|-----------------|----------------------------------|-----|--------|-------------|-------------|
| Chromium Cr | Co+Cu+Fe+Mn        | 3QNYCRCOCUFEMN  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|             |                    | 5QNCRCOCUFEMN   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|             |                    | 3QNYCRCOCUFENI  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|             | Co+Cu+Fe+Ni        | 5QNCRCOCUFENI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|             |                    | 3QNYCRCOCUMNNI  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|             |                    | 5QNCRCOCUMNNI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|             | Co+Cu+Mn+Ni        | 5QNCRCOCUMNNI-A | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 30          | 25          |
|             |                    | 3QNYCRCOFEMNNI  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|             |                    | 5QNCRCOFEMNNI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|             | Co+Fe+Mn+Ni        | 3QNYCRCUFEMNNI  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|             |                    | 5QNCRCUFEMNNI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|             |                    | 3QNYCRCUFEAGNI  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|             | Cu+Fe+Mn+Ni        | 5QNCRCUFEAGNI   | 50 mm Standard 9 pin             | Ne  | Quartz | 20          | 16          |
|             |                    | 3QNYCRCUFEAGNI  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|             |                    | 5QNCRCUFEAGNI-A | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 20          | 16          |



### Five Elements

| Element   | Additional Element | Lamp Type       | Version                          | Gas | Window | Max Current | Rec Current |
|-----------|--------------------|-----------------|----------------------------------|-----|--------|-------------|-------------|
| Cobalt Co | Cu+Fe+Mn+Mo        | 3QNYCOCUFEMNMO  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|           |                    | 5QNCOCUFEMNMO   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|           |                    | 5QNCOCUFEMNMO-A | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 30          | 25          |
|           | Cu+Fe+Mn+Ni        | 3QNYCOCUFEMNNI  | 37 mm Standard                   | Ne  | Quartz | 10          | 8           |
|           |                    | 5QNCOCUFEMNNI   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |

### Six Elements

| Element     | Additional Element | Lamp Type          | Version                              | Gas | Window | Max Current | Rec Current |
|-------------|--------------------|--------------------|--------------------------------------|-----|--------|-------------|-------------|
| Chromium Cr | Co+Cu+Fe+Mn+Mo     | 3QNYCRCOCUFEMNMO   | 37 mm Standard                       | Ne  | Quartz | 10          | 8           |
|             |                    | 5QNCRCOCUFEMNMO    | 50 mm Standard 9 pin                 | Ne  | Quartz | 30          | 25          |
|             | Co+Cu+Fe+Mn+Ni     | 3QNYCRCOCUFEMNNI   | 37 mm Standard                       | Ne  | Quartz | 10          | 8           |
|             |                    | 3QNYCRCOCUFEMNNI-V | 37 mm Varian Coded                   | Ne  | Quartz | 10          | 8           |
|             |                    | 5QNCRCOCUFEMNNI    | 50 mm Standard 9 pin                 | Ne  | Quartz | 30          | 25          |
|             |                    | 5QNCRCOCUFEMNNI-A  | 50 mm Perkin Elmer AAnalyst (Lumina) | Ne  | Quartz | 30          | 25          |

### Seven Elements

| Element      | Additional Element | Lamp Type           | Version                          | Gas | Window | Max Current | Rec Current |
|--------------|--------------------|---------------------|----------------------------------|-----|--------|-------------|-------------|
| Aluminium Al | Ca+Cu+Fe+Mg+Si+Zn  | 3QNYALCACUFEMGSIZN  | 37 mm Standard                   | Ne  | Quartz | 15          | 15          |
|              |                    | 5QNALCACUFEMGSIZN   | 50 mm Standard 9 pin             | Ne  | Quartz | 30          | 25          |
|              |                    | 5QNALCACUFEMGSIZN-A | 50 mm PE coded AAnalyst (Lumina) | Ne  | Quartz | 30          | 25          |

# Heraeus Hollow Cathode Lamps

## The right element for sensitive metals analysis

| Group \ Period | Ia   | IIa   | IIIb   | IVb   | Vb  | VIb  | VIIb  | VIII   |  |
|----------------|--|---|--|---|---|--|---|--|--|
| 1              | 1.008<br>Hydrogen<br><b>H</b>                                |   |  |   |   |  |   |  |  |
| 2              | 6.940<br>Lithium<br><b>Li</b><br>670.8<br>323.3<br>10 (10)   | 9.012<br>Beryllium<br><b>Be</b><br>234.9<br>–<br>15 (15)    |  |   |   |  |   |  |  |
| 3              | 22.990<br>Sodium<br><b>Na</b><br>589.0<br>330.3<br>8 (8)     | 24.305<br>Magnesium<br><b>Mg</b><br>285.2<br>202.6<br>4 (6) |  |   |   |  |   |  |  |
| 4              | 39.098<br>Potassium<br><b>K</b><br>766.5<br>404.4<br>8 (8)   | 40.080<br>Calcium<br><b>Ca</b><br>422.7<br>–<br>6 (6)       | 44.956<br>Scandium<br><b>Sc</b><br>391.2<br>408.2<br>15 (25)   | 47.900<br>Titanium<br><b>Ti</b><br>364.3<br>399.0<br>15 (30)  | 50.942<br>Vanadium<br><b>V</b><br>318.4<br>385.5<br>15 (30)   | 51.996<br>Chromium<br><b>Cr</b><br>357.9<br>429.0<br>12 (12)   | 54.938<br>Manganese<br><b>Mn</b><br>279.5<br>403.1<br>12 (20) | 55.847<br>Iron<br><b>Fe</b><br>248.3<br>372.0<br>15 (30)       | 58.933<br>Cobalt<br><b>Co</b><br>240.7<br>304.4<br>15 (30)   |
| 5              | 85.468<br>Rubidium<br><b>Rb</b><br>780.0<br>794.8<br>10 (10) | 87.620<br>Strontium<br><b>Sr</b><br>460.7<br>–<br>12 (12)   | 88.906<br>Yttrium<br><b>Y</b><br>410.2<br>362.1<br>15 (25)     | 91.220<br>Zirconium<br><b>Zr</b><br>360.1<br>351.9<br>15 (30) | 92.906<br>Niobium<br><b>Nb</b><br>334.4<br>358.0<br>15 (30)   | 95.940<br>Molybdenum<br><b>Mo</b><br>313.3<br>390.3<br>15 (30) | 98.906<br>Technetium<br><b>Tc</b>                             | 101.070<br>Ruthenium<br><b>Ru</b><br>349.9<br>392.5<br>15 (20) | 102.906<br>Rhodium<br><b>Rh</b><br>343.5<br>365.8<br>15 (15) |
| 6              | 132.905<br>Caesium<br><b>Cs</b><br>852.1<br>455.5<br>10 (10) | 137.330<br>Barium<br><b>Ba</b><br>553.6<br>418.7<br>15 (25) | 138.906<br>Lanthanum<br><b>La</b><br>550.1<br>418.7<br>15 (25) | 178.490<br>Hafnium<br><b>Hf</b><br>307.3<br>298.8<br>15 (25)  | 180.948<br>Tantalum<br><b>Ta</b><br>271.5<br>277.6<br>15 (30) | 183.850<br>Tungsten<br><b>W</b><br>255.1<br>400.9<br>15 (30)   | 186.207<br>Rhenium<br><b>Re</b><br>346.0<br>345.2<br>15 (25)  | 190.200<br>Osmium<br><b>Os</b><br>290.9<br>301.8<br>10 (10)    | 192.220<br>Iridium<br><b>Ir</b><br>208.9<br>264.0<br>15 (20) |
| 7              | 223<br>Francium<br><b>Fr</b>                                 | 226.025<br>Radium<br><b>Ra</b>                              | 227<br>Actinium<br><b>Ac</b>                                   | 260<br>Rutherfordium<br><b>Rf</b>                             | Hahnium<br><b>Ha</b>  |  |   |  |  |

Element — 24.305 — Atomic Weight

Element Symbol — **Mg**

Alternative Wavelength nm — 285.2 — Recommended Wavelength nm

Maximum current mA for 37 mm lamps — 202.6 — Maximum DC current mA for 50 mm Perkin Elmer lamps\*

\* In the case of Perkin Elmer instruments, if the AAS displays modulated current rather than Continuous current then the lamp should be operated at approximately half the quoted maximum lamp current.

|                    |   |   |  |                                   |   |   |   |  |
|--------------------|---|---|--|-----------------------------------|---|---|---|--|
| <b>Lanthanides</b> | 140.120<br>Cerium<br><b>Ce</b><br>520.0<br>569.7<br>15 (20) | 140.908<br>Praseodymium<br><b>Pr</b><br>495.1<br>492.5<br>15 (25) | 144.240<br>Neodymium<br><b>Nd</b><br>492.5<br>490.2<br>15 (25) | 145<br>Promethium<br><b>Pm</b>    | 150.400<br>Samarium<br><b>Sm</b><br>429.5<br>476.0<br>15 (25) | 151.960<br>Europium<br><b>Eu</b><br>459.4<br>333.4<br>12 (20) | 157.250<br>Gadolinium<br><b>Gd</b><br>368.4<br>419.1<br>15 (25) | 158.925<br>Terbium<br><b>Tb</b><br>432.7<br>431.9<br>15 (25) |
| <b>Actinides</b>   | 232.038<br>Thorium<br><b>Th</b><br>371.9<br>–<br>15 (25)    | 231.036<br>Protactinium<br><b>Pa</b>                              | 238.029<br>Uranium<br><b>U</b><br>358.5<br>351.5<br>15 (25)    | 237.048<br>Neptunium<br><b>Np</b> | 244<br>Plutonium<br><b>Pu</b>                                 | 243<br>Americium<br><b>Am</b>                                 | 247<br>Curium<br><b>Cm</b>                                      | 247<br>Berkelium<br><b>Bk</b>                                |

|  |   |  | Ib  | IIb   | IIIa  | IVa   | Va                             | Vla                            | VIIa | 0   |   |   |                               |                                 |                              |
|--|---|--|---|---|---|---|--------------------------------|--------------------------------|------|---|---|---|-------------------------------|---------------------------------|------------------------------|
|  |   |  |   |   |   |   |                                |                                |      | 4.002<br>Helium<br><b>He</b>                                  |   |   |                               |                                 |                              |
|  |   |  |   |   |   |   |                                |                                |      | 10.810<br>Boron<br><b>B</b><br>249.8<br>–<br>15 (25)          | 12.011<br>Carbon<br><b>C</b>                                | 14.007<br>Nitrogen<br><b>N</b>                            | 15.100<br>Oxygen<br><b>O</b>  | 18.998<br>Fluorine<br><b>F</b>  | 20.179<br>Neon<br><b>Ne</b>  |
|  |   |  |   |   |   |   |                                |                                |      | 26.982<br>Aluminium<br><b>Al</b><br>309.3<br>394.4<br>10 (20) | 28.086<br>Silicon<br><b>Si</b><br>251.6<br>350.7<br>15 (25) | 30.974<br>Phosphorus<br><b>P</b><br>213.6<br>–<br>10 (10) | 32.060<br>Sulphur<br><b>S</b> | 35.453<br>Chlorine<br><b>Cl</b> | 39.948<br>Argon<br><b>Ar</b> |
| 58.710<br>Nickel<br><b>Ni</b><br>232.0<br>305.1<br>15 (30)           | 63.546<br>Copper<br><b>Cu</b><br>324.8<br>327.4<br>5 (10) | 65.380<br>Zinc<br><b>Zn</b><br>213.9<br>307.6<br>10 (10)   | 69.735<br>Gallium<br><b>Ga</b><br>287.4<br>403.3<br>15 (15)   | 72.590<br>Germanium<br><b>Ge</b><br>265.2<br>269.1<br>15 (20)   | 74.992<br>Arsenic<br><b>As</b><br>193.7<br>197.2<br>12 (15)         | 78.960<br>Selenium<br><b>Se</b><br>196.0<br>204.0<br>15 (15)  | 79.904<br>Bromine<br><b>Br</b> | 83.800<br>Krypton<br><b>Kr</b> |      |   |   |   |                               |                                 |                              |
| 106.400<br>Palladium<br><b>Pd</b><br>244.8/247.6<br>340.5<br>15 (20) | 107.868<br>Silver<br><b>Ag</b><br>328.1<br>338.3<br>4 (5) | 112.410<br>Cadmium<br><b>Cd</b><br>228.8<br>326.1<br>8 (8) | 114.820<br>Indium<br><b>In</b><br>303.9<br>451.1<br>5 (10)    | 118.690<br>Tin<br><b>Sn</b><br>224.6/233.4<br>300.9<br>12 (12)  | 121.750<br>Antimony<br><b>Sb</b><br>206.8/217.6<br>231.1<br>12 (25) | 127.600<br>Tellurium<br><b>Te</b><br>214.3<br>225.9<br>6 (15) | 126.905<br>Iodine<br><b>I</b>  | 131.300<br>Xenon<br><b>Xe</b>  |      |   |   |   |                               |                                 |                              |
| 195.090<br>Platinum<br><b>Pt</b><br>265.9<br>299.8<br>15 (20)        | 196.997<br>Gold<br><b>Au</b><br>242.8<br>267.6<br>10 (10) | 200.590<br>Mercury<br><b>Hg</b><br>253.6<br>–<br>6 (6)     | 204.370<br>Thallium<br><b>Tl</b><br>276.8<br>377.6<br>10 (10) | 207.200<br>Lead<br><b>Pb</b><br>217.0/283.3<br>283.3<br>10 (15) | 208.980<br>Bismuth<br><b>Bi</b><br>223.1<br>306.8<br>12 (12)        | 209<br>Polonium<br><b>Po</b>                                  | 210<br>Astatine<br><b>At</b>   | 222<br>Radon<br><b>Rn</b>      |      |   |   |   |                               |                                 |                              |

 Hollow Cathode lamps of these elements are available from Heraeus

|   |  |   |  |  |  |
|---|--|---|--|--|--|
| 162.500<br>Dysprosium<br><b>Dy</b><br>421.2<br>416.8<br>15 (25) | 164.930<br>Holmium<br><b>Ho</b><br>410.4<br>417.3<br>15 (25) | 167.260<br>Erbium<br><b>Er</b><br>400.8<br>408.8<br>15 (25) | 168.934<br>Thulium<br><b>Tm</b><br>371.8<br>375.2<br>15 (25) | 173.040<br>Ytterbium<br><b>Yb</b><br>398.8<br>264.4<br>15 (25) | 174.967<br>Lutetium<br><b>Lu</b><br>336.0<br>337.7<br>8 (20) |
| 251<br>Californium<br><b>Cf</b>                                 | 254<br>Einsteinium<br><b>Es</b>                              | 257<br>Fermium<br><b>Fm</b>                                 | 258<br>Mendelevium<br><b>Md</b>                              | 259<br>Nobelium<br><b>No</b>                                   | 260<br>Lawrencium<br><b>Lr</b>                               |

The Heraeus hollow cathode lamp product range comprises 70 single-element lamps and more than 120 multi-element lamps of the most varied designs to cover almost all appliances.

Use our replacement lamp search engine at [www.heraeus-noblelight.com/en/\\_technik/hclampfinder.aspx](http://www.heraeus-noblelight.com/en/_technik/hclampfinder.aspx) to find the right hollow-cathode lamp for your appliance.

**Safety information:** Hollow cathode lamps used in normal atomic absorption applications and to instrument manufacturers' specification provide very little risk, however the lamps are under reduced pressure, can emit UV light and may contain toxic metals. For this reason each lamp has a safety label. These labels are attached to the lamp and contain each hazard associated with that particular lamp. Each user should carry out specific risk assessment before use in accordance with their national safety law.

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