

End of Life (EOL)

What is EOL and what effects can it have?

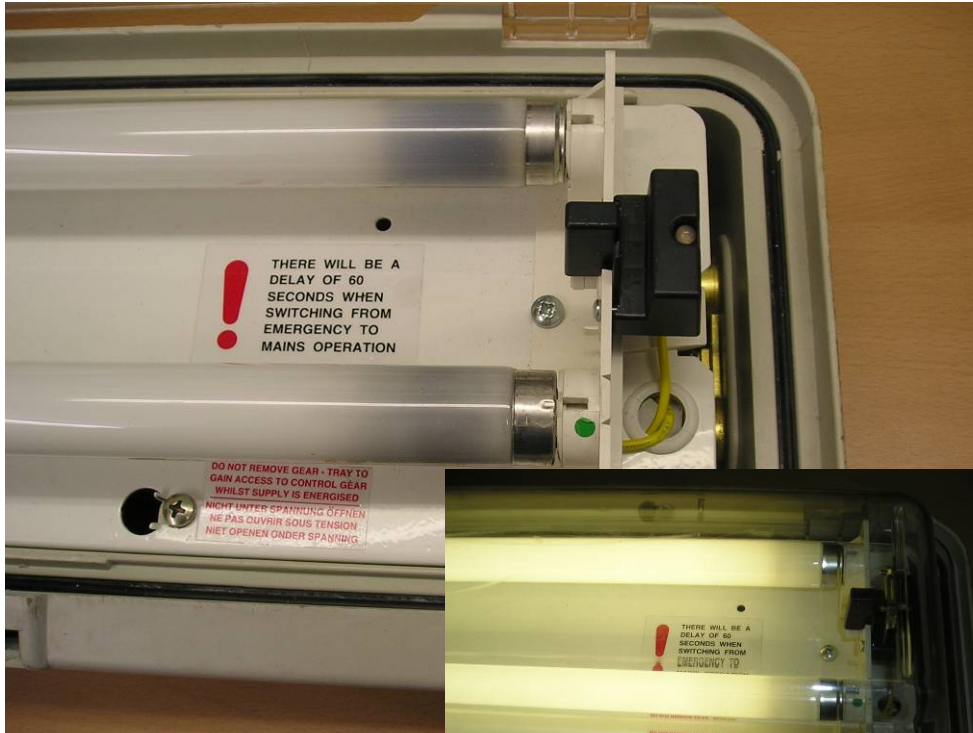
What is EOL?

- A lamp reaches End of Life when it no longer operates correctly, this may be for two reasons:
 - The gas inside the lamp becomes degraded and will no longer support the discharge.
 - There is insufficient emissive material on the cathode to initiate the discharge.
 - **In both instances, the lamp goes out and/or will not restart.**

What is EOL?

- EOL produces a asymmetric (dc) voltage waveform across the lamp.
- This is commonly known as “the rectifier effect”

Normal EOL



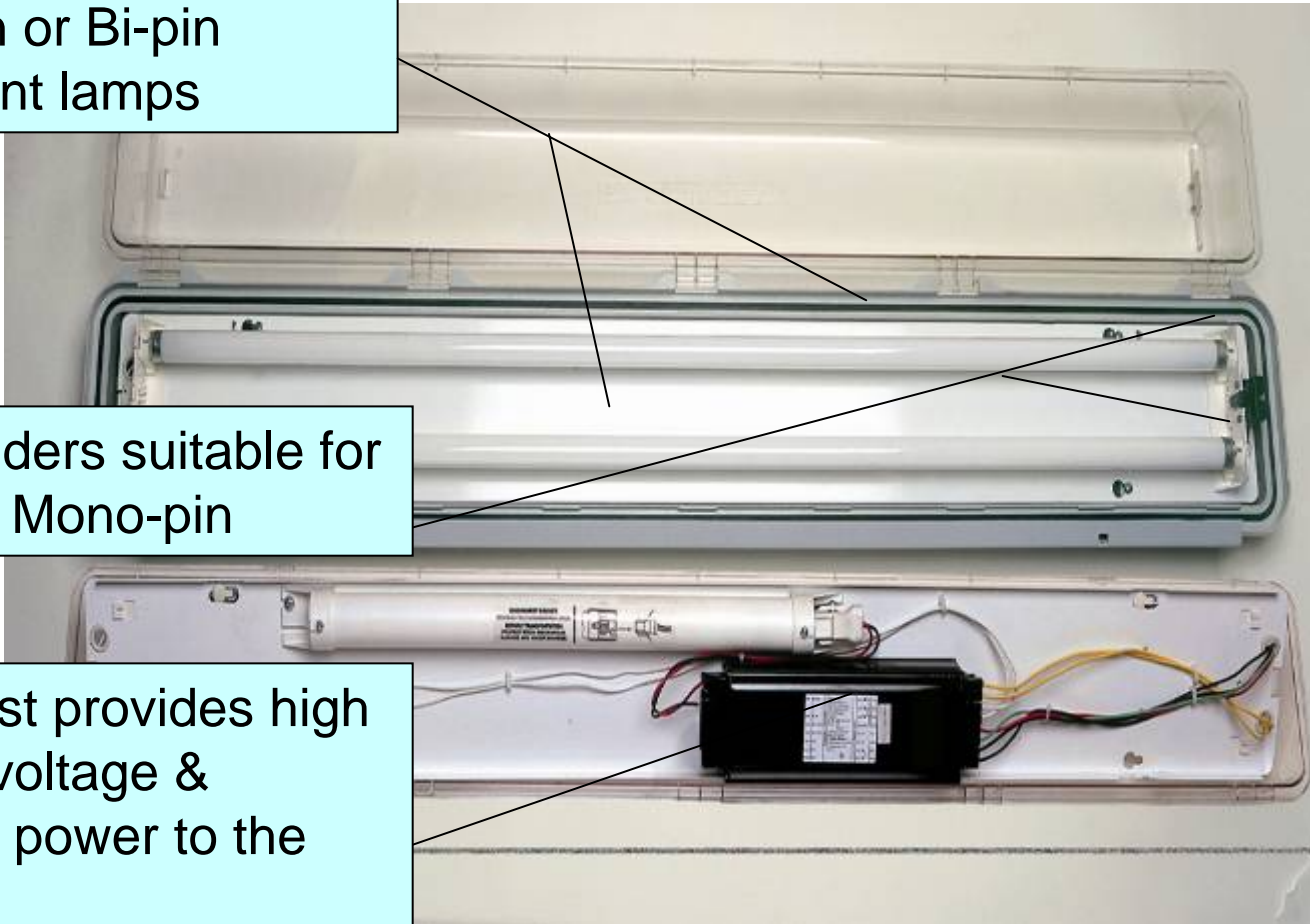
- These pictures show lamps which have reached (or are reaching) the end of their useful life.
- All fluorescent discharge lamps will look like this as they age. It should not be assumed that this is an immediate problem.

How Exe Luminaires Work?

Mono Pin or Bi-pin fluorescent lamps

Lampholders suitable for Bi-pin or Mono-pin

HF ballast provides high starting voltage & constant power to the lamps



Ex e Luminaires

- Modern Ex e luminaires typically use T8 (25mm dia) lamps
- In Ex e luminaires the lamps require to be COLD started as opposed to the normal method of warm start commonly used in commercial HF ballasts.
- Cold starting these lamps requires a greater starting voltage
- This voltage is provided and controlled using the HF ballast.
- During lamp start, this higher voltage results in extra stress on the ballast circuits and lamp cathode.

Ex Electronic Ballasts

- Electronic ballasts work on the constant current principle. The circuit increases or reduces the voltage to keep the current through the lamp constant
- Until this voltage reaches an inbuilt limit designed into the ballast the constant current is maintained
- When the lamp cathode becomes exhausted or breaks, a higher voltage is needed at the cathode in order to supply electrons and keep the lamp running.

What effects can EOL have?

- In most instances one cathode becomes depleted or broken before the other
- The extra voltage applied by the ballast is concentrated at the one cathode. This means that excess power can be generated locally which overheats the surrounding lamp tube and the connections into the lamp and spreads to the lampholder.

What effects can EOL have?

- Usually the local overheating at the cathode is a brief event, quickly destroying the remains of the cathode and the gas in the discharge tube. The lamp goes out and can not be re-started.
- If the condition persists the lamp overheats, sometimes sufficiently to melt the glass tube, (the lamp then goes out) or causes damage to the lamp cap and lampholder.

What effects can EOL have?

- Overheating of the surface of the lamp also means that the temperature can be above the surface ignition temperature “T rating” of the equipment

Why is EOL now an issue?

- A number of our European competitors have experienced serious failures in the field.
- These failures have led to dangerous conditions which could potentially have been catastrophic.
- Because of this the German manufacturers and PTB, a German notified body, started investigations into the so called “End of Lamp Life” effect on Exe luminaires.

Why is EOL now an issue?

- It was only when PTB asked for additional tests to be added to the Ex e standard that the rest of the European manufacturers were alerted to this issue
- To date, details of the results from these investigations by PTB have not been made public, although the following website has some information:

<http://www.explosionsschutz.ptb.de/pruefung-plex-komp-langfeld-engl.htm>

- The PTB investigation concluded that there was no need for widespread replacement of existing control gear as the estimated risk of an incident compared to the numbers installed was small

New Ex Requirements

- The standard covering Ex e lighting - IEC 60079-7 has been updated to include additional testing on the ballast to simulate EOL parameters.
- These changes introduce type tests limiting the power potentially dissipated at the end of the lamp to 10W maximum. This is considered to be a safe value for a T rating of T4 and a maximum operating T_{amb} of 60°C.

New EOL Ballast Requirements

- Ballasts meeting the new edition of the standard must have two distinct methods of detecting that a lamp is reaching, or has reached the end of its useful life:
 1. At switch on it shall attempt for a few seconds to start a lamp. If it cannot strike the lamp it must shut off the power to that lamp.
 2. In luminaires that are never switched off, it must sense that a lamp is starting to run outside the set parameters known to the ballast and subsequently shut down the lamp before any damage is done to the ballast or lampholders.
- In both cases above, if the product is a two lamp version, the second lamp will not be affected by the shut down of the first.

Chalmit Ballasts

- Chalmit high frequency Ex ballasts have always been designed to shut down when trying to start failed lamps
- No problems of EOL have ever been reported with Chalmit luminaires or ballasts

Chalmit EOL Ballasts

- All Chalmit Ex ballasts have now been re-certified to meet the new edition of the IEC 60079-7: 2006 standard.
- These ballasts will now be used in every Chalmit Exe luminaire:
 - Protecta
 - Acclaim
 - Curie Elite



Features of Chalmit EOL Ballasts

- Incorporates dc EOL detection method
- Fail safe design with automatic testing
 - Any fault in microcontroller will shut down ballast
 - Functions in both mains and emergency operation
- Compensates for low ambient temperature to give increased light output
- Ex q protection: internal faults are analysed and protected against
 - Components run at reduced voltage and power
 - Will not melt under the un-regulated fault conditions (possible in Ex d enclosures)
 - Easily recycled

EOL Ballast Certificates



AMENDMENT 4

to EC-Type Examination Certificate KEMA 00ATEX121 U

Manufacturer: N.V. Nederlandse Apparatenfabriek "Nedap"
Address: Paradijweg 26, 7141 DC Groenlo, The Netherlands

Description

In Table, the range of Electronic Ballasts, is extended with types mentioned in the table. These Electronic Ballasts are tested in accordance with the draft standard IEC 60779-7 ed. 4.0 (Annex H) for the Asymmetric pulse test and the Asymmetric power test.

Electrical data

Model	Input voltage	Battery	Output
CH-EOL-40/Relego 9508543	110/120 V/AC	0 V/AC / 4 A/0	2 x 18 W
CH-EOL-40/Relego 9508573	220/230 V/AC	0 V/AC / 4 A/0	2 x 18 W
CH-EOL-40/Relego 9508602	110/120 V/AC	0 V/AC / 4 A/0	2 x 18 W
CH-EOL-40/Relego 9508629	220/230 V/AC	0 V/AC / 4 A/0	2 x 18 W
CH-EOL-50/Relego 9508653	220/230 V/AC	0 V/AC / 4 A/0	2 x 18 W
CH-EOL-50/Relego 9508667	110/120 V/AC	0 V/AC / 7 A/0	2 x 30 W
CH-EOL-51/Relego 9508701	220/230 V/AC	0 V/AC / 7 A/0	2 x 30 W
CH-EOL-40/Relego 9508691	110/120 V/AC	0 V/AC / 4 A/0	2 x 30 W
CH-EOL-41/Relego 9508683	220/230 V/AC	0 V/AC / 4 A/0	2 x 30 W
CH-EOL-40/Relego 9508627	110/120 V/AC	0 V/AC / 7 A/0	2 x 30 W
CH-EOL-40/Relego 9508645	220/230 V/AC	0 V/AC / 7 A/0	2 x 30 W
CH-EOL-53/Relego 9508661	220/230 V/AC	0 V/AC / 7 A/0	2 x 30 W

All other data remain unchanged.

Test documentation

Drawing no.	Test documentation	Date
T1064-433, rev. A (sheet 10.01 of 1)		24.02.2006
T1064-433, rev. A (DW of CMC/VA EOL)		10.02.2006
T1064-433 (DW of materials)		24.02.2006
T1064-433, rev. A (sheet 10.01 of 1)		24.02.2006
T1064-433 (page 12.02 to 12.09 of 0)		13.01.2006
T1064-423 (DW of material 11 pages)		24.02.2006
T3027-321, rev. A (sheet 10 of 1)		24.02.2006
T3027-322, rev. A 01 (sheet 10 of 1)		27.02.2006
T3027-325, rev. A (sheet 10 of 1)		24.02.2006
T3027-326, rev. A (sheet 10 of 1)		24.02.2006
T3027-327, rev. A (sheet 10 of 1)		24.02.2006
T3027-328, rev. A (sheet 10 of 1)		24.02.2006
T3027-329, rev. A (sheet 10 of 1)		24.02.2006
T3027-330, rev. A (sheet 10 of 1)		24.02.2006
T3027-331, rev. A (sheet 10 of 1)		24.02.2006
T3027-332, rev. A (sheet 10 of 1)		24.02.2006
T3027-333, rev. A (sheet 10 of 1)		24.02.2006
T3027-334, rev. A (sheet 10 of 1)		24.02.2006

Amendment 4 February 2006
KEMA Quality B.V.

C.D. van Es
Certification Manager

[008231]
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AMENDMENT 5

to EC-Type Examination Certificate KEMA 00ATEX121 U

Manufacturer: N.V. Nederlandse Apparatenfabriek "Nedap"
Address: Paradijweg 26, 7141 DC Groenlo, The Netherlands

Description

In Table, the range of Electronic Ballasts, is extended with types mentioned in the table. These Electronic Ballasts are tested in accordance with the draft standard IEC 60779-7 ed. 4.0 (Annex H) for the Asymmetric pulse test and the Asymmetric power test.

Electrical data

Model	Input voltage	Output
CH-EOL-40/Relego 9508730	110/120 V/AC	2 x 18 W / 2 x 30 W
CH-EOL-41/Nedap 9508721	220/230 V/AC	2 x 18 W / 2 x 30 W
CH-EOL-54/Relego 9508660	220/230 V/AC	2 x 30 W

All other data remain unchanged.

Test documentation

Drawing no.	Test documentation	Date
T1064-425, rev. A (sheet 10.01 of 1)		24.02.2006
T1064-425, rev. A (sheet 10.02 of 2)		24.02.2006
T1064-425 (DW of materials)		24.02.2006
T1064-425, rev. A (sheet 10.01 of 1)		24.02.2006
T1064-425, rev. A (sheet 12.01 of 2)		24.02.2006
T1064-425 (DW of materials 4 pages)		24.02.2006
T1064-425, rev. A (sheet 23.01 of 1)		24.02.2006
T1064-425, rev. A (sheet 23.02 of 1)		24.02.2006
T1064-425, rev. A (sheet 23.03 of 1)		24.02.2006

Amendment 5 March 2006
KEMA Quality B.V.

C.D. van Es
Certification Manager

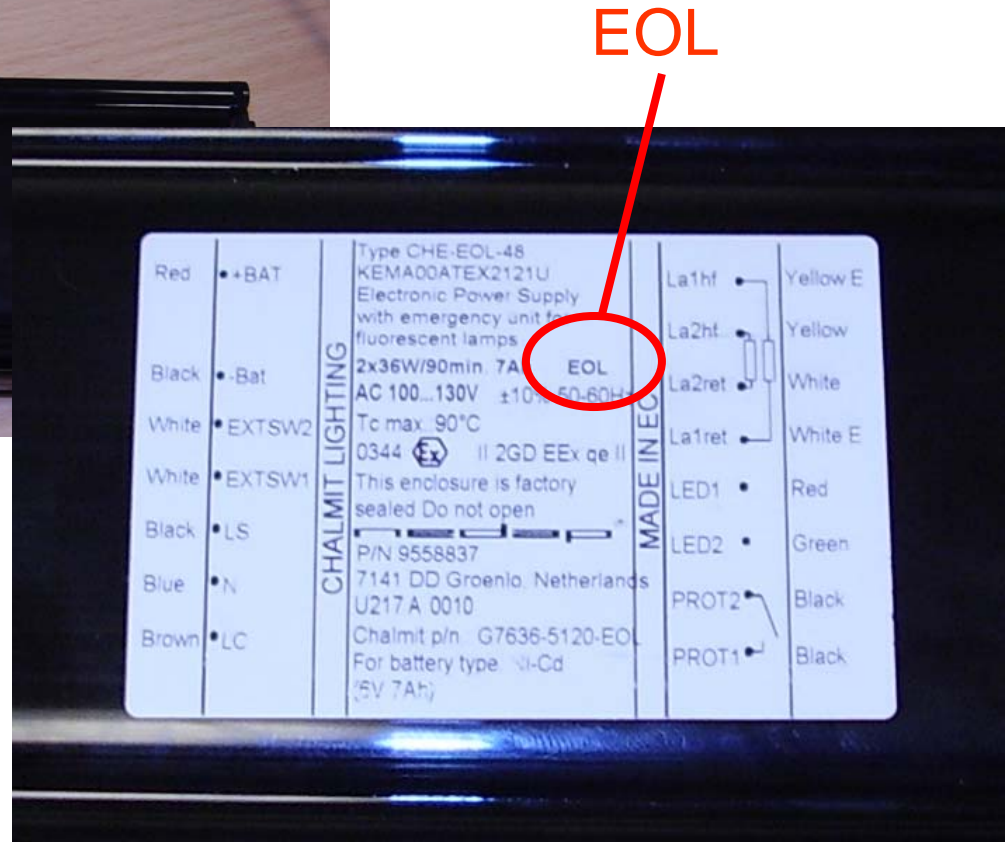
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Chalmit
Lighting



EOL Ballast Certificates



EOL Product Certificate

Certificate Number
Baseefa04ATEX0220/2



Issued 8 March 2006
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1 SUPPLEMENTARY EC - TYPE EXAMINATION CERTIFICATE

2 Equipment or Protective System Intended for use in Potentially Explosive Atmospheres
Directive 94/9/EC

3 Supplementary EC - Type Examination Certificate Number: Baseefa04ATEX0220/2

4 Equipment or Protective System: The Protecta III Range of Luminaires

5 Manufacturer: Chalmit Lighting

6 Address: 388 Billingham Road, Glasgow, G72 4BL

7 This supplementary certificate extends EC - Type Examination Certificate No. Baseefa04ATEX0220 to apply to equipment or protective systems designed and constructed in accordance with the specifications set out in the Schedule of the said certificate but having any variations specified in the Schedule attached to this certificate and the documents therein referred to.

This supplementary certificate shall be held with the original certificate.

This certificate may only be reproduced in its entirety, without any change, without inclusion.

Baseefa Customer Reference No. 0948

Project File No. 06/011

This certificate is granted subject to the general terms and conditions of Baseefa (2011) Ltd. It does not necessarily indicate that the equipment may be used in particular situations or circumstances.

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Registered in England no. 4026076 at the above address

K S SINCLAIR
00344 11336
On behalf of
Baseefa (2011) Ltd

Certificate Number
Baseefa04ATEX0220/2



Issued 8 March 2006
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13 Schedule

14 Certificate Number Baseefa04ATEX0220/2

15 Description of the variation to the Equipment or Protective System

Variation 1.1

The ballasts used in these luminaires covered by KEMA00ATEX2121U, have been tested and comply with the requirements of Annex H of draft standard IEC60598-7 edition 4.0 for both the Asymmetric Pulse Test and ASYMETRIC Pulse Test as described in Amendments 4 and 5 of the KEMA certificate.

16 Report Number

None

17 Special Conditions for Safe Use

None

18 Essential Health and Safety Requirements

Compliance with the Essential Health and Safety Requirements is not affected by this variation.

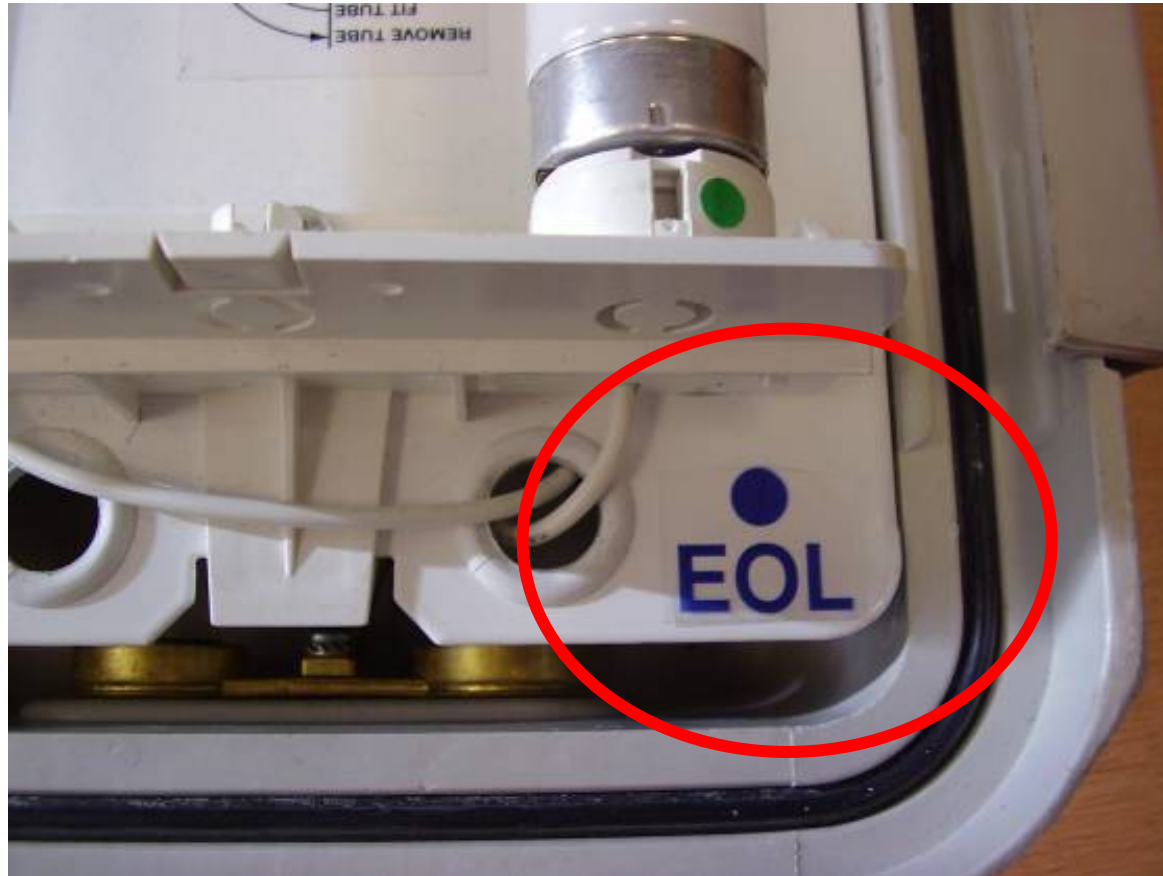
19 Drawings and Documents

Drawing	Sheet	Issue	Date	Title
D061	1	-	21/12/05	NEDAP Ballast EOL Certificates Checklist

Chalmit
Lighting



EOL Product Marking



Chalmit EOL Summary

- All Chalmit Ex e fluorescent luminaires and ballasts are now certified to the new requirements of IEC 60079-7: 2006 for both Asymmetric Pulse Test and Asymmetric Power Test
- These can be easily identified by the blue dot and “EOL” lettering shown on the product.
- EOL ballasts can be retro-fitted into existing Protecta III, Acclaim & Curie products if required.