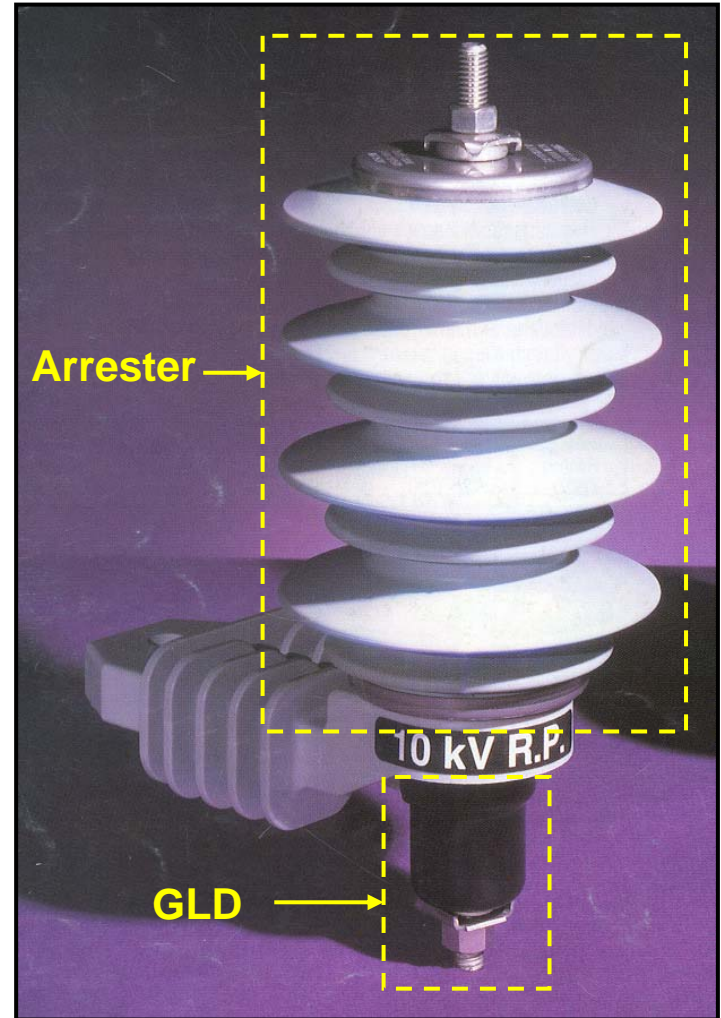
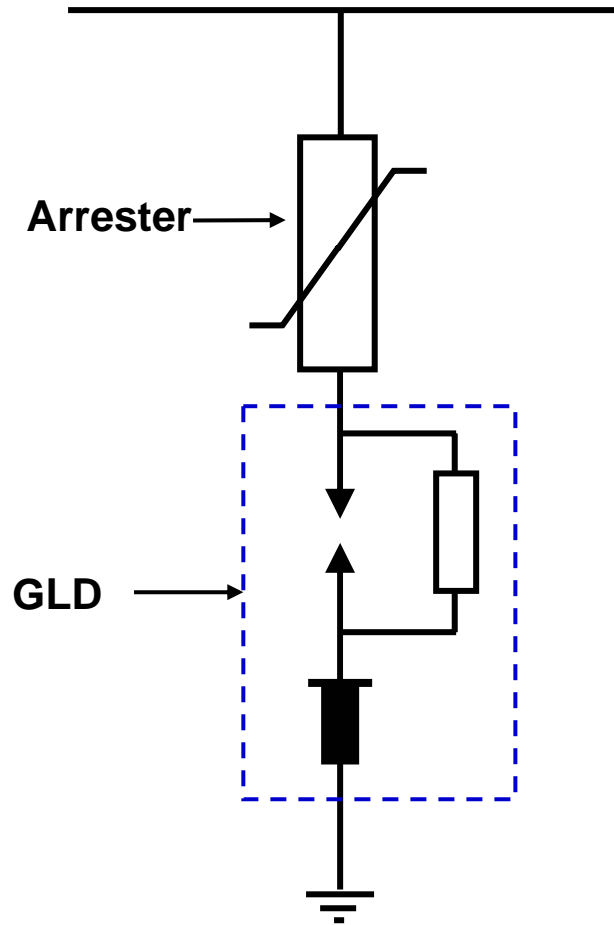

IEC's test requirements for Ground Lead Disconnectors, not sufficient for Eskom applications

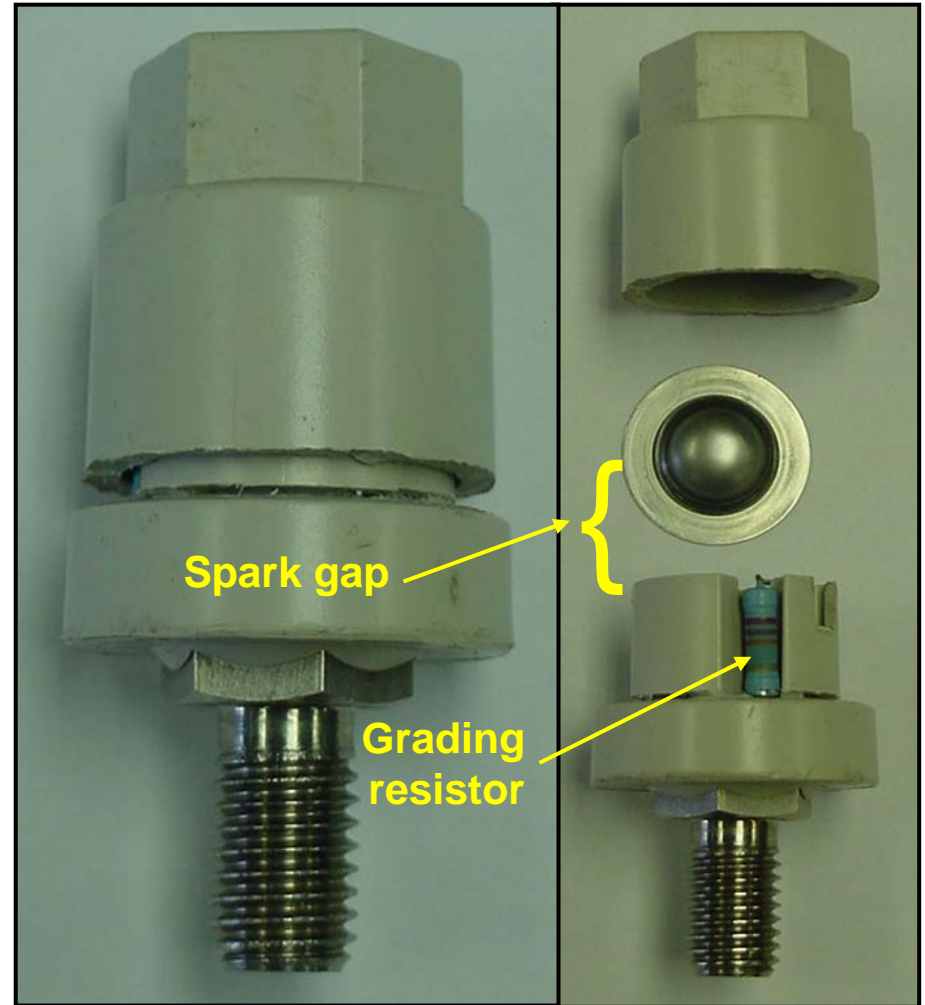
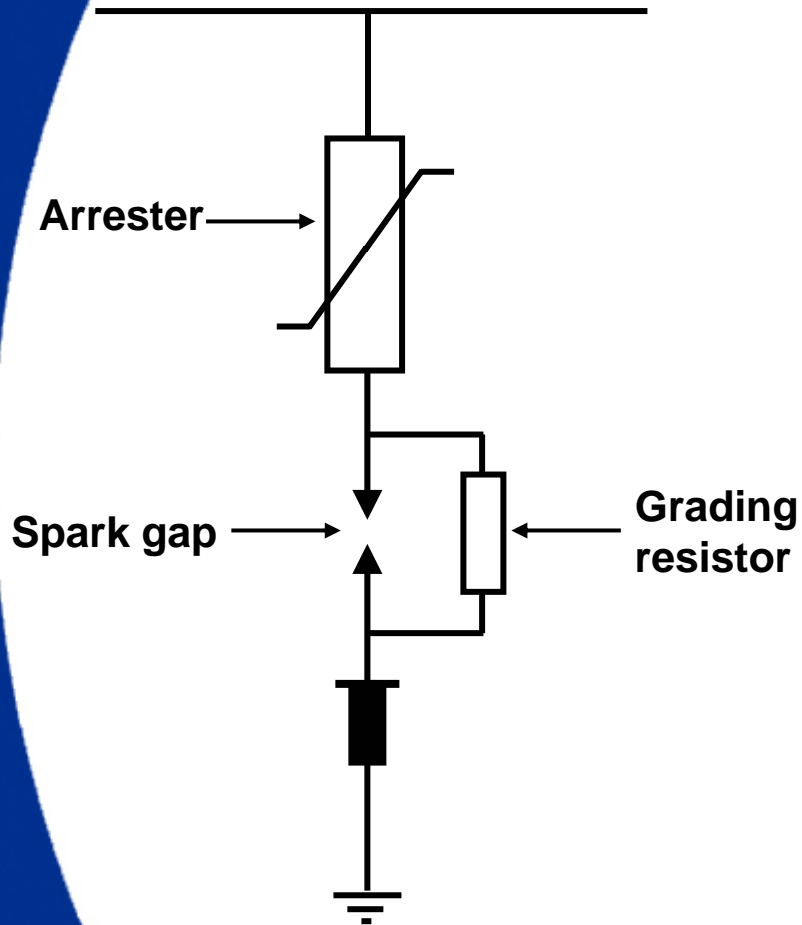
**Presented at: UPDEA Colloquium
Electrotechnical Standardisation**

Presented by: Rossouw Theron (IARC)

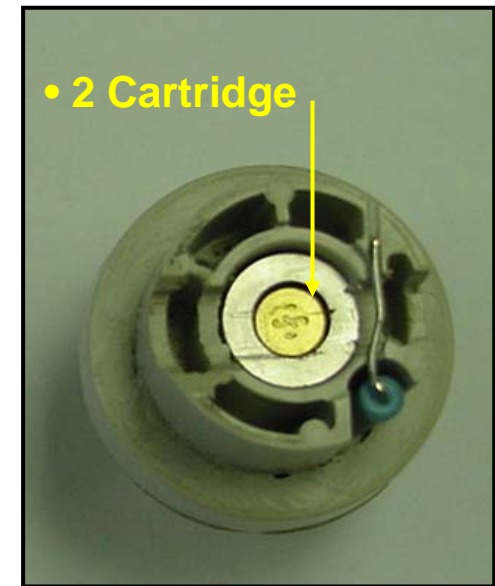
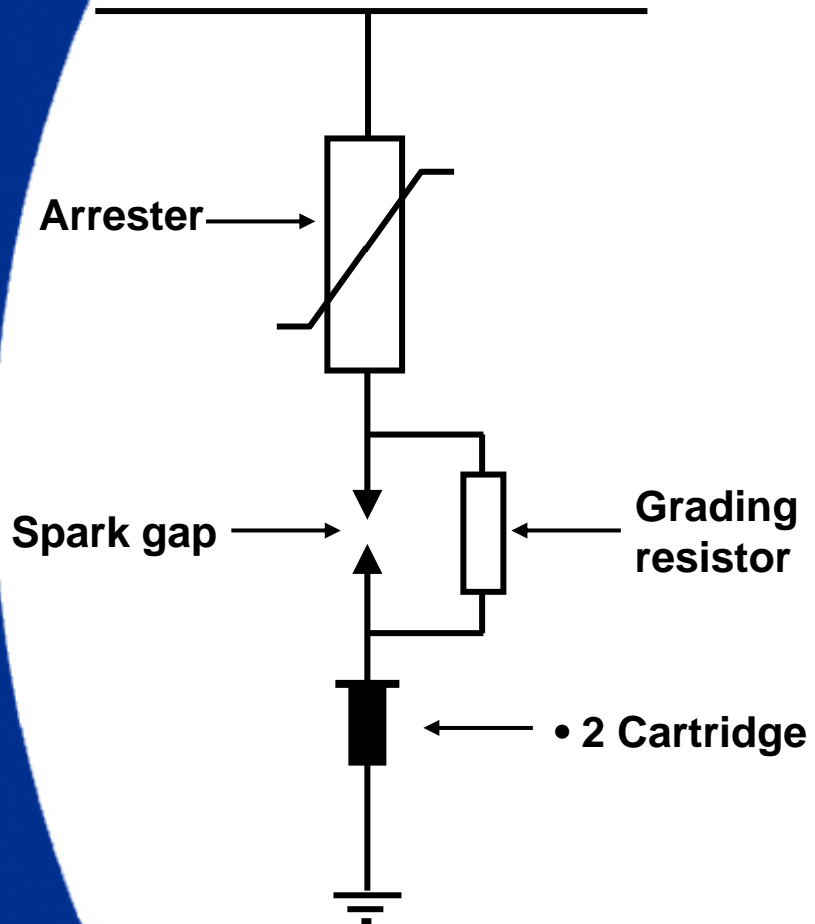
Typical surge arrester



Ground lead disconnecter (GLD)



Ground lead disconnecter (GLD)



IEC 60099-4: GLD test requirements

IEC 60099-4: Specification for metal-oxide surge arresters without gaps for a.c. systems

Type test requirements for GLDs according to IEC 60099-4 are:

- Disconnecter withstand tests
- Disconnecter operation test

IEC 60099-4: GLD test requirements

Disconnecter withstand tests:

When an arrester is fitted with a GLD it shall withstand, without operating, each of the following tests:

- **Long-duration current impulse test**

The arrester and GLD are subjected to a series of 18 long-duration current impulses (2000 μ s square wave).

- **Operating duty test**

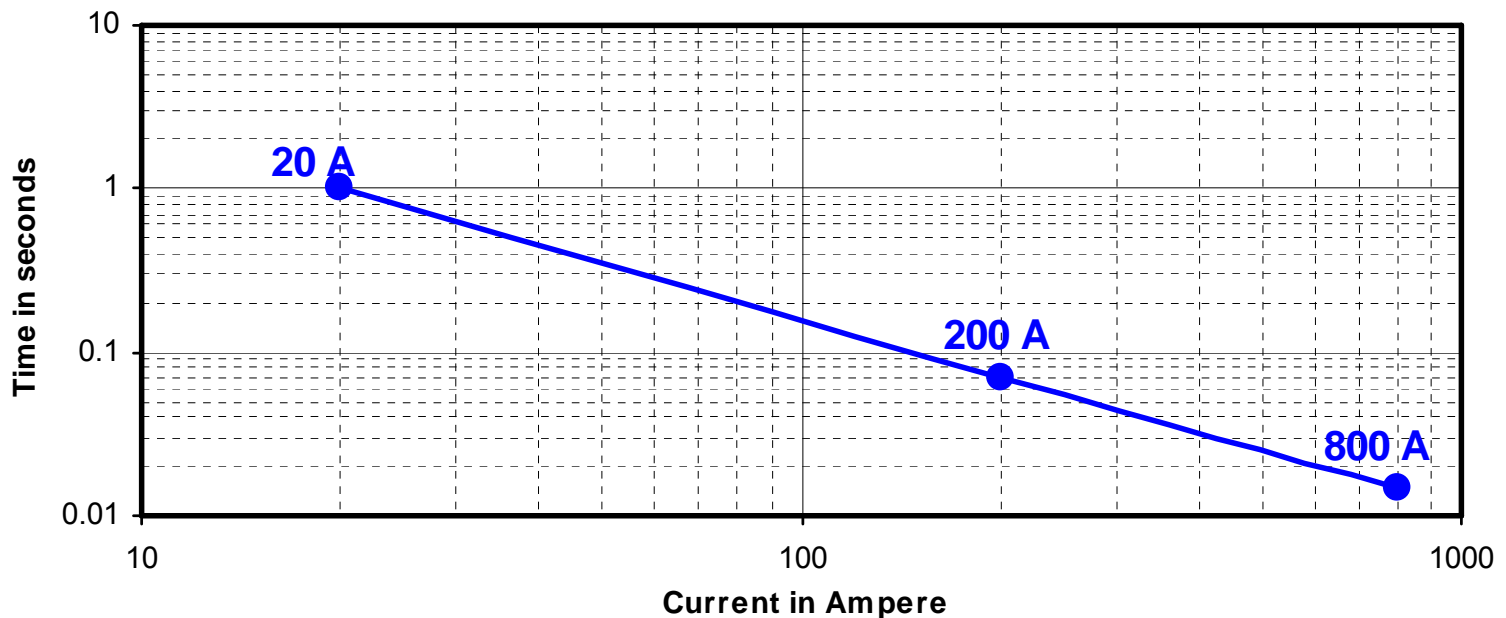
The arrester and GLD is subjected to a series of 20 lightning current impulses (10 kA, 8/20 μ s) and 2 high current impulses (100 kA, 4/10 μ s).

IEC 60099-4: GLD test requirements

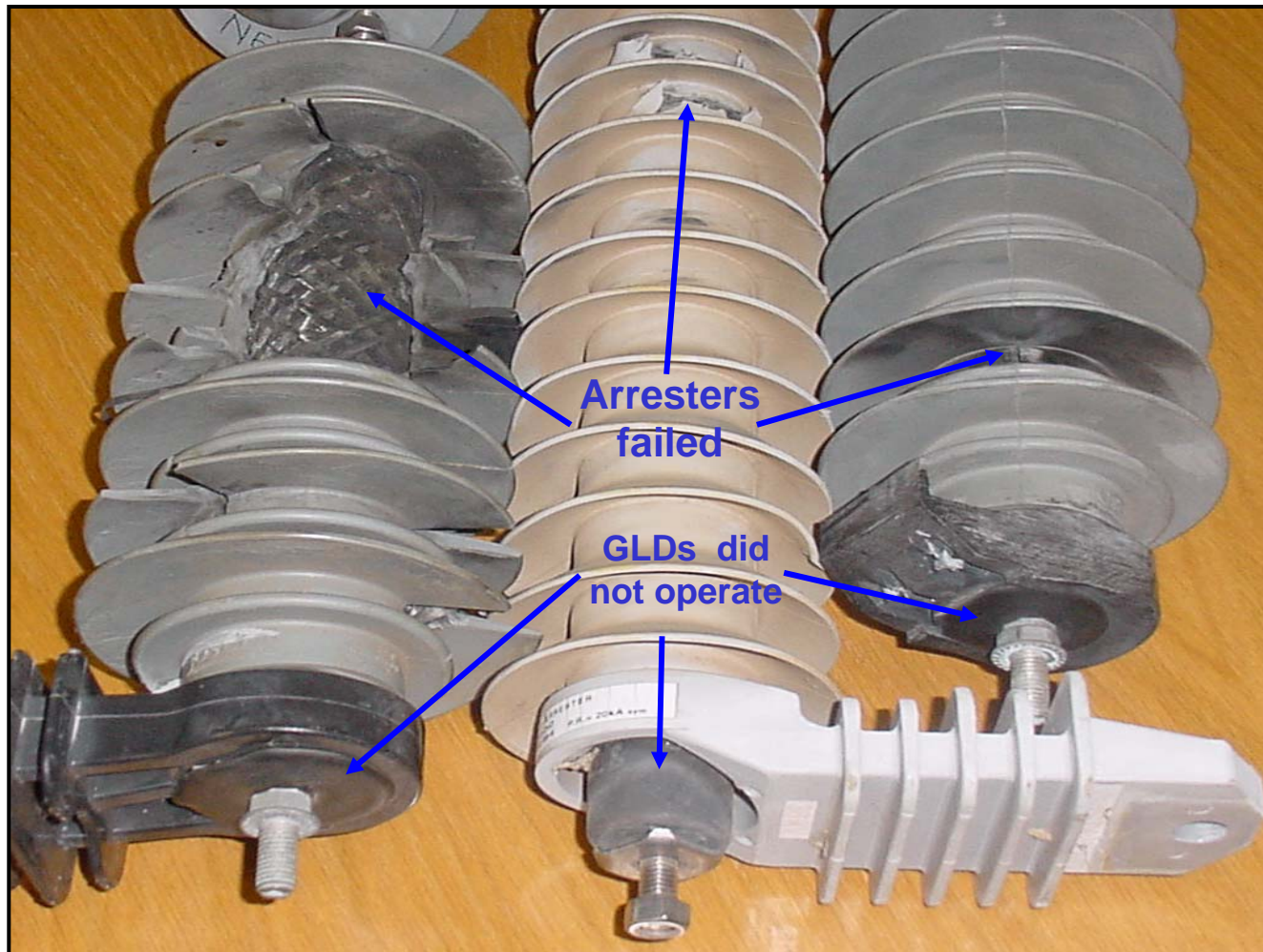
Disconnecter operation test:

The time delay for the operation of the disconnector is determined for three values of current, 20 A, 200 A and 800 A r.m.s

GLD operation curve



Failures – Prior to 2003

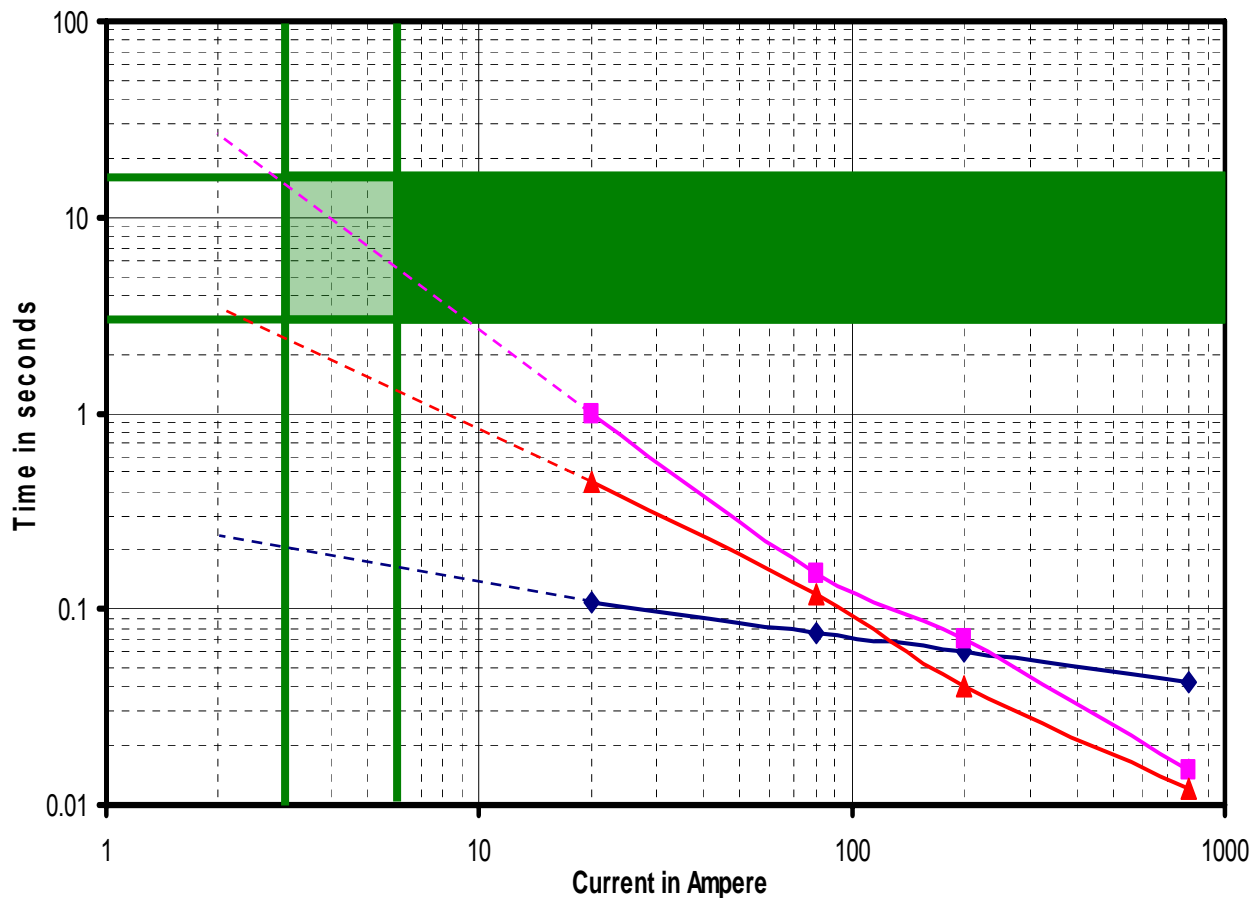


Grading of Sensitive Earth Fault (SEF) with GLD

Typical GLD operation curves

SEF setting philosophy

- Trip delay: 3 s to 15 s
- Pick-up: 3 A to 6 A



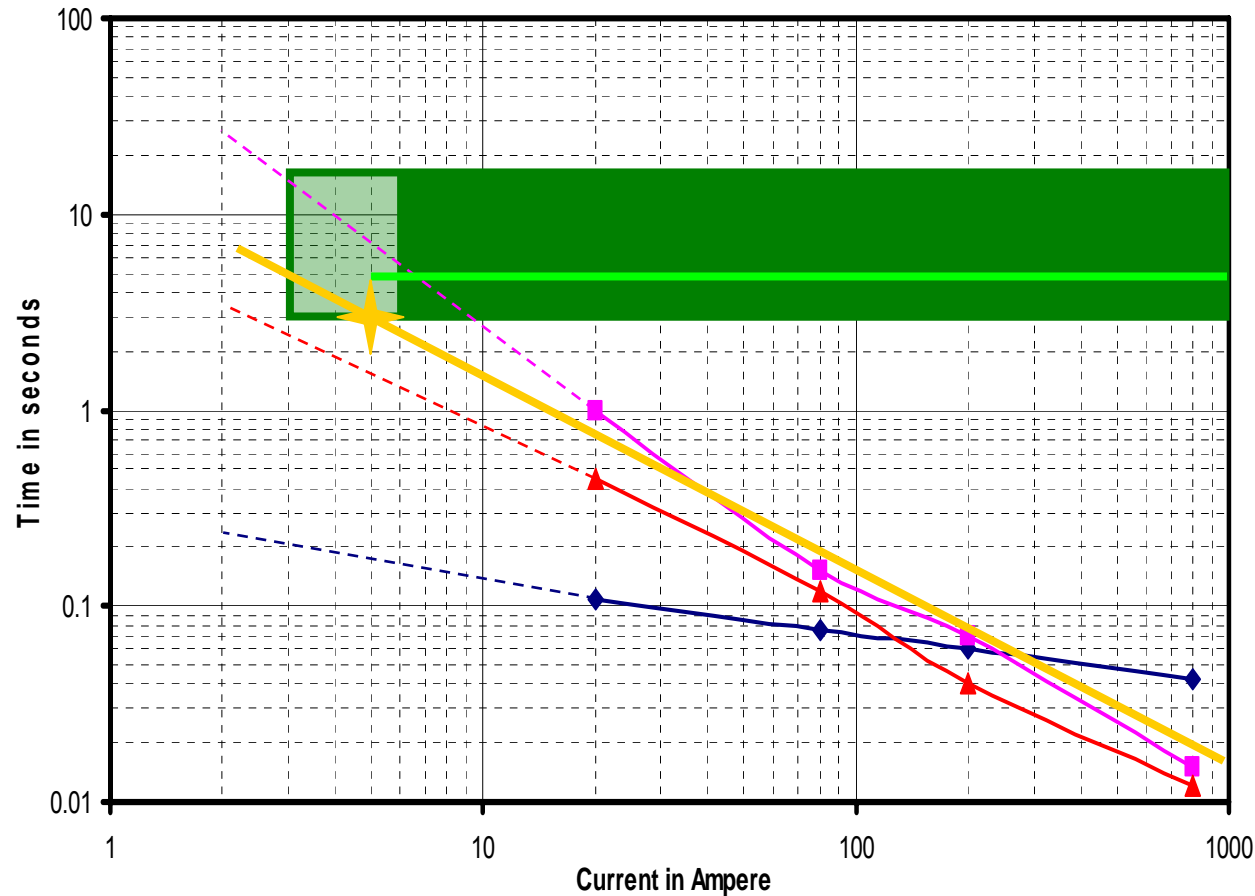
Specified GLD operating time

Typical SEF setting:

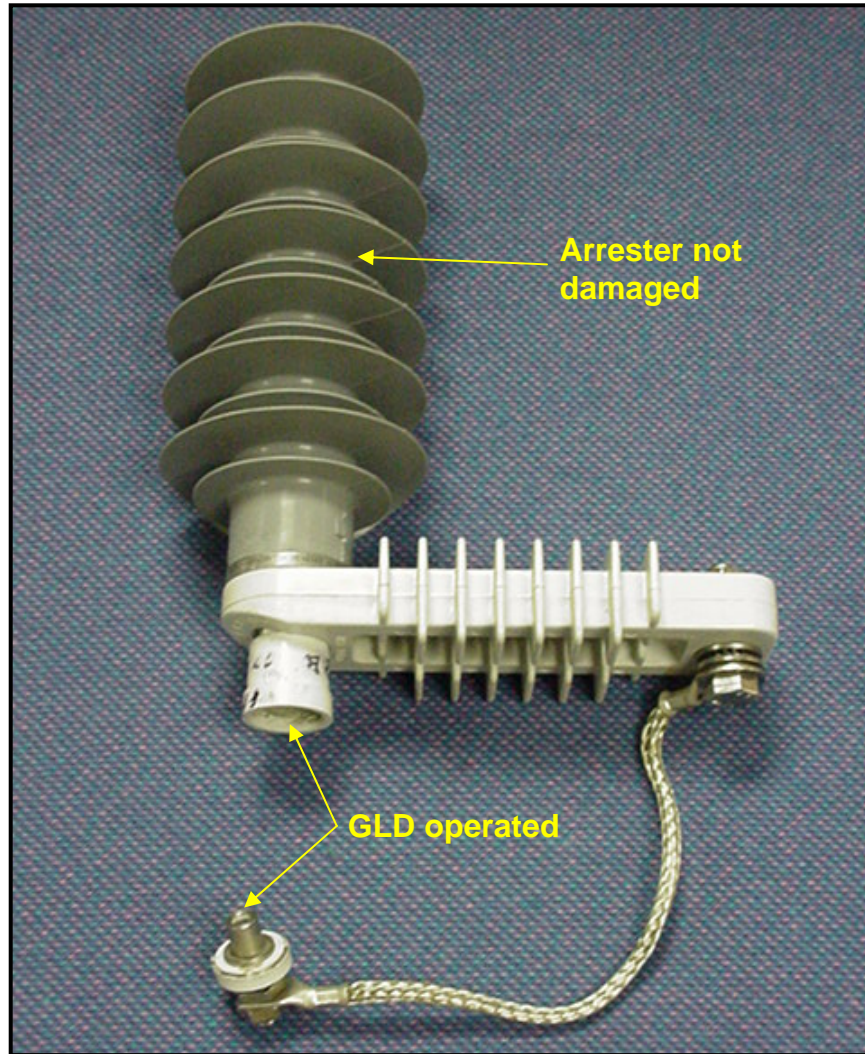
5 s @ 5 A

Specified minimum GLD operating time:

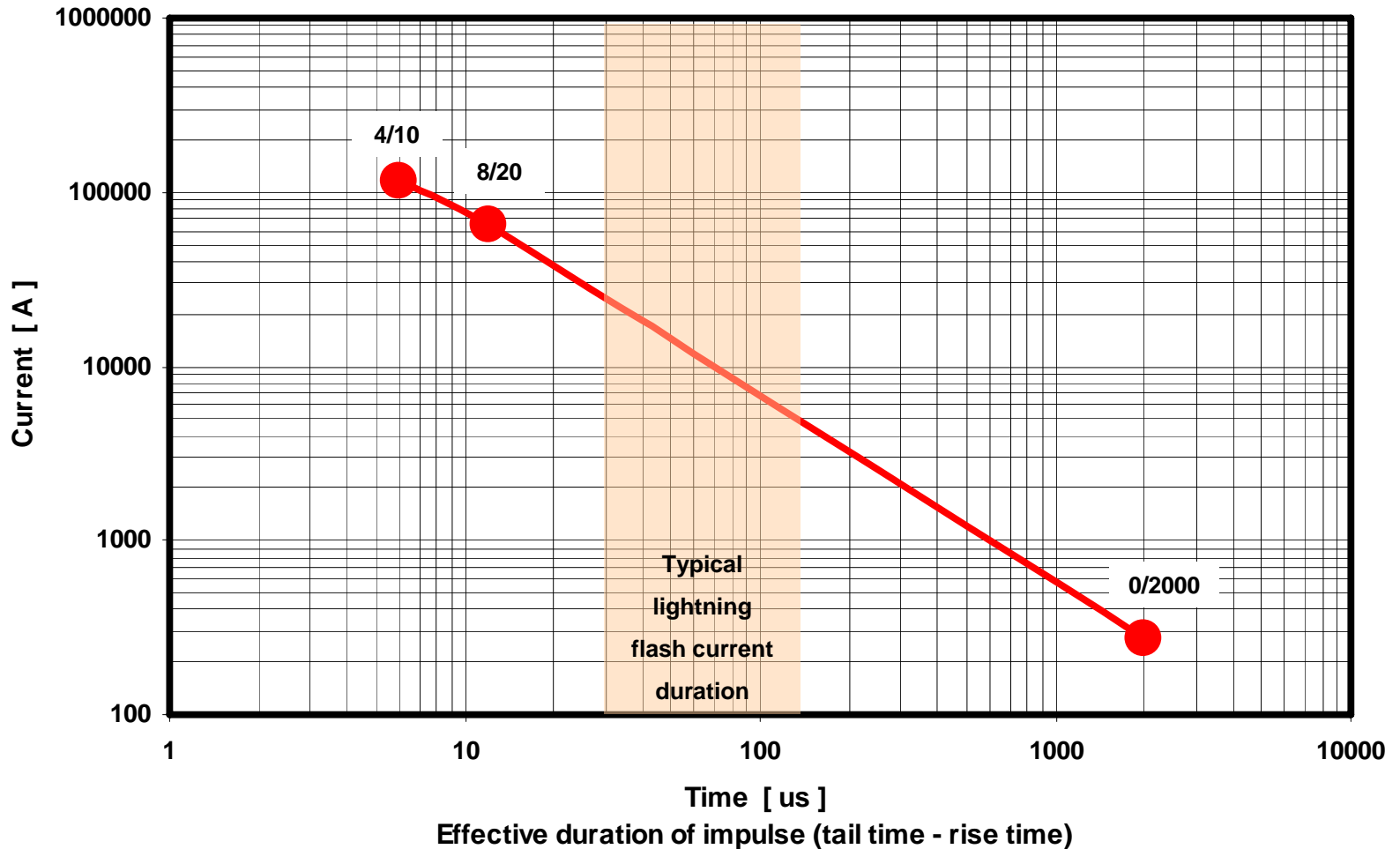
3 s @ 5 A



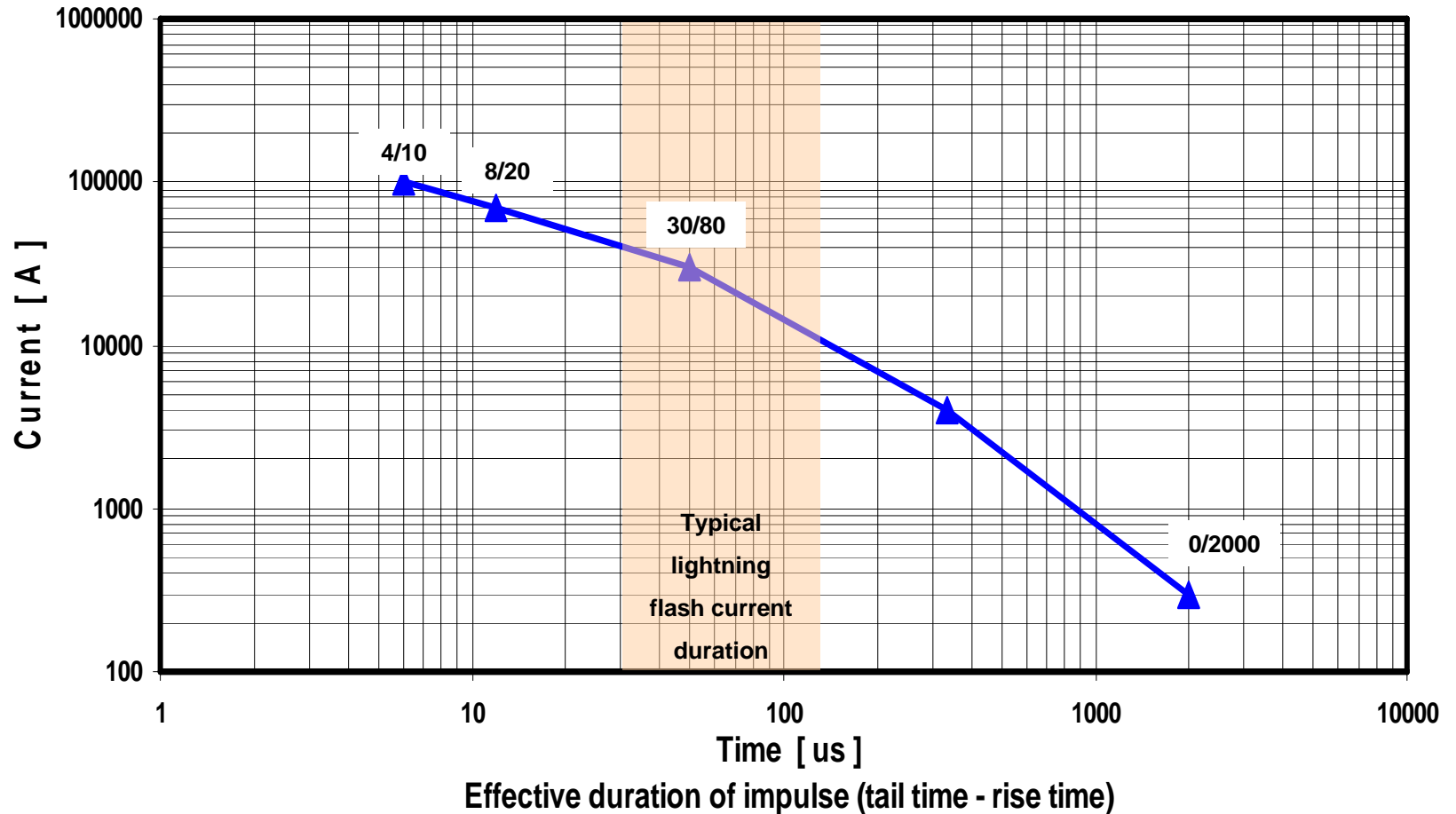
Failures: 2004 - 2005



GLD test points according to IEC 60099-4

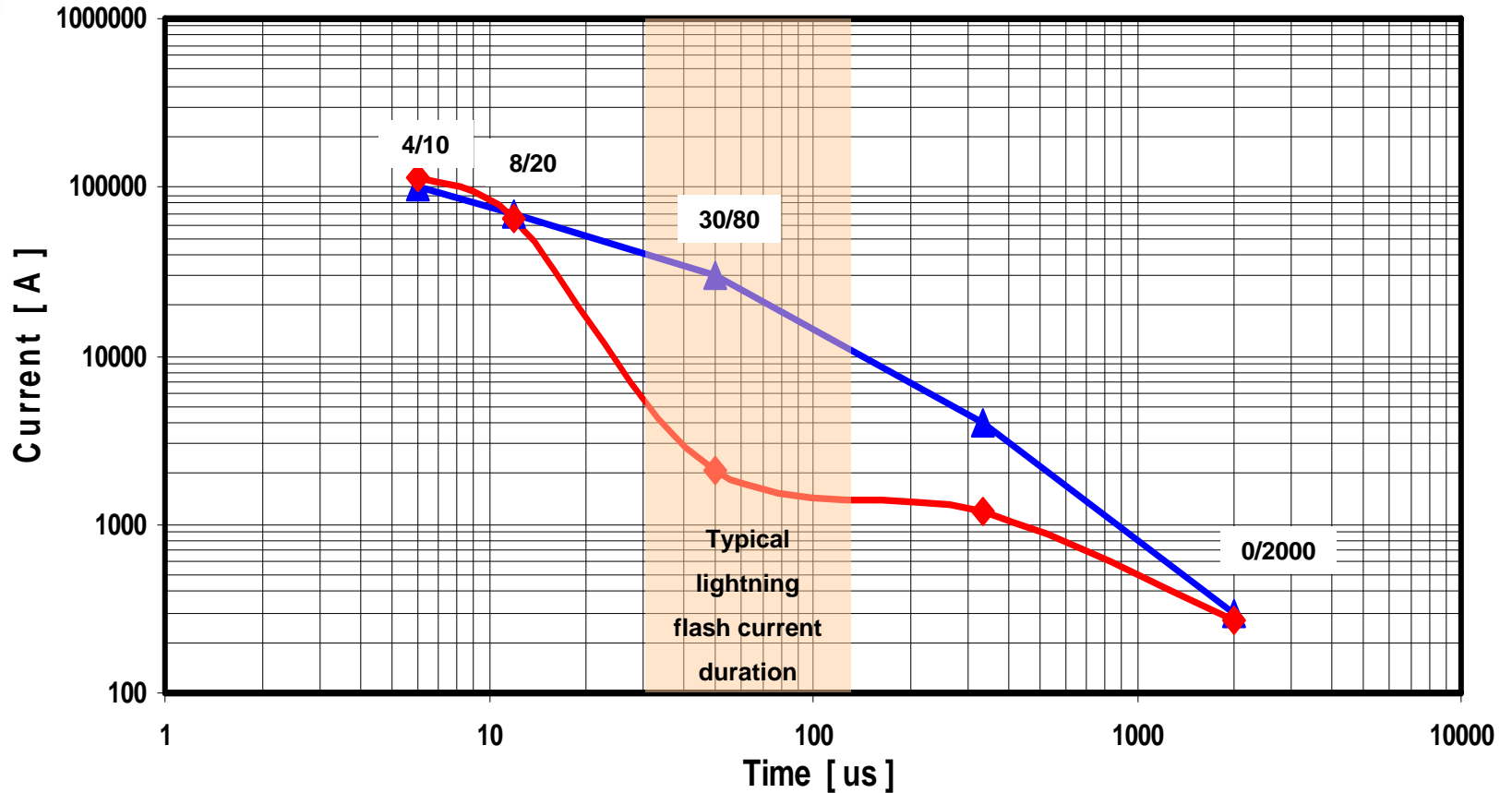


Arrester damage curve

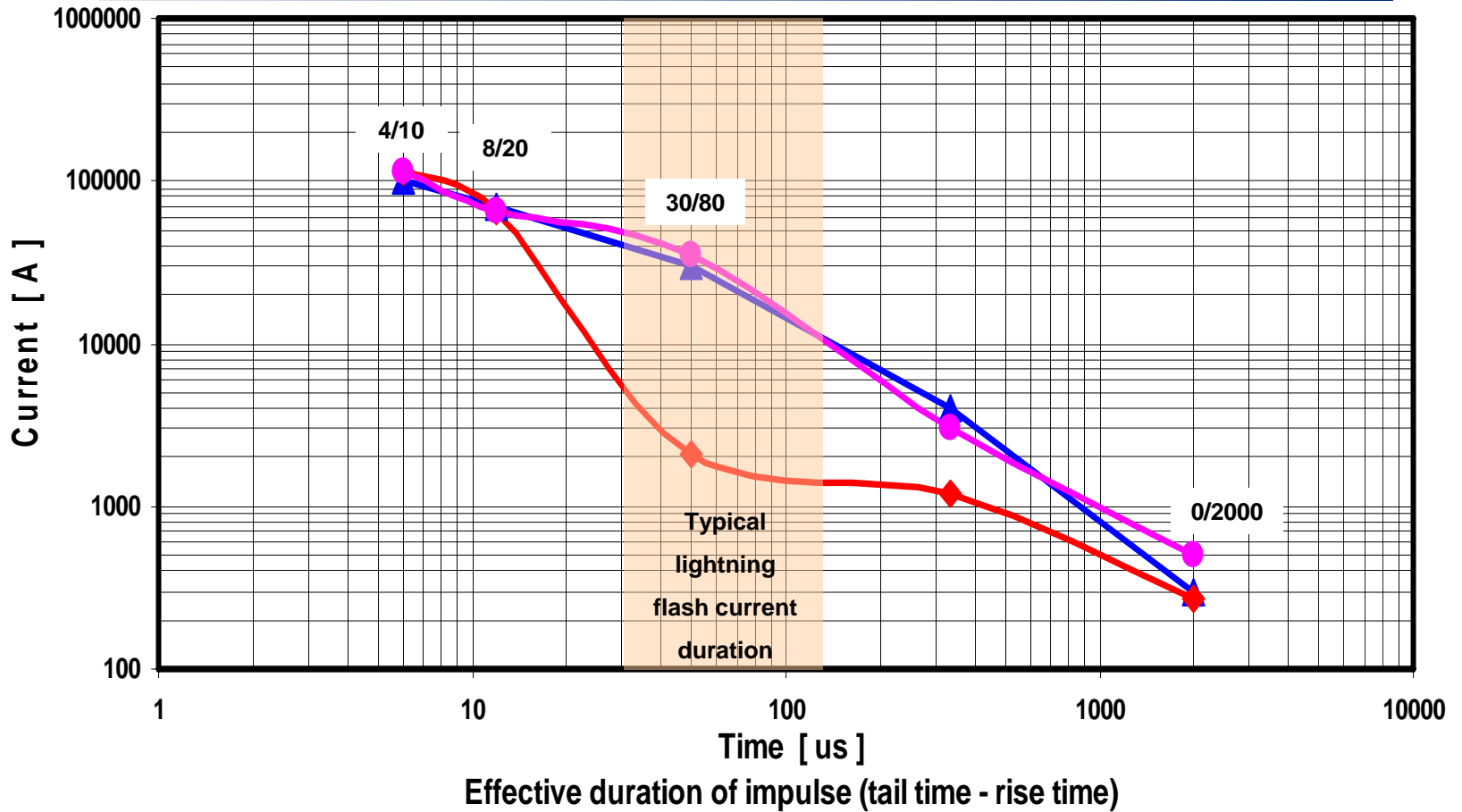


—▲— MOV failure level

Arrester damage curve vs transient operation curve of GLD

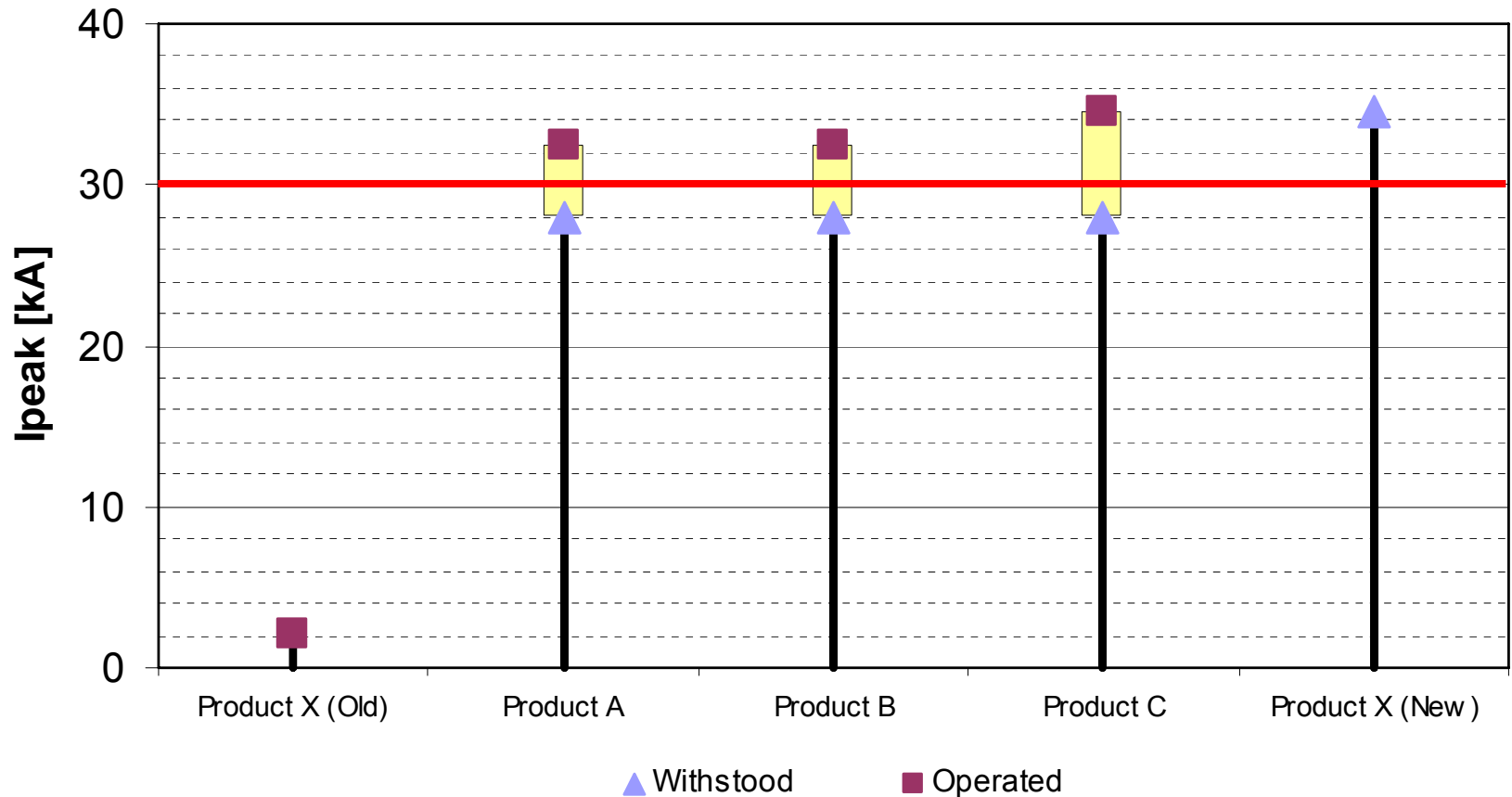


Arrester damage curve vs transient operation curve of GLD



—▲— MOV failure level —◆— Old GLD —●— New GLD

GLD operation for 30/80 us current impulse



Eskom's GLD test requirements

1. Disconnecter operation test

GLD operating time is determined at 20 A, 200 A and 800 A, as well as at 5 A

2. Long duration current impulse withstand test

18 x 2000 μ s square wave current impulses

GLD resistance measurements and 5 A operation test

3. Operating duty withstand test

20 x 8/20 μ s, 10 kA and 2 x 4/10 μ s, 100 kA current impulses

GLD resistance measurements and 5 A operation test

4. High lightning duty current impulse withstand test

2 x 30/80, 30 kA current impulses

GLD resistance measurements and 5 A operation test

5. Repetitive surge withstand ability test

1000 voltage impulses, sufficient to ensure spark-over of the GLD's internal gap

GLD resistance measurements and 5 A operation test

6. Moisture ingress test

GLD is immersed in boiling water for 42 hours

QUESTIONS ?