What is the effect of current limiting devices on fault levels ?

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Answer …

No effect

Zilch

Zero

Papow

Nice try

No cigar

Nada

Sorry

Yeh.. Nah

What is a fault level ?

Definition :

RMS value of the …

prospective (= theoretical) …

symmetrical (steady-state) …

short circuit current.

Calculated using Ohm's Law : $I = \frac{U}{Z}$

No effect from current limiting device in U and Z

What do current limiting devices do ?

Current limiting devices reduce :

#1 actual current (not theoretical or prospective current)

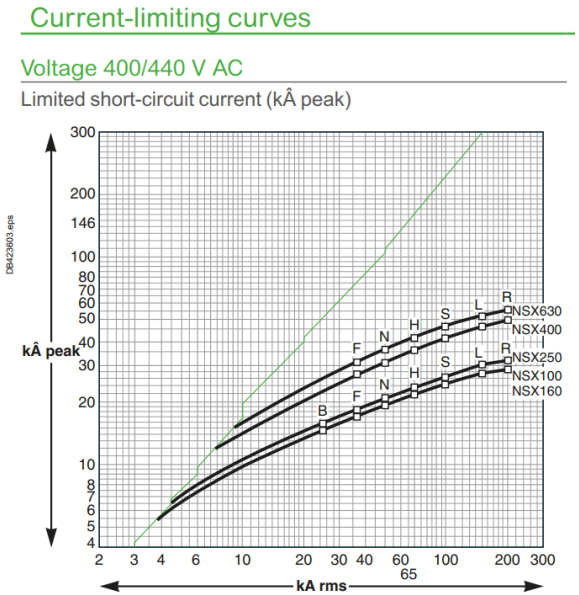
#2 allow trips in < 10ms (typically) so no steady state symmetrical signal

Unable to determine the “RMS value” of the limited waveform

Unable to determine a “limited fault level”

How to measure current limitation

With current limiting curves !



Example : Schneider Electric NSX160 MCCB, prospective current of 40kA MS

Peak let-through = 18.5 kA peak

Energy let-through = 6.10^5 A^2s

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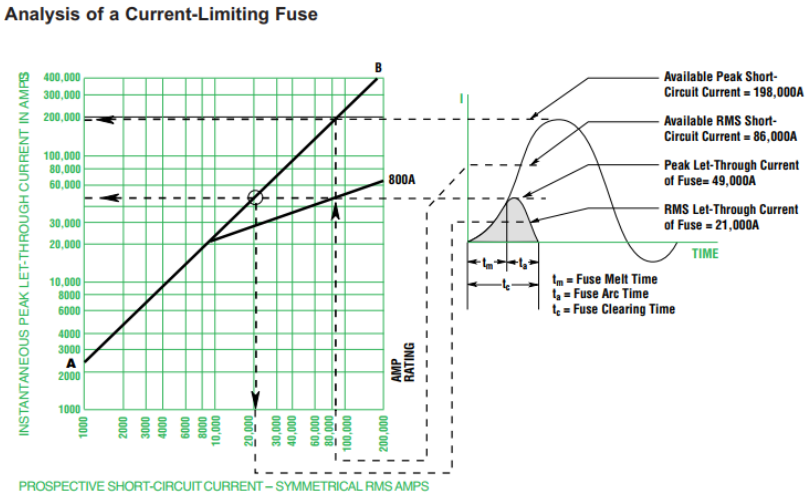
That is it.. No further info can be inferred.

Where does the “myth” come from ?

Inappropriate interpretation and usage of current limiting curves from some manufacturers.



(1) Introduce the concept of an “apparent “ or “RMS Let-Through” current which corresponds to a “true” RMS fault current with the same peak as the limited peak

(2) Imply or suggest that this “apparent” RMS is the “new” fault level downstream of the fuse

(3) This leads to assume downstream switchgear/equipment can be selected based on this “apparent” RMS value

Step 3 is :

- False
- Dangerous
- Non Compliant to 60947-2 (refer cascading)

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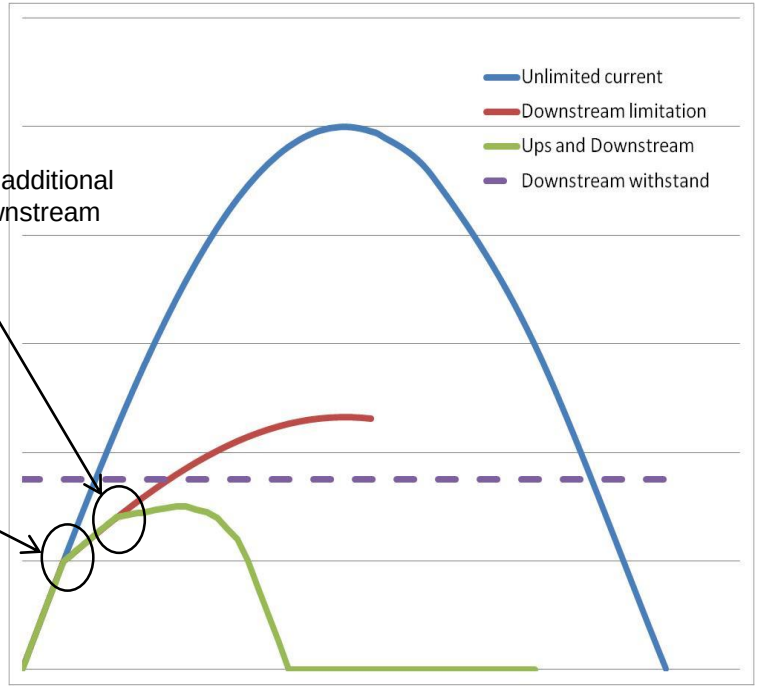
Effect of a downstream current limiting device



The downstream device starts reacting first

It reduces the current seen by the upstream device (ie it affects its performance)

The only way to test how they both work together is to do a test (60947-2)

Results of the testing are provided in Cascading charts

Cascading increases the breaking capacity of downstream devices by association

Conclusion

Do not assume the fault level downstream of current limiting devices is “6kA” (*)

It isn’t !

The load-side fault level is the same as the **line-side** fault level

(*) or any other value lower than the calculated (Ohm’s Law) prospective fault current

Earth Fault Protection on Incomers
Is more Protection too much Protection?

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Motivation for installation earth fault protections

Better protection ?

Earth fault loop impedance ?

Internal arc fault protection ?

Arc flash hazard reduction ?

Key considerations

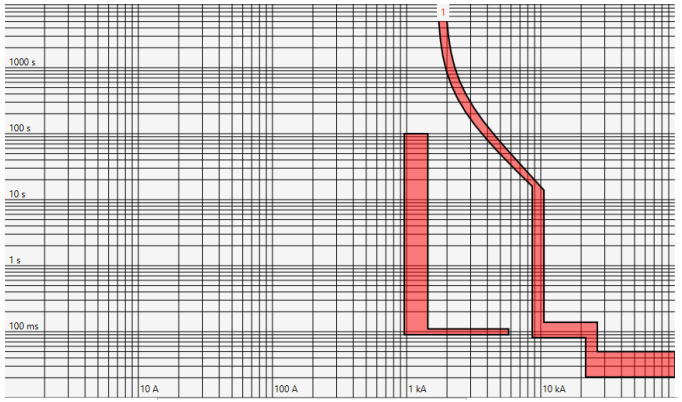
1 : There is no limit to improving safety

2 : Additional safety measures should not create a NEW risk

What does earth fault protection do ?

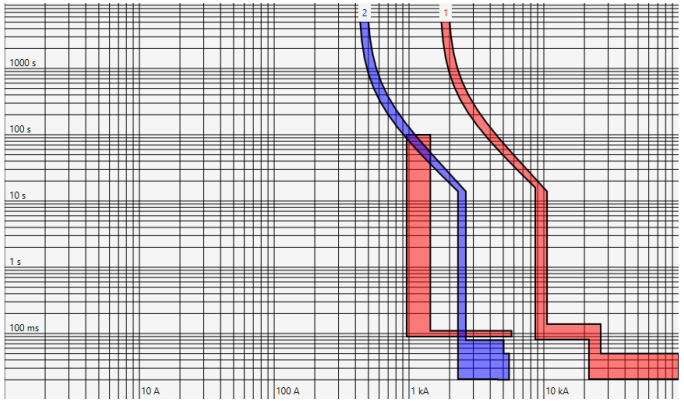
Monitors earth fault current

Issues a trip order when earth fault current exceeds a user set threshold for a certain time



Consequence of equipping the main incomer with earth fault protection

- The Main incomer (SPD) could trip on any earth fault in the installation (not only for faults in the MSB)
- A trip of the SPD could be :
  - a non conformance to AS/NZS300 Clause 2.5.5 (Reliability of supply) , and
  - could create a hazard : loss of supply to safety services



Solution :

- Assess discrimination performance of the installation under earth fault conditions
- Implement earth fault protection on outgoing supplies as well

Is the earth fault necessary ?

- Can the SPD protection be set (short time / instantaneous settings) to achieve the protection requirements achieved by the earth fault protection relay ?
- Can the switchboard / installation be designed in such a way as to
  - reduce the risk of earth fault currents occurring, or
  - Generate high earth currents that will trigger the short-time / instantaneous protection

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