ABB AG - EPDS

I_S-limiter™

The world’s fastest limiting and switching device

Agenda

The world’s fastest limiting and switching device

Customers

Function: Insert-holder with insert

Comparison: I_S-limiter – Circuit-breaker

Breaking of a short-circuit current with I_S-limiter

Detection of short-circuit currents

Reliability: I_S-limiter as protection device at highest level

Applications

Technical data

Unbeatable advantages

Summary

I_s-limiter™

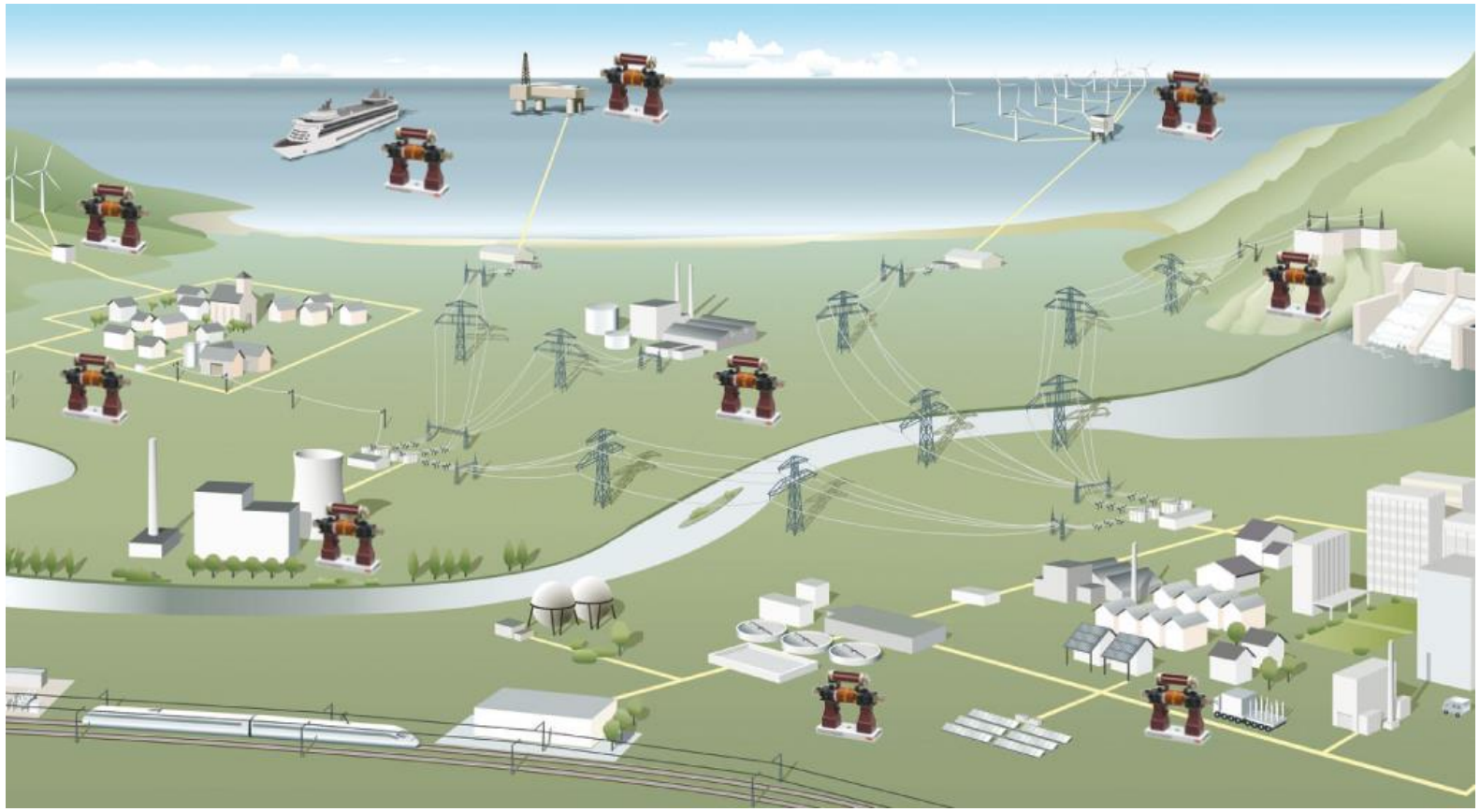
The world’s fastest limiting and switching device

ABB’s solution for complex application engineered according to customer’s project specification

- **Solves short-circuit current problems** in electrical networks before peak short-circuit current is reached
- Reliability and function proofed in thousands of installations
- Experiences since 1958 with more than 3,000 I_s-limiters in service in 80 countries

I_s-limiter™

The world’s fastest limiting and switching device



I_s-limiter™

The world's fastest limiting and switching device

Customers

Industry

- Paper mills
- Refineries
- Chemical industries
- Car industries
- Power stations
- Steel-, Aluminum mills
- On- / Offshore platforms
- Ships / Vessels
- Data center

Town's utilities

Utilities

Test-laboratories



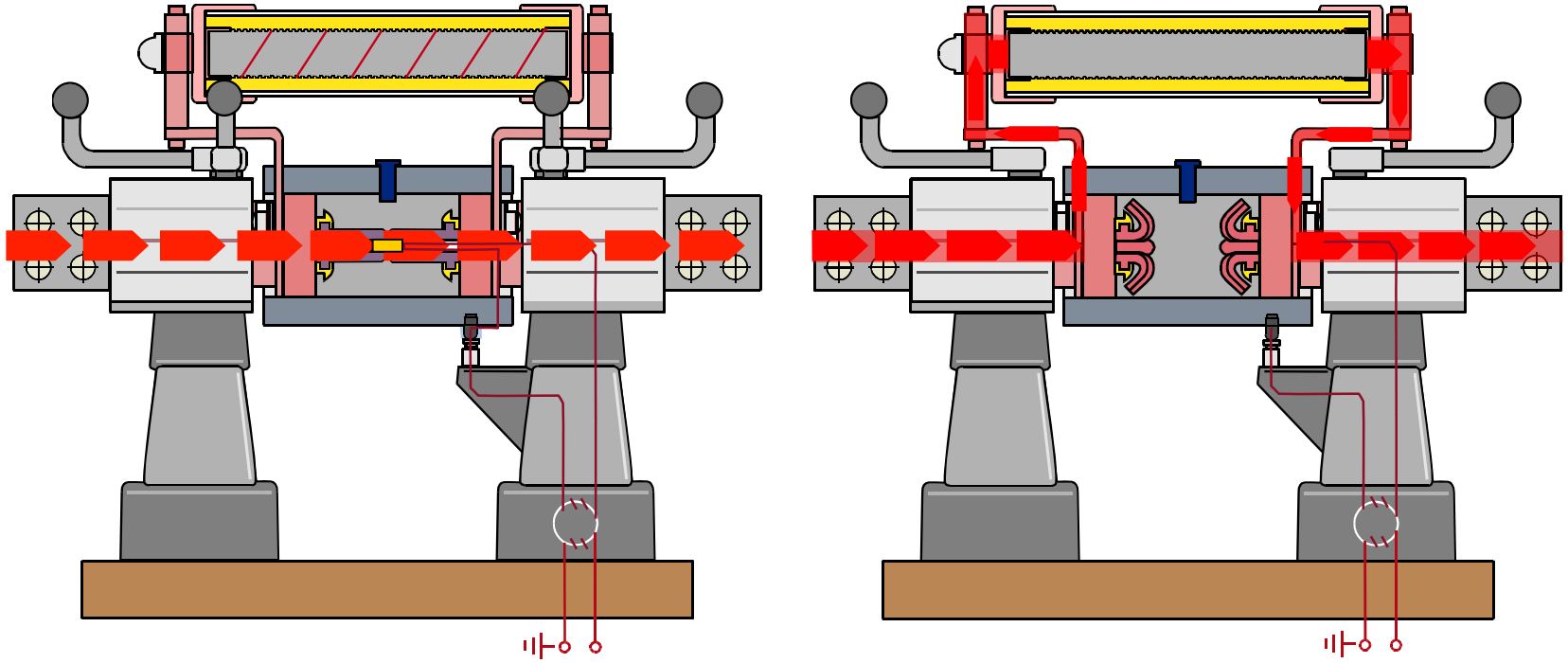






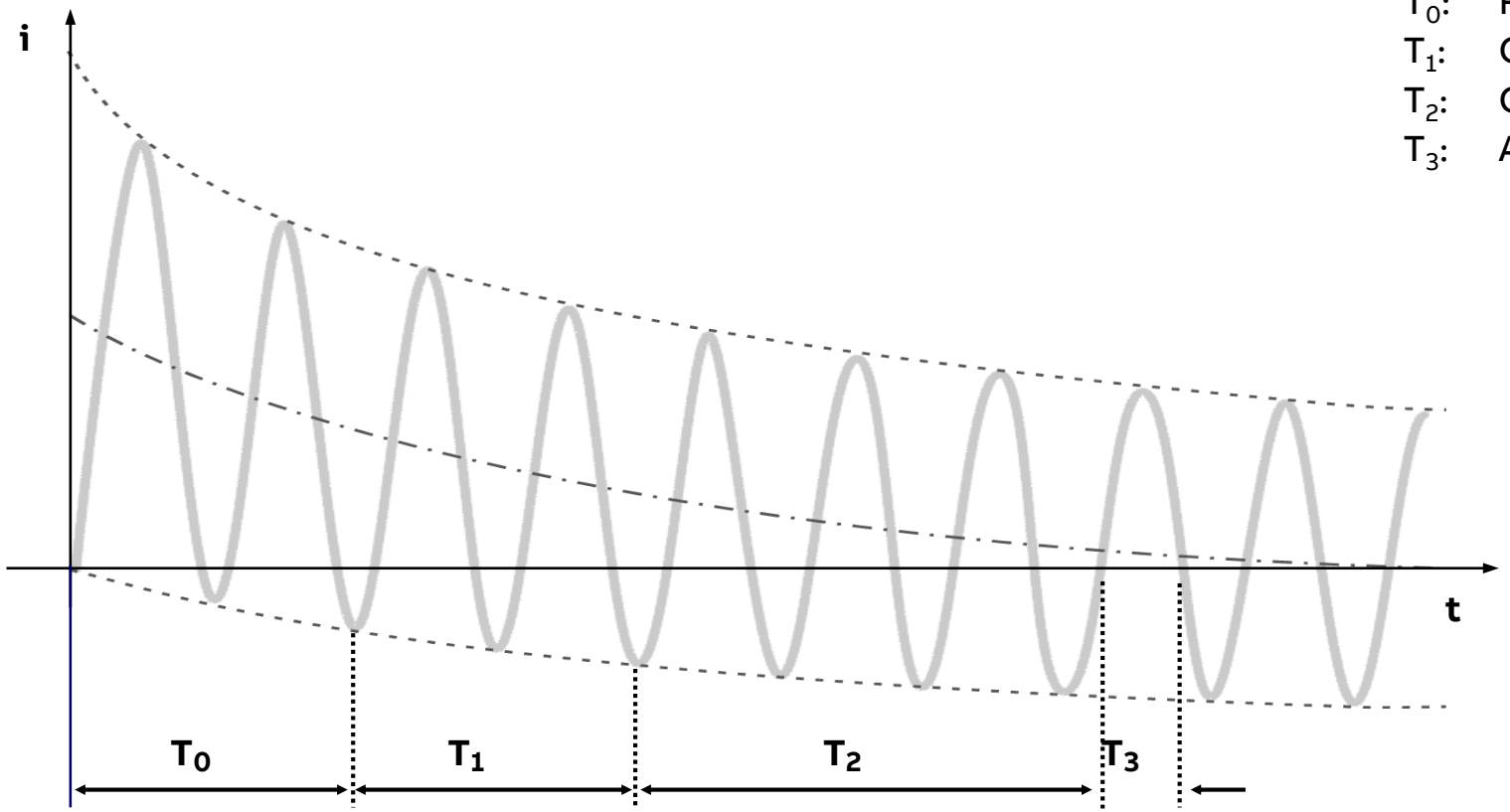
I_s-limiter™

Function: Insert-holder with insert



I_S-limiter™

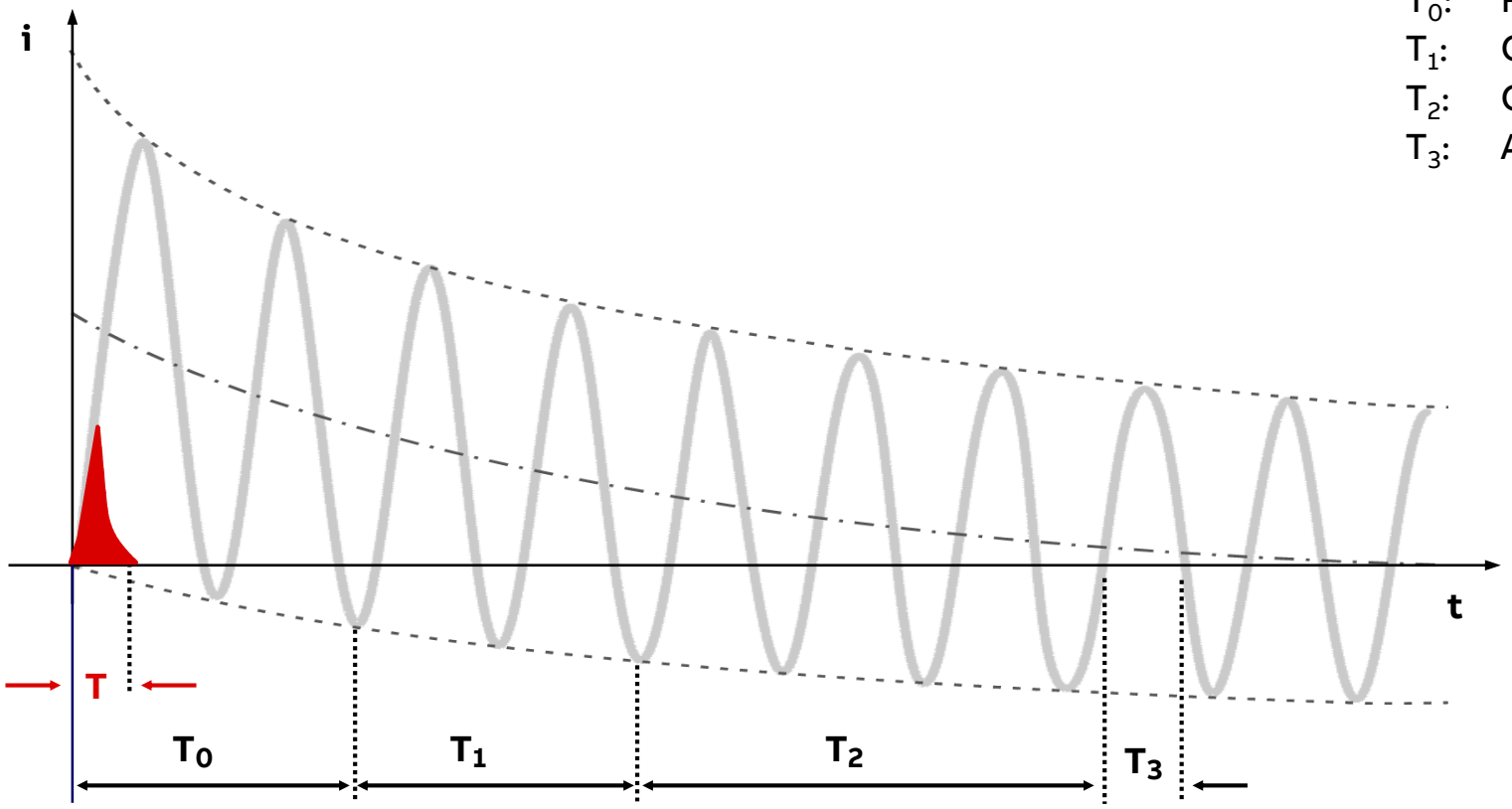
Comparison: I_S-limiter – Circuit-breaker



T_0:	Response time of protection relay:	10 - 20	ms
T_1:	Operating time of protection relay:	30 - 40	ms
T_2:	Operating time of circuit-breaker:	40 - 80	ms
T_3:	Arc duration:	10 - 20	ms
		90 - 160	ms

I_S-limiter™

Breaking of a short-circuit current with I_S-limiter



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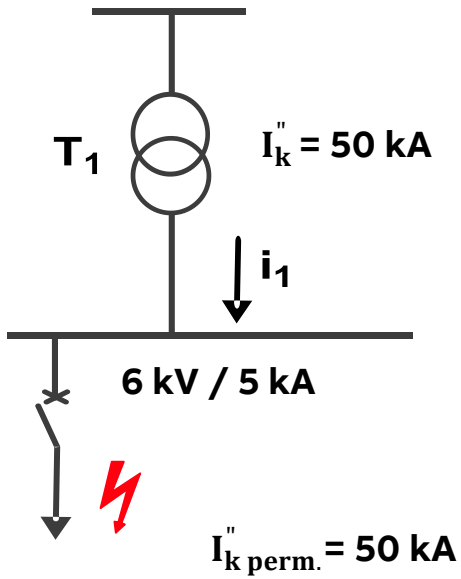
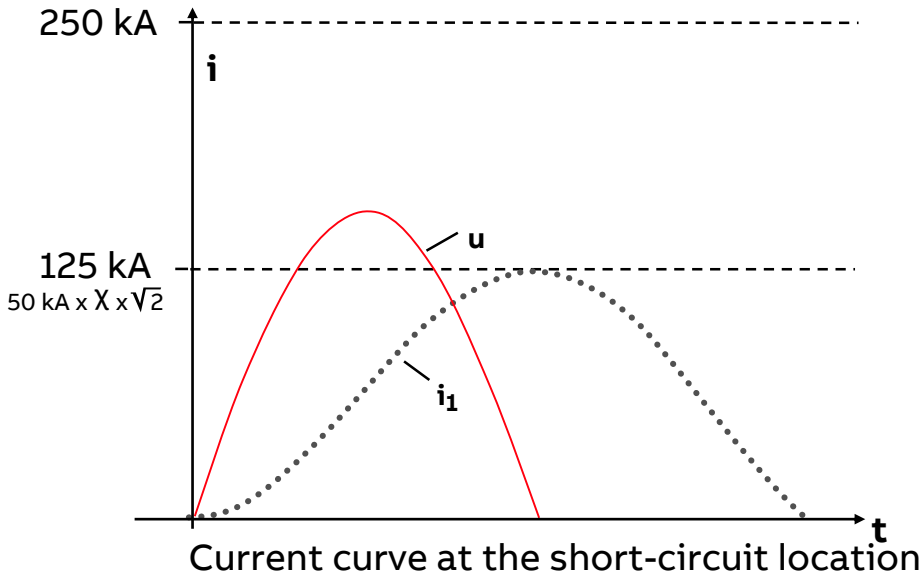
T_3:	Arc duration:	10 - 20	ms
		90 - 160	ms

Current flow time by use of I_s-limiter: T = 5 - 10 ms

I_s-limiter™

Breaking of a short-circuit current with I_s-limiter

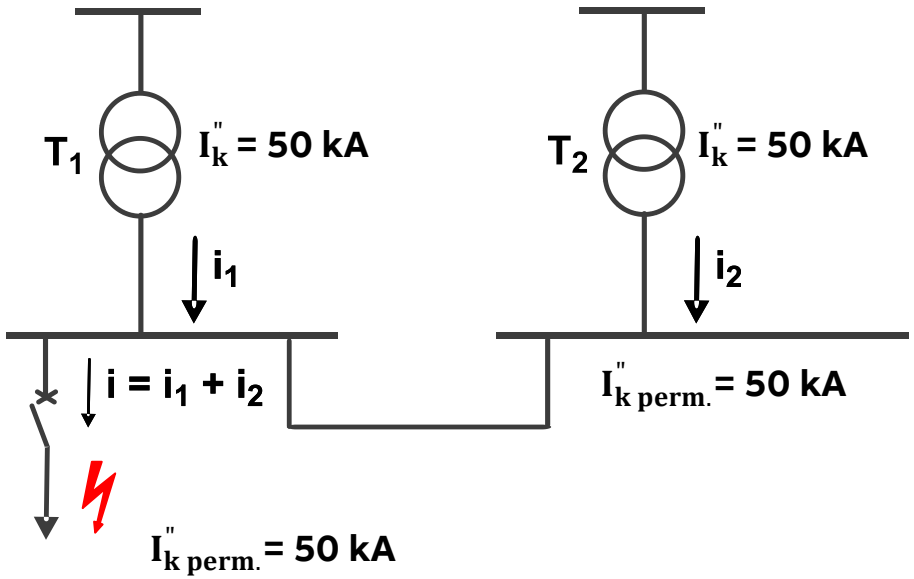


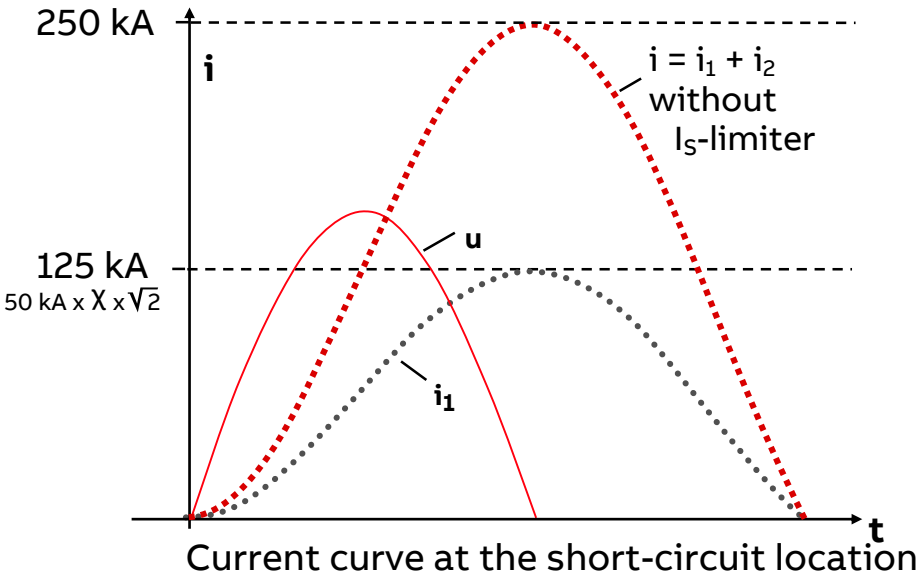


Current curve at the short-circuit location

I_S-limiter™

Breaking of a short-circuit current with I_S-limiter





I_S-limiter™

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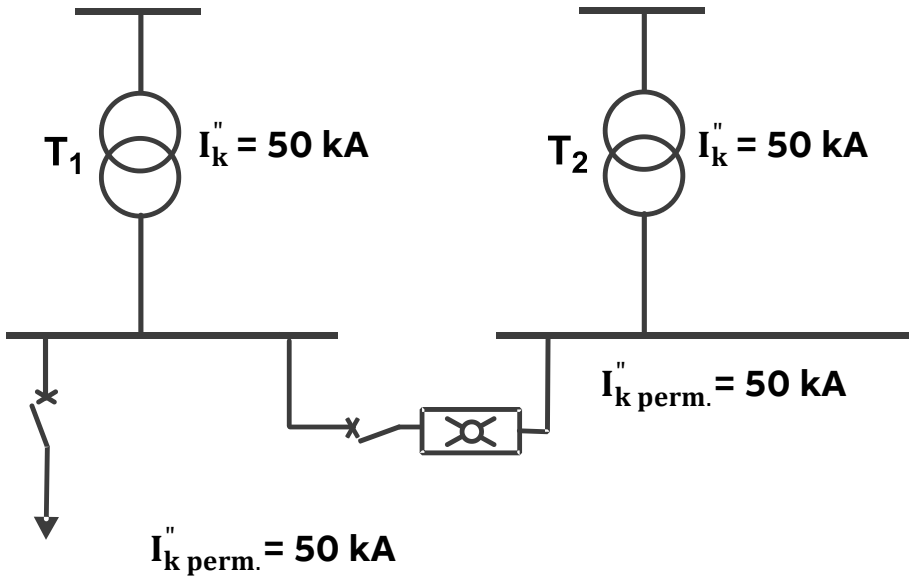
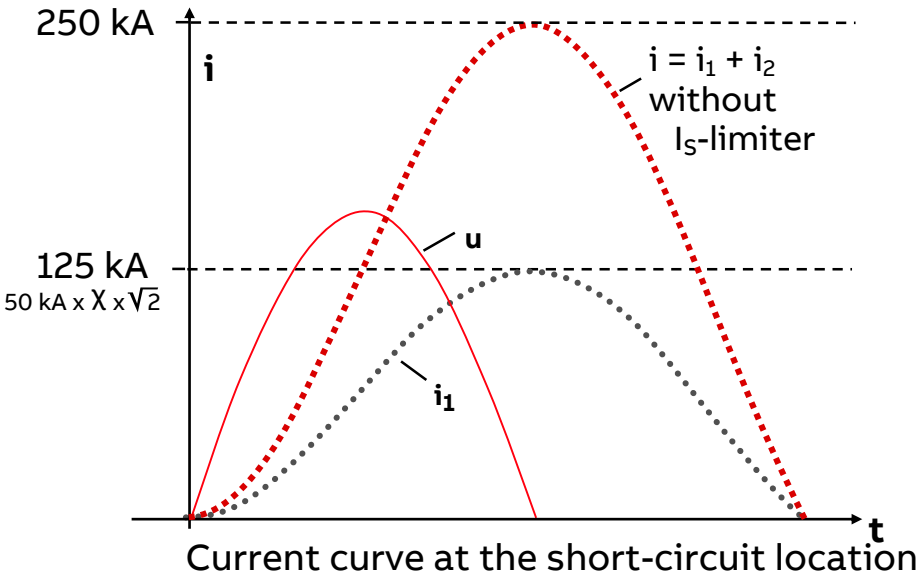
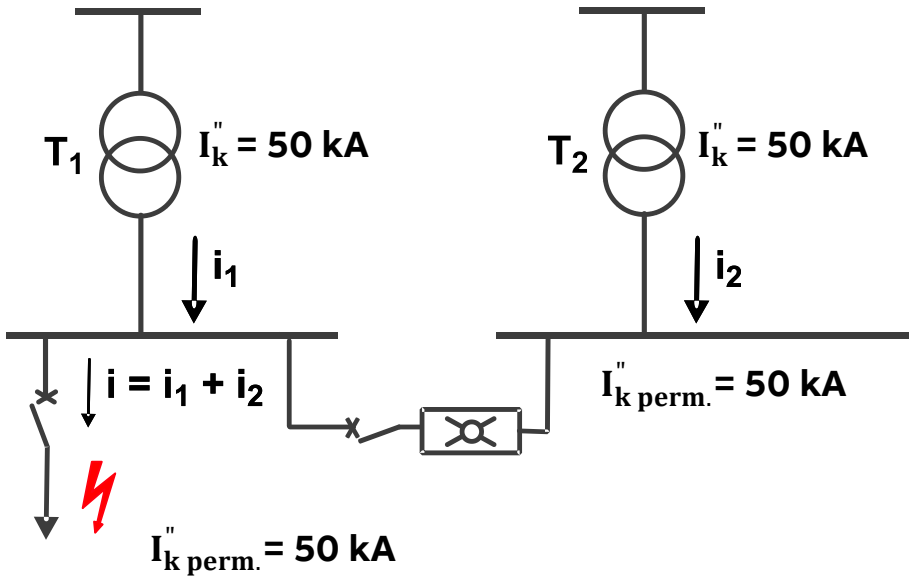


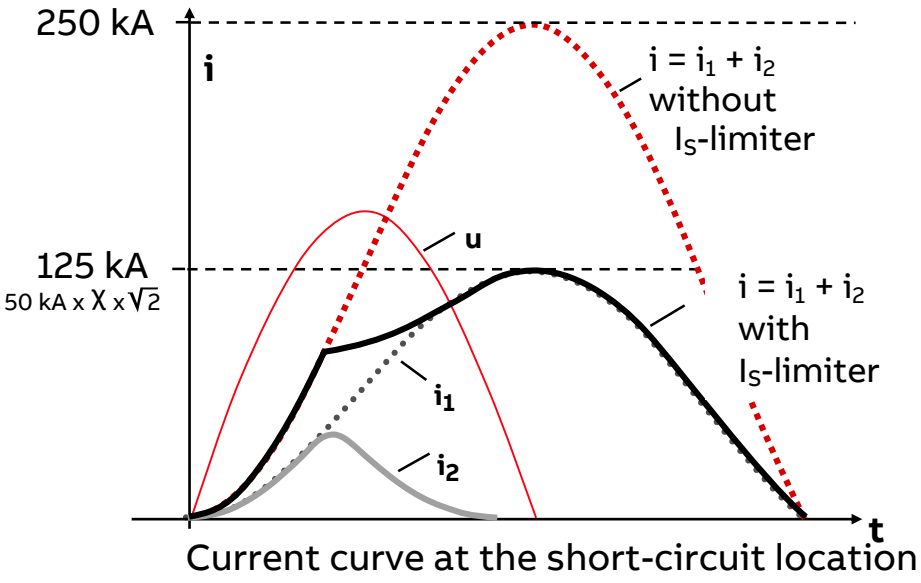


Current curve at the short-circuit location

I_S-limiter™

Breaking of a short-circuit current with I_S-limiter

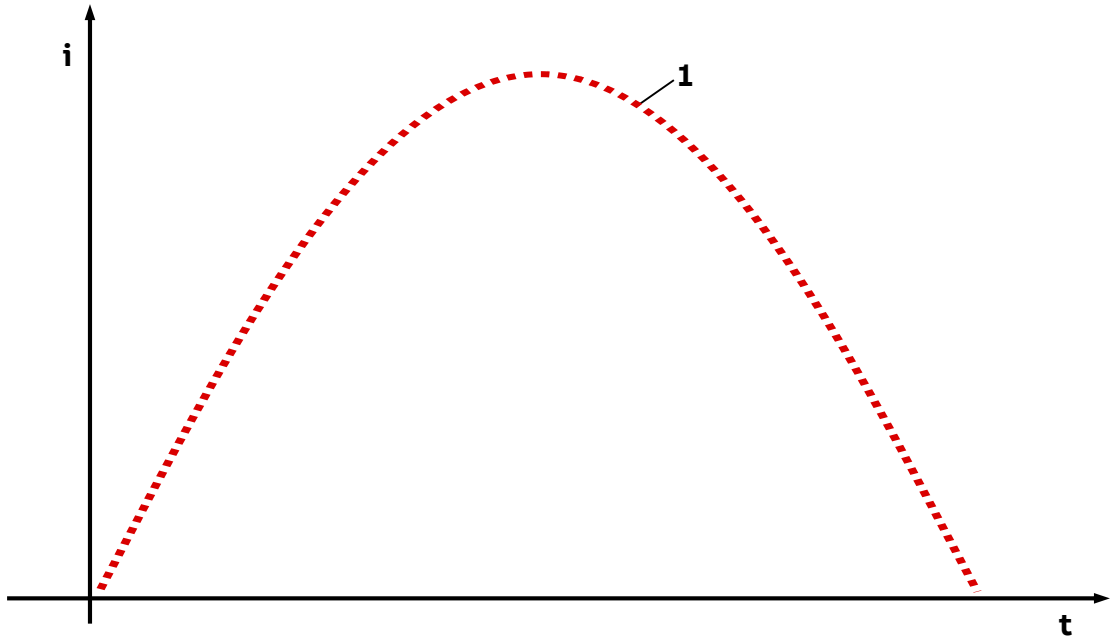




Current curve at the short-circuit location

I_s-limiter™

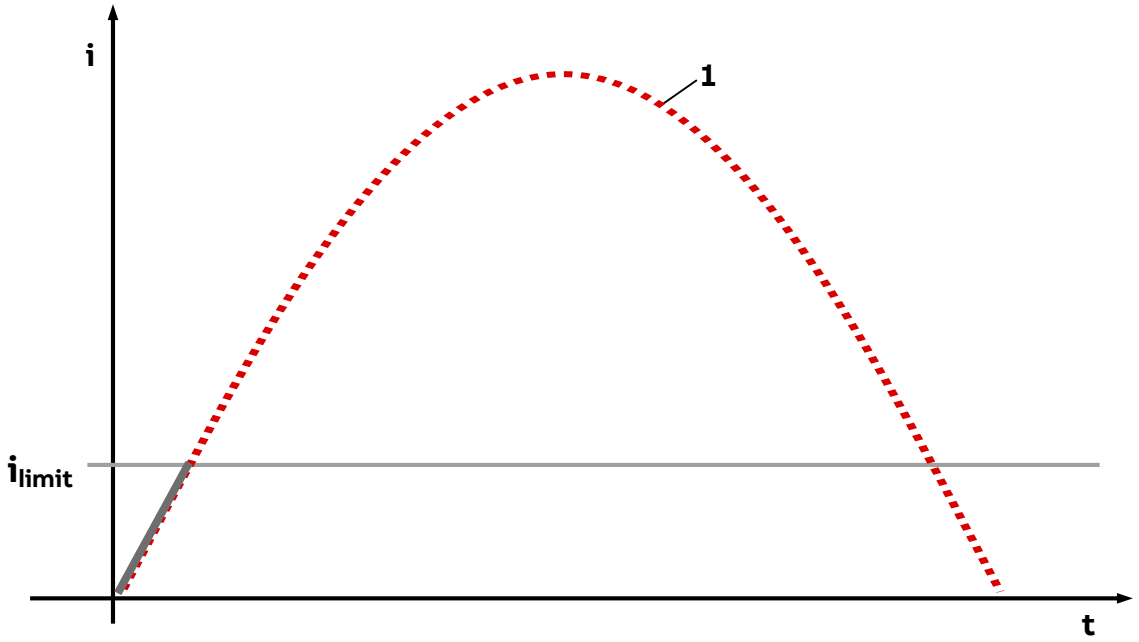
Detection of short-circuit currents



1 Short-circuit current without I_s-limiter

I_s-limiter™

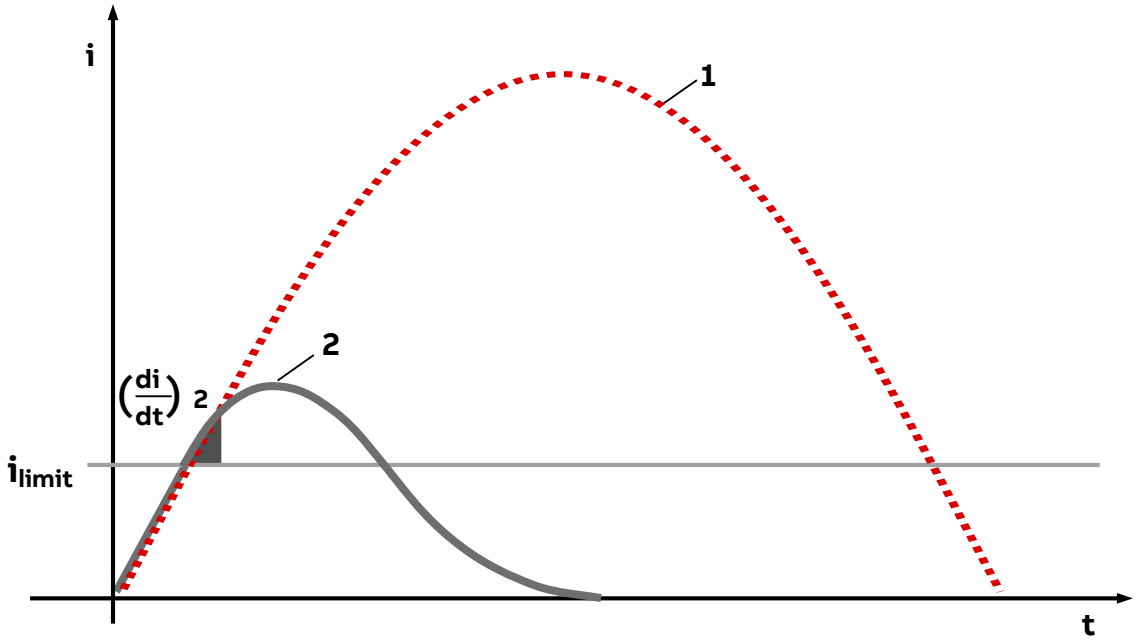
Detection of short-circuit currents



1 Short-circuit current without I_s-limiter

I_s-limiter™

Detection of short-circuit currents



$$i_{limit} \wedge (^{di}/_{dt})$$

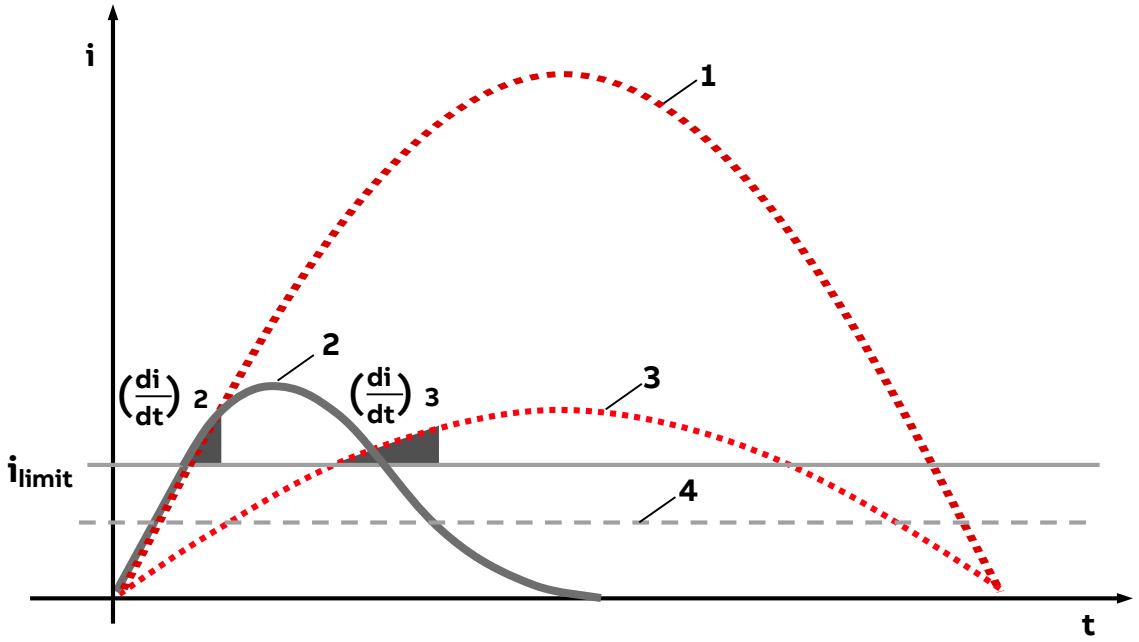
$\wedge$ ≙ logical „and“

1 Short-circuit current without I_s-limiter

2 Short-circuit current - I_s-limiter tripped -

I_s-limiter™

Detection of short-circuit currents



$$i_{limit} \wedge (^{di}/_{dt})$$

∧ ≙ logical „and“

1 Short-circuit current without I_s-limiter

2 Short-circuit current - I_s-limiter tripped -

3 Overcurrent - I_s-limiter not tripped -

4 Peak value of service current

I_S-limiter™

Reliability

I_S-limiter as protection device at highest level

Self monitoring

Redundancy – Separate independent system for each phase

Protection against EMI

- EMC tested according to IEC 61000
- Special current transformers –
  Low impedance shield between primary and secondary winding
- Filters for incoming / outgoing wires
- Special tripping and measuring wires –
  Each pair tightly twisted and protected by steel conduit

Test equipment – Quick, complete and easy test by user

I_S-limiter™

Application: I_S-limiter mounted in bus section

Advantages

Improving “power quality“ by gaining higher voltage stability

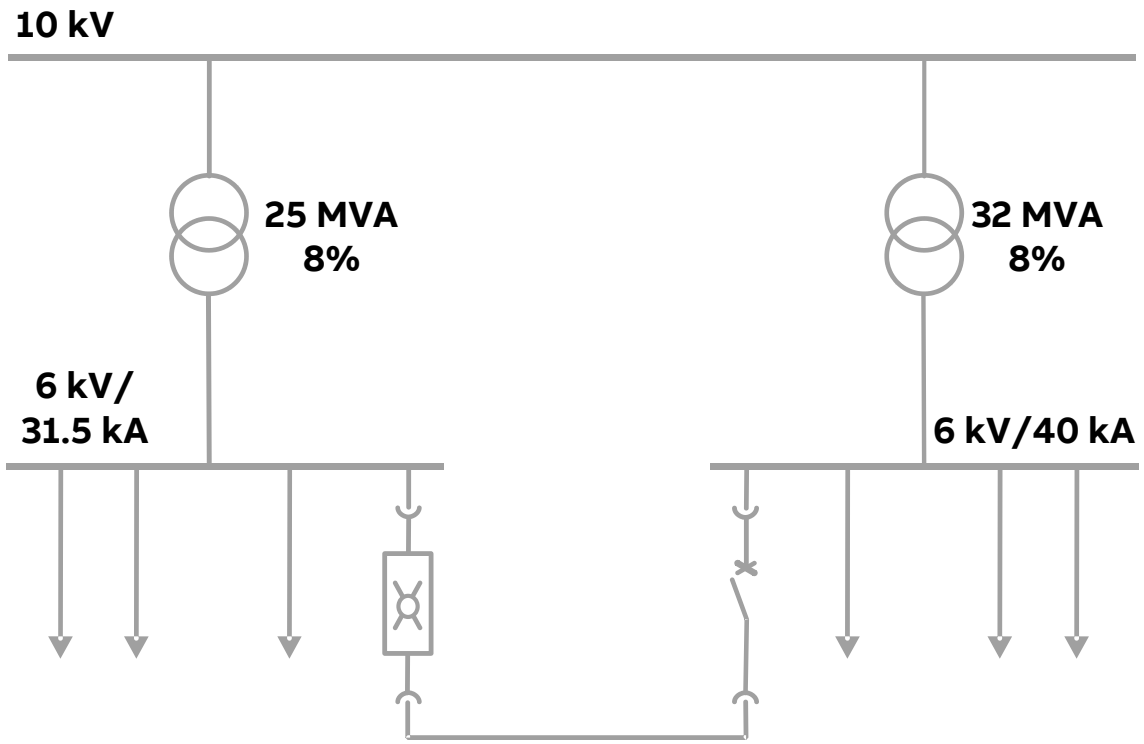
Higher availability of the system and processes

Increased reliability of power supply

Optimizing load flow

Reduction of energy released in case of a fault

No need to change existing busbar system and cabling



I_s-limiter™

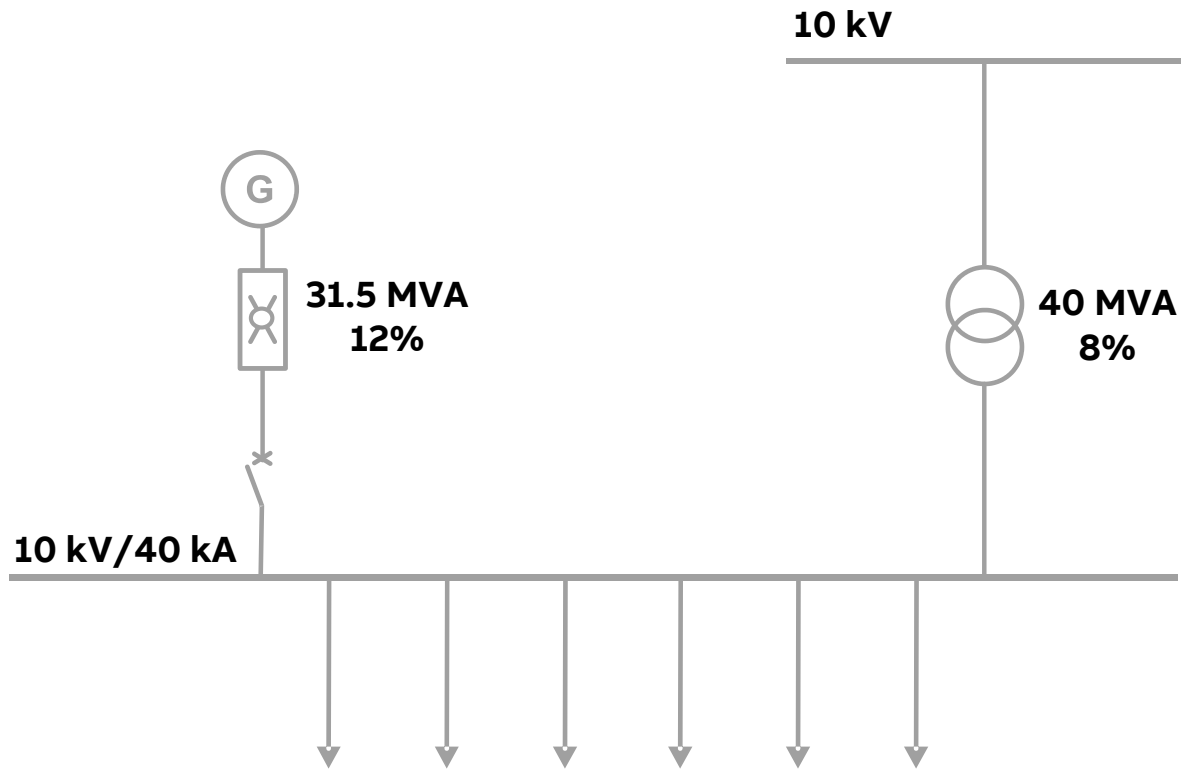
Application: I_s-limiter in generator feeder

Advantages

Generator can be connected independent of the short-circuit capability of the system

Higher availability of existing or new system

System extension without replacing existing electrical equipment such as circuit-breaker, busbar or cable system



I_S-limiter™

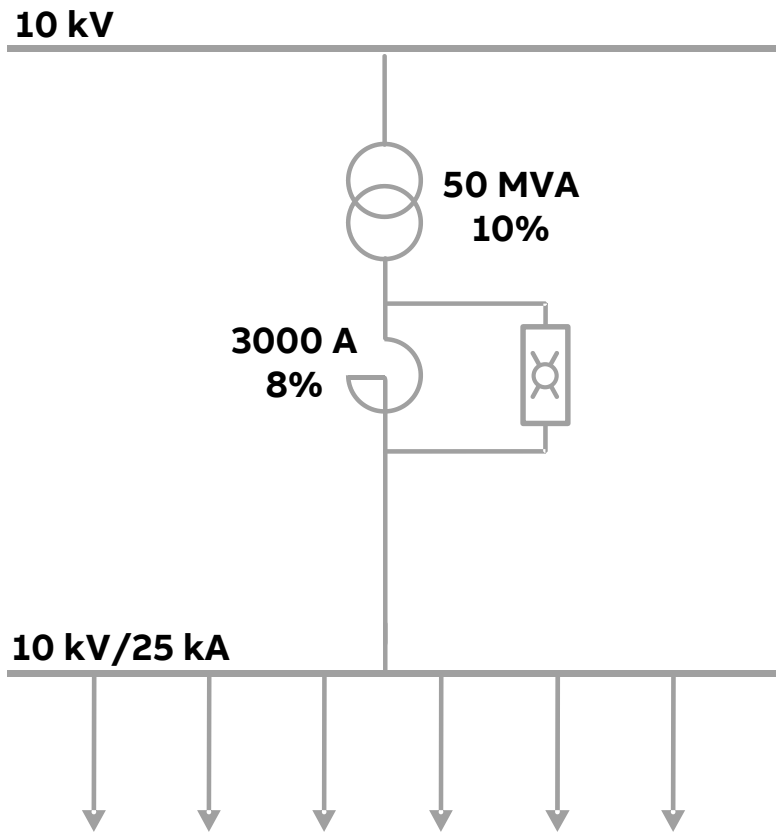
Application: I_S-limiter in parallel to reactor

Advantages

Eco- and cost-efficient due to reduction of ohmic losses of the reactor

Increased power quality due to avoidance of voltage drop through reactor

Ensuring continuous power supply through reactor in case of I_s-limiter tripping



I_s-limiter™

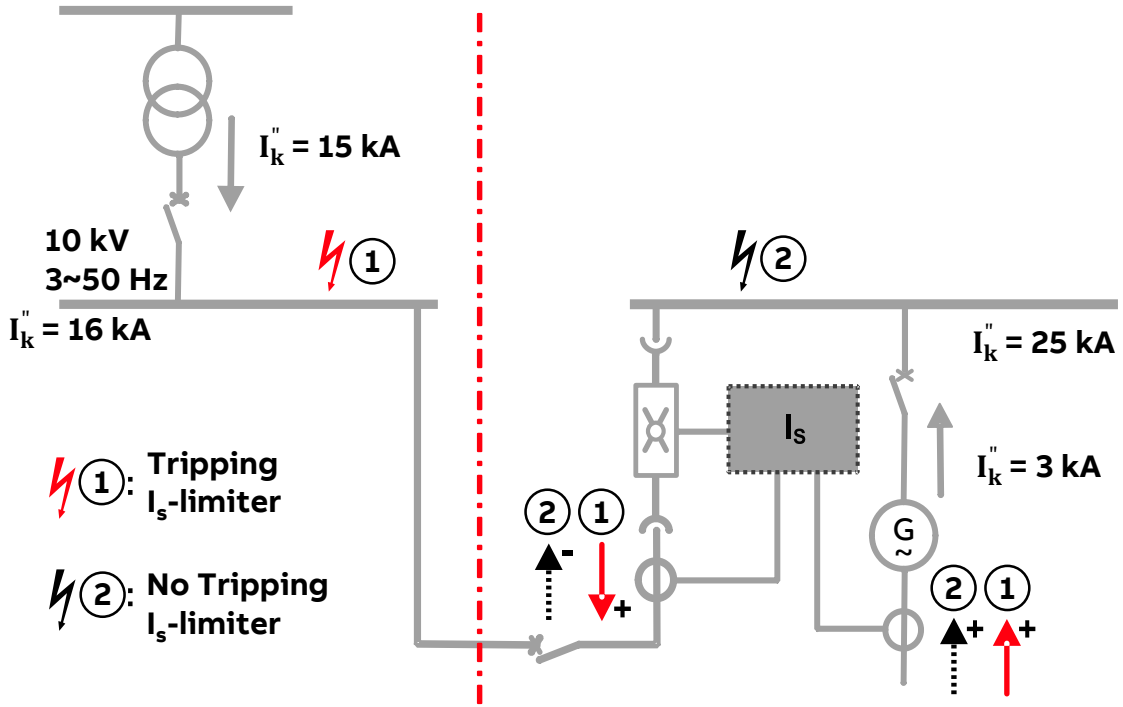
Application: Connection of a generator to a Network with current-direction comparison

Advantages

Connect private / industrial generator feeder to the fully loaded grid ①

No conflict to Grid Code

Selective tripping of the I_S-limiter
(Tripping only at faults within grid section ①, not at faults within grid sections ②)



I_S-limiter™

Application: I_S-limiter with summation of currents

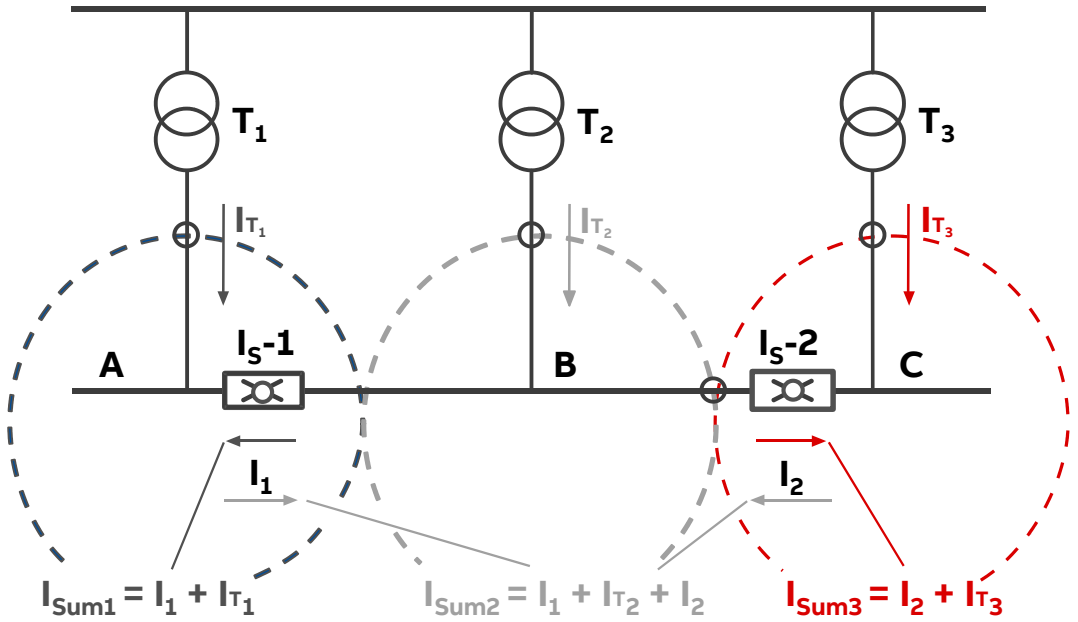
Advantages

Only I_s-limiter(s) close to fault location trip

Limitation of short-circuit affected area due to isolation of fault

Nearly no voltage dip in large healthy area in case of short-circuit fault

Higher availability of system and processes



I_S-limiter™

Technical data

For higher rated currents I_S-limiter can be connected in parallel

Rated voltage	Rated current	Switching capability
0.75 kV	… 5000 A	… 140 kA_{RMS}
12.00 kV	… 4000 A	… 210 kA_{RMS}
17.50 kV	… 4000 A	… 210 kA_{RMS}
24.00 kV	… 3000 A	… 140 kA_{RMS}
36.00 kV	… 2500 A	… 140 kA_{RMS}
40.50 kV	… 2500 A	… 140 kA_{RMS}

I_s-limiter™

Unbeatable advantages

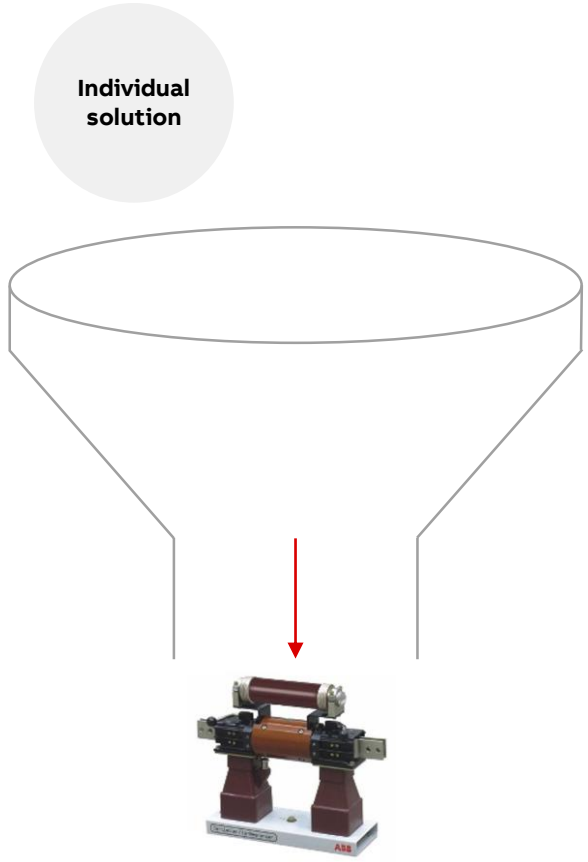
Individual solution

Individual solution – From loose components to fully type tested panels

Project related **detailed engineering** according to customer's application

Measuring of current rise di/dt – Optimized tripping value based on instantaneous current plus current rise measuring

Selective tripping in predefined areas of the network avoiding of unnecessary downtime and repair cost



I_S-limiter™

Unbeatable advantages

Equipment and process protection

Safe protection of…

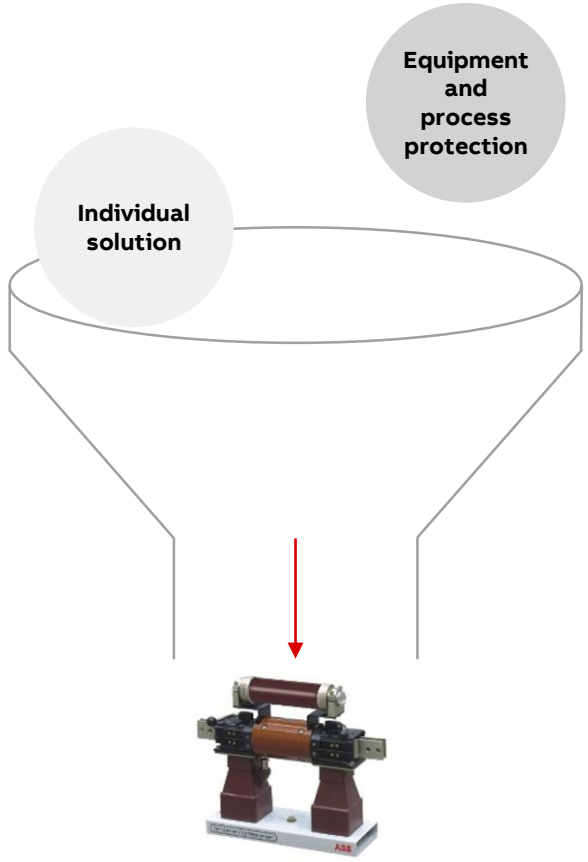
- Electrical installations and equipment
- Critical applications such as data center, chemical industry or refineries
- Processes and systems
- Auxiliary supply in power plants

… by immediate separation from the fault affected network

Leading to…

Minimization of damage by reducing short-circuit current energy and respectively limiting stress on network components

Improving “power quality” by reducing voltage dip



I_S-limiter™

Unbeatable advantages

Cost and eco-efficient solution

Protection of customer's investment

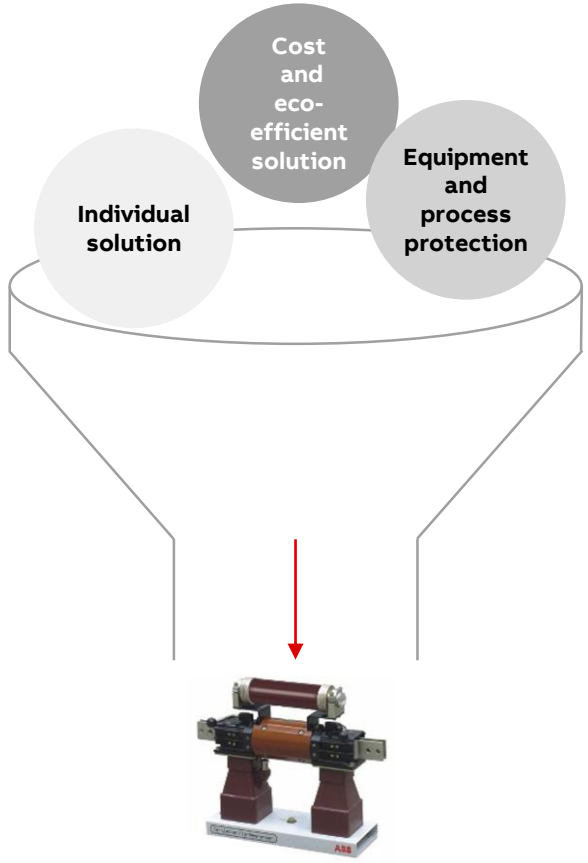
System extension without replacing existing electrical equipment such as circuit-breaker, busbar, cable system …

Cost- and eco-efficient due to minimization of electrical losses and refurbishment of tripped inserts

Cost-efficient due to minimized down time

Cogeneration – Integration of distributed power generation to fully loaded system

Downsizing of the system by using lower rated equipment



I_s-limiter™

Summary

ABB's solution for complex applications engineered according to customer's project specification

- Solves short-circuit current problems in electrical networks before peak short-circuit current is reached
- The world's fastest limiting switching device

How can we support you?