Complex Solution for the Distribution Substation

REF 542*plus*

Application and Setting Guide

ABB

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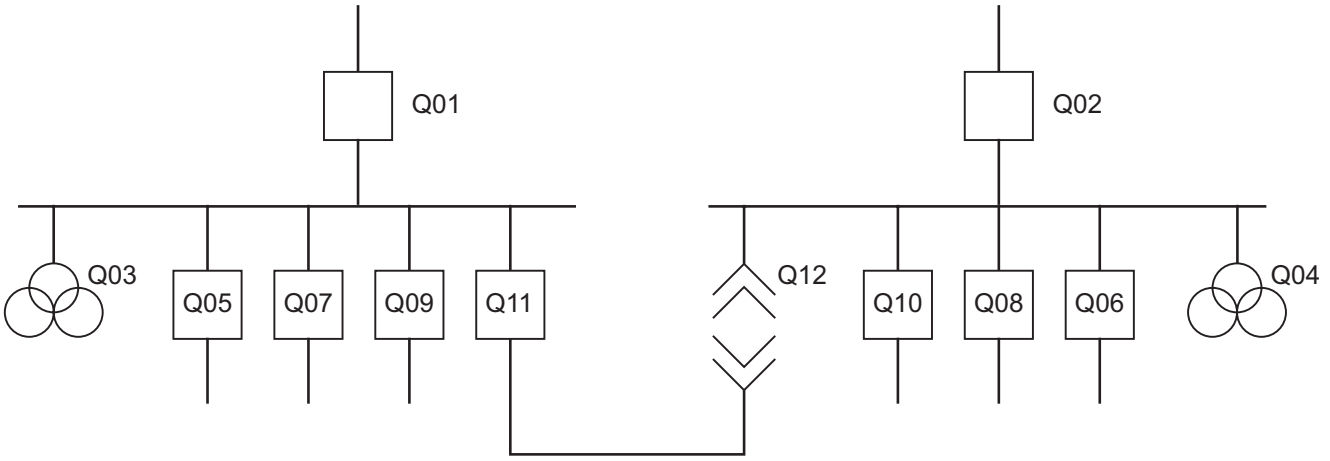
Standard indoor switchgear: 2 sections, 10 cubicles per section.



Thereby is:

Q01, Q02	incoming cubicles
Q03, Q04	voltage transformer cubicles
Q05 - Q10	outgoing feeders
Q11	bus coupler
Q12	bus riser

The protections should be placed from economical point of but to save basic functionality of the substation. The functionality of the cubicles can be divided into several groups:

- High functionality (incoming feeder and bus coupler)
- Medium functionality (outgoing feeders)
- Limited functionality (VT cubicles)

The task is to use maximum functionality in a cheapest way.

One of the best solutions is to combine several types of the protections in order to get the best functionality. Here we offer to use REF 542*plus*, REF 610 and REA as an arc protection system.

At first it is necessary to define auxiliary power supply. The most widespread case is 220 VDC.

Then define the most complicated protections in this kind of scheme:

Incoming feeders and bus coupler. REF 542*plus*

In order to have best optionality choose REF 542*plus* with maximum binary I/O boards (3), also choose communication board MODBUS RTU, and software license Multi (see detailed info in the TRM).

Type definition code: **76B2NFFF301WB26**

[76]	REF 542*plus*
[B]	Mainboard - basic version
[2]	Power supply - rated voltage 220 VDC
[N]	No analog I/O
[F]	Binary I/O3 - 80…250 V/143V Standard
[F]	Binary I/O3 - 80…250 V/143V Standard
[F]	Binary I/O3 - 80…250 V/143V Standard
[30]	Analog input 3CT+3VT+1CT0.2A+1VT
[1]	Modbus RTU/SPAbus RS485 communication board
[W]	Housing-Wide
[B]	HMI V5 - IEC auxiliary voltage 110-220VDC
[2]	HMI cable 2.5m
[6]	Software Multi License

This protection allows to implement all kinds of logic schemes and to fit all requirements.

The outgoing feeders should be equipped with REF 610. REF 610 has only current analog inputs hence only current protections, but it is possible to implement voltage protections by using dry contacts in the interbay communications from REF 542*plus*. It will work like external trip. So it is possible to make underfrequency load shedding.

Also REF 610 allows to implement arc selective arc protection for outgoing feeders (to control only cable compartments). By using loop sensor we can control arc in the cable compartments of the cubicle and as REF 610 gets the analog signal from current transformers of the cubicle we can achieve selective trip in case of the arc.

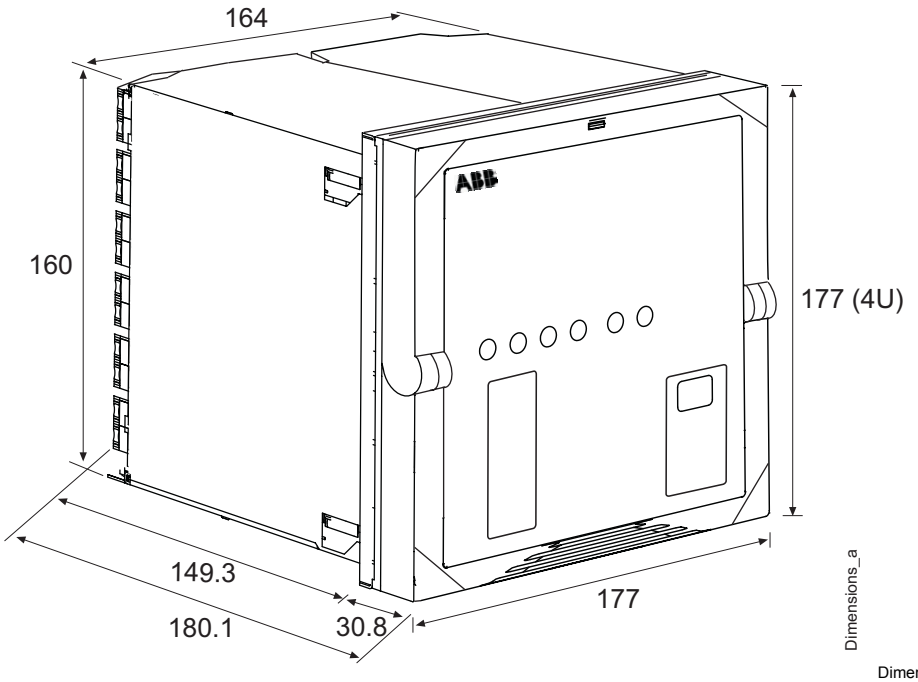
So here we can define the order code for the protection: **REF610C52HCHT**

REF610	type of the protection
C	current release of the device
5	analog input current 5A
2	earthfault current 0.2A (for better sensitivity)
H	auxiliary voltage AC 100/110/120/220/240 V Input voltage, DC 110/125/220/250 V
C	not used
H	input/output binary card extension (3 SO & 3 DI DC 110/125/220/250)
T	communication card RS_485 with input for arc protection

Also it is necessary to specify the length of the loop sensor for the arc protection. They could be the following types:

1.5 m ±3%	1MRS120534-1.5
3.0 m ±3%	1MRS120534-3.0
5.0 m ±3%	1MRS120534-5.0

The length depends on the size of the cubicle and of the mounting track.



Dimensions_a

The dimension of the protection is on the picture above.

Some notes about wiring in the cubicles with REF 610.

To wire properly REF 610 it is necessary to put the following input signals:

- CB position open
- CB position closed
- External trip (if needed)
- CBFP (from downstream cubicle)
- Overcurrent protection blocking from downstream cubicle (if needed)
- There is no inputs for the earthing switch or CB disconnector (truck). So interlocking should be made by dry contacts.
- Output contacts PO1, PO2 and PO3 are used for CB control. It has TCS function. (for TCS application see TRM p.70).
- Output contacts also are used for CBFP and overcurrent blocking the upstream CB (incoming or bus coupler), signaling contacts.

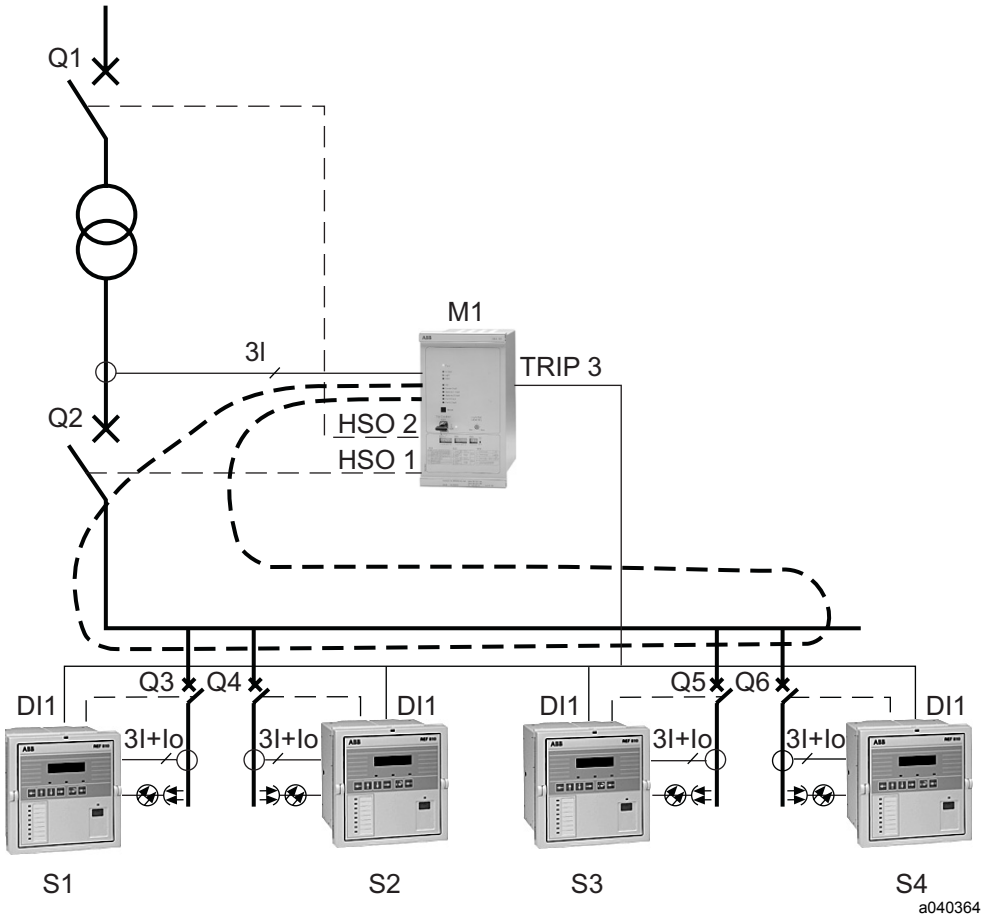
Arc protection

Arc protection: as the main unit for arc protection REA is used. REA is the independent arc protection unit which works separately from usual relay protections. REA takes current analog inputs from incoming CT's and light signal from it is own loop. REA protection unit has one input for loop sensor to control the following compartments:

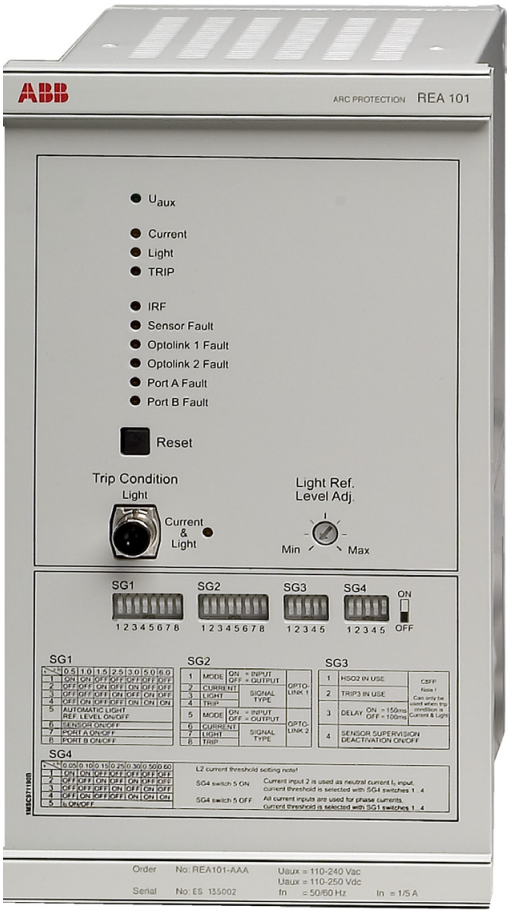
- Cable compartment of the incoming cubicle
- Busbars of the section
- CB compartment of the section

So when the arc occurs in the mentioned above compartments REA trips the incoming CB in order to have selectivity. But it will not trip if the arc occurs in the cable compartment of the outgoing cubicle. REA has 2 trip contacts. One usually trips the CB, second one is usually for signaling purposes.

So the scheme of the arc protection:



Code definition for the arc protection: **REA-101-AAA**



REA 101_right_coi300

It has power supply unit for 110…240 VAC / 110…250 VDC. Also it is necessary to order the loop sensor for the protection. To calculate the length you need the general arrangement plan. Loop has to be wired via busbar compartment and comes back from CB compartment (or vice versa). The total length is double front size of the section plus length of two distances between CB compartment and busbar compartment plus mounting backup (20%).

REA has standard types of the sensors:

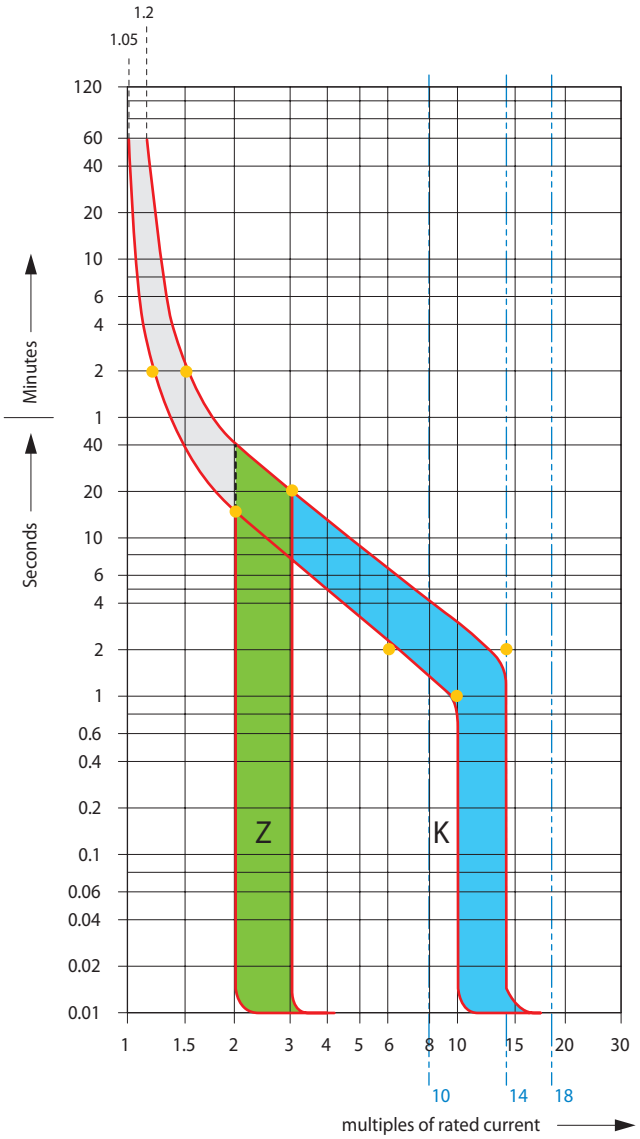
5 M ± 3 %	1MRS 120512.005
10 M ± 3 %	1MRS 120512.010
15 M ± 3 %	1MRS 120512.015
20 M ± 3 %	1MRS 120512.020
25 M ± 3 %	1MRS 120512.025
30 M ± 3 %	1MRS 120512.030
40 M ± 3 %	1MRS 120512.040
50 M ± 3 %	1MRS 120512.050
60 M ± 3 %	1MRS 120512.060

The maximum length of the sensor is 60 m. The loop is constantly controlled.

MCB recommendations for different circuits:

Type of the circuit\voltage	110 VDC	220 VDC
Protection supply	S202-P-K6	S282-UC-K4
Binary inputs	S202-P-K2	S282-UC-K1

MCB should be with K-characteristic (8-12 Inom).



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It is better to separate power supply circuits from binary inputs and signaling circuits.

For more detailed information look at technical reference manuals and application notes of the products.

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