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RD4B

LE12569AA_E 10/20 - 01IM cod.RD4B21.B

Time sensors

They detect the signals, where rise

Protection

They report anomalies in the system, protecting it

Index

The technical documentation for the product is available on **www.imeitaly.com** website in the **"Technical documentation"** area, type in the field **"Technical note code NT871**".

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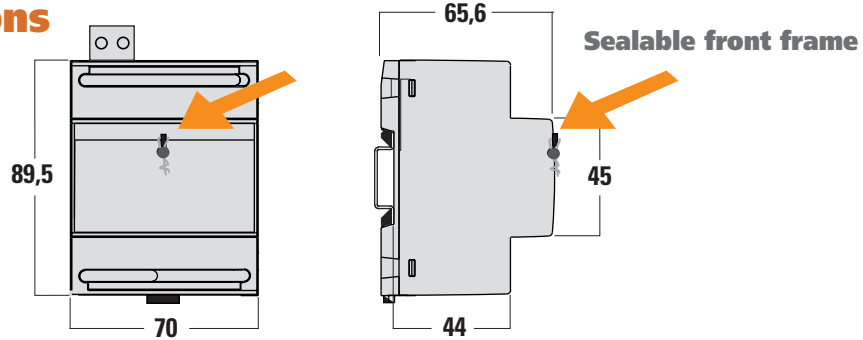
Wiring instructions

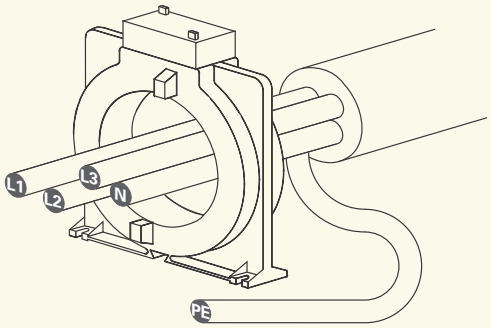
Mounting of this equipment must be carried out just by skilled personnel.
Please make sure that the data on the label (extra supply voltage, frequency, etc.) correspond to the network on which the meter must be connected.
In the wiring scrupulously respect the wiring diagram; an error in connection unavoidably leads to wrong measurements or damages to the device.

- **Mounting position does not affect in any way the proper working**
- **Setting operations (intervention threshold, delay time, etc.) must be carried out with non-fed meter**
- **Scrupulously respect the wiring diagram; an error in connection unavoidably leads to wrong measurements or damages to the device**
- **The attainment of the full functionality for the differential protective system is related to the mounting mode. Therefore we suggest:**
  - To reduce as much as possible the distance between ring current transformer and differential relay
  - For connection, to use shielded or braided cables
  - To avoid placing the ring current transformer-differential relay connection cables in parallel with power conductors
  - To avoid mounting ring current transformer and differential relay near sources of strong electromagnetic fields (big transformers)
  - Just the active conductors cross the ring current transformer **(drawing D1)**
  - Using a shielded cable, the armor must be grounded as per **(drawing D2)**
  - The conductors must be placed in the middle of the ring current transformer **(drawing D3)**

Dimensions



D1



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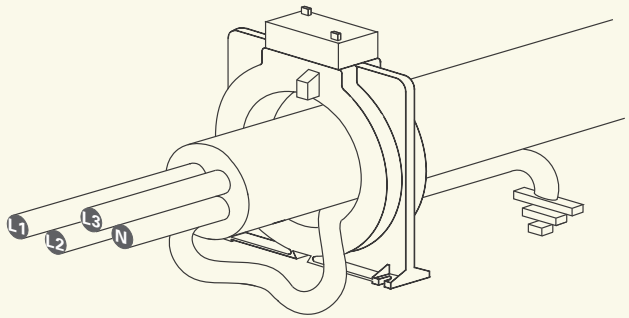

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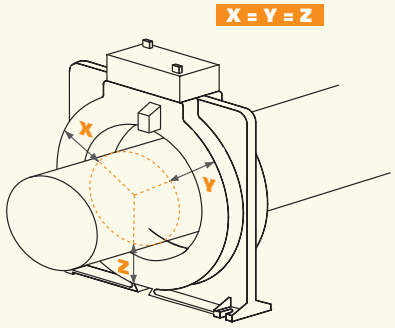

Wiring diagrams

AL.2

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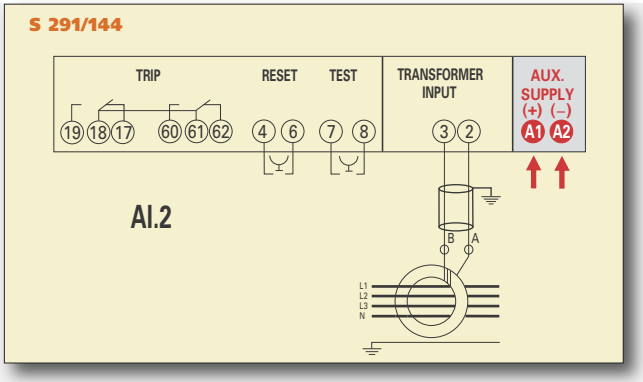

Negative Security

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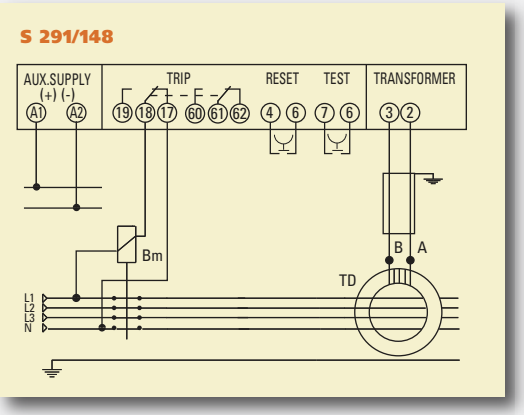

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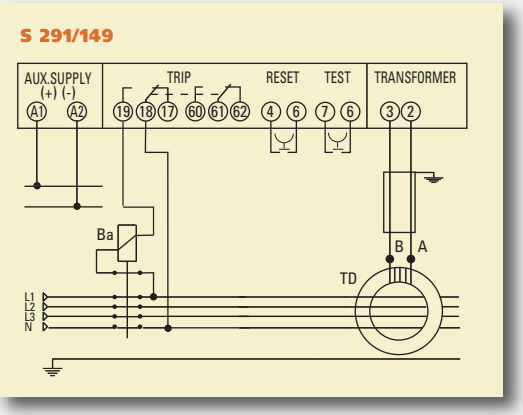

Positive Security

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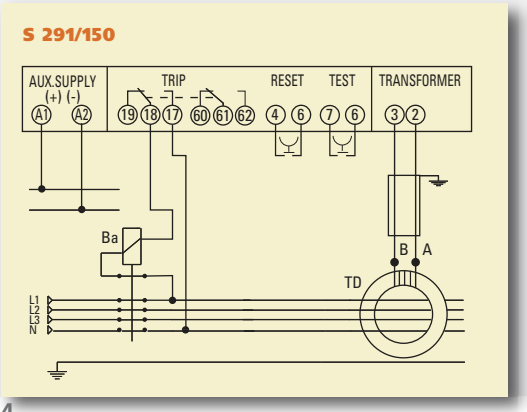

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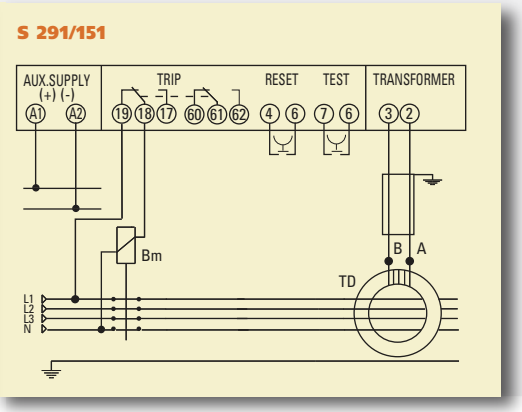

AL.50%

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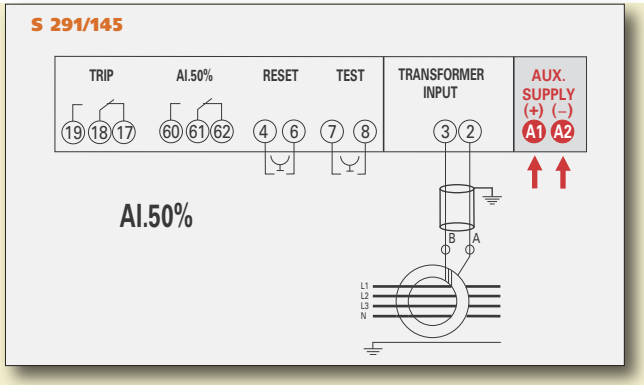
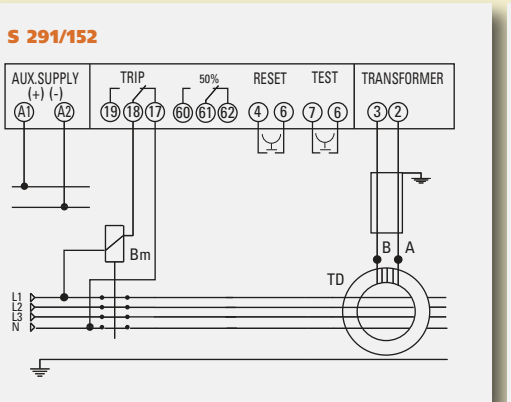


Negative Security

S 291/152



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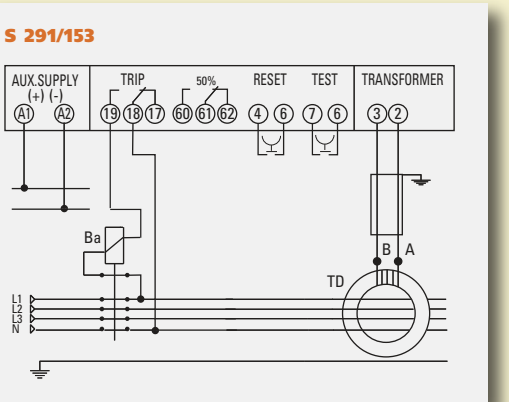

Positive Security

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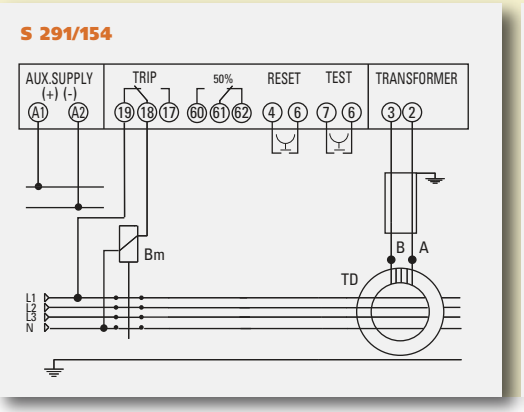

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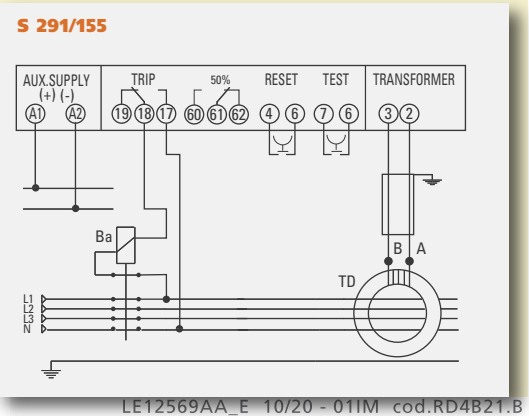

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Ring Current Transformers

Choice of the ring current transformer for differential relays series DELTA depending on the minimum value of the leakage current to be detected and the diameter of the hole in which have to pass all the active conductors of the line to be protected.

Mounting with strong transient currents (max. 6In) according to IEC/EN 60947-2 enclosure M.
In order to avoid ill-timed interventions (caused by transient currents and not by real insulation defects), the standards provide for a test 6 times the rated current; for installations in conformity with what provided by the standard, you have to stick to the values shown in the table

Diameter: transformer inner hole diameter (passing cables/bars)
IΔn min: min. IΔn value which can be loaded on the differential relay linked to the ring current transformer
In: switch or disconnector rated current
The shown values are valid only if the conductors are exactly passing in the middle of the ring current transformer

Ex. choice of the ring current transformer for switch rated current **(In) = 125A**
Respecting the parameters provided by the standard **IEC/EN 60947-2 enclosure M.**
you have to use a transformer model **Del-80 (code TDGC2)**
Current In = 170A - Current 6In = 1020A

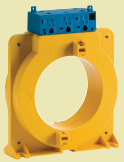
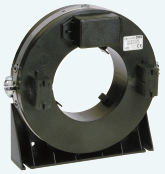
For plants with poor transient currents **(< 6In)** it is possible to use ring current transformers with lower rated currents, following this formula:

$$\frac{\text{6In (value shown in the table)}}{\text{Is (rated current of used switch)}} = \text{Max. allowed overload}$$

Using a transformer **DelA-310 (code TDAC2)** with value **6In = 3780A** with switch with rated current **In = 1250A**

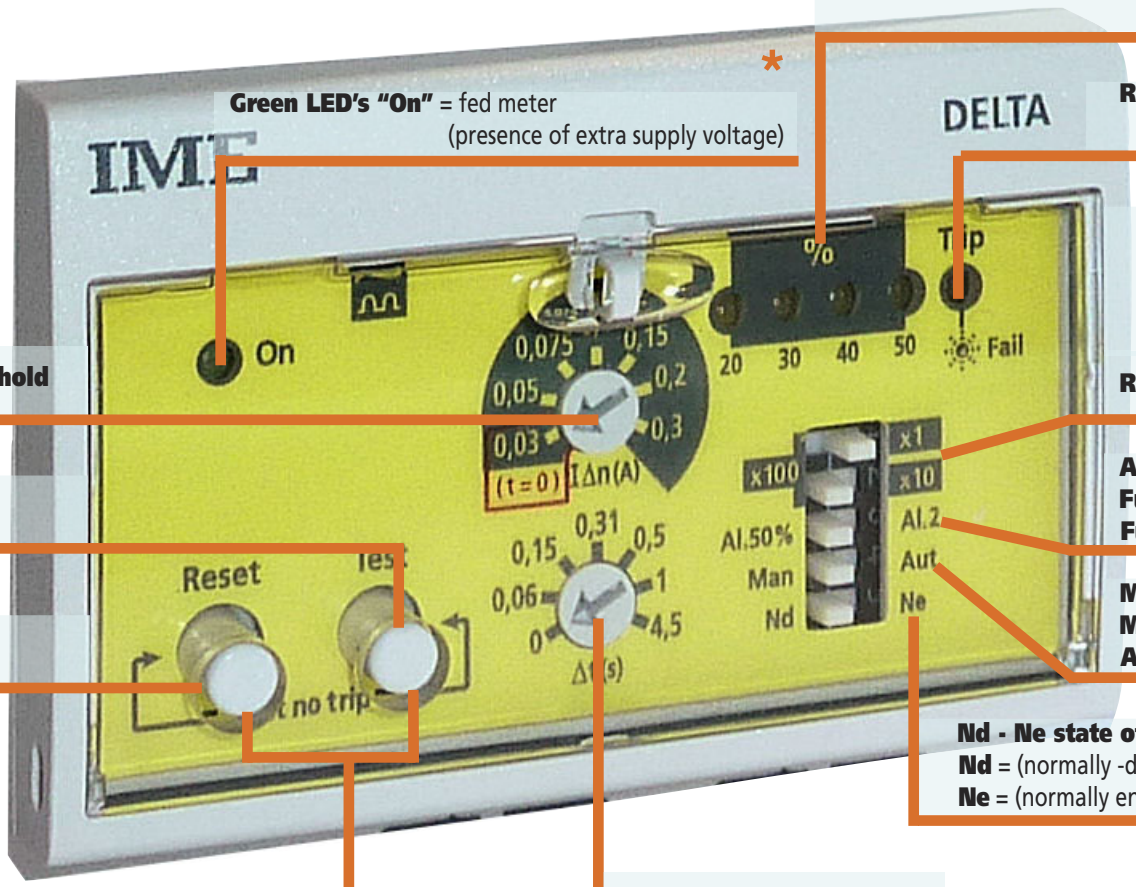
$$\frac{3780A}{1250A} = 3{,}024$$

The highest admitted overload corresponds to 3,024 times the switch rated current


Model	Del-28	Del-35	Del-60	Del-80	Del-110	Del-140	Del-210	DelA-110	DelA-150	DelA-310
Code	TDGA2	TDGB2	TDGH2	TDGC2	TDGD2	TDGE2	TDGF2	TDAA2	TDAB2	TDAC2
Diameter	28mm	35mm	60mm	80mm	110mm	140mm	210mm	110mm	150mm	310mm
IΔn	0,03A			0,05A	0,1A	0,3A		0,5A		1A
In	65A	70A	90A	170A	250A		400A	250A		630A
6In	390A	420A	540A	1020A	1500A		2400A	1500A		3780

Front Frame Description

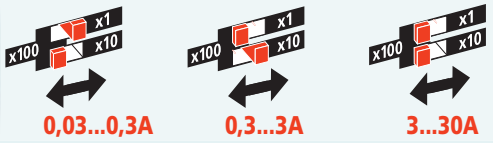


* = LED signalling

* **Yellow LED's "20-30-40-50%"** = IΔn instantaneous value (in percentage of IΔn value)

* **Green LED's "On"** = fed meter (presence of extra supply voltage)

* **Red LED's "Trip / Fail"** = alarm intervention /ring transformer - earth leakage relay connection breakdown



Range selector x1 / x10 / x100

IΔn intervention threhold

AL.50% - AL.2 function selector
Function AL.2 = alarm with double exchange relay output
Function AL.50% = alarm + pre-alarm 50% of selected IΔn

Test push-button

Man - Aut reset selector
Man = Manual
Aut = Automatic

Reset push-button

Nd - Ne state of output relay selector
Nd = (normally -de-energized) negative security
Ne = (normally energized) positive security

Δt (s) intervention time

Test no trip test push button + reset push button

Setting

Intervention point selection

IΔn(A)	0,03	0,05	0,075	0,1	0,15	0,2	0,3
x1	30mA	50mA	75mA	100mA	150mA	200mA	300mA
x10	300mA	500mA	750mA	1A	1,5A	2A	3A
x100	3A	5A	7,5A	10A	15A	20A	30A

Delay time selection

Adjusting range: 0 - 0,06 - 0,15 - 0,31 - 0,5 - 1 - 4,5s

Intervention threshold IΔn	0,03A	0,05...30A					
Loaded delay Δt(s)	0s	0,06s	0,15s	0,31s	0,5A	1s	4,5s
Non-intervention time @ 2IΔn		0,06s	0,15s	0,31s	0,5A	1s	4,5s
Max. delay @ 5IΔn	0,03s	0,13s	0,28s	0,44s	0,7s	1,8s	5,5s

By selecting the intervention threshold on position 0,03, the intervention delay is automatically excluded, irrespective of the position of the range selector x1/x10/x100

To load the intervention threshold IΔn = 30mA with instantaneous intervention, select 0,03 taking care that range selector is on position x1.

Function selection

Function Al.2 = programmable alarm relay

Wiring diagram S291/144

Double throw SPDT output, terminals 17-18-19 / 60-61-62
Negative/conditional (normally de-energized relay) or positive/unconditional (normally energized relay) security selectable by 11 Nd-Ne dip-switch.

Function Al.50% =programmable alarm relay + pre-alarm relay 50% IΔn selected.

Wiring diagram S291/145

Pre-alarm relay Al.50%: 1 SPDT contact, terminals 60-61-62
Negative/conditional (normally de-energized relay) security
Alarm relay: 1 SPDT contact, terminals 17-18-19
Negative/conditional (normally de-energized relay) or positive/unconditional (normally energized relay) security selectable by 11 Nd-Ne dip-switch.

State of relay selection

Nd (normally de-energized)
Negative securaty failing the extra supply voltage, the output relay does not change its state.

Ne (normally energized)
Positive securaty failing the extra supply voltage, the output relay switches in alarm condition. The pre-alarm relay (AL50%-AL-2 function) is always normally de-energized.
Output relay contact range: 5A 250Vac cosφ 1 – 3A 250Vac cosφ 0,4 – 5A 30Vdc.

Test

By pressing **Test** key you can simulate the alarm condition, the LED turning on and the output relay switching.
At the moment of installation it is important to carry out a **Test** (with alarm relay release) to verify the proper working of the protection.

Test no trip

By pressing in sequence **Reset** then **Test** and keeping both pressed you can verify the proper working of the differential relay without provoking the output relay switching (with alarm relay release).

Reset (reset after alarm intervention)
The reset can be selected in manual or automatic mode..

Man (manual)
The state of alarm remains until the operator does not act on Reset key.
The reset is inhibited with continuous differential current > 50% of loaded IΔn

Aut (automatic)
When the alarm has occurred, the device automatically resets, making 10 attempts with different delays (see table).

After 30 minutes from reset, the attempt counter automatically resets.
The reset is inhibited with continuous differential current > 50% of loaded IΔn

Attempts	Delay
1	30s
2	1min
3	2min
4	4min
5	8min
6	16min
7	32min
8	64min
9	128min
10	256min

Visual signalling

On	20	30	40	50	Trip	Condition	
●	●	●	●	●	●	Rest	No supply voltage or device out of order
●	●	●	●	●	●	Monitoring	Differential current < 20% of loaded IΔn value
●	●	●	●	●	●	Monitoring	Differential current 20% of loaded IΔn value
●	●	●	●	●	●	Monitoring	Differential current 30% of loaded IΔn value
●	●	●	●	●	●	Monitoring	Differential current 40% of loaded IΔn value
●	●	●	●	●	●	Monitoring	Differential current 50% of loaded IΔn value
●	●	●	●	●	●	Monitoring	Differential current >70% of loaded IΔn value
●	●	●	●	●	●	Alarm	Differential current >% of loaded IΔn value
●	●	●	●	●	●	Alarm Storage	Switch tripping, no differential current
●	●	●	●	●	●	Reset	Reset in absence of differential current (fault removal)
●	●	●	●	●	●	Alarm	Ring current transformer – differential relay connection breakdown
●	●	●	●	●	●	Test	Pressing of test key
●	●	●	●	●	●	Test no trip	Simultaneously pressing of Test + Reset keys Reset LED turning off or automatically after 30s

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Relay output position

AL.2				AL.50			
Negative Security		Positive Security		Negative Security		Positive Security	
19 - 18 - 17	60 - 61 - 62	19 - 18 - 17	60 - 61 - 62	19 - 18 - 17	60 - 61 - 62	19 - 18 - 17	60 - 61 - 62
19 18 17	60 61 62	19 18 17	60 61 62	19 18 17	60 61 62	19 18 17	60 61 62
19 18 17	60 61 62	19 18 17	60 61 62	19 18 17	60 61 62	19 18 17	60 61 62
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Adder Ring Current Transformers

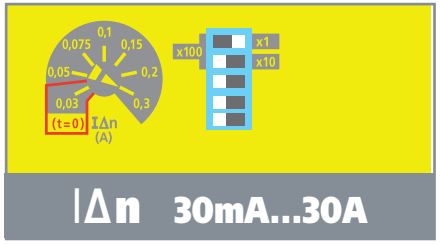
Use of adder ring current transformers

If insulation problems or with the dimensions of the cables/bars of the line to be protected don't allow to use ring current transformers (max. hole diameter 300mm), it is possible to use measuring current transformers with 5A secondary winding and same primary currents, accuracy class 0,5 or 1.

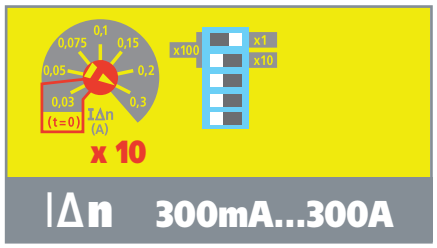
Choice of the adder ring current transformer

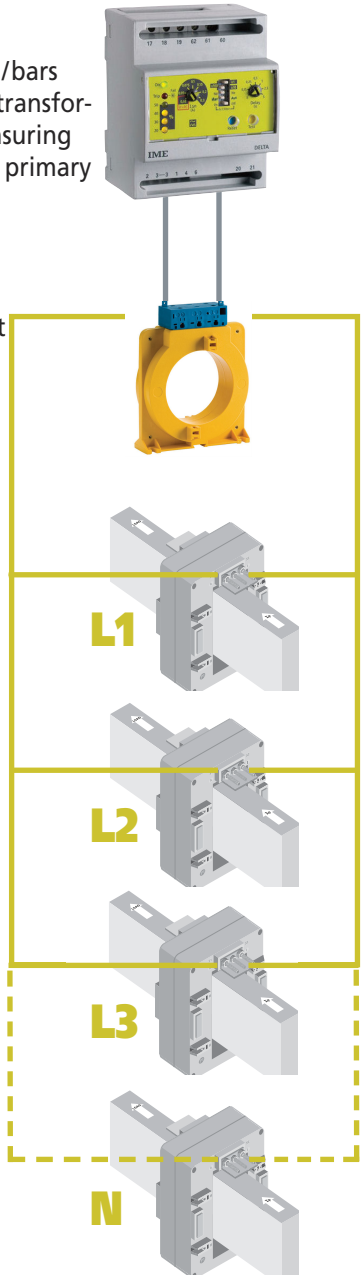
Transformer ratio: according to the used measuring current transformer ratio.
In case of connection with measuring current transformer with ratio higher than 400/5A the IΔn intervention current values which can be selected on the differential relay are multiplied by 10.

CT 100...400A



CT 500...5000A

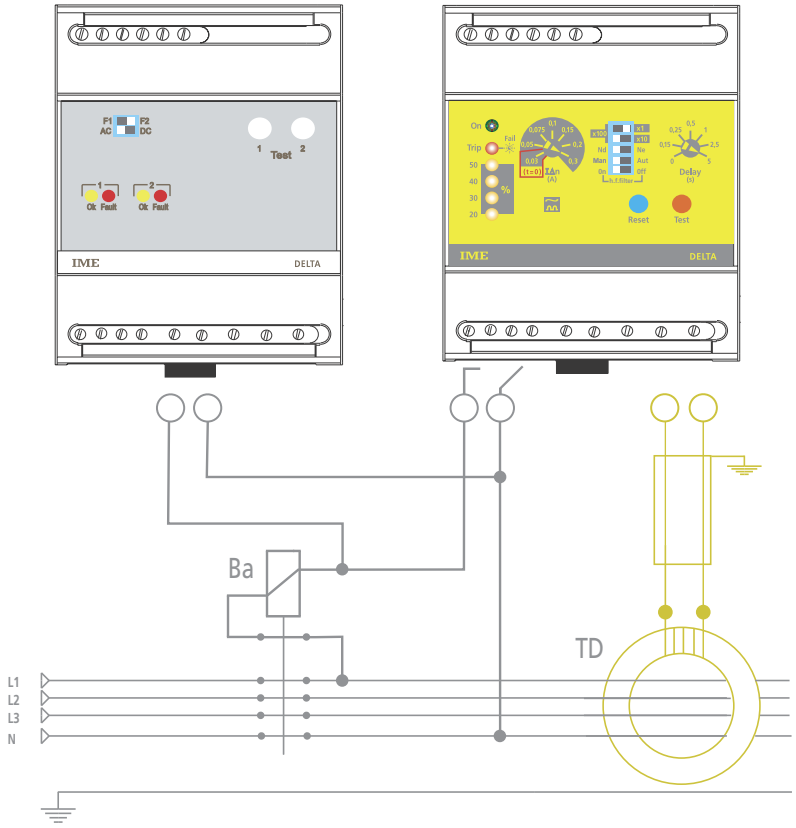




Delta TCS Controller

Switch opening circuit controller with current launch coil, model Delta TCS

It guarantees the reliability of the differential protection by monitoring the efficiency of the release circuit of one or two current launch coil switches and signaling the opening circuit breakdown through alarm display (front LED) and output relay intervention. It can be used for all the applications which use the current launch coil circuit to control its efficiency (for instance safety circuits, acoustic and visual signaling of states of alarm, fire pumps, etc.)



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