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# Delta D4-h



LE12570AA\_E 10/20 - 01IM - cod.RDD421..



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## Time sensors

**They detect the signals, where rise**



## Protection

**They report anomalies in the system, protecting it**



## Communication

**They communicate the measurements carried at a distance**

**Interface different ways of communication**

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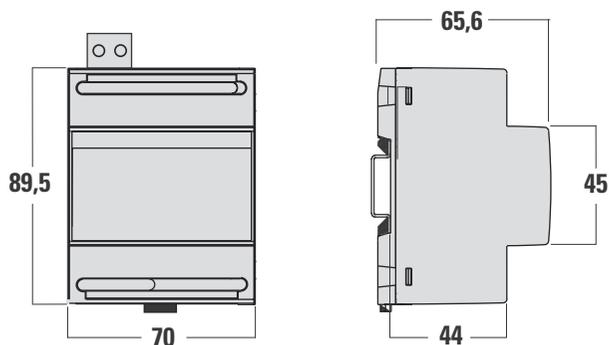
## Wiring instructions

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.

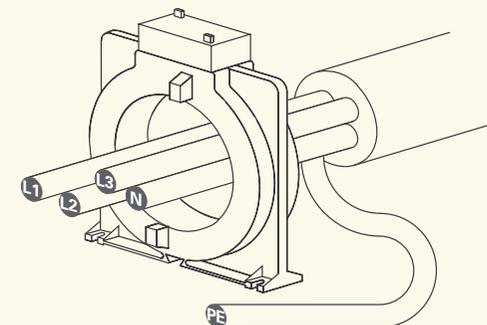
- Mounting position does not affect in any way the proper working
- Scrupulously respect the wiring diagram; an error in connection unavoidably leads to wrong measurements or damages to the device
- The attainment of the full functionality for the differential protective system is related to the mounting 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**)

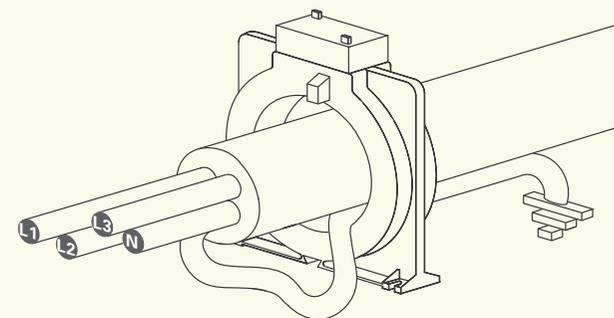
## Dimensions



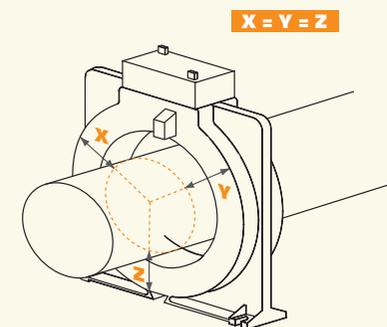
### D1



### D2



### D3



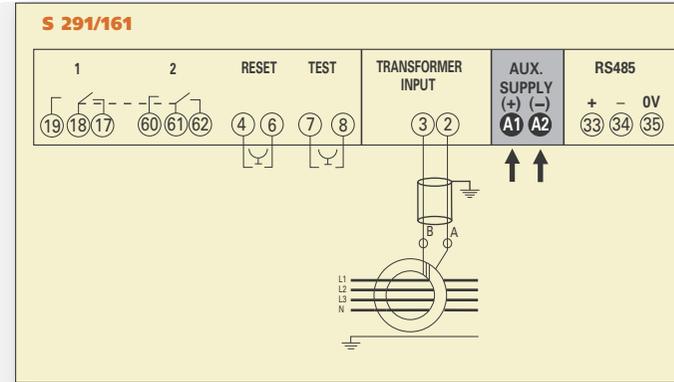


## Wiring diagrams

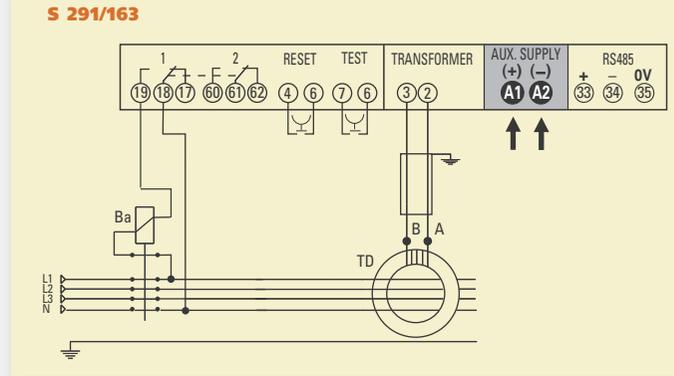
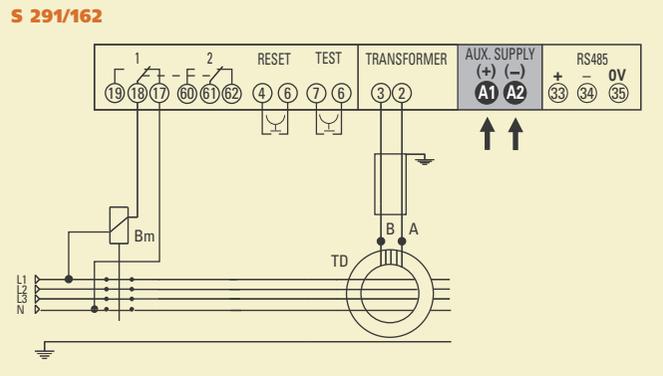
**AL.2 = 100%**

**NOTE:** the wiring diagrams, show the device complete with RS485 interface.  
In case of version without of these features, the corresponding terminals must not be considered.

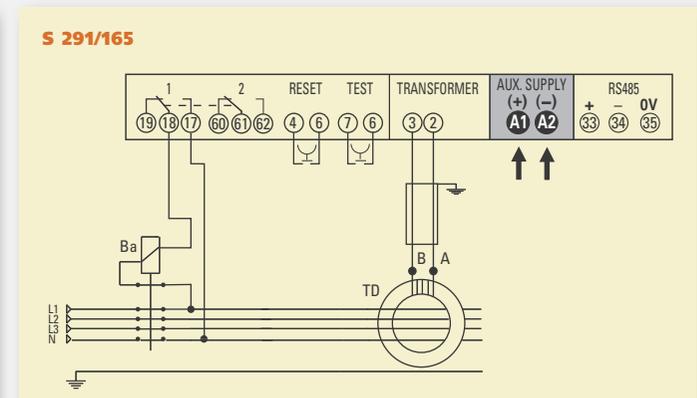
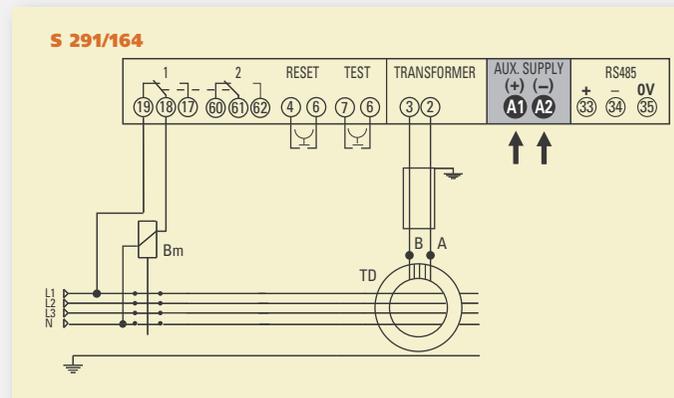
<b>AL.2 = 100%</b>	<b>rEL</b>	
<b>100%</b>	<b>nd</b>	<b>nE</b>
Alarm 2 contacts (2 relay in parallel)	Normally de-energized	Normally energized



**rEL = nd**



**rEL = nE**



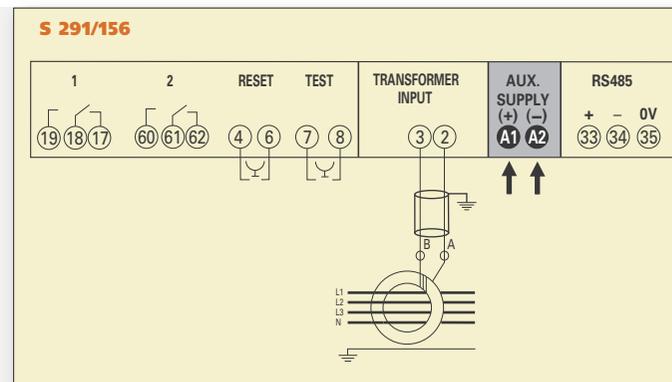


# Wiring diagrams

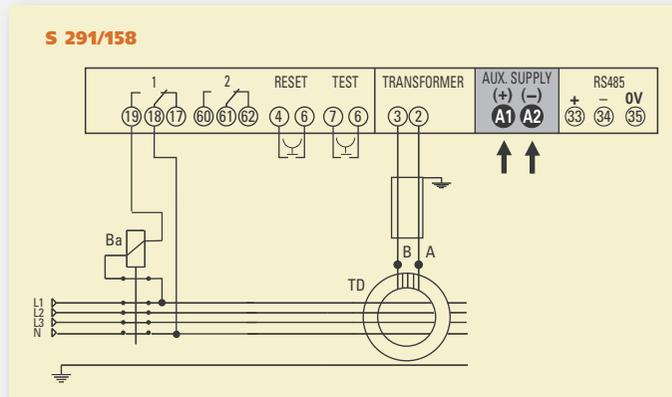
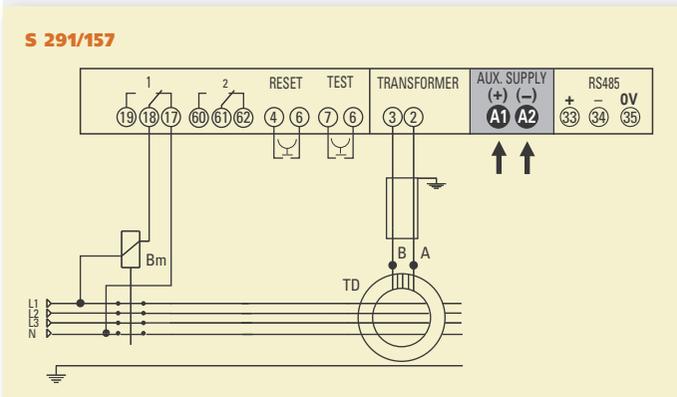
## AL.2 = 20-30-40-50% rEM

**NOTE:** the wiring diagrams, show the device complete with RS485 interface.  
In case of version without of these features, the corresponding terminals must not be considered.

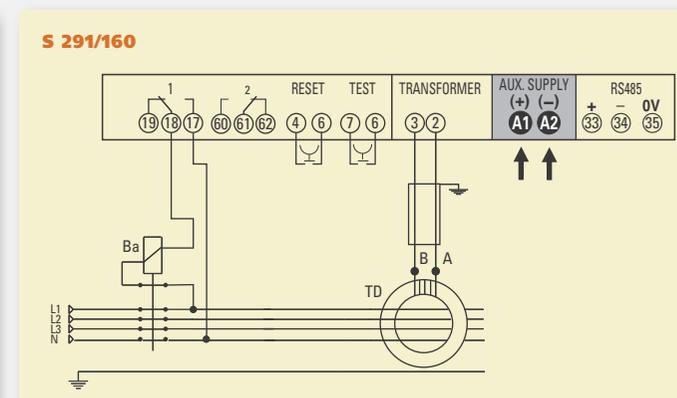
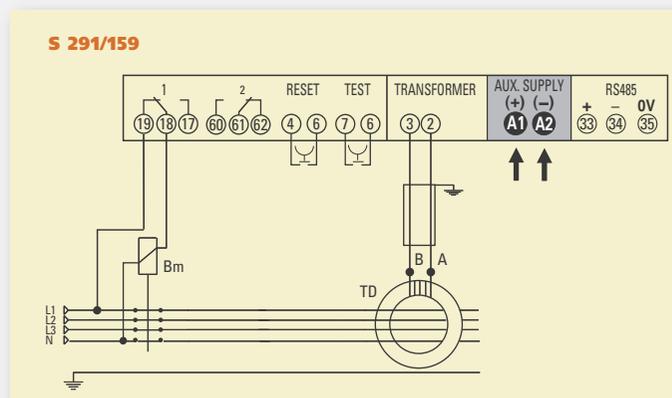
AL.2 = 20-30-40-50% rEL		rEL	
20-30-40-50%	rEM	nd	nE
Alarm relay 1	Pre-alarm relay 2	Remote RS485	Normally energized



### rEL = nd



### rEL = nE



## 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:

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

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

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

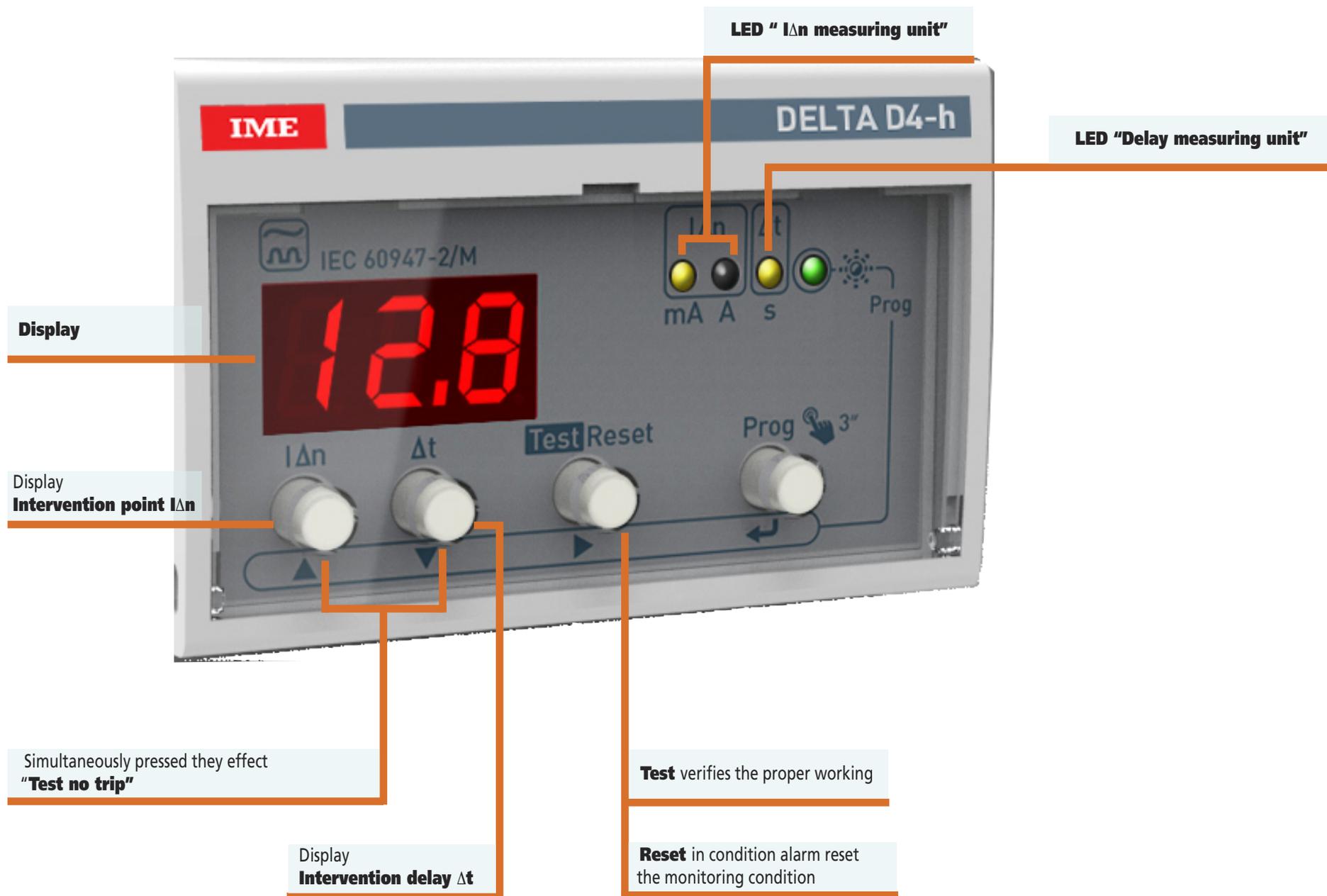
**The highest admitted overload corresponds to 3,024 times the switch rated current**

\* Values measured according to normal load PF = 0.5 - dt = 0 - t = 2 sec.

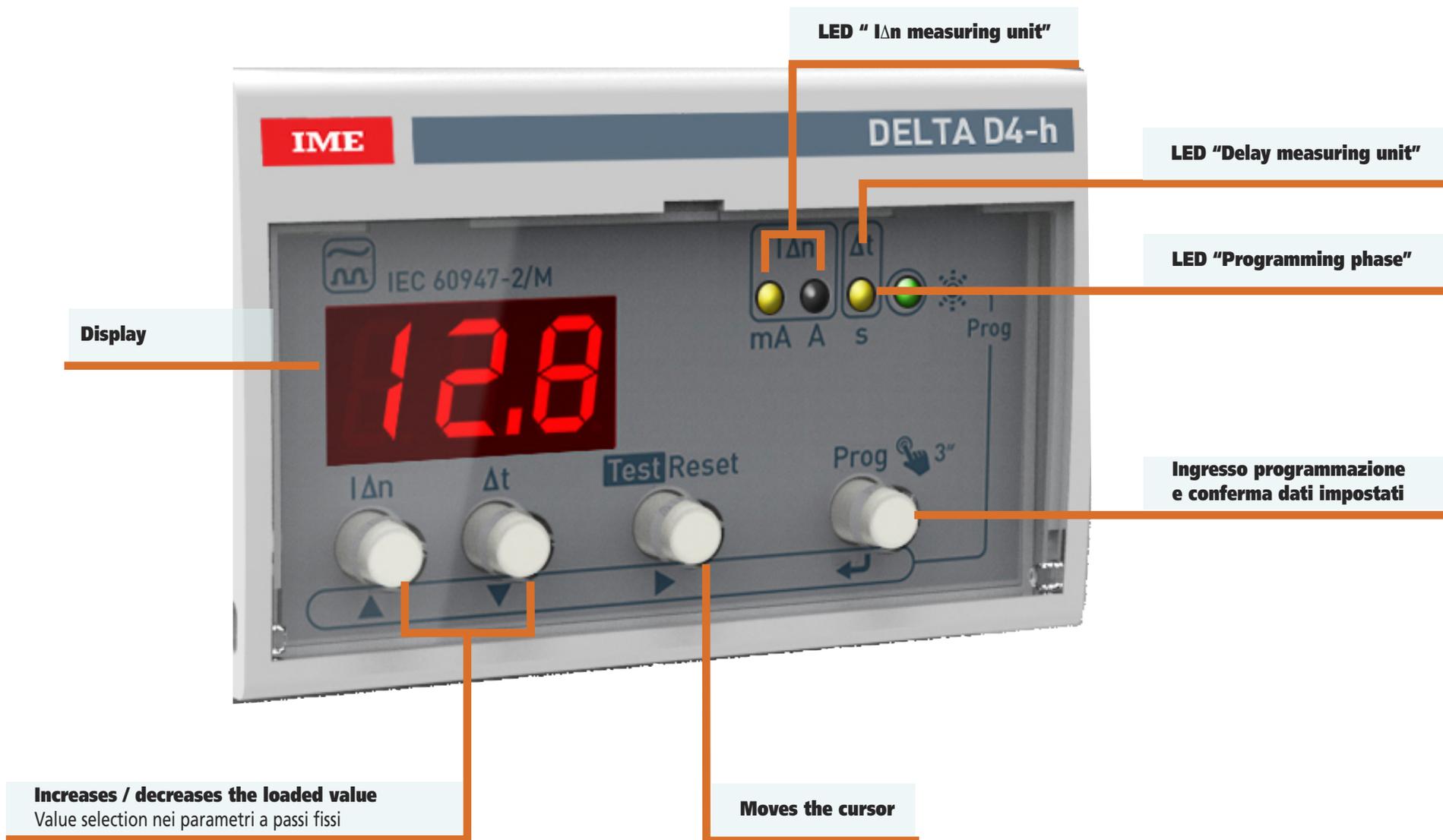
										
Model	Del-28	Del-35	Del-60	Del-80	Del-110	Del-140	Del-210	DelA-110	DelA-150	DelA-310
Code	TDGA2	TDGB2	TDGH2	TDGC2	TDGD2	TDGE2	TDGF2	TDAA2	TDAB2	TDAC2
Diameter	28mm	35mm	60mm	80mm	110mm	140mm	210mm	110mm	150mm	310mm
IΔn *	0,03A	0,03A	0,05A	0,1A	0,15A	0,15A	1A	1A	0,3A	3A
In	65A	70A	90A	170A	250A	250A	400A	250A	250A	630A
6In	390A	420A	540A	1020A	1500A	1500A	2400A	1500A	1500A	3780



## Front Frame Description in monitoring condition



## Front Frame Description in Programming Phase





## Programmable parameters

Feed the meter, terminals **A1** and **A2**

### 1 PAS

#### Access Password

Keep pressed **Prog** key until the page **PAS** key until the page

Press

**000** is shown

Load password **100** and confirm

#### ATTENTION

During the whole programming phase the **LED Prog** is blinking, signaling that the meter is not in monitoring phase but in programming phase.

increases the loaded value

reduces the loaded value

moves the cursor

confirms

### 2 Mod

Press

The meter can be used in **ELR** or **Mon** function.

**ELR** active protection (standard working for earth leakage relay)

**Mon** non-active protection; the meter just works as leakage current display

function selection

confirms

**2.1** In the event the **Mon** function is selected (monitor), **SAV** page appears (setting backup)

Press

**nO** programming is not backed up and you leave the phase or

**YES** programming is backed up

function selection

confirms

The meter just works as display, alternatively showing Mon wording and the  $I_{\Delta n}$  leakage current instantaneous value (together with the turning on of **A** or **mA** metering unit **LED**)

**2.2** If the **ELR** active protection function is selected (earth leakage relay standard working), appears the **SAV** page (setting backup)

function selection

confirms

### 3 Idn

#### Intervention Point Selection

Press

Selectable values: 30mA...30A (19 ranges)

$I_{\Delta n}$	30mA	50mA	75mA	100mA	150mA	200mA	300mA	500mA	750mA
				1A	1,5A	2A	3A	5A	7,5A
				10A	15A	20A	30A		

range selection

confirms

### 4 dt

#### Intervention Delay Selection

Press

Selectable values  $\Delta t(s)$ : 0 – 0,06 – 0,15 – 0,25 – 0,5 – 1 – 2,5 – 5s

value selection

confirms

Set point ( $I_{\Delta n}$ )	30mA	50mA...30A						
Selected delay $\Delta t(s)$	0s	0,06s	0,15s	0,25s	0,5s	1s	2,5s	5s
Non-operating time at @ $2I_{\Delta n}$		0,06s	0,15s	0,25s	0,5s	1s	2,5s	5s
Max. delay @ $5I_{\Delta n}$	0,03s	0,13s	0,22s	0,44s	0,7s	1,8s	3s	5,5s

#### ATTENTION

by selecting the intervention threshold at 30mA (see previous point) the intervention delay is automatically excluded (it is not possible to select other values besides 0s)

### 5 rEL

#### State of Relay Selection

Terminals 17-18-19

Press

Selectable values:

**nd** = negative security (normally de-energized) OR

**nE** = positive security (normally energized)

state selection

confirm



## 6 AL.2 Alarm 2 Terminals 60-61-62 (relay 2)

Press

Selectable values: 20-30-40-50-100-rEM

value selection  
 confirms

**20-30-40-50%** = pre-alarm 20-30-40-50%IΔn (value loaded at point 3)  
wiring diagram **S 291/156**

**State of relay:** negative security (normally de-energized)

The pre-alarm intervention detects a differential current higher than loaded value (%IΔn)

**100%** = alarm with 2 output contacts, just one setting (value charged at point 3)  
wiring diagram **S 291/161**

**State of relay:** negative security (normally de-energized) or normally energized  
positive security according to what programmed for relay 1 (value charged at point 5)

**rEM** = remote control

wiring diagram **S 291/156**

It can be manufactured just with RS485 communication.

Relay is driven via communication

**State of relay:** negative security (normally de-energized)

## 7 rSt

Reset

Press

Selectable values: **MA<sub>n</sub> - AU<sub>t</sub>**

value selection  
 confirms

**MA<sub>n</sub>** = local or remote manual-reset

The state of the alarm lingers on until the operator doesn't act on **Reset** key.  
Reset is inhibited with persistent differential current >50% loaded IΔn.

**Local manual-reset:** front frame key **Test/Reset**

**Remote manual-reset:** external contact make, terminals 4-6.

**AU<sub>t</sub>** = automatic reset

Press

**rEt** = number of attempts: 1...255

increases the loaded value  
 reduces the loaded value  
 moves the cursor  
 confirms

**dEL** = lapse between the attempts: 1...999s

increases the loaded value  
 reduces the loaded value  
 moves the cursor  
 confirms

When the alarm is intervened, the meter automatically resets, making the programmed number of attempts with relevant time interval.

After 30 minutes from reset, the attempt counter automatically resets.

Reset is inhibited with persistent differential current >50% loaded IΔn

## 8 FLt

Filter for harmonic components

Press

Selectable values: **OFF - On**

The filter is automatically disabled with I<sub>n</sub> = 30mA setting (point 3)

value selection  
 confirms

## 9 RS485 communication (where provided)

For the communication as well as the transferred data modes, please refer to the communication Protocol.

**Add** Address

Press

Selectable values: 1...255

increases the loaded value  
 reduces the loaded value  
 moves the cursor  
 confirms



**bAu** transmission speed

Press  $\leftarrow$

Selectable values: 4,8 – 9,6 – 19,2 – 38,4 Kbit/s

▲ ▼ value selection confirms

**PAr** Parity Bit

Press  $\leftarrow$

Selectable values: **non** (none) – **odd** (odd) – **EVE** (even)

▲ ▼ value selection confirms

**tIM** Waiting time before answer

Press  $\leftarrow$

- ▲ increases the loaded value
- ▼ reduces the loaded value
- ▶ moves the cursor
- ◀ confirms

Selectable values: 3...99ms

Press  $\leftarrow$

**10 Programming backup**

**SAV** backup

Press  $\leftarrow$

Selectable values:

- YES** programming is saved (message displayed **Sto**)
- nO** programming is not saved and you leave the phase (message displayed **Abo**)

▲ ▼ value selection confirms

## Display in monitoring condition

### Instantaneous differential current $I\Delta n$

Display indication + metering unit LED (mA or A)



### Value of programmed $I\Delta n$ intervention point

Press  $I\Delta n$

Display indication + metering unit LED (mA or A)



### Value of programmed $\Delta t$ intervention delay

Press  $\Delta t$

Display value + metering unit  $\Delta t(s)$



### Alarm condition signaling

**Alarm intervention:** message **ALL** + relay 1 switching\*

**Pre-alarm intervention:** relay 2 switching

**Ring current transformer-relay connection breakdown:** message Ct + relay 1 switching\*

**Remote control intervention:** relay 2 switching

\*Relay 1 and 2 with configuration AL2 = 100% (2 Relay in parallel)



## Control

### Manual Test

Verifies the proper working of earth leakage relay, included the output relays

#### Local

Front key **Test/Reset**

#### Remote

External contact make, terminals 7-8 (not possible with d.c. extra supply voltage)

After having carried out the **Test**, display alternatively shows **000 / tSt**

### Manual-Reset

#### Local

Front key **Test/Reset**

#### Remote

External contact make, terminals 4 - 6

After having carried out the **Reset**, display alternatively shows **rES / 000**

### Test manuale no Trip

Verifies the proper working of earth leakage relay, without causing the output relay switching

Front key **▲ (IΔn) + ▼ (IΔn)** simultaneously pressed

Displayed message **tnt +** contemporaneous switching on of **4 LED's (ma / A / s / Prog)**

By releasing the keys, if the meter is properly working, message **YES** is displayed

When the test is over, the earth leakage relay automatically returns in monitoring condition

**Test.**

## Programmed parameter modification

If it is necessary to modify a parameter of the meter (once the device is programmed), it is possible to enter the programming menu and directly access the parameter to modify, without having to scroll the whole menu.

Keep pressed the **Prog** key until the page **PAS** is displayed

Press **↵**

Appears **000**

Load **100** and confirm

Using the keys **▲** **↵** scroll the parameters

Press the **Prog** key to enter and modify the programming

With the first pressure of the **Prog** key, it is displayed the value for that parameter actually stored

Modify the parameter, then keep pressed the **Prog** key until appears the wording **SAV**

Press once again **Prog**

The message **nO** is displayed

Act on **▲** to display **YES**

Confirm by pressing **↵**

In any moment of the programming phase, it is possible to exit the menu without modifying any parameter, by keeping pressed the **Prog** key until appears the wording SAV

Press once again **Prog**

The message **nO** is displayed

Confirm by pressing **↵**

The message **Abo** is displayed

The meter leaves the programming menu without modifying any parameter

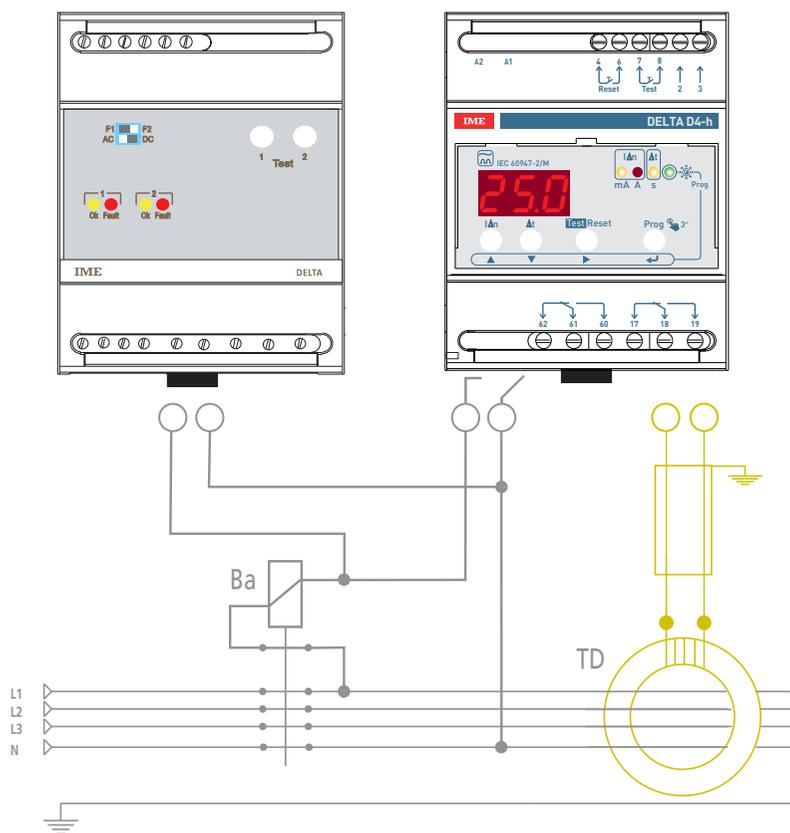
Key	Message	Parameter	Value	Point
▼	<b>Mod</b>	Function	ELR standard - MON monitor	2
▼	<b>Idn</b>	Intervention threshold	30mA...30A	3
▼	<b>dt</b>	Intervention delay	0...5s	4
▼	<b>rEL</b>	State of reay	Normally energized or de-energized	5
▼	<b>AL.2</b>	Alarm 2	Alarm 2 contacts / alarm + pre-alarme / alarm + remote control	6
▼	<b>rSt</b>	Reset	Manual or automatic	7
▼	<b>FLt</b>	Armonic filter	On / Off	8
▼	<b>Add</b>	RS485 address	1...255	9
▼	<b>bAu</b>	RS485 communication speed	4,8 - 9,6 - 19,2 - 38,4 Kbit/s	
▼	<b>PAr</b>	RS485 parity bit	Even - odd - none	
▼	<b>tIN</b>	RS485 waiting before answer	9...99ms	
▼	<b>SAV</b>	Backup		10



## 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.)



## Auxiliary Supply

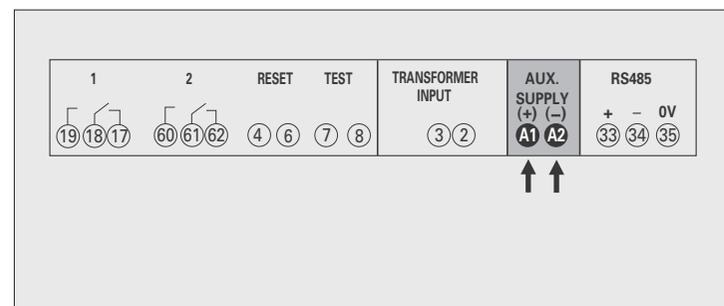
### Terminals A1 and A2

**Auxiliary supply** direct or alternating current electrical supply which is necessary for proper working of the device.

Please verify that the available supply voltage meets the one shown on the data label of the meter (voltage value and any frequency).

Where a double voltage is shown (for instance 20...150Vdc / 48Vac) the meter can be fed with alternating voltage 48Vac or direct voltage 20...150Vdc indifferently.

In case of direct voltage supply please respect the shown polarities **A1 (+)** and **A2 (-)**.



## Factory settings

- PAS** Access password: **100**
- Mod** Function: **ELR**
- Idn** Intervention point: **30mA**
- dt** Intervention delay: **0s**
- rEL** State of alarm Relay: **nd** negative security – normally de-energized
- AL.2** Relay 2 function: **100** alarm with 2 contacts
- rSt** Reset: **MAN** manual
- FLt** Filter: **OFF**

### RS485 Communication (where provided)

- Add** Address: **255**
- bAu** Transmission speed: **9,6** Kbit/s
- PAr** Parity Bit: **non** none
- tIM** Waiting time before answer: **3** ms

## Example of networking

