LIGHTING-FLOW DIMMER STABILIZER.

ILUEST+ MT series

General index

1. Introduction.

1.1. Acknowledgement letter.

We would like to thank you in advance for the trust you have placed in us by purchasing this product. Read this instruction manual carefully before starting up the equipment and keep it for any possible future consult that can arise.

We remain at you entire disposal for any further information or any query you should wish to make.

Yours sincerely.

SALICRU

- ❒ The equipment here described can cause important physical damages due to wrong handling. This is why, the installation, maintenance and/or fixing of the here described equipment must be done by our staff or specifically authorised.
- ❒ According to our policy of constant evolution, we reserve the right to modify the specifications in part or in whole without forewarning.
- ❒ All reproduction or third party concession of this manual is prohibited without the previous written authorization of our firm.

1.2. Using this manual.

The target of this manual or publication is to provide information regarding the safety and to give explanations about the procedures for the installation and operating of the equipment. This manual and rest of support documentation has to be read carefully before installing, location change, setting or any handling of any kind, including the start up and shutdown operation

This equipment can be **installed by qualified personnel** and, with the only help of this manual, **it can be used by personnel with no specific training**.

1.2.1. Conventions and used symbols.

«**Warning**» symbol. Carefully read the indicated paragraph and take the stated prevention measures.

«**Danger of electrical discharge**» symbol. Pay special attention to it, both in the indication on the equipment and in the paragraph referred to this user's manual.

«**Main protective earthing terminal**» symbol. Connect the earth cable coming from the installation to this terminal.

«**Earth bonding terminal**». Connect the earth cable coming from the installation to this terminal.

«**Notes of information**» symbol. Additional topics that complement the basic procedures.

Preservation of the environment: The presence of this symbol in the product or in their associated documentation states that, when its useful life is expired, it will not be disposed together with the domestic residuals. In order to avoid possible damages to the environment, separate this product from other residuals and recycle it suitably. The users can contact with their supplier or with the pertinent local authorities to be informed on how and where they can take the product to be recycled and/or disposed correctly

1.2.2. For more information and/or help.

For more information and/or help of your specific unit, request it to our Service and Technical Support (**S.T.S.**).

1.2.3. Safety instructions.

- Compliance as regards to "Safety instructions" is mandatory, being the user the legal responsible regarding to its observance and application

1.2.3.1. To keep in mind

- The local electrical regulations and the different restrictions of the client's site, can invalidate some recommendations included in the manuals. When discrepancies exist, the user has to comply the local regulations.
- Do not install the equipment in corrosive, wets, dusty environments or in those ones that exceed the environment limits of the product and never outdoors, less those ones designed for it specifically.
- Do not obstruct the cooling grids by entering objects through themselves or other orifices.
- Leave a minimum space of 15 cm in the equipment peripheria for air flow cooling.
- The location will be spacious, airy, away from heat sources and with easy access.
- A part from the cooling space quoted previously, an additional 75 cm will be left for an eventual intervention of the **(S.T.S.)** around the equipment, considering that if it means to move the equipment, the connected cables will have the needed clearance.
- Place the equipment the closest to the power supply and loads to be fed.
- Do not put materials over the equipment or parts that obstruct the correct visualization of the synoptic.
- Do not clean the equipments with products that are abrasive, corrosive, liquids or detergent. To clean the equipment, wipe over a damp cloth and then dry it. Avoid sprinkling or spillage that could enter through the slots or cooling grids.
- Avoid the direct sunlight.

1.2.3.2. General safety warning

- All connections of the equipment, will be done with no power supply and the switch/es on rest, position «OFF».

-  Inside the equipment there are dangerous voltages, do not open the enclosure, the access to it has to be done by authorised and competent staff. In case of maintenance or fault, consult to the closest **S.T.S.**.
-  The protection earth connection must be connected, assuring that it is done before connecting the input voltage.
- Installation of hardwired equipments has to be done by qualified personnel in electrical installations of low voltage.
- The used cross cable sections to supply the equipment and loads, will be according to the nominal current stated in the nameplate label of the equipment, and respecting the Low Voltage Electrotechnical Regulations.
- All the electrical power supply cables of the equipment and loads, have to be fixed to non-movable parts, otherwise they will exposed to strain-relief.
-  Keep in mind that if the equipment has manual Bypass, mains will be present and if the input circuit breaker is switched "On", there will be output voltage either on the stabilizer operating mode, or over the bypass (failure of the own stabilizer). Put danger warning and/or emergency switches if the Safety Standards requires them in your particular installation.
- The stabilizers have to be considered as autotransformers or outgoing distribution lines in the point of view of electrical installation and safety. These devices are «transparent» to the input voltage.
- It is essential to connect the Neutral to the foreseen terminal at the input in three phase equipments.
- In three phase stabilizers and power line conditioners with independent regulation per phase, where unbalanced voltages in the mains or loads exist, the phase to phase voltage at the output could not be the same; nevertheless the stabilization phase to neutral will be preserved.
- Indoor assembling products **(T)** are designed for to be installed by a predetermined group of persons.
  - ❒ Its installation has to be projected and executed by qualified staff, who will be the responsible to apply the regulations and safety and EMC norms that regulates the specific installations where this product is destined to.
- Take the following preventive measures, before manipulating any terminal strip:
  - ❒ Disconnect the respective protection mechanisms (circuit breaker switches or fuses).
  - ❒ Use tools with isolated handles.
  - ❒ Wear rubber gloves and shoes.
  - ❒ Never manipulate the connection cables or inside the equipments with voltage and in case the conditions would require it, it has to be done by extreming the safety measures and taking off any metal object, which is in contact with the body like rings, watches or other hang objects.
  - ❒ Do not place metal objects inside the batteries, although you are working with no voltage. Risk of short-circuit when feeding the power supply.
  - ❒ Never manipulate with your hands or through conducting objects, do not short the terminal block.

2. Quality and standard guarantee.

2.1. Declaration of the management.

Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard **ISO 9001** and **ISO 14001** and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, through:

- The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.
- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

2.2. Standard.

The **ILUEST+ MT** product is designed, manufactured and commercialized in accordance with the standard **EN ISO 9001** of Quality Management Systems. The CE marking shows the conformity to the EEC Directive by means of the application of the following standards:

- **2006/95/EC** Low voltage directive.
- **2004/108/EC** Electromagnetic Compatibility directive (EMC).

In accordance with the specifications of the harmonized standards. Standards as reference:

- **UNE-AENOR EA0032-2007**: Test report of the lighting flow dimmer stabilizers. General and safety requirements of the "Laboratorio Central Oficial de Electrotecnia (LCOE)", report nr 20080710300.
- **IEC 62041**: Electromagnetic Compatibility (EMC).
- **UNE-AENOR EA0033-2007**: Test report of the lighting flow dimmer stabilizers. Operating requirements of the "Laboratorio Central Oficial de Electrotecnia (LCOE)", report nr 200807100299.

2.3. Environment.

This product has been designed to respect the environment and has been manufactured in accordance with the standard **ISO 14001**.

Equipment recycling at the end of its useful life:

Our company commits to use the services of authorised societies and according to the regulations, in order to treat the recovered product at the end of its useful life (contact your distributor).

Packaging: To recycle the packing, follow the legal regulations in force.

3. Presentation.

3.1. Views and legends.

3.1.1. Views of the equipment.

References or abbreviations between bold brackets **( )** that are shown in the contents of this document, make mention to the connection, manoeuvring, indication and auxiliary parts, that the electrical fitter and/or user has to know, including the standardised options. These references together with their function are log in section 3.1.3 and referred to figures 1 to 13.

Figures from 1 to 3 and from 5 to 8 show the front views of the **ILUEST+ MT** equipments with indoor format **(T)**, single or three phase depending on the power range, with or without protection covers against direct contact **(TF*)** and with the possible options already assembled from factory.

For outdoor equipments **(I)**, basically consider that it is an indoor equipment **(T)** built in an enclosure with protection degree IP54. For this reason, figures 9 and 10 show the views of front door/s **(Pf)** closed only, because the internal view corresponds to the indoor model **(T)**.

With reference to the assembling of equipments with options, it is possible to manufacture any of the versions, nevertheless some structures have been designed according to the market, so it is only described the standard ones. Basically, two sets have to be considered, internal and external options:

- Internal options. Individuals or combined, attending to the compatibility among them: manual Bypass, separate automatic Bypass (BA1) per phase (BA3) and lighting arrestors. Designed from factory for the following assembling:
  - ❒ Single phase equipments up to 20 kVA or three phase ≤ 45 kVA (see figures 2 and 5 respectively). A metal case is added with the options, which is mechanically fixed from factory to the own base of **ILUEST+ MT**.
  - ❒ Three phase equipments from 60 and 80 kVA (see figures 7 and 8). The standard equipment and options will be assembled in a metal case with higher format (same enclosure as the standard 100 kVA models).
  - ❒ 100 kVA three phase equipments (see figures 7 and 8). Due to the capacity of the case of the standard model, the options will be installed in the own enclosure.
- External options. Electronic card with digital I/O.
  - ❒ This communication card, is supplied inside a small metal case (see figure 13). This case has to be fixed mechanically by using one of the two foreseen solutions:
    - – With the included supports **(SGD)**, to fix it in a DIN rail.
    - – Or, by means of the 4 drills **(t_7)** to fix it a to a support or to the wall directly.

Figures 4 and 11 are complementary and they correspond to the view of the control panel with LCD and control cards BM535* / BM536* /BM542* respectively.

Figure 12 corresponds to the own view of the card with digital I/O.

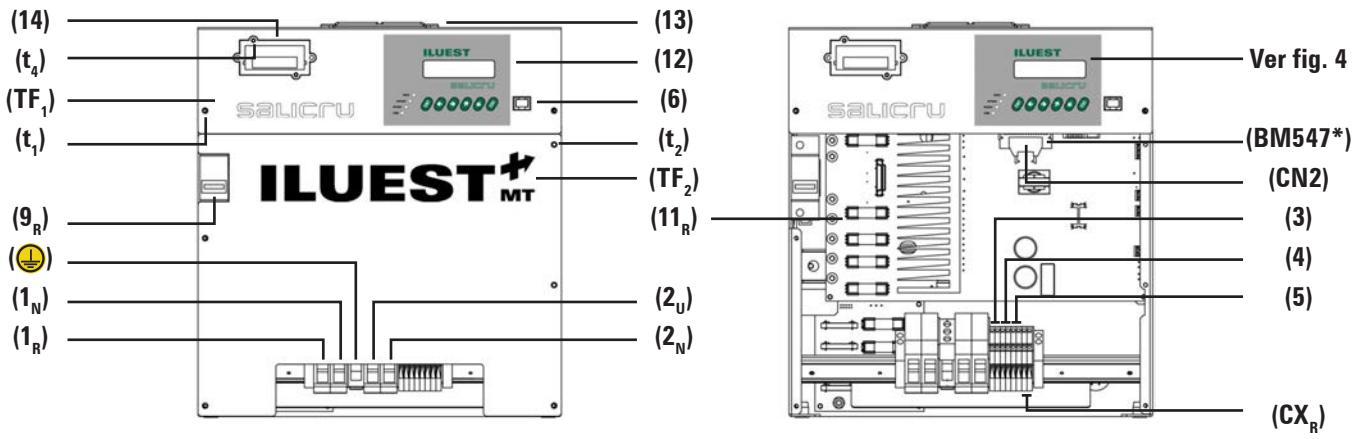


Fig. 1. Single phase **ILUEST+ MT (T)** view up to 20 kVA.

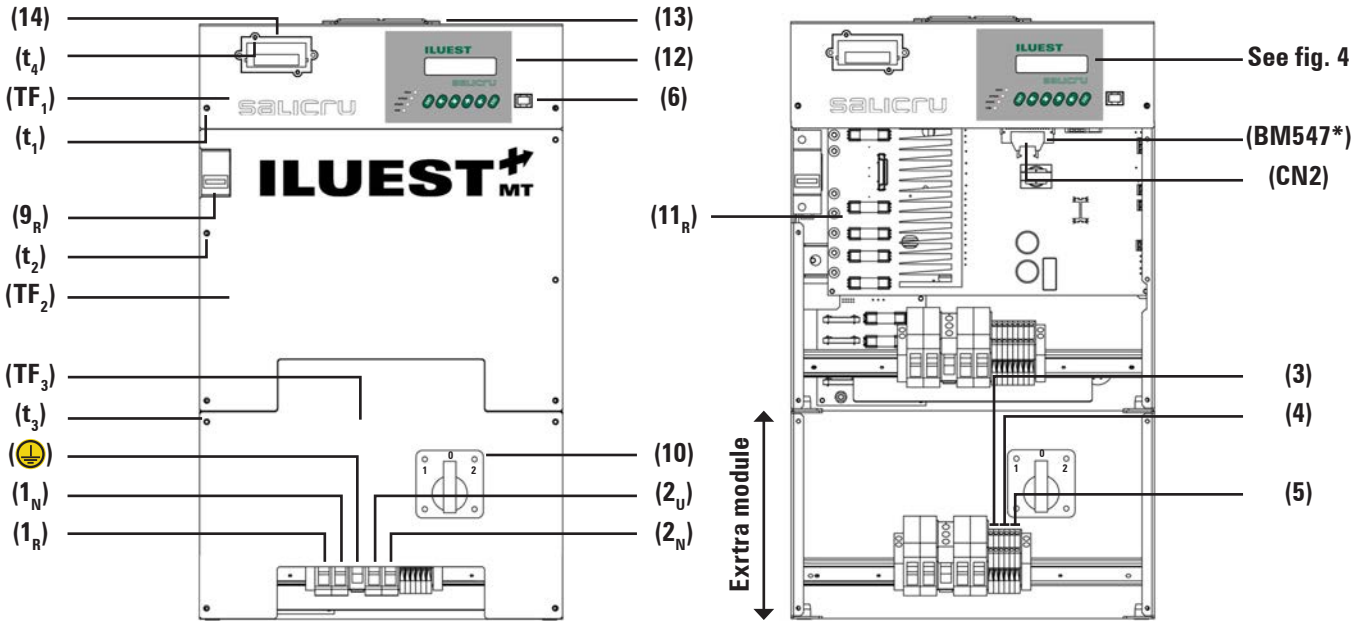


Fig. 2. Single phase **ILUEST+ MT (T)** view up to 20 kVA, with the option module.

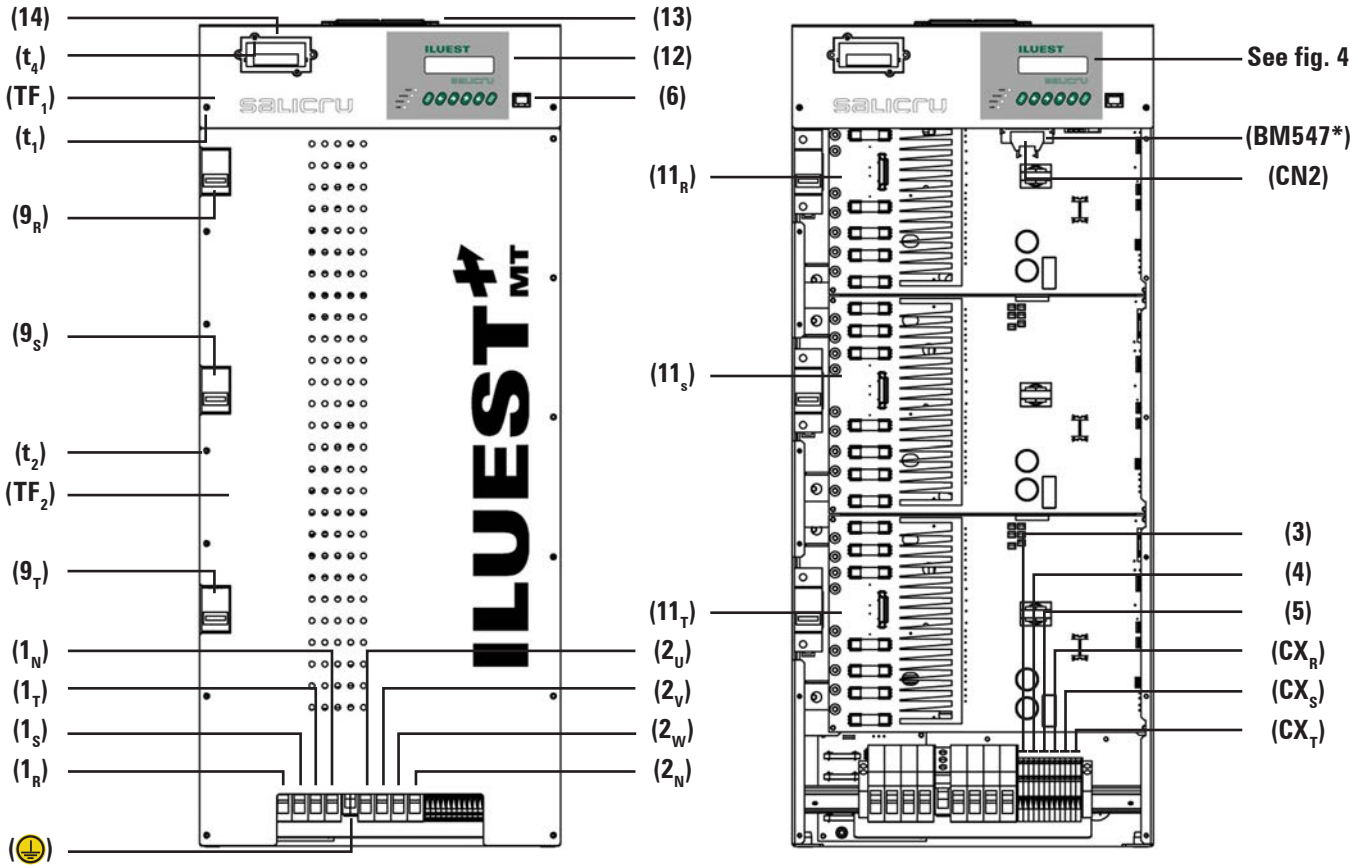


Fig. 3. Three phase **ILUEST+ MT (T)** view up to ≤ 45 kVA.

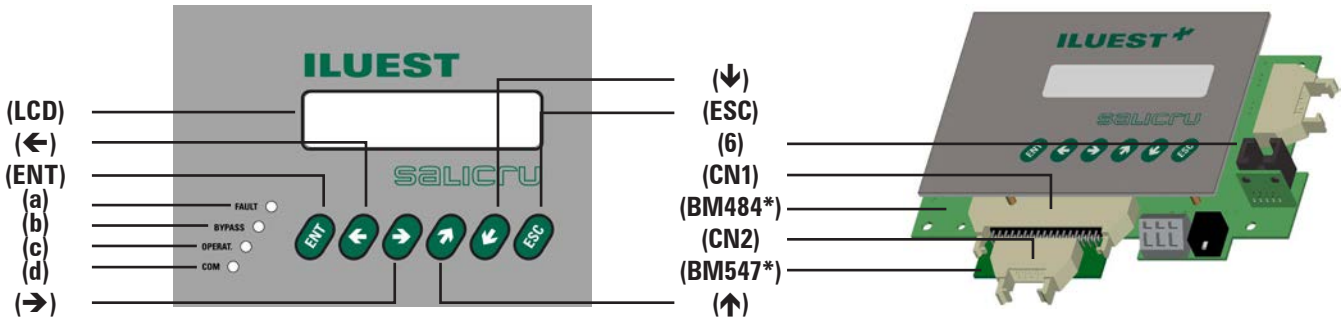


Fig. 4. View of the control panel with LCD **(12)**.

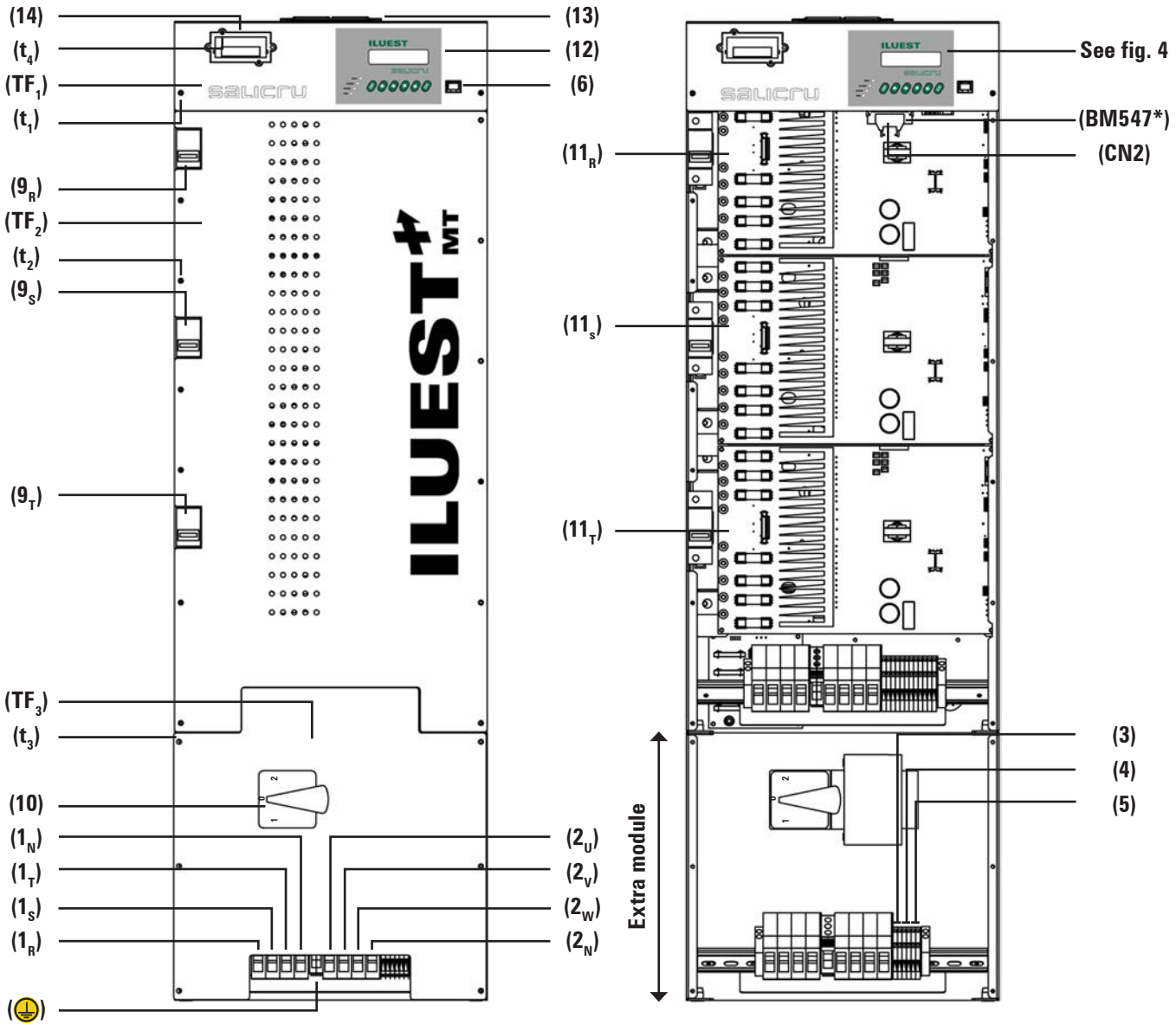
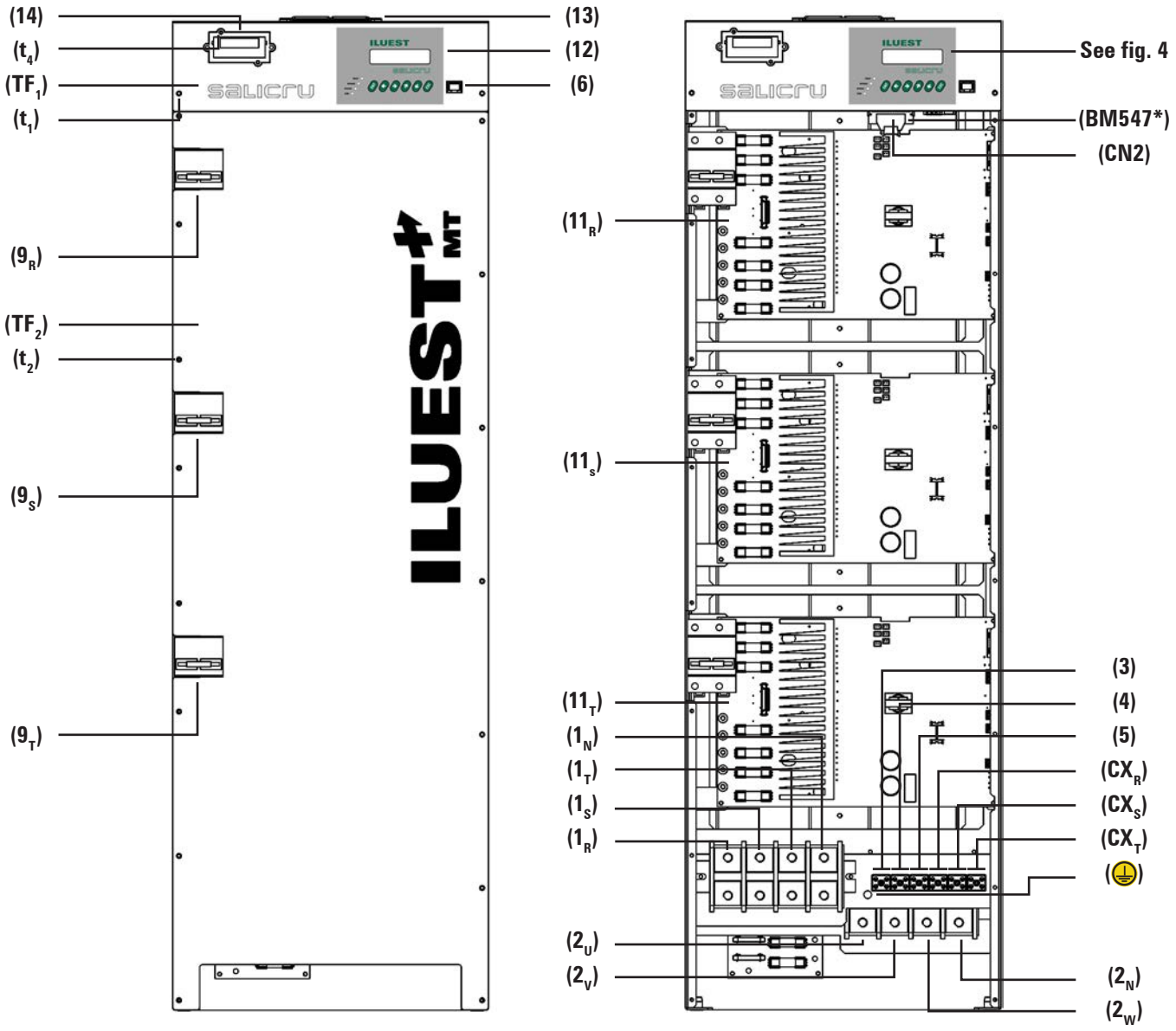


Fig. 5. Three phase **ILUEST+ MT (T)** view up to ≤ 45 kVA, with option module.



60 and 80kVA **ILUEST+ MT** do not have any module for the options as it happens in the lower power equipments . In case of requesting an equipment of this power with any standardised option, it will be supplied assembled in the higher enclosure size (see figure 7 and 8).

Fig. 6. Three phase **ILUEST+ MT (T)** view of 60 and 80 kVA.

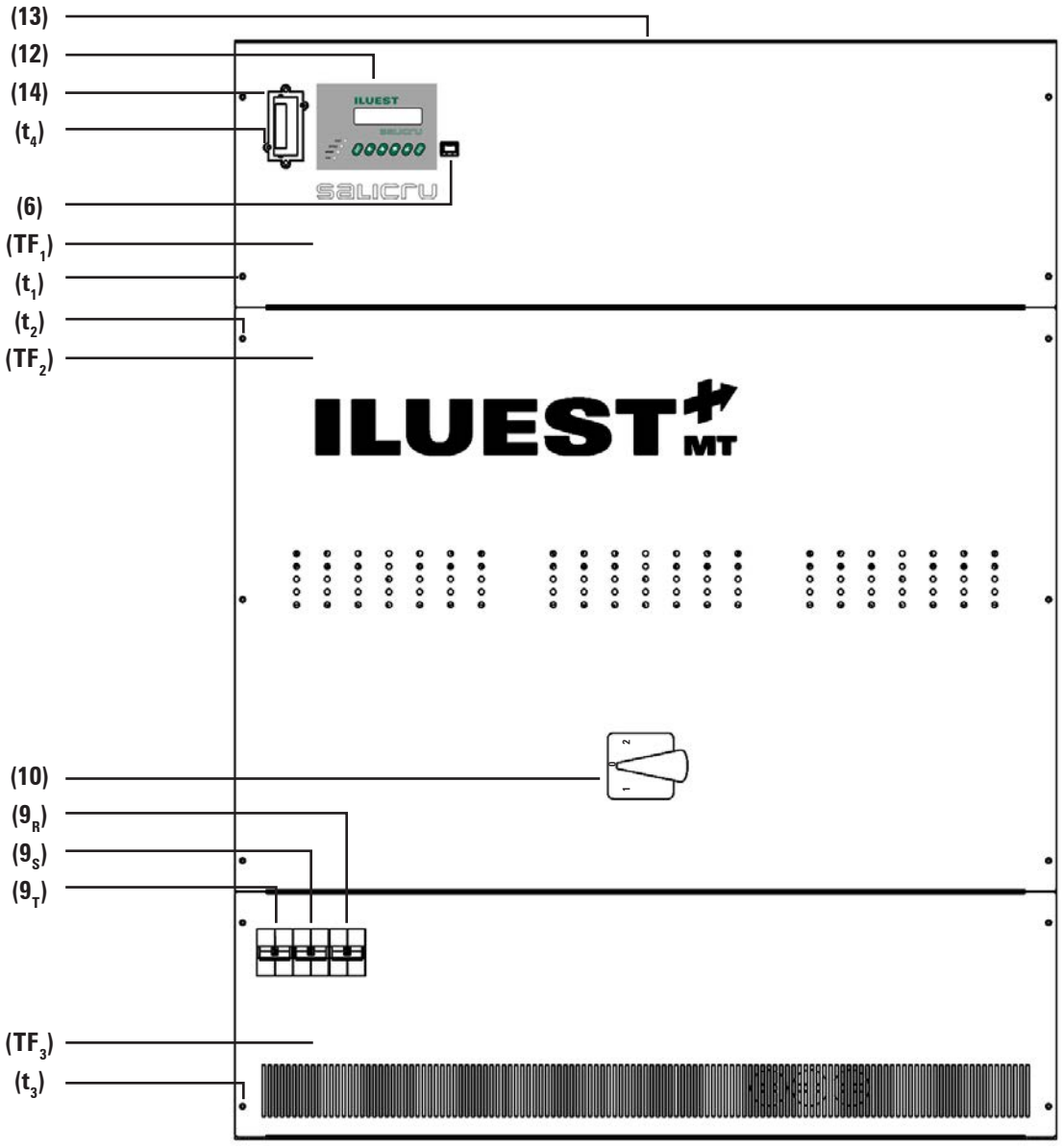


Fig. 7. Three phase **ILUEST+ MT (T)** view of standard 100 kVA and from 60 to 100 kVA with options and front cover **(TF_3)** fitted in.

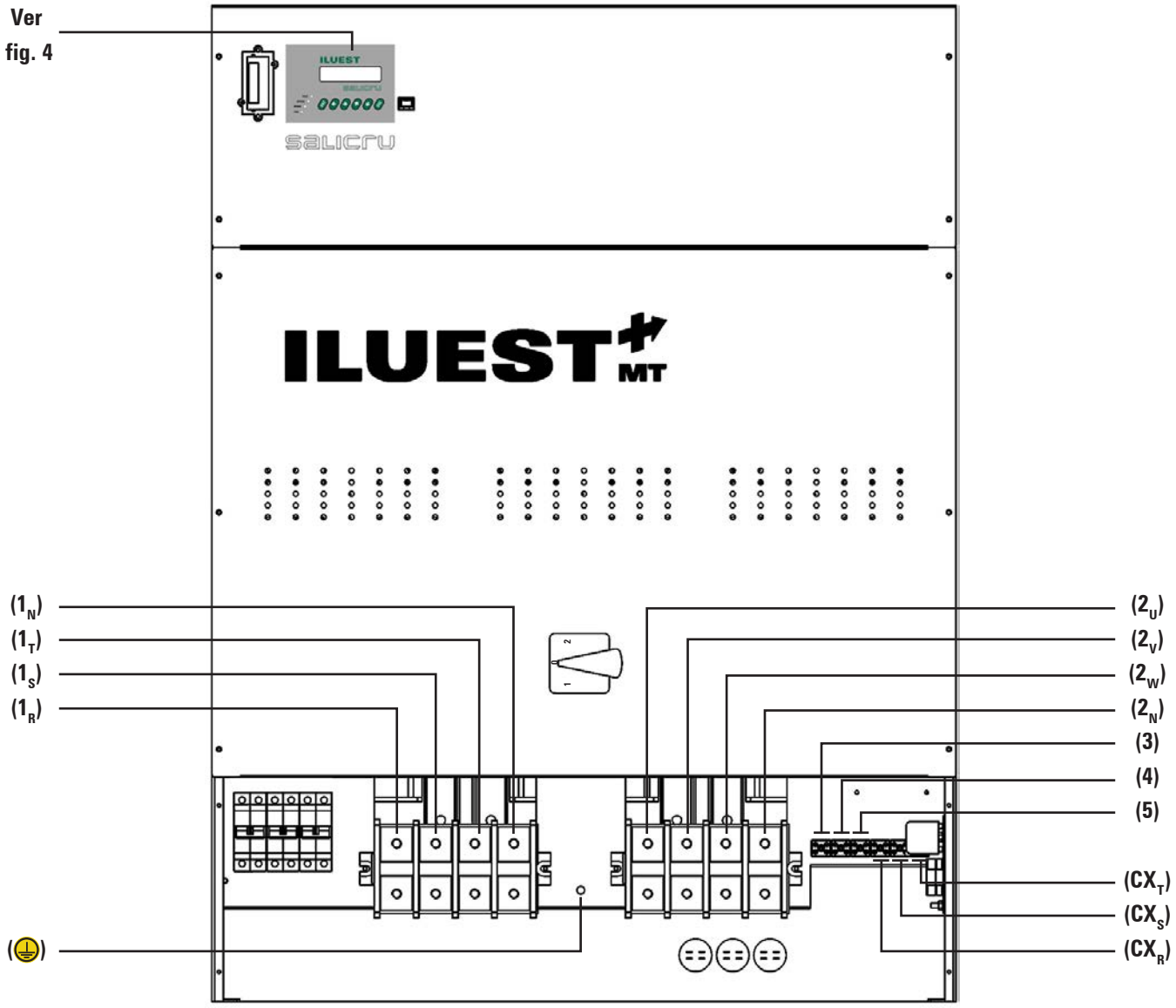


Fig. 8. Three phase **ILUEST+ MT (T)** view of standard 100 kVA and from 60 to 100 kVA with options and front cover **(TF_3)** removed.

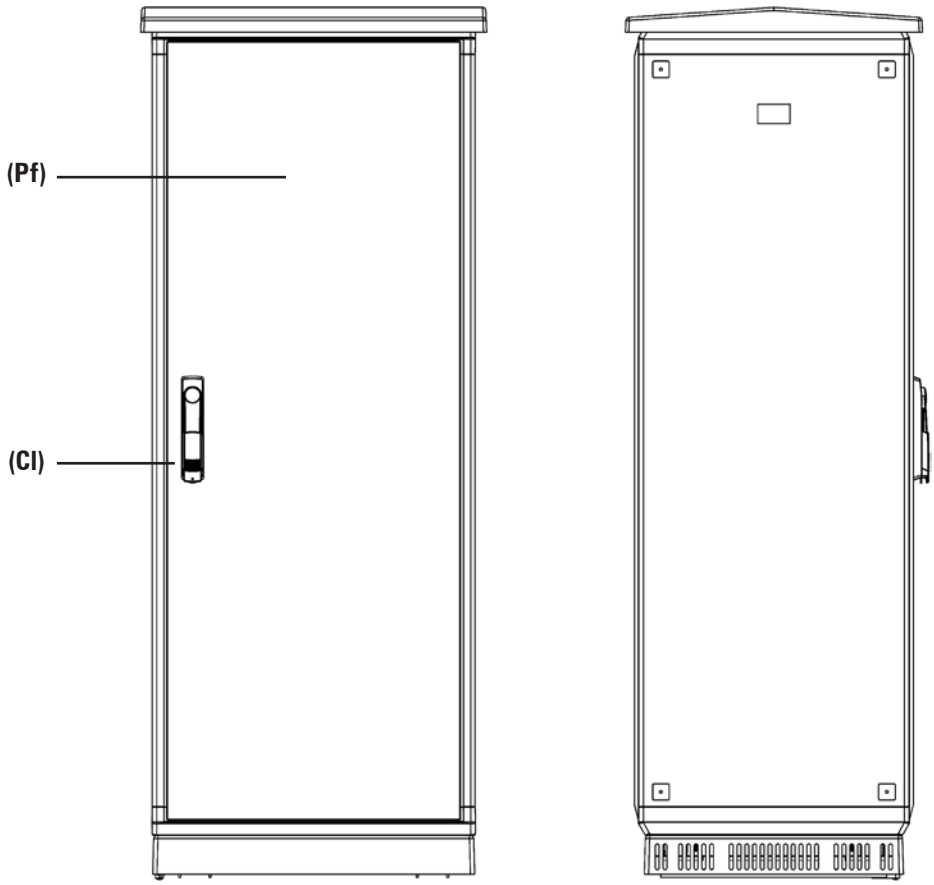


Fig. 9. **ILUEST+ MT (I)** view for single and three phase models ≤ 45 kVA, including the option module.

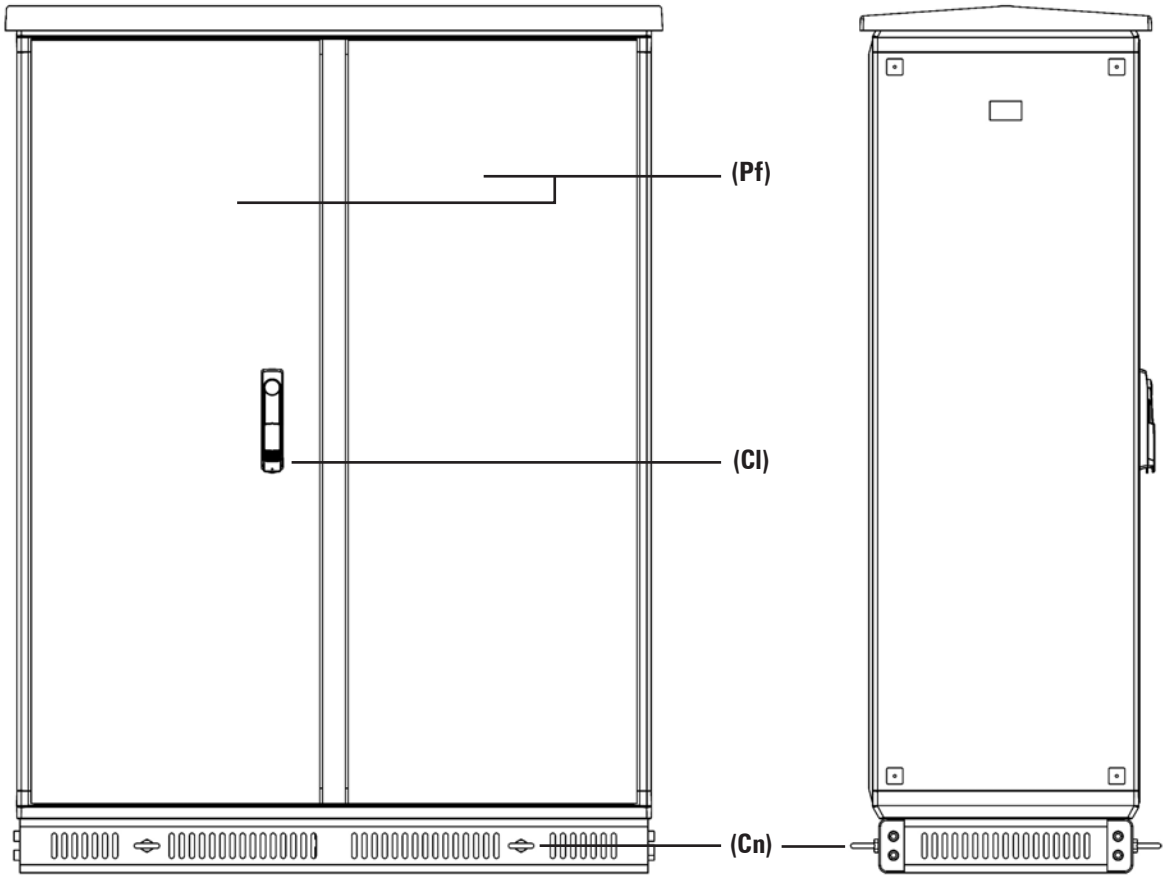


Fig. 10. **ILUEST+ MT (I)** view for three phase models of 100 kVA and ≥ a 60 kVA with the option module.

3.1.2. Electronic control cards BM535* / BM536* / BM542*.

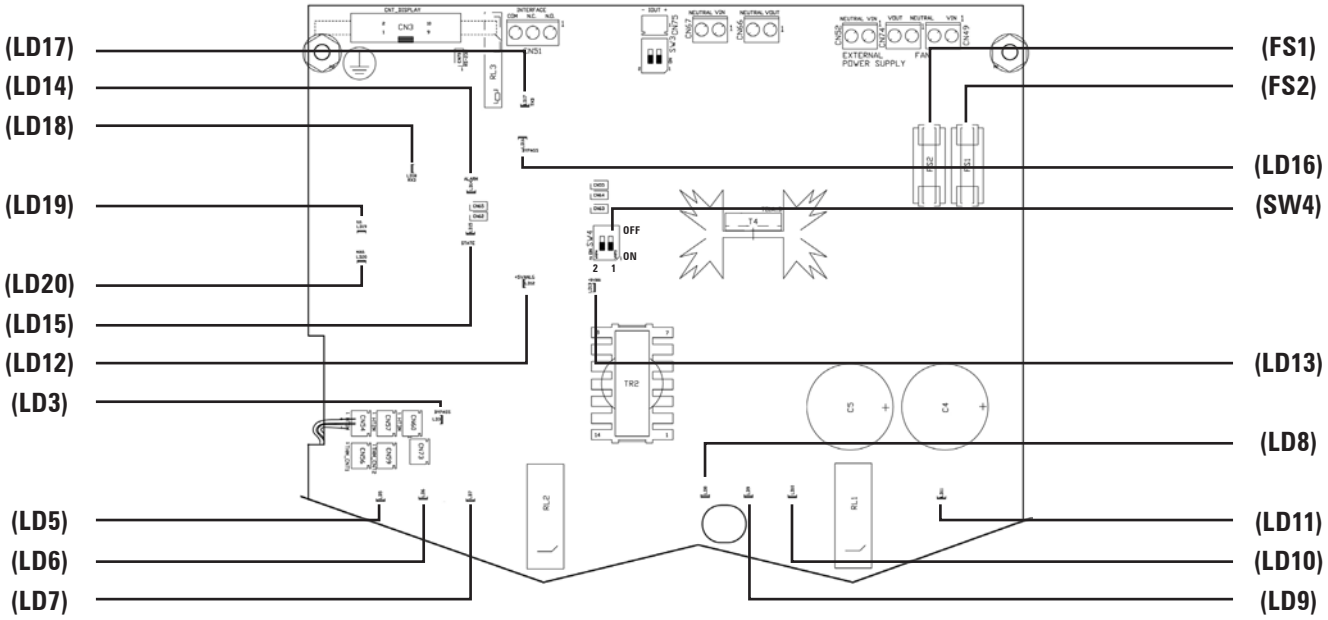


Fig. 11. Layout of the led indicators, dipswitch and protection fuses, in controls BM535* / BM536* / BM542* **(11*)**.

3.1.3. Legends corresponding to the equipment views and control electronic cards BM535* / BM536* / BM542*.

(1_R) Input terminal phase R.

(1_S) Input terminal phase S.

(1_T) Input terminal phase T.

(1_N) Input terminal neutral N.

(2_U) Output terminal phase U.

(2_V) Output terminal phase V.

(2_W) Output terminal phase W.

(2_N) Output terminal neutral N.

(⏚) Terminal of earth.

(3) **(1)** Terminals of AC/DC power supply from control panel with LCD **(12)**.

(4) **(1)** Terminals of power supply -phase-, for headline contactor coil (ON/OFF order of the equipment).

(5) **(2)** Terminals of saving order "Saving On".

(6) RJ connector of control panel for RS-232, accessible through the front of the equipment.

(7) Electronic card of SICRES telemaintenance (Option).

(8) External option in case, digital I/O BM491*.

(9_R) Input circuit breaker phase R.

(9_S) Input circuit breaker phase S.

(9_T) Input circuit breaker phase T.

(10) Manual bypass switch, make before break (Option).

- Position "1" or "EST". Lamps supplied by the ILUEST.
- Position "0", out of service.
- Position "2" o "BM". Lamps supplied from mains directly.

(11_R) **(3)** Control cards BM535* / BM536* / BM542* for phase R.

(FS1) Protection fuse of phase (R) for control PCB power supply.

(FS2) Protection fuse of neutral (N) for control PCB power supply.

(LD3) Excitation led for Bypass relay (Red).

(LD5.. 11) Led that shows the taps of the static switches that are triggered in this moment (Yellow).

(LD12) Led for analogical power supply 5V (Green).

(LD13) Led for digital power supply 5V (Green).

(LD14) Alarm Led (Red).

(LD15) Status Led (Green).

(LD16) Bypass Led (Red).

(LD17) Led TxD (Yellow).

(LD18) Led RxD (Yellow).

(LD19) Led for activated saving order (Yellow).

(LD20) Led for activated bypass order (Yellow).

(SW4) Dipswitch with the assigned address of the control PCB BM*.

(11_S) **(3)** Control cards BM535* / BM536* / BM542* for phase S.

(11_T) **(3)** Control cards BM535* / BM536* / BM542* for phase T.

(12) Control panel (see figure 4):

(LCD) LCD panel.

(ENT) «ENTER» key.

(ESC) «ESC» key.

(↗) Move up the cursor.

(🡻) Move down the cursor.

(➔) Move to the right the cursor.

(🡸) Move to the left the cursor.

LED indicators:

(a) "Fault" Led (Red).

(b) "Bypass" Led (Yellow).

(c) "Operat." Led (Green).

(d) "Prog." (Yellow).

(BM484*) Communication and management PCB of the control panel with LCD, attached to itself.

(CN1) Communication bus connector.

(BM547*) Connection adaptor PCB of BM484* to SICRES.

(CN2) Communication connector with SICRES.

(13) Fans for cooling the equipment.

(14) Plastic case with connector -slot-, foreseen to insert the telemaintenance PCB option, SICRES **(7)**.

(Cl) Handle to open and close the front door **(Pf)** of the outdoor case or cabinet **(I)**, it includes lock through triangular key.

(Cn) Lifting lugs to be used for placing the equipment.

(CX_R) Normally closed contact -NC- relay interface, "Static Bypass phase R". It is not available with BA1 or BA3 option.

(CX_S) Normally closed contact -NC- relay interface, "Static Bypass phase S". It is not available with BA1 or BA3 option.

(CX_T) Normally closed contact -NC- relay interface, "Static Bypass phase T". It is not available with BA1 or BA3 option.

(I) Outdoor case or cabinet format.

(Pf) Front door of the outdoor case or cabinet **(I)**.

(Pr) Cable glands.

(T) Indoor basic format.

(TF_1) Front cover to protect against direct contact, control panel with LCD.

(TF_2) Front cover to protect against direct contact, control PCB of the equipment.

(TF_3) Front cover to protect against direct contact, of the power connections.

(t_1) Fixing screws of the front cover **(TF_1)**.

(t_2) Fixing screws of the front cover **(TF_2)**.

(t_3) Fixing screws of the front cover **(TF_3)**.

(t_4) Fixing screws for telemaintenance SICRES card.

([1]).- It is recommended, to use the same phase to feed the AC/DC power supply of the control panel (terminals **(3)**) and to feed the headline contactor, as it is shown in the circuit diagrams of this manual, with the connection over the phase R.

([2]).- To force the -saving order-, it is needed to connect a normally open and dry contact of an external controller (switch, relay, astronomical clock,...), between the terminals **(5)**. When closing the circuit through this contact, the saving order is activated. **NEVER APPLY VOLTAGE TO THE TERMINALS (5), CONNECT A NORMALLY OPEN AND DRY CONTACT ONLY**.

([3]).- All control electronic cards BM535* / BM536* / BM542* have the same optical led indicators, dipswitches and protection fuses, being single or three phase structures. Therefore, the function of these components are only described for the control of phase R **(11_R)**.

Basically, a three phase is based on three single phase units duly connected and with a single control panel with LCD.

3.1.4. Legends corresponding to the external case option (8), Digital I/O BM491*.

(BM491*) Digital input and output (I/O) cards.

(Fc10) Ribbon cable of 10-ways. Supplied to connect between the digital I/O card and SICRES card.

(Fc34) Ribbon cable of 34-ways. Supplied to connect between the digital I/O card and communication and management card of control card with LCD, BM484*.

(SGD) Support to fix the case of the option in a DIN rail.

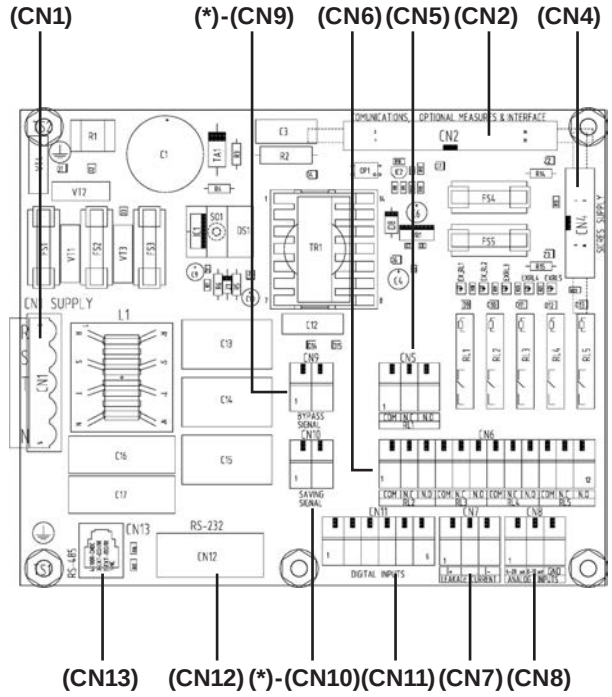
(TC) Opening for input and output cable entry.

(TF_5) Cover for wall-mounting case of the digital I/O option.

(t_5) Fixing screws for wall-mounting case cover **(TF_5)**.

(t_6) Fixing screws for support for DIN rail **(SGD)**.

(t_7) Drills for fixing the case of the option.



(*) CN9 and CN10. Order to force to Bypass and/or saving (use a dry contact to close the circuit **-NEVER APPLY VOLTAGE-**).

Fig. 12. Digital I/O card BM491* (Options).

Among the available connections of the digital I/O BM491* there are:

(CN1) AC power supply connector, according to the mains tipology, either single phase (R-N) or three phase (R-S-T-N) and connected before the headline contactor.

(CN2) Communication BUS connector with control panel.

(CN4) Connector for communication card of telemaintenance SICRES.

(CN5) Relay terminal strip RL1. Headline contactor control (on/off of the equipment).
Terminals 1-2-3, corresponding to the relay contact (COM-NC-NO). NC contact, useless.
The headline contactor control can be done both through these terminals and through the usual connection (terminals **(4)** of the equipment).

(CN6) Terminal strip of 4 digital outputs. Each output supplies a contact (COM-NC-NO), belonging to a programmable relay by means of the assignation of the available alarms or status of the equipment, through the control panel (see section 6.3.3) and they are preset to:
- Relay RL2. Overload. Terminals 1-2-3.
- Relay RL3. Overtemperature. Terminals 4-5-6.
- Relay RL4. Bypass. Terminals 7-8-9.
- Relay RL5. Output voltage fault. Terminals 10-11-12.

(CN7) Useless connector.

(CN8) Terminal strip of 2 analogical inputs 4 ÷ 20 mA:
- Earth leakage current probe, terminal 1
- Photocell probe, terminal 2.
- GND common, terminal 3.

(CN9) Terminal strip to force to Bypass «Bypass order».

(CN10) Terminal strip to force to Saving «Saving order».

(CN11) 5 digital inputs, which are preset from factory to the following terminals:
- Digital input 1. Indication of a circuit breaker tripping from outgoing distribution from sector 1, terminal 1.
- Digital input 2. Indication of a circuit breaker tripping from outgoing distribution from sector 2, terminal 2.
- Digital input 3. Indication of a circuit breaker tripping from outgoing distribution from sector 3, terminal 3.
- Digital input 4. Indication of a circuit breaker tripping from outgoing distribution from sector 4, terminal 4.
- Digital input 5. Indication of a circuit breaker tripping from outgoing distribution from sector 5, terminal 5.
- GND common, terminal 6.

(CN12) RS-232 through DB9 connector.
In the control panel of the module, it is available the same communication port but with RJ connector type **(9)**.
The connection of this RJ connector is basically with three wires (PC, terminal,..) same as the supplied at the DB9 of the control card, also the DB9 option from control panel **(9b)**, has extended communication for modem.
Conceptually a RS-232 channel is not multipoint, so only one connection can be used at the same time.

(CN13) RS-485 through the RJ connector.
It is possible to use the communication ports RS-485 and RS-232 at the same time.

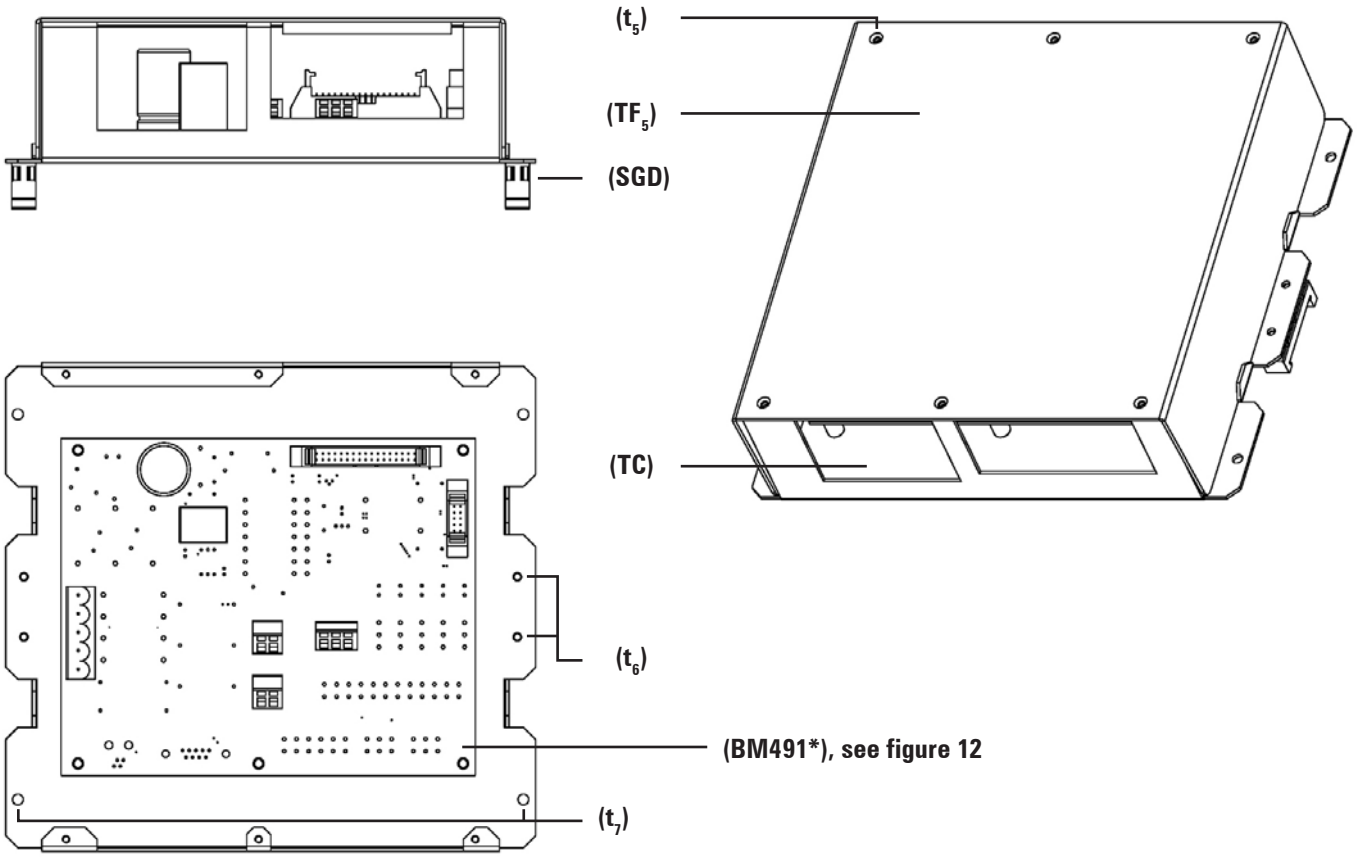


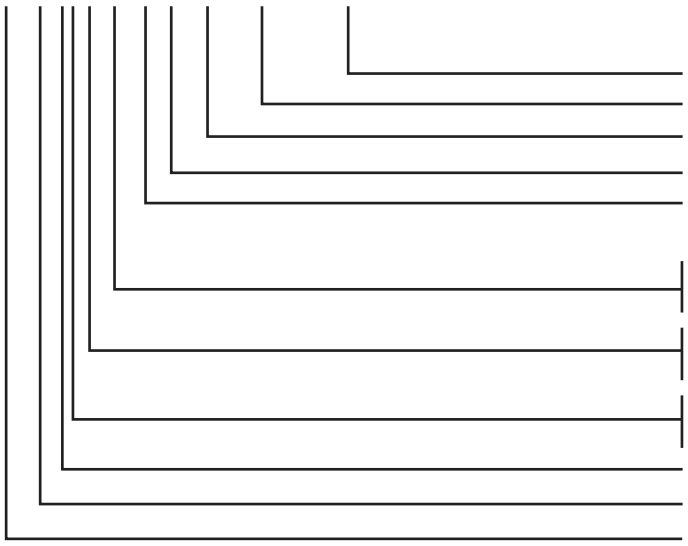
Fig. 13. External option in case **(8)**, digital I/O BM491*.

3.2. Nomenclature and structural diagram.

3.2.1. Nomenclature.

Single phase ILUEST+ MT series.

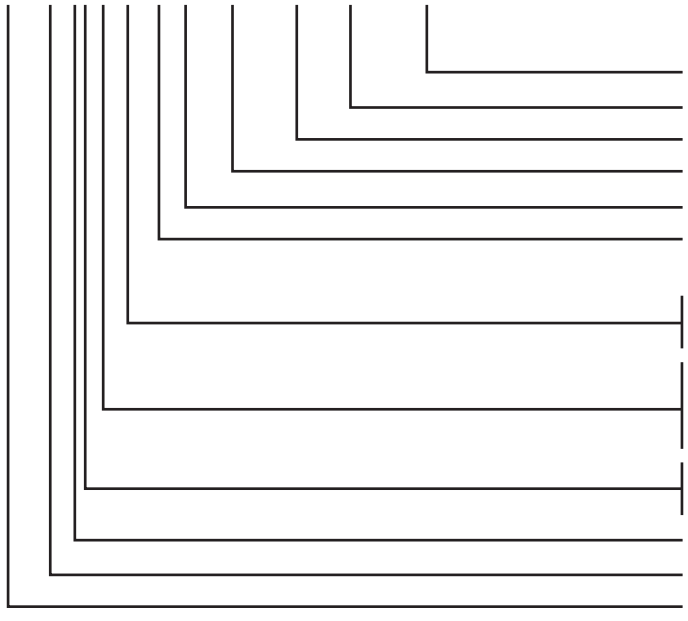
NA 10-2IBMD-CO 2 220V 60Hz “EE84526”



EE***	Special equipment “EE”.
60Hz	Frequency unless is 50Hz.
220V	Voltage unless is 230V.
2	Control panel ready to connect digital I/O.
CO	"Made in spain" silk screen on the equipment and packaging, for customs purposes.
D	Input lightning arrestor of 6,5 kA
DD	Input and output lightning arrestors of 6,5 kA.
BM	Manual bypass.
BA1	Automatic bypass, common for all the equipment.
I	Outdoor format.
T	Indoor format.
2	First character of the voltage.
10	Power of the equipment in kVA.
NA	Single phase of NA series

Three phase ILUEST+ MT series.

NAT 30-3IBMD-CO 2 3x380V 60Hz T/T “EE84526”



EE***	Special equipment “EE”.
T/T	Delta/Delta.
60Hz	Frequency unless is 50Hz.
3x380V	Voltage unless is 3x400V.
2	Control panel ready to connect digital I/O.
CO	"Made in spain" silk screen on the equipment and packaging, for customs purposes.
D	Input lightning arrestor of 6,5 kA
DD	Input and output lightning arrestors of 6,5 kA.
BM	Manual bypass.
BA1	Automatic bypass, common for all the equipment.
BA3	Automatic bypass, independent for each phase.
I	Outdoor format.
T	Indoor format.
3	First character of the voltage.
30	Power of the equipment in kVA.
NAT	Three phase of NA series.

(*) Each equipment is supplied from factory with only one LCD, doesn't matter if it is single or three phase.

First acronyms mean, a part from the name of the equipment , its electrical nature: NAT for three phase equipments and NA for single phase ones.

3.2.2. Structural diagram.

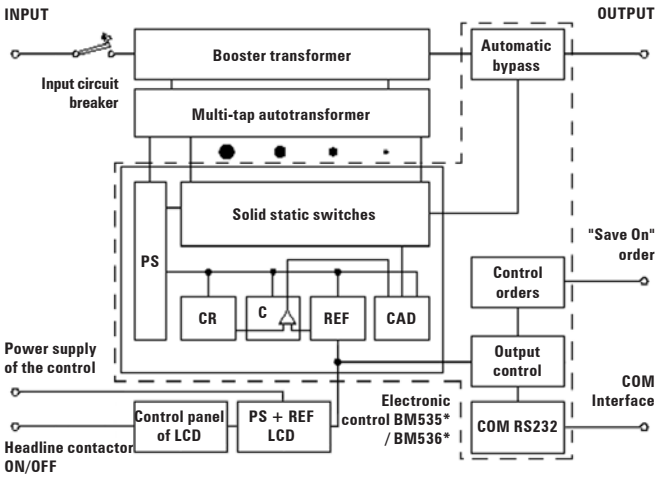


Fig. 14. **ILUEST+ MT** single line diagram.

3.3. Description of the system.

3.3.1. Introduction.

The new range of lighting flow dimmer-stabilizers **ILUEST+ MT** series performs both in the lighting power supply voltage stabilization and in the lighting flow dimming during the time with lower light requirement.

Thanks to its design, it is guaranteed that the voltage that feeds the lamps are always inside the ±2 % range of the nominal value, so the auxiliary devices and themselves work in the foreseen conditions, having the flow and lighting at optimal levels.

A significant advantage is to keep in mind the lamps lifetime because, as it is well-known, the night overvoltages are one of the main reasons for the premature depletion of themselves. Indeed, on the one hand, a stabilized voltage makes longer the lifetime of the discharge lamps and if the overvoltages are cancelled, it is also achieved a lower consumption because the consumed power is kept to its nominal value (a 10% of overvoltage increases the consumption in more than 20 % and decreases the lamp lifetime up to 50%). On the other hand, to dim the power supply voltage till a preset values, allows keeping a lighting levels according to the required ones in those periods of time that the visual requirements are lower.

3.3.2. Constructive features.

ILUEST+ MT are based on the well-known voltage stabilizers from “RE2” series, which are being manufactured for more than thirty years and they have been improved with the last and new techniques, so in this way, it is assured its high reliability and efficiency.

Main constructive parts are (see figure 14):

- Multitap autotransformer per phase.
- Booster transformer per phase.
- Electronic control with microprocessor per phase.
- Solid automatic bypass per phase.
- RS-232 communication channel.
- Control panel with LCD and led indicators.

The static switches are semiconductors controlled by its electronic system, so at any time is only triggered the tap that provides the correct output voltage.

Figure 14, the secondary winding of the booster transformer is supplied from the voltage got from one of the taps of the autotransformer, which it is fed from the commercial mains directly through a circuit breaker. This tap is connected to the booster transformer through the static switches that are managed by an electronic control, therefore only one semiconductor is working at the same time, which corresponds to the tap that provides the correct output voltage. This voltage is added in phase or counter phase to the mains, through the booster transformer, by correcting the voltage fluctuations in the mains.

3.3.3. Operating principle.

The dimmer stabilizer is installed at the headline of the lighting, either in the own control panel or in a separate case, without needing any additional wiring till the lamps (see figure 19 «Typical installation circuit diagram»). The circuit diagram shown in figure 19 corresponds to a three phase equipment. Nevertheless all connection control do not differ between a single or three phase unit, so it is useful as a typical installation example.

The start up/shutdown of the equipment is done through the activation/deactivation of the headline contactor, by means of the time scheduler or astronomical clock of the own control panel with LCD, prior programming, or through any external device (photocell, time scheduler, switch,...), which performs over itself directly.

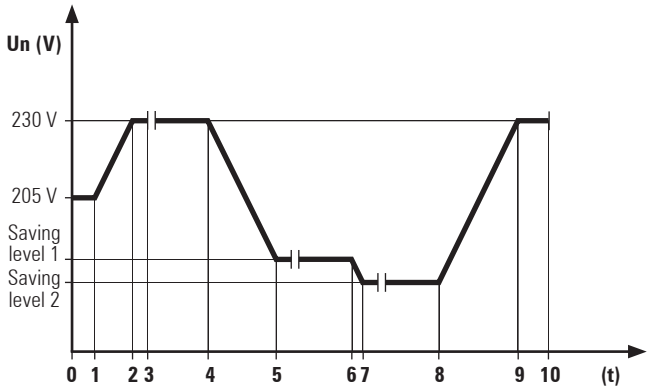
When the equipment receives voltage, it is started up over the Bypass for the first 2 seconds and then starts the operating daily duty cycle (see figure 15), doing a "soft start" of the installation, starting from 205 V and keeping this level for 2' 30", after this time starts the ramp-up till reaching the nominal 230 V in another 5 minutes more. In all the start up process, the voltage is stabilized to the corresponding values.

Once ended the start up process, the equipment will continue supplying stabilized voltage to the installation at its nominal value, till the saving voltage order is received. This order can be activated in two ways:

- Through the own control panel with LCD of the **ILUEST**, the equipment can be set to make the daily automatic start up (to feed the headline contactor), as well as the saving and nominal orders (see chapter 6).
- Through the activation of an external device that belongs to the end-user (time scheduler, astronomical clock, remote control, manual activation, ...), connected to the terminal strip labelled as «Saving On» with the only condition that the equipment has to be started up (headline contactor activated).

In any case, with any of them, it is started a "soft ramp-down" process that takes 10 minutes, till the saving value.

This process will be repeated as many times as it is set, as well as there were blackouts or mains faults.



0.- **ILUEST+ MT** start up (headline contactor activated). During the first 2 seconds the equipment works on Bypass.
1.- "Soft ramp-up" of start up begins.
2.- Nominal level is reached.
3.- Warming-up time at nominal level.
4.- Order to dim the voltage to saving level 1. "Soft ramp-down" is started.
5.- Saving level 1 is reached.
6.- End of operation on saving level 1 and order to dim the voltage to saving level 2. "Soft ramp-down" is started.
7.- Saving level 2 is reached.
8.- End of operation on saving level 2 and return (or not) to nominal level, on progressive ramp-up too.
9.- Nominal level is reached. Operating at nominal voltage till its disconnection.
10.-Daily shutdown.

Fig. 15. Duty cycle.

3.3.4. Version.

- This indoor version **(T)**, is designed to be installed inside the own control, protection and management panel, never outdoors because its protection degree is IP20.

  The enclosures like for distribution, must have opening to cool the **ILUEST+ MT** in a natural way, but it doesn't mean the noncompliance as regards to the protection degree.

3.4. Standard options (extras).

3.4.1. Automatic Bypass (BA1) or (BA3).

As an option a second automatic bypass based on contactors can be added to the automatic and solid state bypass, which in the three phase units it can be common for all the phases (BA1) or independent for each one of them (BA3).

3.4.2. Internal Manual Bypass Switch (BM).

It is supplied an internal manual Bypass switch of three positions, which allows feeding the loads through the **ILUEST stabilizer (position "1" or "EST")** or **from the commercial mains directly -Bypass- (position "2" or "BM")**. The middle position **"0"** leave **the output with no voltage** and consequently the loads too.

This switch is break before make, so there is a break in the power supply to the loads during the changes of position of this cam switch, in case they are turned on.

These two poles for single phase equipments or four poles for three phase switches, make easier the maintenance tasks, therefore these maintenance tasks can be done without breaking the power supply to the lamps when the switch is on **position 1 -Bypass-**.

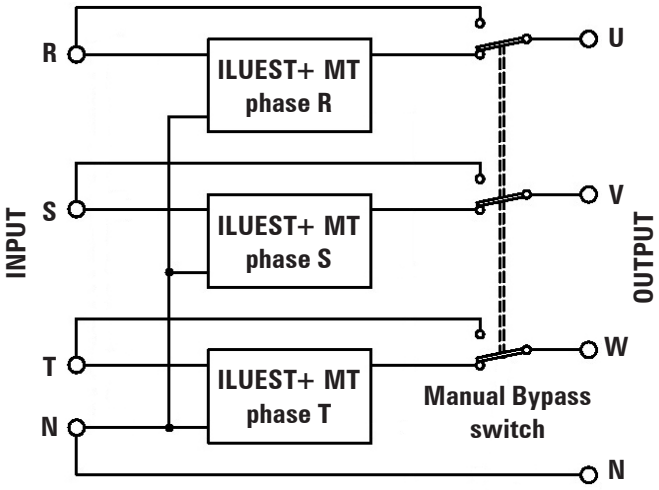


Fig. 16. Circuit diagram of manual Bypass.

3.4.3. Lightning arrestor of 6,5 kA at the input (D) or at the input and output (DD).

After the varistors, installed as standard at the input in the equipment, it is the protection system against atmospheric lightning of high level. Also, it can have led indicators and auxiliary contacts for its telemanagement.

3.4.4. External case option, digital I/O BM491*.

This electronic unit concentrates, different communication and control connections like:

- RS-232 (physically has two RS-232 connectors, one in DB9 format and another one in RJ, but they can't be used at the same time).
- RS-485.
- 5 digital inputs.
- 5 programmable dry contacts through the control panel with LCD. One of the relays is used to control the headline contactor (ON/OFF).

3.4.5. External manual bypass panel.

As an option to the internal manual bypass (BM), already described in section 3.4.2, it is available an external manual bypass designed with the same criteria, two poles for single phase equipments and four poles for three phase ones and break before make type.

3.4.6. Communication/telemaintenance electronic card SICRES.

The SICRES electronic card is able to provide a communication interface for Ethernet networks with TCP-IP and SNMP protocols, GRPS modem and RTC modem.

The RS-232 port is not multipoint (see manual EK764*00), so if this channel is going to be used for any purpose, the other connections will not be available although the equipment has more connectors.

All the equipments are supplied as standard with a slot for the SICRES card. It allows inserting the own communication card at any time throughout the product's lifetime, in order to extend the management and telemaintenance functionality.

3.4.7. GPRS modem.

It is in charge of doing the remote transmission of the managed parameters by the SICRES communication card.

The connection of a GPRS modem is used for the remote access to the equipment.

The direct access to the equipment or monitoring and control of all the units (telemaintenance) will depend on the contracted service.

4. Installation.

4.1. Important safety instructions.

- Check and respect the "Safety instructions" of section 1.2.3 of this document.
- The unpacking procedure of the equipment is explained in section 4.2. and illustrated in figure 17.
- **Never** make the connection tasks or cable manipulation that involve risk of electrical discharge when voltage is present.
- Check the data of the nameplate in the packaging, are the required ones by the installation (see figure 17).
- **ILUEST+ MT** have 4 drills at the bottom to be fixed in a solid and levelled base (see figure 18). It is compulsory to make the mechanical operations of equipment fixing, before continue with the installation.
- The location has to be ventilated and with easy access, and **never** outdoors.

  Also, the following text has to be kept in mind:

Fig. 17. Unpacking procedure.

The enclosures like for distribution, must have opening to cool the **ILUEST+ MT** in a natural way, but it doesn't mean the noncompliance as regards to the protection degree.

- Respect the indications and recommendations of section 4.4 as regards to ventilation, attending the evacuation air flow stated in table 1.
- Never obstruct the cooling holes.
- The input circuit breakers **(9_R)**, **(9_S)** and **(9_T)**, have to be at position "0" or "Off".
- To have access to the connection parts, it is necessary to open the front door and/or remove the protection cover of the connection parts according to the power and format of the equipment:
  - ❒ Format **(T)**:
    - – Single phase up to 20 kVA and three phase ≤ 45 kVA, either in standard assembling or with the option module.
      - € In these equipments is not needed to remove any cover. The connection terminals are accessible from front directly.
    - – Three phase of 60 and 80 kVA in standard assembling.
      - € Remove the screws **(t_2)** that fix the front cover **(TF_2)**.
      - € Remove the front cover **(TF_2)**.
      - € Connection terminals will be at sight.
      - € When ending the connection tasks, leave the equipment with the cover **(TF_2)** put it back and fixed with the screws **(t_2)**.
    - – Three phase of 60 and 80 kVA with options, and standard 100 kVA or with options.
      - € Remove the screws **(t_3)** that fix the front cover **(TF_3)**.
      - € Remove the front cover **(TF_3)**.
      - € Connection terminals will be at sight.
      - € When ending the connection tasks, leave the equipment with the cover **(TF_3)** put it back and fixed with the screws **(t_3)**.
  - ❒ Format **(I)**:
    - – Open the front door **(Pf)** through the handle **(Cl)**, by unblocking the lock with the supplied triangular key.
    - – As this equipment is an indoor equipment **(T)** basically, inside in an outdoor enclosure, proceed according to the previous steps depending on the power and configuration.
    - – When ending the connection tasks, leave the equipment in its original status, put the cover back and close the door/s **(Pf)** by blocking the handle **(Cl)** by means of the triangular key.
- The indoor equipments **(T)** do not have cable glands **(Pr)** locates in the base of the frame to enter the connection cables and fixing of themselves. Instead of it, the base of the equipment is completely open in all its cross section.

  It is compulsory to fix the cables, for example with bridles, in order to avoid yanking out that could pull the connection cables up from terminals, with the risk that it means (possible electrical discharges to persons, short-circuit, leakage to ground, ...).
- In the outdoor equipments **(I)** there are cable glands **(Pr)** located in the base of the enclosure to enter the connection cables.

It is compulsory to fix the cables, for example with bridles, in order to avoid yanking out that could pull the connection cables up from terminals, with the risk that it means (possible electrical discharges to persons, short-circuit, leakage to ground, ...).

- The cross cable section of the input and output lines will be determined by the currents stated in the nameplate of the equipment, by respecting the Local and/or National Low Voltage Electrotechnical Regulations. For control cables, use as minimum a cross cable section of 2,5 mm^2.

  Use RZ1-K cables preferably.
- The connection of **ILUEST+ MT** will be done at the headline of the power supply. As an example figures 19 and 20, show a typical three phase installation circuit diagram and the same installation with an equipment with options.
- **ILUEST+ MT** has single pole circuit breaker protections per phase and the installation of the equipment upstream will have its respective RCD protections. Make sure the correct compliance about it.
- In case of installing an external manual bypass by yourself, follow the following recommendations:

  Bypass must avoid the voltage feedback through the output of the equipment, in order to avoid damages (the equipment is not protected against the connection of voltage at the output). Therefore, the Bypass must disconnect the output of **ILUEST+ MT** when it is manoeuvred. The best choice is a cam switch of three positions and break before make, with the common connected to the load, one contact to the output of the equipment (position "1") and the other one to the reserve source, which corresponds to the power supply of the equipment (position "2"). The middle position of the cam switch will correspond to "0" (out of service).

4.2. Reception of the equipment.

4.2.1. Unpacking and contents checking.

- When doing the reception of the equipment, check that there has not been any incident during transport. Otherwise, make the appropriate claims to your provider or in lack of him to our firm. Also check that the data in the nameplate adhered in the packing of the equipment are the same as the stated in the purchase order. Otherwise, as soon as possible make the disconfirmation, quoting the serial number of the equipment and references in the delivery note
- Once the reception is done, keep the equipment in its original packing till its commissioning in order to protect it against mechanical crashes, dust, dirt, etc.
- The packaging of the equipment has wooden pallet, cardboard or wooden case (under request only), Expanded polyestilenne corners and/or panels or Polyethylene foam (PE), Polyethylene cover and polyester strip.

  All materials are recyclable, so if they are gone to be disposed, do it according to the current regulation. It is recommended to keep the packaging, in case you have to use it in future.
- Follow the steps of figure 17 for a correct unpacking of the equipment. Although pictures of these figures shows an outdoor **(I)** equipment only, proceed in the same way for indoor format **(T)**:

❒ Cut the polyester strips that wrap the cardboard packing.

❒ Open the flaps of the cardboard packing.

❒ Remove the top cardboard

❒ Remove the four corners and/or two expanded polystyrene (EPS) panels or polystyrene foam (PE).

❒ Take out the cardboard packaging by pulling it up

❒ Remove the plastic bag of polystyrene (PE) that wraps the equipment.

❒ Take out the documentation.

❒ By means of a hand pallet truck or similar mediums bring the equipment closer to the installation location.

❒ Check the base of the location has the mechanization stated in figure 18.

❒ Lift the equipment with the suitable mediums according to the weight of the model (see table 6), remove the wooden pallet and place it in the final location.

All the indoor equipments **(T)** have 2 nuts of M10 at the top side of the case, which allow fixing two lifting lugs, property of the user, for the location tasks.

In outdoor equipments **(I)** with double front door **(Pf)** case (see figure 10), it is already supplied with 4 lifting lugs anchored to the base of the own case, in order to make easier the installation tasks in the final location.

For outdoor models **(I)** with only one door **(Pf)** case, use slings according to the weight of the equipment.

❒ Secure the **ILUEST+ MT** mechanically, through the suitable bolts (not supplied), to the mechanized base.

- Till its final installation, it is better to leave the equipment over the original wooden pallet in order to make easier its mobility. In the same way, it is not installed so far, it is recommended to pack the unit again after doing the needed inspections, if it has been unpacked.
- Check that, together with the equipment, there is an operating and installation user's manual.

4.2.2. Storage.

- Due to the lack of batteries and/or other parts sensitive to the passage of time, the only norms to meet for a correct storage are to leave it in places free of dust, humidity, chemical agents or high temperature, covered, never outdoors, even if the own equipment allows it, in order to preserve the packaging till its final installation.

⚠ Do not pile up the equipments, because the packaging is not designed for this purpose and functionality. Also, the gravity centre of all **ILUEST+ MT** is high or very high, because it is located at 2/3 of its height approx., so it becomes unstable and even more if you don't respect the indications.

Warning! There is a high risk of fall down the equipment in case of not respecting these indications, so it can entails **serious or very serious damages/injuries and even the death of persons** in case of impact and/or destruction of the equipment.

4.2.3. Location.

- Location of the equipment will depend on the format.

In case of outdoor format **(I)**, the equipment will be placed over a pedestal made of concrete and fixed through bolts to it firmly. Due to its protection degree IP54 will be able to be placed outdoor

For indoor format **(T)** and due to its protection degree IP20, it will be placed inside the existent control centre, considering that for its correct cooling is needed to have the suitable airflow depending on the model and stated in table 1. **Never install the unit outdoors**.

- Whatever the place is, all formats **is obligatory to be fixed to the wall, inside of the enclosure or floor with parts that guarantee a total and permanent strength** through its respective holes made in its base, see figure 18.
- ⚠ The forced air cooling flow of the unit is foreseen in upward way from base toward the highest part. Leave the needed space to make possible the air circulation, taking care of the stated parameters.

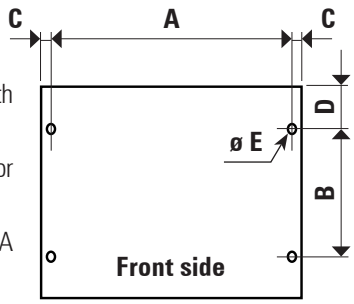
4.3. Fixing points.

Mechanized base of the indoor equipments **(T)**:

€ Single phase up to 20 kVA, with or without option module.

€ Three phase ≤ 45 kVA with or without option module.

€ Three phase 60 and 80kVA standard.

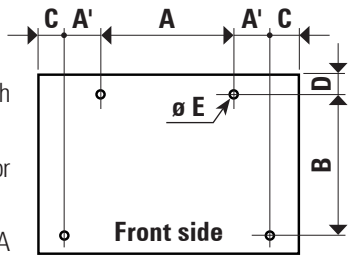


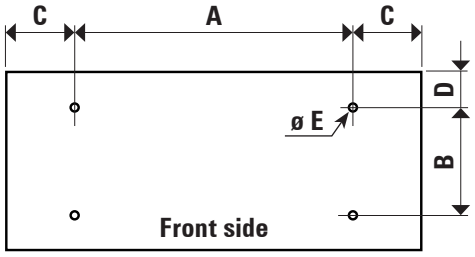
Mechanized base of the outdoor equipments **(I)**:

€ Single phase up to 20 kVA, with or without option module.

€ Three phase ≤ 45 kVA with or without option module.

€ Three phase 60 and 80kVA standard





Mechanized base for indoor **(T)** and outdoor **(I)** equipments>

€ Three phase 60 and 80 kVA with options.

€ Three phase 100 kVA with and without options.

	Model	A	A'	B	C	D	ø E
Indoor (T)	Single phase up to 20 kVA and three phase ≤45 kVA with and without the option module	325	-	145	12,5	47,5	10
	Three phase 60 and 80 kVA without the option module	325	-	270	12,5	80	10
	Three phase 60 and 80 kVA with options, and 100 kVA with and without options	770	-	200	15	75	10,5
Outdoor (I)	Single phase up to 20 kVA and three phase ≤45 kVA with and without the option module	195	92,5	186	78	77	14
	Three phase 60 and 80 kVA without the option module	195	92,5	286	78	91	14
	Three phase 60 and 80 kVA with options, and 100 kVA with and without options	500	-	350	268	55	11

Fig. 18. Mechanized base of **ILUEST+ MT**.

4.4. Cooling.

Lighting flow stabilizer for headline in street lighting **ILUEST** is a unit of high performance, so it has heat losses, although they are very low (<3%), they have to be kept in mind for their location inside enclosures. Heat losses due to an efficiency lower than 100%, create heat that has to be dissipated out from the equipment. This is why, the enclosure where the equipment is located, has to allow a air flow cooling that allows the correct cooling of the equipment. These air volumes are stated in table 1 for each power

The ideal is that the enclosure allows an air inlet through the bottom and air exhausting through the top. Usually it is needed that this air exhausting has to be forced by fans in order to create an air depression inside the cabinet.

Model	Power (kVA)	Air volume to exhaust m^3/h / CFM	Maximum heat losses (W)
NA+ 3,5-2	3,5	25 / 15	105
NA+ 5-2	5	25 / 15	150
NA+ 7,5-2	7,5	50 / 29	225
NA+ 10-2	10	50 / 29	300
NA+ 15-2	15	75 / 44	450
NA+ 20-2	20	100 / 59	600
NAT+ 7,5-4	7,5	50 / 29	225
NAT+ 10-4	10	50 / 29	300
NAT+ 15-4	15	75 / 44	450
NAT+ 20-4	20	100 / 59	600
NAT+ 25-4	25	100 / 59	750
NAT+ 30-4	30	220 / 129	900
NAT+ 45-4	45	220 / 129	1350
NAT+ 60-4	60	320 / 188	1800
NAT+ 80-4	80	440 / 259	2400
NAT+ 100-4	100	440 / 259	3000

Tabla 1. Cooling air volume and heat losses depending on the model.

4.5. Recommended protection devices and cross cable sections.

4.5.1. Recommended protections.

- Install protections against overcurrents (overloads and short-circuits), against earth leakage current and overvoltages in accordance with the local regulations.

  Regarding transient voltages, although the equipment is protected with varistors, it is recommended the use of other methods of protection (like lightning arrestors) if the environment conditions require it.
- The input circuit breaker and earth leakage protections, will be sized according to the currents stated in the nameplate of the equipment. It is advisable that the earth leakage protections are with automatic rearmament to avoid unexpected tripping, due to inrush currents made by storms.

  The circuit breaker protection will be K characteristic with 2 or 4 poles for single or three phase equipments respectively.

  The earth leakage current of **ILUEST** is lower than 16 mA. This current can be increased if there were interferences of high frequency or high harmonic tax in mains.

  The current by default, the disconnection threshold of the earth leakage switches, which could be with automatic rearmament, will be of 300 mA as maximum and the earth resistance, measured when commissioning the equipment, will be 30 Ω as maximum. Nevertheless, earth leakage breakers with maximum current of 500 mA or 1 A will be allowed whenever the measured resistance of the earth when commissioning is lower or equal to 5 Ω and 1 Ω, respectively.
- The installation will have a contactor with 230VAC coil to switch ON/OFF the equipment, and it will be sized with the input current stated in the nameplate of the equipment as minimum.

4.5.2. Recommended cross cable sections.

- Whatever the installation is (under floor or at sight), it is recommended to consult the Low Voltage Regulations according to the local country.
- Cross cable section at the input and output will be determined from the currents stated in the nameplate of the equipment, by respecting the Local and/or National Low Voltage Electrotechnical Regulation. For control cables, use as minimum the 2,5 mm^2.

  Also it is recommended to use RZ1-K cable type for all connections.
- The output of the equipment to the loads of each phase, will be divided into four single pole circuit breakers. This way, in case there was a problem in one sector, it will not affect to the total installation. The **ILUEST+ MT** has 40kA varistors as TVSS (Transient Voltage Surge Suppressor) at the input . Nevertheless, in some places with important storms with lightnings, such protection can't be enough, so then it is recommended to use additional protections like lightning arrestors (alone or combined with varistors).

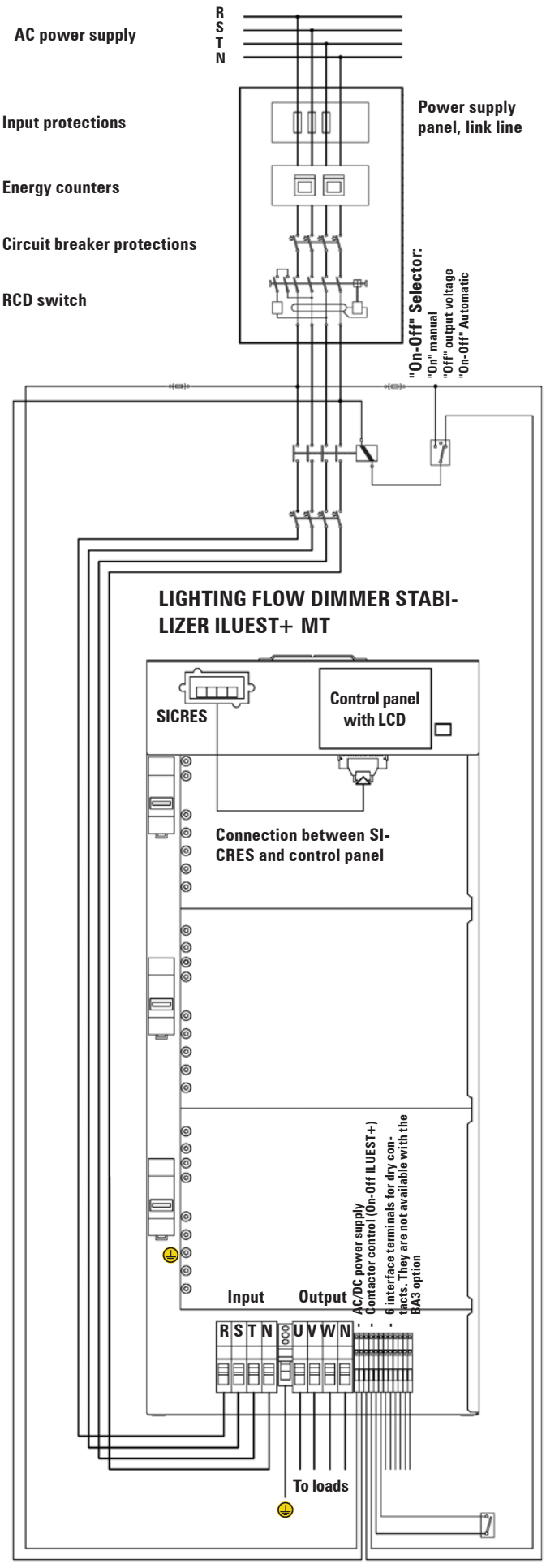


Fig. 19. Typical three phase installation circuit diagram.

Model	Power (kVA)	Input current (A)	Output current (A)
NA+ 3,5-2	3,5	17	15
NA+ 5-2	5	25	22
NA+ 7,5-2	7,5	37	33
NA+ 10-2	10	49	43
NA+ 15-2	15	74	65
NA+ 20-2	20	98	87
NAT+ 7,5-4	7,5	12	11
NAT+ 10-4	10	16	14
NAT+ 15-4	15	25	22
NAT+ 20-4	20	33	29
NAT+ 25-4	25	41	36
NAT+ 30-4	30	49	43
NAT+ 45-4	45	74	65
NAT+ 60-4	60	98	87
NAT+ 80-4	80	131	115
NAT+ 100-4	100	163	144

Tabla 2. Input and output currents for standardised models.

4.5.3. Installation diagrams.

Figures 19 and 20 show as an example the typical electrical installation of a three phase unit from **ILUEST+ MT** and the same installation with an equipment with options. It is important to meet the following premise:

- **ILUEST+ MT** has to be **always** installed at the headline of the lighting.
- **Manoeuvring:**
  - ❒ On / off contactor.

    Lighting installation must have a contactor to manage the on/off manoeuvring, which has to be fitted at the input of the lighting flow equipment (at the headline).

    This manoeuvring can be done by a switch, a schedule timer or any other automatism. Nevertheless, the **ILUEST+ MT** has control panel with LCD as interface between user and equipment, which can make all the functions of schedule timer and astronomical clock, by controlling the start up, saving and nominal levels, and the equipment shutdown.

    To execute these functions, it is required:

    – To feed the AC terminals **(3)** from power supply of control panel, from the input line of the headline contactor (see figure 19).

    – Connect the contactor coil to the terminals **(4)** according to the same figure 19, in order to leave the system to operate according to the settings automatically.
- If the system to turn on/off the installation is done through timers or photocells, there will also be an additional manual switch (to be fitted in and purchased by the user), which allows the system switching, irrespective of the quoted devices.
- The equipment has to be installed downstream from lighting contactor, because this way it is guaranteed that it is turned off when lights are turned off too, and the equipment will not have voltage, avoiding overheating and unnecessary consumptions.

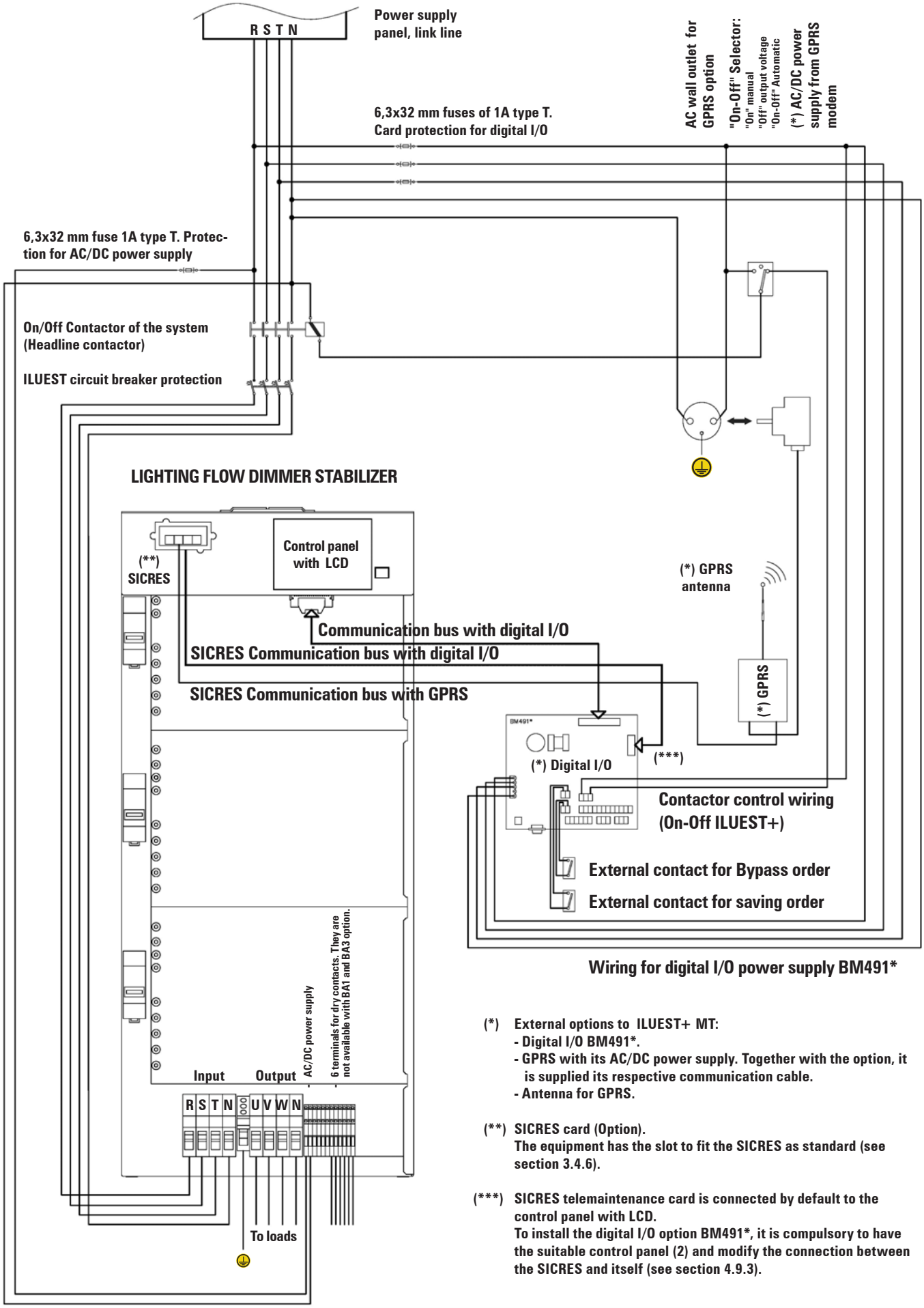
4.6. Connection.

As an example, both the circuit diagram from figure 19 and the one from figure 20 belong to three phase equipments.

For single phase equipments, proceed in the same way, but there will only be one phase. Nevertheless the control connections will be same.

Respect the wiring, protection layout and the auxiliary control and management switches that are shown in the circuit diagram strictly, never mind the mains typology (single or three phase).

- To have access to the connection parts, it is needed to open the front door and/or remove the protection cover of the connection parts of the connection parts depending on the version and power of the equipment:
  - ❒ Format **(T)**:
    - Single phase up to 20 kVA and three phase ≤ 45 kVA, both standard enclosure or with the option module.
      - € In these equipments are not needed to remove any cover. The connection terminals are accessible directly.
    - Three phase 60 and 80 kVA in standard enclosure.
      - € Remove the screws **(t_2)** that fix the front cover **(TF_2)**.
      - € Remove the front cover **(TF_2)**.
      - € Connection terminals will be at sight.
      - € When the connection tasks are finished, leave the equipment with the cover **(TF_2)** fitted in and fixed with the screws **(t_2)**.
    - Three phase 60 and 80 kVA with options and 100 kVA standard or with options.
      - € Remove the screws **(t_3)** that fix the front cover **(TF_3)**.
      - € Remove the front cover **(TF_3)**.
      - € Connection terminals will be at sight.
      - € When the connection tasks are finished, leave the equipment with the cover **(TF_3)** fitted in and fixed with the screws **(t_3)**.
  - ❒ Format **(I)**:
    - Open the front door **(Pf)** by means of the handle **(Cl)**, by unblocking the lock with the supplied triangular key.
    - Because this version is just an indoor format **(T)** inside of an outdoor case, proceed according to the previous steps and depending on the power and configuration.
    - When the connection tasks are finished , leave the equipment in its original status, put the cover back and close the door/s **(Pf)** blocking the handle **(Cl)** by means of the triangular key.



(*) External options to ILUEST+ MT:
- Digital I/O BM491*.
- GPRS with its AC/DC power supply. Together with the option, it is supplied its respective communication cable.
- Antenna for GPRS.

(**) SICRES card (Option).
The equipment has the slot to fit the SICRES as standard (see section 3.4.6).

(***) SICRES telemaintenance card is connected by default to the control panel with LCD.
To install the digital I/O option BM491*, it is compulsory to have the suitable control panel (2) and modify the connection between the SICRES and itself (see section 4.9.3).

Fig. 20. Three phase typical installation circuit diagram, with the standardized external options digital I/O BM491* and/or GPRS.

4.6.1. Connection of power supply of the equipment

- It is compulsory to earth the equipment through the terminal labelled as (⏚), making sure that it is done before supplying voltage to the input of the equipment
- Connect the wires coming from the on/off contactor of the system, to the input terminals:
  - ❒ **(1_R)** and **(1_N)** for single phase equipments.
  - ❒ **(1_R)**, **(1_S)**, **(1_T)** and **(1_N)**, for three phase equipments.

  Respect the phase/s and neutral rotation stated in the equipment labelling and figures 1 to 4 and 6 to 8 of this manual.

  It is essential the connection of the neutral in any three phase star system, identifying it in the labelling of the terminals with a «N».

4.6.2. Connections of the output to loads.

- Connect the load or group of loads to the output terminals:
  - ❒ **(2_R)** and **(2_N)** for single phase equipments.
  - ❒ **(2_R)**, **(2_S)**, **(2_T)** and **(2_N)**, for three phase equipments.

  Respect the phase/s and neutral rotation stated in the equipment labelling and figures 1 to 4 and 6 to 8 of this manual.

  It is essential the connection of the neutral in any three phase star system, identifying it in the labelling of the terminals with a «N».
- Both if the lighting installation already existed before installing **ILUEST+ MT** or it is new, make sure the correct distribution of the loads in order to avoid the phase unbalancing and to optimise the installation.
- It is recommended to divide the output of each phase into four single pole switches. In this way any problem in one of the areas will not affect to the total installation.

4.6.3. Power supply of the LCD control panel. Terminals (3).

- Connect two wires of RZ1-K type of 2,5 mm^2 cross section coming from the input of the headline contactor (phase R and neutral N), to terminals **(3)** -power supply for control panel with LCD- by respecting the wiring circuit diagram of figures 19 and 20.

4.6.4. Connection of the headline contactor coil. Terminals (4).

- Connect the contactor coil to terminals **(4)** by means of wires of 2,5 mm2 of RZ1-K type, by respecting the circuit diagram of figures 19 and 20.

4.6.5. Connection of the remote control, saving order. Terminals (5).

- Use a dry contact, i.e. a switch, to be installed by the user, between these terminals **(5)** to close the circuit and start and remain on saving level.
- **Never** apply voltage to these terminals. Apply dry contacts only.
- Although all the equipments have terminals to activate the saving order when it is needed, it is advisable and most efficient the automation of the process, by using all the functionality of the control panel with LCD and in particular the own saving order through the internal time scheduler or astronomical clock
- When the unit has the digital I/O option card BM491*, the activation of this order can also be done through the corresponding terminal strip **(CN10)**.

  In case of requirement, the saving order can be applied to terminals **(5)** over the equipment or to the connector **(CN10)** of the digital I/O option card BM491*, but never from both at the same time.

4.6.6. Relay interface, terminals (CX_R), (CX_S), (CX_T).

- All the standard equipments (without the BA1 or BA3 options), are supplied from factory with a dry contact terminal strip, 2 or 6 terminals for single or three phase equipments respectively.

  Each couple of pins correspond to normally closed contact -NC- of the "Bypass" relay from the control card of each phase. Do not apply voltage and/or current higher than 2A 250V AC or 30V DC.

  Use wires type RZ1-K of 2,5 mm^2 of cross section.

4.7. Power supply contactor selector switch of manual "On"/ manual "Off" / automatic On-Off.

- If the lighting turning on/off is done by timers and photocells, there will be a manual switch that allows to turn on/off the system, irrespective of the quoted device.

  A switch of three positions like the required by the regulations can be observed in figures 19 and 20, to activate the manual function «On» (manual forcing to turn on the contactor), «Off» manual (manual forcing to shutdown the contactor) and automatic function «On-Off» (contactor will be activated or deactivated according to the control automatism itself).

  This switch is not supplied with the equipment, it will belong to the own user's installation.

4.8. Communication ports. Connector (6).

- Control panel with LCD from **ILUEST+ MT**, has a RS-232 serial port through RJ45 of 8 pins **(6)** (see figures 1 to 8 and 21).

Reference	RJ 45 Pin-out
GND	4
TXD	5
RXD	6

RJ 45 pins

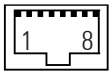


Fig. 21. RJ45 connector for RS-232 **(6)**.

- Also, in those installations with the Digital I/O option **(8)**, there is a DB9 connector **(CN12)** in the BM491* board (see figure 22).

This connector provides the RS-232 communication port, in the same way as the RJ45 serial port does **(6)**, also supplied the control panel with LCD.

It is not possible to use both RS-232 connections at the same time because this is no a multipoint channel.

Reference	DB9 pin-out
CD	1
RXD	2
TXD	3
DTR	4
GND	5
RTS	7
CTS	8
RI	9

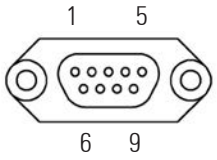


Fig. 22. DB9 connector **(CN12)** for RS-232 in BM491*.

- In the same BM491* option board, there is another port, a RS-485 through a RJ10 connector **(CN13)** of 4 pins (see figure 23).

Reference	RJ 10 pin-out
EXT-$\overline{\text{DO}}$/$\overline{\text{RI}}$	2
EXT-DO/RI	3
100R-GNDC	4

RJ 10 pins RS485

Fig. 23. RJ10 connector **(CN13)** for RS-485 in BM491*.

4.9. Options.

- The standardised options in **ILUEST+ MT** are designed to be assembled at factory, less those ones that do not affect to the own structure of the equipment, like the SICRES electronic card.
- This section describes the connection of the internal and external standardised options only, which implicate a modification over the equipment and/or its connections.
- All connections or actions over the equipment have to be done with no voltage present.

4.9.1. SICRES CARD. To be installed in the equipment.

- Communication card SICRES option, will be supplied as separate item from the equipment and the installer will be the one in charge to make the needed actions to leave it running.

  Proceed to make it installation, as follows:

  - ❒ Unpack the SICRES card.
  - ❒ All the equipments have a plastic slot **(14)** close to the control panel with LCD **(12)**, that is ready precabled from factory, to allocate the SICRES card **(7)**.
  - ❒ Insert the card till the bottom of the slot.
  - ❒ Fix it with the two supplied screws **(t_4)**.
  - ❒ To make the communication with the SICRES card, check the documentation supplied in the CD (manual EK764*).

4.9.2. GPRS modem, external to the equipment.

- Modem will be supplied as separate item from the equipment, with its AC/DC power supply and the communication antenna.
- Never install it outdoors. In case of requiring to do it, assemble it inside a box with the suitable protection degree.
  - ❒ Unpack the modem.
  - ❒ Check that the antenna, AC/DC power supply, communication cable with RJ connectors in both ends and fixing screws are supplied together with the device.
  - ❒ Fix the modem to solid parts by means of screws.
  - ❒ Fix the antenna, attending to the only limitation imposed by the own length of the cable.
  - ❒ Do not mechanize the own case of **ILUEST+ MT** to fix the modem or its antenna, because there is high risk of perforating internal parts of the equipment during doing it, and the consequent failure or destruction when starting it up.
  - ❒ Connect the cable of the antenna to the GPRS modem.
  - ❒ Feed the GPRS by means of the supplied AC/DC power supply, encapsulated type with plug (similar to the charger of a cell phone).
  - ❒ The power supply must be connected to an outlet, where its line comes from the AC input of the headline contactor and insert the other end of the cable with the DC output jack to the connector of the modem labelled as "POWER" or DC.
  - ❒ Interconnect the SICRES (connector RS-232 B) and GPRS modem by means of the supplied cable with the RJ connectors in both ends.

4.9.3. Communication card with digital I/O BM491*.

- The installation and connection of the option with the equipment is only reserved to the staff from **(S.T.S.)** or authorised one, because it involves internal modification in the equipment in more or less range depending on the available equipment.
- The electronic card with digital inputs and outputs I/O, is supplied inside a metallic box and packaged separate from the equipment.
- Never install it outdoors. In case of requiring to do it, assemble it inside a box with the suitable protection degree.
- Proceed for the installation as follows:
  - ❒ Unpack the option.
  - ❒ Check that it is supplied with two connection buses of 1,8 m (ribbon cable), one of 10 ways and another one of 34 ways, with the respective connectors inserted in each ends.
  - ❒ The box of the option is supplied together with the supports **(SGD)** already coupled. These supports allow fixing the box over a DIN rail.

    In case the DIN rail is not available, these two supports **(SGD)** can be removed and fix the metallic box directly to the wall or any other support, by means of screws through the holes **(t_7)**.

    The option has be to be located as closest as possible to the **ILUEST+ MT**, because the supplied communication buses to interconnect both items has 1,8 m length, so the height of the equipment has to be kept in mind for the cable length.

❒ To proceed to connect the digital I/O BM491* card, is needed to remove the screws **(t_5)** that fix the cover **(TF_5)**.

❒ The box has two cutout **(TC)** allow to make easier the cable routing through thte connection points.

❒ The connectors and communication pin-out of the BM491* card, are described and related in section 3.1.4 and the pin-out of the communication ports in section 4.8. Make the needed connections:

– CN5. Contactor control. This function is usually done in the equipment through the terminal strip **(4)**.

– CN6. 4 digital outputs.

– CN8. 2 analogical inputs.

– CN9. Bypass order. To force the unit to bypass.

– CN10. Saving order. This function can also be activated on the equipment through the terminals **(5)**.

– CN11. 5 digital inputs.

– CN12. RS-232 port in a DB9 connector.

– CN13. RS-485 port in a RJ connector.

- Needed requirements as regards to control panel.

❒ The equipment needs a control panel ready to be connected to the digital I/O. Otherwise, it will have to be replaced as follows:

– Remove the screws **(t_1)** that fix the front cover **(TF_1)** of the control panel and cover.

– Remove the screws **(t_2)** that fix the front cover **(TF_2)**.

– Remove the screws **(t_3)** that fix the front cover **(TF_3)**, if it proceeds (equipments with option module or > 80 kVA).

– Remove the connections from **(BM484*)** -see figure 5-.

– Remove the fixing screws of the control panel set.

– Replace the control panel by another one that it is ready to support the digital I/O option and fix it by means of the removed screws in the previous step.

– Connect the **(BM484*)** again, as it were, less the connection over the connector **(CN2)** of **(BM547*)** -see figure 5-.

– The control panel has been replaced properly.

❒ For equipments that have control panel ready for the connection of the digital I/O option, from factory originally or because its adaptation has already been done.

The difference in the connections can be checked by comparing figures 19 and 20, because the first one is connected to the SICRES of the control panel and the second one, both are connected to the digital I/O BM491* card.

Proceed in the same way to leave the connection as it is needed:

– Remove the adaptor board from 34 ways to 10 ways **(BM547*)**, which is already inserted in the connector **(CN1)** of the **(BM484*)** -see figure 5-.

– Take the connection bus - ribbon cable of 34 ways -. Insert the connector of one of its ends into the connector **(CN1)** of **(BM484*)** and the other end in the connector **(CN2)** of BM491* card of the option.

– Remove the 10 ways bus connected in the rear side of the slot box **(14)** for SICRES card.

– Take the second connection bus - ribbon cable of 10 ways-. Insert the connector of its ends into the connector of the slot from SICRES from previous point and the other end in the connector **(CN4)** of BM491* of the option.

– The output of the connection buses -ribbon cable- to outside, is foreseen through the same gland plate of the power cables. Put them properly in order to avoid crushing between any of the front covers **(TF_*)**.

– Put the front cover **(TF_1)** of the control panel and the screws **(t_1)** that fix it.

– Put the front cover **(TF_2)** and fix it with the screws **(t_2)**.

– Put the front cover **(TF_3)** and fix it with the screws **(t_3)** (equipments with option module or > 80 kVA).

– Put the cover **(TF_5)** of the digital I/O case option and fix it with the screws **(t_5)**.

– The adaptation and connections have been finished. Check the correct operating of the **ILUEST+ MT** and option.

Otherwise contact with the **(S.T.S.)**.

4.9.4. External manual bypass.

- It allows feeding the loads directly from mains during the preventive maintenance tasks or when the **ILUEST+ MT** is faulty. It is conspicuously useful in tunnels and/or indoor lighting to not turn them off, even when it is fixed, replaced or checked. The type of Bypass is break before make, so there are breaks in the power supply when doing the transference from the **ILUEST+ MT** to Bypass and vice versa.
- ⚠ When turning the switch from Bypass to Manual to **position «2» (Bypass mode)**, the lamps will be supplied from mains directly, regardless of the position of the input circuit breaker of each phase from **ILUEST+ MT**. If you don't want to have the lamps turned on, turn the protections from control panel «Off».
- The functionality is the same, both if the Bypass is integrated and it is an external manual Bypass. In both cases, two or four poles cam switches are used, depending if they are single or three phase.

  Nevertheless the installation tasks are different. Meanwhile in an equipment with internal manual Bypass, it is not needed additional connections, the external manual Bypass is needed to make the interconnections between both parts (see figure 16).

❒ Connect the terminals belonging to the common of the Bypass panel to the distribution line that will feed the loads.

❒ Connect the terminals belonging to one of the contacts of the switch, to the output terminals of **ILUEST+ MT**.

❒ Finally, connect the terminals belonging to the second contacts of the switch to commercial mains directly.

5. Operating.

5.1. Start up and shutdown.

5.1.1. To control before starting up.

Before starting up the system, there are some settings and checking that have to be done:

- Check the correct connection of mains and loads, according to the procedures described in the previous section. It is advisable to make the first start up with no load connected.
- In case of any option devices already installed, check connection and settings before proceeding to start up the equipment (see specific user's manuals).
- Check the manual selector, located in the switch gear panel of the installation, is in "Automatic" position.

5.1.2. Commissioning.

- The equipment and lighting (if they are connected) starts up when the headline contactor is turned on and they are shutdown when the contactor is turned off. This contactor can be managed by the equipment itself, through the control of LCD panel or by an external part out from the equipment (photocell, timer, astronomical clock, switch for manual control, ...).

  Nevertheless the following described start up, is done from the first assumption, being consistent with the diagrams in figures 19 and 20 (control over the contactor through the own control panel of the equipment).
- Connect the power supply to the equipment (turn on the input protections of the switch gear panel), with the input switch **(9_R)** for single phase equipments or **(9_R)**, **(9_S)** and **(9_T)** for three phase ones in «0» or «Off» position and loads disconnected. Check the voltage of the phases at the input terminals of the contactor, if it is correct, the LCD from control panel will be active.

  ❒ **ILUEST+ MT** is delivered by default from factory with the time scheduler deactivated "Off" to allow its first start up and check are correct.

  Check the setting by means of the following instructions:

  – Starting from the screen 0.1, press upward key **(🡅)** as many times as needed to access to screen 9.1 «TIME SCHEDULER» and press once key **(🡆)**, to access to the screen 9.2 «Activate Time scheduler (NO)».

  – When time scheduler is activated (with (YES) selected), the equipment will automatically be started up and shutdown depending on its setting. If it is on working timetable, the equipment will turn on the contactor and if it is out from the working timetable, it will be turned off.

  – In this situation (with the time scheduler activated but if the time is out from the start up time programmed), if we activate the contactor manually by means of the "On-Off" selector, the **ILUEST+ MT** will be supplied but it will remain on Bypass.

  – If the time scheduler is deactivated by selecting (NO), the input contactor will be activated.

  – To select (YES) or (NO), by starting from the screen 9.1 «TIME SCHEDULER», press key **(ENT)** so the indicator (NO) or (YES) will blink and it will be able to be changed through the key **(🡄)** to change from (YES) to (NO) and through the key **(🡆)** to change from (NO) to (YES) and finally with the **(ENT)** to validate the selection.
- Turn «On» the input protections **(9_R)** for single phase equipments or **(9_R)**, **(9_S)** and **(9_T)** for three phase ones.
- Activate the time scheduler and make a test setting to check a complete duty cycle (start up, saving order, nominal and shutdown), before entering the final setting and respecting the procedure established in chapter 6 of this manual.

  Previously check that the time indicated in the LCD panel is the current one. Otherwise, correct it.

  Enter times close to the current one (include some minutes delay in the settings, the enough ones to end the procedure). Connect the general input switch of the switch gear panel. Wait till the programmed order of start up is activated and the contactor is turned on.
- Turn off the general switch from switch gear panel and connect the loads.
- Turn "On" the general input switch from switch gear panel again.

  When time scheduler is activated ((YES) selected), the equipment will be started up and shutdown automatically, according to is programming. If it is on the working timetable, the equipment will turn on the contactor and if it is out from the timetable, it will be turned off, and consequently the lights too.
- Once the test cycle has been finished and checked the correct operating of the system, it is recommended to enter the final setting in the time scheduler or astronomical clock depending on the case. The programmed sequences will be repeated everyday, no additional manual operating will be needed.

  Any daily automation can be modified when needed, just changing the position of the required switch.

5.1.3. Complete shutdown of the equipment.

- A complete and manual shutdown will only have sense for **corrective (faults) or preventive maintenances of the equipment, because in normal conditions the shutdown will be totally automatic and neglected through the headline contactor**.
- Turn «Off» the input protections **(9_R)** for single phase equipments or **(9_R)**, **(9_S)** and **(9_T)** for three phase ones.
- Turn off all protections from control panel.

5.2. Definition of the led from control cards BM535*/BM536*/BM542* and address dipswitch (SW4).

- To access to the electronic control card/s depending if the equipment is single or three phase, it is needed to remove the front cover **(TF_2)** in both cases. This cover is fixed by screws **(t_2)** located in the front side of the equipment.

  It is needed to remove all the screws to take out the cover.

When ending the connection, put the protection cover back and fix it with the screws **(t_2)**.

5.2.1. Led optical indicators BM535* / BM536*/ BM542*.

Figure 11 shows the layout of the led optical indicators included in the control cards BM535* / BM536*/BM542* and it is repeated for each phase.

(LD3) Red Led, Bypass relay activated.

(LD5÷11) Yellow Leds. They state the quantity of solid static switches that are triggered in that moment.

(LD12) Green Led. Analogical power supply 5V, in operation.

(LD13) Green Led. Digital power supply 5V, is running.

(LD14) Red Led, alarm indicator. It is activated by overload, fault and Bypass.

If it is permanently turned on, contact with the Service and Technical Support **(S.T.S.)**. The affected phase will remain on Bypass. In case of three phase equipments, the phase with this led turned on neither will stabilize nor will regulate at saving level.

(LD15) Green Led. It states the operating mode of the equipment:

- Nominal, active led.
- Saving, led turned off.
- Ascent and descent ramps, it will blink.

(LD16) Red Bypass Led. It is activated by active Bypass, by fault, overload, overtemperature, by manual activation or by software of Bypass.

(LD17) Yellow Led. Communications "TxD".

(LD18) Yellow Led. Communications "RxD".

(LD19) Yellow Led. Saving order activated.

(L208) Yellow Led. Bypass order activated.

5.2.2. Address setting, for control communication (SW4).

Each electronic control card BM535*/BM536*/BM542* has a preset address in order to establish the communications with the control panel with LCD, which is selectable through the dipswitch **(SW4)**.

By default, the assigned addresses in a three phase equipment are 1-2-3 correlatively for phases R-S-T (see table 3), which are ordered from top to bottom or from left to right, depending on the power of the equipment. For a single phase equipment the address is always 1.

Address	SW4-1	SW4-2
1 (phase R)	OFF	OFF
2 (phase S)	ON	OFF
3 (phase T)	OFF	ON

Tabla 3. Assigned addresses of the controls.

5.3. Settings.

- Settings for end-user are the **ILUEST+ MT** parameters. To check or change the preset values in order to adapt the equipment to the installation, go to screen 13.1 (0000) NORMAL and enter the user password. To do it, proceed as follows:
  - ❒ Starting from screen 0.1, press upward key **(↙)** till reaching screen 13.1.
  - ❒ Press **(ENT)**.
  - ❒ Characters will be on blinking mode.
  - ❒ Press keys (↙) or (↗) to change the value and keys (➔) or (➔) to change the character till entering the password (0500).
  - ❒ Press **(ENT)** to confirm
- Once the entered password is correct , (0500) PROGR., there will be access to change the **ILUEST+ MT** parameters. To do it and starting from screen 0.1, press as many times the upward key **(↙)** as it is needed till reaching screen 5.1 «ILUEST PARAMETERS» (see screen map of LCD in figure 26).
- Press key **(➔)** to go to screen 5.2 «TYPE OF SETTING». From this screen the settings can be selected to (GLOBAL), same setting for all phases or (INDIVIDUAL), different setting for each phase.

  To select (GLOBAL) or (INDIVIDUAL) press key **(ENT)** from screen 5.2 «TYPE OF SETTING», and (GLOBAL) or (INDIVIDUAL) will blink. To change the selection, use key **(➔)** or **(➔)** to jump between them and **(ENT)** to confirm the selection.

  In case (INDIVIDUAL) option was selected, the phase to set has to be selected to (1 (R), 2 (S) or 3 (T)). To do it press **(ENT)**to enter into the selecting phase mode, select the number of the phase by means of keys **(↙)** or **(↗)** and confirm the selection with key (ENT). Change or make the needed settings in the selected phase and repeat the procedure and settings for the rest of phases.
- When selecting the type of lamp in screen 5.3., the **ILUEST+ MT** will set all the preset parameters from factory for that kind of lamp. Once the type of lamp is selected, any parameter can be changed (start voltage, duration of starting status, nominal voltage, saving voltage 1, saving voltage 2) in order to be customized to the installation.

6. Control panel with LCD.

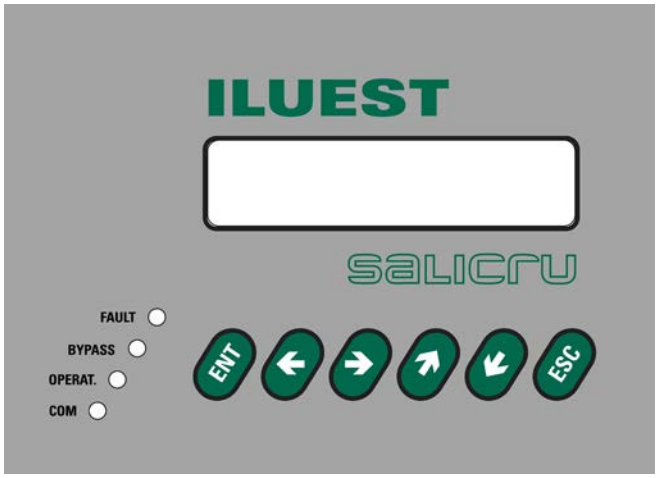


Fig. 24. Control panel with LCD.

6.1. Definition of the keys, led indicators and their functionality.

(12) Control panel with LCD (see figure 24).

- **(ENT)** Key «ENTER».
- **(ESC)** Key «ESC».
- **(↗)** Key to move up (backward).
- **(↙)** Key to move down (forward).
- **(➔)** Key to move to right.
- **(←)** Key to move to left.

Led optical indicators (see figure 24).

- **(a)** Red Led "**FAULT**".
- **(b)** Yellow Led "**BYPASS**".
- **(c)** Green Led "**OPERAT.**".
- **(d)** Yellow Led "**COM.**".

6.1.1. Led optical indicators.

Figure 24 shows the layout of the led optical indicators included in the control panel with LCD, and they are turned on when their function are activated.

(a) Red led indicator "**FAULT**". It is turned on when Bypass of one or more phases is activated, due to: fault, overload, manual activation or by software activation. Also it is triggered by overtemperature and high or low input/output voltages.

(b) Yellow led indicator "**BYPASS**". It is turned on when any of the phases of the equipment is on Bypass.

(c) Green led indicator "**OPERAT.**". It is turned on when the equipment is calibrated and in normal operating mode.

(d) Yellow led indicator "**COM.**". Meanwhile the communications with the control card of each phase are established, it blinks.

6.2. Basic functions of the keys.

- Through keys upward **(↙)** and backward **(↗)**, there is access to all the menus of the LCD panel, being able to move from one to another with themselves.
- Through keys right **(➔)** or left **(←)**, there is access to the screens of all the submenus of the LCD panel, being able to move from one to another with themselves.
- Key **(ENT)**, has different purposes depending on the menu we are:
  - ❒ Submenu entry. Press key **(ENT)** to activate the function setting, the figures in the screen blink. With keys **(➔)** - **(←)** the character to set is selected and with keys **(↙)** - **(↗)** the value is selected or with keys **(➔)** - **(←)** the different options are selected. To confirm press **(ENT)**. Next field will blink, to continue doing settings, proceed in the same way or press **(ESC)** to escape.
  - ❒ Validation of measurements or parameters.
- When pressing key **(ESC)** from any screen of any submenu, it is gone back to main screen **(Screen 0.1)**, unless we are inside of any screen from **«Parameters»** menu, changing any of them. Then the first pulsation of key **(ESC)** will stop the blinking of the value and the second one will go back to main screen.
- Notes related to the screens of figure 26 and related to figure 25, as an example:
  - ❒ Some screens has a determined quantity of «**–**» characters. Each one of it, means one character so the maximum length of the field will be determined by the quantity of them.
  - ❒ Each screen is labelled with a number located in its right bottom corner. It is only included as a mere reference for its next description and explanation.
  - ❒ Other note (*1), means the hidden programming screens through the password (0500) in «**screen 13.1**». This safety level avoids that non-authorised staff can alter or modify any setting.

Fig. 25. Reference notes of the screens.

6.3. Description of the screens.

6.3.1. Main screen «Start».

Screen 0.1

Basic screen, which is displayed when the equipment is started up. It shows the time, date and equipment status
It is also the displayed screen when pressing **(ESC)** to escape from any menu or submenu of LCD panel.

Screen 0.2

It allows activating or deactivating the Saving and /or Manual shut-down orders, so it modifies the status of the equipment.

Screen 0.3

It displays the status of the communications for each control and phase BM535*/BM536*/BM542*:

- 0 = It doesn't communicate.
- 1 = It communicates.
- and the number of the phase that it is communicating is displayed in the right bottom corner (1 phase R, 2 phase S and 3 phase T).

6.3.2. «Measurements» menu (Screen 1.1).

To go from main screen press once the upward key **(↙)**. By means of key **(➔)** there is access to all the screens of submenus, being able to move from one to another with the keys **(➔)** or **(←)**.
The figure on top right corner of each submenu means the number of the phase that they belong to. Each one corresponds to a determined phase: 1 phase R, 2 phase S and 3 phase T.
To display the measurements of one phase, press **(ENT)**, select the number of phase (1-2-3 for R-S-T) with keys **(↙)** or **(↗)** and confirm with **(ENT)**. Next press **(ESC)** to escape and press **(↙)** to go back to menu «Measurements».

Screen 1.2

Submenu for input voltage and frequency.

Screen 1.3

Submenu for output voltage and current supplied to the load.

Screen 1.4

Submenu for apparent power (kVA) and active (kW) supplied to the load, as well as its type (Resistive, L = Inductive, C = Capacitive) with its power factor.

Screen 1.5

Submenu for percentage of load and saving, which is done depending on the input and output voltages.

Screen 1.6

Submenu for temperatures of heatsink (DIS), tap autotransformer (T) and booster transformer (B).

Screen 1.8

Submenu for firmware version of control of each phase.

Screen 1.9

Submenu internal temperature of the equipment in ºC.

6.3.3. «Alarms» menu (screen 2.1).

To go from main screen press twice the forward key **(↙)**. By means of key **(➔)** the most recent active alarm is displayed, being able to move from one to another inside of the alarm list with the keys **(➔)** or **(←)**.
If there is not any alarm, it will not possible to go forward with key **(➔)**.
Figure 26 is showing just only one alarm as an example, but there could be some of them, the active ones and ordered by appearance order. In table 4, there are all the possible alarms displayed in the LCD panel.

Representation in LCD panel	Description
OVERLOAD	Output overload alarm
BYPASS	Bypass alarm
LOW INPUT V.	Low input voltage alarm
HIGH INPUT V.	High input voltage alarm
LOW OUTPUT V.	Low output voltage alarm
HIGH OUTPUT V.	High output voltage alarm
HIGH TEMP. 1	High temperature 1 alarm (heatsink)
HIGH TEMP. 2	High temperature 1 alarm (inductor)
P. DEVICE ERR. 1	Semiconductor 1 fault
P. DEVICE ERR. 2	Semiconductor 1 fault
BYPASS FAULT	Bypass fault alarm
BLOCKING ALARM	Equipment blocked alarm
MANUAL BYPASS	Manual bypass alarm
GENERAL ALARM	General alarm
EARTH LEAKAGE CURRENT HIGH	Earth leakage current > than programmed one
DIGITAL ALARM 1 ACTIVATED	Tripping alarm for output switch 1
DIGITAL ALARM 2 ACTIVATED	Tripping alarm for output switch 2
DIGITAL ALARM 3 ACTIVATED	Tripping alarm for output switch 3
DIGITAL ALARM 4 ACTIVATED	Tripping alarm for output switch 4
DIGITAL ALARM 5 ACTIVATED	Tripping alarm for output switch 5

Tabla 4. Alarm list displayed in the LCD panel.

Screen 2.2

Example: Active alarm and quantity of modules that they have it.

6.3.4. «Data logger» menu (Screen 3.1).

To go from main screen press three times the forward key **(↙)**. By means of key **(➔)** there is access to the first log screen starting from the most recent one (maximum 200 logs) and being able to move from one to another with the keys **(➔)** or **(←)**.
In case of no logs, it will not be possible to move forward with key **(↙)**.

Screen 3.2

It allows to clear the event data logger.

Screen 3.3

Example of an event log of the equipment: day (dd/mm), if the alarm has been activated or deactivated (ACT/DES), number of the affected phase (M:), time of the alarm (hh:mm) and alarm code - reference.

6.3.5. «General parameters» menu (Screen 4.1).

Some the screens of this menu are hidden by default and a password has to be entered (0500) in «**screen 13.1**» to change any setting. This access control restricts non-authorised staff modifying settings.
To go from main screen press four times the forward key **(🡽)**. By means of key **(➔)** there is access to all the screens of general parameters, being able to move from one to another with the keys **(➔)** or **(🡸).**

Screen 4.2

Regarding to the clock of the equipment. It can be set, considering its structure (hh:mm:ss), set the daylight saving time (DST) or out from daylight saving time (--), set the day (dd:mm:yy) and weekday. So that the equipment works automatically with the astronomical clock, the data related to time and GMT (figure screen 10.4) has to be entered before, during the installation procedure or later on with the technical service intervention, depending on the case.
The system will work in stand alone when having the reference data, but the daylight saving times will not be changed automatically and vice versa. If the time scheduler is going to be used to start up the equipment, it is needed to update the clock time (daylight summer or winter time).

Screen 4.3

The contrast of the LCD panel can be set for an optimal visualisation.

Screen 4.4
Language setting: Spanish, English, French and Hungarian.

Screen 4.5
Regarding to communication parameters with **ILUEST** phases.

Screen 4.6
Regarding to external communication parameters through RS-232.

Screen 4.7
Regarding to external communication parameters through RS-485

Screen 4.8
DST (Daylight Saving Time) for Europe, AUTOMATIC/MANUAL and shown in the screen as AUTO/MAN..

This selection allows activating or not, the daylight saving time in an Automatic way for the Europe zone, by adding the DST in summer and cancelling it in winter. With the option activated to AUTO, which is preset from factory, it is allows selecting if the Time scheduler runs on OFFICIAL or SOLAR time.

- OFFICIAL time, when the time is changed from winter to summer DST or vice versa (it activates or deactivates the DST), the set times in the time scheduler are not affected, therefore they are moved together with the official time as regards to the solar time.
- If it is selected SOLAR time, when the time is changed from winter to summer DST or vice versa (it activates or deactivates the DST), the set times in the time scheduler are shown with a forward or backward hour as regards to the time that it was before the DST time change, therefore they are left equal as they were before changing the official time.

6.3.6. «ILUEST+ parameters» menu (Screen 5.1).

All the screens of this menu are hidden by default and a password has to be entered (0500) in «**screen 13.1**» to make any setting. This safety level allows that non-authorised staff makes any setting or modify any preset values.
To go from main screen press five times the upwards key **(🡽)**. By means of key **(➔)** there is access to all the screens of programming parameters of **ILUEST+ MT**, being able to move from one to another with the keys **(➔)** or **(🡸)**

Screen 5.2
A GLOBAL setting can be selected for all the phases together, or INDIVIDUAL, one by one. When GLOBAL setting is selected, it operates over the LCD control panel application, when INDIVIDUAL is selected, it operates over the resident application in each control of each phase of the equipment.

Screen 5.3
Preset parameters for each type of lamp (high pressure sodium HP, low pressure sodium LP, high pressure mercury HP, low pressure mercury LP (fluorescents) and metal halide). When selecting any type of lamp a preset values for nominal start voltage and saving voltage are uploaded.

Screen 5.4
Voltage and duration in start status. Any parameter can be set individually, to adapt them to the installation needs

Screen 5.5
Nominal and saving voltages. Any parameter can be set individually, to adapt them to the installation needs.

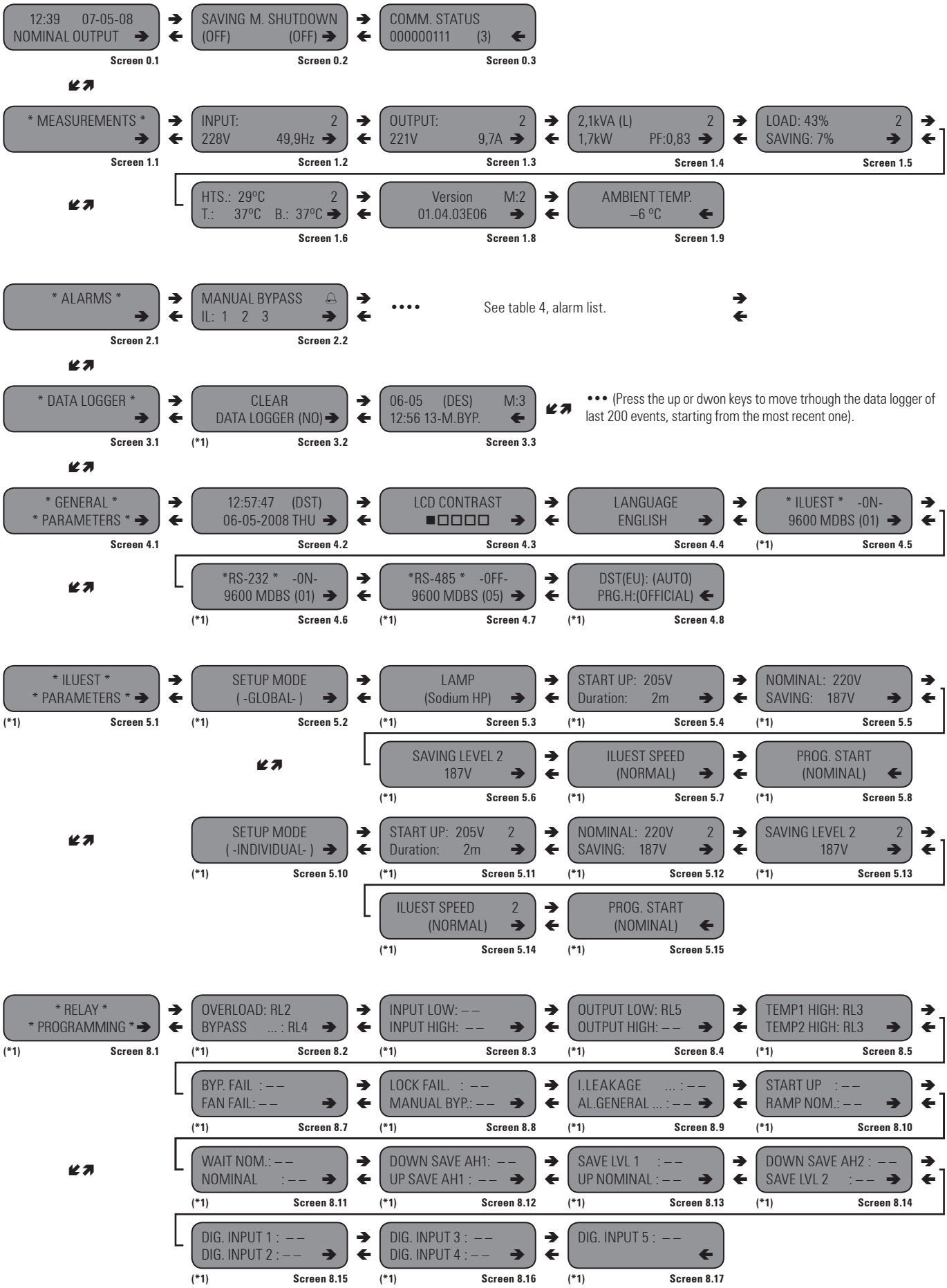
Screen 5.6
Saving level (voltage) 2. The parameter can be set to adapt it to the installation needs.

Screen 5.7

Speed of **ILUEST**. The operating normal speed or test fast speed can be selected, in order to avoid waiting long period times in the status of **ILUEST** to allow making the settings and testing.

Screen 5.8 and 5.15
It allows setting the start voltage of the equipment, by selecting one of the preset levels: NOMINAL (by default), SAVING 1, SAVING 2 or START only, which is displayed as "----".

The last option is foreseen for those particular installations, that having activated the astronomical clock of the equipment or a photocell sensor, the start up time moves depending on the day of the year that we are and the geographical location, or even depending on the light conditions of the day. With the selected "----" option, the start order of the equipment will use the one corresponding to the period of time of the current time, without doing any change in the voltage level till a new order of the time scheduler.



It follows in the next page (see screen 9.1).

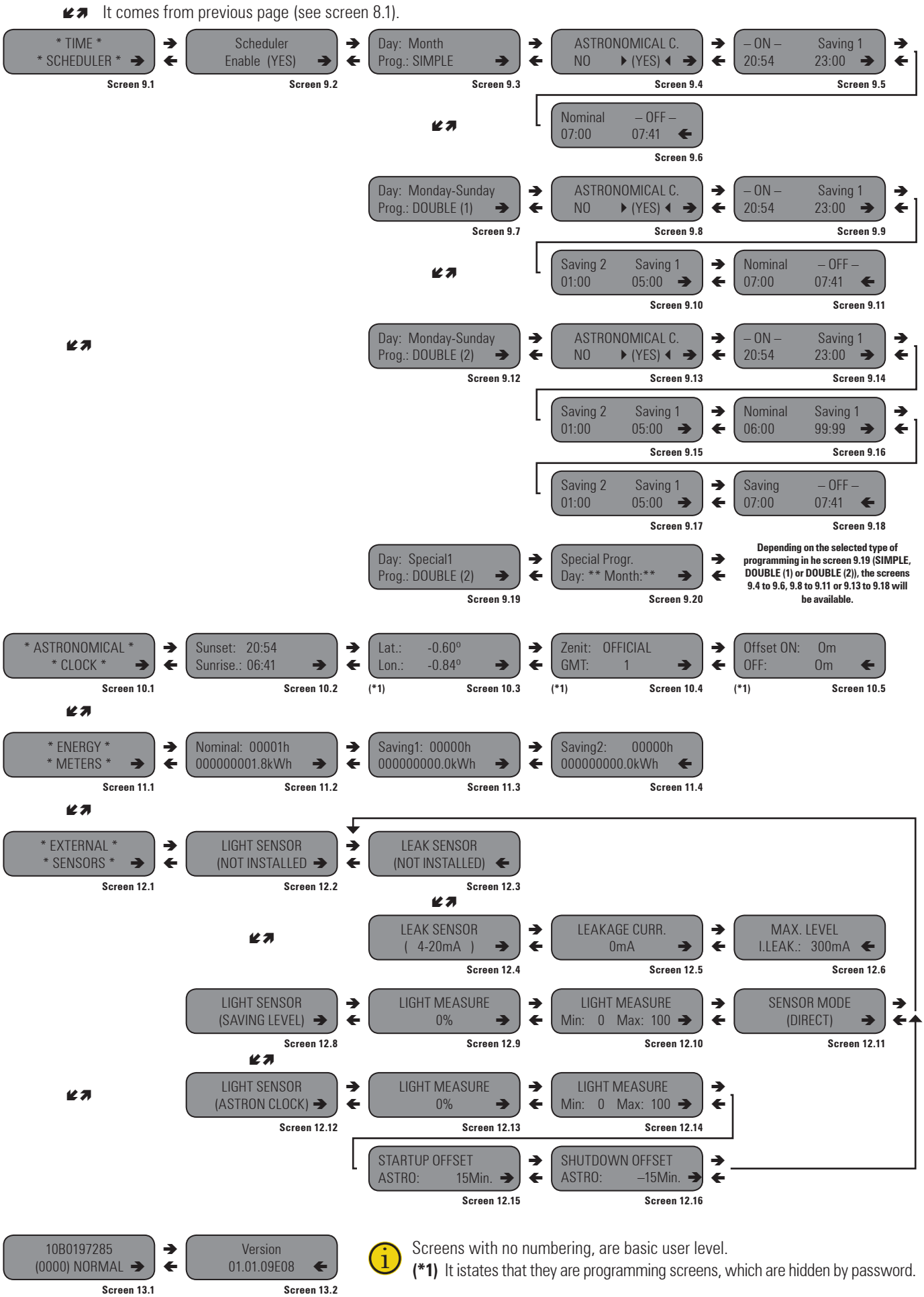


Fig. 26. Screen map of LCD panel synoptic.

Screen 5.10
By means of this screen, the INDIVIDUAL mode of setting can be selected, so it allows to set the parameters per each control card independently (1, 2 or 3) corresponding to phases R-S-T:

- Start voltage and duration of itself (Screen 5.11) .
- Nominal and saving voltages (Screen 5.12).
- Saving level (voltage) 2 (Screen 5.13).
- Speed of **ILUEST+ MT** (Screen 5.14).

6.3.7. «Relay setting» menu (Screen 8.1).

All the screens of this menu are hidden by default and a password has to be entered (0500) in «**screen 13.1**» to make any setting. This safety level allows that non-authorised staff makes any setting or modify any preset values.
To go from main screen press the forward key **(↵)** as many times as it were needed to access to screen 8.1. By means of key **(➔)** there is access to all the screens of relay setting of control card BM491*, being able to move from one to another with the keys **(➔)** or **(←)**.

Screens 8.2 to 8.17
A relay from card BM491* can be associated to any alarm or status, so when the alarm or status is active the associated relay is activated too.

6.3.8. «Time scheduler» menu (Screen 9.1).

To go from main screen press the forward key **(↵)** as many times as it were needed to access to screen 9.1. By means of key **(➔)** there is access to all the screens of time scheduler, being able to move from one to another with the keys **(➔)** or **(←)**.
Time scheduler can be activated in order to make automatic the daily start up and shutdown, as well as the shifting to saving or nominal. The daily setting can be done for all the weekdays or can be customized for any particular weekday.
Also, the start up and shutdown can be selected to be activated by the astronomical clock, this way it will never be a fix time because it will depend on the season of the year (the astronomical clock calculates the sunrise and sunset for each day of the year, depending on a geographical coordinates).
All values in the time fields from time scheduler are preset to 99:99 from factory. If later on any programming requires to have disabled any step, all fields from the implicit screens will have to be set to 99:99, less when there is a generic deactivation of the time scheduler.

Screen 9.2
Time scheduler activation can be selected, to activate (YES) or to not activate (NO). When selecting YES, the equipment starts up and shutdown and shift to saving and nominal automatically.

Screen 9.3
It is possible to select the weekdays with a determined programming: each weekday, from Monday to Friday, Saturday and Sunday, Monday to Sunday, and 10 special days. It can be selected the days +10 special days that are affected by the programming. Duty cycle is SIMPLE, which means On (start up to nominal) - Saving 1 - Nominal - Off (out of service).

Screen 9.4, 9.8 and 9.13
Astronomical clock can be activated (YES/NO) in order to make variable the start up and shutdown of the equipment depending on the day duration and according to the season of the year.

Screen 9.5, 9.9 and 9.14
Time when it will start up (in case the astronomical clock were NOT active) and time when it will shift from Nominal to Saving 1.

Screen 9.6, 9.11 and 9.18
Time when it will shift from Saving 1 to Nominal and time when it will be shutdown (in case the astronomical clock were NOT active).

Screen 9.7
It is possible to select the weekdays that will act over a determined programming, each weekday, from Monday to Friday, Saturday and Sunday, Monday to Sunday, and 10 special days. It can be selected the days + 10 special days that are affected by the programming. Duty cycle is DOUBLE (1), which means On (start up to nominal) - Saving 1 - Saving 2 - Saving 1 - Nominal - Off (out of service).

Screen 9.10
Time when it will shift from Saving 1 to Saving 2 and time that it will shift from Saving 2 to Saving 1.

Screen 9.12
It is possible to select the weekdays that will follow a determined programming, each weekday, from Monday to Friday, Saturday and Sunday, Monday to Sunday, and 10 special days. It can be selected the days +10 special days that are affected by the programming. Duty cycle is DOUBLE (2), which means to make two consecutive time DOUBLE (1) program without going Off.

Screen 9.15
Time when it will shift from Saving 1 to Saving 2 and time that it will shift from Saving 2 to Saving 1.

Screen 9.16
Time when it will shift from Saving 1 to Nominal and time when it will shift from Nominal to Saving 1.

Screen 9.17
Time when it will shift from Saving 1 to Saving 2 and time that it will shift from Saving 2 to Saving 1.

Screen 9.19
It is possible to select the weekdays that a determined programming will perform, each day of the week, from Monday to Friday, Saturday and Monday, Monday to Sunday, and 10 special days. The day of the week +10 special days can be selected to affect the stated programming. The microprocessor allows saving up to 10 "SPECIAL*" programs, each one with its determined day and month, where "*" states the number of program from 1 to 10.

Screen 9.20
Day and month of the year for each special programming.

6.3.9. «Astronomical clock» menu (Screen 10.1).

Some screens in this menu are hidden by default and a password has to be entered (0500) in the «**screen 13.1**» to make any setting. This safety level allows that non-authorised staff makes any setting or modify any preset values.
To go from main screen press the upwards key **(🡅)** as many times as it were needed to access to screen 10.1. By means of key **(➔)** there is access to all the screens of astronomical clock, being able to move from one to another with the keys **(➔)** or **(🡄)**.

Screen 10.2
Sunset and sunrise. Data calculated by the astronomical clock, depending on the geographical location that the equipment is installed (entered values in screen 10.3) day of the year and GMT (value in screen 10.4).

Screen 10.3
Geographical location of the city or town where **ILUEST** is installed. The geographical coordinates of latitude and longitude in degrees, tenths and hundredths of a degree can be obtained from a GPS, map, Internet,....and entered in this screen.

Screen 10.4

Time zone as regards Greenwich Meridian. Select zenith: OFFICIAL, CIVIL, NAUTICAL or ASTRONOMICAL.
GMT (Greenwich Meridian Time): In Spain, for example, the time referred to GMT is GMT+1 / GMT+2 (winter / summer), less in Canary Islands.

Screen 10.5

Offset (positive or negative delay) to start up «On» and shutdown «Off» **ILUEST**. A value can be entered to put forward or delay some minutes, the start up and/or shutdown of the equipment therefore the lighting too

Relating to zenith: Official, civil, nautical or astronomical.
Generally Sunrise and Sunset are referred to the moment when the solar ring is over the horizon. So, we have to consider the semi-diameter of the sun ring, which has 16 minutes of arch.
So, the sunrise and sunset happen when the sun has an altitude of –0º50' (34' for refraction, and plus 16' for semi-diameter of the ring). It is the **official twilight**.
Meanwhile the atmosphere reflects the solar light, the sky is not dark instantly during the sunset, it is the twilight period. During the **civil twilight**, there is enough light to make activities outside; it happens meanwhile the altitude of the sun is –6º
During the **nautical twilight**, there is enough darkness to see the most brilliant stars, but not enough light to see the horizon, activating the browsers to measure the stellar altitudes; it happens meanwhile the altitude of the sun is –12º.
During the **astronomical twilight**, the sky still has too much light to make reliable astronomical observations; it happens meanwhile the altitude of the sun is –18º.
Once the sun is below 18º relating to horizon, we talk about **astronomical darkness**. The same twilight diagram is repeated , to the other way till the sunrise.
In summer, the astronomical twilight is prolonged all night long in those places that its latitude overcomes the 49º.
Recommendation: For a normal use of **ILUEST+ MT** astronomical clock, it is recommended to put the option «Zen» to «Off» (**Official**).

6.3.10. «Energy counters» menu (Screen 11.1).

To go from main screen press the upwards key **(🡅)** as many times as it were needed to access to screen 11.1. By means of key **(➔)** there is access to all the screens of energy counters, being able to move from one to another with the keys **(➔)** or **(🡄)**.
This menu allows checking the running time in each status (Nominal, Saving 1 and Saving 2), as well as the accumulated consumptions in kWh of each one.

Screen 11.2
Number of hours and accumulated kWh with the equipment in Nominal status.

Screen 11.3
Number of hours and accumulated kWh with the equipment in Saving 1 status.

Screen 11.4
Number of hours and accumulated kWh with the equipment in Saving 2 status.

6.3.11. «External Sensors» menu (Screen 12.1).

To go from main screen press the upwards key **(🡅)** as many times as it were needed to access to screen 12.1. By means of key **(➔)** there is access to all the screens of external sensors, being able to move from one to another with the keys **(➔)** or **(🡄)**.

Screens 12.2, 12.8 and 12.12
Light sensor selection. Select among Not installed (12.2), Saving level (12.7) or Astronomical clock (12.11).
When selecting saving level, the light sensor will act over the own saving level according to the preset values in the linked screens or it will be done over the astronomical clock if this option has been selected and under the preset values of the linked screens.

Screen 12.3 and 12.4
Earth leakage current selector. Options: Not installed or 4-20 mA (i.e: RMA25 sensor from Afeisa).
The input for the sensor in digital I/O card BM491*, is applied between pins 1 and 3 of connector CN8, considering pin 3 as the negative.

Screen 12.5
Measurement screen of earth leakage current sensor.

Screen 12.6
Screen for setting of alarm level, earth leakage current. By default 300 mA.

Screens 12.9 and 12.13
Light sensor measurement in % (i.e.: FF-LESA13B2 sensor from HONEYWELL Commet from 1000 - 100 000 Lux).
The input for the sensor in digital I/O card BM491*, is applied between pins 2 and 3 of connector CN8, considering pin 3 as the negative.

Screens 12.10 and 12.14
As a total darkness or infinite light can't be achieved, there is a setting to set the actuation of the sensor in %, within a minimum of 0 and maximum of 100, correlational with the analogical output of 4-20 mA respectively.
If **ILUEST+ MT** is on Nominal, the sensor will not act because it is the maximum level. If it were in Saving 1 or Saving 2, any of

them will be the minimum level depending on the case. Therefore maximum and minimum levels will be Nominal-Saving 1 or Nominal-Saving 2 respectively.

Screen 12.11

Type of actuation, it is selectable between Direct or Reverse options. This function allows making the needed voltage settings to achieve a higher or lower lighting depending on the measurement of the sensor.
For example, with the Direct option activated, there will be a higher lighting inside a tunnel of the highway network, as much higher is the light outside, reducing the dazzle effect when going in or out from itself. The maximum light will be when lights will be connected to nominal voltage.
With Reverse option activated, it is achieved the contrary effect, so as higher is the measurement of the sensor, the lower will be the voltage that supplies the lighting in order to achieve a contrast effect. The minimum light will be at Saving voltage 2.

Screens 12.15 and 12.16

Offset to start up and shutdown of astronomical clock depending on the measurement of the light sensor. In public lighting, when there is more light, it is interesting to turn on the lights later or to turn off them before. So:

- Sunrise ON, enter an offset value with + sign.
- Sunset OFF, enter an offset value with – sign.

In case, it were not required both to delay the start up and/or to bring forward the shutdown of the equipment due to a higher natural light, it is able to be entered a fix offset value (screen 10.5) of the same value as the variable one (screens 12.15 and 12.16) but with opposite sign.

6.3.12. «Serial number and Password» menu (Screen 13.1).

To go from main screen press the upwards key **(🡅)** as many times as it were needed to access to screen 13.1, where it is stated the serial number of the equipment and it is entered the safety «Password». By means of key **(➔)** there is access to the next screen of this menu, being able to move from one to another with the keys **(➔)** or **(🡄)**.
To access for restricted settings or data changing (screens with reference (*1) stated below of themselves in figure 28), enter the access «Password» (0500).

Screen 13.2

Firmware version of LCD panel.

7. Maintenance, warranty and service.

7.1. Basic maintenance guide.

Main directives for a correct maintenance are aliked to those ones made by our Service and Technical Support when making the **Preventive** maintenance (see section 7.4).

7.2. Troubleshooting guide (F.A.Q.).

In case of wrong operating of the equipment, and before contacting with the Service and Technical Support **(S.T.S.)**, the user should try to solve the problem with its own means, if the symptoms are one of the followings:

7.2.1. If the equipment doesn't start up.

Check:

- All connections have been done according to chapter 4.
- Protections in the control panel (RCD and circuit breaker switch) are in position "I" or "On".
- Input voltage in the headline contactor input terminals is correct (check the phase to phase and phase to neutral voltages).
- "On-Off" selector of the control panel (to be installed by the user and it will belong to him) is in "Automatic" position.
- Time scheduler of the control panel with LCD is set to OFF, so the equipment will not start up till the time set.

  If all the points checked till now are correct, the headline contactor has to be activated.
- The input voltage in the **ILUEST+ MT** terminals is correct (phase to phase **(1_R)-(1_S)-(1_T)** and phase to neutral **(1_R)-(1_S)-(1_T)-(1_N)** voltages.
- Circuit breaker switches **(9_R)** for single phase or **(9_R)**, **(9_S)** and **(9_T)** for three phase, are in position "I" or "On".
- **(FS1)** and **(FS2)** fuses of each electronic unit are in good status.

7.2.2. If the equipment is on Bypass.

Check:

- It is not turned «On» «M. shutdown» in the LCD panel.
- If there is any active internal alarm (overload at the output).

7.3. Warranty conditions.

The limited warranty by **our company** only applies to those products that you acquire for commercial or industrial use in the normal development of your business.

7.3.1. Covered product.

Lighting Flow Dimmer-Stabilizer, **ILUEST+ MT** mode.

7.3.2. Warranty terms.

This product is guaranteed against any parts and/or labour defect for 12 months period from its commissioning by **our company** staff or other specifically authorised, or 18 months from its factory delivery, whichever expires first. In case of failure of the product inside the warranty period, we must repair, in our facilities at no cost, the faulty part or parts. The transport expenses and packaging will be borne to the user.

We guarantees for period time higher than 10 years, the availability of parts and spare parts, as hardware as software, as well as a complete assistance regarding the reparations, components replacement and software updating.

7.3.3. Out of scope of supply.

Our company is not forced by the warranty if it appreciates that the defect in the product doesn't exist or it was caused by a wrong use, negligence, installation and/or inadequate testing, tentative of repairing or not authorized modification, or any other cause beyond the foreseen use, or by accident, fire, lightnings or other dangers. Neither it will cover, in any case, compensations for damages or injuries.

7.4. Available maintenance and service contracts.

When the warranty is expired, and adapting to the customer's needs, there are several maintenance modalities:

Preventive.

It guarantees a higher safety to preserve the correct operating of the equipments with a yearly preventive visit, in which the specialised technicians of **our company** make several tests and sets in the systems:

- Check and write down the input and output voltages and currents per phase.
- Check the logged alarms (with the option telemanagement pack).
- Check the readings of the LCD panel.
- Digital LCD panel: input/output voltage and current and temperatures.
- Other measurements.
- Check the fan status.
- Check the load level.
- Check the selected language.
- Check the correct location of the equipment.
- General cleaning of the equipment.

This way, it is guaranteed the perfect operating and the possible coming faults are avoided.

These supervisions are usually done without shutdown the equipment. In those cases that a shutdown were needed, date and time would agree with the customer to do the task.

This maintenance modality covers, inside the working timetable, all the journey expenses and manpower.

Corrective.

When a fault occurs in the equipment operating, and previous notice to our Service and Technical Support **(S.T.S.)**, in which a specialized technician will establish the failure scope and he will determine a first diagnostic, the corrective action starts.
The needed visits for its correct resolution are unlimited and they are included inside the maintenance modalities. It means that in case of failure, we will check the equipments as many time as it were needed

Besides, inside these two modalities, is possible to fix the **action timetable and response times** in order to be adapted to the customer's needs:

- **LV8HLS**. Customer's attention from Monday to Friday from 9 h. to 18 h. The response time is inside the same day or, as maximum, in the next 24 hours of the fault notification.
- **LS14HLS**. Customer's attention from Monday to Saturday from 6 h. to 20 h. Response time is inside the same day or, as maximum, at first time of the next working day.
- **LD24HLS**. Customer's attention from Monday to Sunday 24 h., 365 days per year. Response time in less than two or three hours after the fault notification.

Additional arrangement: 1-m-cb.

- **Index 1**. It means the number or **Preventive** visits per year. It includes displacement and manpower expenses inside the established timetable for each maintenance modality, as well as all the needed **Corrective** visits. Excluding all the parts in case of reparation.
- **Index m**. It means to include all the **spare parts**.

7.5. Technical Service Network.

Coverage, both national and international, from our Service and Technical Support **(S.T.S.)**, can be found in our Website.

8. Annexes.

8.1. General technical specifications.

INPUT	
Voltage	Single phase 120, 220, 230,240 V (3 wires: 1 phase + N +PE).
	Three phase 3x208, 3x220, 3x380, 3x400, 3x415 V (5 wires: 3 phases + N +PE).
Regulation range	+33% / –8% $U_{nominal}$. + 4% / –29% $U_{saving\ 1}$. + 10% / –24% $U_{saving\ 2}$.
Frequency	48 ÷ 63 Hz.
Protection	Single pole circuit breaker per phase / electronics by temperature, overload, fault and input MOV.
OUTPUT	
Power	See table 6.
Voltage	Single phase 120, 220, 230,240 V (3 wires: 1 phase + N +PE).
	Three phase 3x208, 3x220, 3x380, 3x400, 3x415 V (5 wires: 3 phases + N +PE).
Regulation accuracy	> ± 2%
Soft start voltage	Preset depending on the type of lamp (selectable).
Minimum saving level	180 V (phase to neutral). Selectable to VM, VSAP, HM and fluorescent.
Speed ramps	From 1 V / minute to 6 V / minute..
Response time	< 100 ms.
Regulation	Independent per phase.
Phase unbalancing	100 % permissible.
Efficiency	> 97 %.
Permissible overload	120 % > 1 min., 150 % for 30 sec.
Harmonic distortion	Nil.
Saving voltage selection 1 or 2	With control panel with LCD. With Telemanagement Pack SICRES.
Permissible power factor	From 0,5 lagging to 0,5 leading.
BYPASS	
Type	Static, with no break in the transfer
Features	Automatic and independent per phase.
Activation criteria	Overtemperature, overload, fault, output fault, manual activation.
Rearmament	Automatic by alarm condition disappearing. Quantity of retries: 5; Time between retries: 2 min..
COMMUNICATION	
Ports	RS-232 andRS-485 (as an option)
Standard relay interface, less with the BA1 or BA3 option	Separate relay for each control. Max. voltage and current of the contacts 2A 250V AC or 30V DC.
Monitoring	Telemanagement pack SICRES (option).
OPTICAL INDICATORS	
Optical indicator in the control panel with LCD	Fault, Bypass, Operat. and Com..
Optical indicator in each control card BM535*/BM536*/BM542*	Active Bypass relay, triggered static switch tap (7), analogical power supply 5 V, digital power supply 5 V, alarm, operating mode (nominal, saving and ramps), Bypass, TxD and RxD communications, saving order, Bypass order.
GENERALS	
Cooling	Forced (see air flow in table 1).
Operating temperature	-40ºC to +55ºC (4% power derate for each ºC > 45ºC)
Relative humidity	Up to 95%, non-condensing.
Operating altitude	< 2.400 m.s.n.m.
Mean Time Between Failures (MTBF)	60.000 hours.
Mean Time To Repair (MTTR)	30 minutes.
Acoustic noise at 1 metre	< 35dBA (with typical load).
FORMATS AND PROTECTION	
Indoor (T) with protection degree IP20	Assembled in sheeted steel frame at carbon cold, with holes to be fixed to the floor.
Outdoors (I) with protection degree IP54	Indoor equipment assembled inside a case or polyester cabinet.
STANDARDIZED OPTIONS	
Option assembled from factory	Manual Bypass, Bypass type BA1 or BA3, Lightning arrestors.
To be installed in the equipment	SICRES telemanagement unit.
To be installed external to the equipment	Manual Bypass, digital I/O, GPRS modem.
Communications of digital I/O cards BM491*	
Inputs	1 for saving order. 1 for Bypass order. 5 digitals.
Outputs	5 dry contacts (switched dry contacts are supplied for each one).
Communication ports	RS485 through DB9 connector. RS232 through RJ connector of 4 pins.
Communications of SICRES card	
SICRES telemanagement card	Communication interface for Ethernet networks with TCP-IP and SNMP protocols, GRPS modem, RTC modem.
Internal or external manual Bypass	
Break before make type	Two or Four poles cam switch of 3 positions (1-0-2).
STANDARDS	
Safety	EN-60950-1.
Electromagnetic compatibility (EMC)	EN-61000-6-2; EN61000-6-3.
Operating	UNE AENOR EA 0033-2007.
Marking	CE.
Environmental quality management	ISO 9001 and ISO 14001 TÜV.

Tabla 5. General technical specifications.

8.2. Particular technical specifications.

	MODEL	Power (kVA)	Max. Dimensions (mm) (Depth x Width x Height)	Weight (kg)
INDOOR	NA+ 3,5-2 T	3,5	245 x 350 x 380 (*)	42
	NA+ 5-2 T	5		43
	NA+ 7,5-2 T	7,5		45
	NA+ 10-2 T	10		46
	NA+ 15-2 T	15		50
	NA+ 20-2 T	20		67
OUTDOOR	NA+ 3,5-2 I	3,5	320 x 520 x 1348	72
	NA+ 5-2 I	5		73
	NA+ 7,5-2 I	7,5		75
	NA+ 10-2 I	10		76
	NA+ 15-2 I	15		80
	NA+ 20-2 I	20		105
INDOOR	NAT+ 7,5-4 T	7,5	245 x 350 x 800 (**)	60
	NAT+ 10-4 T	10		80
	NAT+ 15-4 T	15		81
	NAT+ 20-4 T	20		82
	NAT+ 25-4 T	25		90
	NAT+ 30-4 T	30		95
	NAT+ 45-4 T	45		139
	NAT+ 60-4 T	60	355 x 350 x 1100	181
	NAT+ 80-4 T	80		204
	NAT+ 100-4 T	100	350 x 653 x 1070	214
OUTDOOR	NAT+ 7,5-4 I	7,5	320 x 520 x 1348	94
	NAT+ 10-4 I	10		116
	NAT+ 15-4 I	15		117
	NAT+ 20-4 I	20		118
	NAT+ 25-4 I	25		125
	NAT+ 30-4 I	30		130
	NAT+ 45-4 I	45		173
	NAT+ 60-4 I	60	420 x 520 x 1348	221
	NAT+ 80-4 I	80		244
	NAT+ 100-4 I	100	420 x 770 x 1348	254

(*) Option module for single phase models increases the height of the equipment into 200 mm.
(*) Option module for three phase models increases the height of the equipment into 300 mm.

Tabla 6. Dimensions and weights.

8.3. Glossary.

Soft start.

Type of start up or turning on the lights. It is done in order to avoid the mechanical stress that the lamps suffer and the overload that it means when they are started at nominal.

Bypass.

System that connects the output with the input directly when there is a failure in the loads or equipment. It avoids to shutdown the lighting.

Control centre.

Electrical panel destined to feed, distribute, protect, etc., the lighting installations.

Electromagnetic compatibility.

Its target is to establish evaluation procedures of conformity and electromagnetic protection requirements relating to electromagnetic compatibility of the equipments, systems and installations for its following marketing and commissioning.

Dry contacts.

Electrical contacts are parts of management that connect or disconnect our receivers (coils, lights, motors, etc.). Those contacts are housed inside the contact chamber and they work by different systems, i.e. buttons, switches, relays, etc.

Harmonic currents.

Added currents to the fundamental frequency with a determined sinewave shape. They are called like this because when this harmonics currents appear, they distort the original wave shape.

Equipment to incorporate.

Equipment based on a chassis that has all the parts in, being not able to have any specific protection against electrical shocks

In this case the electrical shock protection has to be provided by an additional enclosure that it will be fitted in the final installation.

Equipment of continuous variation.

Equipment where the output voltage varies in a continuous way or steps lower than 0,3 % of the nominal voltage.

They are habitually characterized, because the power stage is based on a variable and motorized autotransformer. The voltage provided to the loads is given by the autotransformer directly through the carbon brushes system, or in combination with a transformer, called «booster» that adds or subtracts; or the voltage variation is given by pure power static parts.

Equipments with step variation.

Equipment where the output voltage varies in steps higher or equal to 0,3 % of the nominal voltage.

They are habitually characterized, because the power stage is based on a tap autotransformer. The voltage provided to the loads is given by the autotransformer directly, or in combination with a transformer, called «booster» that adds or subtracts; The switching between the different taps can be done with static, electromechanical or dynamic parts.

Dynamic equipments.

Equipment to make functions of voltage stabilizing and light flow dimming, where its main circuit uses parts with motorized movement (motorized variable autotransformers, carbon brushes, etc.).

Static equipments.

Equipment to make functions of voltage stabilizing and light flow dimming, where its main circuit uses static parts (thyristors, triacs , etc.).

Independent equipment.

Equipment housed in an enclosure completely closed, less the bottom surface, in order to assure the protection degree according to its marking.

Outdoor.
Denomination used to designate the capacity of the enclosure, due to its protection degree to be placed outdoor.

Relay interface.
Communication port of the equipment with the external world, made up by some dry contacts.

Static solid switch .
Electrically speaking, it is an electronic switch without physical movement based on a silicon square with a particular mix.

IP20 / IP54.
Suitable protection degree to withstand the inclemency of the weather.

CE marking.
Certification that has to meet all the electrical equipments in Europe. Any manufacturer has its own capacity for its auto certification.

Telemanagement pack.
Optional pack to establish local and/or remote communication with **ILUEST**. It contents a card, built in the equipment, and application software.

Time scheduler.
Clock with capacity to temporize the activation of one or several relays.

Astronomical clock.
Clock with mathematical algorithm, which is able, by programming the latitude and longitude of a determined geographical point previously, to keep the sunset and sunrise tables of all the days of the year. Usually it is used to turn on/off the lighting in an accurate way.

Indoor.
Denomination used to designate the location of the equipment inside of an existent feeder pillar or control centre.

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Product Range

Uninterruptible Power Supply (UPS)
Lighting Flow Dimmer-Stabilizers (ILUEST)
Switch Mode Power Supplies
Static Inverters
Photovoltaic Inverters
Voltage Stabilisers and Power Line Conditioners

Nota: Salicrú can give other electronics solutions according to the application specifications or technical specifications.