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The light you need



Design Memorandum
ESDONI, XEO LUM,
ORBICOM & NODITEL

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HIGH PERFORMANCE LIGHT FLOW STABILISERS-DIMMERS

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ESDONI. General Description

1 Introduction

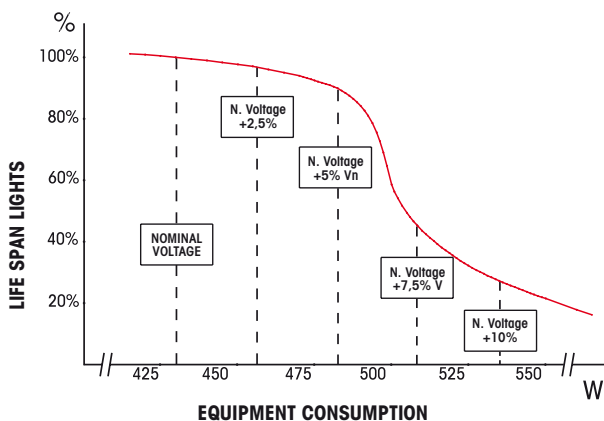
High-performance flow Stabilisers-Dimmers are installed at the line head and in addition to reducing the lighting level as required by the Spanish Regulation on Energy Efficiency at Exterior Lighting Installations, obtaining savings of over 40% during these periods, they also stabilise voltage when the installation is working at full power, avoiding consumption excesses and the reduction in the life of the bulbs caused by network instabilities and excess voltages.

The fact that they are installed at the line head means that their incorporation both in new lighting installations as well as at already existing ones is extremely simple and facilitates access for their maintenance. The installation of a flow reducer-stabiliser at the line head prolongs the life of the bulbs and reduces the occurrence of malfunctions. To achieve these results, reliable equipment must be deployed which is **high performance** and easy to maintain, as otherwise the advantages may become drawbacks.

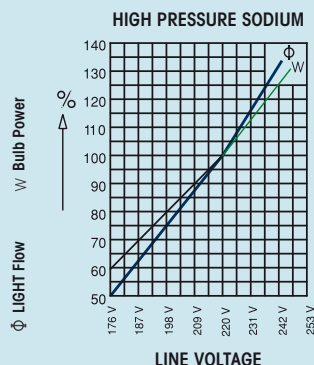
In 1988 the first ESDONI equipment was developed and patented under no.8802945. Since then ESDONI equipment has continued to evolve until arriving at the current models. ESDONI equipment is designed for the optimisation of lighting installations with "High pressure sodium vapour" (HPS), "Mercury vapour" (MV) or even Metallic Halide bulbs (MH).

In accordance with the Spanish Regulation on Energy Efficiency on Exterior Lighting Installations:

"Installations of over 5 kW shall be endowed with a light level regulation system, allowing the reduction in the LIGHT flow by up to 50 %"



> Life and consumption of the bulb in line with network voltage. (Auxiliary equipment - ballast series - 400 W - high pressure sodium)



> Variation in power and LIGHT flow in line with the voltage. (Auxiliary equipment 220V. - series ballast - high pressure sodium)

Energy Saving

ESDONI regulates the bulbs with minor variations in voltage (14 steps). In this way, the changes in voltage do not affect the working life of the bulbs. If carried out with less skips, the changes would be sharper and would shorten the life thereof.

Stabilisers-dimmers are items of equipment designed to generate an energy saving. To this end, the first condition to be required of a system endowed with these characteristics is that it should be very efficient. To this end, the actual consumption of the equipment shall be minimal, raising performance levels to the maximum. ESDONI High-performance flow Stabilisers-Dimmers achieve performances values of over 99% at full load (Tests at official laboratory accredited by ENAC, test no.IE-ITE2010100003). It is possible to achieve these values thanks to the use of power relays in switching.

The almost zero fall in voltage in power relays sets them apart from semiconductors whose inevitable voltage drop generates great losses in performance at full load.

In accordance with the Spanish Regulation on Energy Efficiency in Exterior Lighting, the systems to be implemented at installations shall be "Stabilisers-Dimmers", not only Dimmers.

As these items of equipment are Stabilisers-dimmers the saving generated is greater in comparison with voltage dimmers. As the latter do not stabilise the output voltage in line with the input voltage, they generate voltage variations in the lamps (unstabilised voltage). These variations result in excessive consumption before starting the reduction cycle at certain times, entailing a reduction in the working life of the bulb. Consequently, the total saving generated is less.

ESDONI. General Description

Operation

The current systems are characterised by their simplicity, efficiency and their contribution to maintenance savings.

Their basic functions are:

- A)** To limit the intensity peak produced at the time of the start-up of the bulbs.
- B)** To stabilise the tension of the lighting line.
- C)** To reduce the voltage in the lighting line at low use times.
- D)** To reduce the consumption of the installation and, hence, those of the CO₂ emissions into the atmosphere.
- E)** To reduce the solid waste owing to the reduction in the wear and tear of the bulbs.

To carry out these functions, the new generation of ESDONI equipment incorporates in the control circuit a powerful microprocessor and an output voltage reading system in True Rms as otherwise, the mean value of the output voltage is strongly affected by the form of wave of the discharge bulbs.

ESDONI equipment consists of three wholly independent phases, both physically and electrically, which allows a problem to be individualised at any of the three stages. Furthermore, the ESDONI equipment may operate on a no-load basis which allows one of the phases to be disconnected without affecting the others and it facilitates maintenance and checking work. Each stage is protected by way of a unipolar circuit breaker which allows one phase to be disconnected without disconnecting all the lighting.

Generally speaking, ESDONI equipment shall use for its activation or deactivation a general input contactor which shall be controlled by way of an astronomic switch or remote management system. Hence, during daytime hours whilst the lighting is not working, the equipment shall not be powered. The contactor may be installed both inside the lighting board, as well as inside the ESDONI cabinet itself. On the other hand, ESDONI equipment may operate on a continuous basis as may be the case of tunnels without the need for any contactor.

Output voltage regulation is carried out by way of a robust voltage stabiliser with an autotransformer by way of direct outputs with a differential of 3V controlled by power relays which avoids voltage drops which occur in the systems controlled by semiconductors and results in less losses, longer working life and an extraordinary per-

formance by the equipment. The choice of each socket is controlled electronically on the control circuit to achieve the different stabilised voltages (nominal level, start-up level and reduced voltage levels). The power switching elements have high performance and almost zero losses, along with great immunity to exterior disruptions. Changes between the various sockets of the transformer are always carried out in correlative fashion, closing the subsequent or previous socket by way of a summation transformer, before opening the switch in operation, thereby avoiding delicate synchronisms, minimum operating loads and micro cuts in output voltage, thereby ensuring the absence of harmonics.

The level change terminals shall receive the order at the desired time, starting a slow reduction (5 V per minute) until reaching the reduced level voltage. If controlled by the Xeo Lum remote management system, different reduction levels can be programmed during the course of the night.

The output voltage regulation remains at +/- 1% for load variations from 0 to 100%, input voltages of 230 V +/- 7% and temperature fluctuations from -10 °C to +50 °C, with this regulation being wholly independent at each of the stages. The more the input voltage is, the more the output margin will be.

ESDONI equipment permanently controls the output voltage to the lighting line by way of an advance technology electronic circuit. When powering the ESDONI, an operating check is carried out and after a delay of around 30 seconds the output is activated to the bulbs of the lighting installation under a start-up level.

3.1.- Start-up level

ESDONI equipment start their start-up cycle with a voltage which is slightly higher than the maximum voltage required by the standard EN 60927 at the ignition coils and higher, in turn, to the test voltage indicated in standard EN 60662, achieving a smooth start-up of the lamps and limiting start-up current peaks at the ballasts and power supply lines.

The start-up level is maintained during the programmed time to ensure the thermal stabilisation of the lamps (6 minutes recommended for HPS and 12 minutes for MV) and achieving a smooth start-up of the lamps by reducing the peak current at the installation connection. Once the start-up level time has elapsed, the ESDONI equipment starts a slow variation (5V per minute, approximately) until attaining the voltage value of the nominal level.



ESDONI. General Description

3.2.- Stabilisation at Nominal Level

ESDONI equipment ensures stability of 1% in the output voltage with fluctuations of +/- 7% on the network and load variations of 0 to 100%. A rise in the net fluctuation will be compensated to guarantee the higher output voltage stabilisation.

The voltage values of the nominal level may be programmed with a view to achieving additional savings in the event of new installations or when preventive maintenance is carried out with the replacement of all the installation bulbs.

The nominal voltage is programmable in line with the wear and tear of the lamps (210, 215, 220V).

When an external element (astronomic switch or remote management module) gives the order, ESDONI starts the reduced level cycle.

3.3.- Stabilisation at Reduced Level

ESDONI reduces the output voltage slowly (around 5 V per minute) until attaining the reduced level and the output voltage can fall by at least up to 75% of the network input value.

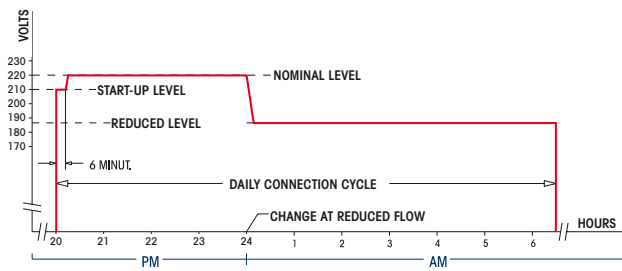
The reduced level voltages (Vr) programmed at the factory are 175 V for HPS and 195 V for MV and MH.

The reduced level consists of 1 level if it is controlled by astronomic switch and 6 levels if carried out by remote management and it may be maintained until the lighting is turned out or return to the nominal level in the early hours of the morning.

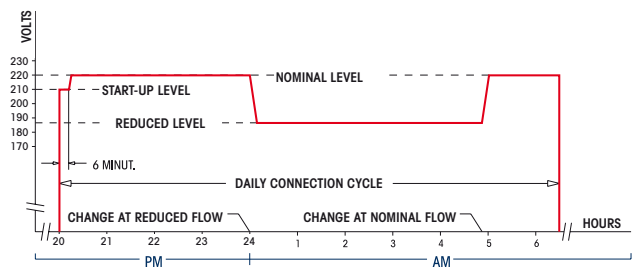
The reduced level voltages can be programmed with an increment in order to correct poor lighting or major falls in voltage at the lighting installations. When the Xeo Lum acts, this increment is lower.

The operation of the ESDONI is cyclical, it starts off with connection, passes through the programmed reduction levels (from 1 to 6) and ends with disconnection. If the ESDONI-EN equipment is working and network supply is interrupted when the voltage comes back, the equipment carries out the start-up cycle, maintaining the output voltage at 210 V in order to achieve the perfect turning back on of all the installation bulbs and limit the start-up currents of the bulbs.

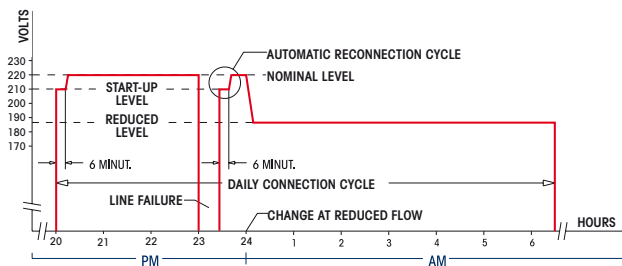
Once the start-up period programmed for the stabilisation of the bulbs has elapsed, the equipment returns to the reduced operating time programmed for this day and at this time.



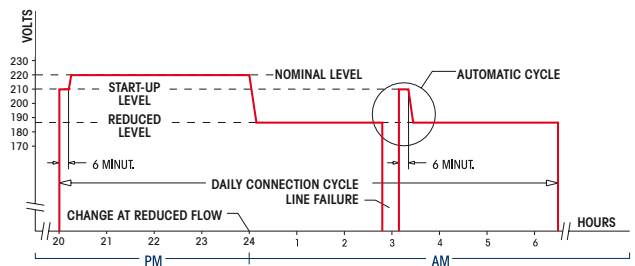
> Nominal, reduced and start-up level curve until start of the ESDONI-EN equipment



> Nominal, reduced and start-up level curve and return to nominal level of ESDONI-EN equipment



> Network cut-off with ESDONI-EN equipment, working under nominal level



> Network cut-off with ESDONI-EN equipment, working under reduced level



ESDONI. General Description

4 Installation

The mechanical affixation and connection of the electric conductors is carried out at the base of the equipment. When they are installed with a all-weather cabinet, the fixing studs shall jut out at least 60 mm from the vertical alignment and it is recommended to use threaded studs which are 12 mm in diameter. The equipment is installed on top of a workbench with appropriate dimensions where the studs can be received and the pipe for the cables is foreseen (see the measurements in the point on Dimensions and weights).

The connecting of the ESDONI equipment is very simple: the electrical installation is carried out in series between the general lighting board contactor and the distribution lines, taking special care to keep all the auxiliary circuits of the lighting board connected at the output of ESDONI. The equipment connecting strip is situated on the upper part of the equipment. It consists of line input terminals, stabilised output terminals and level change terminals (See point on Connections).

It is recommendable, once the connection of the cables to the ESDONI equipment has been carried out and before the unscrewing thereof, to turn on the lighting installation, bridging each input and output phase, verifying after around 10 minutes the turning on of all the lamps of the installation and checking that the currents of each phase do not exceed the equipment capacity. Having carried out this check, turn off the installation and subsequently connect the equipment, respecting the inputs and outputs as well as the phase order.

The turning on of the installation is carried out with the activation of the general contactor which powers the ESDONI equipment input. The turning on order is carried out by way of an astronomical clock or remote management system. This equipment stabilises the voltage at nominal value until they receive a change signal at reduced flow level at the auxiliary terminals (systems without remote management) or the Xeo Lum remote management sends it.

All the ESDONI equipment is ready for use with HPS, MV and MH lamps, selecting the operating mode by making the request thereof to the factory or installer. They come out of the factory programmed, unless otherwise indicated with the following values:

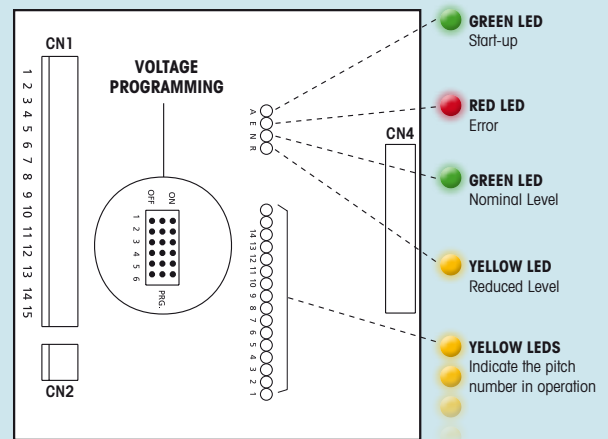
- Output voltage 220 V
- Start-up time 6 minutes
- Reduced flow voltage 175 V

The programming of the output voltage values and start-up times are described in the "Programming" section.

5 Programming

Should the Xeo Lum remote management system not be incorporated, ESDONI allows programming by way of the configuration of the control board bridges which incorporates each of the phases.

The following voltage programming bridges and LIGHT indications have been foreseen therein:



- **"A"** green Led, indicates the start-up time by flashing
- **"E"** red Led, indicates ERROR by sub output voltage, excess temperature (stops the system and the bypass enters)
- **"N"** green Led, indicates nominal level and flashes when it attains stabilisation
- **"R"** yellow Led, indicates reduced level and flashes when it attains stabilisation
- **"1 a 14"** yellow Led, indicates the pitch number activated
- Programming bridges: there are two different forms of operation in line with the configuration of the bridges

ESDONI Mode Programming without Xeo Lum whose default factory configuration is:

1	2	3	4	5	6	Nominal Level	Reduced Level	Start-up Time
OFF	OFF	OFF	OFF	OFF	ON	220 V	175 V	6 min. VSAP-serie

ESDONI. General Description

	POSITION		Nominal Level	POSITION		Start-up Time
	1	2		5	6	
	OFF	OFF	220 V	OFF	OFF	50 s Fluorescence
	ON	OFF	215 V	ON	OFF	
	OFF	ON	210 V	OFF	ON	6 min VSAP
	OFF	ON	175 V	ON	ON	
ON	OFF	185 V				
OFF	ON	195 V				
	ON	205 V				

Xeo Lum Mode Programming (when the equipment incorporates Xeo Lum):

1	2	3	4	5	6
ON	ON	SW3	SW4	ON	ON

The configuration of positions 3 and 4 provide us with the direction of the phase installed as shown in the table below:

3	4	DIRECTION	CONFIGURATION
ON	ON	SLAVE 0	PHASE R
OFF	ON	SLAVE 1	PHASE S
ON	OFF	SLAVE 2	PHASE T

Technical Characteristics

- High performance, higher than 99% under nominal level in full load
- Regulation of line voltage with precision of $\pm 1\%$ for load variations from 0% to 100%, input voltages 230 V $\pm 7\%$. A higher variation in the input voltage, causes variation in the precision
- Measurement of the output voltage in True Rms
- Absence of harmonics
- Absence of micro cuts
- Independence of physical and electrical phases
- Independent protection of each phase
- Allows unbalances from 0% to 100%
- Does not vary the $\cos\phi$ of the installation

- Easily incorporated
- Installed at the line head
- Does not require any modification of the installation
- Wireless control at the installation
- Ease of maintenance as it does not have forced ventilation.

Three major series are differentiated: EN (Three phase with neutral), SN (Three phase without neutral) and M (Monophase).

Maintenance

In the equipment design it has been foreseen that the maintenance should very low in line with the long life of its components, being limited to cleaning tasks, checking operation and verifying that the voltage values programmed fall within the tolerance. It is recommended to carry out an inspection of the equipment once a year, as well as checking that the power connections are tightened properly. To carry out the cleaning and revision of the equipment connections, it is very important that the power supply should be disconnected. Any handling which involves the opening of the equipment must be carried out by duly authorised staff with sufficient technical qualifications.

The ESDONI High performance flow Stabilisers-Dimmers are designed in modular fashion in such a way that the replacement of any of its parts should be a simply, speedy task.

Reliability

Each of the independent phases is protected from overloads by way of a magnetothermal switch at the network input and a thermal protector against excess temperature inside it. To avoid the disconnection of the lighting installation, a system endowed with a by-pass with automatic reset is necessary at the statistical equipment which acts under the following circumstances:

- Anomalies in the control board
- Subvoltage at the output
- Excess temperature in the equipment

The composition of all the elements described above forms a power supply phase, with of the three phases operating separately at the three-phase equipment. In addition, the ESDONI equipment may incorporate a manual bypass at the control console. Also on request, bypass status output terminals may be supplied.



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Protections from atmospheric discharges can also be incorporated, comprising gas unloaders and accessible from the front console so they can be put back easily. Their installation is recommended in the centre of the control.

As a consequence of the technology, the switching power is very low, around 6% of the power during use, along with high immunity to electrical disturbances which bring about prejudicial random switching. The use of relays affords compared with semiconductors, greater reliability in out-control situations and a high level of insulation between the alternating network and the electronic control circuits. In addition, they ensure several hundred thousand manoeuvres, obtaining great operating reliability and a long duration of the stabiliser-reducer equipment. ORBIS guarantees all their ESDONI High performance flow Stabilisers-Dimmers equipment for a period of 2 years against any manufacturing flaw.

The warranty includes the total solution of the problem, in other words, travel, diagnosis, labour and spare parts for the repair. The installer or the maintenance company are given the option of receiving training courses on the equipment.

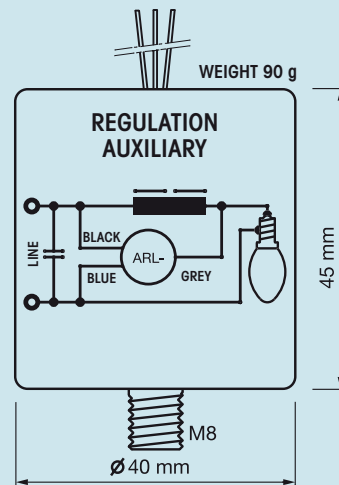
⇒ ARL Regulation Auxiliaries

Public lighting installations are made up, in the main, of equipment with HPS, MV or MH lamps. In equipment with series ballasts and an HPS lamp, their power can be reduced and regulated using the regulator-stabiliser equipment at the line head up to 40% of the nominal value. With equipment for MV bulbs and series-type ballasts, the system power can be reduced directly with ESDONI equipment up to 25% of the nominal value, equivalent to a power supply of 195 V. When reductions are attempted at below 195 V, shutdowns and instability occur in the lighting installation, brought about by the reverse characteristic of the arc voltage of the bulbs (the lower the power, the higher the arc voltage).

There are lighting installations with HPS and MV bulbs in the same installation, in which case the reduction of the whole installation is limited to the parameters of the MV bulbs (25% reduction).

With a view to achieving the greatest possible saving and the stable operation of MV bulbs, the Regulation Auxiliaries are developed, a component which, installed between the ballast and the MV lamp, allows further reduction in voltage, avoiding any undesired shutdowns and instabilities and obtaining savings of over 35% in MV for values in the reduced flow voltage equivalent to HPS lamps.

With the incorporation of the Regulation Auxiliaries, similar savings are obtained in the HPS and MV bulbs at installations which share both models or solely with MV bulbs, eliminating, in turn, any annoying disturbances caused by these lamps. There are two regulation auxiliary models, the ARL-1 model for lamps of 80 and 125 W with MV and the ARL-2 model for lamps of 250 and 400 W with MV. The installation of the ARL is very simple, being connected by way of three wires at the light fitting itself or wherever the ballast, phase, neutral and ballast-lamp connection is located. Secured by way of threaded stud M8.



1 Example of saving with ESDONI equipment

SITUATION WITHOUT ESDONI REDUCTION REGULATOR

Public lighting installation with seventy-eight 250 W HSPV units VSAP 250 W.

• **Installed Power:**

- 250 W of lamp + 25 W auxiliary equipment = 275 W per luminary
- 275 W x 78 luminaries = 21.450 W at rated voltage (220 V)

• **Additional consumption for over-voltage:**

A mean night-time over-voltage of 6% produces a 14% increase in consumption.

$$21.450 \text{ W} \times 1,14 = 24.453 \text{ W} = 24,453 \text{ kW at true voltage}$$

• **Consumption per year:**

With an annual usage of 4.200 hours

$$24,453 \text{ kW} \times 4.200 \text{ hours} =$$

102.703 KWh consumption/year



ESDONI. General Description

SITUATION WITH ESDONI REDUCTION REGULATOR

Annual consumption with ESDONI equipment and reduction mode after 24:00 until the installation is completely switched off.

- Hours used at rated power: 1.700
- Hours used at reduced power: 2.500

$21,450 \times 1.700 = 36.465$ KWh consumed per year at rated power.

$21,450 \times 2.500 \times 0,6 = 32.175$ KWh consumed per year at reduced power.

$36.465 + 32.175 =$

68.640 KWh consumption/year with ESDONI

1 1 Annual Savings

- Savings in Power due to stabilisation and reduction mode:

$102.703 - 68.640 = 34.063$ KWh /year, equivalent to **32,9% of power.**

$34.063 \text{ kWh/year} \times 0,091 \text{ €/kWh} = \mathbf{3.099 \text{ €/year}}$

- Savings for maintenance:

$$A = \frac{H \times P \times N}{V} \left(\frac{1}{D} - 1 \right) = 421 + 16\% \text{ VAT} = 489 \text{ €/year}$$

A: Maintenance savings

H: Hours of use = 4.200

P: Lamp replacement price = 36 €

V: Mean lamp lifetime = 12.000 hours

D: Depreciation with 6% over-voltage = 0,7

N: Number of lamps = 78

- Total economic savings in €/year with ESDONI

- Due to stabilisation and reduction mode: 2.963 €/year

- Due to maintenance costs savings: 320 €/year

TOTAL ANNUAL SAVINGS:

3.099 + 489 = 3.588 €/year (including taxes)

1 E Tests

Tests have been carried out at L.C.E. de Linkebeek BELGICA (LABORELEC C.V.) which certifies life tests based on 4,000 hours, the least depreciation of the HPS bulbs in operation by way of ESDONI equipment in comparison with lamps connected directly to the network. In addition, tests have been carried out at the output ITE as well as tests regarding compliance with the reference standards:

Static models: Test report no. 2001031548

Dynamic models: Test report no. 2001031549

ITE high performance Tests: IE - ITE - 2010100003-3

ITE high performance Tests: IE - ITE - 2010100003-2

ITE high performance Tests: IE - ITE - 2010100003-1

1 E Reference Standards

- Specification **AENOR EA 0032:2007.**
Voltage stabilisers and LIGHT flow reducer equipment at the line head. General and safety requirements.
- Specification **AENOR EA 0033:2008.**
Voltage stabilisers and LIGHT flow reducer equipment at the line head. Operating requirements.
- **ISO 9001: 2000**

The ESDONI high performance flow Stabilisers-dimmers comply with all the required standards and it is one of the main systems accredited for its use as a saving element in public lighting, in accordance with the Regulation on Energy efficiency in exterior lighting.

In addition, this type of equipment is recommended by IDEA (Spanish Institute for Energy Diversification and Saving) and CEI (Spanish Lighting Committee) as energy efficiency systems in lighting installations.

To certify said recommendation, the ESDONI equipment has passed the most complete tests at official laboratories accredited by ENAC (National Accreditation Entity).

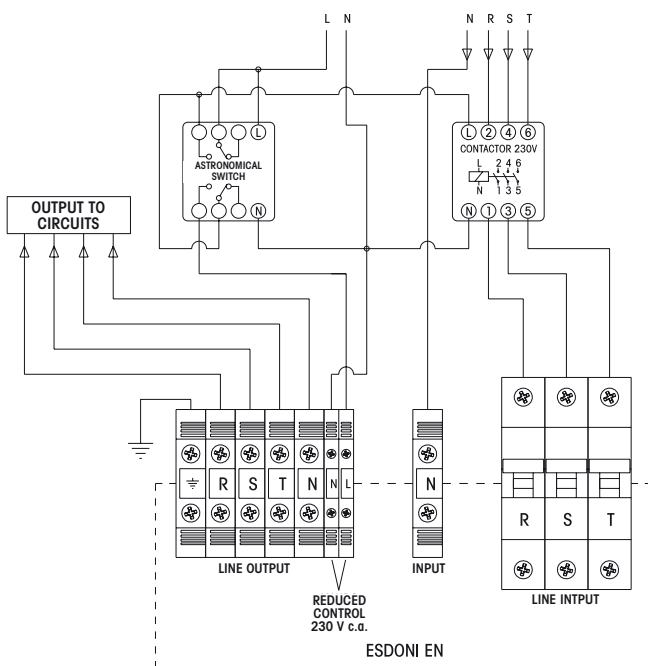


ESDONI-EN



Connections

The ESDONI three-phase equipment-EN for voltages of 3 x 400 V+N are designed for the connection of the load between phase and neutral correspond to the models EN10, EN20, EN30, EN40 and EN50.



.....

The ESDONI-EN high performance flow Stabilisers-Dimmers attain performance values of over 99% at full load. It is possible to attain these values thanks to the use of power relays in switching. The power autotransformer with 14 outputs directly provides power for usage (output, installation). They may be supplied both on board for cabinet bottom, as well as in metallic, stainless steel or polyester cabinet.

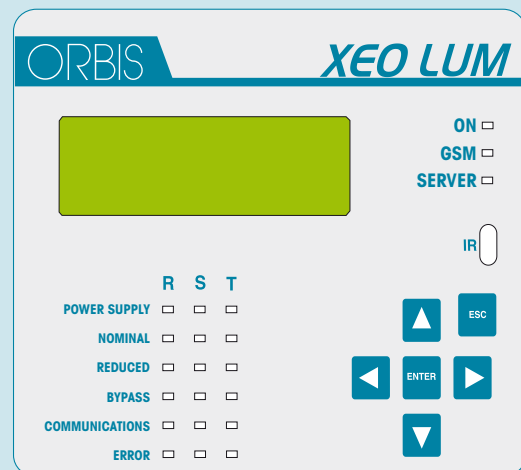
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Accessory

XEO LUM REMOTE MANAGEMENT MODULE

All ESDONI systems with the Xeo Lum option are wired and only the power supply will need to be connected along with the auxiliary output/input terminals and the ModBus expansion terminals should it be wished to expand the system.

- Should it not incorporate Xeo Lum, only the connectors and connectable adapters will need to be connected to the Xeo Lum module.
- Should you have a previous version of ESDONI or any other manufacturer, there is the possibility of incorporating it into the Xeo Lum remote management system.



**> Models table**

Characteristics	EN10	EN20	EN30	EN40	EN50
Power (kVA)	10	20	30	40	50
Power Supply (V) Ve	3 x 400 + N	3 x 400 + N	3 x 400 + N	3 x 400 + N	3 x 400 + N
Nominal Level (V)	220/215/210	220/215/210	220/215/210	220/215/210	220/215/210
Regulation	±1%	±1%	±1%	±1%	±1%
Start-up level (V)	210	210	210	210	210
Reduce Level HPS (V) (V)	175/185	175/185	175/185	175/185	175/185
Maximum reduction	Ve -25%	Ve -25%	Ve -25%	Ve -25%	Ve -25%
Reduced Level MV (V)	195/205	195/205	195/205	195/205	195/205
Max. Curr. per phase (A)	15	30	45	60	75
Max. Curr. equipment (A)	3 x 15 = 45	3 x 30 = 90	3 x 45 = 135	3 x 60 = 180	3 x 75 = 225
Max. Curr. per phase (A)	15	30	45	60	75
Weight (Kg. with polyester cabinet)	110	125	160	190	210
Weight (Kg. with metallic cabinet)	120	135	170	200	220
Weight (Kg. on board)	80	95	130	160	180

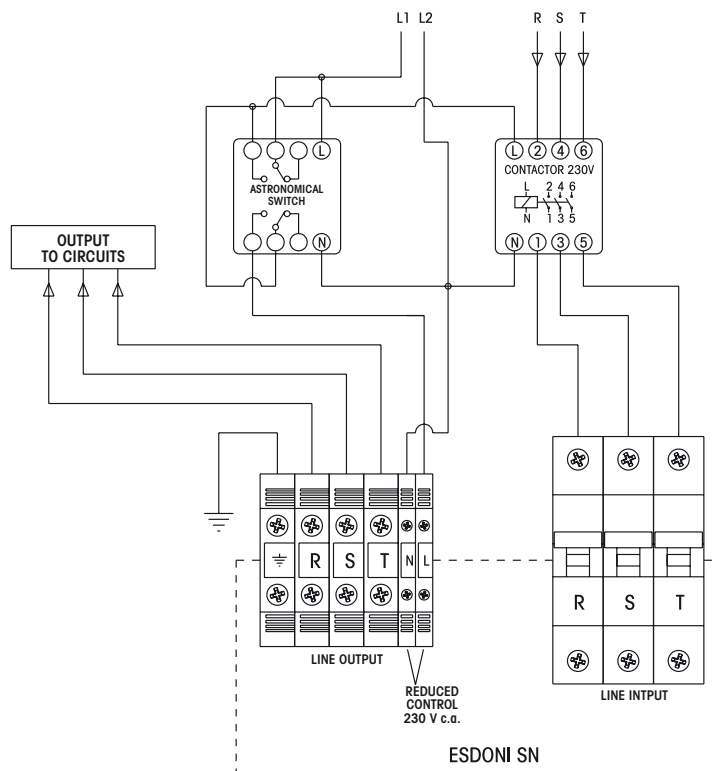


ESDONI-SN [WITHOUT NEUTRAL]



In some places the three-phase supply stands at 3x230 V without a neutral instead of the usual 3x230 V / 400 V. In these supplies the loads are connected between phases, as the voltage between phases is 230 V. For these installations, Flow Stabilisers-Reducer equipment is required which is prepared for powering without a neutral. As in the rest of the versions, the ESDONI-SN can be supplied without a cabinet, with a metallic cabinet, stainless steel cabinet or polyester cabinet.

Connections





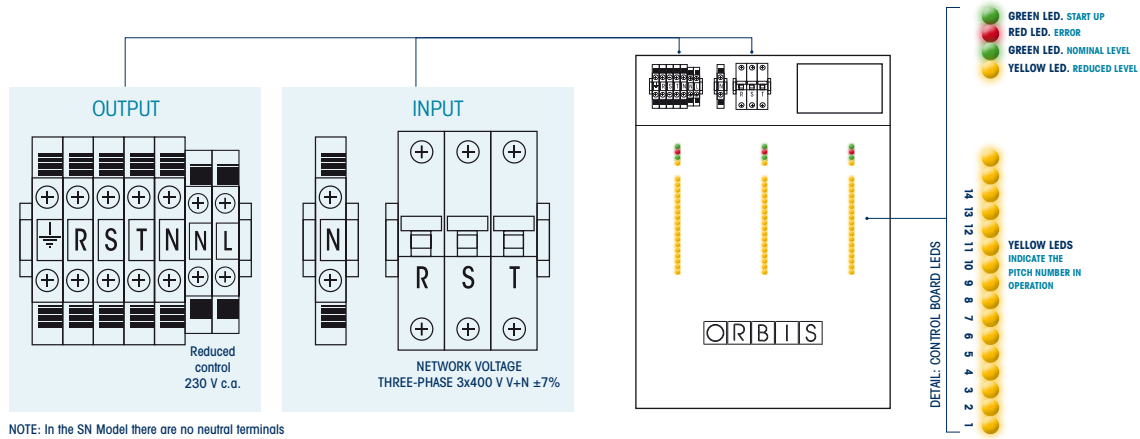
ESDONI-SN [WITHOUT NEUTRAL]

> Models table

Characteristics	SN6	SN12	SN18	SN24	SN30
Power (kVA)	6	12	18	24	30
Power Supply (V) Ve	3 x 230	3 x 230	3 x 230	3 x 230	3 x 230
Nominal Level (V)	220/215/210	220/215/210	220/215/210	220/215/210	220/215/210
Regulation	±1%	±1%	±1%	±1%	±1%
Start-up level (V)	210	210	210	210	210
Reduced Level HPS (V)	175/185	175/185	175/185	175/185	175/185
Max. Curr. per Phase (A)	15	30	45	60	75
Maximum reduction	Ve - 25%	Ve - 25%	Ve - 25%	Ve - 25%	Ve - 25%
Reduced Level MV (V)	195/205	195/205	195/205	195/205	195/205
Weight (Kg. with polyester cabinet)	110	125	160	190	210
Weight (Kg. with metallic cabinet)	120	135	170	200	220
Weight (Kg. on board)	80	95	130	160	180

ESDONI-EN / ESDONI-SN

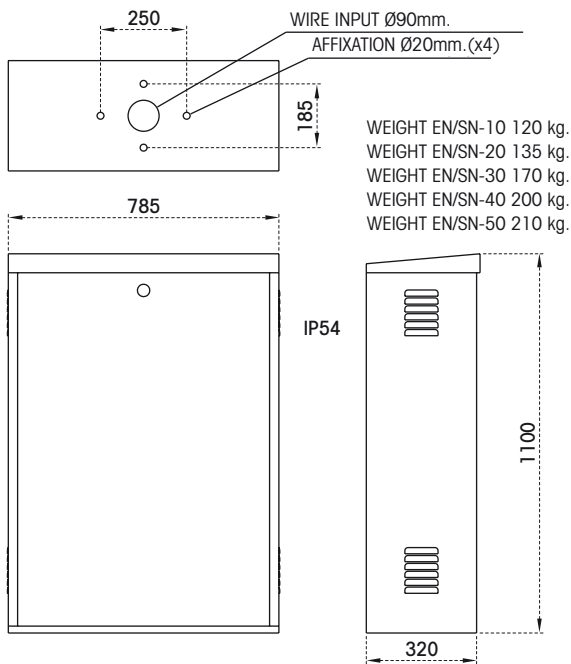
Connection Terminals



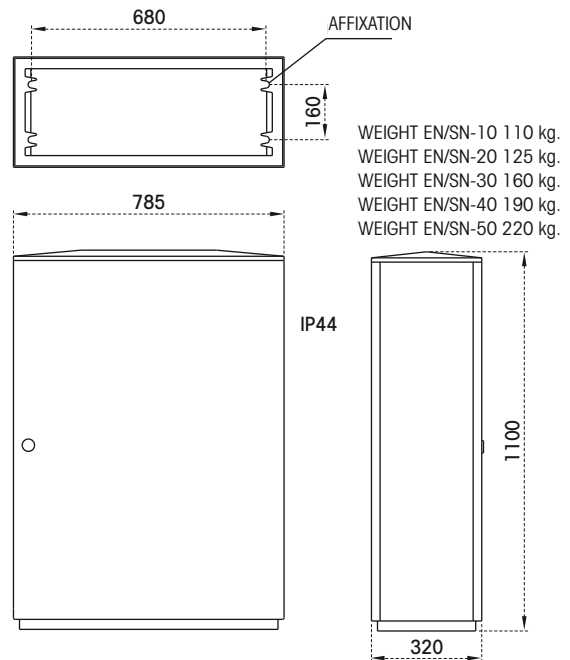
NOTE: In the SN Model there are no neutral terminals

Dimensions and Weights

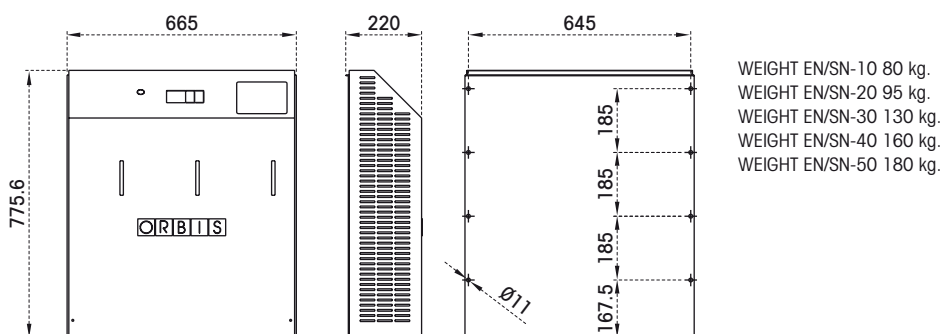
Metallic cabinet RAL-7035



Polyester cabinet RAL-7035



Assembly board. Metallic Cover RAL 1003





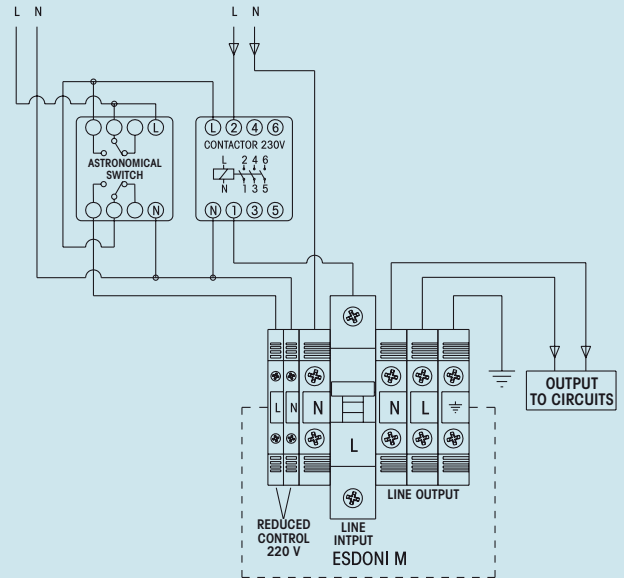
ESDONI-M



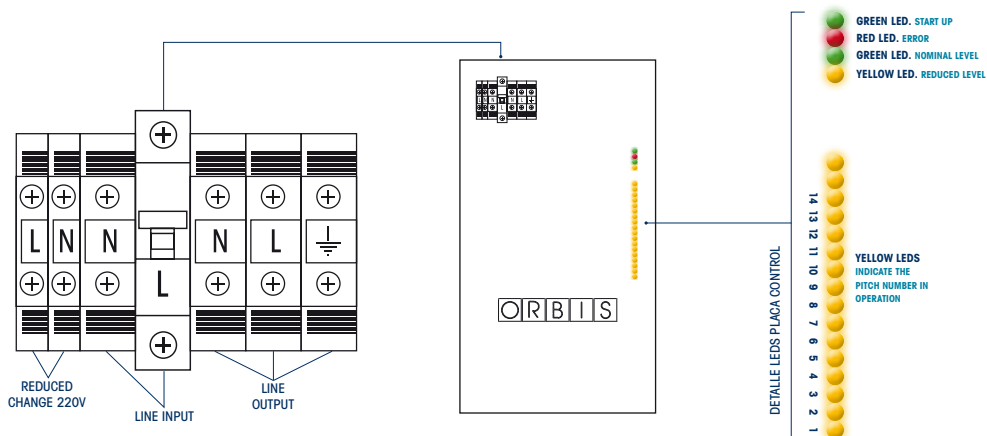
The ESDONI-M models are presented as a saving solution owing to the flow reduction and stabilisation at Public Lighting mono-phase installations. They carry out the same functions as the ESDONI-EN for powers of up to 16.6 kVA. Their application is ideal at installations such as sports tracks, lighting exterior in office buildings, small gardens, urbanizations, etc.

Connections

The ESDONI-M mono-phase equipment is designed for the connection of load between phase and neutral and they correspond to models M3, M6, M10 and M16.



Connection Terminals





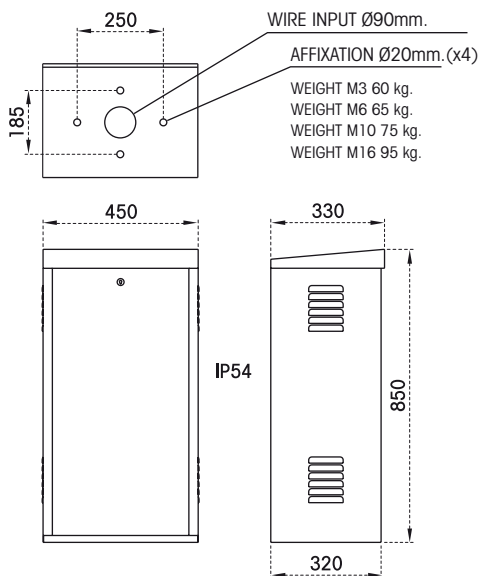
ESDONI-M

Models table

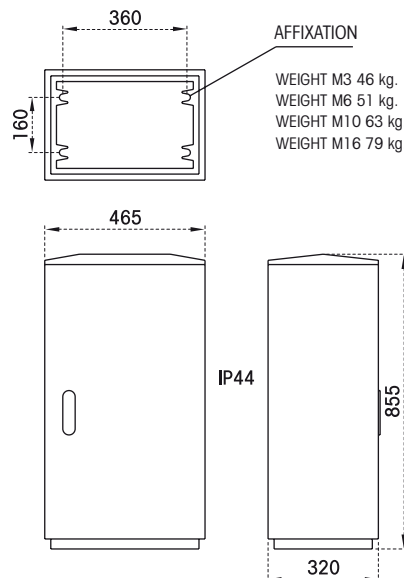
Characteristics	M3	M6	M10	M16
Power (kVA)	3,3	6,6	10	16,6
Power Supply (V) Ve	230	230	230	230
Nominal Level (V)	220/215/210	220/215/210	220/215/210	220/215/210
Regulation	±1%	±1%	±1%	±1%
Start-up level (V)	210	210	210	210
Reduce Level HPS (V) (V)	175/185	175/185	175/185	175/185
Maximum reduction	Ve -25%	Ve -25%	Ve -25%	Ve -25%
Reduced Level MV (V)	195/205	195/205	195/205	195/205
Max. Curr. equipment (A)	15	30	45	75
Weight (Kg. with polyester cabinet)	46	51	63	79
Weight (Kg. with metallic cabinet)	60	65	75	95
Weight (Kg. on board)	41	46	58	74

Dimensions and Weights

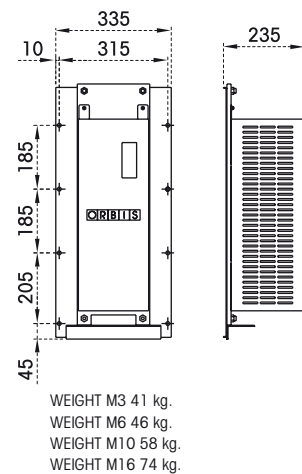
Metallic cabinet RAL-7035



Polyester cabinet RAL-7035



Assembly board.
Metallic Cover RAL 1003



XEO LUM

LIGHTING REMOTE MANAGEMENT SYSTEMS



XEO LUM



The Xeo Lum system combines more advanced remote management by way of a WEB interface and a GPRs server, along with the efficiency of the ESDONI high performance Stabilisers-Dimmers, giving rise to a very versatile system in the control of Municipal Public Lighting.

1 Description

Composition of the monitoring and control unit:

- 1 Viewer.
- 2 GPRS Communications Module by way of Web server.
- 3 Console for local control of regulator.
- 4 Astronomic function incorporated.
- 5 Inputs and outputs configurable for control of external elements and expansion port for connection of accessories.
- 6 Frontal infrared port.
- 7 MODBUS internal expansion port.

1.1 Viewer

Consists of a 4-line display which shows us in real time the system data and, in turn and with the aid of the console, allows us to modify system configuration.

1.2 GPRS communications module by way of Web server

Enables an IP to be assigned to the system and have it accessible in wireless form, making use of the GPRS* mobile network.

- Possibility of Manual or automatic configuration. In the event of working with a Standard operator for the client, it enables us to dump the configuration preloaded at the server to the SIM; subsequently, there is the possibility of modifying those parameter down-loaded manually.
- Ease of installation, once configuration has been completed, it enables us to carry out a test to check that the configuration is correct.

**The client is free to choose the mobile operator depending on the coverage in the area.*

1.3 Xeo Lum Module Connection

All ESDONI systems with the Xeo Lum option are wired and it shall only be necessary to connect the "POWER SUPPLY" connection terminals, the external ModBus expansion terminals and the auxiliary inputs / outputs.

If it does not incorporate the Xeo Lum, the ESDONI will be prewired and you will just need to connect the connectable connectors to the Xeo Lum module (see Fig. 1).

1.4 Console for local regulator control

This is very useful for maintenance staff who don't have a computer and for systems which do not have a Xeo Lum SW license.

By means of this console we can configure the following ESDONI options:

- System status.
- Internal network analyser
- Internal Energy Meter

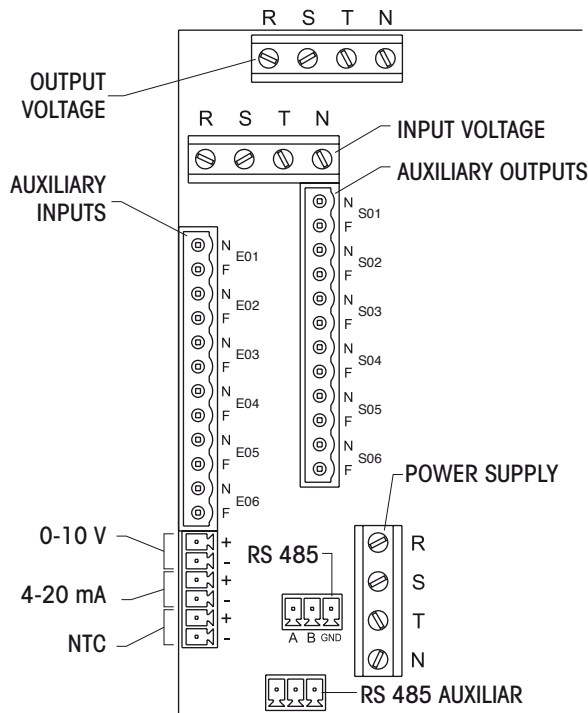


Fig. 1: Xeo Lum Module Connection Terminals

- Programme and see operating mode.
- Saving by phase.
- Configure and see the system alarms.
- Programme and see the Date, time and position of the system.
- Configure the modem.
- Configure the IP server.
- Configure the MODBUS directions.
- Carry out a test on the devices configured for MODBUS.
- See status of the external sensors connected.
- Activate / deactivate the Datalogger.
- Modify the sampling time.
- Change the system operating status, normal, reduced, test mode etc.
- Modify the programming of the astronomical clock.
- Modify start-up voltages and in the different reduced periods as well as the start-up times.
- It allows the mobile numbers of the maintenance staff to be entered so that they receive notification by SMS message.
- Allows the alarm notification thresholds to be changed.

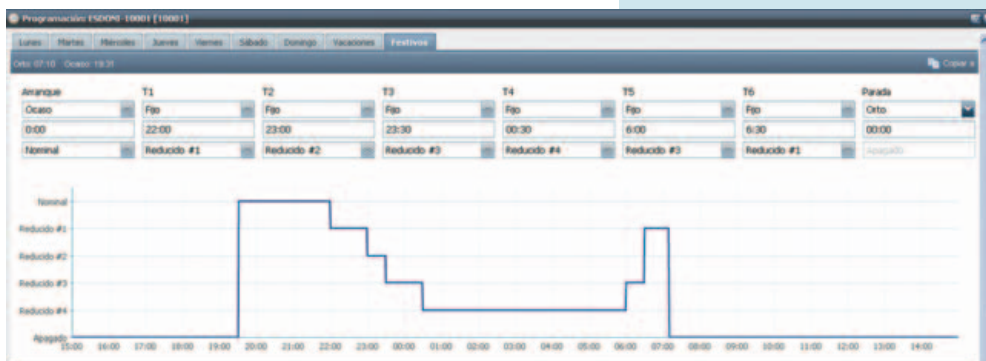
ID	DESCRIPCIÓN
E01	Resettable differential switch 1
E02	Resettable differential switch 2
E03	Magnetohermal 1
E04	Magnetohermal 2
E05	Auxiliary Input
E06	Auxiliary Input
S01	Astronomical Output
S02	External Bypass
S03	Auxiliary Output
S04	Auxiliary Output
S05	Auxiliary Output
S06	Auxiliary Output
0-10V	Analogue input 0-10 V
4-20mA	Analogue input loop 4-20 mA
NTC	External NTC Input
RS 485	Mod Bus expansion port

* The configuration of E/S is variable to be adapted to the installation

1.5 Astronomical function incorporated

It is an astronomical clock integrated in the equipment which enables us to programme the area in autonomous fashion and ensures us of the optimum operation as it does not depend on a central server. By means of this astronomical clock both the on, off levels as well as 6 reduced voltage levels can be programmed, as the figure shows.

The hours to be programmed shall be Dawn, Twilight or fixed, with fixed meaning a time referenced by the clock in real time included in the Xeo Lum module.



Astronomical Function Incorporated Screen

1.6 Inputs and outputs configurable for control of external elements

The system is provided with auxiliary inputs and outputs which enable us to monitor and control the auxiliary equipment required at the installation:

- 6 optocoupled digital inputs.
- 6 digital outputs with relay output (potential-free contact).
- 1 analogue input.
- 1 external temperature probe input.

This allows us the possibility of connecting weather stations or external luminosity sensors which enable us to have a reference when we work in tunnels and thereby activate emergency systems owing to excess rain and lighting control.

1.7 Frontal infrared port

Mainly used to dump configurations by means of a remote control.

1.8 MODBUS expansion port

It also has a MODBUS RS485 expansion port for the connection of equipment or E/S expansion modules compatible with the MODBUS protocol.

This bus enables us to expand installations which, by dint of technical and functional requirements, require extra elements which the controller does not afford directly or which in the future may be required, such as, for example:

- NODITEL-MODBUS input modules.
- Standard inputs and output modules.
- Cable theft detection modules.
- Additional ESDONI.

1.9 Communications options

There are all kinds of communication possibilities such as:

- Ethernet
- Fibre optics
- Wifi
- Freeband radio

Consult with ORBIS the type of communication which best adapts to your project. The default configuration is GPRS, but there is the possibility of other options available.

Operation

As can be seen in the following figure, the interface is made up of a screen (upper left part), a keyboard (lower right part), Led status indicators and an infrared interface.

2.1 Keyboard



By pressing this key we return to the previous menu. When we are at the idle screen, we move onto the next roll play screen without having to wait the 10 seconds it takes in automatic mode.



By pressing this key, we move on to the next menu or we enter the editing of a parameter.






The Horizontal or Vertical forward buttons enable us to browse the menus as well as to increase or reduce an amount when we are inside a submenu.

XEO LUM

During the course of this manual we will see usage examples in which we will make reference to these buttons.

2.2 Leds status indicators

On the upper right part are the indicators corresponding to Xeo Lum:

- ON**  It lights up when the Xeo Lum interface is on.
- GSM**  Flashes continuously when there is no GSM coverage; once there is coverage, there is a flash every second.
- SERVIDOR**  It comes on once the connection has been made with the Xeo Lum server.

On the lower left part are the indicators corresponding to ESDONI. They indicate to us the statuses of the R, S and T phases separately:

- **POWER SUPPLY:** Lights up when the phases are powered.
- **NOMINAL:** Lights up when the phases are in nominal status.
- **REDUCED:** Lights up when the phases are in reduced status.
- **BYPASS:** Lights up when the phases are in bypass status.
- **COMMUNICATIONS:** Lights up when the ModBus communications between phase and XeoLum control module are correct
- **ERROR:** Lights up when there is a problem on the control board of the phase in question.

2.3 Infra-red Interface

On the upper part of the keyboard is the bidirectional infrared interface. This interface is used to programme the system from a remote control.

This enables us to load the same programme to various ESDONI in quick, convenient and efficient fashion, avoiding errors.



Xeo Lum Software

3.1 General Aspects

In the main, it is an application whose engine is a data base and as input/output interfaces a Web for the user and a GPRS server for the ESDONI regulator or regulators.

In the case of the Web interface, we can connect from any device with the possibility of Internet connection, as well as receive SMS at the programmed phones. The operating diagram can be seen on the following page.

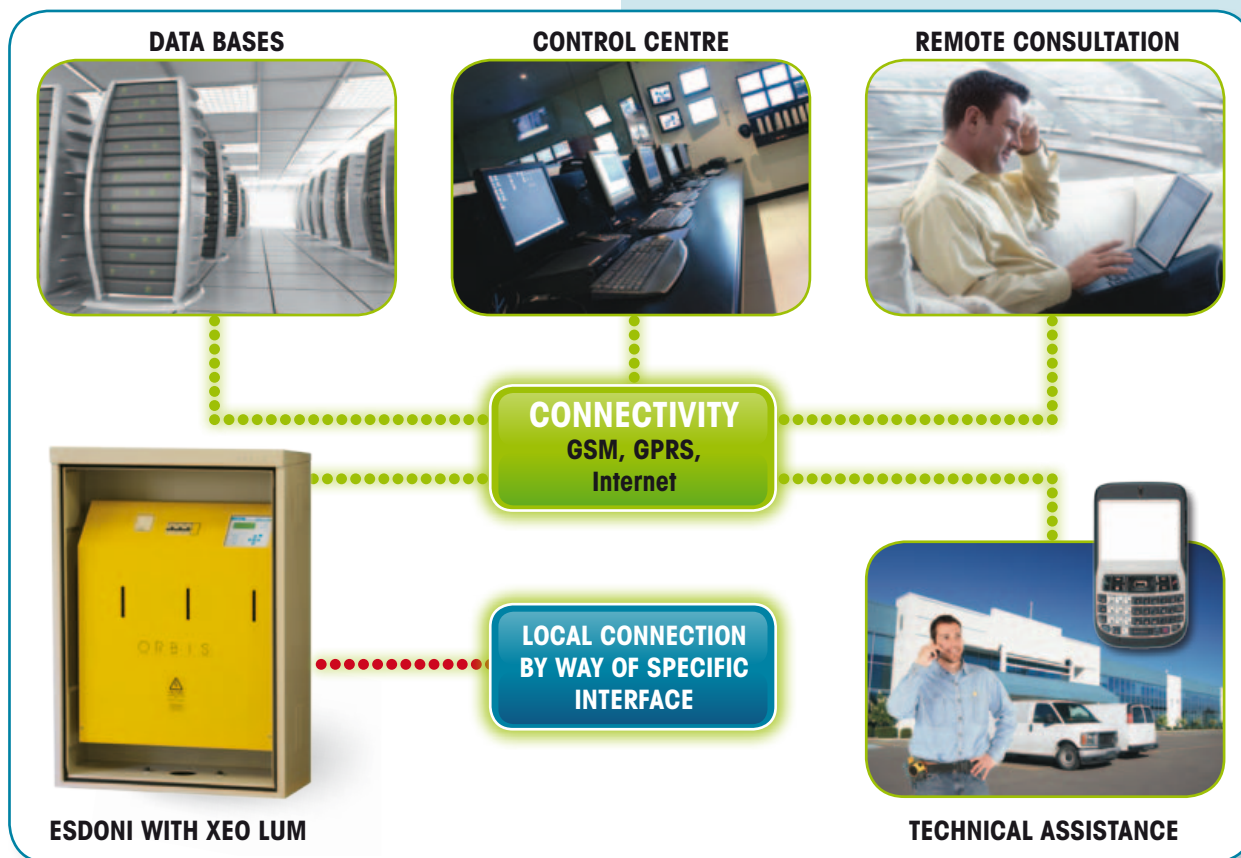
3.1.1 Equipment management on the Web in individual fashion or by groups:

Equipment supervision and management over the Web allowing individual access or by way of predefined groups.

Groups or subgroups can be formed with an indefinite nesting level. An example would be the definition of a group whose common criterion would be the location of the regulators, within this several subgroups can be created with a common criterion such as the system power and subgroups will be thereby be successively created.

The definition of groups enables us to carry out control actions in simpler, speedier fashion on sets of regulators grouped under a common criterion, facilitating system management.

XEO LUM



Operating diagram for Xeo Lum software

3.1.2. Georeferenced representation (GIS) of equipment and equipment groups with information in real time about maps, showing status icons and informative text:

This enables us to gain rapid, precise knowledge about an installation, whereby it is viewed in integrated fashion by way of icons, location, status and informative texts relating to equipment parameters.

The advantage it brings to the user is that you don't need to have technical knowledge about how an item of equipment works and you don't have to constantly consult one by one, for example, saving, displaying to the user the total savings at each point.

3.1.3 Remote configuration of the regulator and action in real time over the Web:

The configuration and manoeuvres of the regulators can be carried out in remote fashion by way of the user application which shall see to the updating of the regulators with the changes made in real time.

The configuration actions can be generated individually for a regulator or for a group. (See Fig. 1)

3.2 Geographic Position

3.2.1 Data History:

The application server stores the data sent by the regulators, generating a History with all the events, output voltages, estimated savings etc. The capacity of this historic record is 2 years. (See Fig. 2)

3.2.2 Automatic generation of installation operating reports by e-mail with summary graphics and malfunction diagnosis:

Automatic creation of operating reports by regulator or installation, including the different notifications generated by statuses, alarms or events. These reports can be generated subject to the request of an authorised user from the management application (on request) or generated periodically in the interval chosen and sent automatically by e-mail.

3.2.3. Alarm management in real time with notifications by e-mail and SMS:

All the alarms and events generated by the regulator can be notified by SMS or e-mail to the user or users assigned previously. (See Fig. 3)

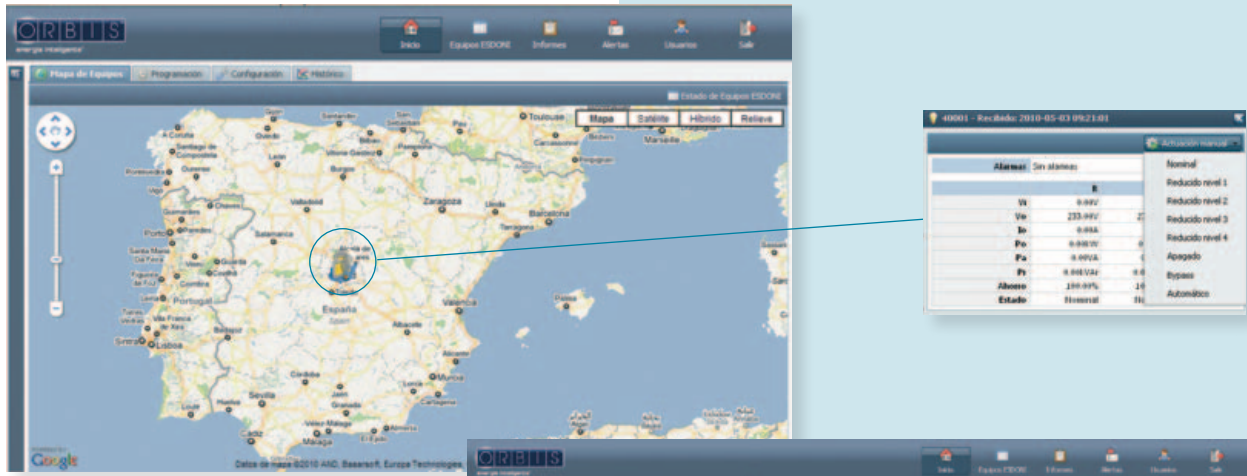


Fig. 1 Remote configuration of the regulator and action in real time over Web

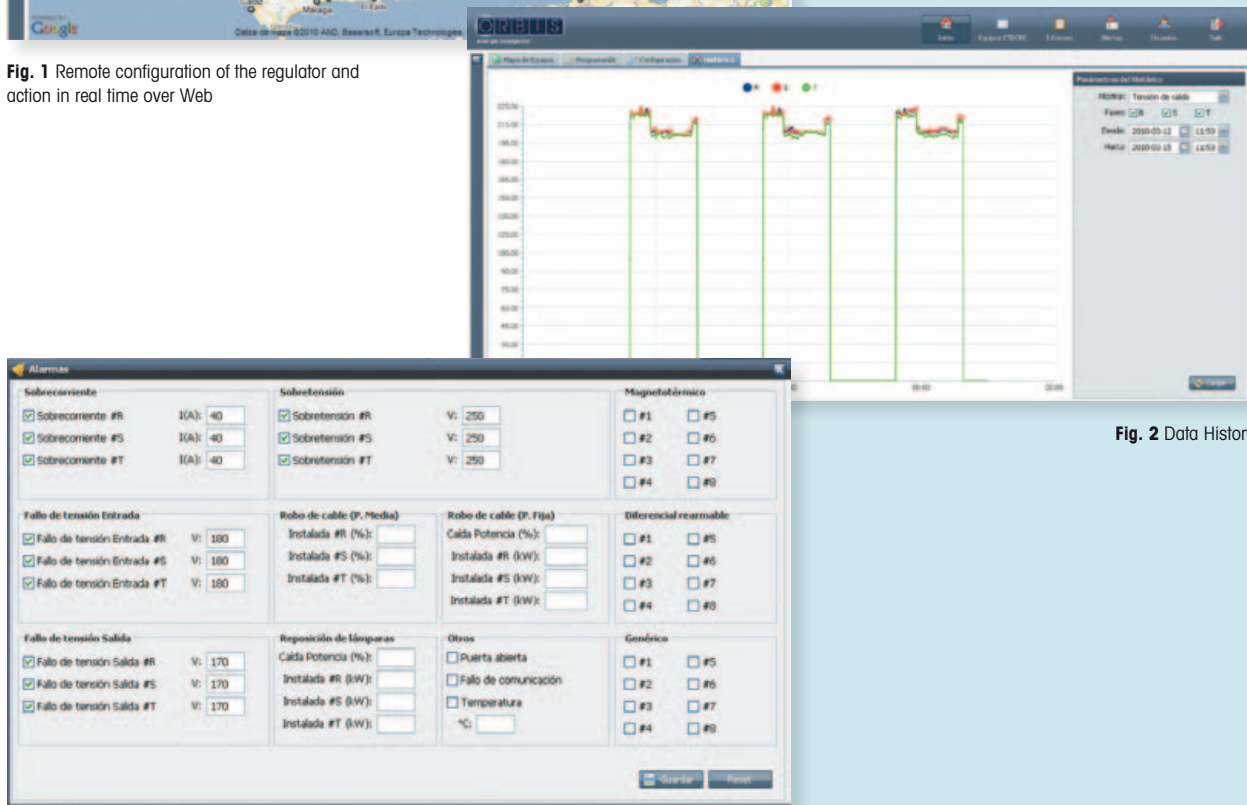


Fig. 2 Data History

Fig. 3 Alarm management in real time with notifications by e-mail and SMS

3.3 Alarms

3.3.1 Automatic updates of firmware of the regulator by way of the server:

The regulators are updated remotely and automatically, maintaining the equipment with the latest version of firmware available for each regulator model. In these cases, grouping by models becomes necessary so as to be able to update in the most effective way possible.

3.3.2 Management of user rights with three levels: superadministrator, operator and viewer:

The management application has three levels of interaction which define the user privileges: these levels are administration, operator and viewer.

The viewer will only have access in reading mode, the operator will have reading access and permission to change some technical parameters and the administrator will have total control of the company group to which it belongs and the superadministrator will have total control of the system.

XEO LUM

3.3.3 Remote programming of the working profile (Astronomical clock):

In this way we can programme by days, week or special holiday programme a running profile comprising six consecutive periods between the turning on and turning off.

Programming shall be with Dawn or Twilight or fixed, in the latter case using the clock in real time of the equipment to make the change. It also allows time offset for Dawn and Twilight.

3.3.4 User registration:

All inputs to the system and modifications made is registered with the user name and time so that the administrator can see who has used the equipment.

3.3.5 User mailbox within the Web application:

The user application includes an event mailbox where all information about alarms and other scheduled events can be viewed to facilitate the monitoring of the installations and equipment managed by the user.

3.4 Operation of Software

The system needs to use a SIM card to communicate with the server (standard GPRS communication). Said card needs to comply with the following general parameters:

- Telemetry cards from 10 to 25Mb/month minimum
- Disable the PIN

The use of cards within a VPN (private network) is also allowed. The communications menu has options to enter the access data (APN, login and password).

Once in communication with the server, we connect to the equipment from anywhere. The default website for the application is: <http://esdoni.orbis.com.es/> though depending on the type of client this can be personalised and hence the location could be another.

When a client has one or several licenses, ORBIS TECNOLOGÍA ELÉCTRICA S.A. will register it on the application server and provide him with an administrator User and Password. Once the client enters the application, it can register as many users as it needs so that they can supervise or manage its network. From the screen we choose the language and then we type the User and Password assigned.

From here by way of the training of ORBIS technicians or the help menu, the technician or supervisor of the application can manage the installation.

Selection screen for language / user / password



XEO LUM MODULAR



4 Xeo Lum Modular

The Xeo Lum Modular affords the possibility of incorporating a remote management system when requested for installations which do or don't have a Stabiliser-Reducer, whether it is an ESDONI or equipment from any other manufacturer.

The Xeo Lum Modular can be adapted to any existing control centre owing to its size of 9 modules and installation on a DIN rail. Thanks to this type of modular assembly, we can integrate a remote management system at conventional control centres or at those which incorporate a saving system.

The modular system incorporates the main functions required for remote management such as consumption, voltages, powers, cosines by phase, status of inputs and outputs, etc. Internally it incorporates two complete network analysers for measuring both the Power supply input and the bulb output. We can see all this information on its display. To find out further information about the other functions, consult "Xeo Lum Description" on page 20.

One of the main characteristics in the connection is the number of auxiliary inputs and outputs.

- 12 auxiliary inputs
- 4 auxiliary outputs
- 2 RS 485 Ports (peripheral expansion Mod Bus and another for ESDONI board control)
- 1 RS 232 Port

4.1 Examples of Xeo Lum Modular installations

Control Centre without saving system:

In this regard we can remote control and integrate its alarms, astronomical programming, consumption, voltages, auxiliary outputs...

Dual level Control centre with control line:

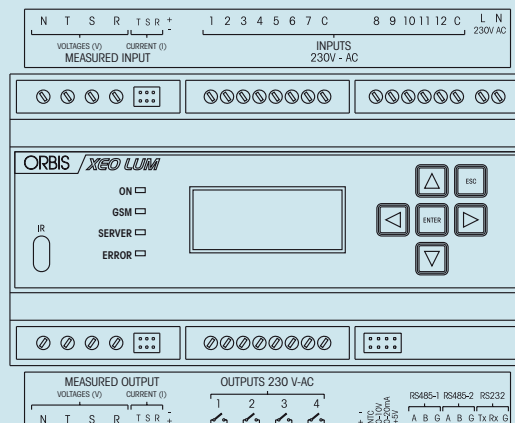
From the Xeo Lum Modular we can handle the programming, both astronomical and reduced hours, whenever there is a dual level with a control line (a very useful functionality for comparing consumption before and after starting the reduction).

Control centres which have a Stabiliser-Reducer:

In the event of installing a Xeo Lum Modular at control centres which have ESDONI high performance flow Stabilisers-dimmers systems, we are able to provide the installation with high energy efficiency, expanding the possibilities both in terms of the management of the installations as well as the control and maintenance thereof.

The Xeo Lum Modular enables us to both to modify the internal parameters of the ESDONI high performance flow Stabiliser-Reducer (the stabilised voltage level, maximum reduction and staggered reduction by time-frames...) as well as to interact with the control centre (resettable differential skip alarms, magnetothermal, astronomical programming, etc.) All these options help us to adapt the lighting to the requirements of the street, both generally and on specific occasions, without the need to send a maintenance technician to the installation. To adapt this type of installations, consult the ORBIS after-sales service.

➤ Connection Terminals



The common terminals of the inputs are independent.



The remote management system for electrical boards is a product aimed at carrying out measurement analyser functions, remote lighting control and the detection of malfunctions, by way of a GSM communication thereof, complementing the offer of ESDONI flow Stabiliser-Dimmer equipment.

1 General Characteristics

Their main objective is to establish from a central facility and mobile units of the technical service, the main parameters of the lighting boards, as well as certain situations which may require assistance or immediate technical knowledge. This system – which we can call remote management - is not solely used in lighting boards and it may be used in any kind of protection and control board.

It is made up of two main items of equipment: a master called ORBICOM which carries out the electrical measurements, affords direct information on its display and establishes communications; and various slave nodes called NODITEL, connected at the various lines of the board and which oversee the smooth operation of the manoeuvres and protections thereof, permanently sending information about operation and anomalies to the master.

ORBICOM

The master module, called ORBICOM, is an autonomous element whose installation is carried out at the lighting board, carrying out the following functions:

- Measurement of the line voltage in True RMS between each phase and the neutral, range 255 V.
- Measurement of the current at each of the three phases.
- Maximum current: 80 A per phase.
- Calculation of the phi cosine at the three phases.
- Calculation of the active power at each of the three phases, between each phase and neutral.
- Calculation of the total active power.
- Incorporates configurable astronomic connections/disconnections.
- Measurement of the voltage en True RMS between each phase and the neutral at the output to the lighting lines when installed with ESDONI equipment, range 255 V.
- Calculation of the saving at each phase as a % when installed with ESDONI equipment.
- Calculation of the total saving as a % when installed with ESDONI equipment.
- Intruder alarm, cable theft and replacement of bulbs and power failures by SMS.
- Connection of up to 15 NODITEL units per RS485 port.
- Direct reading of events on alphanumeric display of the equipment.
- Remote sending of data to the central unit by RS232 port, via GSM modem, phone wire etc.
- Remote programming of turning lighting on/off in astronomical or fixed fashion.

NODITEL

The nodes called NODITEL are elements which are auxiliary to ORBICOM which allow the expansion of the system functions, taking data and transmitting it to the master. Their most important characteristics and functions are the following:

- Nodes which communicate with ORBICOM via RS485
- Defection of fuses, magnetothermal, differential failures etc. (by way of the detection of voltages of under 160 V R.M.S.)

ORBITCOM / NODITEL

- Each NODITEL has microswitches (DIP) whereby its direction is programmed.
- There may be up to 15 slave modules on the RS485 bus.
- Direct power supply from the 230 volt network
- When voltage is applied to module, the GREEN LED showing the presence of a supply voltage is activated. If there are no problems, the GREEN LED flashes at a rate of 0.5 seconds ON/1 second-OFF.
- If there is a problem which the appliance may detect such as, for example, its failure or the voltage of any phase is low (under 160 volts), the RED LED flashes at a higher rate (0.1 seconds Ton and 0.1 seconds Toff).
- Each module can detect the voltage up to three phases of the same line, in other words, phase R, S and T with its neutral.

≡ Operation

A calculation is made of the energy saving for each phase, based on the potential difference between the input and output voltages of each of the phases. The saving percentage is estimated for a lighting installation with HPS lamps and an average life of the lamps. The saving is positive for input voltages greater than those of output and negative for input voltages lower than that of the output.

As regards the manoeuvres, a relay is activated with potential-free output for each input phase, in order to carry out an independent by-pass at each phase of the Stabiliser Reducer in the lighting board, when it is detected that the output voltage has disappeared or is lower than 160 V.

Properties of these by-pass include the timing upon lighting connection for at least one minute, allowing the system time for stabilisation. Under an operating regime, its activation is immediate when there is an anomaly. The activation/deactivation of the relays of the three phases can be carried out via SMS message from a predetermined mobile phone when the lighting installation is connected. The activation of the bypass relay/relays is indicated in the viewer.

Another of the relays has a potential-free contact which controls the connection of the general contactor of the lighting installation. The activation/deactivation of said

relay is carried out via SMS from a predetermined mobile phone for maintenance tasks and/or from the general checkpoint, as well as by way of remote astronomic programming of the canal astronomic channel.

In addition to these functions there are:

- A voltage control input to indicate the operating status of the lighting installation
- Flow reduction signalling which is controlled with another potential-free relay which may be controlled by SMS and with the remote astronomic programme of the voluntary channel
- Alarms for voltage failures at the outputs and at the general input with NODITEL.
- Intruder alarms and opening of the board
- Cable theft or fused lamps

All the alarms and measurements can be managed by way of a programme under a W95 system or superior, either in local mode or remote mode, by way of a phone modem or GSM.

In this way the sending of certain alarms to GSM phones can be programmed by way of SMS messages. Certain commands can also be sent from the GSM phone by way of SMS messages to the GSM modem installed at the electrical board for receiving information about the input-output voltages and alarms, ordering the connection and disconnection of the board, cancelling the flow reduction and connecting-disconnecting the by-pass.

≡ Communications Software

The communications software has the following possibilities:

3.1 Request for various parameters

Some working parameters are requested which the system registers internally:

- Line voltage Phase R, line current Phase R, Cosφ Phase R
- Line voltage Phase S, Line current Phase S, Cosφ Phase S
- Line voltage Phase T, Line current Phase T, Cosφ Phase T
- Output voltage of ESDONI at Phase R
- Output voltage of ESDONI at Phase S
- Output voltage of ESDONI at phase T



- % saving Phase R, % saving Phase S, % saving phase T
- % total saving
- KW at phase R, KW at phase S, KW at phase T, total KW
- Number of NODITEL connected.
- Possible incidents at each NODITEL
- Voltage failures
- Registration of board opening
- GSM operations registration
- Registration of lighting connection/disconnection

3.2 Parameters of the GSM modem

By way of the information contained in these parameters, it shall be possible to programme the number to phone numbers to which calls are made in the event of failures, alarms or other incidents. These calls shall be made to fixed or mobile GSM phones with contents or SMS messages or data strings.

3.3 Request for data acquisition file

There is an acquisition system of up to 1024 records.

Each record provides us with the following information:

- Date / Time
- V.Pri1 V.Pri2 V.Pri3: Primary voltages
- Amp.1 Amp.2 Amp.3: Currents
- V.Se1 V.Se2 V.Se3: Secondary voltages
- Wat.1 Wat.2 Wat.3: Active powers
- Cos1 Cos2 Cos3: Cosines
- AHR AHS AHT: Savings

The data collection times may be programmed between: 5, 10, 15, 30, 60 minutes. Graphic representation and export to Excel.

3.4 Reading control of the status of the RS485 bus modules

Status in which each of the NODITEL finds itself (direction, status of each phase etc.)

3.5 Request for electrical parameters measured at this time. Network analyser mode.

By way of this order the instantaneous electrical parameters are requested.

4 Presentation of ORBICOM Data

With the system in autonomous mode, several screens are displayed alternatively, so that every 10 seconds the various system values and information can be viewed in grouped fashion. We distinguish between seven basic screens:

Screen 1

This screen displays the date and time, primary currents and voltages and secondary or output voltages or output of the flow Reducer. It has:

```

Lun 4 Feb 08 12:56
Up: 220 221 222 U
Ip: 00.0 00.0 00.0 A
Us: 215 213 214 U

```

On line 1 are: day, date, month, year, hour and minutes. On line 2 are the line voltages. On line 3 the line currents. On line 4 the output voltages of the regulator.

Screen 2

This screen shows the powers per phase, total powers and Cosφ. (INDUCTIVE or CAPACITIVE)

```

TOT 00.0 kW Cos
R 00.0 kW 00.0 I
S 00.0 kW 00.0 I
T 00.0 kW 00.0 I

```

Screen 3

```

Estado: Sistema ON
PUERTA ABIERTA
Ah: +00.0, +00.0, 0%
BPR BPS BPT

```

Line 1 indicates possible system statuses, whereof the following are defined:

SYSTEM ON: System on (phase at terminal 28)

SYSTEM OFF: System off (lack of phase at terminal 28)

Line 2 indicates the following: Door status: OPEN DOOR (lack of phase at terminal no.27).

Line 3 indicates the savings per phase. As a saving, the mean life is calculated for the installation based on the difference between the line voltage and the output voltage of the Stabiliser-Reducer.

Line 4 indicates when the system is activated in normal operation (AR, AS, AT) or as a BYPASS (BPR, BPS, BPT).

**Screen 4**

```
AHORRO TOTAL: +00.0%
0%                75%
```

This screen displays the total saving made by the system. Line 1 shows how many percent saving has been obtained by way of the flow reduction and stabilisation concepts. Line 3 shows a bar line in graphic mode of the % saving.

Screen 5

This displays the status of the intelligent modules connected to the system, indicating those which are unregistered or without communication. The following appears:

```
INFORMACION MODULOS
DESACTIVADOS 02 04 06
07
```

Lines 2 to 4 display those which are programmed. If they are all on the line, the following appears:

```
INFORMACION MODULOS
Todos OK
```

Screen 6

This shows the status of the sensed phases by the intelligent modules. It only displays information on the modules which are active, connected and on the line.

Hence, if we have a module and its three inputs have the correct voltage, the following appears:

```
ESTADO MODULOS:
MOD-01                OK
PERMISO REDUC ON
```

If there is a failure at any of the phases, the following appears:

```
ESTADO MODULOS:
MOD-01        Fallo Fase:S
PERMISO REDUC ON
```

This screen indicates that phase S fails. If two or more phases fail, it would indicate:

```
ESTADO MODULOS:
MOD-01        Fallo Fase:RST
PERMISO REDUC ON
```

When it is on this screen, if there is more than one module, each are alternated on screen, MOD-01, MOD-02, MOD-03 etc. To speed up this presentation, the module can be changed by pressing key S2. On the lower line the information on the reduction permission appears.

Screen 7

This screen displays: the time and date, the sunrise and sunset times of said date, the type of day (normal, holiday) and the astronomic channel status (SYS-ON) and the voluntary channel (REDUC).

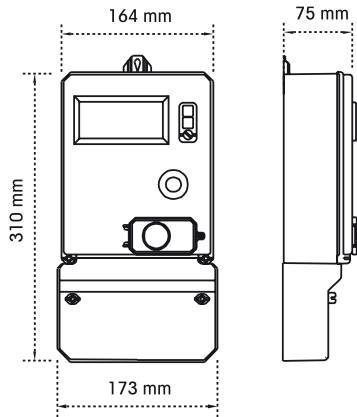
```
Lun 4 Feb 08 12:56
ORT: 07:55    OCA:19:00
DIA: NORMAL
SYS-ON:OFF   REDUC:OFF
```



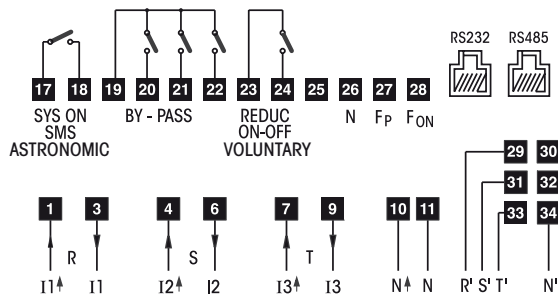
ORBICOM / NODITEL

Technical Specifications

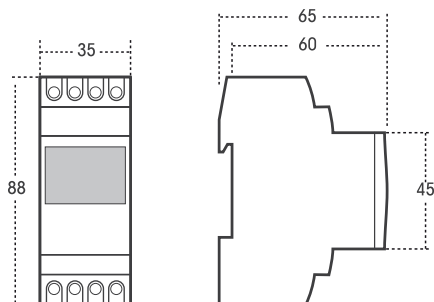
Dimensions ORBICOM



Connections ORBICOM



Dimensions NODITEL



Technical Characteristics ORBICOM

Nominal line voltage	3 x 230/400 Vc.a.
Measurement voltage	3 x 230 Vc.a. + N
Max. current per phase	80 A
Reference frequency	50 Hz
Own consumption	Aprox. 20 VA
Running reserve	6 years by way of lithium battery
Running precision	< ±0,5 s/24 h a 23 °C
Operating temperature	-10 °C a + 45 °C
Precision class	Class 1 active energy Class 2 reactive energy
Protection class	II under correct assembly conditions
Protection type	IP 51
Mechanical resistance	IK 06
Assembly	By way of affixation triangle in accordance with the standard DIN 43857

Technical Characteristics NODITEL

Power supply voltage	230 Vc.a.
Measurement voltage	3 x 230 Vc.a. + N
Alarm voltage by phase	160 Vc.a.
Reference frequency	50 Hz
Own consumption	Aprox. 5 VA
Operating temperature	-10 °C a + 45 °C
Precision class	Class 1
Protection class	II under correct assembly conditions
Protection type	IP 20 in accordance with EN 60529
Mechanical resistance	IK 02
Assembly	On symmetric profile of 35 mm in accordance with EN60715 (DIN rail)



☰ Reference Standards

National and international standards applicable:

- **EN 62053-21:** Electrical energy measurement equipment. Specific requirements. Part 21: static active energy meters (class 1 and 2).
- **EN 60529:** Protection classes afforded by the surroundings (IP Code).
- **UNE-EN 62054-21:** Electrical energy measurement equipment (c.a.). Load control and tariffing. Part 21: Specific requirements for time switches.
- **UNE-EN 62056-21:** Electrical energy measurement equipment. Data swap for reading meters, tariff and load control. Part 21: Local data swap.
- **EN 60715:** Dimensions of the low voltage switchgear. Standardised assembly on rails for mechanical supports relating to electrical devices at switchgear installations.
- **EN 62053-23:** Electrical energy measurement equipment. Specific requirements. Part 23: static reactive energy meters (class 2 and 3).
- **EN 50102:** Protection classes provided by the Elec. Mat. surroundings against external mechanical impacts (IK code).

Legal and regulatory requirements

Spanish Low voltage Directive and Electromagnetic Compatibility Directive and General Regulation for Certification of Products and Services, AENOR.

☰ List of Remote Management System Elements

In order to be able to carry out any kind of installation of the remote management system, the following elements are provided:

- ORBICOM
- NODITEL
- RS485 cable for the connection of ORBICOM to the first NODITEL
- GSM MODEM
 - Modem feeder cable
 - RS232 cable for connection of the modem with the computer
- ORBICOM remote management software
- RS232 cable for local connection between a PC and ORBICOM
- RS232 cable for connection between the modem and ORBICOM

The possible installations are the following:

- The basic installation is carried out with an ORBICOM
- One or several NODITEL (up to 15) can be added for each ORBICOM. To connect the first NODITEL to the ORBICOM the RS485 cable is required. The connection between the first NODITEL and subsequent ones can be carried out using a normal two-wire cable.

In order to be able to carry out remote communication, one GSM modem must be installed for each ORBICOM. Along with the modem the feeder cable is supplied as well as the RS232 cable which communicates the modem with the computer and the RS232 modem cable is necessary for ORBICOM.

In order to be able to parameterise and communicate both locally and remotely, the ORBICOM remote management software is necessary and the RS232 cable for local connection between a PC and ORBICOM. Only with the first software is the RS232 cable necessary for local connection between a PC and ORBICOM.

This all enables us to completely control an electrical installation from a centralised checkpoint and thereby be able to achieve better management of the installations. For remote communication another GSM modem is required which already incorporates a RS232 cable for modem communication with the computer.



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