THE CLEVER SAVING

Luminous flux regulators

IREM Stabilux

Luminous flux regulation: why?

The energy consumption in the lighting sector, whether in public lighting or private users, constitutes a high percentage of the total energy used.

Energy saving and light pollution are two currently much discussed topics involving all the operators in the lighting field to such an extent as to become the object of national and international recommendations and directives.

UNI standard 10819 sets down clear indications on the creation of lighting plants with particular guidelines for cutting down maintenance costs, reducing energy consumption, and limiting the flow of light dispersed upwards at desired times.

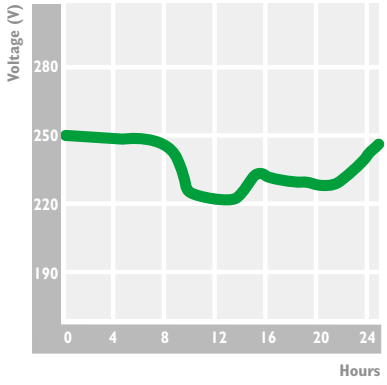
In connection with this, many governments have taken steps with promotional campaigns and subsidies to provide incentives for using high efficiency lighting sources and equipment suitable to curb energy consumption.

The statutory provisions in force therefore encourage the birth of new technologies that permit to reach these aims by acting on voltage stabilisation and regulation.

The luminous flux regulator **STABILUX** is IREM's technical answer which, by acting on the above-mentioned parameters, allows the requirements of users to be satisfied.

The distribution networks

Voltage variations in a Turin district during one day



In order to work properly and uphold their characteristics over time, lighting sources should be powered with a voltage which does not exceed 5% of their nominal value.

Much higher values are often found, particularly at the times of lighting plants full operation.

These variations are mainly due to the lower amount of power drawn by large consumers at night.

Voltage fluctuations and overvoltages in particular are extremely critical for lamps, as they accelerate their ageing by reducing their duration and the luminous flux emitted in time.

To allow lamps to attain both the life expectancy values declared by their manufacturers and the expected luminous flux, voltage stabilization is required.

A beneficial side effect of voltage stabilisation is the additional energy saving obtained through a "clipping" of the voltage exceeding the nominal value.

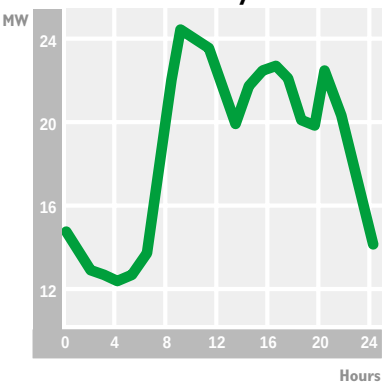
This saving may be quantified at about 5-7%.

Stabilization, however, must be achieved through reliable technologies, offering high speed compensation of the mains variations.

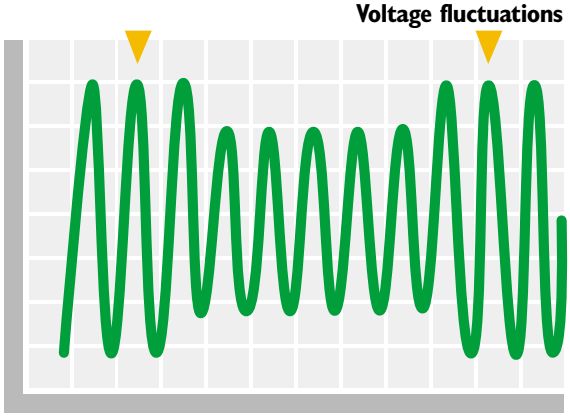
The luminous flux regulators **STABILUX** use the "feedthrough power" technology adopted by voltage stabilisers used to power loads susceptible to mains fluctuations.

Voltage stabilisation has a considerable impact on the lengthening of lamp life, consequently reducing the costs associated with maintenance, replacement and disposal.

Energy consumption in the same area on the same day



Voltage fluctuations



Stabilux: the answer

The luminous flux regulators **STABILUX** satisfy two of the main requirements of lighting plants: safety and reduction of running costs.

They constitute the most modern and complete range of regulators available on the market today.

experience and know-how in the design and manufacture of:

- Voltage Regulators
- Micro-Hydroelectric Power Plants
- Power Supplies and Igniters for discharge lamps.

Thanks to its close cooperation with the leading lamp manufacturers in the lighting industry, IREM has been able to acquire the essential know-how for the development of **STABILUX**.

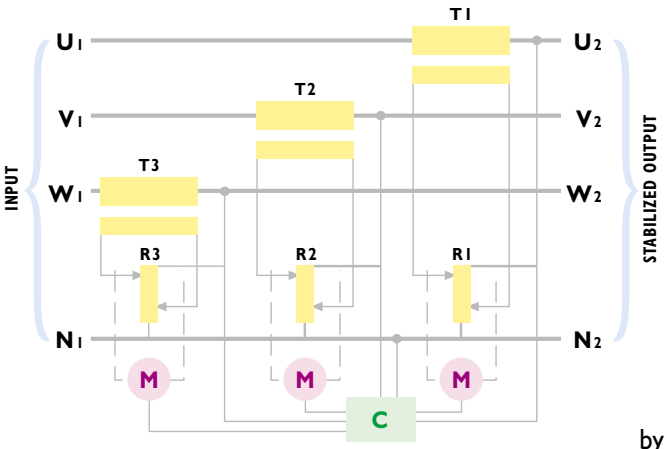
The products are based on the "feedthrough power" principle adopted by the voltage regulators used for the feeding of loads sensitive to mains variations.

The "heart" of the control circuit is a CISC technology microprocessor, which enables the **STABILUX** to provide the lighting plant operator with all the information on "operating status", electrical values and failures that may occur.

The regulator can receive commands and even be programmed from remote.

It is a flexible system which, thanks to its extreme versatility, can adapt to any lighting plant, new or already existing.

Stabilux: reliability



T: booster transformer
R: variable autotransformer
C: electronic control circuit
M: servomotor

It is a widely held view that the connection of an electrical device to a lighting plant can reduce its reliability.

With **STABILUX** this fear can be dispelled.

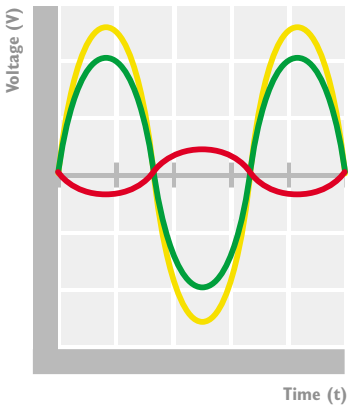
In fact, among the various systems available (i.e. phase cut-off, direct regulation and switching in series with the line), **STABILUX** has adopted the booster transformer technology. This system is not only highly regarded, but also the most tested. Over 550,000 voltage stabilisers have been installed by **IREM** since 1965.

The operating principle is based on a motor-driven autotransformer altering the voltage of the primary winding of the booster transformer. The servo driven motor operates the mobile contacts (brushes) of the variable autotransformer varying the ratio and giving to the booster primary winding the additive or subtractive voltage necessary to bring the output voltage within the preset stabilisation limits.

The regulation of the output voltage is "true RMS", therefore the regulator is unaffected by possible harmonic distortions present on the supplying line.

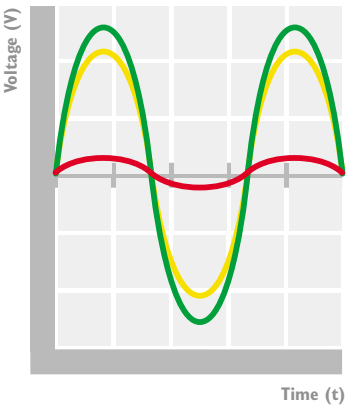
This type of voltage regulator has the advantage of having no mobile contacts or brushes in series to the line and of interposing only a few transformer windings of large section between the lamps and the power supply line. Therefore in case of regulator and/or control failure, the lamps will remain on. The great advantage of this system is that it does not cause significant alteration of the impedance characteristic, with no need to replace the already existing line protection.

Operating principle of the regulator



"resulting" voltage
Input voltage
subtractive voltage supplied by the booster transformer

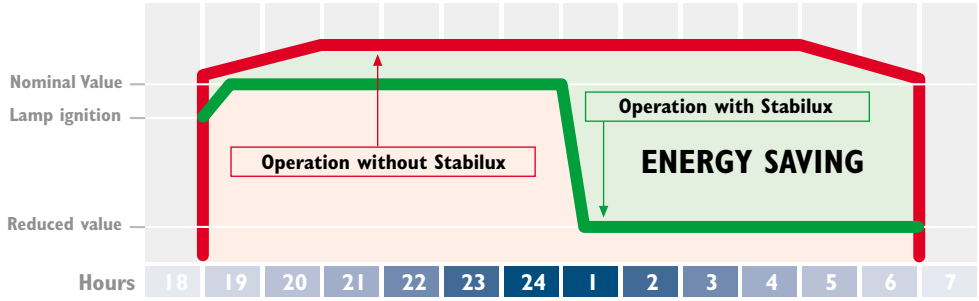
Operating principle of the regulator



"resulting" voltage
Input voltage
additive voltage supplied by the booster transformer

Stabilux: how it works

Operating diagram and energy saving



The luminous flux regulator **STABILUX** starts up by automatically executing the ignition cycle of the lamps in a time programmable by the user depending on the type of lighting source powered.

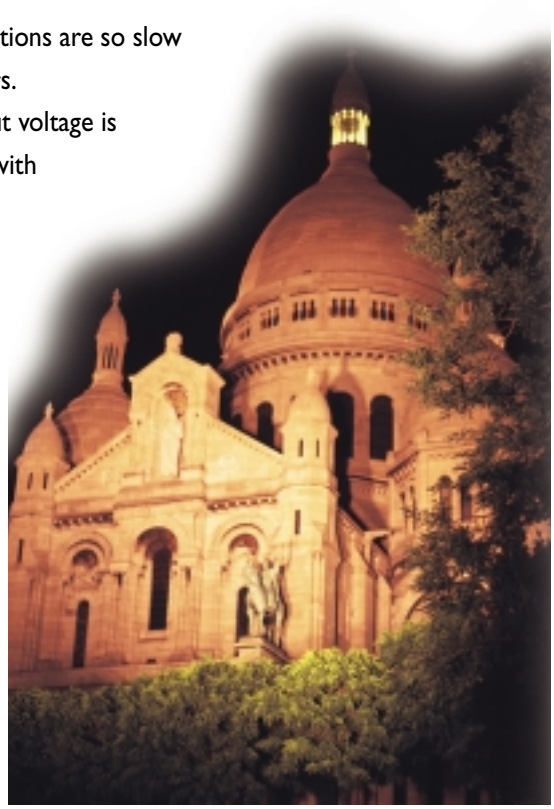
After this, the regulator gradually reaches the preset rated voltage value.

When, for various reasons, the peak lighting level is no longer needed, the regulator reduces the voltage powering the lamps, thus achieving a significant energy saving.

The transitions between the various operating conditions are so slow that the change in illumination is not perceptible to users.

Whatever the operating conditions, the output voltage is maintained within ±1% of the preset value, even with considerable input voltage variations.

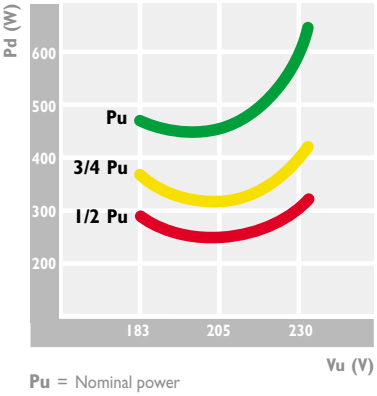
After a black-out, when the mains is restored, **STABILUX** performs a new ignition cycle before bringing the output voltage back to the preset value. This function is essential to grant a safe restrike of the lamps.



Stabilux: the typical features of the "booster" system

Luminous flux regulator (50 kVA)

Losses with variable load and output voltage, and with constant input voltage at nominal value (230V)



Pu = Nominal power
Pd = Dissipated power
Vu = Output voltage

The booster transformer regulation system is characterized by:

High efficiency. Thanks to the feedthrough power technology, the typical losses are so low as to ensure an average efficiency higher than 98%.

Extensive compensation of mains fluctuation. Stabilisation enables compensation of the mains voltage variations maintaining an output accuracy of +/-1%.

High speed compensation of mains fluctuation. The mains voltage variations are compensated at a speed of 40 ms/volt.

No harmonic distortions. The harmonic distortion introduced, unlike systems using fully electronic technologies, is negligible, less than 0.2% in any load conditions.

Sinusoidal absorption from the mains. As the transformer's magnetizing power is negligible with respect to the load, the waveform of the current absorbed by the mains is sinusoidal in compliance with the IEC 555-2 standard.

Insensitiveness to load variations. The regulator can operate properly whatever the load conditions (from 0 to 100%), keeping its characteristics unaltered.

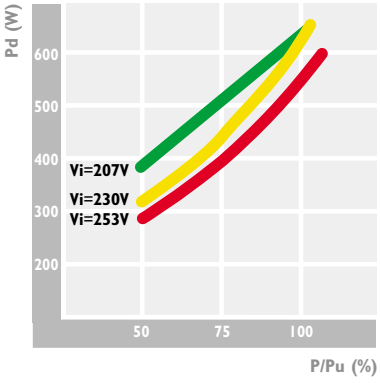
Insensitiveness to load power factor. Provided the rated current does not exceed the nominal value, the regulator operates properly irrespective of the line power factor.

Compatibility with any kind of lamp. **STABILUX** can power any kind of lamp used in public and private lighting plants.

No effect on line impedance. The typical impedance of the regulator is negligible. As a result, the installation of **STABILUX** in an already existing system does not effect the efficiency of existing protections.

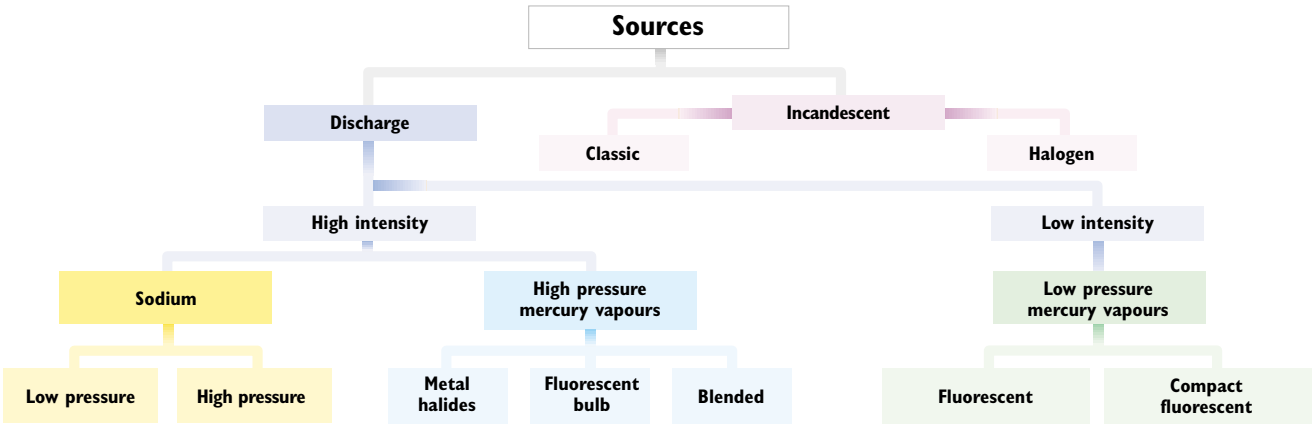
Luminous flux regulator (50 kVA)

Losses with variable load and input voltage, and with constant output voltage at nominal value (230V)



P = Rated power
Pu = Nominal power
Pd = Dissipated power
Vi = Input voltage

The lighting sources



The lighting sources used in lighting plants can be divided into two main groups:

- incandescent lamps
- gas discharge lamps

Incandescent lamps, which include halogen lamps, are temperature radiators, i.e. part of the heat produced is emitted in the form of light (as occurs in nature with the sun).

The discharge lamps, on the other hand, are luminescence radiators, i.e. the light emitted by these lamps is not a subproduct of heat, but is generated by the direct transformation of electric energy into light energy.

Gas discharge lamps are used mainly in those lighting plants that require compact lighting sources with high power and efficiency.

These lamps, used in public and private lighting, may be underpowered without any problems in order to save energy.

The use of a **STABILUX** luminous flux regulator with lamps equipped with electronic reactor is of no advantage.

In fact, the electronic control devices stabilize the voltage even in underpowering conditions. Although no damage is caused to these devices by use of the luminous flux regulator, the resultant energy saving is minimal.

The underpowering of lamps

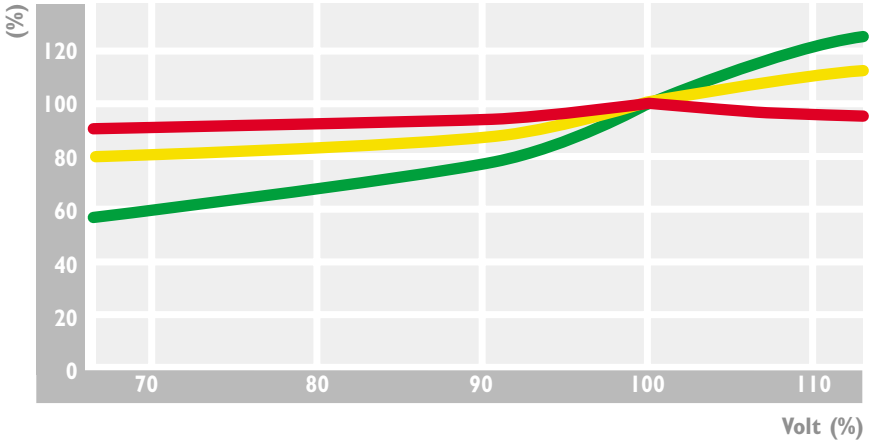
The tables below indicate, for the different kinds of lamps, the variation of some electric parameters with different underpowering values.

This makes it possible to assess the amount of saving that can be achieved by using a **STABILUX** at the different selectable voltage values.

Legend

A = *lamp nominal power W*
B = *power dissipated by the power supply W*
C = *lamp current (A)*
D = *lamp luminous flux (lm)*
E = *capacity of power factor improving capacitor (µF)*

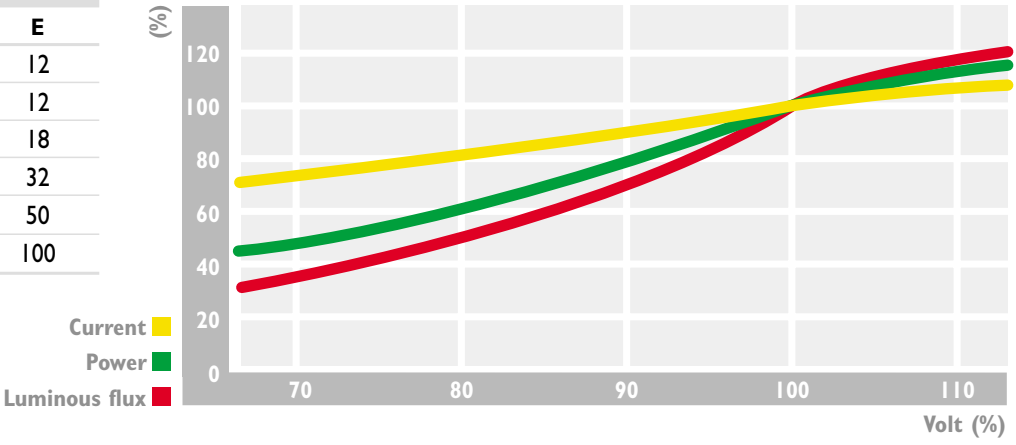
Low pressure sodium lamps



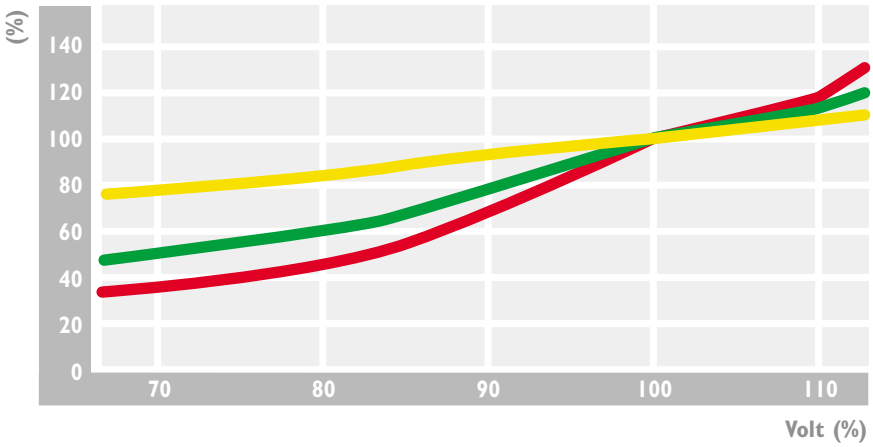
A	B	C	D	E
90	25	0,94	13000	10
135	30	0,97	20800	12
180	35	0,91	32300	18

High pressure sodium lamps

A	B	C	D	E
70	17	0,98	5900	12
100	18	1,2	9800	12
150	22	1,8	14500	18
250	27	3	27500	32
400	38	4,6	48000	50
1000	58	10,6	125000	100



Metal halide lamps



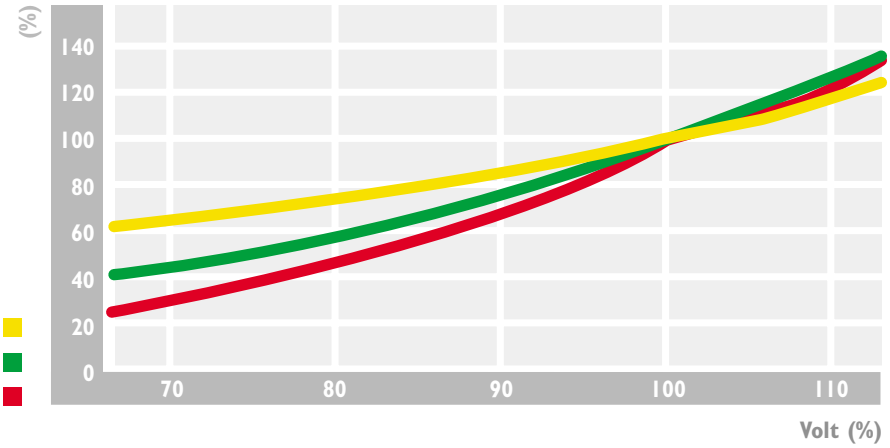
A	B	C	D	E
250	27	2,15	17000	18
400	38	3,4	30500	28
1000	58	8,25	81000	65
2000	80	16,5	189000	125

Current
Power
Luminous flux

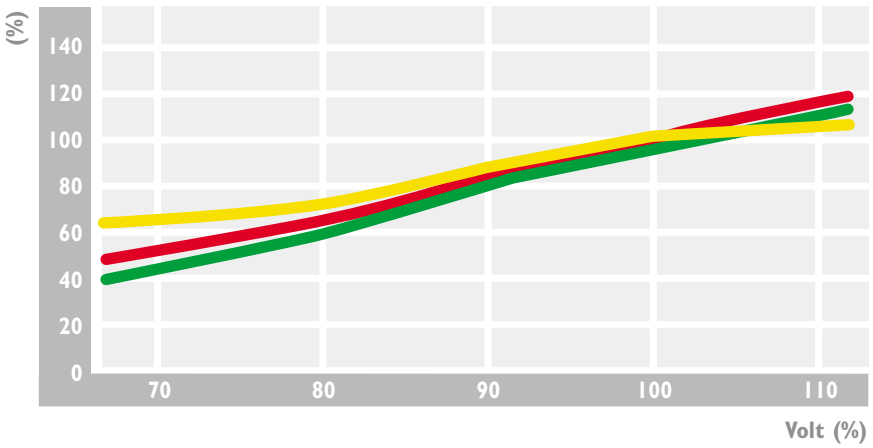
Mercury vapour lamps

A	B	C	D	E
50	10	0,61	1800	7
80	12	0,8	3700	7
125	15	1,15	6200	10
250	22	2,13	12700	18
400	27	3,25	22000	25

Current
Power
Luminous flux



Fluorescent lamps



A	B	C	D	E
18	3	0,37	1150	4
36	7	0,44	2850	4
58	11	0,68	4600	6

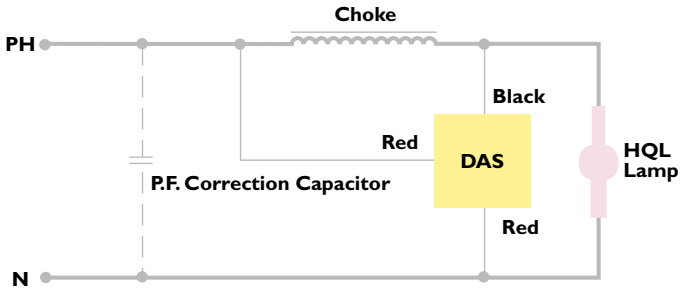
Current
Power
Luminous flux

The saving

The savings achievable with voltage regulation and stabilizing depend on the type of lamp, the characteristics of the electric installation and the effective line voltage. The table below indicates the savings that can be obtained by powering lamps, under good conditions, at a reduced voltage instead of the nominal line voltage. The table shows that different savings can be achieved with different lamps. Some of them in fact accept lower voltages.

Type of lamp	Minimum voltage allowed without DAS	with DAS	Energy saving
High pressure sodium	183V		45÷50%
Low pressure sodium	190V		35%
Mercury vapours	200V	183V	26÷30% / 32÷40%
Metal halides	183V		40%
Fluorescent with standard control gear	190V		35÷45%
Compact fluorescent	190V		30÷35%
Mixed lamps	190V		30%

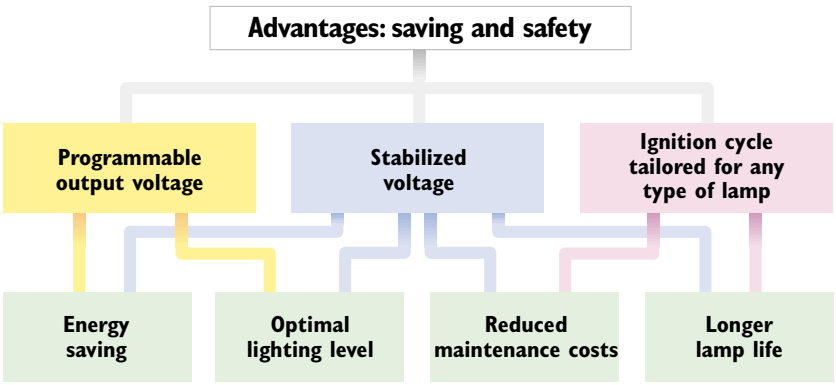
Actually, late at night, when on account of the lower energy consumption the mains voltage is often 5/10% higher than the nominal value, the savings increase further by at least 8/10%. Obviously the possibility of underpowering lamps assumes that the installation has been performed correctly, i.e. that the line drops are maintained within 5%. Otherwise, in order to avoid the last lamps of the line being switched off, the regulator must be programmed to supply a voltage value higher than that which would have given maximum saving. In particular, mercury vapour lamps cannot be underpowered below certain values. To achieve maximum saving, it is necessary to use an Anti-Switch-off Device, or DAS. The DAS is a class II component that can be installed in the luminaire when mercury lamps have to be underpowered below 200 Volt. It consists of an RC group to be connected as in the diagram below.



The DAS permits lamp current to be increased during underpowering, thus avoiding flickering and/or switching off.

Considerable advantages may be obtained by using DAS in mixed systems, where a few mercury vapour lamps can condition the percentage saving of the whole system.

The advantages

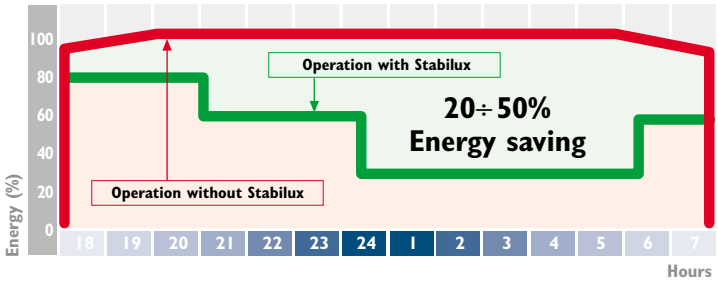


STABILUX offers extremely important advantages to the powered systems, i.e.:

ENSURES energy saving up to 50%, thanks to the stabilizing and regulation of the lamp voltage programmable according to ignition time. Different voltage values can be set in order to obtain the maximum energy saving and the level of lighting envisaged by the applicable regulations. It is possible to customize each system in relation to the volume of traffic on the road.

PERMITS ignition cycles tailored for each type of lamp. The SOFT-START function with stabilized voltage contributes considerably to lengthening lamp life. In fact the reduction of pressure and temperature inside the lamp during the ignition phase limits the lamp "stress" at the most critical time.

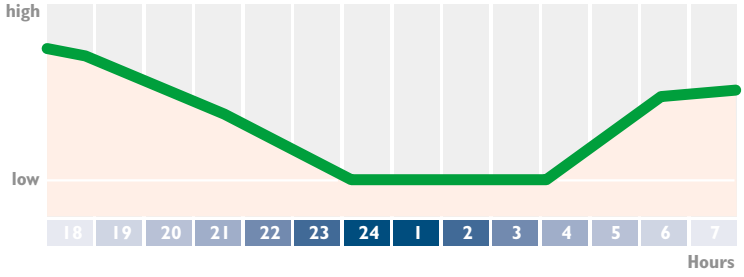
Operating diagram and energy saving



INCREASES the lamp life thanks to stabilizing and ignition at values other than the nominal. On average, it may be claimed that, by using **STABILUX**, the average life of the lamps is doubled, while maintaining high quality light standards.

As a result, the need for replacement is greatly reduced.

Traffic volume

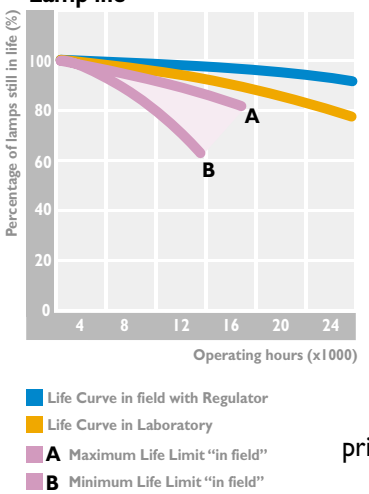


The advantages

CORRECTLY FEEDS sodium, mercury, metal halide and fluorescent lamps, keeping their original characteristics unaltered over time.

Studies conducted in laboratory and on the field have shown that the luminous flux emitted is kept at very high levels even after 16÷20,000 hours of actual operation.

Lamp life



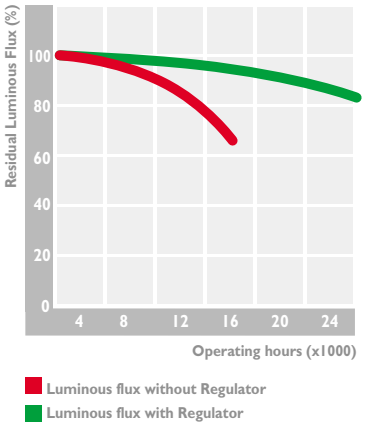
CUTS DOWN plant maintenance costs, ensuring a return on investment (ROI) in an extremely rapid time.

RECONCILES SAFETY, SAVING AND QUALITY of lighting for roads, spurs, motorways, squares, tunnels, parking areas, stadiums, ports, airports, stations, power plants, military barracks, prisons, industrial plants, department stores.

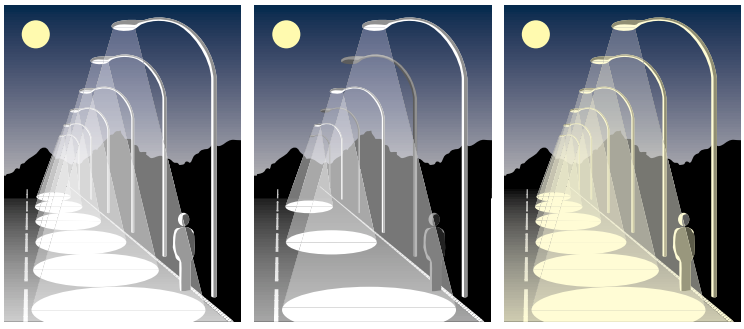
VIGOROUSLY CONTROLS luminous pollution in compliance with the new statutory provisions required by UNI standard 10819.

CONTRIBUTES, by prolonging the life of luminous sources, to contain the costs of disposal of exhausted lamps. It also permits the saving of a considerable quantity of CO_2 emissions due to the smaller amont of energy consumed.

Luminous Flux Variation



ENSURES greater driving safety with constant and uniform lighting, avoiding the dangerous shadow cones caused by the lamp alternate switching off.



Calculating the saving

For an analytical calculation of the advantages deriving from application of the **STABILUX** luminous flux regulator and an assessment of the amortisation period, it is recommended that each project is assessed individually. The calculation can be worked out using the following formulae or using the LUX MASTER Software provided by IREM on request.

Calculation of the achievable savings

The total annual advantage deriving from the application of regulator can be obtained from the following formula:

Rac = Ree + Rom + Res

where: • **Rac** = overall annual saving
• **Ree** = electrical energy saving
• **Rom** = maintenance saving
• **Res** = saving due to stabilization

➪ *Calculation of the total annual energy saving Ree*

Ree = Pa x Nh x Re(%) x €/kWh

where • **Pa** = Active power absorbed by the plant
• **Nh** = Number of hours per year in underpowered operation
• **Re** = Electrical energy saving as a percentage
• **€/kWh** = Cost of one kWh of electrical energy

➪ *Calculation of the saving on maintenance costs Rom*

Rom =[(Cl+Csl):8.000 - (Cl+Csl):16.000)] x Nt

where: • **Cl** = Total cost of the lamps
• **Csl** = Total cost for replacement of the lamps
• **Nt** = Total number of hours/year of operation of the plant
• **8000** = Number of hours of the lamps without **STABILUX** (average life)
• **16.000** = Number of hours life of the lamps with **STABILUX** (average life)

➪ *Calculation of the annual energy saving due to stabilization (7/8% average)*

Res = Pa x Nt x Res(%) x €/kWh

where: • **Pa** = Active power absorbed by the plant
• **Nt** = Total number of hours/year of operation of the plant
• **Res** = Electrical energy saving as a percentage due to stabilization
• **€/kWh** = Cost of one kWh of electrical energy

The proposal

The luminous flux regulators **STABILUX** constitute the most complete range present on the market today. Three series of regulators are available to satisfy the requirements of each single plant, and guarantee a return on investment in line with the requirements of the various users.

This catalogue contains the regulators for 230/400 Volt mains. On request many models are also available at 220/380 and 240/415 Volts.

The proposal consists of more than seventy standard models available in single and three-phase versions.

EMR series for low power lighting plants. Three single-phase models available for power ratings from 3.5 to 15kVA.

PMR series specific for public lighting plants. 42 three-phase models available for power rating from 9 to 50 kVA.

PMT series suitable for lighting applications in which "safety and saving" are essential, integrating natural light with artificial light. Tunnels, underpasses, indoor lighting in factories and offices are good examples of applications. To guarantee a better result, SRL10 luminance sensors are available for interfacing with the regulators.

All versions are provided with intelligent control using latest generation microprocessor technology, capable of commanding and controlling at the same time the plants connected.

STABILUX PMR and **PMT** models can be integrated in a remote control and remote management systems to obtain the maximum operation advantages.

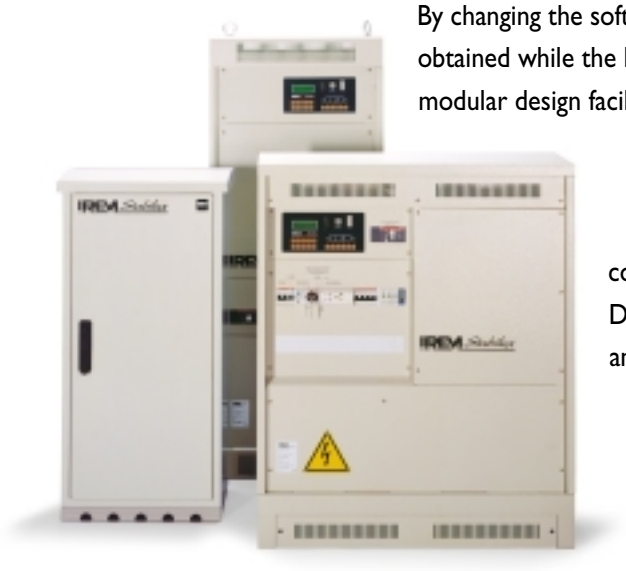
By changing the software of the regulator, different performances can be obtained while the hardware remains unaltered. All the items have a modular design facilitating maintenance and servicing.

Stabilux

EMR Serie
EMR Indoor version IP20

PMR Serie
AN Indoor version IP21
AQ Indoor version with distribution panel IP21
EX Outdoor version IP54
EQ Outdoor version with distribution panel IP54
GR Open frame version IP00
GQ Open frame version with distribution panel IP00

PMT Serie
AN Indoor version IP21



Standard compliance:

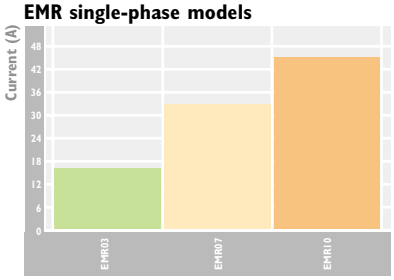
STABILUX regulators are manufactured in compliance with the standards contained in the Directives: EMC 89/336/CEE and following amendments,

Low Voltage 73/23/CEE and following amendments.

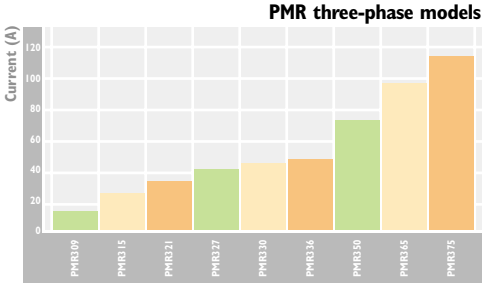
The choice of STABILUX

The choice of the most suitable regulator is based on the current absorbed by the load. In the case of existing plants, whether single- or three-phase, the value of the current absorbed by the load can be obtained using ammeter clamps. For single-phase loads, simply multiply the value of the current measured by the nominal voltage and select from the table the **STABILUX** model capable of delivering the power and current obtained. You are recommended to allow a safety margin of 20÷25% for future system expansions. To determine the power of the regulator to be used in a three-phase mains system, you will need to know the maximum current of each of the three phases. From the table of models available, choose the regulator capable of delivering for each phase a current equal to or greater than the measured value. Again in this case you are advised to allow an overdimensioning by 20÷25%.

EMR single-phase models



PMR three-phase models



For new plants, you can identify the right regulator during design by taking into consideration the load parameters, namely:

- the sum of the active power of the lamps
- the cosφ of the system (typically 0.9 for power factor corrected lighting sources)
- possible future expansions
- line losses (2÷5%)

As a general rule, the power of **STABILUX** is determined by adding 25-30% to the lamp power expressed in Watt.

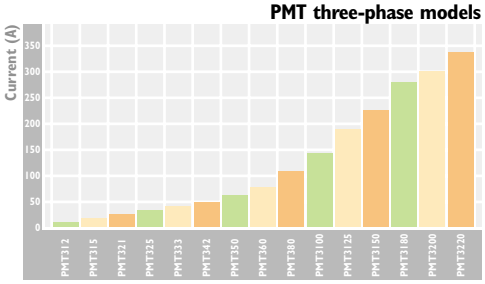
The phase current is determined using the following formula:

$$I = \frac{Nl \times (Pl + Pa)}{Vf \times Cos\varphi}$$

where:

Nl = number of lamps
Pl = power of lamps
Pa = auxiliary power
Vf = nominal phase voltage
Cosφ = power factor

PMT three-phase models



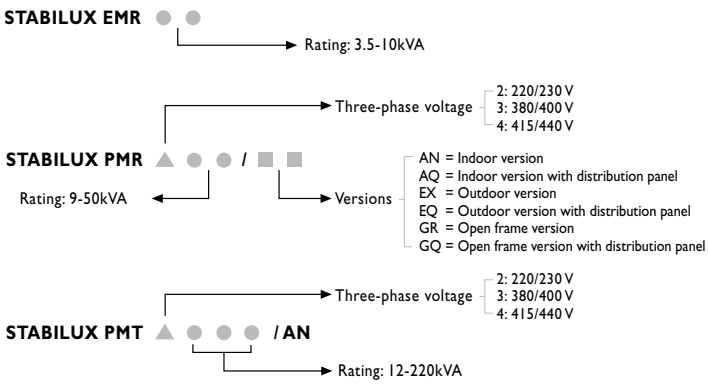
Remember that the regulator can operate with any load power factor provided that the current deliverable on each phase is not exceeded. The regulator will also operate perfectly with those loads where phases have significantly different absorption levels.

Regulator range

Model	Rated power (kVA)	Rated current (Amp.)	Phases	Dimensions (mm) wxdxh	Weight (kg)	Protection degree
EMR 03	3,5	15,9	1+N	180 x 230 x 660	18	IP20
EMR07	7	31,8	1+N	180 x 230 x 660	26	IP20
EMR10	10	45,5	1+N	180 x 230 x 660	30	IP20
EMR15	15	65,2	1+N	305 x 240 x 720	60	IP20
EPT03	3	4.3	3+N	470 x 240 x 570	42	IP20
EPT05	5	7.2	3+N	470 x 240 x 570	52	IP20
EPT08	8	11.5	3+N	545 x 290 x 600	76	IP20
EPT10	10	14.4	3+N	545 x 290 x 600	80	IP20
PMR309AN	9	13,0	3+N	940 x 335 x 1130	140	IP21
PMR315AN	15	21,7	3+N	940 x 335 x 1130	173	IP21
PMR321AN	21	30,3	3+N	940 x 335 x 1130	178	IP21
PMR327AN	27	39,0	3+N	940 x 335 x 1130	193	IP21
PMR330AN	30	43,3	3+N	940 x 335 x 1130	260	IP21
PMR336AN	36	52,0	3+N	940 x 335 x 1130	278	IP21
PMR350AN	50	72,2	3+N	940 x 335 x 1130	315	IP21
PMR309AQ	9	13,0	3+N	940 x 335 x 1130	140	IP21
PMR315AQ	15	21,7	3+N	940 x 335 x 1130	173	IP21
PMR321AQ	21	30,3	3+N	940 x 335 x 1130	178	IP21
PMR327AQ	27	39,0	3+N	940 x 335 x 1130	193	IP21
PMR330AQ	30	43,3	3+N	940 x 335 x 1130	260	IP21
PMR336AQ	36	52,0	3+N	940 x 335 x 1130	278	IP21
PMR350AQ	50	72,2	3+N	940 x 335 x 1130	315	IP21
PMR309EX	9	13,0	3+N	1000 x 320 x 1000	113	IP54
PMR315EX	15	21,7	3+N	1000 x 320 x 1000	146	IP54
PMR321EX	21	30,3	3+N	1000 x 320 x 1000	156	IP54
PMR327EX	27	39,0	3+N	1000 x 320 x 1000	166	IP54
PMR330EX	30	43,3	3+N	1000 x 320 x 1000	230	IP54
PMR336EX	36	52,0	3+N	1000 x 320 x 1000	255	IP54
PMR350EX	50	72,2	3+N	1000 x 320 x 1000	296	IP54
PMR309EQ	9	13,0	3+N	1000 x 320 x 1000	113	IP54
PMR315EQ	15	21,7	3+N	1000 x 320 x 1000	146	IP54
PMR321EQ	21	30,3	3+N	1000 x 320 x 1000	156	IP54
PMR327EQ	27	39,0	3+N	1000 x 320 x 1000	166	IP54
PMR330EQ	30	43,3	3+N	1000 x 320 x 1250	230	IP54
PMR336EQ	36	52,0	3+N	1000 x 320 x 1250	255	IP54
PMR350EQ	50	72,2	3+N	1000 x 320 x 1250	296	IP54

Model	Rated power (kVA)	Rated current (Amp.)	Phases	Dimensions (mm) wxdxh	Weight (kg)	Protection degree
PMR309GR	9	13,0	3+N	910 x 260 x 960	125	IP00
PMR315GR	15	21,7	3+N	910 x 260 x 960	158	IP00
PMR321GR	21	30,3	3+N	910 x 260 x 960	168	IP00
PMR327GR	27	39,0	3+N	910 x 260 x 960	178	IP00
PMR330GR	30	43,3	3+N	910 x 260 x 960	245	IP00
PMR336GR	36	52,0	3+N	910 x 260 x 960	263	IP00
PMR350GR	50	72,2	3+N	910 x 260 x 960	300	IP00
PMR309GQ	9	13,0	3+N	910 x 260 x 960	125	IP00
PMR315GQ	15	21,7	3+N	910 x 260 x 960	158	IP00
PMR321GQ	21	30,3	3+N	910 x 260 x 960	168	IP00
PMR327GQ	27	39,0	3+N	910 x 260 x 960	178	IP00
PMR330GQ	30	43,3	3+N	910 x 260 x 960	245	IP00
PMR336GQ	36	52,0	3+N	910 x 260 x 960	268	IP00
PMR350GQ	50	72,2	3+N	910 x 260 x 960	300	IP00
PMT312AN	12	17,3	3+N	490 x 340 x 960	121	IP21
PMT315AN	15	21,7	3+N	590 x 380 x 1485	142	IP21
PMT321AN	21	30,3	3+N	590 x 380 x 1485	230	IP21
PMT325AN	25	36,1	3+N	590 x 380 x 1485	242	IP21
PMT333AN	33	47,7	3+N	590 x 380 x 1485	276	IP21
PMT342AN	42	60,6	3+N	590 x 380 x 1485	285	IP21
PMT350AN	50	72,2	3+N	590 x 380 x 1485	305	IP21
PMT360AN	60	86,6	3+N	590 x 380 x 1485	311	IP21
PMT380AN	80	115,5	3+N	650 x 600 x 1600	450	IP21
PMT3100AN	100	144,3	3+N	1100 x 600 x 1600	532	IP21
PMT3125AN	125	180,4	3+N	1100 x 600 x 1600	687	IP21
PMT3150AN	150	216,5	3+N	1100 x 850 x 1600	781	IP21
PMT3180AN	180	260,0	3+N	1100 x 850 x 1600	990	IP21
PMT3200AN	200	288,7	3+N	1600 x 850 x 1600	1080	IP21
PMT3220AN	220	317,6	3+N	1600 x 850 x 1600	1140	IP21

Key



The EMR series

With the single-phase regulators of **EMR** series, IREM is offering a range of modular appliances permitting considerable application flexibility.

The compact dimensions and low weight enable these regulators to be installed inside electric distribution cabinets of standard dimensions, made of metal, polyester, or fibre glass.

The **EMR** range includes four models of 3.5, 7, 10 and 15 kVA, all in vertical modules of self-bearing steelwork with IP20 protection degree.

Thanks to their compact structure, single-phase modules of different power ratings can be installed in the same cabinet to supply single-phase and three-phase loads of different power.

a three-phase system. All regulators of **EMR** series are fitted with main circuit breaker, output overload protection, digital timer, microprocessor control board to set the different operating cycles, automatic by-pass, maintenance by-pass, digital inputs to activate operating cycles.

The control and distribution panel is not available for these models.

On request, regulators can be supplied with control and distribution panel, and installed inside IP54 polyester cabinets .

Choose the power of the regulator using the criteria described on page 15.

Technical data and standard fittings

EMR series - Technical data

Nominal input voltage	230V 1ph+N 50/60 Hz
Input voltage variations	from 183 to 242 Volt
Nominal output voltage	230 V RMS stabilized
Output voltage accuracy	±1%
Admitted load variations	from 0 to 100%
Stabilization speed	20 ms/Volt
Voltage regulation speed	6 Volt/min
Lamp ignition voltage	selectable from 202 to 230 Volt via switch
Ignition cycle duration	6 min
Operating voltage at underpower conditions available on three levels: 1) minimum level Vrid selectable from 175 to 202 Volt via switch 2) first intermediate level supplying a voltage Vr1=Vrid+(Vnom-Vrid)/3 3) second intermediate level supplying a voltage Vr2=Vnom-(Vnom-Vrid)/3 *Note: the two intermediate levels cannot be clock controlled but only via external commands*	
Waveform distortion	less than 0.2% in any operating condition
Efficiency	higher than 97%
Operating temperature	from -20 to +35°C
Cooling	natural air cooled
Storage temperature	from -40 to +75°C
Company certifications	ISO9001-ISO14001
Product certification	CE

Standard fittings

- Overload protection
- Input circuit breaker
- Tripping coil. It opens the input circuit breaker after 5 min. operation with 20% overload
- Device to reactivate the ignition cycle after a black-out exceeding 5 ms
- Manual by-pass
- Maintenance by-pass
- Digital clock for weekly programming
- LEDs for signalling of: mains input on, ignition voltage on output, nominal output voltage, reduced output voltage, alarm in case of control board failure
- Command for automatic by-pass
- Digital inputs for activation of: ignition cycle, operation at nominal voltage, underpowered operation, operation at first intermediate voltage, operation at second intermediate voltage
- Input/output terminal board
- Auxiliary terminal board
- Microprocessor board with possibility of setting underpowered conditions from 16 predefined values

The PMR series

The **PMR** series satisfies the present and future requirements of public lighting plants, among which the need for units which can dialog with the modern communication systems, permitting remote control by the operator.

The series includes a range of three-phase regulators with powers ranging from 9 to 50 kVA.

Three versions are available:

- with IP21 metal cabinet for indoor installations
- with IP54 fibre glass cabinet for outdoor installations
- with IP00 self-supporting rack for installation inside electric distribution panels or cabinets.

All these versions can be fitted with a control and distribution panel for the lighting lines.

Despite their high power rating, the dimensions of these models are quite reduced. This is a highly appreciated feature, especially for outdoor installations where the environmental impact is limited.

The regulators **STABILUX PMR** perform voltage stabilization and regulation independently on each single phase; this makes them ideal for installations with unbalanced loads and/or asymmetrical voltages. voltage stabilization is effected on the true RMS value; therefore **STABILUX** regulators are not affected by possible waveform distortions on the power supply line.

All models are equipped with main circuit breaker, protection of the auxiliary circuits, automatic by-pass, display, programming keyboard, input/output terminal boards, auxiliary terminal boards.

They are also equipped with CISC microprocessor control capable of managing customized operating cycles, and measuring the installation electric values and functional parameters.

The regulators can also be managed and controlled via a remote control/remote management system.

Programs can be retrieved from and loaded on the regulator by means of a removable “memory bank”: the "TOUCH-MEMORY".

Standard operating programs in four languages are loaded on this regulator.

The PMR series

The operating parameters can be customized in relation to the volume of traffic, and to the geographical location of the plant.

This application flexibility is made possible by a "pull-down" programming menu on which you may work:

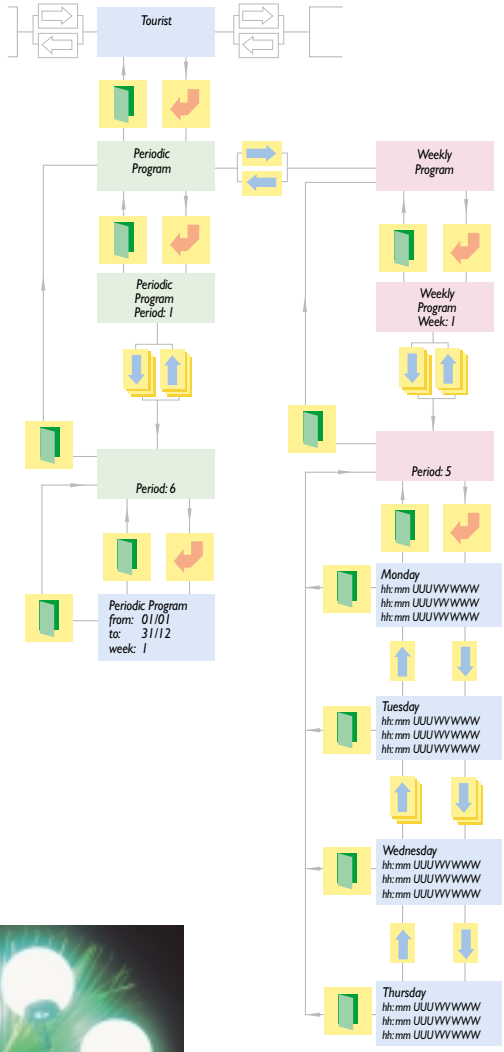
1) either using the keyboard and the LCD on the control panel of the **STABILUX**;

2) or the RS232 communication interface.

is extremely simple because it is "guided". It is also protected by a multi-level access password system to prevent improper use of the regulator.

Programming of the operating cycles may be made on a daily, weekly, monthly, seasonal, or annual basis.

operating cycles may also be programmed for days with particular lighting requirements such as national holidays, festivals, special events, a.s.o.



100% of lamps switched on

Lamps operated at reduced voltage

It is possible to program daily, weektly, periodic customized operating cycles.

Standard program

City

	18	19	20	21	22	23	24	1	2	3	4	5	6	7	Tot. h Nominal	Tot. h Reduced
Fall	●	●	●	●	●	●	●	●	●	●	●	●	●	●	7,45	6,00
Winter	●	●	●	●	●	●	●	●	●	●	●	●	●	●	7,35	6,00
Spring			●	●	●	●	●	●	●	●	●	●			3,25	6,40
Summer			●	●	●	●	●	●	●	●	●	●			3,50	6,50
Total hours per year															1970	2270

Suburbs - Highways

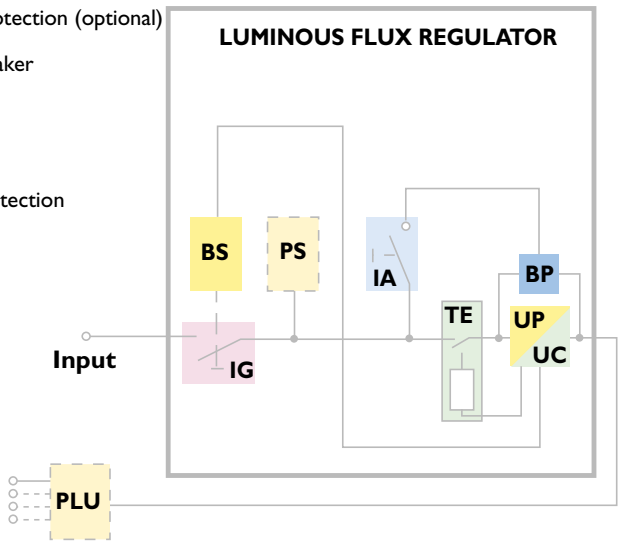
	18	19	20	21	22	23	24	1	2	3	4	5	6	7	Tot. h Nominal	Tot. h Reduced
Fall	●	●	●	●	●	●	●	●	●	●	●	●	●		5,50	8,00
Winter	●	●	●	●	●	●	●	●	●	●	●	●	●		5,30	8,00
Spring				●	●	●	●	●	●	●	●	●	●		1,75	7,90
Summer			●	●	●	●	●	●	●	●	●	●	●		2,00	8,00
Total hours per year															1330	2912

Touristic areas

	18	19	20	21	22	23	24	1	2	3	4	5	6	7	Tot. h Nominal	Tot. h Reduced
Fall	●	●	●	●	●	●	●	●	●	●	●	●	●		0,00	13,50
Winter	●	●	●	●	●	●	●	●	●	●	●	●	●		0,00	13,30
Spring			●	●	●	●	●	●	●	●	●				0,00	9,70
Summer			●	●	●	●	●	●	●	●	●				5,50	4,50
Total hours per year															500	3742

The standard versions (AN-EX-GR)

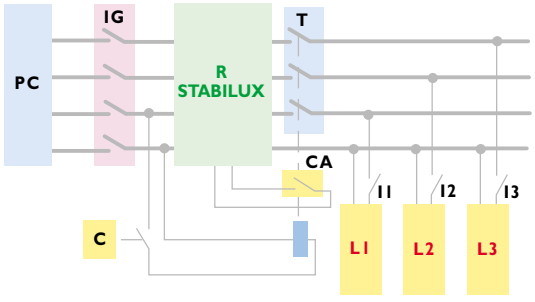
PS: Overvoltage protection (optional)
BS: Tripping coil
IG: Input circuit breaker
IA: Auxiliary switch
TE: Main breaker
UP: Power unit
BP: By-pass
UC: Control unit
PLU: Output lines protection



The standard versions are used where a control and distribution panel for the lamp power supply lines is already available. The time needed to install these regulators is very short as the intervention is limited to the connection of the regulator between the power supply line and the protections of the lines to be powered. The AN and GR versions require less than an hour. The outdoor versions require about three hours as it is necessary to build a concrete base on which the regulator must be fixed.

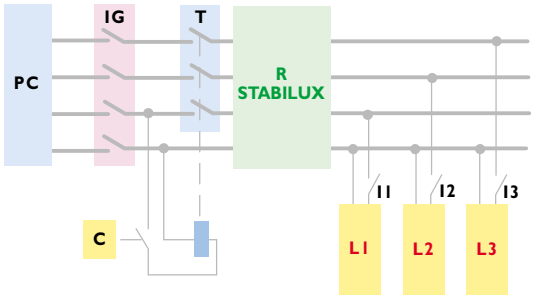
The figures below illustrate two insertion possibilities; the one selected will depend on the type of installation.

Lighting plant with **STABILUX** connected before the line contactor



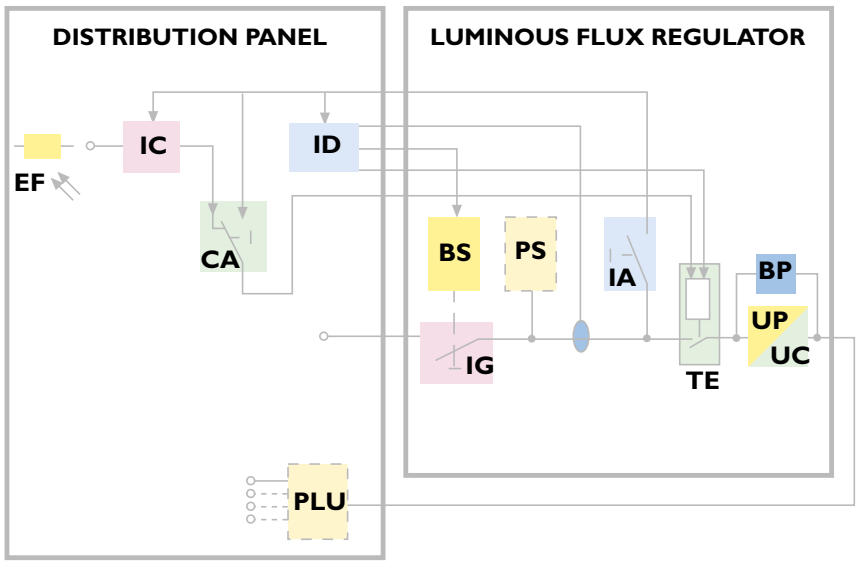
PC: Delivery point
IG: Main switch
T: Line contactor
C: Twilight switch
R: **STABILUX**
I1: Switch (phase no.1)
I2: Switch (phase no.2)
I3: Switch (phase no.3)
L1: Load
L2: Load
L3: Load
CA: Remote command to force the ignition cycle

Lighting plant with **STABILUX** connected after the line contactor



PC: Delivery point
IG: Main switch
T: Line contactor
C: Twilight switch
R: **STABILUX**
I1: Switch (phase no.1)
I2: Switch (phase no.2)
I3: Switch (phase no.3)
L1: Load
L2: Load
L3: Load

Versions with control and distribution panel (AQ-EQ-GQ)



PS: Overvoltage protection (optional)
BS: Tripping coil
IG: Input circuit breaker
IA: Auxiliary switch
TE: Main breaker
ID: Earth leakage relay with automatic resetting

IC: Twilight switch
CA: Auto/manual switch
PLU: Output circuit breaker (optional)
EF: Photo-sensor control system
UP: Power unit
BP: By-pass
UC: Control unit

The versions with control and distribution panel (GQ-EQ-AQ) contain in a single cabinet both the **STABILUX** luminous flux regulator, and the panel for control, distribution and protection of the lamp power supply lines.

This permits to get a distribution panel in compliance with EN 60439 standards.

As an option, it is possible to install circuit breakers or earth leakage trips to protect the output lines. The types of protection available are shown in the section "Fittings".

Technical data and standard fittings

PMR series - Technical data

Nominal input voltage	3x230V 3ph+N
Input voltage variations	from 183 to 253 Volt
Nominal output voltage	230V RMS stabilized
Output voltage accuracy	±1%
Admitted load variations	from 0 to 100%
Stabilization speed	40 ms/Volt
Voltage regulation speed	6 Volt/min
Load Power factor	Any
Lamp ignition voltage	selectable from 202 to 230 Volt via microprocessor control
Parameters programmable by the user:	• operating voltages: 6 values per day for each day of the week, for each of the 6 week models • lamp ignition voltage • operating voltages at underpowered conditions • operating voltages at nominal conditions • transition speed from one operating cycle to the other • ignition cycle duration • line drop compensation voltage • alarm intervention time
Waveform distortion	less than 0,2% in any operating condition
Efficiency	higher than 97%
Operating temperature	from -20 to +35°C
Cooling	forced
Storage temperature	from -40 to +75°C
Protection degree	IP 00-21-54 depending on the versions
Isolation class	I
Product certification	CE

Standard fittings

- 4-pole input circuit breaker with tripping coil
- Input circuit breaker for protection of the control circuit
- Input circuit breaker for protection of the auxiliary circuits
- Twilight switch (only in versions equipped with distribution panel)
- Earth leakage trip with auto resetting (only in versions equipped with distribution panel)
- Contactor for load powering
- Manual by-pass
- Automatic by-pass
- Device to reactivate the ignition cycle after a black-out exceeding 5 ms
- Presetting for installation of output line protections
- Presetting for installation of overvoltage protections
- RS232 interface for connection to a modem and to remote control/management systems
- Reports on display in 4 languages:
  - input and output voltage
  - rated current
  - active and apparent power delivered by each phase
  - cosφ
  - total operation hours
  - operation hours at nominal voltage, reduced voltage, by-pass
  - total energy consumed
  - total energy saved
  - energy saved in each of the last 12 months
  - energy consumed in each of the last 12 months
- Alarms. The alarm conditions that result in tripping of the protection systems are:
  - output voltage out of range
  - minimum cosφ out of range
  - current delivered out of range
  - temperature out of range
  - control circuit failure
  - earth current leakage
- Signals reported on LEDs:
  - presence of input voltage
  - regulator in manual operation
  - alarm on
  - regulator in automatic operation
  - control failure
  - by-pass operation
  - control on
- Signals reported through dry contacts:
  - underpowered operation or nominal conditions
  - by-pass operation
  - alarm on
- External digital commands. Through a dry relay contact the regulator can receive commands for:
  - activation of the ignition cycle
  - activation of operation at nominal voltage
  - activation of underpowered operation
  - plant switching-on/off
- External analog commands:
  - 0-20 mA
  - 4-20 mA
  - 0-10 V
- Programming:

  Weekly frequency. In a year 6 different weekly models can be programmed, each with different daily operating cycles. Each day can be divided into a maximum of 6 different periods of duration and voltages. Special programming days: 10 per year

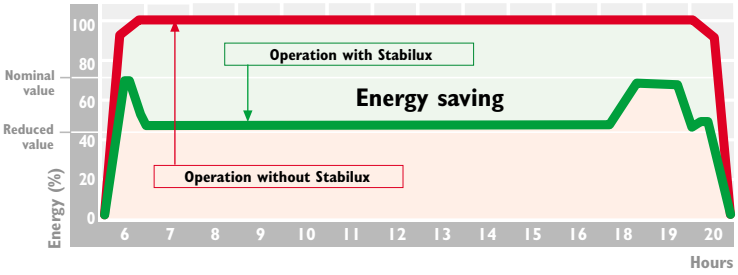
The PMT series

The regulators of the **PMT** series have specific features for indoor lighting plants and for tunnels where there is a need to ensure saving and safety by integrating the artificial light with natural light.

As these regulators use the same control logic as the PMR series, they can also be remotely controlled and managed.

The difference with the PMR models lies in the type of software used by the microprocessor. This software enables to customize the use of the **STABILUX** regulator depending on the application requirements.

Operating diagram and energy saving



The **PMT** series is in fact suitable for managing the lighting plants of industrial complexes, warehouses, office blocks, parking areas, underpasses, tunnels, exhibition halls.

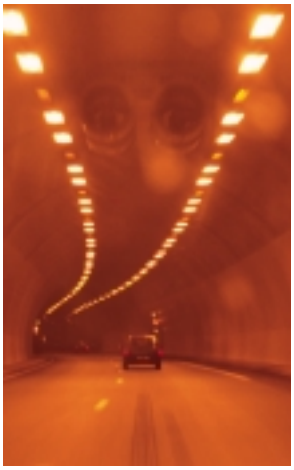
In accordance with the latest provisions on the subject, the lighting plants in tunnels must be suitable for users to pass through under conditions of safety, limiting the blinding effect to the maximum extent possible.

Adaptation between the luminance provided in the tunnel and that along the external approach road must be gradual, without strong light variations.

The **PMT** versions are programmed to carry out this function, i.e. to switch on, switch off, and progressively regulate up to 6 reinforcement lighting circuits by the connection to external luminance sensors. By means of signals (0-10 V, 4-10 mA, 0-10 mA) proportional to the luminance (cd/m^2) or to the external brightness (lux) detected by the SRL sensor, **STABILUX** selects and regulates the reinforcement circuits avoiding the risk of blinding the road driver.

As regards permanent circuits, when it is necessary to keep them separate from the reinforcement circuits, the use of hourly programmable regulators is recommended.

The **STABILUX PMT** are available in three-phase versions for indoor installation in a range from 12 to 220 kVA. Standard operating programs in 4 languages are installed on



board the regulators. Users can customize all programming with great ease according to their requirements.

Programming is guided and protected by an access password system.

The maximum number of reinforcement circuits to be managed can be set in the programming menu (max 6), together with the minimum and maximum switch-on and switch-off values for each reinforcement circuit.

The example that follows refers to the use of PMT regulators equipped with the SRL10 luminance sensor for management of reinforcement circuits in a tunnel.

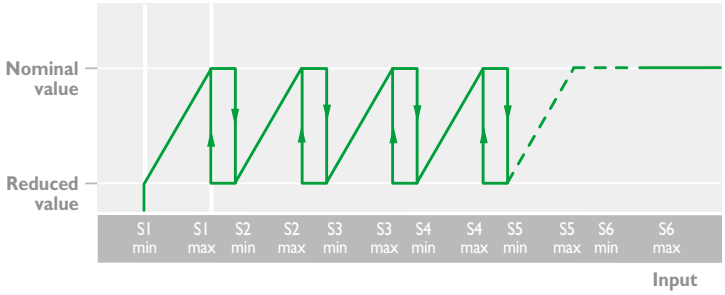
In this case the regulator has been programmed to manage an analog signal varying from 4 mA, corresponding to a luminance reading at the tunnel entrance of 0 cd/m^2, to 20 mA corresponding to an external luminance reading of 5000 cd/m^2.

When an external luminance of 50 cd/m^2 is reached the regulator

• provides to switch on the first reinforcement circuit through a relay,

• starts the ignition cycle by delivering the preselected voltage. This value can be set between 175 and 230Volt. Duration of the ignition cycle can be set between 1 and 20 minutes.

Before ignition of the reinforcement circuits, the lighting in the tunnel is ensured by the permanent circuit at a level of 80 lux. Subsequently, the regulator will deliver a voltage value that depends on:



• the minimum level set depending on the type of lamps and their ageing

• the signal given by the luminance sensor.

The speed with which the regulator reaches the steady state condition is selectable from 1 to 50 volt/sec.

When the signal sent by the sensor reaches 450 cd/m^2 the regulator delivers the nominal voltage of 230V.

Up to a luminance value of 500 cd/m2 the voltage stays at 230V.

When this value is exceeded:

• the voltage drops to the preset value so as to repeat the ignition cycle;

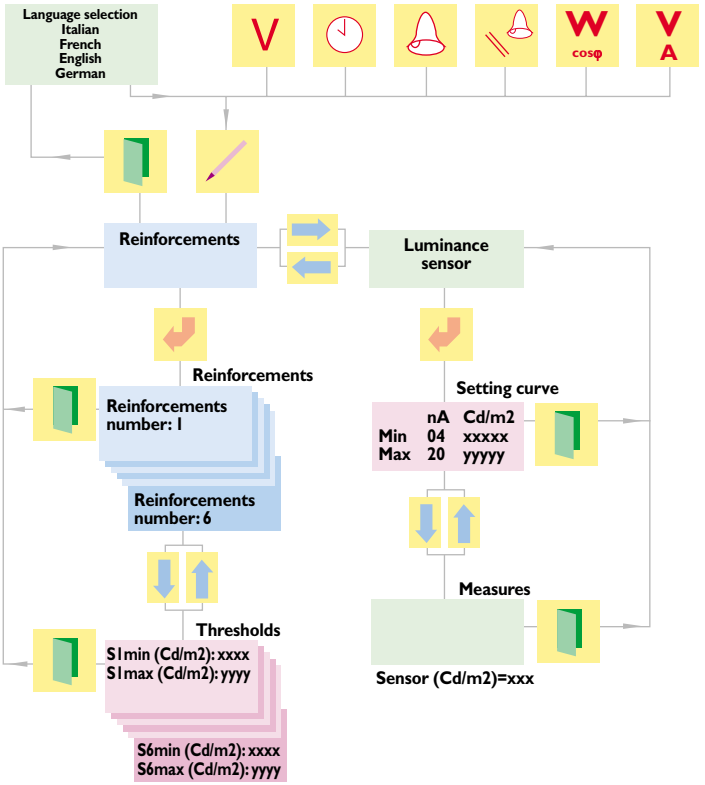
• the second reinforcement is switched on.

This process continues until all the reinforcement circuits have been switched on. The ignition values of the reinforcement circuits are independent and variable at the user's discretion in accordance with the service requirements.

At twilight, the opposite process will occur, i.e. the progressive switching-off of the reinforcement circuits with interspersed regulation of the voltage within the preset limits.

The use of the luminance sensor enables to achieve the maximal saving and at the same time ensures the desired lighting level. For applications in offices or industrial plants, the regulation is carried out at the times of the greatest energy requirement when the cost is notably higher than in other consumption hours.

As lowering of the lamp power supply voltage reduces the power dissipated by the luminous sources, air-conditioning costs are also lowered in the summer months. This permits further energy savings.



Features of the luminance sensor SRL-10D

Luminance	0 - 5000Cd/m²
Output signal	0 - 20mA
Aperture angle	20°
Power supply	24V
Protection degree	IP67
Isolation class	II

Technical data and standard fittings

PMT series - Technical data

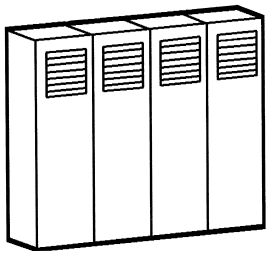
Nominal input voltage	3x230V 3ph+N
Input voltage variations	from 183 to 253 Volt
Nominal output voltage	230V RMS stabilized
Output voltage accuracy	±1%
Admitted load variations	from 0 to 100%
Stabilization speed	40 ms/Volt
Voltage regulation speed	6 Volt/min
Load Power factor	any
Lamp ignition voltage	Selectable between 202 and 230 Volt through microprocessor control
Parameters programmable by the user:	• min./max threshold values to switch on/off the reinforcement circuits (max. 6) • lamp ignition voltage • operating voltage with minimum threshold Smin • operating voltage with maximum threshold Smax • duration of ignition cycle • line drop compensation voltage • alarm intervention time
Waveform distortion	Less than 0.2% in any operating condition
Efficiency	greater than 97%
Operating temperature	from -20 to +35°C
Cooling	Forced
Storage temperature	from -40 to +75°C
Protection degree	IP21
Isolation class	I
Product certification	CE

Standard fittings

- 4-pole input circuit breaker with tripping coil
- Input circuit breaker for control circuit protection
- Input circuit breaker for auxiliary circuit protection
- Contactor for load powering
- Manual by-pass
- Automatic by-pass
- Device to reactivate the ignition cycle after a black-out exceeding 5 ms
- Presetting for installation of output line protections
- Presetting for installation of overvoltage protections
- RS232 interface for connection to a modem and to remote control/management systems
- Reports on display in 4 languages:
  - input and output voltage
  - rated current
  - active and apparent power delivered by each phase
  - cosφ
  - total operation hours
  - operation hours at nominal voltage, reduced voltage, in by-pass
  - total energy consumed
  - total energy saved
  - energy saved in each of the last 12 months
  - energy consumed in each of the last 12 months
- Alarms. The alarm conditions that result in tripping of the protection systems are:
  - output voltage out of range
  - minimum cosφ out of range
  - current delivered out of range
  - temperature out of range
  - control circuit failure
- Signals reported on LEDs:
  - presence of input voltage
  - regulator in manual operation
  - alarm on
  - regulator in automatic operation
  - control failure
  - control on
  - by-pass operation
- Signals reported through dry contacts:
  - underpowered operation or nominal conditions
  - by-pass operation
  - alarm on
- External digital commands. Through a dry contact the regulator can receive commands for:
  - activation of the ignition cycle
  - activation of operation at nominal voltage
  - activation of underpowered operation
  - plant switching-on/off
- External analog commands:
  - 0-20 mA
  - 4-20 mA
  - 0-10 V
- Programming:

Weekly frequency. In a year 6 different weekly models can be programmed, each with different daily operating cycles. Each day can be divided into a maximum of 6 different periods of duration and voltages. Special programming days: 10 per year

Fittings

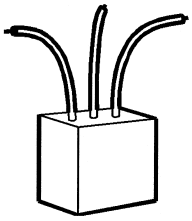


Overvoltages protection (PS/PSF)

(only for PMR/PMT models)

The overvoltage protections (PS/PSF) are high capacity discharge devices which, when connected between the input terminals and ground, protect **STABILUX** from atmospheric discharges.

N.B.: for power ratings up to 65 kVA the PS model should be used; for higher ratings, the PSF model should be used.



Anti Switch-Off Device (DAS)

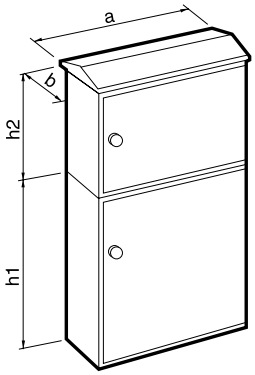
The anti switch-off device is an additional component to be mounted in the luminaire of mercury lamps in order to maximize the energy saving when lamps accepting lower voltage values are connected to the same line.

Lamp	HG 80W	HG 125W	HG 250W	HG 400W	HG 1000W
Type	DAS 80	DAS 125	DAS 250	DAS 400	DAS 1000

Meter cabinet (VNL)

(only for PMR models, versions EX and EQ)

This is an additional fibre glass IP54 cabinet for measuring meters to be placed alongside or on top of **STABILUX** models.



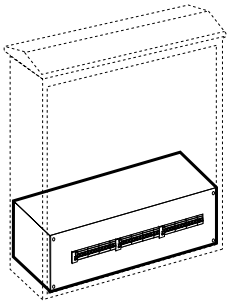
Power (kVA)	Model	VNL dimensions (axbxh1)	VNL + STABILUX dimensions (axbxh1+h2)
9 – 27	VNL50	1000 x 320 x 750	1000 x 320 x 1750
30 – 50	VNL50	1000 x 320 x 750	1000 x 320 x 2000
65 – 75	VNL75	1000 x 320 x 750	alongside only

Additional cabinet for output protections

(only for PMR models, versions EX and EQ)

The a.m. models are fitted with a DIN bar for mounting of output line protection switches.

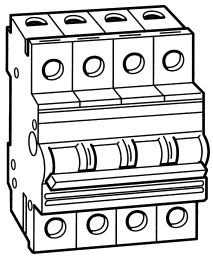
For power ratings up to 27 kVA, space is available for 20 modules. By using a specific rack, it is possible to install up to 60 modules. In this configuration, dimensions of the cabinet are altered from mm 1000x320x1000h to mm 1000x320x1250h.



For power ratings above 50 kVA there is space available for 60 modules.

For the models with higher power ratings, it is necessary to use an additional cabinet to be set alongside the regulator. In this case the space available is of 60 modules and the dimensions are mm. 1000x320x1000h.

Output line protections (PLU)



(only for PMR models, versions EX and EQ)

Automatic circuit breakers or earth leakage trips can be installed for protection of the output lines. When ordering, clearly indicate the size of the switches, choosing from those listed in the table below.

This table also indicates the dimensions (in modules) of each switch in order to help you determine the maximum number of protections that can be installed in the different regulators.

Capacity (A)	Automatic Circuit breaker		Earth Leakage Trips			
	Eurocurve C		ID = 0,3 A		ID = 0,5 A	
	IP + N	3P + N	IP + N	3P + N	IP + N	3P + N
10	PLU210C	PLU410C	PLU210MD3	PLU410MD3	PLU210MD5	PLU410MD5
16	PLU216C	PLU416C	PLU216MD3	PLU416MD3	PLU216MD5	PLU416MD5
20	PLU220C	PLU420C	PLU220MD3	PLU420MD3	PLU220MD5	PLU420MD5
25	PLU256C	PLU425C	PLU225MD3	PLU425MD3	PLU225MD5	PLU425MD5
32	PLU232C	PLU432C	PLU232MD3	PLU432MD3	PLU232MD5	PLU432MD5
dimensions	2 mod.	4 mod.	4 mod.	6/8 mod.	4 mod.	6/8 mod.

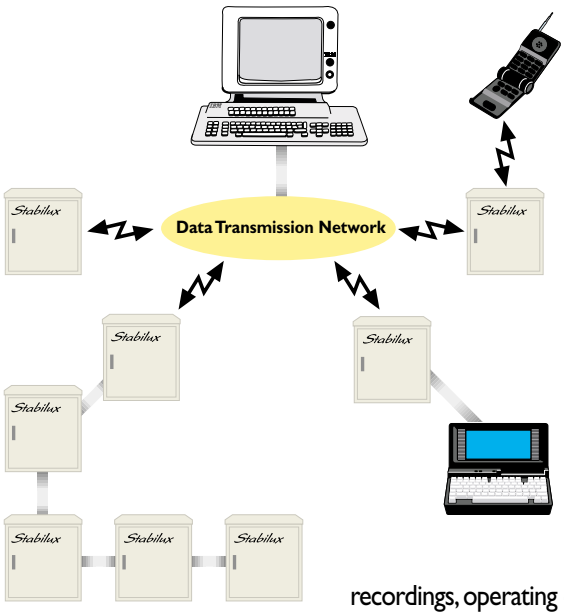
Note: The choice of protections to be installed in the regulators is the task of the designer or installation engineer.

Luminance sensor SRL-10D

This is a component that is connected to the PMT regulators to provide a current proportional to the level of luminance detected.

Remote control and Remote management

The luminous flux regulators **STABILUX** can also be managed and controlled through DTE transmission systems (GSM, Modem on switched telephone lines, dedicated data lines) by means of the RS232 serial port on the data control unit of the flux regulator.



Connecting and transmitting data

• The central unit handling the remote control periodically activates, automatically or at the request of the operator, a procedure for connection with the luminous flux regulators.

• Each regulator, whenever a programmed alarm condition occurs, connects to the central unit indicating type and time at which it occurred. Simultaneously it can send an SMS message to the mobile phone of the plant operator.

Remote control

Once the connection is made, the data stored and acquired by the microprocessor (measurements, recordings, operating conditions, alarms, etc.) are available to be read, evaluated or forwarded to the central unit.

Remote management

Remote management may be used to modify the duration of the different operating cycles, the voltage values, the alarm values, the functional parameters of the regulator. In other words, the user can also perform from any distance all those operations that would normally be performed manually on the regulator.

Changing the operating parameters of the regulator is only possible after entry of selective passwords.

Remote control features

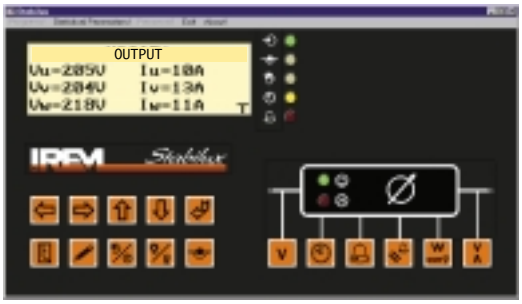
Remote control functional features

• Real time control of the regulators operation by the central unit

• Signalling of a current alarm to the central unit and the operator (SMS)

• Polling - periodic and automatic or individual and manual for plant control

• Display of data from remote (voltage, current, cosφ, alarms, etc.)



• Modification from a remote position of the regulator operating parameters

• Forcing of the operating state (plant switching on/off, by-pass, underpowered, nominal, manual, automatic operation).

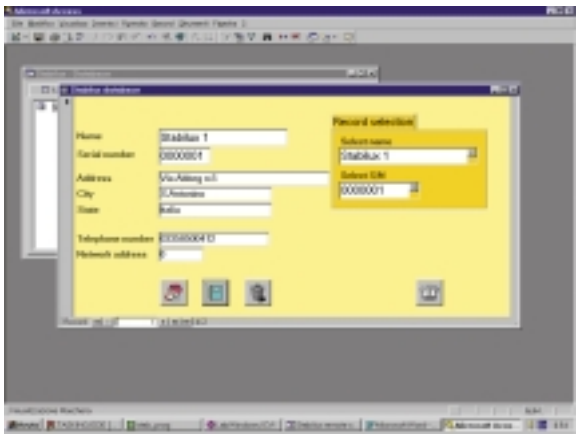
LUX MANAGEMENT Software

This is an application software for the management of data acquired.

It is designed for the Windows environment and uses a commercial data base: MICROSOFT ACCESS™.

This gives the user complete freedom to make changes to the program and manage existing archives in a personal way.

The standard version is designed to handle:



• Plant general data
• Plant general index
• Data acquisition
• Alarm reception
• Data processing
• Graphs and measurements
• Utilities

The service

Besides the supply of products, **IREM** also offers its customers a number of other services:

Support in assessing economic convenience of the investment

From the technical data of the lighting plant, **IREM** can provide its customers, free of charge, a calculation file enabling them to work out the ROI of their regulator.

Warranty

All **IREM** regulators are guaranteed for a period of 2 years.

Servicing

IREM have established technical servicing centres in many countries throughout the world providing service both during the warranty period and afterwards.

After-sale service contracts

Programmed technical servicing contracts may be taken out to ensure that regulators receive periodic technical service.

Remote monitoring contracts

On request, all regulators can be connected to **IREM** monitoring centre where checking of all the operating parameters is performed for all the connected regulators. This service ensures that the reliability and efficiency of lighting plants remain at the highest level.

IREM. Experience and Quality

IREM is a leading company in the manufacture of electromechanical and electronic equipment for the control of the mains power in the following sectors:

- powering of discharge lamps for professional applications;
- protection of electric users against line disturbances;
- luminous flux regulation in lighting plants;
- power generation by micro hydroelectric plants.

Since its foundation in 1947, ***IREM*** has gained wide recognition due to the reliability and innovative content of its higt-tech products. A reliable company deserving the Oscar-Award. In 1992, in Los Angeles, ***Mario Celso*** - founder of ***IREM*** - was granted the ***"Scientific-Technical Award"*** by the Academy of Motion Picture Arts and Sciences.

Two production plants, a philosophy based on "quality upgranding" as the company's primary concern and direct export exceeding 50% of the global turnover are a warranty of continuity and development.

Experience, quality and professional skill: these are the factors that permitted ***IREM*** to achieve in 1993 the certification of its quality system in compliance with ***UNI EN ISO 9001*** standard, a further confirmation of ***IREM*** commitment to constant improvement to ensure the maximum satisfaction of the customer and its capacity to guarantee:

• a constant quality standard
• precision and repeatability of all working processes
• dropping of acceptance control at the customer's plant
• identification and traceability of a product through the years.

In year 2000, ***IREM*** has obtained the certification of its environment management system according to ***UNI EN ISO 14001*** standard. This certification is a firm demonstration of the company's will to protect the environment not just through its products, but also via precise patterns of behaviour.

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