

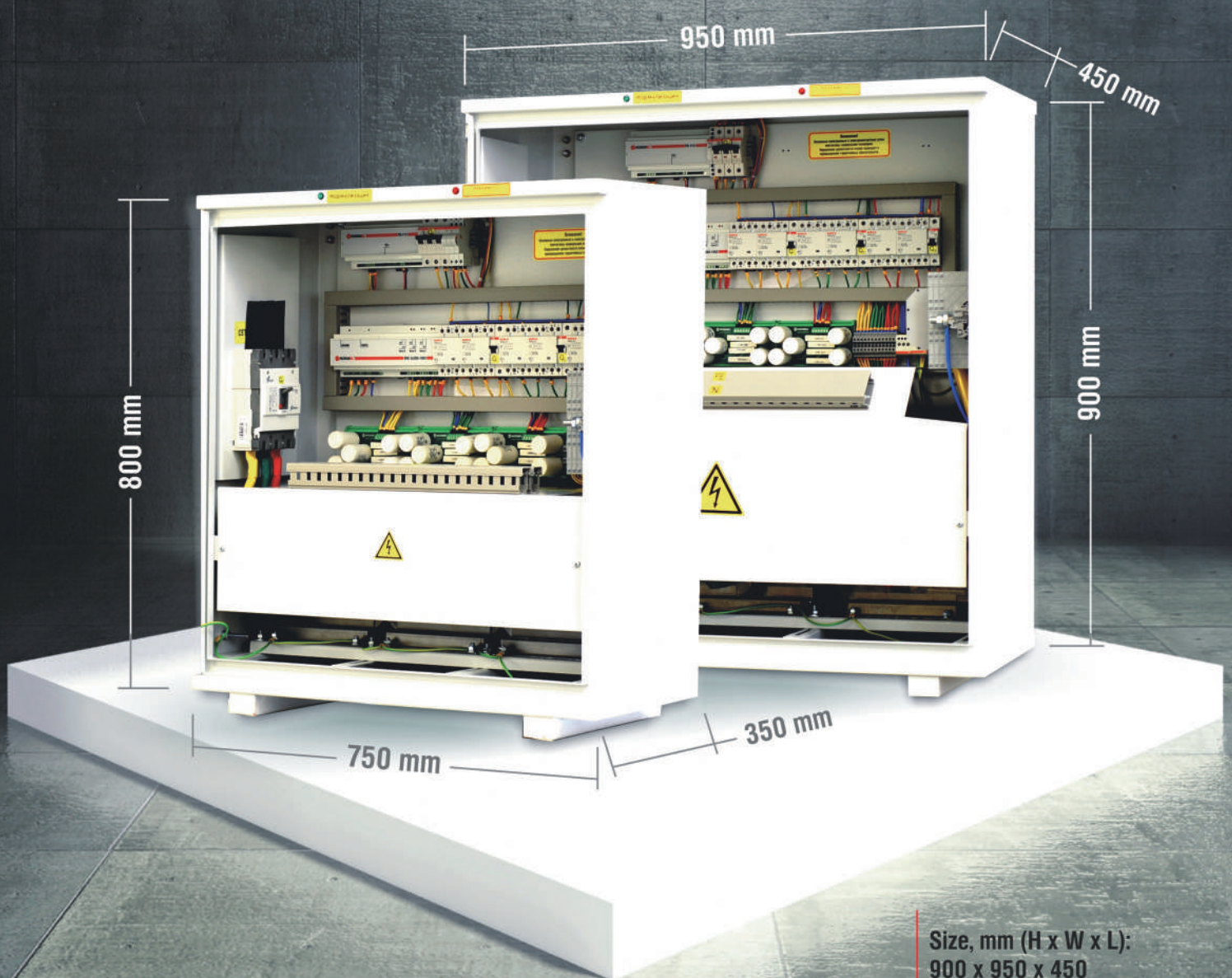


NORMELTM

ENERGY SERVICE AND PROTECTION

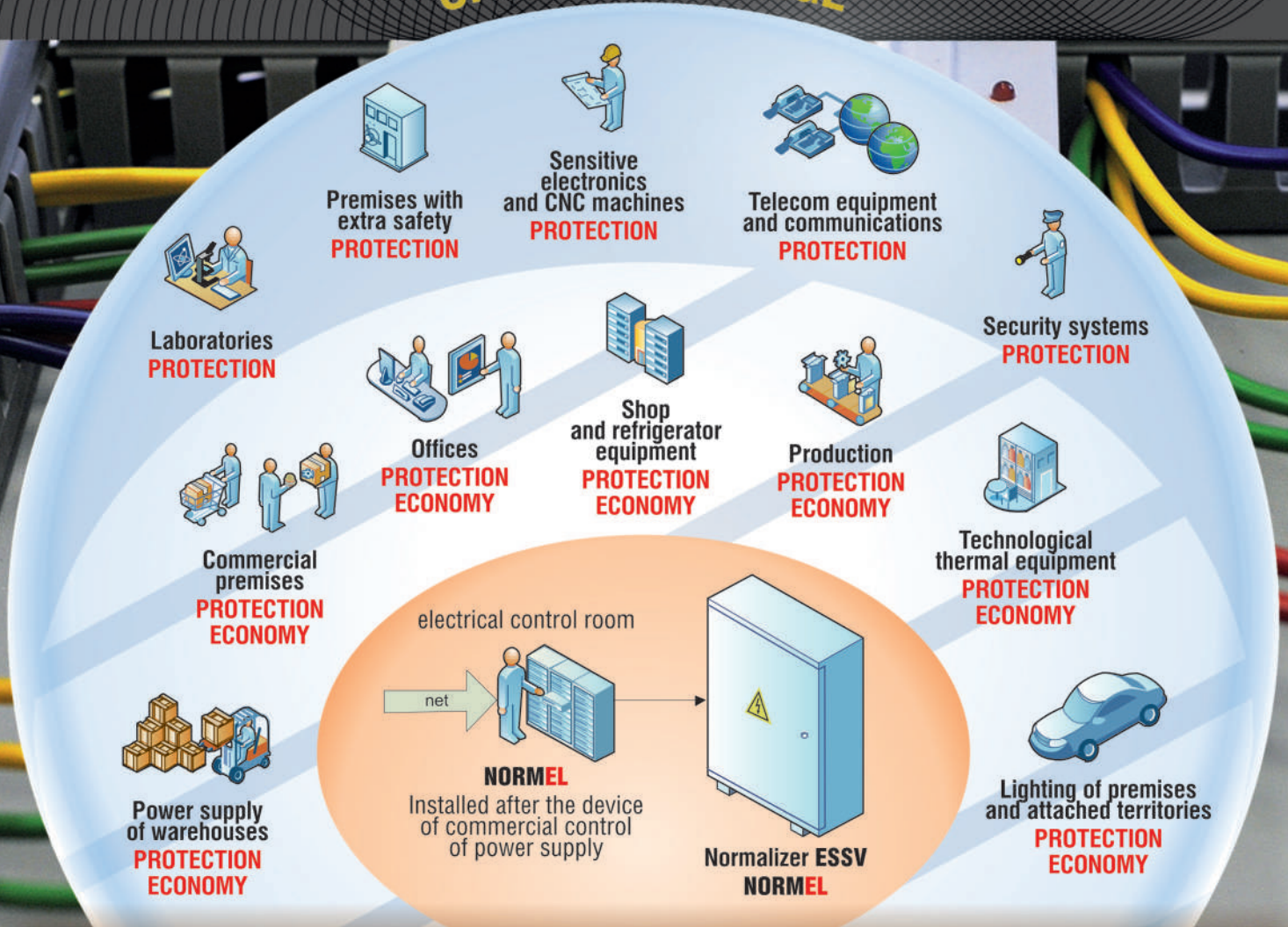
**THREE-PHASE NORMALIZERS
OF AC VOLTAGE**

Three-phase normalizers
of ac voltage with the function
of energy saving and control on
each phase for the nets of 0,4 kV



Size, mm (H x W x L):
900 x 950 x 450
800 x 750 x 350

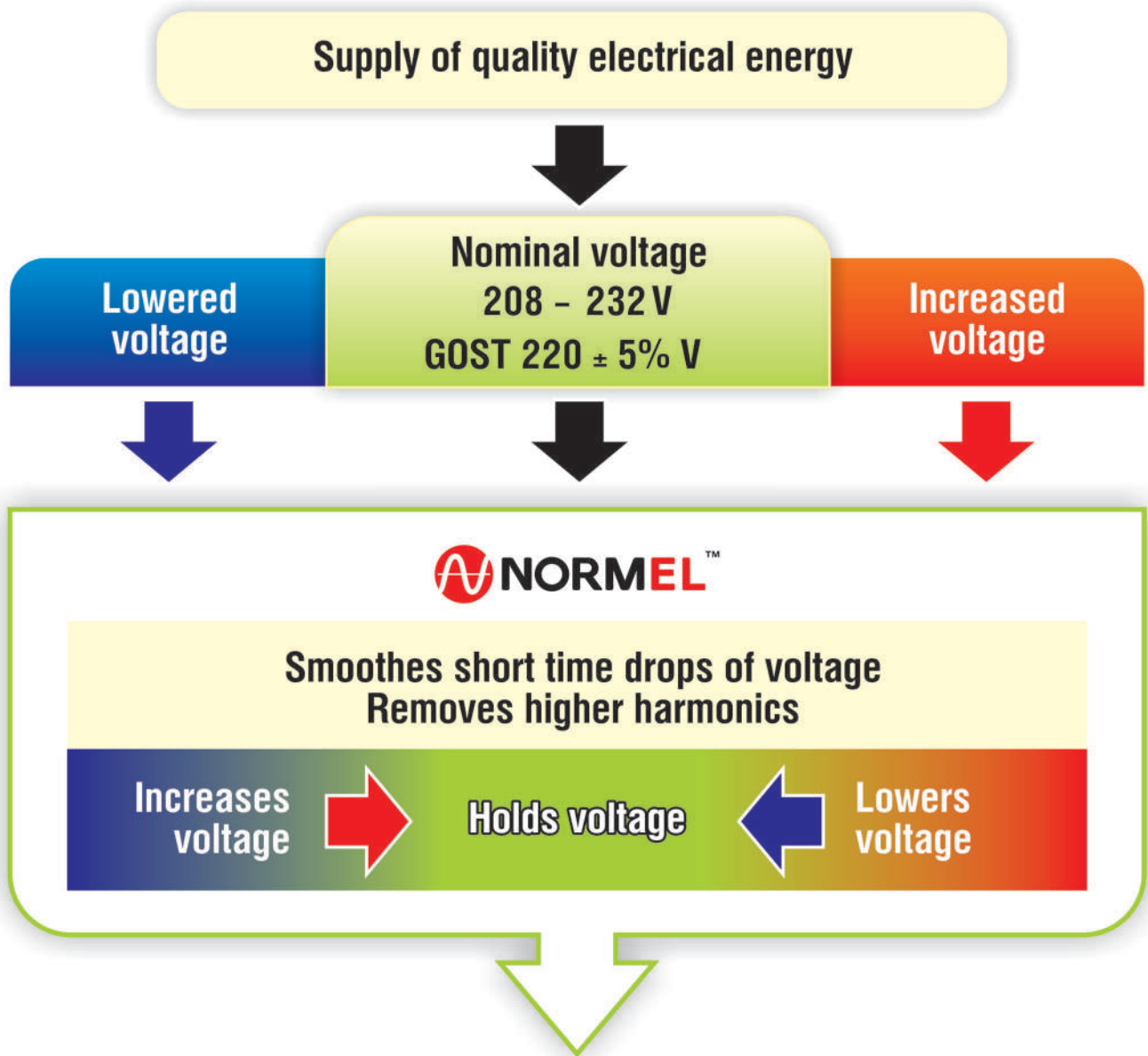
SPHERE OF USAGE



Comparison of characteristics of energy saving normalizers NORMEL and standard stabilizers with the capacity 55 kVA

Characteristics	Standard stabilizer	Energy saving normalizer NORMEL
Capacity	55 kVA	55 kVA
Reduction of expenses on electrical energy	do not reduce expenses, as they themselves are users of electrical energy	up to 25%
Joint economic effect	—	up to 60%
The quality of the received energy	sometimes they are sources of higher harmonics	according to interstate standards GOST 13109-97 "Removal of higher harmonics"
Efficiency coefficient	95,0%	99,7%
Dimensions		3-6 times less than standard stabilizers
Weight	250 kg	70 kg
Service	monthly examination and tuning of the equipment	only one prophylactic examination per year
Increase of service life of attached equipment	1,5 times more	2-4 times more
Price	average 250 000 rubles	110 000 rubles
The time of payback	is not paid back, as they themselves are users of electrical energy	6-18 months due to energy saving

General Principles and Results of the Usage of Energy Saving Normalizer NORMEL



Positive economic effect

- Economy due to the increase of service life of the equipment
- Economy due to the stability of the equipment
- Economy of electric energy



Application and Sphere of Usage of the Normalizer **NORMEL**

The energy saving normalizer of ac voltage **NORMEL** permits to change its output voltage by the programmed setting, that is $U = \pm 13V \pm 3V$, depending on the levels of input phase voltages. It allows to achieve a considerable economy of the used energy at the increased voltages of the power net. At that, the use of the device allows to increase the life service of electric equipment due to the sparing regime of electric supply of users.

The device NORMEL is widely used as an individual energy saving device of normalized power supply in all spheres of national economy. The use of the energy saving normalizer **NORMEL** is power distributed networks 0.4 kV allows:

- to get economy of the used electric power up to 25%
- to free additional capacity
- to increase resources of switched in equipment, both household and technological
- to remove drops of voltage and, as a consequence, to do away with faults in production (in particular when working with CNC machines)
- to remove “sagging” of voltage up to 40 ms
- to unload power line on current



The device NORMEL combines in itself the features of the device both for saving energy and the stabilizer of voltage.

The device NORMEL is designed for automatic regulation of the voltage value in power nets of 380/220 V, 50 Hz. The regulation is realized in set limits, when there is deviation from the parameters of GOST 54149-2010.

The device NORMEL is a passive filter, which prevents the penetration of impulse and high frequency disturbances into the load.

The device NORMEL is designed on the basis of the patents of the RF N 2237270 issued on 09.01.2003 and N 2377630 issued on 16.09.2008.

Examples and Results of Industrial Application of Energy Saving Normalizer NORMEL



Western Siberian railways, Novosibirsk, Branch of Joint Stock Company (NV) "Russian Railways"

"Russian Railways" is included into the three world leaders of railway companies; it is a junction of the national economic system and provides stable activities of industrial enterprises and, as well, it is the most available means of transport for millions of people.

The results of the use of the device at the station of Rubtsovsk: reduction of consumption of electric energy by **13.6%**, reduction of the current of load and, as a consequence, shift to the left of the distribution of the possibility of used energy power according to phases.



Hypermarket "Auchan Ryasansky" (Moscow)

is one of the representatives of the greatest retail networks of the French Corporation "Groupe Auchan SA", founded in 1961.

Results: reduction of electric power supply by **14%**, reduction of reactive power is **50%**; unload of power net on current is **18%**; reduction of the number of bulbs to be changed is up to **9%**.



Joint Stock Company "Industrial building installment enterprises SMNU-70" (Novosibirsk)

carries out building electric installment works on the sites of the state corporation for nuclear energy "Rosatom".

Result: complete absence of faults in the work of CNC machines.



State energy enterprise "Vologdaoblkommunenergo" (Vologda)

provides reliable quality power supply of citizens, housing service companies, social sphere and industrial customers of the city of Vologda and districts of Vologda Region.

Results: reduction of the consumption of power by **12.7%**.

Examples and Results of Industrial Application of Energy Saving Normalizer NORMEL



“Novosibirsk State Regional Scientific Library” (Novosibirsk)

was opened in 1926 and it occupies a significant place in Russian library communities. It plays an active role in public life of the Siberian Region.

Results: reduction of average monthly consumption of electric energy by **20%**, **3 times** reduction of bulbs to be changed.



Joint Stock Company “Olenevsky mining and processing plant” (Murmansk region, Olenegorsk)

develops deposits of ferruginous quartzite and is included into the division of Close Joint-Stock company “Sever stal resource” (“North Steel Deposits”), one of the largest producers of concentrated iron ore, close burning coal and gold in Russia.

Results of the use of the device on the power net of the pump “WEG-22”: reduction of electric power consumption by **11.6%**; effective removal of variations and drops of voltage when a pump dredge is switched on with the power of **3150 kVt**.



Group of companies “Retail Service” (Altai Region, Barnaul)

provides services on complex automatization of mining companies, as well as production and realization of labels, wrappings, printed materials, expendable materials on the territory of Altai Region and the Altai Republic, Kemerovo and Novosibirsk regions.

Result: reduction of power consumption by **21.2%**.



LLC “Luybnensky Vodokanal” (Luybnensky Water supply company) (Moscow Region, Lyubni) is a part of water supply and sewing systems of Luybni (Moscow region).

Results of the use of the device on depth pumps: reduction of electric energy consumption by **6%**, upload of power net on current is **3%**, protection of the pump from external negative influence of the net.



SBHI (State Budget Health-service Institution) Novosibirsk Regional Dermatovenerological Dispensary (Novosibirsk)

is one of the leading medical and preventive institutions of the Siberian Region.

Result: complete absence of power faults of the electronic equipment, reduction of expenses on electric energy by **18.5%** at mixed loads.



LLP “Kazzink” (The Republic of Kazakhstan, Ust-Kamenogorsk) is a large integrated producer of zink, with a big share of production of copper, precious metals and lead on the territory of the Republic of Kazakhstan, which was founded in 1977.

Results of the use of the device in ceiling lighting: average monthly saving of electric energy **12.7%**; complete absence of faults in the work of the equipment and protection from power surge in industrial power nets.



Group of companies “ROLF” is one of the largest automobile dealers and importers of cars in Russia. It was founded in 1991 and has become one of the founders of the Russian automobile market.

Results: reduction of electric power by **9.6%**; reduction of reactive power up to **60%**.



The group of companies “Commander” (Krasnoyarsk)

includes 7 food hypermarkets and 60 supermarkets of the type ‘a shop near your house’, a furniture salon with the area of 10,000 square meters, and more than 20 shops selling sliding door wardrobes, kitchen and other furniture, as well as furniture production workshop; commercial buildings.

Result: reduction of the consumption of electric power by **18.9%**; reduction of exchange of electric bulbs up to **85%**.



Trade-exposition center “Kaleidoscope” (Novosibirsk) offers

a widest choice of building and decorative materials, furniture and interior equipment in three trade-exposition halls and two trade-ware halls.

Result: reduction of the consumption of electric power by **14.8%**; reduction of exchange of electric bulbs up to **95%**; reduction of reactive power by **50%**.

Principle Peculiarities of the Energy Saving Normalizers NORMEL

- Efficiency coefficient of the device is 99.7%
- Load energy may vary from 0 up to 100% which does not influence the quality of normalized voltage
- Saving of energy up to 25%
- Provides the quality of energy according to the valid international standards of GOST P54149-2010 in the process of automatic regulation of the size of input voltage $\pm 5\%$
- Prevents the penetration of impulse high frequency disturbances into the network load
- The device does not contain any high power semi-conductor elements in its circuit, thus is not a source of higher harmonics (disturbances)
- The process of normalization goes on without breakage of power chain and distortion of sinusoidal wave of voltage and current
- Has easy adaptability to working electric networks
- The weight and the size of the device is 3-6 times less than those of all known stabilizing systems
- The cost of normalizing 1 kVA with the use of the device NORMEL is 1,600 -2,000 rubles. This indicator with standards stabilizers is 2 times larger
- Provides the increase of the life service of electric equipment
- The time of payback is from 4 up to 18 months depending on the size of workload of the normalizer



Examples and Results of Industrial Application of Energy Saving Normalizer NORMEL



Sport complex “Olympyiski” (Moscow), a unique multifunctional sport entertaining construction, which is considered one of the sights of the city, was built for the 22nd Olympic Games in Moscow in 1980.

Result: saving of electric power is **14%**.



Joint stock company “Yaroslavsky broiler” (Yaroslavl region, village of Oktyabrsky) is the only enterprise for production and processing of chicken broilers meat in Yaroslavl region. It was founded in 1977.

Result: reduction of expenses on electric energy by **13.7%** at mixed loads



State enterprise Palace of Culture “Rodina” (Berdsk), one of the largest cultural enterprises in Novosibirsk region, started its work in 1971.

Results: saving of electric energy was more than **10%**; complete absence of electric power faults; normalization of the work of electric equipment



Close joint stock company “Volchikhinsky brewing plant” (Village of Volchikha, Altaiskii region) was founded in 1932. It specializes on production and bottling of beer and soft drinks.

Results: complete absence of faults in the work of electronic equipment; reduction of expenses on electric energy **18.5%** at mixed loads



Production complex “The plant of trade equipment” (Novosibirsk), the enterprise engaged in the production and assemblage of trade and office furniture, entrance systems, fencing barriers on the basis of profile systems.

Result: reduction of expenses on electric energy is **19.5%** at mixed loads



Joint stock company “Orekhovo-Zuevsky Gorvodokanal” (Orekhovo-Zuevo, Moscow region), was included into the city water supply system in November of 1920 and since then has been providing stable work of water supply and sewage systems in the town.

Results: reduction of the consumption of electric energy by **5.2%**.

General Information about Energy Saving Normalizers **NORMEL**



Functionally the device NORMEL provides the following working regimes:

“Transit” – the voltage on the load is equal to the voltage of the network.

“Decrease of the network voltage” or voltage limiting – the voltage on the load is lower than the voltage of the network for a given value.

“Increase of the voltage” or “voltage addition” – the voltage on the load is higher than the voltage of the network for a given value.

- The device NORMEL provides the control of input voltage in the working range of 180–260 V and one-step regulation on each phase separately.
- When levels of voltage considerably deviate from the values of GOST requirements, it is possible to use a larger number of normalizers of the same power (two or more) with sequential switching on, which will lead to increasing the range of voltage regulation according to the number of installed devices NORMEL.

Technical Data

Voltage in power net	380/220 V
Frequency	50 Hz
Load current on the phase	from 30 to 400 A
Efficiency coefficient	not less than 99,7%
Type of load	any load
Ranges of input voltages of power networks	
- for one-step type:	170–260 V

Devices NORMEL are protected from overload currents and short circuits.

The type of the climatic implementation of the device corresponds to GOST 15150-69

The degree of the protection of the envelope corresponds to GOST 14254-86, the category from P-20 to P-66.

The elements of the principle circuit of the device NORMEL are a passive filter of currents of higher harmonics.

Principle circuits of the device NORMEL are protected by the patents of the RF N2237270 issued on 09.01.2203 and N237630 issued on 18.03.2006 by the Federal Service on Intellectual Property, Patents and Trade Marks.

Product Range of Energy Saving Normalizers NORMEL

of Complete Sets Produced by Joint Stock Company "AVEK" (Russia, Novosibirsk)

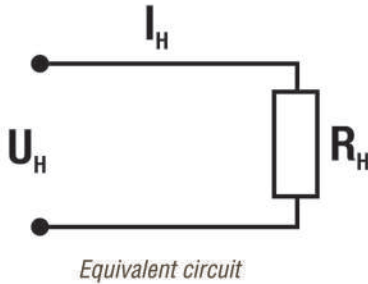
NORMEL	Three-phase one step with control on each phase				
type	Nominal current, A	Load power, kVA	Range of input voltage, V	Dimensions, mm	Weight, kg
ESSV-I 3.200-050-02	50	35	170 – 260	800x750x350	73
ESSV-I 3.200-080-02	80	55			90
ESSV-I 3.200-130-02	130	85			101
ESSV-I 3.200-160-02	160	110			116
ESSV-I 3.200-205-02	205	135			132
ESSV-I 3.200-250-02	250	165		140	
ESSV-I 3.200-330-02	330	220		950x900x450	193
ESSV-I 3.200-415-02	415	270			202

Explanation of complete sets

- B** basic set
- D** for the work electric engines with square-cage rotors at $I_{start}=I_{nominal} \times 10$ and the time of start up to 10 sec.
- I** normalizer completed with a system of external indication of input and output parameters
- K** normalizer completed with a controlled system of cooling electro-magnetic transformers
- L** normalizer completed with phase shunt ohmic chains for customers that are particularly
- M** normalizer completed with the system of protection from non-full-phase regime and loss of zero point (for normalizers with power 35-85 kVA)
- S** normalizer completed with additional reactive output filter (snabber) for liquidating impulse disturbances
- T** normalizer completed with a system of protection from overheating of electro-magnetic transformers

Any product position can be modified through various combinations of the listed sets according to the order of the customer and for additional payment. In this case the code of the set is completed with corresponding letter symbols. The example: ESSV-XX-XXX-XXX-XX.B.D.J.K.I.N.S.T. It is necessary to underline the symbols of the corresponding modifications.

Theoretical Grounds of Economic Effects



U_H — voltage of the load, V
 I_H — current of the load, A
 R_H — resistance of the load (**const**), Ohm

In case when $U_H \geq 222V$, the regime of voltage limiting is activated, at that $U_H = 222V - 12V = 210V$

As $R_H = \text{const}$, then according to the law of Ohm,
 $U = I \cdot R_{\text{const}}$
 $I \downarrow = U \downarrow / R_{\text{const}}$

The current in the chain also decreases. Power $P = U \cdot I$

The resistance has an ohmic character, thus:
 $P = U \cdot I$ or
 $P = U^2 / R$; $P = I^2 \cdot R$

Taking into account that current I and voltage U decrease, then
 $P = U^2 / R$ or
 $P = I^2 \cdot R$, thus
 $P = U \cdot I$

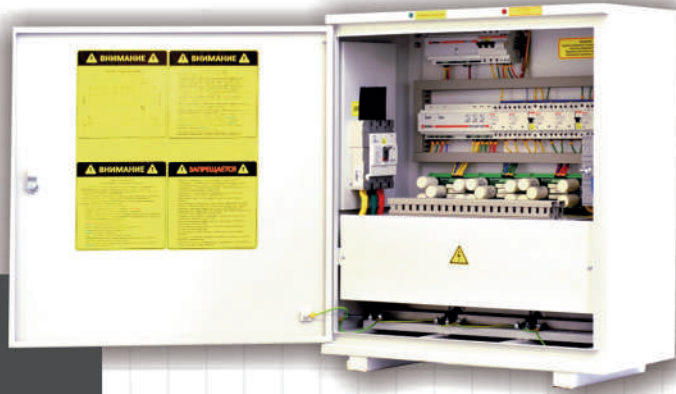
The Main Components of the Value of Economic Effect from the Usage of Energy saving Normalizers NORMEL

As a consequence of normalizing electric power through the use of energy saving normalizers NORMEL, the following results have been achieved:

- Economy of money due to the reduction of energy consumption
- Economy of money due to the increase of the working resource of the electric receivers
- Economy of money due to the faultless work of complicated equipment (machines with numerical program control), and as a consequence, the reduction of faults and inactive time
- Economy of money due to the unload of power lines on current which leads to the decrease of losses of electric power in lines
- Economy of money due to the unload of power lines on current which leads to the increase of inter-reconstruction periods of all the system of power supply
- Economy of money due to the reduction of maintenance expenses connected with the repairs of the equipment caused by low quality electric power



Structural Components of Energy Saving Normalizers NORMEL



Normalizers NORMEL are produced as a device of module construction in a single metal envelope with the dimensions of 800 x 750 x 350 (mm) or 950 x 900 x 450 (mm) made of steel 2 mm thick with high quality polymeric coat.



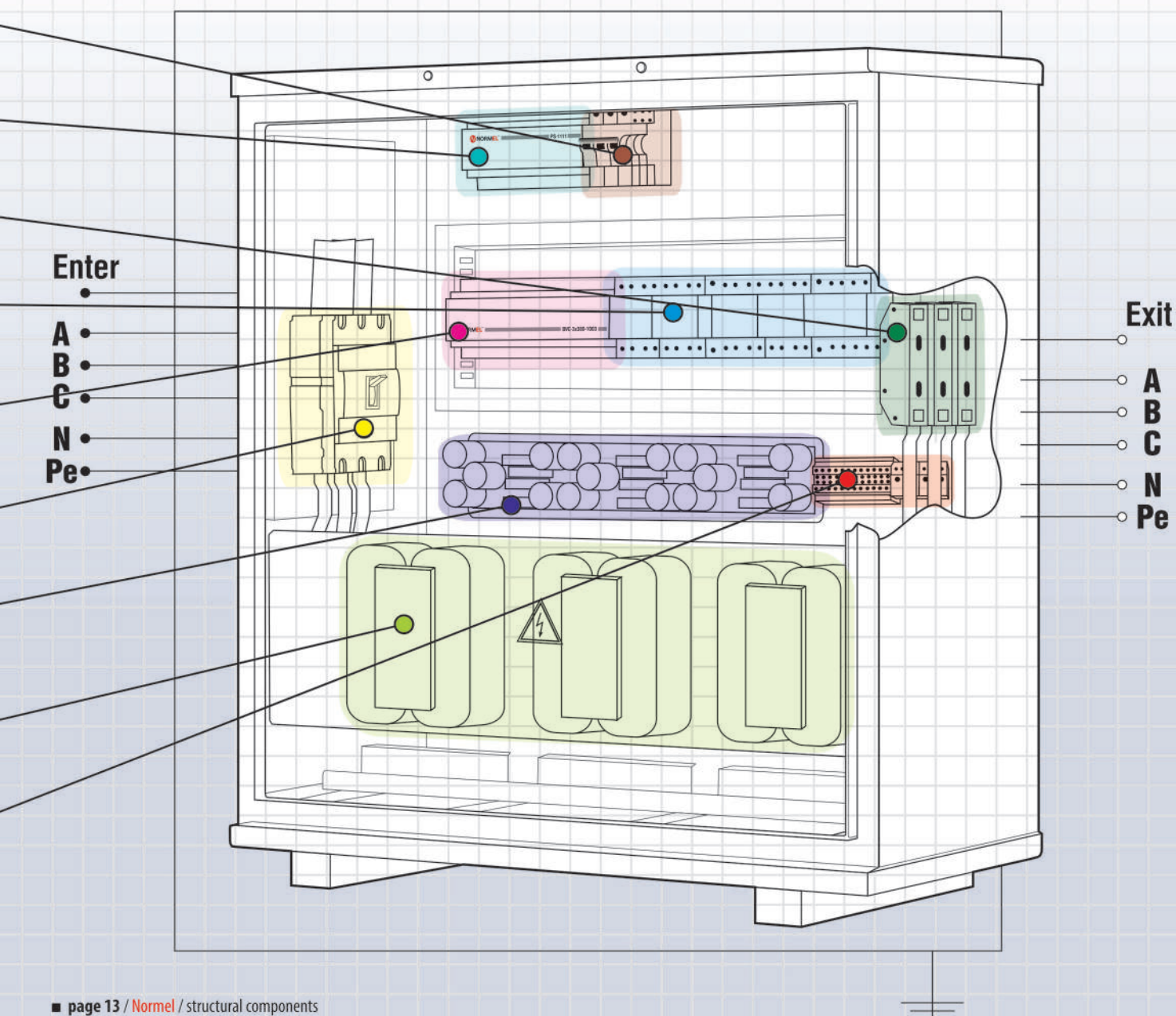
- BLOCK OF DIFFERENTIAL PROTECTION**
designed for the protection of control systems
- POWER UNIT**
designed for the protection of power systems
- POWER TERMINAL BLOCK "LOAD"**
designed for switching chains supplying power
- COMMUTATION BLOCK**
realizes commutations connected with the change of the working regime of the normalizer
- CONTROL BLOCK WITH A SYSTEM OF INDICATION**
designed for the output of control signals
- LEAD-IN AUTOMATIC SWITCH**
is a protection commutation device of the normalizer
- BLOCK OF PHASE SNABBERS**
is a phase electric filter
- POWER ELECTRO-MAGNETIC TRANSFORMERS**
are designed for realizing functions of electro-magnetic phase impact
- COMMUTATION BLOCK**

The Application of the Industrial Series ESSV

- For automatic regulation of the values of voltage in electric nets of 380/220 V, 50 Hz
- For saving electric power up to 25%
- For improving the quality of electric power according to the requirements of GOST P541140-2010

The device **NORMEL** allows to change its output voltage for the size of a programmed setting, that is $U = \pm 13V \pm 3V$ depending on the level of input phase voltages which is a condition of effective work of all electric receivers without undue reduction of its productivity.

The regulation of voltage is realized in programmed limits when the voltage is deviated from the parameters of GOST P541140-2010.



The principle difference from the known auto transformational regulation of the stream of electric power is in the method of integration of phase retardation coils, and, as a result, the principle of regulation of output parameters of the net.

This method gives a number of advantages of technical, exploitation, dimensional, price and reliability character, namely:

Principle Peculiarities of the Technology of NORMEL

The main difference used in the circuit of NORMEL is the regulation of parameters of the net not through commutations of phase power contours, but through finding in them some electromotive forces, differently directed, from the side of thin winding of phase retardation coils, by changing their polarity of switching related to its thick (power) winding.

- The regulation goes on without breaking power net, which removes problems connected with commutations and transient phenomena caused by them
- Due to the fact that 95% of normalizer's power is transferred by electric and only 5% by electro-magnetic way, retardation coils used in the device have the power corresponding to 5% from the nominal power of the normalizer, which influences the size, weight and the price of the device in general
- The absence of power commutation elements in the circuit creates conditions for long (not less than 15 years) faultless work

In the Process of Work of Normalizer There are Used Three Main Phase-Independent Modes

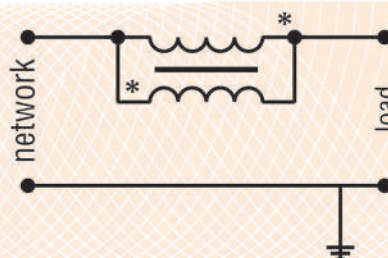
“TRANSIT” mode

at $209 \text{ V} \pm 1 \text{ V} \leq U_{\text{phase input}} \leq 222 \text{ V} \pm 1 \text{ V}$, at that

$$U_{\text{phase input}} = U_{\text{phase output}}, \text{ where}$$

$U_{\text{phase input}}$ – phase voltage at the input of the normalizer

$U_{\text{phase output}}$ – phase voltage at the output of the normalizer

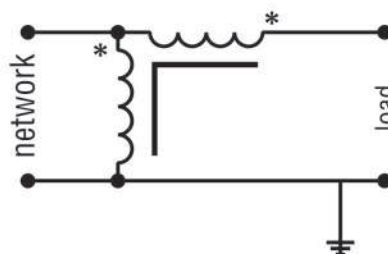


“VOLTAGE ADDITION” mode

at $U_{\text{phase input}} \leq 209 \text{ V} \pm 1 \text{ V}$;

$$U_{\text{phase output}} = U_{\text{phase input}} + U = (209 \text{ V} \pm 1 \text{ V}) + (12 \text{ V} \pm 1 \text{ V});$$

$$U_{\text{phase output}} = 220 \text{ V} \div 221 \text{ V}, \text{ где } U = 12 \text{ V} \pm 1 \text{ V}.$$

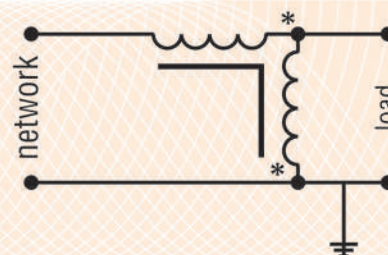


“VOLTAGE LIMITING” mode

at $U_{\text{phase input}} \geq 222 \text{ V} \pm 1 \text{ V}$;

$$U_{\text{phase output}} = U_{\text{phase input}} - U = (222 \text{ V} \pm 1 \text{ V}) - (12 \text{ V} \pm 1 \text{ V});$$

$$U_{\text{phase output}} = 209 \text{ V} \div 211 \text{ V}.$$



РОССИЙСКАЯ ФЕДЕРАЦИЯ



ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2618115

НОРМАЛИЗАТОР ПЕРЕМЕННОГО НАПРЯЖЕНИЯ

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Заявка № 2015149625

Приоритет изобретения 18 ноября 2015 г.

Дата государственной регистрации в

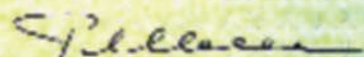
Государственном реестре изобретений

Российской Федерации 05 мая 2017 г.

Срок действия исключительного права

на изобретение истекает 18 ноября 2035 г.

Руководитель Федеральной службы
по интеллектуальной собственности

 *I. Н. Полуев*





ЕВРАЗИЙСКИЙ ПАТЕНТ

№ 018813

Название изобретения:

**«СТАБИЛИЗАТОР ПЕРЕМЕННОГО НАПРЯЖЕНИЯ
(ВАРИАНТЫ)»**

Патентовладелец (льцы):

КЛАВСУЦ ДМИТРИЙ АЛЕКСАНДРОВИЧ (RU)

Изобретатель (и):

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Заявка №:	201001720
Приоритет изобретения:	16 сентября 2008 г.
Дата подачи заявки:	31 августа 2009 г.
Дата выдачи патента:	30 октября 2013 г.

Настоящим удостоверяется, что евразийский патент выдан на изобретение, изложенное в прилагаемом описании и формуле изобретения.

При уплате установленных годовых пошлин патент действует на территории государств-участников Евразийской патентной конвенции – Азербайджанской Республики, Кыргызской Республики, Республики Армения, Республики Беларусь, Республики Казахстан, Республики Таджикистан, Российской Федерации, Туркменистана, и на территории Республики Молдова на основании Соглашения между Евразийской патентной организацией и Правительством Республики Молдова.

ГРИГОРЬЕВ Александр Николаевич
Президент Евразийского патентного ведомства



URKUNDE

Es wird hiermit bescheinigt, dass für die in der Patentschrift beschriebene Erfindung ein europäisches Patent für die in der Patentschrift bezeichneten Vertragsstaaten erteilt worden ist.

Europäisches Patent Nr.

Patentinhaber

CERTIFICATE

It is hereby certified that a European patent has been granted in respect of the invention described in the patent specification for the Contracting States designated in the specification.

European patent no.

2343620

Proprietor of the patent

CERTIFICAT

Il est certifié qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les Etats contractants désignés dans le fascicule de brevet.

Brevet européen n°

Titulaire du brevet

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Benoît Battistelli

Präsident des Europäischen Patentamts
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