PRODUCT CATALOG

Power Factor Correction
Power Quality

COMAR Condensatori

Save Your **Energy.**

CLOUD CONTROL SYSTEM

IoT device, with online platform and data storage in the Cloud, for real-time monitoring of automatic power factor correction equipment

- ✓ Real-time monitoring of the power factor correction banks
- ✓ Alarms for malfunction and maintenance requirements
- ✓ Continuous control of the power of the banks with automatic exclusion of abnormal ones
- ✓ Recording of electrical variables in the cloud
- ✓ Immediate dashboard of energy saving and environmental protection
- ✓ VPN-GSM technology. No need to connect to customer's network

Overview

Products

Power factor correction components

Technical terms

Bank of an automatic power factor correction unit → The correction unit, controlled by a switching device (contactor or static module).

Rated capacitance of the capacitor C_n → The designed capacitive value of the capacitor, expressed in μF.

Capacitor temperature class→ The range of working temperatures within which a capacitor can operate safely and efficiently. According to the IEC 60831 standard, there are four categories represented by a number and a letter (A, B, C, D).

Conditional short-circuit current I_{cc} → The value of the short-circuit current that the panel can withstand for the total operating time (opening time) of the short-circuit protection device, under specified conditions, without suffering irreparable damage.

Short-circuit current I_{cw} → The effective value of the current related to the short-circuit test for 1 second without opening the protections, which the panel can withstand without suffering irreparable damage .

Rated current I_n → The effective value of the alternating current flowing when the rated voltage , frequency, power or capacitance.

Cosφ → A dimensionless quantity between 0 and 1, where φ indicates the phase shift between voltage and current at the fundamental frequency of the system (50 Hz or 60 Hz).

Power Factor → The ratio between Active Power (P) and Apparent Power (S). The Power Factor is also a dimensionless quantity between 0 and 1. Cosφ and PF coincide only in sinusoidal systems free of harmonic currents; in the presence of harmonics, PF is always lower than cosφ.

Total Demande Distortion TDD → A percentage value of harmonic distortion at full load.

Total Harmonic Distortion of current THD(I)→ It is a percentage value that quantifies the total harmonic distortion in current present in an electrical system. It indicates the degree of alteration of the current waveform compared to the ideal sinusoidal waveform. THD(I) is important for monitoring power quality in an installation and identifying suitable equipment.

Maximum Harmonic Distortion of panel current THD(I)max→ Refers to the maximum percentage THD(I) value that the panel can withstand.

Total Harmonic Distortion of voltage THD(U)→ A percentage value that quantifies the total voltage harmonic distortion of a system. It indicates the degree of alteration of the voltage waveform compared to the ideal sinusoidal waveform. THD(V) is important for monitoring power quality in an installation.

Maximum Harmonic Distortion in voltage THD(U)max→ Refers to the maximum percentage THD(U) value that the panel, equipped with detuning reactors, can withstand.

Maximum Harmonic Distortion of capacitor current THD(I_c)max → Refers to the maximum permissible percentage THD(I) value to meet technical design requirements. It is a characteristic value of each capacitor and indicative of its performance: the higher the value, the more robust the capacitor.

Rated grid frequency f_n→ The frequency at which electrical energy is distributed.

Tuning frequency → It's the frequency of the series circuit of inductance and capacitance (L/C). In a power factor corrector with tuning reactors. Due to the Ferranti effect, the supply voltage on the capacitors is higher than the mains voltage: for this reason, capacitors with a suitably increased rated voltage must be used. The tuning frequency can also be expressed indirectly with the detuning factor (p%).

Ingress Protection (IP) → A classification used to describe the level of protection an enclosure (cabinet) provides against the ingress of solids and liquids, as defined by IEC 60529.

Steps→ The maximum number of combinations characteristic of a given automatic power factor correction unit, depending on the capacitor banks (number and power). For example, a 175 kvar compensator with 25+50+100 kvar banks allows for 7 steps. The greater the number of steps, the better the precision and flexibility of the compensation.

Insulation level → For a capacitor compliant with IEC/EN 60831, it indicates the impulse voltage it can withstand.

Dielectric losses → Specifically refers to the energy dissipation in the capacitor's dielectric material when subjected to an alternating electric field.

Total capacitor losses → Refers to the sum of all forms of energy dissipation, including dielectric losses as well as other losses due to the capacitor's internal resistance.

Apparent Power S → The total power flowing in a circuit, considering both active and reactive power. It is measured in Volt-Amperes (VA).

Transformer Apparent Power S_n → The rated power of the transformer, measured in Volt-Amperes (VA).

Active Power P → The component of electrical power that actually performs useful work. It is measured in Watts (W) and represents the portion of total power converted into usable energy.

Load Distortion Power G_h → The sum of the power of all distorting loads present in the network, measured in Watts (W).

Reactive Power Q → The component of electrical power that does not directly contribute to useful work but is necessary for maintaining the magnetic field in electrical devices. It is measured in Volt-Amperes Reactive (VAR) and is related to the phase difference between current and voltage in an AC circuit.

Rated Reactive Power of the PFC Panel Q_n → The rated reactive power of the power factor correction panel, measured in Volt-Amperes Reactive (VAR).

Discharge resistor → A resistor through which the stored charge in the capacitor is dissipated when the capacitor is no longer powered (<75V in 3 minutes, as per IEC 60831).

Resonance → In a low-voltage (LV) electrical installation, it is the phenomenon of harmonic current amplification caused by non-linear loads, resulting from the L-C circuit formed by the MV/LV transformer supplying the installation and the power factor correction unit. To avoid this risk, the PFC must be equipped with detuning reactors (or blocking inductors or chokes). The risk calculation is standardized by IEC 60831, Appendix A.

Panel operating temperature→ The temperature range within which the panel operates safely and efficiently.

Insulation voltage U_i → For a power factor correction system in compliance with IEC/EN 61439-1/2, the insulation voltage indicates the maximum grid voltage the entire system can withstand without damages to its components.

Maximum operating voltage U_{max} → The maximum voltage the capacitor can withstand for the periods specified by the IEC/EN 60831-1/2 standard (1.1 ×Un).

Rated voltage U_n → The nameplate voltage of the equipment, based on which its rated power is calculated.

Working voltage U_e → The nameplate voltage of the equipment at which it can be operated.

COMAR Condensatori S.p.A.

Since 1968 we have been supplying standard products, as well as customised solutions, according to customer requirements. We are a leading manufacturer of single-phase capacitors, power factor correction boards, and harmonic reduction filters.

Installers, engineering companies and end users can find answers to their needs for both **energy efficiency** with power factor correction and **energy quality** with solution that reduce harmonics and disturbances content in electrical networks.

Strong of the value that Made in Italy represents, we sell in more than 90 countries worldwide, thanks to a sales network that guarantees the availability of COMAR solutions.

Vision

We firmly believe that the increased demand for electricity in developed and emerging countries must be solved first and foremost by reducing waste.
Power Factor Correction plays an important role in the 'smart' use of the energy currently produced; in fact it postpones and limits the construction of new power plants and contributes to the environment protection by reducing emissions and the consumption of non-renewable fuels.

Mission

Providing professionally manufactured solutions that, in addition to meeting quality and safety standards, are also appreciated by customers in terms of supply flexibility, adherence to delivery times, ease of installation and maintenance,

Quality & Certifications

The excellence of COMAR products is based on an Italian production chain, entirely under control within our factory . The path to quality assurance of design, procurement, production, testing and delivery is guaranteed by ISO 9001 certification obtained in 1998 .

The company's quality system, which is constantly updated to meet regulatory requirements and production needs, maintains COMAR processes at a level of excellence confirmed by approvals to the main industrial standard: IMQ, VDE, UL, CESI, DEKRA

Materials & Environment

Achieving **ISO14001** approval back in 2003 places Comar among the first manufacturing companies to commit to environmental protection with a focus on materials. Thanks to our constant work with suppliers, we guarantee the compliance of our products with the RoHS and REACH directives.

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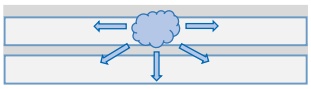
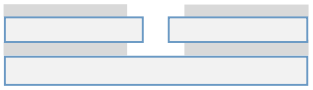
Capacitor Characteristics

Our power factor correction capacitors are **single-phase** capacitors made from high thickness bi-oriented, metallised polypropylene (MKP) film with low shrinkage and high mechanical properties. The most outstanding feature of this type of film is the **self-regeneration of the dielectric**, which enables the restoration of electrical characteristics in the event of imperfections/ deterioration of the plastic substrate.

Dielectric micro short circuit



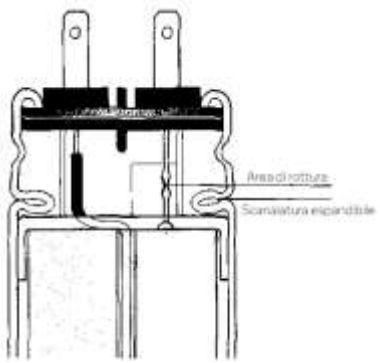
Film casting and surface metallisation



Insulation of the damaged point

In the higher-performance series, capacitors consisting of several capacitive elements in series are used to increase the resistance to working **currents**.
Insulation and heat exchange with the outside is ensured by the use of PCB-free vegetable dielectric oil or on request by epoxy resin (Dry Type)

All capacitors are equipped with an **overpressure safety device** that disconnects the capacitor in the event of an internal short circuit. This system is mechanical, based on the expansion of the metal housing and the consequent breaking of the internal connection wires.



Each condenser undergoes three quality checks during the production stages: after the film winding, during ageing process and finally after final assembly.
The check includes measurement of capacitance, dissipation factor [tan(δ)], verification of insulation to earth and overvoltage resistance

Although most industrial networks are 400V, capacitors are distinguished by their **rated** design **voltage (Un)**, which can vary from 415 to 550V.

The higher the rated voltage, the more the capacitor will withstand grid **overvoltage** situations. Our in-house laboratory is engaged in design and testing to ensure regulatory standards, particularly with regard to overvoltage and high **temperatures** withstand , which are the most critical factors on capacitor's life.

	Ambient temperature limits		
Class	**Maximum**	**Daily Average**	**Yearly Average**
A	40°C	30°C	20°C
B	45°C	35°C	25°C
C	50°C	40°C	30°C
D	55°C	45°C	35°C

Overvoltage factor versus Un	Daily Maximum duration
1	Continued
1,1	8 hours
1,15	30 min
1,2	5 min
1,3	1 min

Why should we correct Power Factor ?

Most loads in today's electrical systems are inductive, requiring two types of power:
- **the Active Power (P)** that does the work of the machine (e.g. mechanical, hydraulic, ...) and is measured in kW
- **the Reactive Power (Q)** that constantly flows to the load and then back to the source and is measured in kvar (kilovolt reactive amperes).

Active Power and Reactive Power make up **Apparent Power**, which is measured in kVA.
The **Power Factor** is simply the ratio between Active Power and Apparent Power

Electric capacitors are currently the cheapest source of reactive power, as when made available to loads locally, it avoids the withdrawal from the energy supplier and the resulting additional currents on the grid. Power factor correction, thus reducing apparent powers, leads to a **rational use of electrical energy** with the following benefits,

Reducing electricity utility costs
The difference between active and apparent power forces the power supply company to overload the distribution system: the penalties are therefore intended to incentivise the customer to improve the low power factor.

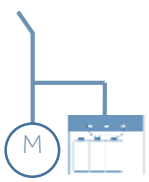
Increase in available power
By reducing the kvar demand on the load side , the maximum power that can be delivered by generators and transformers is made available to the net.

Improving voltage stability
Supplying the demand of reactive power to high loads decreases voltage drops between transformers, cables and the other equipment avoiding undervoltage supply

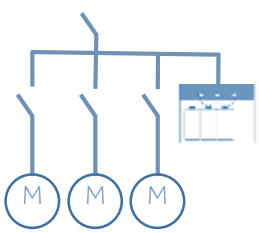
Reduction of losses due to Joule effect
The circuit current is reduced in direct proportion to the increase in power factor, the I^2R loss or resistive loss in the circuit is inversely proportional to the square of the power factor.

Power factor correction strategies

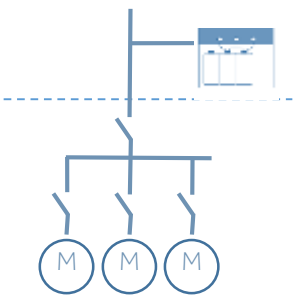
Distributed
Power factor correction equipment is installed close to the individual load and dimensioned for the required reactive power. Considering that the effect of capacitors is felt upstream of the installation point, this is the ideal solution for compensating high inductive currents.



Group of parallel loads
Automatic power factor correction systems guarantee the rephasing of several consumers, following their reactive energy demand. For companies with high loads, the choice of local power factor correction for the large loads and centrally for the remaining power is usually the most advantageous technical and economic solution.



Centralised
Installing a single automatic switchboard, typically at the point of energy delivery, is the easiest solution to implement. It is ideal for small and medium-sized companies, and the savings for the user are essentially directed towards the elimination of penalties on bills.



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Sizing of Power Factor Correction equipment

The reactive power required to correct power factor of a load is determined by the following formula:

$$kvar = kWLoad \cdot (tan\varphi 1 - tan\varphi 2) = kWLoad \cdot M$$

Where: $\mathbf{tan\varphi 1} = kvarh / kWh$

M value is determined by following table

	tanφ2	0,62	0,59	0,57	0,54	0,51	0,48	0,46	0,43	0,4	0,36	0,33	0,29	0,25	0,2	0,14	0
	cosφ2	0,85	0,86	0,87	0,88	0,89	0,9	0,91	0,92	0,93	0,94	0,95	0,96	0,97	0,98	0,99	1
tanφ1	cosφ1																
4,90	0,2	4,28	4,31	4,33	4,36	4,39	4,41	4,44	4,47	4,5	4,54	4,57	4,61	4,65	4,7	4,76	4,9
3,87	0,25	3,25	3,28	3,31	3,33	3,36	3,39	3,42	3,45	3,48	3,51	3,54	3,58	3,62	3,67	3,73	3,87
3,18	0,3	2,56	2,59	2,61	2,64	2,67	2,7	2,72	2,75	2,78	2,82	2,85	2,89	2,93	2,98	3,04	3,18
2,68	0,35	2,06	2,08	2,11	2,14	2,16	2,19	2,22	2,25	2,28	2,31	2,35	2,38	2,43	2,47	2,53	2,68
2,29	0,4	1,67	1,7	1,72	1,75	1,78	1,81	1,84	1,87	1,9	1,93	1,96	2	2,04	2,09	2,15	2,29
1,98	0,45	1,36	1,39	1,42	1,44	1,47	1,5	1,53	1,56	1,59	1,62	1,66	1,69	1,73	1,78	1,84	1,98
1,73	0,5	1,11	1,14	1,17	1,19	1,22	1,25	1,28	1,31	1,34	1,37	1,4	1,44	1,48	1,53	1,59	1,73
1,52	0,55	0,9	0,93	0,95	0,98	1,01	1,03	1,06	1,09	1,12	1,16	1,19	1,23	1,27	1,32	1,38	1,52
1,33	0,6	0,71	0,74	0,77	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1	1,04	1,08	1,13	1,19	1,33
1,23	0,63	0,613	0,639	0,666	0,693	0,72	0,748	0,777	0,807	0,837	0,87	0,904	0,941	0,982	1,03	1,09	1,233
1,17	0,65	0,55	0,58	0,6	0,63	0,66	0,68	0,71	0,74	0,77	0,81	0,84	0,88	0,92	0,97	1,03	1,17
1,14	0,66	0,519	0,545	0,572	0,599	0,626	0,654	0,683	0,712	0,743	0,775	0,81	0,847	0,888	0,935	0,996	1,138
1,11	0,67	0,488	0,515	0,541	0,568	0,596	0,624	0,652	0,682	0,713	0,745	0,779	0,816	0,857	0,905	0,966	1,108
1,08	0,68	0,459	0,485	0,512	0,539	0,566	0,594	0,623	0,652	0,683	0,715	0,75	0,787	0,828	0,875	0,936	1,078
1,05	0,69	0,429	0,456	0,482	0,509	0,537	0,565	0,593	0,623	0,654	0,686	0,72	0,757	0,798	0,846	0,907	1,049
1,02	0,7	0,4	0,43	0,45	0,48	0,51	0,54	0,56	0,59	0,62	0,66	0,69	0,73	0,77	0,82	0,88	1,02
0,99	0,71	0,37	0,4	0,43	0,45	0,48	0,51	0,54	0,57	0,6	0,63	0,66	0,7	0,74	0,79	0,85	0,99
0,96	0,72	0,34	0,37	0,4	0,42	0,45	0,48	0,51	0,54	0,57	0,6	0,64	0,67	0,71	0,76	0,82	0,96
0,94	0,73	0,32	0,34	0,37	0,4	0,42	0,45	0,48	0,51	0,54	0,57	0,61	0,64	0,69	0,73	0,79	0,94
0,91	0,74	0,29	0,32	0,34	0,37	0,4	0,42	0,45	0,48	0,51	0,55	0,58	0,62	0,66	0,71	0,77	0,91
0,88	0,75	0,26	0,29	0,32	0,34	0,37	0,4	0,43	0,46	0,49	0,52	0,55	0,59	0,63	0,68	0,74	0,88
0,86	0,76	0,24	0,26	0,29	0,32	0,34	0,37	0,4	0,43	0,46	0,49	0,53	0,56	0,6	0,65	0,71	0,86
0,83	0,77	0,21	0,24	0,26	0,29	0,32	0,34	0,37	0,4	0,43	0,47	0,5	0,54	0,58	0,63	0,69	0,83
0,8	0,78	0,18	0,21	0,24	0,26	0,29	0,32	0,35	0,38	0,41	0,44	0,47	0,51	0,55	0,6	0,66	0,8
0,78	0,79	0,16	0,18	0,21	0,24	0,26	0,29	0,32	0,35	0,38	0,41	0,45	0,48	0,53	0,57	0,63	0,78
0,75	0,8	0,13	0,16	0,18	0,21	0,24	0,27	0,29	0,32	0,35	0,39	0,42	0,46	0,5	0,55	0,61	0,75
0,72	0,81	0,1	0,13	0,16	0,18	0,21	0,24	0,27	0,3	0,33	0,36	0,4	0,43	0,47	0,52	0,58	0,72
0,70	0,82	0,08	0,1	0,13	0,16	0,19	0,21	0,24	0,27	0,3	0,34	0,37	0,41	0,45	0,49	0,56	0,7
0,67	0,83	0,05	0,08	0,11	0,13	0,16	0,19	0,22	0,25	0,28	0,31	0,34	0,38	0,42	0,47	0,53	0,67
0,65	0,84	0,03	0,05	0,08	0,11	0,13	0,16	0,19	0,22	0,25	0,28	0,32	0,35	0,4	0,44	0,5	0,65
0,62	0,85		0,03	0,05	0,08	0,11	0,14	0,16	0,19	0,22	0,26	0,29	0,33	0,37	0,42	0,48	0,62
0,59	0,86			0,03	0,05	0,08	0,11	0,14	0,17	0,2	0,23	0,26	0,3	0,34	0,39	0,45	0,59
0,57	0,87				0,03	0,05	0,08	0,11	0,14	0,17	0,2	0,24	0,28	0,32	0,36	0,42	0,57
0,54	0,88					0,03	0,06	0,08	0,11	0,14	0,18	0,21	0,25	0,29	0,34	0,4	0,54
0,51	0,89						0,03	0,06	0,09	0,12	0,15	0,18	0,22	0,26	0,31	0,37	0,51
0,48	0,9							0,03	0,06	0,09	0,12	0,16	0,19	0,23	0,28	0,34	0,48
0,46	0,91								0,03	0,06	0,09	0,13	0,16	0,2	0,25	0,31	0,46
0,43	0,92									0,03	0,06	0,1	0,13	0,18	0,22	0,28	0,43
0,40	0,93										0,03	0,07	0,1	0,14	0,19	0,25	0,4
0,36	0,94											0,03	0,07	0,11	0,16	0,22	0,36

Example:

$Cos\varphi_1$ = 0.71 original power factor (before correction)

$Cos\varphi_2$ = 0.97 target power factor (after correction)

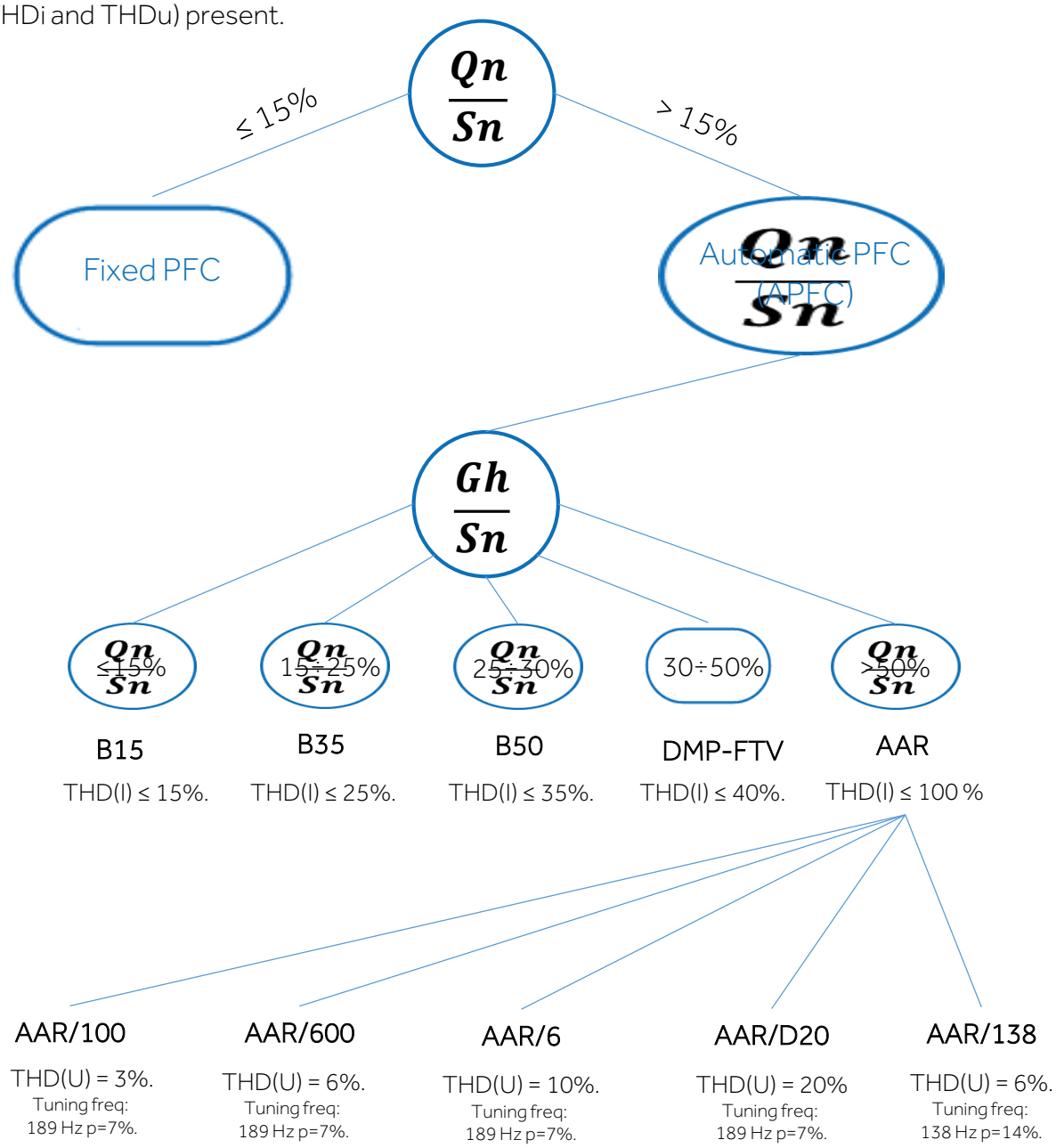
M = 0,74

Thus, given a load of 1000kW, it will be necessary to use a power factor of 1000*0,74=740 kvar.

A handy sizing tool is available on our website https://www.comarcond.com/en/calculator/

Selecting the series

We offer a wide range of power factor correction systems, depending on the harmonic content in the grid. We always recommend, if possible, to carry out the necessary measurements on the power grid in order to determine the harmonic distortion rate (THDi and THDu) present.



Sn = Transformer apparent power (kVA)
Qn = Power of the PFC cabinet (kvar)
Gh = Power of distorting loads (kW)
THD(I) = Maximum permissible current harmonic distortion rate
THD(U) = Maximum permissible voltage harmonic distortion rate

All COMAR series can be realised with **static thyristor insertion** and/or converted to **hybrid compensation** equipment,
This catalogue contains, by way of example, the B35-ST and AAR/100-ST series for the static insertion and the AAR/100-HSVG for the hybrid series

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Transformers for electrical power distribution can be of two different types: oil-insulated transformers, whose cooling does not require any special aids, and resin-insulated transformers, which are forced or naturally cooled.

It is always advisable to provide for a **fixed power factor correction of MV/LV transformers**, as even if they are running with low loads (e.g. overnight), they absorb **reactive power** that must be corrected.

The calculation of the approximate **capacitive power** requiredcan be carried out using the formula:

$$Q = I_0\% * \frac{Sn}{100}$$

I_0 = off-load current (supplied by transformer manufacturer)
Sn = rated transformer power

Alternatively, if the required data are not available, the table below can be used, differentiated by transformer type with **normal loss** characteristics.
It is recommended not to exceed the suggested values in order to avoid the injection of capacitive energy into the grid, which is penalised in certain countries

REACTIVE POWER* required for off-load
MV/LV TRANSFORMERS (kvar)

Transformer power (kVA)	Transformers in OIL	RESIN transformers
100	5	2,5
160	7,5	5
200	7,5	5
250	7,5	7,5
315	10	7,5
400	10	7,5
500	12,5	7,5
630	15	10
800	17,5	10
1000	22,5	12,5
1250	25	15
1600	30	20
2000	35	22,5
2500	45	30
3150	55	45

Fixed Three-phase Asynchronous Motors Correction

One of the most common loads is the **three-phase asynchronous motor**, which can be corrected locally with the advantage of having a lower current flowing through the power cable.

The power of the capacitors must not exceed the off-load reactive power of the motor, due to the risk of self-excitation and resonance phenomena between the capacitor and the motor inductance. The following table shows the reactive power in the case of a cage motor. For motors with a wound rotor, a 5% increase is recommended.

Motor power rating		2 poles 3000 rpm		4 poles 1500 rpm		6 poles 1000 rpm		8 poles 750 rpm	
HP	kW	Off-load	On-load	Off-load	On-load	Off-load	On-load	Off-load	On-load
1	0,74	0,5	0,6	0,5	0,7	0,6	0,8	0,75	1
2	1,5	0,8	1	1	1,2	1,1	1,4	1	1,5
3	2,2	1,1	1,4	1,2	1,5	1,4	1,8	1,5	2
5,5	4,1	1,7	2,2	1,9	2,5	2,1	2,8	2,5	3,5
7,5	5,5	2,3	3	2,5	3,4	2,8	3,7	3	4,5
10	7,4	3	4,4	3,6	4,6	4,1	5,4	4,5	6
15	11	4	6,5	5,5	7,2	6	8	7	9
30	22	10	12,5	11	13,5	12	15	12,5	16
50	37	17,5	24	20	27	22	30	17,5	27,5
100	74	28	45	32	49	37	54	35	55
150	110	40	64	46	70	52	76	55	80
200	150	50	81	58	89	65	95	70	105
250	180	60	98	72	105	82	115	90	130
350	257	70	113	80	130	90	146	125	185

COMAR Solutions for Fixed Correction

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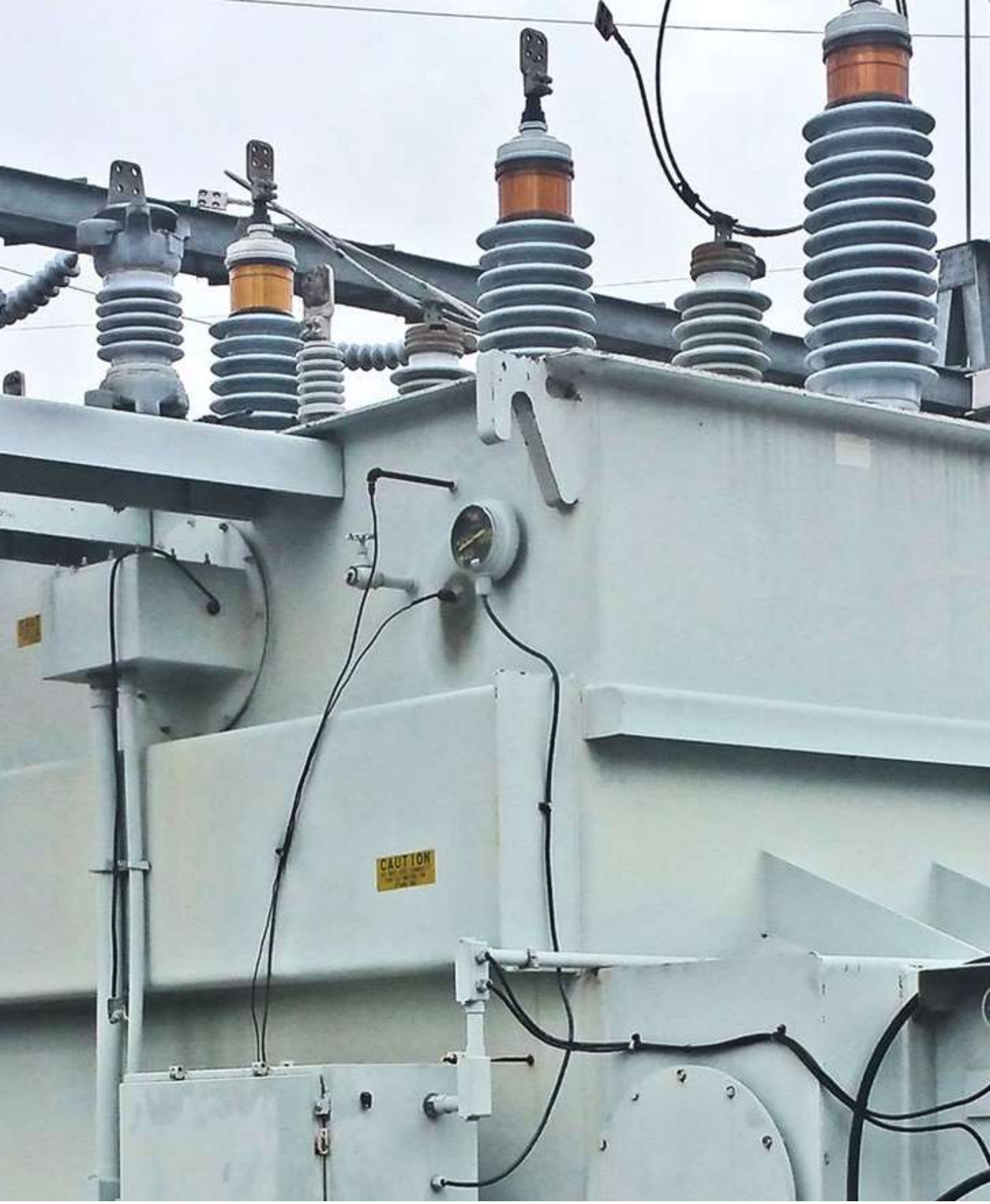


GS – CS • RFIX

Fixed PFC equipment

COMAR Condensatori

GS - CS

Fixed Power Factor Correction

The **GS** and **CS** series devices are specially designed for fixed power factor correction in applications such as off-load correction of transformers, fixed power factor correction of constant loads. For systems with a high presence of harmonics, the CS series with tuning reactor is available.

PERFORMANCE DATA

Rated voltage	415 Vac GS series 400 Vac CS series
Max. voltage on capacitors (without harmonic distortion)	450 Vac GS-B15 series; 550 Vac GS-B50 series; 550 Vac CS series
Rated frequency	50 Hz (60 Hz on request)
Insulation voltage	690 Vac
Tolerance on capacitance	-5% / +10%

QUALITY

Regulations	IEC/EN 60831-1 / 2, IEC/EN 61921

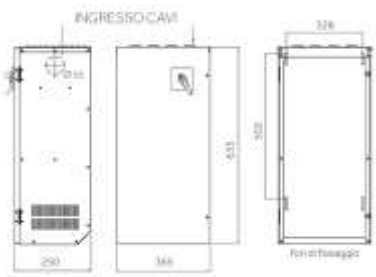
TECHNICAL DATA

Power supply	Three-phase + earth.
Degree of protection	IP 30.
Installation	Vertical. GS Series: wall-mounted. CS Series: floor-standing. Indoor installation, in a position that favours ventilation and free from sunlight.
Ventilation	GS series: natural. CS series: forced .
Fuses	T and M versions only. The capacitive batteries are protected by triplets of high breaking capacity fuses (100kA). The protection of the power circuits uses NH-00 curve gG fuses; for the auxiliary circuits sectionable fuse holders and 10.3x38 fuses.
Disconnector Contactors	T and M versions only. Three-pole vacuum with door lock. Only in M versions. Each battery is driven by a three-pole contactor (Class AC6-b). The limitation of current peaks caused by the insertion of capacitive batteries is ensured by means of precharge resistors.
Capacitors	Single-phase capacitors made of self-healing metallised polypropylene (MKP), equipped with anti-explosion device and discharge resistance. Impregnated in PCB-free vegetable oil. Delta connection. Type of continuous service. - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - dissipation losses: ≤0.4 W/kvar - temperature category: -25 / D

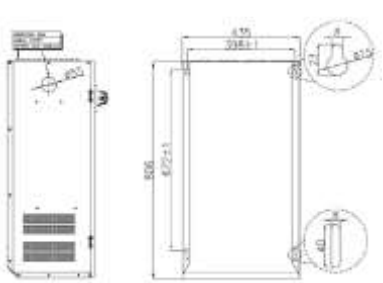
VERSIONS

GSG; CS; GS4	single battery without protection device.
GSG-T; CS-T; GS4-T	single battery with disconnector and protection device (fuses).
GSG-M; CS-M; GS4-M	single battery with disconnector , protection device (fuses) and contactor for battery insertion (requires external 230V power supply by installer)

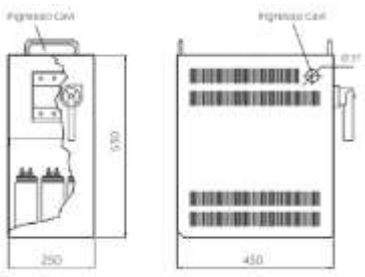
Serie GSG



Serie GS4



Serie CS



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STANDARD CONFIGURATIONS

Note

- The cable entry is always side and top;

Code	Type	Qn kvar	A V	In A	capacitance µF	Dimensions (l x w x h) mm	Weight Kg	THDI Max. *(%)*	THDIc Max. *(%)*	Protection
8951412125325	GSG-B15	12,5	415	17	3 x 77	368x256x635	13	15	50	-
8951412250325	GSG-B15	25	415	35	3 x 154	368x256x635	16	15	50	-
8951412375325	GSG-B15	37,5	415	52	3 x 231	368x256x635	19	15	50	-
8951412500325	GSG-B15	50	415	70	3 x 308	368x256x635	21	15	50	-
8951412625325	GSG-B15	62,5	415	87	3 x 385	368x256x635	26	15	50	-
8951412750325	GS4-B15	75	415	104	3 x 462	435x326x806	38	15	50	-
8951413100325	GS4-B15	100	415	139	3 x 616	435x326x806	43	15	50	-
8971412125355	GSG-B50	12,5	415	17	3 x 77	368x256x635	15	35	80	-
8971412250355	GSG-B50	25	415	35	3 x 154	368x256x635	18	35	80	-
8971412375355	GSG-B50	37,5	415	52	3 x 231	368x256x635	21	35	80	-
8971412500355	GSG-B50	50	415	70	3 x 308	368x256x635	23	35	80	-
8971412625355	GSG-B50	62,5	415	87	3 x 385	368x256x635	28	35	80	-
8971412750355	GS4-B50	75	415	104	3 x 462	435x326x806	40	35	80	-
8971413100355	GS4-B50	100	415	139	3 x 616	435x326x806	41	35	80	-
8951413012325	GSG-B15-T	12,5	415	17	3 x 77	368x256x635	16	15	50	25A fuses
8951413025325	GSG-B15-T	25	415	35	3 x 154	368x256x635	19	15	50	50A fuses
8951413037325	GSG-B15-T	37,5	415	52	3 x 231	368x256x635	22	15	50	80A fuses
8951413050325	GSG-B15-T	50	415	70	3 x 308	368x256x635	24	15	50	100A fuses
8951413062325	GSG-B15-T	62,5	415	87	3 x 385	368x256x635	29	15	50	125A fuses
8951413075325	GS4-B15-T	75	415	104	3 x 462	435x326x806	41	15	50	160A fuses
8951414010325	GS4-B15-T	100	415	139	3 x 616	435x326x806	42	15	50	Fuses 2x100A
8971413012355	GSG-B50-T	12,5	415	17	3 x 77	368x256x635	18	35	80	25A fuses
8971413025355	GSG-B50-T	25	415	35	3 x 154	368x256x635	23	35	80	50A fuses
8971413037355	GSG-B50-T	37,5	415	52	3 x 231	368x256x635	25	35	80	80A fuses
8971413050355	GSG-B50-T	50	415	70	3 x 308	368x256x635	28	35	80	100A fuses
8971413062355	GSG-B50-T	62,5	415	87	3 x 385	368x256x635	35	35	80	125A fuses
8971413075355	GS4-B50-T	75	415	104	3 x 462	435x326x806	47	35	80	160A fuses
8971414010355	GS4-B50-T	100	415	139	3 x 616	435x326x806	48	35	80	Fuses 2x100A
8971412125505	GSG-B50-M	12,5	415	17	3 x 77	368x256x635	18	35	80	25A fuses
8971412250505	GSG-B50-M	25	415	35	3 x 154	368x256x635	23	35	80	50A fuses
8971412375505	GSG-B50-M	37,5	415	52	3 x 231	368x256x635	25	35	80	80A fuses
8971412500505	GSG-B50-M	50	415	70	3 x 308	368x256x635	28	35	80	100A fuses
8971412625505	GSG-B50-M	62,5	415	87	3 x 385	368x256x635	35	35	80	125A fuses
8971412750505	GS4-B50-M	75	415	104	3 x 462	435x326x806	47	35	80	160A fuses

<u>CS series with tuning reactor</u>:

- total dissipation losses 6 W / kvar (AVG);
- maximum permissible voltage harmonic distortion is THDU = 3% (189 Hz).

Code	Type	Qn kvar	A V	In A	capacitance µF	Dimensions (l x w x h) mm	Weight kg	THDI Max. *(%)*	THDIc Max. *(%)*	Protection
8981402125705	CS-AAR/100	12,5	400	18	3 x 77	250x450x530	32	100	3%	-
8981402250700	CS-AAR/100	25	400	36	3 x 154	250x450x530	41	100	3%	-
8981402500700	CS-AAR/100	50	400	72	3 x 308	250x450x530	59	100	3%	-
8981403012705	CS-AAR/100-T	12,5	400	18	3 x 77	250x450x530	35	100	3%	25A fuses
8981403025705	CS-AAR/100-T	25	400	36	3 x 154	250x450x530	44	100	3%	50A fuses
8981403050705	CS-AAR/100-T	50	400	72	3 x 308	250x450x530	62	100	3%	100A fuses
8981402125675	CS-AAR/100-M	12,5	400	18	3 x 77	250x450x530	36	100	3%	25A fuses
8981402250675	CS-AAR/100-M	25	400	36	3 x 154	250x450x530	45	100	3%	50A fuses
8981402500675	CS-AAR/100-M	50	400	72	3 x 308	250x450x530	63	100	3%	100A fuses

RFIX

Fixed Power Factor Correction

The **RFIX** series is the latest development for fixed power factor correction of small loads, characterised by its compact dimensions. The compact design and lightness of the solution allows easy and quick wall installation.

PERFORMANCE DATA

Rated voltage	**415 Vac** (others on request)
Max. voltage on capacitors (without harmonic distortion)	**450 Vac RFIX-B15 series;** **550 Vac RFIX-B50 series;**
Rated frequency	**50 Hz** (60 Hz on request)
Insulation voltage	690 Vac
Voltage overload	1.1 Un (rated voltage)
Tolerance on capacitance	-5% / +10%
Discharge resistance	75V residual within 3 minutes (included)

QUALITY

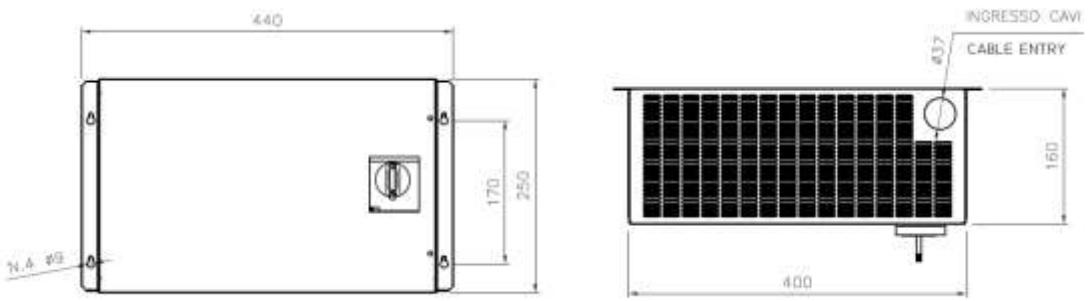
Regulations	IEC/EN 60831-1 / 2, IEC/EN 61921

TECHNICAL DATA

Power supply	Three-phase + earth.
Degree of protection	IP 30.
Installation	Vertical, wall-mounted . Indoor installation, in a well ventilated positionand free from solar radiation.
Ventilation	Natural.
Fuses	T version only. The capacitive batteries are protected by high breaking capacity fuses (100kA). The protection system for the power circuits uses NH-00 curve gG fuses; for the auxiliary circuits sectionable fuse holders and 10.3x38 fuses.
Disconnector	T version only. Three-phase off-load disconnector with mechanical door interlock.
Capacitors	Single-phase capacitors made of self-healing metallised polypropylene (MKP), equipped with anti-explosion device and discharge resistor. They are impregnated in vegetable oil, free of PCBs. Delta connection. Type of service: continuous. - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - Total dissipation losses: ≤0.4 W/kvar - temperature category: -25 / D

VERSIONS

RFIX	single battery without protection and disconnection device.
RFIX-T	single battery with disconnector and protection fuses.



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STANDARD CONFIGURATIONS

Note

- Cable entry is always from top

Code	Type	Qn kvar	A V	In A	capacitance µF	Weight kg	THDI Max. *(%)*	THDIc Max. *(%)*
8951412034335	RFIX-B15	3,4	415	4,7	3 x 21	6	15	50
8951412062335	RFIX-B15	6,25	415	8,7	3 x 38,5	6,3	15	50
8951412125335	RFIX-B15	12,5	415	17,4	3 x 77	6,5	15	50
8951412175335	RFIX-B15	17,5	415	24,3	3 x 105	7	15	50
8951412250335	RFIX-B15	25	415	34,8	3 x 154	9,5	15	50
8951412340335	RFIX-B15	34	415	48	3 x 210	10,5	15	50
8951412034350	RFIX-B50	3,4	415	4,7	3 x 21	6	35	80
8951412062350	RFIX-B50	6,25	415	8,7	3 x 38,5	6,3	35	80
8951412125350	RFIX-B50	12,5	415	17,4	3 x 77	6,5	35	80
8951412175350	RFIX-B50	17,5	415	24,3	3 x 105	7	35	80
8951412250350	RFIX-B50	25	415	34,8	3 x 154	9,5	35	80

Solution with disconnector and fuses

Code	Type	Qn kvar	A V	In A	capacitance µF	Weight kg	THDI Max. *(%)*	THDIc Max. *(%)*	Protective organ
8951412034355	RFIX-T-B15	3,4	415	4,7	3 x 21	6	15	50	16A fuses
8951412062355	RFIX-T-B15	6,25	415	8,7	3 x 38,5	6,3	15	50	16A fuses
8951412125355	RFIX-T-B15	12,5	415	17,4	3 x 77	6,5	15	50	25A fuses
8951412175355	RFIX-T-B15	17,5	415	24,3	3 x 105	7	15	50	40A fuses
8951412250355	RFIX-T-B15	25	415	34,8	3 x 154	9,5	15	50	50A fuses
8951412340355	RFIX-T-B15	34	415	48	3 x 210	10,5	15	50	80A fuses
8951412034375	RFIX-T-B50	3,4	415	4,7	3 x 21	6	35	80	16A fuses
8951412062375	RFIX-T-B50	6,25	415	8,7	3 x 38,5	6,3	35	80	16A fuses
8951412125375	RFIX-T-B50	12,5	415	17,4	3 x 77	6,5	35	80	25A fuses
8951412175375	RFIX-T-B50	17,5	415	24,3	3 x 105	7	35	80	40A fuses
8951412250375	RFIX-T-B50	25	415	34,8	3 x 154	9,5	35	80	50A fuses

GE230 • B15 • B35 • B50 • DMP
AAR/100 • AAR/600 • AAR/6 • AAR/D20 • AAR/138
B35-ST • AAR/100-ST

Automatic
Power Factor Correction

COMAR Condensatori

TECHNICAL DATA COMMON TO ALL SERIES IN STANDARD CONFIGURATION

Enclosure	Made of steel sheet, protected against corrosion by phosphating and epoxy powder coating. Colour RAL 7035. External degree of protection: panel type G3E, G4E **IP30**; G4RM **IP40**; G6E, G8E, G9E **IP31** Internal degree of protection: panels with interlocked switch-disconnector IP20 live parts; IP 20 protection in additional modules In the G6, G8 and G9 cabinets, capacitor banks are assembled on drawers that can be pulled out from the front of the cabinet for quick maintenance G6, G8, G9 cabinets are equipped with eyebolts for lifting
Installation	Indoor installation, in a well ventilated position free from solar radiation. Pollution degree 1 Working temperature: -5 / +40 °C; Relative humidity RH50% @40°C (EN61435-1) Altitude: <1000 asl
Main Disconnector	Three-phase off-load disconnector with door interlock.
Wiring	Internal connections are made with FS17-450/750V insulated, flame-retardant low smoke emission cables. On non-preinsulated cable lugs, the connection point is covered with a durable heat-shrink sleeve. Auxiliary circuits are appropriately identified in accordance with current standards.
Bank insertion	The banks are driven by three-phase contactors (Class AC6-b). Series without tuning reactor have contactors with a pre-insertion resistor to limit peak inrush current Static insertion series are fitted with thyristor insertion modules controlled by microprocessor such that switching on/off occurs when the potential difference between the mains and the capacitors is zero. (zero crossing). The switching time for the insertion of the capacitor banks is approximately 200 ms.
Fuses	The capacitive banks are protected by high breaking capacity fuses (100kA). The protection system for the power circuits uses NH-00 curve gG fuses; for the auxiliary circuits sectionable fuse holders and 10.3x38 fuses.
Auxiliary circuits	400 Vac for G3E, G4E, G4RM 230 Vac for G6E, G8E, G9E Internal transformer
Impulse withstand	6 kV for type G3E, G4E; 8 kV for G4RM, G6E, G8E, G9E
Capacitors	Single-phase capacitors made of self-healing metallised polypropylene (MKP), equipped with over-pressure device and discharge resistance. Impregnated with PCBs-free vegetable oilf. Delta connection. Continuous duty type. - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - capacitance tolerance: -5% / +10%. - Dielectric losses: ≤0.2 W/kvar; total dissipation losses: ≤0.4 W/kvar - temperature category: -25 / D In the higher-performance series, '**Heavy Duty**' capacitors made of high thickness film and multiple elements in series are installed to reduce the effect of high currents on the element heads
Tuning reactor (where present)	Iron core with oriented crystals; aluminium windings Resin impregnation Dissipation loss (average): 6W/kvar Over-temperature control probe
Controller	Electronic, measurement type: varmetric on 4 quadrants. Current signal: via current transformer (user-supplied) with 5A secondary, class 1 Current signal sensitivity: 2.5% for BMR series, 0.3% for HPR series
Ventilation	Natural for series without de-tuning chokes with power below 200 kvar. Forced by high-efficiency fans with top expulsion for others
CCS	remote monitoring system for real time data display, emailing of alarms, historical data storage. Included on DMP-FTV, AAR/6, AAR/D20 series; on request on other series The symbol indicates that the equipment is equipped with CCS The symbol indicates that the CCS system is installable on the equipment
Safety	Automatic equipment shut-down in case of high THDi, over-temperature >50°C, under and overvoltage. bank shut down for reactor overtemperature (where fitted) Dry contact NC for extreme internal temperature (>70°C) In addition on HPR controller: auto shut-down for high THDu, loss of capacitance of the bank
Testing	100% of the equipment undergoes visual inspection, phase-to-phase and phase-to-ground insulation tests, bank efficiency and ventilation circuit checks. Capacitors are tested for capacitance, dissipation factor [tan(δ)], verification of insulation to earth and overvoltage resistance at three consecutive points of the production process: after winding, during ageing process and at final assembly
Regulation	Capacitors: IEC/EN 60831-1 / 2 certified by IMQ (V1927) Equipment: IEC/EN 61439-1 / 2, IEC/EN 61921; 2014/35/EC Electromagnetic compatibility: 2014/30/EC.

GE 230V

Automatic power factor correction

GE 230V series power factor correction panels are suitable for three-phase 230V networks with **low harmonic** current **content.** These devices guarantee accurate power factor correction, thanks to a multi-step logic that effectively fractionates the power.

PERFORMANCE DATA

- **Rated voltage** 230 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=230; Umax 255

HARMONIC CONTENT

RESONANCE NOT ADMITTED

THD(I)max. = 25 % in the grid

THD(Ic)max. = 70 % on capacitors

STANDARD CONFIGURATIONS

Code	Type	Qn	Cable entry	In	bank power	Steps	Disconnector	Controller	CCS	Weigh t
		(kvar)		(A)	(kvar)	(n)	(A)	(type)		(kg)
8571232125108	G3E	12,5	↙	31	2,5+2x5	5	80	BMR6		16
8571232175100	G3E	17,5	↙	44	2,5+5+10	7	80	BMR6		23
8571232250100	G3E	25	↙	62	5+2x10	5	125	BMR6		26
8571232375108	G4E	37,5	↙	94	2,5+5+10+20	15	200	BMR6		46
8571232550208	G4RM	55	↙	138	5+10+2x20	11	200	BMR6		89
8571232750208	G4RM	75	↙	188	5+3x10+2x20	15	315	BMR6		95
8571232950208	G4RM	95	↙	238	5+10+4x20	19	400	BMR6		102
8571233115209	G6E	115	↓	288	5+10+3x20+40	23	500	HPR6	🛠	175
8571233140209	G6E	140	↓	351	2x10+2x20+2x40	14	630	HPR6	🛠	192
8571233160209	G6E	160	↓	401	4x20+2x40	8	630	HPR6	🛠	207
8571233180209	G6E	180	↓	452	7x20+1x40	10	800	HPR6	🛠	240
8571233200209	G6E	200	↓	502	2x20+4x40	10	800	HPR6	🛠	255

Note

- For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.
- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

The B15 series are suitable for three-phase networks with an operating voltage of **400 Vac and low harmonic content**.
Suitable for small users and tertiary sector with daily work cycles (8h)

PERFORMANCE DATA

- Rated voltage 415 Vac (others on request)
- Rated frequency 50 Hz (60 Hz on request)
- Insulation voltage 690 Vac
- Voltage overload 1.1 Un (rated voltage)
- Capacitors Un=415; Umax 450

HARMONIC CONTENT
RESONANCE NOT ADMITTED

THD(I)max. = 15%. in the grid

THD(Ic)max. = 50 % on capacitors

STANDARD CONFIGURATIONS

Code	Type	Qn	Cable entry	In	bank power	Steps	Disconnector	Controller	CCS	Weight
		(kvar)		(A)	(kvar)	(n)	(A)	(type)		(kg)
8631412102320	G3E	10,2	↙	14	3x3,4	3	40	BMR4		14
8631412159320	G3E	15,9	↙	22	3,4+2x6,25	5	40	BMR4		15
8631412221320	G3E	22,15	↙	31	3,4+6,25+12,5	7	80	BMR4		16
8631412310320	G3E	31,25	↙	43	6,25+2x12,5	5	80	BMR4		18
8631412435320	G3E	43,75	↙	61	6,25+12,5+25	7	100	BMR4		22
8631412500320	G3E	50	↙	70	2x12,5+25	4	100	BMR4		23
8631412625320	G3E	62,5	↙	87	12,5+2x25	5	160	BMR4		26
8631412750320	G4E	75	↙	104	2x12.5+2x25	6	200	BMR4		38
8631413100400	G4E	100	↙	139	2x12,5+25+50	8	200	BMR4		43
8661413125325	G4RM	125	↙	174	25+2x50	5	315	BMR4		80
8661413150325	G4RM	150	↙	209	2x25+2x50	6	315	BMR4		85
8661413175325	G4RM	175	↙	243	25+3x50	7	400	BMR4		87
8661413200325	G4RM	200	↙	278	2x25+50+100	8	400	BMR4		89
8661413225325	G4RM	225	↙	313	25+2x50+100	9	500	BMR4		95
8661413250325	G4RM	250	↙	348	25+50+75+100	10	500	BMR4		102
8661410000325	G6E	300	↓	417	25+50+3x75	12	630	HPR6	🛠	175
8661410050325	G6E	350	↓	487	50+4x75	9	800	HPR6	🛠	192
8661413400325	G6E	400	↓	556	2x50+4x75	14	800	HPR6	🛠	207
8661413450325	G6E	450	↓	626	3x50+2x75+150	16	1000	HPR6	🛠	240
8661413500325	G6E	500	↓	696	50+4x75+150	13	1000	HPR6	🛠	255
8631413525420	G8E	525	↑	731	7x75	7	1250	HPR12	🛠	315
8631413600420	G8E	600	↑	836	8x75	8	1250	HPR12	🛠	330
8631413675420	G8E	675	↑	940	7x75+150	9	1600	HPR12	🛠	350
8631413750420	G8E	750	↑	1045	6x75+150	10	1600	HPR12	🛠	380
8631413825420	G8E (II)	825	↑	1149	5x75+3x150	11	800+1000	HPR12	🛠	510
8631413900420	G8E (II)	900	↑	1254	4x75+4x150	12	1000+1000	HPR12	🛠	530
8631413975420	G8E (II)	975	↑	1358	3x75+5x150	13	1000+1250	HPR12	🛠	550
8631414105420	G8E (II)	1050	↑	1462	2x75+6x150	14	1000+1250	HPR12	🛠	650
8631414120420	G8E (II)	1200	↑	1671	2x75+5x150+300	16	1250+1250	HPR12	🛠	690
8631414135420	G8E (II)	1350	↑	1880	2x75+4x150+2x300	18	1600+1250	HPR12	🛠	730

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

B35

Automatic power factor correction

The B35 series are suitable for three-phase networks with an operating voltage of **400 Vac and medium-low harmonic content**. Suitable for industrial users with daily work cycles (8h).

PERFORMANCE DATA

- **Rated voltage** 415 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=450; Umax 500

HARMONIC CONTENT
RESONANCE NOT ADMITTED

THD(I)max. = 25 % in the grid

THD(Ic)max. = 70 % on capacitors

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
8671412102340	G3E	10,2	↙	14	3x3,4	3	40	BMR4		14
8671412159340	G3E	15,9	↙	22	3,4+2x6,25	5	40	BMR4		15
8671412221340	G3E	22,15	↙	31	3,4+6,25+12,5	7	80	BMR4		16
8671412310340	G3E	31,25	↙	43	6,25+2x12,5	5	80	BMR4		18
8671412435340	G3E	43,75	↙	61	6,25+12,5+25	7	100	BMR4		22
8671412500340	G3E	50	↙	70	2x12,5+25	4	100	BMR4		23
8671412625340	G3E	62,5	↙	87	12,5+2x25	5	160	BMR4		26
8671412750340	G4E	75	↙	104	2x12.5+2x25	6	200	BMR4		38
8671413100340	G4E	100	↙	139	2x12,5+25+50	8	200	BMR4		43
8671413125345	G4RM	125	↙	174	25+2x50	5	250	BMR4		80
8671413150345	G4RM	150	↙	209	2x25+2x50	6	315	BMR4		85
8671413175345	G4RM	175	↙	243	25+3x50	7	400	BMR4		87
8671413200345	G4RM	200	↙	278	2x25+50+100	8	400	BMR4		89
8671413225345	G4RM	225	↙	313	25+2x50+100	9	500	BMR4		95
8671413250345	G4RM	250	↙	348	25+50+75+100	10	500	BMR4		102
8671410000355	G6E	300	↓	417	25+50+3x75	12	630	HPR6	🛠	175
8671410050355	G6E	350	↓	487	50+4x75	9	800	HPR6	🛠	192
8671413400355	G6E	400	↓	556	2x50+4x75	14	800	HPR6	🛠	207
8671413450355	G6E	450	↓	626	3x50+2x75+150	16	1000	HPR6	🛠	240
8671413500355	G6E	500	↓	696	50+4x75+150	13	1000	HPR6	🛠	255
8671413525440	G8E	525	↑	731	7x75	7	1250	HPR12	🛠	315
8671413600440	G8E	600	↑	836	8x75	8	1250	HPR12	🛠	330
8671413675440	G8E	675	↑	940	7x75+150	9	1600	HPR12	🛠	350
8671413750440	G8E	750	↑	1045	6x75+2x150	10	1600	HPR12	🛠	380
8671413825440	G8E (II)	825	↑	1149	5x75+3x150	11	800+1000	HPR12	🛠	510
8671413900440	G8E (II)	900	↑	1254	4x75+4x150	12	1000+1000	HPR12	🛠	530
8671413975440	G8E (II)	975	↑	1358	3x75+5x150	13	1000+1250	HPR12	🛠	550
8671414105440	G8E (II)	1050	↑	1462	2x75+6x150	14	1000+1250	HPR12	🛠	650
8671414120440	G8E (II)	1200	↑	1671	2x75+5x150+300	16	1250+1250	HPR12	🛠	690
8671414135440	G8E (II)	1350	↑	1880	2x75+4x150+2x300	18	1600+1250	HPR12	🛠	730

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- Cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

The B50 series are suitable for three-phase networks with an operating voltage of **400 Vac** and **medium harmonic content**. The use of Heavy Duty double-element capacitors increases the life of the capacitor even in harsh situations . They are suitable for industrial users with continuous duty cycles.

PERFORMANCE DATA

- **Rated voltage** 415 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=500; Umax 550

HARMONIC CONTENT

RESONANCE NOT ADMITTED

THD(I)max. = 35 % in the grid

THD(Ic)max. = 80 % on capacitors

STANDARD CONFIGURATIONS

Code	Type	Qn	Cable entry	In	bank power	Steps	Disconnector	Controller	CCS	Weight
		(kvar)		(A)	(kvar)	(n)	(A)	(type)		(kg)
8681412102350	G3E	10,2	↙	14	3x3,4	3	40	BMR4		14
8681412159350	G3E	15,9	↙	22	3,4+2x6,25	5	40	BMR4		15
8681412221350	G3E	22,15	↙	31	3,4+6,25+12,5	7	80	BMR4		16
8681412310350	G3E	31,25	↙	43	6,25+2x12,5	5	80	BMR4		18
8681412435350	G3E	43,75	↙	61	6,25+12,5+25	7	100	BMR4		22
8681412500350	G3E	50	↙	70	2x12,5+25	4	100	BMR4		23
8681412625350	G3E	62,5	↙	87	12,5+2x25	5	160	BMR4		26
8681412750350	G4E	75	↙	104	2x12.5+2x25	6	200	BMR4		38
8681413100350	G4E	100	↙	139	2x12,5+25+50	8	200	BMR4		43
8681413125355	G4RM	125	↙	174	25+2x50	5	250	BMR4		80
8681413150355	G4RM	150	↙	209	2x25+2x50	6	315	BMR4		85
8681413175355	G4RM	175	↙	243	25+3x50	7	400	BMR4		87
8681413200355	G4RM	200	↙	278	2x25+50+100	8	400	BMR4		89
8681413225355	G4RM	225	↙	313	25+2x50+100	9	500	BMR4		95
8681413250355	G4RM	250	↙	348	25+50+75+100	10	500	BMR4		102
8681410000345	G6E	300	↓	417	25+50+3x75	12	630	HPR6	🛠	175
8681410050345	G6E	350	↓	487	50+4x75	9	800	HPR6	🛠	192
8681413400345	G6E	400	↓	556	2x50+4x75	14	800	HPR6	🛠	207
8681413450345	G6E	450	↓	626	3x50+2x75+150	16	1000	HPR6	🛠	240
8681413500345	G6E	500	↓	696	50+4x75+150	13	1000	HPR6	🛠	255
8681413525450	G8E	525	↑	731	7x75	7	1250	HPR12	🛠	315
8681413600450	G8E	600	↑	836	8x75	8	1250	HPR12	🛠	330
8681413675450	G8E	675	↑	940	7x75+150	9	1600	HPR12	🛠	350
8681413750450	G8E	750	↑	1045	6x75+2x150	10	1600	HPR12	🛠	380
8681413825450	G8E (II)	825	↑	1149	5x75+3x150	11	800+1000	HPR12	🛠	510
8681413900450	G8E (II)	900	↑	1254	4x75+4x150	12	1000+1000	HPR12	🛠	530
8681413975450	G8E (II)	975	↑	1358	3x75+5x150	13	1000+1250	HPR12	🛠	550
8681414105450	G8E (II)	1050	↑	1462	2x75+6x150	14	1000+1250	HPR12	🛠	650
8681414120450	G8E (II)	1200	↑	1671	2x75+5x150+300	16	1250+1250	HPR12	🛠	690
8681414135450	G8E (II)	1350	↑	1880	2x75+4x150+2x300	18	1600+1250	HPR12	🛠	730

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

DMP-FTV

Automatic power factor correction

The DMP-FTV series are suitable for three-phase networks with an operating voltage of **400 Vac** and **medium to high harmonic** current **content**. They are suitable for small generation systems (FTV or other) and continuous duty cycles. The use of **Heavy Duty** double-element capacitors increases capacitor life even in harsh situations

PERFORMANCE DATA

- **Rated voltage** 415 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=550; Umax 600

HARMONIC CONTENT

RESONANCE NOT ADMITTED

THD(I)max. = 40 % in the grid

THD(Ic)max. = 90 % on capacitors

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
8881412250500	G3E	25	↙	35	2x6,25+12,5	4	80	BMR6		15
8881412310500	G3E	31,25	↙	43	6,25+2x12,5	5	80	BMR6		18
8881412435500	G3E	43,75	↙	61	6,25+12,5+25	7	100	BMR6		22
8881412500500	G3E	50	↙	70	2x12,5+25	4	100	BMR6		23
8881412625500	G3E	62,5	↙	87	12,5+2x25	5	160	BMR6		26
8881412750500	G4E	75	↙	104	2x12.5+2x25	6	200	BMR6		38
8881413100500	G4E	100	↙	139	2x12,5+25+50	8	200	BMR6		46
8881413125500	G4RM	125	↙	174	2x12.5+2x50	5	250	BMR6		83
8881413150500	G4RM	150	↙	209	2x25+2x50	6	315	BMR6		84
8881413175500	G4RM	175	↙	243	25+3x50	7	400	BMR6		87
8881413200500	G4RM	200	↙	278	2x25+50+100	8	400	BMR6		89
8881413225500	G4RM	225	↙	313	25+2x50+100	9	500	BMR6		95
8881413250500	G4RM	250	↙	348	25+50+75+100	10	500	BMR6		102
888141000045R	G6E	300	↓	417	25+50+3x75	12	630	HPR6	🖧	175
888141005045R	G6E	350	↓	487	50+4x75	7	800	HPR6	🖧	192
888141340045R	G6E	400	↓	556	2x50+4x75	8	800	HPR6	🖧	207
888141345045R	G6E	450	↓	626	3x50+2x75+150	9	1000	HPR6	🖧	240
888141350045R	G6E	500	↓	696	50+4x75+150	10	1000	HPR6	🖧	255
888141360050R	G8E	600	↑	836	8x75	8	1250	HPR12	🖧	330
888141365050R	G8E	650	↑	904	50+6x75+150	11	1600	HPR12	🖧	345
888141375050R	G8E	750	↑	1045	6x75+2x150	10	1600	HPR12	🖧	380
888141382550R	G8E (II)	825	↑	1149	5x75+3x150	11	800+1000	HPR12	🖧	510
888141390050R	G8E (II)	900	↑	1254	4x75+4x150	12	1000+1000	HPR12	🖧	530

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

Automatic Power Factor Correction with Tuning reactors

The AAR/100 series are suitable for three-phase networks with an operating voltage of **400 Vac** and **high harmonic content** in **current.** Suitable where there is a risk of resonance (L-C) between the power factor correction system and the equivalent network inductance. Not suitable for networks with high voltage distortions

PERFORMANCE DATA

- **Rated voltage** 400 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=500; Umax 550

HARMONIC CONTENT

THD(I)max. = 100 % in the grid

THD(U)max. = 3%. in the grid

p = 7% (189 Hz)

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
8561402250700	G4E	25	↙	36	2x6.25+12.5	4	200	BMR4		88
8561402310700	G4E	31	↙	44	6,25+2x12,5	5	200	BMR4		90
8561402435700	G4E	43,75	↙	63	6,25+12,5+25	7	200	BMR4		100
8561402500700	G4RM	50	↓	72	2x12,5+25	4	200	BMR4		105
8561402625700	G4RM	62,5	↓	90	12,5+2x25	5	200	BMR4		115
8561402750700	G4RM	75	↓	108	2x12.5+2x25	6	200	BMR4		125
8561403100700	G4RM	100	↓	144	4x25	4	250	BMR4		145
8561403125700	G6E	125	↓	180	25+2x50	5	315	HPR6	🛠	200
8561403150700	G6E	150	↓	216	25+50+75	6	400	HPR6	🛠	220
8561403175700	G6E	175	↓	252	25+3x50	7	400	HPR6	🛠	250
8561403200700	G6E	200	↓	288	25+2x50+75	8	500	HPR6	🛠	270
8561403225700	G6E	225	↓	324	25+50+2x75	9	500	HPR6	🛠	300
8561403250700	G6E	250	↓	360	2x25+50+2x75	10	630	HPR6	🛠	320
8561403275700	G6E	275	↓	397	25+2x50+2x75	11	630	HPR6	🛠	340
8561403300700	G6E	300	↓	432	25+50+3x75	12	800	HPR6	🛠	360
8561403350700	G8E	350	↑	504	50+4x75	9	800	HPR6	🛠	390
8561403375700	G8E	375	↑	541	25+50+4x75	15	800	HPR6	🛠	410
8561403400700	G8E (II)	400	↑	576	2x50+4x75	14	1000	HPR6	🛠	550
8561403450700	G8E (II)	450	↑	648	25+50+5x75	18	1000	HPR12	🛠	600
8561403500700	G8E (II)	500	↑	720	50+6x75	13	1250	HPR12	🛠	650
8561403550700	G8E (II)	550	↑	792	2x50+6x75	19	1250	HPR12	🛠	700
8561403600700	G8E (II)	600	↑	864	8x75	8	1600	HPR12	🛠	750
8561403650700	G8E (II)	650	↑	936	50+6x75+150	16	800+630	HPR12	🛠	800
8561403750700	G8E (II)	750	↑	1080	6x75+2x150	10	800+800	HPR12	🛠	850
8561403825700	G8E (III)	825	↑	1191	5x75+3x150	11	800+1000	HPR12	🛠	1000
8561403900700	G8E (III)	900	↑	1299	4x75+4x150	12	800+1250	HPR12	🛠	1050
8561403975700	G8E (III)	975	↑	1407	3X75+5X150	13	1000+1250	HPR12	🛠	1100
8561404105700	G8E (III)	1050	↑	1516	2x75+6x150	14	800+1600	HPR12	🛠	1150

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

AAR/600

Automatic Power Factor Correction with Tuning reactors

The AAR/600 series are suitable for three-phase networks with an operating voltage of **400 Vac** and **very high harmonic current content**.
This equipment is suitable for industrial users with continuous duty cycles and **high voltage distortions** (asynchronous generators, mills, plastic injection, etc.).

PERFORMANCE DATA

- **Rated voltage** 400 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=500; Umax 550

HARMONIC CONTENT

THD(I)max. = 100 % in the grid

THD(U)max. = 6%. in the grid

p = 7% (189Hz)

STANDARD CONFIGURATIONS

Code	Type	Qn	Cable entry	In	bank power	Steps	Disconnector	Controller	CCS	Weight
		(kvar)		(A)	(kvar)	(n)	(A)	(type)		(kg)
8551402500600	G4RM	50	↓	72	2x12.5+25	4	200	BMR4		105
8551402625600	G4RM	62,5	↓	90	12,5+2x25	5	200	BMR4		115
8551402750600	G4RM	75	↓	108	2x12.5+2x25	6	200	BMR4		125
8551403100600	G6E	100	↓	144	2x25+50	4	250	HPR6	🛠	180
8551403125600	G6E	125	↓	180	25+2x50	5	250	HPR6	🛠	210
8551403150600	G6E	150	↓	216	25+50+75	6	400	HPR6	🛠	230
8551403175600	G6E	175	↓	252	25+3x50	7	400	HPR6	🛠	260
8551403200600	G6E	200	↓	288	25+2x50+75	8	500	HPR6	🛠	280
8551403225600	G6E	225	↓	324	25+50+2X75	9	500	HPR6	🛠	315
8551403250600	G6E	250	↓	360	2x25+50+2x75	10	630	HPR6	🛠	355
8551403275600	G8E	275	↑	397	25+2x50+2x75	11	630	HPR6	🛠	370
8551403300600	G8E	300	↑	432	25+50+3x75	12	800	HPR6	🛠	380
8551403350600	G8E	350	↑	504	50+4x75	9	800	HPR6	🛠	400
8551403375600	G8E (II)	375	↑	541	25+50+4x75	15	800	HPR6	🛠	520
8551403400600	G8E (II)	400	↑	576	2x50+4x75	14	1000	HPR6	🛠	570
8551403450600	G8E (II)	450	↑	648	25+50+5x75	18	1000	HPR12	🛠	620
8551403500600	G8E (II)	500	↑	720	50+6x75	13	1250	HPR12	🛠	670
8551403550600	G8E (II)	550	↑	792	2x50+6x75	19	1250	HPR12	🛠	720
8551403600600	G8E (II)	600	↑	864	8X75	8	1600	HPR12	🛠	770
8551403650600	G8E (II)	650	↑	936	50+6X75+150	16	800+630	HPR12	🛠	820
8551403750600	G8E (II)	750	↑	1080	6X75+2X150	10	800+800	HPR12	🛠	880
8551403825600	G8E (III)	825	↑	1191	5x75+3x150	11	800+1000	HPR12	🛠	1040
8551403900600	G8E (III)	900	↑	1299	4x75+4x150	12	800+1250	HPR12	🛠	1090
8551403975600	G8E (III)	975	↑	1407	3X75+5x150	13	800+1250	HPR12	🛠	1140
8551404100600	G8E (III)	1050	↑	1516	2X75+6x150	14	800+1600	HPR12	🛠	1190
8551402500600	G4RM	50	↓	72	2x12.5+25	4	200	BMR4	🛠	105
8551402625600	G4RM	62,5	↓	90	12,5+2x25	5	200	BMR4	🛠	115
8551402750600	G4RM	75	↓	108	2x12.5+2x25	6	200	BMR4	🛠	125

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

Automatic Power Factor Correction with Tuning reactors

The **AAR/6** series are suitable for three-phase networks with an operating voltage of **400 Vac** and **very high harmonic current content** with values that do not comply with EN50160 (wire drawing, chemical-pharmaceutical or oil industries. Heavy Duty capacitors with double elements and increased thickness allow use even in extremely harsh working conditions

PERFORMANCE DATA

- **Rated voltage** 400 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=500; Umax 550

HARMONIC CONTENT

THD(I)max. = 100 % in the grid

THD(U)max. = 10%. in the grid

p = 7% (189Hz)

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
855140310005R	G6E	100	↓	144	2x25+50	4	250	HPR6	🖧	105
855140312505R	G6E	125	↓	180	25+2x50	5	315	HPR6	🖧	115
855140315005R	G6E	150	↓	216	2x25+2x50	6	400	HPR6	🖧	125
855140317505R	G6E	175	↓	252	25+3x50	7	400	HPR6	🖧	180
855140320005R	G6E	200	↓	288	4x50	4	500	HPR6	🖧	210
855140322505R	G8E	225	↑	324	25+4x50	9	500	HPR6	🖧	230
855140325005R	G8E	250	↑	360	5x50	5	630	HPR6	🖧	260
855140330005R	G8E(II)	300	↑	432	6X50	6	800	HPR6	🖧	280
855140335005R	G8E(II)	350	↑	504	5x50+100	7	800	HPR6	🖧	315
855140340005R	G8E(II)	400	↑	576	4x50+2x100	8	1000	HPR6	🖧	355
855140345005R	G8E(II)	450	↑	648	3x50+3x100	9	1000	HPR6	🖧	370
855140350005R	G8E(II)	500	↑	720	2x50+4x100	10	1250	HPR6	🖧	380
855140355005R	G8E(III)	550	↑	792	50+5x100	11	1250	HPR6	🖧	400
855140360005R	G8E(III)	600	↑	864	4x50+4x100	12	1600	HPR12	🖧	520
855140365005R	G8E(III)	650	↑	936	3x50+5x100	13	1600	HPR12	🖧	570
855140370005R	G8E(III)	700	↑	1010	2x50+6x100	14	1600	HPR12	🖧	620
855140375005R	G8E(IV)	750	↑	1080	3x50+4x100+200	15	1000+1000	HPR12	🖧	670
855140380005R	G8E(IV)	800	↑	1190	2x50+5x100+200	16	1000+1000	HPR12	🖧	720
855140385005R	G8E(IV)	850	↑	1227	3x50+3x100+2x200	17	1000+1000	HPR12	🖧	770
855140390005R	G8E(IV)	900	↑	1299	2x50+4x100+2x200	18	1000+1000	HPR12	🖧	820
855140410005R	G8E(IV)	1000	↑	1445	2x50+3x100+3x200	20	1250+1250	HPR12	🖧	880

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

AAR/D20

Automatic Power Factor Correction with Tuning reactors

The AAR/D20 series are the ideal solution in three-phase networks with an operating voltage of **400 Vac** and **very high harmonic content in both current and voltage** with values that do not comply with EN50160 (foundries, induction furnaces, arc furnaces). The Heavy Duty capacitors with double elements and increased thickness allow use even in extremely heavy duty situations.

PERFORMANCE DATA

- **Rated voltage** 400 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (rated voltage)
- **Capacitors** Un=550; Umax 600

HARMONIC CONTENT

THD(I)max. = 100 % in the grid

THD(U)max. = 20 % in the grid

p = 7%

STANDARD CONFIGURATIONS

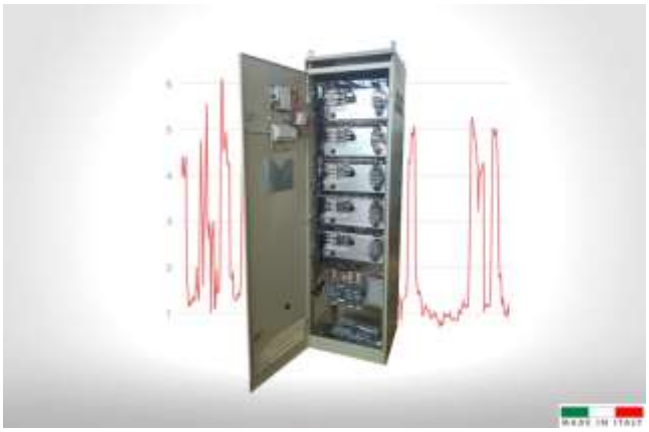
Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
854140310062R	G6E	100	↓	144	2x25+50	4	250	HPR6	🖧	200
854140312562R	G6E	125	↓	180	25+2x50	5	315	HPR6	🖧	259
854140315072R	G6E	150	↓	216	2X25+2X50	6	400	HPR6	🖧	276
854140317562R	G6E	175	↓	252	25+3X50	7	400	HPR6	🖧	332
854140320072R	G9E	200	↓	288	25+2X50+75	8	500	HPR6	🖧	349
854140322572R	G9E	225	↑	324	25+50+2X75	9	500	HPR6	🖧	376
854140325072R	G9E	250	↑	360	2X25+50+2x75	10	630	HPR6	🖧	400
854140327572R	G9E	275	↑	432	25+2X50+2X75	11	630	HPR6	🖧	440
854140330072R	G9E	300	↑	504	25+50+3X75	12	630	HPR6	🖧	485
854140335072R	G9E	350	↑	576	50+4X75	7	800	HPR6	🖧	520
854140340062R	G9E (II)	400	↑	648	2X50+4X75	8	1000	HPR6	🖧	656
854140345062R	G9E (II)	450	↑	720	25+50+5X75	18	1000	HPR12	🖧	772
854140350062R	G9E (II)	500	↑	792	50+6x75	10	1250	HPR12	🖧	800
854140355062R	G9E (II)	550	↑	864	2X50+6X75	11	1250	HPR12	🖧	866
854140360062R	G9E (II)	600	↑	936	8X75	8	1600	HPR12	🖧	910
854140365062R	G9E (II)	650	↑	1010	50+6X75	13	800+630	HPR12	🖧	985
854140375062R	G9E (II)	750	↑	1080	6X75+2X150	10	800+800	HPR12	🖧	1050
854140382562R	G9E (III)	825	↑	1190	5X75+3X150	11	800+1000	HPR12	🖧	1220
854140390062R	G9E (III)	900	↑	1227	4X75+4X150	12	800+1250	HPR12	🖧	1300
854140397562R	G9E (III)	975	↑	1299	3X75+5X150	13	800+1250	HPR12	🖧	1380
854140410562R	G9E (III)	1050	↑	1445	2X75+6X150	14	800+1600	HPR12	🖧	1460

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

Automatic Power Factor Correction with Tuning reactors



The AAR/138 series are suitable for three-phase networks with an operating voltage of **400 Vac and high current distortion with marked presence of the 3rd order harmonic at 150Hz.** (Shopping centres, Data centres, etc.) Heavy Duty capacitors with double elements and increased thickness allow use even in extremely harsc situations.

PERFORMANCE DATA

- **Rated voltage** 400 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (nominal voltage)
- **Capacitors** Un=550; Umax 600

HARMONIC CONTENT

THD(I)max. = 100 % in the grid

THD(U)max. = 6%. in the grid

p = 14% (138 Hz)

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
8821403100750	G6E	100	↓	144	2x25+50	4	250	HPR6	🛠	190
8821403125700	G6E	125	↓	180	25+2x50	5	250	HPR6	🛠	200
8821403150750	G6E	150	↓	216	2x25+2x50	6	400	HPR6	🛠	220
8821403175700	G6E	175	↓	252	25+3x50	7	400	HPR6	🛠	250
8821403200750	G9E	200	↑	288	25+2x50+75	8	500	HPR6	🛠	270
8821403225750	G9E	225	↑	324	25+50+2X75	9	500	HPR6	🛠	320
8821403250750	G9E	250	↑	360	2x25+50+2x75	10	630	HPR6	🛠	340
8821403275750	G9E	275	↑	397	25+2x50+2x75	11	630	HPR6	🛠	370
8821403300750	G9E	300	↑	432	25+50+3x75	12	800	HPR6	🛠	380
8821403350750	G9E	350	↑	504	2x25+4x75	14	800	HPR6	🛠	410
8821403400750	G9E (II)	400	↑	576	2x50+4x75	14	1000	HPR6	🛠	590
8821403450750	G9E (II)	450	↑	648	25+50+5x75	18	1000	HPR12	🛠	640
8821403500750	G9E (II)	500	↑	720	50+6x75	13	1250	HPR12	🛠	690
8821403550750	G9E (II)	550	↑	792	2x50+6x75	19	1250	HPR12	🛠	740
8821403600750	G9E (II)	600	↑	864	8x75	8	1600	HPR12	🛠	790
8821403650750	G9E (II)	650	↑	936	50+8x75	16	800+630	HPR12	🛠	840
8821403750750	G9E (II)	750	↑	1080	6x75+2x150	10	800+800	HPR12	🛠	890
8821403825750	G9E (III)	825	↑	1191	5x75+3x150	11	800+1000	HPR12	🛠	1060
8821403900750	G9E (III)	900	↑	1299	4x75+4x150	12	800+1250	HPR12	🛠	1110
8821403975750	G9E (III)	975	↑	1407	3X75+5X150	13	800+1250	HPR12	🛠	1160
8821404105750	G9E (III)	1050	↑	1516	2x75+6x150	14	800+1600	HPR12	🛠	1210

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

B35-ST

Automatic Power Factor Correction with Static Insertion

The **B35-ST** series is free of switching transients thanks to zero-crossing technology, and is designed to improve the performance of conventional equipment, such as: increasing capacitor bank life, decreasing equipment response time to follow rapid changes in loads with **low to medium harmonic content**.

PERFORMANCE DATA

- **Rated voltage** 415 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (nominal voltage)
- **Capacitors** Un=450; Umax 500

HARMONIC CONTENT
RESONANCE NOT ADMITTED

THD(I)max. = 25 % in the grid

THD(Ic)max. = 70 % on capacitors

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
8531413175200	G8E	175	↑	243	25+3x50	7	400	HPR6	🛠	165
8531413200200	G8E	200	↑	278	25+50+50+75	8	400	HPR6	🛠	180
8531413225200	G8E	225	↑	313	25+50+75+75	9	500	HPR6	🛠	200
8531413250200	G8E	250	↑	348	25+3x75	10	630	HPR6	🛠	220
8531410000200	G8E	300	↑	417	25+50+3x75	12	630	HPR6	🛠	270
8531410050200	G8E	350	↑	487	50+4x75	7	800	HPR6	🛠	280
8531413400200	G9E	400	↑	556	2x50+4x75	8	800	HPR6	🛠	290
8531413450200	G9E	450	↑	626	3x50+2x75+150	9	1000	HPR6	🛠	300
8531413500200	G9E	500	↑	696	50+4x75+150	10	1000	HPR6	🛠	310
8531413600200	G9E	600	↑	836	8X75	8	1250	HPR12	🛠	480
8531413700200	G9E	750	↑	1045	6X75+2X150	10	1600	HPR12	🛠	510
8531413800200	G9E (II)	825	↑	1149	5X75+3X150	11	800+1000	HPR12	🛠	550
8531413900200	G9E (II)	900	↑	1254	4X75+4X150	12	1000+1000	HPR12	🛠	580
8531414105200	G9E (II)	1050	↑	1462	2X75+6X150	14	1000+1000	HPR12	🛠	610

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

Automatic Power Factor Correction with Static Insertion

The entire **AAR/100-ST** series is free of switching transients thanks to zero-crossing technology, and is designed to improve the performance of conventional equipment, such as: increasing capacitor bank life, decreasing equipment response time to follow rapid changes in loads. Suitable for applications with **high harmonic content** such as automotive, port facilities, machine shops, ...

PERFORMANCE DATA

- **Rated voltage** 400 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (nominal voltage)
- **Capacitors** Un=500; Umax 550

HARMONIC CONTENT

THD(I)max. = 100 % in the grid

THD(U)max. = 3%. in the grid

p = 7% (189 Hz)

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	bank power (kvar)	Steps (n)	Disconnector (A)	Controller (type)	CCS	Weight (kg)
8611402750200	G8E	75	↑	108	2x12,5+50	5	160	HPR6	🛠	180
8611403100200	G8E	100	↑	144	2X25+50	4	200	HPR6	🛠	200
8611403125200	G8E	125	↑	180	25+2X50	5	315	HPR6	🛠	220
8611403150200	G8E	150	↑	216	25+50+75	6	400	HPR6	🛠	240
8611403175200	G8E	175	↑	252	25+3X50	7	400	HPR6	🛠	260
8611403200709	G9E	200	↑	288	25+2x50+75	8	500	HPR6	🛠	300
8611403225709	G9E	225	↑	324	25+50+2x75	9	500	HPR6	🛠	330
8611403250709	G9E	250	↑	360	2x25+50+2x75	10	630	HPR6	🛠	350
8611403300709	G9E	300	↑	432	25+50+3x75	12	800	HPR6	🛠	390
8611403350709	G9E	350	↑	504	50+4x75	9	800	HPR6	🛠	410
8611403400709	G9E (II)	400	↑	576	2x50+4x75	14	1000	HPR6	🛠	570
8611403450709	G9E (II)	450	↑	648	25+50+5x75	18	1000	HPR12	🛠	620
8611403500709	G9E (II)	500	↑	720	50+6x75	13	1250	HPR12	🛠	670
8611403550709	G9E (II)	550	↑	792	2x50+6x75	19	1250	HPR12	🛠	720
8611403600709	G9E (II)	600	↑	864	8x75	8	1600	HPR12	🛠	770
8611403650709	G9E (II)	650	↑	936	50+6x75+150	16	800+630	HPR12	🛠	820
8611403750709	G9E (II)	750	↑	1080	6x75+2x150	10	800+800	HPR12	🛠	870
8611403825709	G9E (III)	825	↑	1191	5x75+3x150	11	800+1000	HPR12	🛠	1030
8611403900709	G9E (III)	900	↑	1299	4x75+4x150	12	1000+1000	HPR12	🛠	1080
8611403975709	G9E (III)	975	↑	1407	3X75+5X150	13	1000+1000	HPR12	🛠	1130
8611404105709	G9E (III)	1050	↑	1516	2x75+6x150	14	1250+1250	HPR12	🛠	1180

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)
- 🖧 indicates that the equipment is equipped with CCS
- 🛠 indicates that the CCS system is installable on the equipment

Hybrid and Dynamic Power Factor Correction

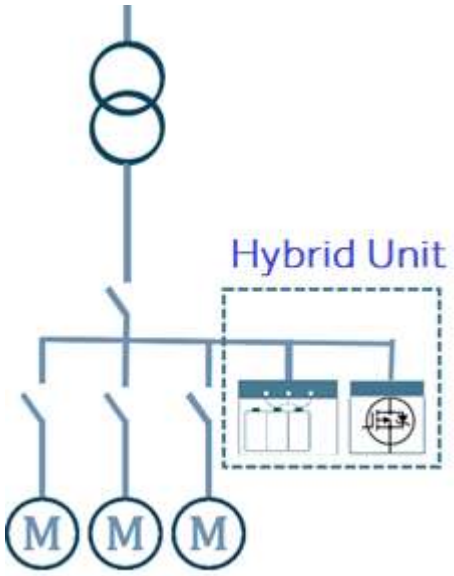
COMAR Condensatori

What is hybrid active correction?

Traditionally, poor power quality has been addressed through the integration of more dedicated and targeted device to solve the specific problem.

- A power factor correction unit is used if the power factor is inadequate.
- A harmonic filter (active or passive) is used if harmonics are identified as a problem.

Advances in diagnostic technology have led to the recognition that power quality problems arise from a combination of different problems and that a more flexible - **hybrid** - solution is needed, integrating troubleshooting into a single equipment.



How does it work?

Hybrid active power factor correction (**HSVG**) combines the technological advantages of dynamic generation with the discrete power of classical capacitor banks, driven by contactors or thyristors.

Connected in parallel to the load supply, the hybrid unit provides a dynamic and controlled current source that can adapt in real time to the changes in the grid.

Thanks to its logic, the system is able to simultaneously manage the steps of the capacitor banks providing the fundamental capacitive reactive power, and the dynamic power (both capacitive and inductive) provided by the integrated active system

The integration of the two technologies within the hybrid unit enables the simultaneous correction of reactive power, reduction of voltage fluctuations, flicker mitigation and phases unbalance in a single device.

Benefits

The hybrid correction solution solves a number of additional problems compared to conventional PFC equipment or passive filters:

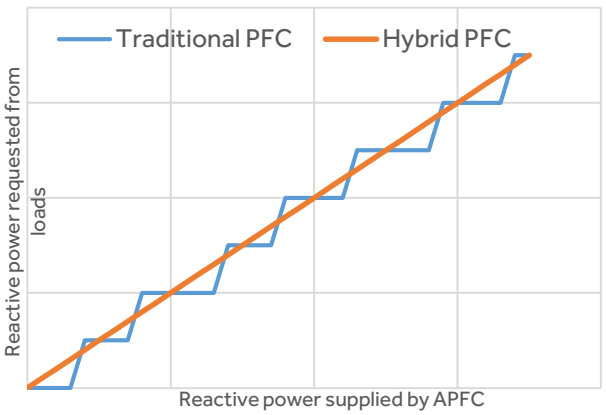
- voltage variations and fluctuations
- Injection of reactive energy into the grid both capacitive and inductive
- Unbalance between phases.
- Low costs compared to a 'pure' dynamic system due to conventional technology for reducing reactive power withdrawal from the grid

With the efficiency provided by electronic control

- Continuous, linear dynamic output: the typical 'steps' of systems with only capacitor banks or inductor banks are eliminated by the SVG component.
- Immediate reaction time
- The Human-Machine-Interface display allows intuitive and simple control.

Where is it needed?

- Highly variable loads
- Unbalance and power factor correction of lines with single-phase loads
- Voltage compensation (flicker)



General technical data common to all hybrid series

Hybrid Power Factor Correction

Hybrid correction can be implemented on all current COMAR power factor correction series.

The installation is similar to that of conventional power factor correction units, with the only additional need to carry the amperometric (CT) signals of all 3 phases.

The equipment leaves the factory already fully configured and therefore does not require any setting by the installer

The AAR/100 hybrid series configurations is given as examples

GENERAL TECHNICAL DATA COMMON TO ALL SERIES

Enclosure	Made of steel sheet, protected against corrosion by phosphating and epoxy powder coating. Colour RAL 7035. External degree of protection: IP31 Internal degree of protection: panels with interlocked switch-disconnector IP20 live parts; IP 20 protection in additional modules Capacitor banks are assembled on drawers that can be pulled out from the front of the cabinet for quick maintenance Cabinets are equipped with eyebolts for lifting
Installation	Indoor installation, in a well ventilated position free from solar radiation. Pollution degree 1 Working temperature: -5 / +40 °C; Relative humidity RH50% @40°C (EN61435-1) Altitude: <1000 asl
Main Disconnector	Three-phase off-load disconnector with door interlock.
Wiring	Internal connections are made with FS17-450/750V insulated, flame-retardant low smoke emission cables. On non-preinsulated cable lugs, the connection point is covered with a durable heat-shrink sleeve. Auxiliary circuits are appropriately identified in accordance with current standards.
Bank insertion	The banks are driven by three-phase contactors (Class AC6-b). Series without tuning reactor have contactors with a pre-insertion resistor to limit peak inrush current Static insertion series are fitted with thyristor insertion modules controlled by microprocessor such that switching on/off occurs when the potential difference between the mains and the capacitors is zero. (zero crossing). The switching time for the insertion of the capacitor banks is approximately 200 ms.
Fuses	The capacitive banks are protected by high breaking capacity fuses (100kA). The protection system for the power circuits uses NH-00 curve gG fuses; for the auxiliary circuits sectionable fuse holders and 10.3x38 fuses.
Auxiliary circuits	230 Vac Internal transformer
Capacitors	Single-phase capacitors made of self-healing metallised polypropylene (MKP), equipped with over-pressure device and discharge resistance. Impregnated with PCBs-free vegetable oilf. Delta connection. Continuous duty type. - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - capacitance tolerance: -5% / +10%. - Dielectric losses: ≤0.2 W/kvar; total dissipation losses: ≤0.4 W/kvar - temperature category: -25 / D In the higher-performance series, **'Heavy Duty'** capacitors made of high thickness film and multiple elements in series are installed to reduce the effect of high currents on the element heads
Tuning reactor (where present)	Iron core with oriented crystals; aluminium windings Resin impregnation Dissipation loss (average): 6W/kvar Over-temperature control probe
SVG	• Mosfest SiC technology • Real-time correction of reactive power and unbalance 99% efficiency • Connection: 3-phase (3-phase + neutral connection on request) Response time: 20ms
Controllers	• HPR+HMI 7" interconnected controllers with three-phase measurement • amperometric signals: by means of 3 current transformers with 5A secondary (not included) • response time: 20ms
Safety	Automatic unit shut-down for high THDi, THDu, loss of capacitance of the banks, over-temperature >50°C, under and overvoltage. bank block for inductance overtemperature (where present), low capacitance Dry contact NC for extreme internal temperature (>70°C)
Testing	100% of the equipment undergoes visual inspection, phase-to-phase and phase-to-ground insulation tests, bank efficiency and ventilation circuit checks.
Standards	Capacitors: IEC/EN 60831-1 / 2 certified by IMQ (V1927) Equipment: IEC/EN 61439-1 / 2, IEC/EN 61921; 2014/35/EC Electromagnetic compatibility: 2014/30/EC.

PERFORMANCE DATA

- **Rated voltage** 400 Vac (others on request)
- **Rated frequency** 50 Hz (60 Hz on request)
- **Insulation voltage** 690 Vac
- **Voltage overload** 1.1 Un (nominal voltage)
- **Capacitors** Un=500; Umax 550

HARMONIC CONTENT

THD(I)max. = 100 % in the grid

THD(U)max. = 3%. in the grid

p = 7%

PATENT PENDING · PATENT PENDING

The AAR/100-HSVG series **hybrid** equipments are particularly suitable for three-phase networks with **high harmonic content**. These devices guarantee accurate correction, even in the presence of **impulsive and unbalanced loads**, thanks to a hybrid logic that manages the SVG system and the multi-step system. **The AAR/100-HSVG** systems can correct **inductive and capacitive loads**.

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	Cable entry	In (A)	SVG power (kvar)	bank power (kvar)	Disconnector (A)	Weight (kg)
8560150400HS0	G6E	150	↓	216	50	2x50	400	200
8560175400HS0	G6E	175	↓	252	50	50+75	400	220
8560225400HS0	G6E	225	↓	324	75	2x75	400	240
8560300400HS0	G8E	300	↑	432	75	3x75	800	270
8560375400HS0	G8E(II)	375	↑	540	75	4x75	800	300

Note

For dimensions, please refer to the mechanical drawings section, referring to the 'Type' column.

- The cable entry (power supply) legend is as follows: ↑ from below, ↙ side up, ↓ from above,
- Rated power is expressed at rated voltage (Un)

SVG

Dynamic power factor correction

PERFORMANCE DATA

- **Operating voltage** 228V- 456V (up to 690V on request)
- **Rated frequency:** 50/60Hz auto selection (45Hz÷ 62Hz)
- **Inverter type:** Silicon Carbide Mosfet
- **Efficiency:** 99%
- **Switching frequency** 40kHz (average)
- **Response time:** <50us (full correction <15ms)
- **correction level:** >97%
- **Power supply** Three-phase, 3-wire or 4-wire (3-phase+neutral)
- **Rated neutral current** 3In (4-wire type only)

Static Var Generators are part of the new electronic power factor correction equipment capable of generating capacitive and inductive reactive energy. Particularly useful in presence of photovoltaic system
They are also characterised by a fast response to load variations and the ability to balance currents on the 3 phases

TECHNICAL DATA

Power factor correction	inductive and capacitive correction
Unbalance compensation	phase-by-phase compensation of unbalanced loads
Communication protocol	RS485 port, RJ45; MODBUS RTU protocol, TCP/IP
Protections	overvoltage, undervoltage, overtemperature
TA Report	150/5 ÷ 30.000/5 A
Degree of protection	IP20
Power losses	≤1%
Assembly	wall or cabinet
Operating temperature	-20 to 40°C (downgraded for temperature > 40°C).
Relative humidity	<95% without condensation formation
Storage temperature	-20 ÷ 70°C
Noise level	< 65 dB
Altitude	≤ 1,500m (from 1,500m to 4,000m, 1% downgrade per 100m)

QUALITY AND TESTING

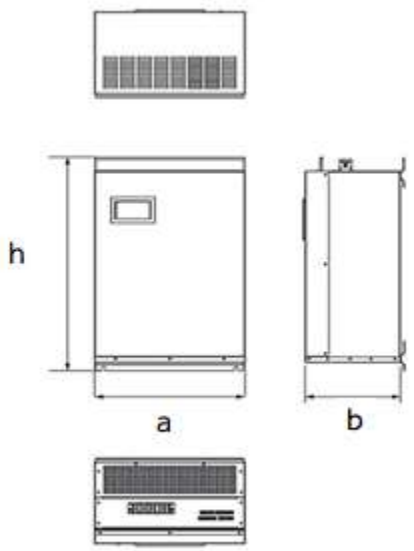
Regulations	EEE519, ER GS/4 and IEC 61000
Certifications	CE
Testing	100% of equipment undergoes visual inspection, insulation testing phase-to-phase and phase-to-ground, power testing and ventilation circuit checks

STANDARD CONFIGURATION

Code	REACTIVE POWER OUTPUT to (kvar)	Dimensions a x b x h (mm)	Weight (kg)
775-30**	30	500 x 88 x 470	24
775-50**	50	500 x 88 x 470	24
775-100**	100	500 x 100 x 520	31
775-200**	200	500 x 220 x 646	63

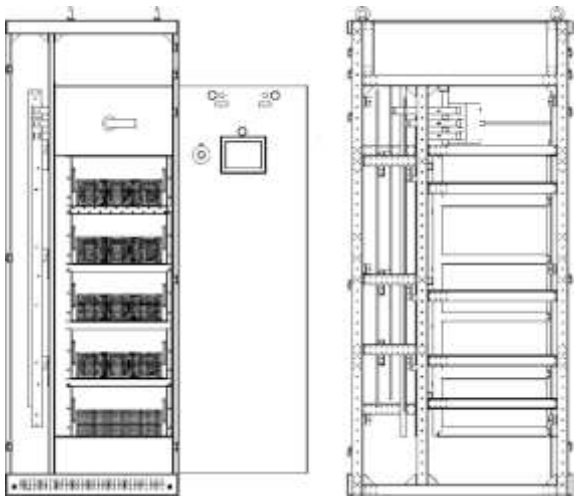
** code suffix depends on features (no. of wires, mounting,)

WALL CONFIGURATION



IN-PANEL CONFIGURATION

For higher powers, cabinet solution consisting of rack modules.



Power Quality

Since some years, many types of applications have been showing an increasing focus on **power quality** where the loads used in the production process can adversely affect the electrical system, reducing - even drastically - the quality of the power itself.
Insufficient power quality therefore has an impact on the efficiency of systems, their availability, the quality of processing, the reliability of machinery, safety, and finally operating costs.
'Energy quality' means:

- Continuity of supply: the absence of interruptions in the provision of electricity service
- The characteristic of voltage and current, intended as the quality of the waveform (amplitude, frequency, variations, etc.).

The increasing popularity of microprocessor-based equipment and power electronics components used in production machinery has contributed greatly to the occurrence of disturbances of electrical variables in networks. Power quality problems range from untimely tripping of circuit breakers, overheating of the neutral, flicker, blocking of electronic equipment, overloads

Harmonics are disturbances, in voltage and current, that distort the original shape of the sinusoid, and have a frequency multiple of the fundamental frequency a (e.g. n x 50Hz).

These unwanted frequencies cause numerous symptoms, including overheating of the neutral conductor and of the power transformers supplying these circuits. (see third harmonic effect) .

Harmonics originate from the action of non-linear loads, such as static converters, variable speed drives, arc welders, diode controlled power controls, etc.

In overall terms, current harmonics can reduce the efficiency of an electrical system, damage its insulators - on lines and machines - and create malfunctions on various components. When symptoms related to harmonics occur, it is necessary to carry out a measurement campaign by observing the total harmonic distortion (THD).

A significant increase in THD under varying load conditions makes it possible to establish a comparison in percentage terms of the current level of each harmonic with respect to the total current flow of the fundamental in the system. Knowing the effects caused by each harmonic current and comparing them with the identified symptoms helps in troubleshooting. The origin of the harmonic must then be isolated and resolved through the appropriate installation of harmonic filters.

The **power factor** is crucial for power quality as it regulates excessive reactive power and reduces unnecessary currents as well as voltage drops.
This implies a reduction in joule losses and thus an immediate improvement of the lines and components that make up the system: in fact, the load on the transformers and lines is reduced, and over-dimensioning can be avoided at the design or expansion stage.
Installing appropriately sized capacitor banks is therefore the first action to consider, requiring power factor correction equipment with tuning reactor in the presence of harmonics.

Frequency variation is an alteration of the mains frequency from the nominal frequency. As an average value, the Regulations takes the one measured within a 10-second interval.
The European frequency of 50 Hz must be maintained for 95 % of the year within a tolerance of ±1 %, while at no time it must exceed an increase of 4 % or a decrease of 6 %. What causes a frequency variation are faults in the generation and transmission system, or even sudden shutdowns of large generators. Negative effects occur in terms of speed variation of motors and possible functional faults on electronic equipment.

A **transient** (impulsive/oscillatory) is a temporary change in voltage of an electrical circuit, due to a disturbance, caused by shunting surges or currents in series inductances.
Voltage transients can cause symptoms ranging from computer crashes and damage to electronic equipment, to the occurrence of discharges and damage to the insulation of distribution equipment. They are manifested by significant voltage increases, lasting only a few microseconds, and are often caused by lightning strikes and the abnormal switching of capacitor banks, or by the return of systems to operation after a power failure, the switching of loads consisting of motors, the switching on or off of loads consisting of fluorescent lamps or high-intensity discharge lamps, the switching of transformers, or the sudden shutdown of certain types of equipment.

In presence of transients, it is necessary to monitor the load in order to associate operating problems or equipment failures with events occurring in the distribution system.

Power Quality Problems & Solutions

Flicker is a phenomenon produced by sudden and repetitive voltage variations. The causes can be varied: from the switching on and off of large loads to the starting of motors, from the presence of arc furnaces to high-power crushers, as well as the use of welding systems or converters.
Depending on how dynamic the load variations are, correction can be obtained with dynamic or hybrid correction systems, and/or active filters. In any case, the dimensioning of flicker compensation requires a measurement of short-term load trends.

Voltage unbalance is one of the most common problems in electrical networks and occurs when one phase is overloaded by assuming a different voltage value than the other phases.

As they are often overlooked, imbalances can become the cause of serious damage to electrical and electronic equipment, especially to transformers and three-phase motors which, in the presence of asymmetries, may be subject to problems of overheating, abnormal noise, excessive vibration and premature failure. In fact, in a 400V motor, apparently small voltage imbalances (2-3%) cause a current imbalance that can exceed 20%, with a temperature rise of more than 30 °C. In these cases, it is necessary to have a voltage stabiliser, which detects and compensates voltage imbalances automatically and independently on each phase.

Voltage fluctuations include voltage drops or voltage rises and are solved by installing a voltage stabiliser that guarantees an output voltage around the rated value.

Voltage sags are responsible for most power quality problems and occur when the voltage drops below 90% and up to 10% (below becomes interruption) of its nominal value. Common symptoms of dips include dimming of incandescent lights, freezing of computers, shutdowns of sensitive electronic equipment, loss of data (memory) of programmable controllers and problems in the control of relays.

Voltage surges above 110% of the nominal value) occur less frequently, but

may cause the equipment to break down, often resulting in the power supply of the electronics.

Some failures may not occur immediately, causing components to fail prematurely.

The main causes of surges include the sudden switch-off of large loads and the abnormal switching of power factor correction capacitors.

AHF • SAF-M

Active Harmonic Filters

COMAR Condensatori

COMAR invests in Power Quality

The experience gained in the energy efficiency sector, as a leader in the design of the best correction solutions, allowed COMAR to get in touch with industrial realities with high energy requirements, such as the steel, petrochemical, paper, packaging, cement and automotive industries.
Thanks to this experience and strategic agreements with specialised partners, COMAR has been able to complement its power factor correction systems with solutions for active harmonic filtering, dynamic power factor correction and to develop the hybrid power factor correction line in-house.

The value proposition is further extended by the establishment of a dedicated Power Quality team capable of supporting companies with a range of tailor-made services, such as:

Power Quality Measurements and Network Analysis
Voltage and current harmonics
Compatibility curves
Unbalanced loads and tension
Active, reactive and distorting power
Identification of anomalies, sources of disturbance, definition of solutions

Power Quality test measurements EN50160
Frequency analysis
Voltage variations
Flicker severity
Tension imbalance
Voltage harmonics
Voltage events, interruptions, dips and surges
Report EN50160

Instrumentation used, depending on the type of analysis: class S or class A analyser, according to IEC61000-4-30.

AHF

Active Harmonic Filters

DATI DI PERFORMANCE

- **Operating voltage** — 228 - 456Vac (up to 690V on request)
- **Frequency** — 45Hz÷ 62Hz (auto)
- **Inverter type:** — Silicon Carbide Mosfet
- **Efficiency:** — 99%
- **Switching frequency** — 40kHz (average)
- **Response time:** — <50us
- **Power supply** — Three-phase, 3-wire or 4-wire
- **Rated neutral current** — 3In (4-wire type only)
- **Residual THDI** — < 5% (at full load)

TECHNICAL DATA

Power factor correction	inductive and capacitive correction
Unbalance compensation	phase-by-phase compensation of unbalanced loads
Harmonic current compensation	Up to the 50th harmonic (both odd and even order)
Communication protocol	RS485 port, RJ45; MODBUS RTU protocol, TCP/IP
Protections	Abnormal voltage/frequency; Inverter short-circuit; Abnormal output current; Inverter overload; Overtemperature
TA Report	150/5 ÷ 30.000/5 A
Degree of protection	IP20
Power losses	≤3%
Assembly	wall or cabinet
Operating temperature	-20 to 40°C (downgraded for temperature > 40°C).
Relative humidity	<95% without condensation formation
Storage temperature	-20 ÷ 70°C
Noise level	< 65 dB
Altitude	≤ 1,500m (from 1,500m to 4,000m, 1% downgrade per 100m)

QUALITY AND TESTING

Regulations EEE519, ER GS/4 and IEC 61000

Certifications CE

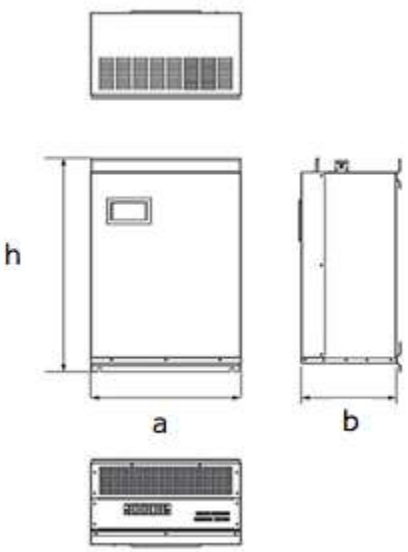
Testing 100% of equipment undergoes visual inspection, insulation testing phase-to-phase and phase-to-ground, power testing and ventilation circuit checks

Table

Code	HARMONIC CURRENT compensable (A)	Dimensions a x b x h (mm)	Weight (kg)
778-25**	25	500x470x88	24
778-35**	35	500x470x88	24
778-50**	50	500x470x88	24
778-60**	60	500*470*88	27
778-75**	75	500*470*88	27
778-100**	100	500*520*88	27
778-150**	150	500*520*100	31
778-300**	300	500*646*220	63

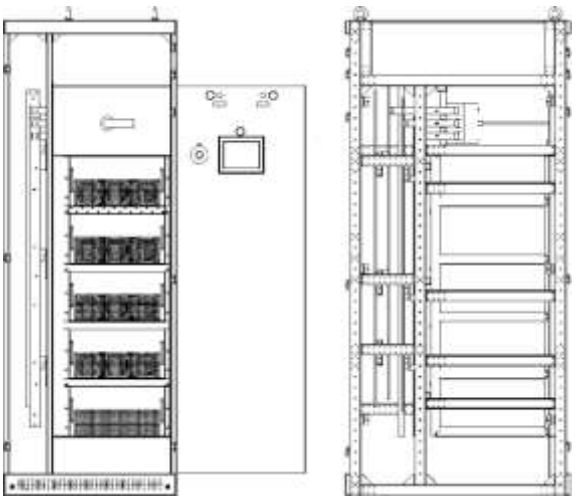
** the code suffix depends on the characteristics (voltage, no. of wires, mounting,)

WALL CONFIGURATION



IN-PANEL CONFIGURATION

For higher powers, cabinet solution consisting of rack modules.



SAF-M

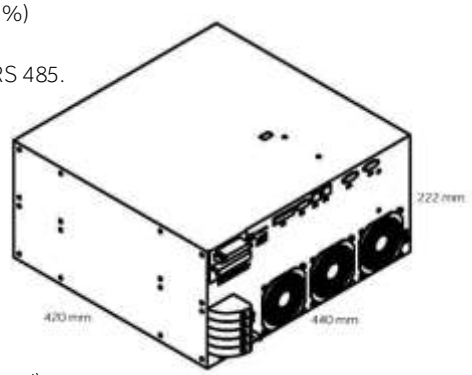
Active Harmonic Filters

SAF-M active filters are the ideal solution for compensating the most demanding harmonic currents, with any type of non-linear load involved, and has a specially **designed modular design** for easy assembly in the cabinet and flexibility in applications. Installation, by the customer, must include the protection device and 3 CTs.

- **Rated voltage** — **3-wire: 380 - 480 Vac**, **4-wire: 380 - 415** Vac
- **Rated frequency** — **50 Hz / 60Hz**
- **Inverter topology** — 3-level NPC topology, IGBT
- **Switching frequency** — 16 kHz
- **Response time** — <100 µs
- **Harmonic currents offset** — Up to the **50th** harmonic (odd and even orders)
- **Residual THDI (current)** — < 5
- **Power supply** — Three-phase, 3-wire or 4-wire (3-phase+neutral)
- **Max. compensated harmonic current / on neutral** — 60 Arms / 180 Apk

TECHNICAL DATA

Power factor correction	cos φ = -0.7 ... 1 ... 0.7 (inductive and capacitive correction).
Power losses	<1100 W at full mitigation efficiency (<2.6%) <970 W in typical operation (<2.3%)
Communication interface	Ethernet TCP/IP, Modbus RTU RS 485.
Digital I/O	2 DI + 2 DO.
T.A. Report	xx:5 A or xx:1 A.
Degree of protection	IP 20 / 21.
Weight (single module)	44 Kg.
Assembly	Wall mounting (vertical or horizontal).
Ambient temperature	0 ... 50°C at full power, up to 55°C with 3% degradation per Kelvin.
Noise level	< 56 to 63 dB A (depending on the load situation).
Altitude	< 1000 m without degradation; up to 4000 m with 1% degradation / 100 m



Display Module

In addition, the SAF-M filter is equipped with the LCD display module, which is used to monitor the measured values of the three-phase network and to change the filter parameters. A display module fits all power supply modules and can be used in any system configuration, whether it is a single power supply module, a dual power supply or a cabinet installation.

QUALITY AND CERTIFICATIONS

Regulations	IEE 519, EN 61000-3-12
Certifications	CE, UL

Our Active Filter solutions, and their codes, are available on request.

RCM • RCL • RPC

Modular capacitors banks

COMAR Condensatori

RCM

Capacitor banks for COMAR switchboard types G6E and G8E

The **RCM** series banks are designed for our **G6E** and **G8E** type cabinets. Inside each rack are assembled triads of single-phase capacitors. Versions with blocking inductors (AAR/... series) are available for high levels of harmonic current distortion.

PERFORMANCE DATA

Tolerance on capacitance	-5% / +10
Rated frequency	50 Hz
Power supply	Three-phase + earth
Voltage overload	1.1 Un (max. 8 hrs. per 24)
Safety System	Overpressure device Thermal probe (reactor)
Auxiliary circuits	230 Vac

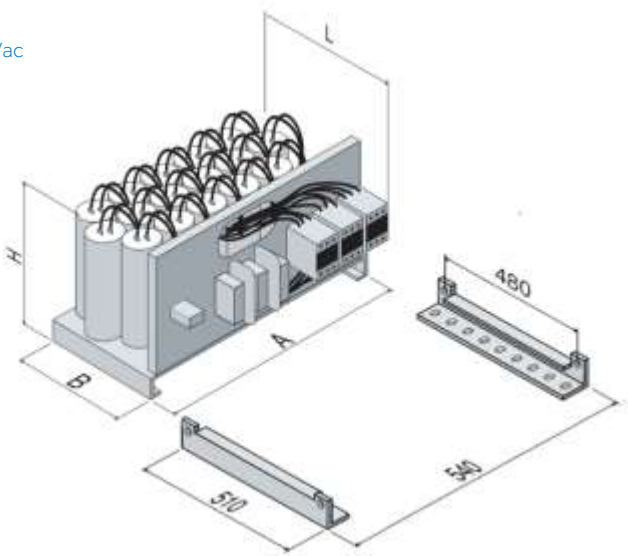
HARMONIC CONTENT

RESONANCE NOT ADMITTED for Bxx series

RCM-B15:	THD(I)max. = 15%.	in the grid
RCM-B35:	THD(I)max. = 25 %	in the grid
RCM-B50:	THD(I)max. = 35 %	in the grid
RCM-AAR/...	THD(I)max. = 100 %	in the grid

TECHNICAL DATA

Rack	Made of galvanised sheet steel.
Ventilation	Not present. By the installer/assembler.
Installation	Indoor, in enclosure not exposed to direct sunlight.
Protection degree	IP 00.
Fuses	The capacitive banks are protected by fuses. The protection of the power circuits (fuses NH-00 curve gG) involves the use of high breaking capacity fuses (100kA).
Contactors	3-phase Class AC6-b contactor suitable for switching capacitive loads.
Capacitors	Single-phase capacitors made of self-healing metallised polypropylene (MKP), equipped with over-pressure device and discharge resistor. Impregnated with PCBs-free vegetable oil. Delta connection. Continuous duty type. - nominal voltage / max. voltage **- B15**: 415 Vac / 450 Vac **- B35**: 450 Vac / 500 Vac **- B50:** 500 Vac / 550 Vac **- AAR/100, AAR/600:** 500 Vac / 550 Vac **- AAR/6, AAR/138, AAR/D20:** 550 Vac / 600 Vac - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - capacitance tolerance: -5% / +10%. - dissipation losses: ≤0.4 W/kvar
Tuning reactors	AAR/100 - AAR/600 - AAR/D20: • Tuning frequency: 189 Hz (p = 7%) • Power losses: 6 W / kvar (AVG) AAR/138: • Tuning frequency: 138 Hz (p = 14%) • Power losses: 6.5 W / kvar (AVG) All equipped with temperature probe to shut Down the bank in case of overtemperature
Thermal category	-25°C / D.
Working temperature	-5°C / +40°C



QUALITY AND TESTING

Regulations	IEC / EN 60831-1/2. EN 61921.
European Directives	Low voltage: 2014/35/EC; Electromagnetic compatibility: 2014/30/EC.
Testing	100% of equipment undergoes visual inspection, insulation testing: phase-to-phase and phase-to-ground, power testing checks

STANDARD CONFIGURATIONS

Note

- Capacitor banks must be protected by a disconnection and protection device and earthed. (in charge of installer)
- The racks are available in different series, for applications with different current harmonic content or different voltage harmonic content (series with inductances), permissible on capacitors.
- Dimension 'L' refers to the overall depth, taking the contactor into account.

Without tuning reactor:

RCM-B15: THD(I)max. = 15% in the network
THD(Ic)max. = 50% on capacitors

RCM-B35: THD(I)max. = 25% in the network
THD(Ic)max. = 70% on capacitors

RCM-B50: THD(I)max. = 35% in the network
THD(Ic)max. = 80% on capacitors

With tuning reactor

RCM-AAR/100 (p=7%) THD(I)max. = 100% in the network
THD(U)max. = 3% in the network

RCM-AAR/600 (p=7%) THD(I)max. = 100% in the network
THD(U)max. = 6% in the network

RCM-AAR/6 (p=7%) THD(I)max. = 100% in the network
THD(U)max. = 10% in the network

RCM-AAR/D20 (p=7%) THD(I)max. = 100% in the network
THD(U)max. = 20% in the network

RCM-AAR/138 (p=14%) THD(I)max. = 100% in the network
THD(U)max. = 6% in the network

Without tuning reactor: Qn expressed at Un=415V

Type							
RCM-B15	RCM-B35	RCM-B50	Qn	In	bank power	Dimensions	Weight
Code	Code	Code	(kvar)	(A)	(kvar)	H x B x L x H (mm)	(kg)
8701412500420	8791412500440	8721412500450	50	70	50	532 x 375 x 480 x 300	15
8701413050420	8791413050440	8721413050450	50	70	2x25	532 x 375 x 480 x 300	18
8701412750420	8791412750440	8721412750450	75	104	75	532 x 375 x 480 x 300	20
8701413075420	8791413075440	8721413075450	75	104	25+50	532 x 375 x 480 x 300	23
8701413100420	8791413100440	8721413100450	100	139	2x50	532 x 375 x 480 x 300	25
8701413150420	8791413150440	8721413150450	150	209	2x75	532 x 375 x 480 x 300	29
8701414015420	8791414015440	8721414015450	150	209	25+50+75	532 x 375 x 480 x 300	30

With tuning reactor Qn expressed at Un=400V

Code	Type	Qn	In	bank power	Dimensions	Weight
		(kvar)	(A)	(kvar)	H x B x W x H (mm)	(kg)
8731402125750	RCM-AAR/100	12,5	18	12,5	532 x 375 x 480 x 300	24
8731402250750	RCM-AAR/100	25	36	25	532 x 375 x 480 x 300	30
8731402500750	RCM-AAR/100	50	72	50	532 x 375 x 480 x 300	44
8731402750750	RCM-AAR/100	75	108	75	532 x 375 x 480 x 300	56
8731403050750	RCM-AAR/100	50	72	2x25	532 x 375 x 480 x 300	64
8731403075750	RCM-AAR/100	75	108	25+50	532 x 375 x 480 x 300	69
8831402125700	RCM-AAR/138	12,5	18	12,5	532 x 375 x 480 x 300	26
8831402225700	RCM-AAR/138	25	36	25	532 x 375 x 480 x 300	33
8831402500700	RCM-AAR/138	50	72	50	532 x 375 x 480 x 300	45
8831403050700	RCM-AAR/138	50	72	2x25	532 x 375 x 480 x 300	58
8741402125650	RCM-AAR/600	12,5	18	12,5	532 x 375 x 480 x 300	26
8741402225650	RCM-AAR/600	25	36	25	532 x 375 x 480 x 300	34
8741402500650	RCM-AAR/600	50	72	50	532 x 375 x 480 x 300	46
8741403050650	RCM-AAR/600	50	72	2x25	532 x 375 x 480 x 300	56
8741403075650	RCM-AAR/600	75	108	75	532 x 375 x 480 x 300	68
8741402250130	RCM-AAR/6	25	36	25	532 x 375 x 480 x 300	38
8741402500130	RCM-AAR/6	50	72	50	532 x 375 x 480 x 300	50
8901402250620	RCM-AAR/D20	25	36	25	532 x 375 x 480 x 300	34
8901402500620	RCM-AAR/D20	50	72	50	532 x 375 x 480 x 300	46

RCL

Capacitor banks for COMAR switchboard type G9E

The RCL series drawers are designed for our **G9E-type** cabinets. Inside each drawer are assembled triads of single-phase capacitors. The versions shown in the catalogue are all equipped with blocking inductors, for applications with a high level of current harmonic distortion.

PERFORMANCE DATA

Tolerance on capacitance	-5% / +10
Rated frequency	50 Hz
Power supply	Three-phase + earth
Voltage overload	1.1 Un (max. 8 hrs. per 24)
Safety System	Overpressure device Thermal probe (reactor)
Auxiliary circuits	230 Vac

HARMONIC CONTENT

RCL-AAR/138:	THD(I)max. = 100 % THD(U)max. = 6%.	in the grid in the grid
RCL-AAR/D20	THD(I)max. = 100 % THD(U)max. = 20 %	in the grid in the grid

TECHNICAL DATA

Rack	Made of galvanised sheet steel.
Ventilation	Not present. By the installer/assembler.
Installation	Indoor, in enclosure not exposed to direct sunlight.
Protection degree	IP 00.
Fuses	The capacitive banks are protected by fuses. The protection of the power circuits (fuses NH-00 curve gG) involves the use of high breaking capacity fuses (100kA).
Contactors	3-phase Class AC6-b contactor suitable for switching capacitive loads.
Capacitors	Single-phase capacitors made of self-healing metallised polypropylene (MKP), equipped with over-pressure device and discharge resistor. Impregnated with PCBs-free vegetable oil. Delta connection. Continuous duty type. - nominal voltage / max. voltage - AAR/138: 500 Vac / 550 Vac - AAR/D20: 550 Vac / 600 Vac - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - capacitance tolerance: -5% / +10%. - dissipation losses: ≤0.4 W/kvar
Tuning reactors	For AAR/D20 series: • Tuning frequency: 189 Hz (p = 7%) • Power losses: 6 W / kvar (AVG) For AAR/138 series: • Tuning frequency: 138 Hz (p = 14%) • Power losses: 6.5 W / kvar (AVG) All equipped with temperature probe to shut-down the bank in case of overtemperature
Thermal category	-25°C / D.
Working temperature	-5°C / +40°C

QUALITY AND TESTING

Regulations	IEC / EN 60831-1/2. EN 61921.
European Directives	Low voltage: 2014/35/EC; Electromagnetic compatibility: 2014/30/EC.
Testing	100% of equipment undergoes visual inspection, insulation testing: phase-to-phase and phase-to-ground, power testing checks

STANDARD CONFIGURATIONS

Note

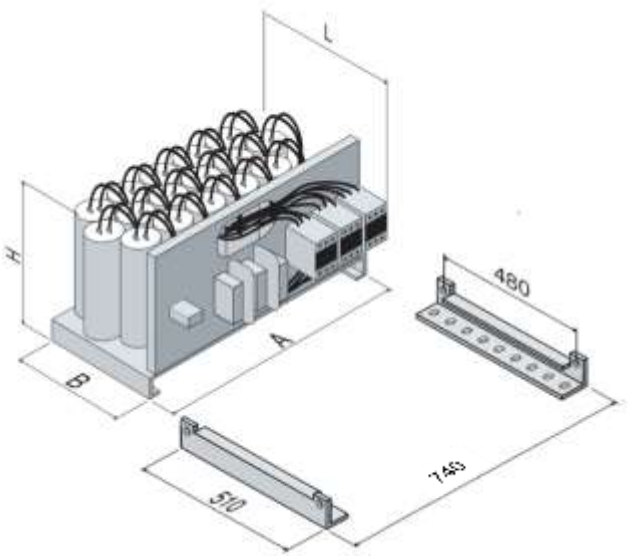
- The power rating is expressed at 400 V - 50 Hz.
- Capacitor banks must be protected by a disconnection and protection device and earthed. (in charge of installer)
- The racks are available in different series, for applications with different current harmonic content or different voltage harmonic content (series with inductances), permissible on capacitors.
- Dimension 'L' refers to the overall depth, taking the contactor into account.

With tuning reactor (and 130°C temperature probe, N.C.):

RCL-AAR/138: THD(I)max. = 100% in the network
THD(U)max. = 6% in the network

RCL-AAR/D20: THD(I)max. = 100% in the network
THD(U)max. = 20% in the network

Code	Type	Qn (kvar)	In (A)	bank power (kvar)	Dimensions A x B x L x H (mm)	Weight (kg)
8831402250900	RCL-AAR/138	25	36	25	732 x 375 x 480 x 300	35
8831402500900	RCL-AAR/138	50	72	50	732 x 375 x 480 x 300	43
8831403050900	RCL-AAR/138	50	72	2x25	732 x 375 x 480 x 300	68
8831402750900	RCL-AAR/138	75	108	75	732 x 375 x 480 x 300	60
8901402250720	RCL-AAR/D20	25	36	25	732 x 375 x 480 x 300	44
8901402500720	RCL-AAR/D20	50	72	50	732 x 375 x 480 x 300	70
8901403050720	RCL-AAR/D20	50	72	2x25	732 x 375 x 480 x 300	74
8901402750720	RCL-AAR/D20	75	108	75	732 x 375 x 480 x 300	85



RPC

Capacitor banks for 19'' switchboard

RPC series drawers are designed for installation inside standard **Data** and **Power Centre** cabinets using **19-inch** drawers. .

PERFORMANCE DATA

Tolerance on capacitance	-5% / +10
Rated frequency	50 Hz
Power supply	Three-phase + earth
Voltage overload	1.1 Un (max. 8 hrs. per 24)
Safety System	Overpressure device
Auxiliary circuits	230 Vac

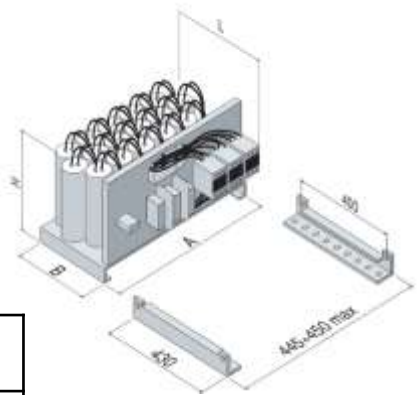
HARMONIC CONTENT

RESONANCE NOT ADMITTED

RPC-B15:	THD(I)max. = 15%. THD(Ic)max. = 50 %	in the grid on capacitors
RPC-B50:	THD(I)max. = 35 % THD(Ic)max. = 80 %	in the grid on capacitors

TECHNICAL DATA

Rack	Made of galvanised sheet steel.
Ventilation	Not present. By the installer/assembler.
Installation	Indoor, in enclosure not exposed to direct sunlight.
Protection degree	IP 00.
Fuses	The capacitive banks are protected by fuses. The protection of the power circuits (fuses NH-00 curve gG) involves the use of high breaking capacity fuses (100kA).
Contactors	Suitable for switching capacitive loads with pre-insertion resistors.
Capacitors	Single-phase capacitors made of self-healing metallised polypropylene (MKP), equipped with over-pressure device and discharge resistor. Impregnated with PCBs-free vegetable oil. Delta connection. Continuous duty type. - nominal voltage / max. voltage B15: 415 Vac / 450 Vac || B50: 500 Vac / 550 Vac - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - capacitance tolerance: -5% / +10%. - dissipation losses: ≤0.4 W/kvar
Thermal category	-25°C / D.
Working temperature	-5°C / +40°C



STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	In (A)	Batteries (kvar)	Dimensions A x B x L x H (mm)	Weight (kg)
8701412250320	RPC-B15	25	35	2	440 x 340 x 490 x 270	11
8701412375320	RPC-B15	37,5	52	3	440 x 340 x 490 x 270	13
8701412500320	RPC-B15	50	70	4	440 x 340 x 490 x 270	17
8701412750320	RPC-B15	75	104	3	440 x 340 x 490 x 270	19
8701413100320	RPC-B15	100	139	4	440 x 340 x 490 x 270	23
8701414010320	RPC-B15	100	139	2	440 x 340 x 490 x 270	23
8721412250350	RPC-B50	25	35	2	440 x 340 x 490 x 270	13
8721412375350	RPC-B50	37,5	52	3	440 x 340 x 490 x 270	15
8721412500350	RPC-B50	50	70	4	440 x 340 x 490 x 270	19
8721412750350	RPC-B50	75	104	3	440 x 340 x 490 x 270	21
8721413100350	RPC-B50	100	139	4	440 x 340 x 490 x 270	25
8721414010350	RPC-B50	100	139	2	440 x 340 x 490 x 270	25

Note

- The power rating is expressed at 400 V - 50 Hz.
- Capacitor banks must be protected by a disconnection and protection device and earthed. (in charge of installer)
- Racks are available in different series, for applications with different current or voltage harmonic content on capacitors.
- Dimension 'L' refers to the overall depth, taking the contactor into account.

QUALITY AND TESTING

Regulations	IEC / EN 60831-1/2. EN 61921.
European Directives	Low voltage: 2014/35/EC; Electromagnetic compatibility: 2014/30/EC.
Testing	100% of equipment undergoes visual inspection, insulation testing: phase-to-phase and phase-to-ground, power testing checks

MK-AS • CT15 – 50 • CTB

Power Factor Correction Capacitors

MK-AS

Single-Phase Capacitors for Power Factor Correction

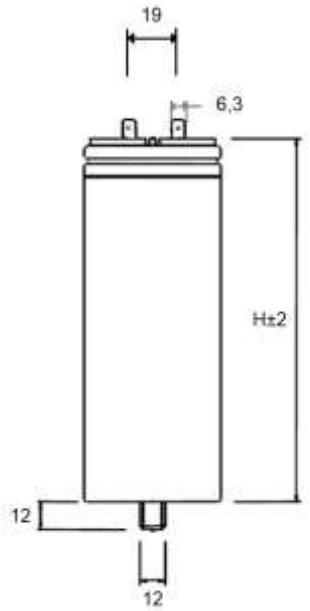
PERFORMANCE DATA

Tolerance on capacitance	-5% / +10%.
Rated frequency	50 Hz (60 Hz on request)
Power supply	Single-phase
Voltage overload	1.1 Un (max. 8 hrs. per 24)
Safety System	Overpressure device
Expected life	80,000 / 130,000 hours

MK-AS capacitors are particularly suitable for **low-voltage** power factor correction. These cylindrical capacitors are manufactured with an aluminium housing. The construction features of the series make the MK-AS a component of excellent quality and reliability.
Supplied complete with fixing nut and discharge resistor

TECHNICAL DATA

Dielectric	Self-healing metallised polypropylene (MKP),
Case	Aluminium.
Execution	Vegetable oil, PCB-free. On request: dry type, resin.
Fixing	M12 shank. Nut and washer (included).
Degree of protection	IP 00.
Overvoltage and insulation test	2.15 Un / 10 seconds between terminal and terminal. 3000 Vac / 10 seconds between terminals and housing.
Dielectric loss	≤ 0.2 W / kvar.
Total capacitor losses	≤ 0.4 W / kvar.
Discharge resistor	Included (50V within 30 seconds).
Safety System	Anti-explosion device
Max. voltage variation / time	< 30V / µs
Thermal category	-25°C / D.
Working temperature	Maximum: +55°C. Daily average: +45°C Annual average: +35°C
Type of service	Continuous for indoor use.



QUALITY AND TESTING

Regulations	IEC EN 60831-1 : 2015. IEC EN 60831-2 : 2015; certified by IMQ (V1927).
European Directives	Low voltage: 2014/35/EC.
Testing	Each condenser undergoes three quality checks during the production stages. Checks include measurement of capacitance, dissipation factor [tan(δ)], verification of insulation to earth and overvoltage resistance

STANDARD CONFIGURATIONS

Code	Power nominal (kvar)	capacitance (µf)	Nominal voltage (Un)	Dimensions (D x H)	Fixing	Terminals
8490461	3,6	66,6	415	60 x 141	M12	Faston
8490581	6,7	124,0	415	60 x 185	M12	Faston
8490431	1,9	31,0	440	60 x 107	M12	Faston
8490465	3,3	55,0	440	60 x 131	M12	Faston
8490384	5,1	84,0	440	60 x 185	M12	Faston
8490492	5,6	92,0	440	65 x 185	M12	Faston
8490438	2,3	38,5	450	60 x 107	M12	Faston
8490487	4,9	77,0	450	60 x 107	M12	Faston
8490496	5,7	105,0	450	65 x 185	M12	Faston
8490639	3,0	38,5	500	65 x 107	M12	Faston
8490556	4,4	56,0	500	65 x 185	M12	Faston
8490577	6,0	77,0	500	65 x 185	M12	Faston
8490621	2,0	21,0	550	60 x 107	M12	Faston
8490650	4,7	50,0	550	65 x 185	M12	Faston

Series of **DMP** capacitors, which provide longer life due to **wave-cut** technology:

Code	Power nominal (kvar)	capacitance (µf)	Nominal voltage (Un)	Dimensions (D x H)	Fixing	Terminals
8490540	3,66	38,5	550	65 x 107	M12	FD
8490766	6,33	66,6	550	65 x 185	M12	FD
8490767	7,32	77	550	65 x 185	M12	FD

CT15 - 50

Three-Phase Capacitors for Power Factor Correction

PERFORMANCE DATA

Rated voltage (Un)	415V
Tolerance on capacitance	-5% / +10
Rated frequency	50 Hz
Power supply	Three-phase
Voltage overload	1.1 Un (max. 8 hrs. per 24)
Safety System	Overpressure device
Expected life	80,000 / 130,000 hours

The three-phase modular capacitors of the **CT** series are designed for fixed low-voltage power factor correction. The construction of the capacitors is designed to guarantee optimum thermal dissipation. Three single-phase MKAS units are assembled inside, each equipped with an anti-explosion device.

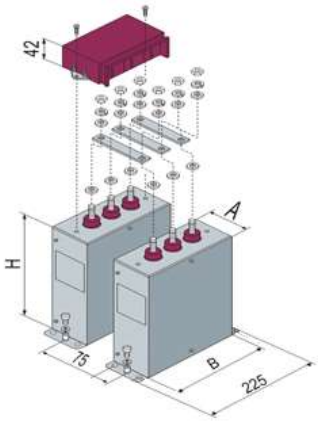
HARMONIC CONTENT

RESONANCE NOT ADMITTED

CT15:	THD(I)max. = 15%.	in the grid
CT50:	THD(I)max. = 35 %	in the grid

TECHNICAL DATA

Dielectric	Self-healing metallised polypropylene (MKP),
Case	Metal (external housing).
Execution	Vegetable oil, PCB-free. On request: dry type, resin.
Fixing	Screw, max. tightening torque per rheophole: 7Nm
Degree of protection	IP 40 with cover.
Test voltage	2.15 Un / 10 seconds between terminal and terminal. 3000 Vac / 10 seconds between terminals and housing.
Dielectric leakage	≤ 0.2 W / kvar.
Total capacitor losses	≤ 0.4 W / kvar.
Discharge resistor	Included (75V residual within 3 minutes).
Max. Voltage variation	25V / µs
Thermal category	-25°C / D.
Type of service	Continuous for indoor use.



STANDARD CONFIGURATIONS

Code	Type	capacitance	Nominal Parameters			Parameters at 440V		Terminals	Weight
		µF	kvar	V	A	kvar	A	Screw	kg
8371103	CT15	3 x 21	3,4	415	4,7	4,3	5,7	M8	2,4
8371106	CT15	3 x 38,5	6,25	415	8,7	8,0	10,4	M8	2,8
8371112	CT15	3 x 77	12,5	415	17,4	15,9	20,9	M8	3,3
8371122	CT15	3x124	20	415	27,8			M8	3,8
8373505	CT50	3 x 21	3,4	415	4,7	4,3	5,7	M8	2,4
8373510	CT50	3 x 38,5	6,25	415	8,7	8,0	10,4	M8	2,9
8373512	CT50	3 x 77	12,5	415	17,4	15,9	20,9	M8	3,4

Note

- Parallel connection bars, which allow modularity of the product, have a maximum capacity of 72A and are included in the supply.
- The dimensions are fixed: A = 70 mm; B = 210 mm; H = 250 mm
- The CT series units are always mounted vertically.
- In order to realise power factor correction batteries, the use of suitable discharge resistors and peak current limitation systems at insertion must be considered, compatible with the capacitor characteristics (25 A / µF).

QUALITY

Regulations	IEC EN 60831-1 : 2015. IEC EN 60831-2 : 2015.
European Directives	Low voltage: 2014/35/EC.

Cylindrical three-phase capacitors for power factor correction

PERFORMANCE DATA

- **Tolerance on capacitance** -5% / +10%.
- **Rated frequency** 50 Hz
- **Power supply** Three-phase
- **Voltage overload** 1.1 Un (max. 8 hrs. per 24)
- **Safety System** Overpressure device
- **Expected life** 130,000 hours

HARMONIC CONTENT

THD(I)max. = 10 in the grid

TECHNICAL DATA

Dielectric	Self-healing metallised polypropylene (MKP),
Case	Aluminium.
Execution	Resin (dry type).
Fixing	M12 threaded tang for ground fixing. Nut and washer included
Degree of protection	IP 40 (with cover for version Ø 85 mm) . IP 20 (in the clamp version for Ø ≥ 100 mm) .
Test voltage	2.15 Un / 10 seconds between terminal and terminal. 3000 Vac / 10 seconds between termination and housing.
Dielectric leakage	≤ 0.2 W / kvar.
Total capacitor losses	≤ 0.4 W / kvar.
Discharge resistance	Included (75V residual within 3 minutes).
Max. voltage variation / time	< 25V / µs
Thermal category	-25°C / C. (on request: -25°C / D)
Type of service	Continuous for indoor use.

M8 threaded screw

terminal

STANDARD CONFIGURATIONS

Code	capacitance	Qn	A	In	Terminals	Dimensions (D x H)	Weight
	µF	kvar	V	A		mm	g
8302579	3 x 62	10	415	14	M8	85 x 200	700
8302588	3 x 77	12,5	415	17,4	M8	85 x 200	875
8302599	3 x 92	15	415	20,9	M8	85 x 285	1050
8302600	3 x 123	20	415	27,8	M8	85 x 285	1400
8302622	3 x 154	25	415	34,8	Clamp	100 x 285	1750
8304811	3 x 55	10	440	13,1	M8	85 x 200	700
8304813	3 x 66	12,5	440	16,4	M8	85 x 200	875
8304615	3 x 83	15	440	19,7	M8	85 x 295	1050
580010	AL BAR KIT for parallel CTB D.85						

- To make power factor correction batteries, provide for the use of appropriate discharge resistors and surge-limiting systems on insertion, compatible with the capacitor characteristics (25 A / µF).

QUALITY AND TESTING

Regulations IEC EN 60831-1 : 2015. IEC EN 60831-2 : 2015.
European Directives Low voltage: 2014/35/EC

BMR 4 • BMR 6 • HPR

Power Factor Controller

The **BMR 4** series of microprocessor-based power factor controllers is designed for the accurate control of electrical quantities in the system, such as voltage, current, power factor, current harmonic distortion rate, as well as ambient temperature and different powers.

PERFORMANCE DATA

Supply and measuring voltage	400 Vac ±10% (230V on request)
Frequency	50 / 60 Hz settable
Power consumption	3 VA
Output	Relay
Operating mode	2 or 4 quadrant
Stage outputs	4

QUALITY

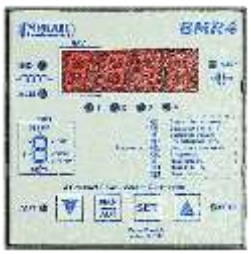
Regulations	EN 61000-6-1; EN 61000-6-2; EN 61000-6-3 EN 61000-6-4; EN 60335-1
European Directives	Low voltage: 2014/35/EC; Electromagnetic compatibility: 2014/30/EC.

TECHNICAL DATA

Main features

- Primary current setting from 5 A to 10000 A
- Measuring cosϕ on fundamental voltage - current
- Threshold setting THDI% max
- Setting the ventilation intervention threshold (FAN)
- Over-temperature threshold setting
- Setting the adjustment factor from 0.85 IND to 0.95 CAP
- Setting the kvar for each individual bank from 0.1 to 6000
- Setting the reconnection time (5 to 240s)
- Setting the rated capacitor voltage (80 to 650V standard step)
- Delay intervention sensitivity setting
- Delay and instantaneous intervention setting THD

Alarms	Voltage and current (max. and min.), under/over-correction, harmonic distortion threshold exceeded, measured temperature above set limit.
Displayed value	Cosφ, Vrms, Irms, ambient temperature, THDI%, ΔQ, target cosϕ, measurement sampling time.
Display / LED	The unit has a 4-digit, 7-segment LED display to ensure easy reading of data in all environmental conditions; capacitor bank status, MAN/AUT, IND/CAP line status, alarms,...
Operation	Automatic with 2 or 4 quadrants / Manual.
Amperometric input	0.3 - 5.5A from standard CT / 5A.
P.F. setting	From + 0.85 (inductive) to -0.95 (capacitive).
Relay contacts	5 A / 250 Vac, max. switching 440 V.
Degree of protection	IP 41; with IP 54 cover (on request).
Operating temperature	-20 / + 55 °C
Storage temperature	-30 / + 60 °C



MODELS

Code	Type	Stage Outputs	Dimensions b x h x p
7591600	BMR4	4	96 x 96 x 60

BMR 6

Electronic Controllers

The **BMR 6** series of microprocessor-based power factor controllers is designed for the accurate control of electrical quantities in the system, such as voltage, current, power factor, current harmonic distortion rate, as well as ambient temperature and different powers.

PERFORMANCE DATA

Supply and measuring voltage	400 Vac ±10% (230V on request)
Rated frequency	50 / 60 Hz settable
Power consumption	3 VA
Output	Relay
Operating mode	2 or 4 quadrant
Stage outputs	6

QUALITY

Regulations	EN 61000-6-1; EN 61000-6-2; EN 61000-6-3 EN 61000-6-4; EN 60335-1
European Directives	Low voltage: 2014/35/EC; Electromagnetic compatibility: 2014/30/EC.

TECHNICAL DATA

Main features	- Primary current setting from 5 A to 10000 A - Measuring cosϕ on fundamental voltage - current - Threshold setting THDI% max - Setting the ventilation intervention threshold (FAN) - Over-temperature threshold setting - Setting the adjustment factor from 0.85 IND to 0.95 CAP - Setting the kvar for each individual bank from 0.1 to 6000 - Setting the reconnection time (5 to 240s) - Setting the rated capacitor voltage (80 to 650V standard step) - Delayed intervention sensitivity setting - Delayed and instantaneous intervention setting THD
Alarms	Voltage and current (max. and min.), under/over-correction, exceeding harmonic distortion threshold, measured temperature above set limit.
Displayed values	Cosφ, Vrms, Irms, ambient temperature, lacking kvar, THDI%, active power, reactive power, apparent power, THDi(max), Vrms MAX, Irms(max), T(max), P(max), Q(max), and A(max).
Display / LED	The unit has a 16-character 2-line backlit LCD display for easy reading of data in all environmental conditions; capacitor bank status, MAN/AUT, IND/CAP line status.
Operation	Automatic with 2 or 4 dials / Manual.
Amperometric input	0.3 - 5.5A from standard CT / 5A.
P.F. setting	From + 0.85 (inductive) to -0.95 (capacitive).
Relay contacts	8 A / 250 Vac, max. switching 440 V.
Degree of protection	IP 41; with IP 54 cover (on request).
Operating temperature	-20 / + 55 °C
Storage temperature	-30 / + 60 °C

MODELS

Code	Type	Stage Outputs	Dimensions b x h x p
7591690	BMR6	6	96 x 96
7591685	BMR6 + RS 485*	6	96 x 96

*MODBUS RTU communication protocol

The **HPR** controller is able to guarantee accurate measurement and processing of the main electrical quantities. The capacitor steps are self-configurable, minimising initial configuration need.

PERFORMANCE DATA

Supply and measuring voltage	90 - 550 Vac
Rated frequency	50 / 60 Hz
Power consumption	3 VA
Output	Relay Tyrystor (on request)
Operating mode	4 quadrant
Stage outputs	6 o 12

QUALITY

Regulations	EC 61010-1; IEC 61006-2; IEC 61006-4: level B IEC 61326-1; UL 61010.
European Directives	Low voltage: 2014/35/EC; Electromagnetic compatibility: 2014/30/EC.

TECHNICAL DATA

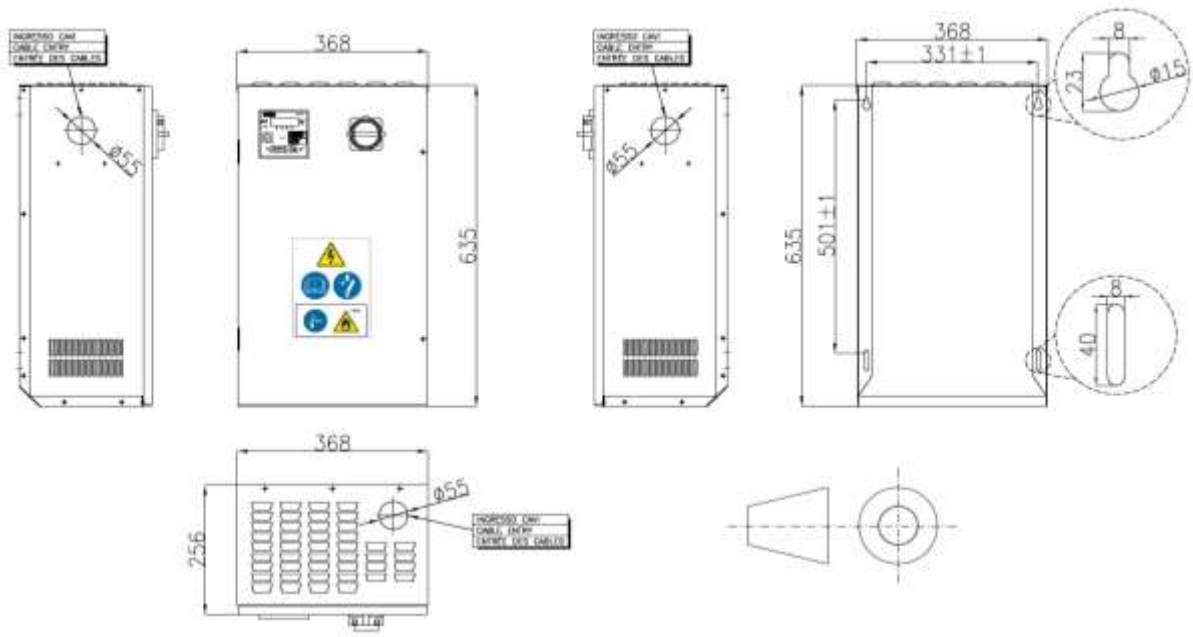
Main features	- Automatic initialisation - Automatic detection and disconnection of defective stages - CT ratio programmable from 1 to 9600 (i.e. CT up to 48000 / 5 A or 9600 / 1 A) - Current and voltage measurement with true rms value - THD% measurement in current, up to the 19th odd harmonic - Measurement of cosϕ between voltage and current using the fundamental waveform - Operation in Manual or Automatic - Digital input: choice between cosϕ1 and cosϕ2 target, external alarm / low current signalling - Temperature sensor: internal NTC - Alarm memory: last ten alarms - RS485 serial output with Modbus-RTU protocol
Alarms	Voltage measurement out of tolerance, Low/high current alarm<5mA and >6A, -Target correction not reached, Bank power loss below 75%, THDu and THDi thresholds exceeded,, Max. operating hours reached, Max. inserts and hours reached by each bank
Displayed quantities	Cosφ, VL-L, VL-N, I, Power Factor, ambient temperature, THD% in voltage and current, maximum values (temperature, voltage, THD), powers (active, reactive and apparent), no. of bank insertions. It can also provide useful alerts for maintenance, such as power loss on banks, number of insertions, actual working time of capacitor banks.
Display / LED	The unit is equipped with a backlit LCD display to ensure easy reading of data in all environmental conditions; capacitor bank status, MAN/AUT, IND/CAP line status
Operation	Automatic 2 or 4 quadrant / Manual.
Amperometric input	0.015 .. 6 A, power consumption < 1 VA, CT ratio 1 ... 9600.
P.F. setting	From + 0.7 (inductive) to -0.7 (capacitive).
Relay contacts	5 A / 250 Vac; 1 A / 400 Vac.
Degree of protection	IP 41 (with IP 54 cover) front; IP 20 rear.
Operating temperature	-20 / + 70 °C
Storage temperature	-40 / + 85 °C

MODELS

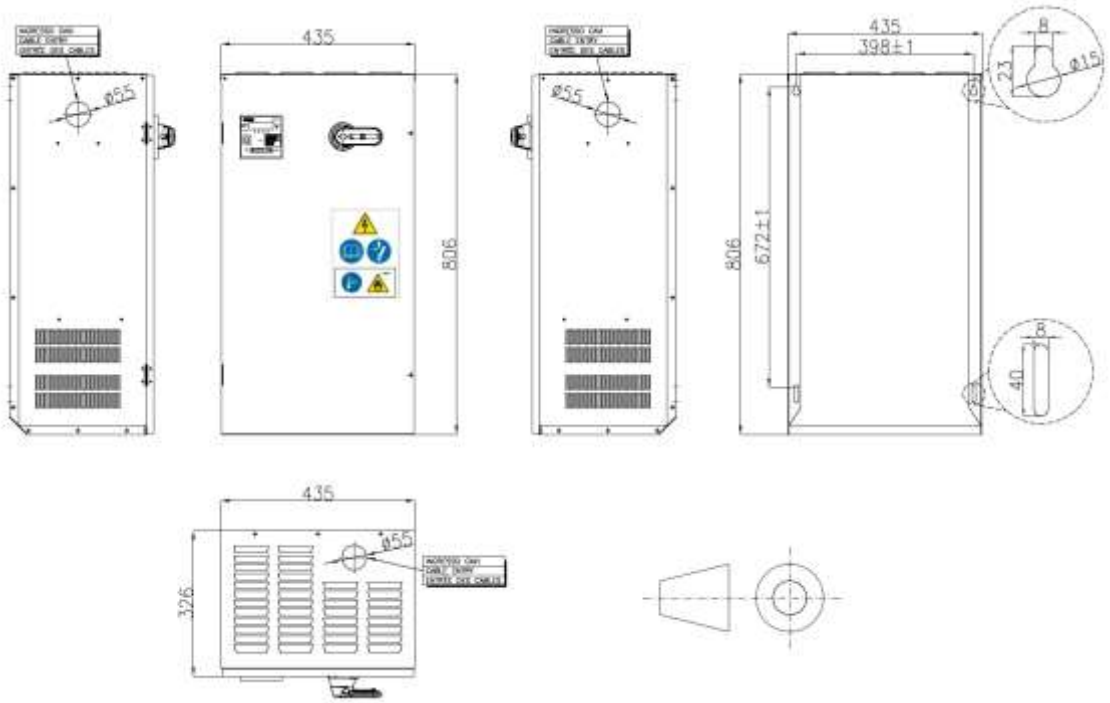
Code	Type	Stage Outputs	Dimensions b x h x p
75993061	HPR 6 - MB (ModBus)	6	144 x 144 x 58
75993121	HPR 12 - MB (ModBus)	12	144 x 144 x 58

Mechanical Drawings

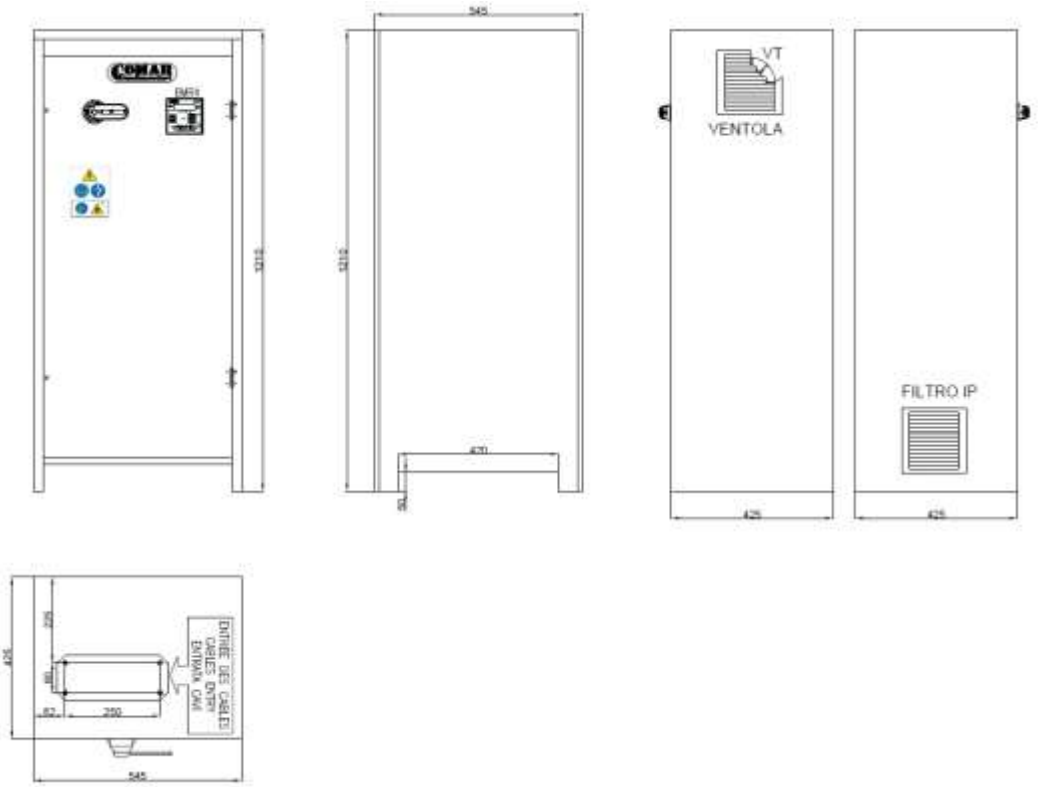
Mechanical drawings



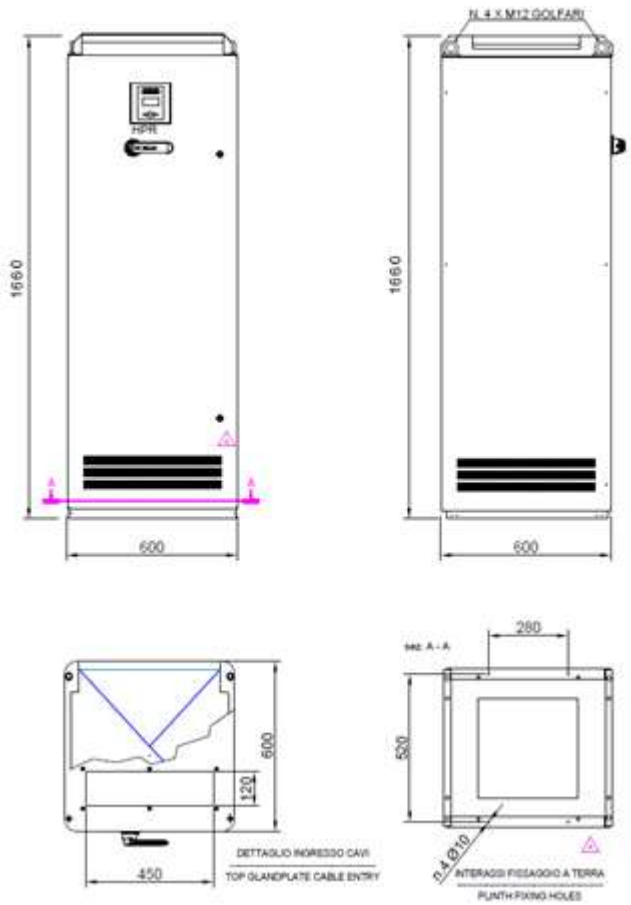
G4E Wall mounting enclosure



Mechanical drawings



G6E Floor mounting enclosure with lifting eyebolt



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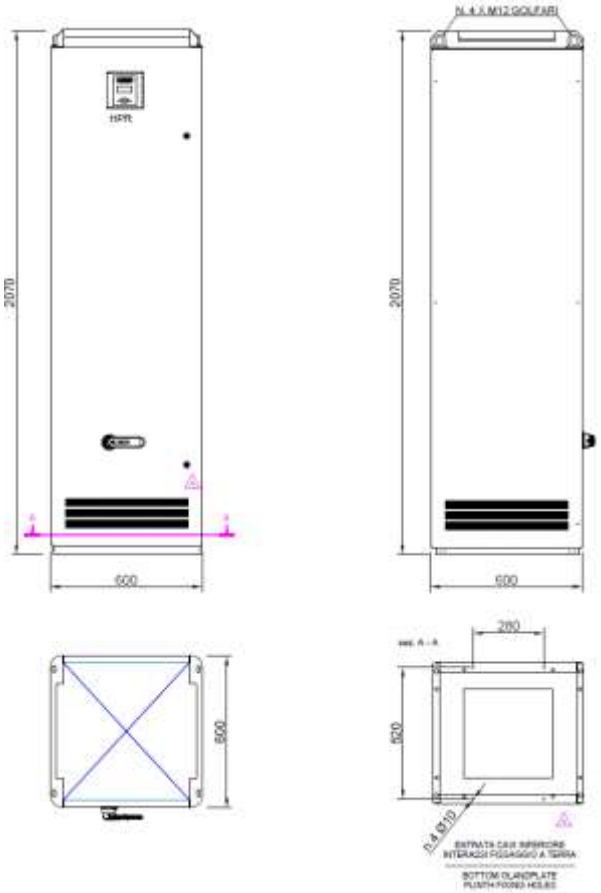
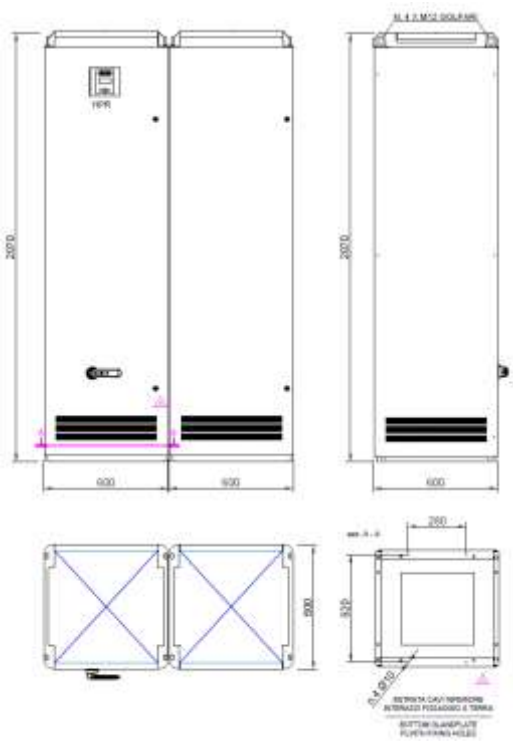
Mechanical drawings



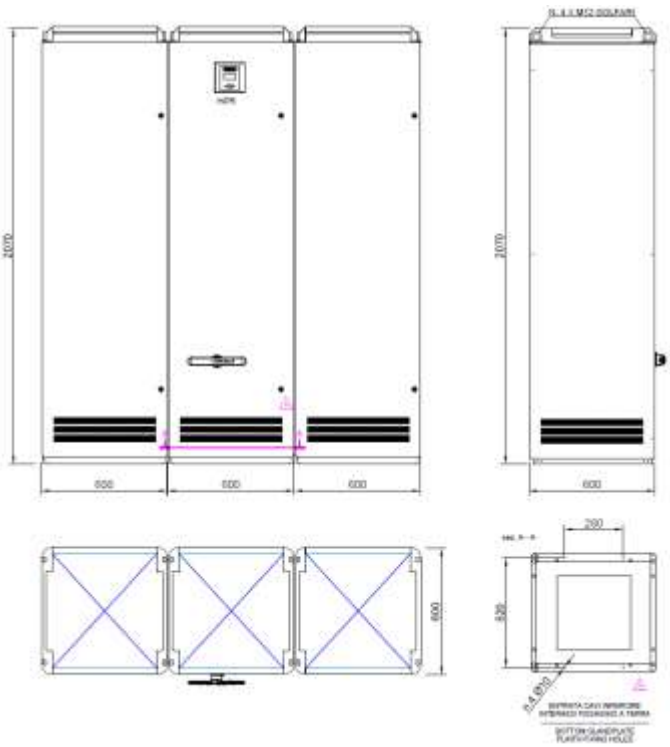
G8E (II)

2 modules

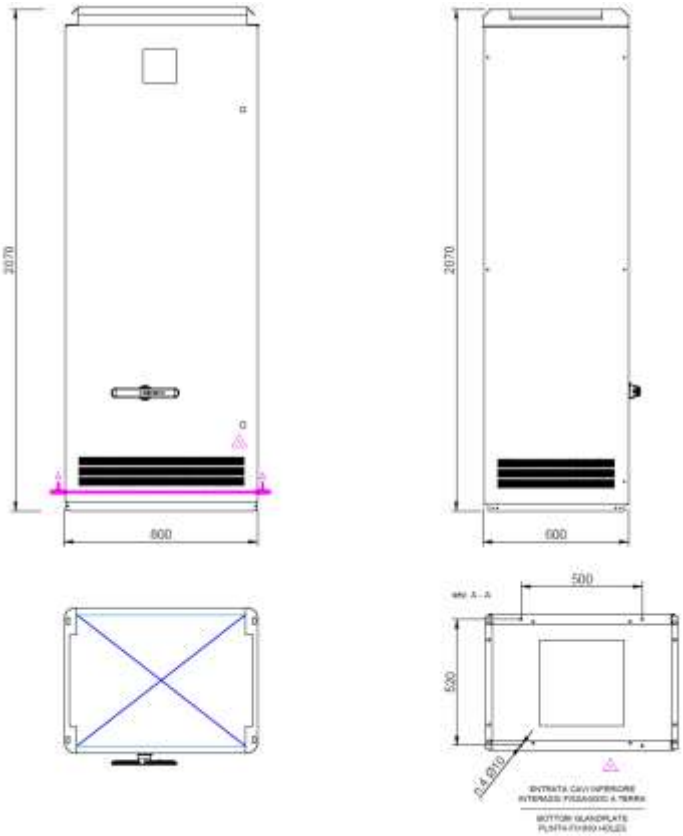


G8E (III)

3 modules

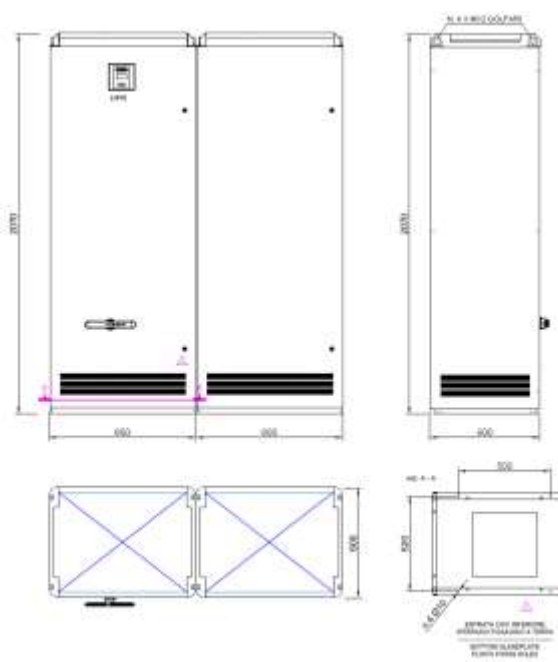


Mechanical drawings



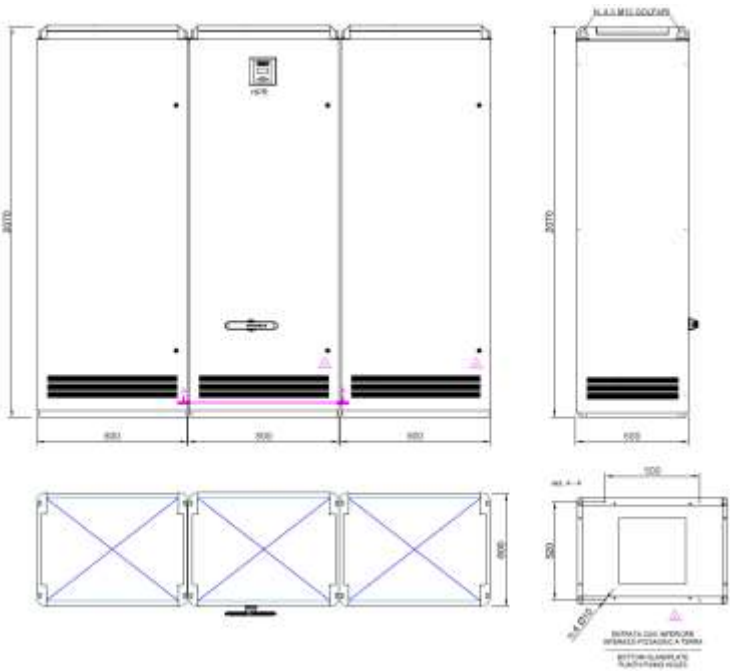
G9E (II)

2 modules



G9E (III)

3 modules:



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Fixed PFC

Automatic PFC

Hybrid PFC

Dynamic PFC

Active harmonic Filters

PFC components

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