CIRCUTOR

L.V. AUTOMATIC CAPACITORS BANKS

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WHAT IS REACTIVE ENERGY?

Inductive reactive energy is energy used to create electrical and magnetic fields in some loads.

This energy passes through the electric grid, it does not only become useful for the task, but it increases the total power distributed by the electric power utilities.

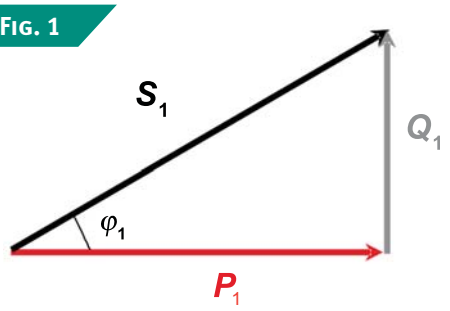
Therefore, in order to avoid this power activity in the system, power capacitors have to be used.

Measurement of existing cos φ

Cos φ is a basic parameter for the reactive power consumption measurement in an electric installation. It gives ratio between active power and apparent power.

$$\cos\varphi = \frac{P_1(\text{kW})}{S_1(\text{kV}\cdot\text{A})}$$

FIG. 1



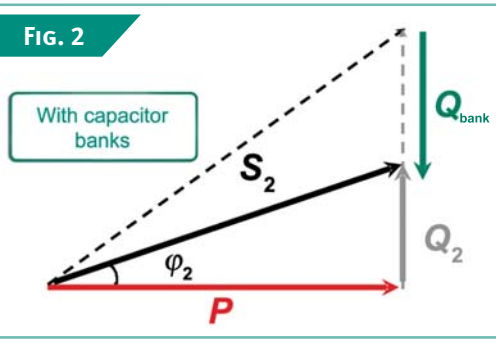
Power factor correction

A way of decreasing reactive power required from a supplier is by installing a capacitor bank.

In Fig. 1 the power level S1 which the electrical system supplies due to the existing cos φ1.

In Fig. 2, once the bank has been installed (Q_{ban}), apparent power S2 decreases. Therefore the final inductive cos φ2 is greater than the initial inductive cos φ1.

FIG. 2



Consumidores de energía reactiva

Examples of equipment which consume reactive energy are all those receivers which require magnetic fields or arcs in order to operate, such as:

- Asynchronous motors
- Power Transformers
- Discharge lamps
- Welding equipments
- Furnaces

WHY CORRECT?

The reason for correcting reactive energy is based on the following aspects:

- Technical optimization of installations
- Reducing the electricity bill

Technical optimization of installations

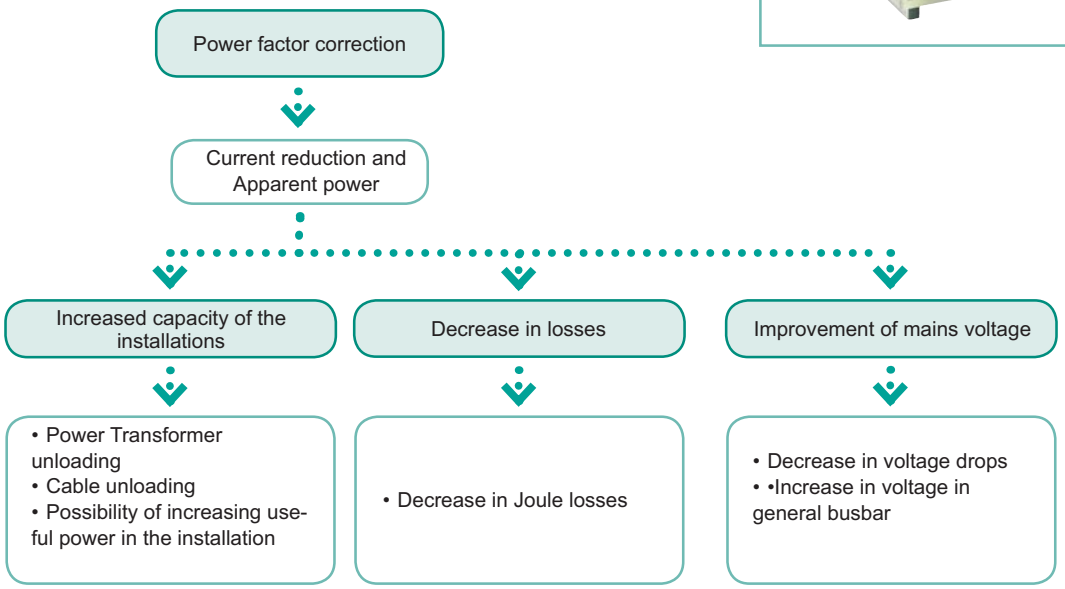
Installing a capacitor bank reduces reactive power consumption required from the distribution system.

The following benefits are achieved as an immediate consequence:

• Same required active power (P)
• Reduction of apparent power S2 required from the distribution system

How does the reduction of apparent power improve the installation?

The following diagram summarises this:



As a general consequence, power factor correction gives improved economic efficiency in existing installations, enhancing their performance without the need for additional investment.

Reducing the financial cost of an installation

Power factor correction reduces the electricity bill because power consumption increases energy costs. This cost may come from different sources:

• As consumed reactive (kvar) or apparent energy (kV·A)
• As a penalty added to the power bill and active energy

Power Utilities apply payment criteria in accordance with existing country regulations.

EXAMPLE OF AN INSTALLATION

The following example shows the differences in an installation with and without capacitor banks. Active power, voltage drop Joule losses and kV·A are shown.

The following installation has been used as an example:

- M.V. / L.V. 800 kV·A power transformer
- A general load of 630 kW, cos φ of 0.6
- A 100 meter copper connection line 4 x (3 x 240) mm² (0.075 Ω/km cable resistance)

A 360 kvar - 400 V bank is connected to the installation to reach a cos φ of 0.98

Installation WITHOUT capacitor bank

Start of cos φ_1	Active power	Voltage drop for 100 m	Joule losses	kVA required to be transformed
0,6	630 kW	19,69 V (- 5 %)	17 kW	1 050 kV·A

Installation WITH capacitor bank

End cos φ_1	Active power	Voltage drop for 100 m	Joule losses	kVA required to be transformed
0,98	630 kW	12 V (- 3 %)	6,4 kW	642 kV·A

Reducing the financial cost of installation

The next table shows a summary of the calculations made:

	WITHOUT bank Cos φ = 0.6	WITH bank Cos φ = 0.98	Decrease (%)
Voltage drop	5 %	3 %	60 %
Joule losses	17 kW	6,4 kW	62%
Power supplied by transformer	1 050 kV·A	642 kV·A	38%

As seen, a decrease in the level of losses in a cable and an increase in voltage, decreases the power to be supplied by the header power transformer.

This means that it moves from an apparent power of 1050 kV·A to a power of 642 kV·A. Therefore the transformer power of 800 kV·A, moves from a 31 % overload to 80 % of the rated load. In conclusion, 20 % of the transformer capacity is available.

CALCULATION CRITERIA

- Voltage drop in a three-phase line

$$\Delta U_C = \frac{Z_C \cdot P}{U \cdot \cos\varphi}$$

- Joule losses in a three-phase line

$$\Delta P = \frac{l}{\gamma \cdot S}\left(\frac{P}{U \cdot \cos\varphi}\right)^2$$

WHERE IS IT CORRECTED?

Where the power factor correction equipment is located depends on various factors, but basically it may be summarised into two important areas:

• Sizes of the installation

This means either an installation with a general distribution board and with relatively small distances to the auxiliary switchboard. Or it is large and divided electrically into different areas with long distances between them and therefore has internal energy distribution and significant secondary switchboard.

• Presence of large load consumers of energy

The presence of these loads means that a special warning is required when undertaking a power factor correction or harmonic filtering study.

Using these criteria, the following table summarises the comparison between the different measurement points from among the existing possibilities.

Location of correction	L.V. main switchboard	Secondary switchboard panels	In loads
No. of equipment	1	According to no. of boards	According to No. of large loads
Main aim	Transformer discharge Reduction of electricity bill	Reduction of electricity bill Line discharge Decrease voltage drop	Line discharge Decrease voltage drop
Comments	No distribution line discharge No Voltage drop decrease	Helps maintain voltage levels	Ideal point for reactive discharge

HOW TO SELECT CORRECTION EQUIPMENT?

To select power factor correction equipment a series of steps have to be followed. These are:

- Selection of the method of correction
- Determining the power of the equipment
- Determining the type of equipment

These steps are described in detail in the following sections:

Form of correction: FIXED

The system of fixed correction is used in loads and installations where:

- Load levels are fairly constant
- There is minimum reactive power to be corrected in low load conditions
- There are significant loads to be individually corrected helping to reduce power distributed by the installation

This type of over correction is usually used in asynchronous motors and power transformers.

Asynchronous motors

An asynchronous motor is a large consumer of inductive reactive energy.
The amount of reactive power consumed is between 20 % and 25 % of the rated power of the motor (depending on its speed).

Calculating the capacitor power to be installed has to take into account the machine's no load power, i.e. as a general rule 90% of this power is taken. Usually the capacitor is calculated for a cos φ of not more than 0.92.

To correct higher values of cos φ switching contactor is required for disconnecting the capacitor when the motor stops (See FKS / ACM type).
Note: it is worth having motors with starters or Speed drives, because the capacitor has to be protected by a rejection filter (reactor in serial with the capacitor).

Kvar depending on					
Motor power		Motor speed			
kW	CV	3000	1500	1000	750
5,5	7	2,0	**2**	2,5	3
7,5	10	2,5	**3**	4	5
10	14	4,0	**5**	6	7,5
15	20	5,0	**6**	7	9
18,5	25	6,3	**7**	9	10
22	30	8,0	**9**	10	12,5
30	40	10,0	**12,5**	15	15
37	50	12,5	**15**	20	20
45	60	15,0	**20**	25	25
55	75	20,0	**20**	25	25
75	100	25,0	**25**	30	30
90	120	30,0	**30**	35	35
110	150	30,0	**35**	40	40
132	180	35,0	**40**	45	45
160	220	45,0	**55**	55	60
200	272	50,0	**60**	60	65
250	340	60,0	**65**	65	70

Transformers

Power transformers are normally always connected. This means that reactive energy is always consumed.
Also, as a consequence of its inductive nature, the reactive energy increases when the transformer is loaded.
The following formulas are used to estimate the consumption of reactive energy:

	Calculation formula	E.g.: transformer 630 kV·A, U_{cc} = 6 %, $I_{vacío}$ = 1 %
Q no load consumption	$Q_{empty} = S_n \cdot I_0$ (%)	$Q_{empty} = 630 \cdot 1\ \% = 6{,}3$ kvar
Q consumption with load	$Q_{load} = I^2 S_n \cdot u_{cc}$ (%)	$Q_{load} = 0{,}9^2 \cdot 630 \cdot 6\ \% = 31$ kvar
Q total	$Q_{total} = Q_{empty} + Q_{load}$	$Q_{total} = 6{,}3 + 31 = 37{,}3$ kvar i.e. 5,9 % de *Sn*

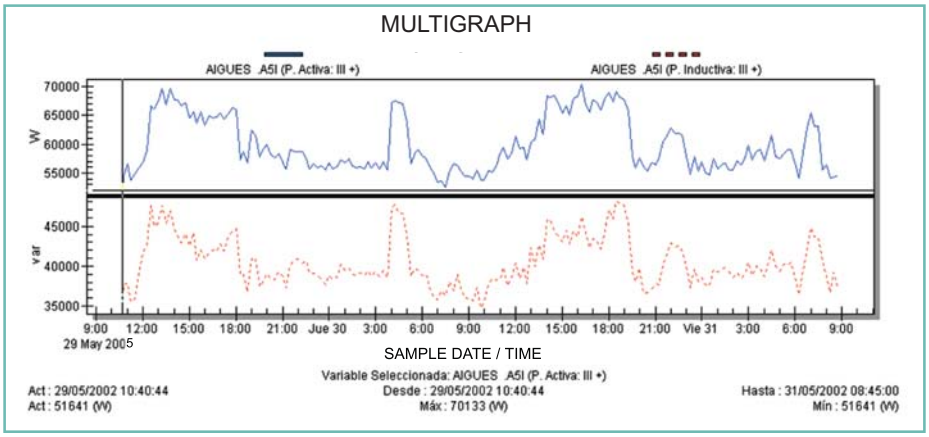
As practical rules:

- Attaching a fixed capacitor with 5 % of the rated power of the power transformer is advised
- Attaching a fixed capacitor with more than 10 % of the rated power of the transformer is not advised to avoid any possible resonance risk.

Methods of correction: AUTOMATIC

Reactive energy consumption, as with active energy, is not normally constant. Therefore the capacitor bank has to be capable of tracking the load curve in the installation.
In order to be able to do this, the capacitor bank is divided into different power steps controlled by a **computer** power factor regulator.

It will be necessary to construct equipment with a response speed and therefore a faster or slower step connection speed in line with the power variation speed in the reactive power.



CIRCUTOR has two possible solutions:

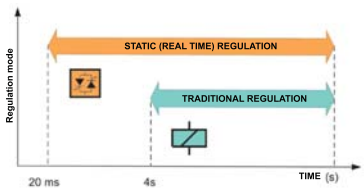
Banks with electro-mechanical contactors

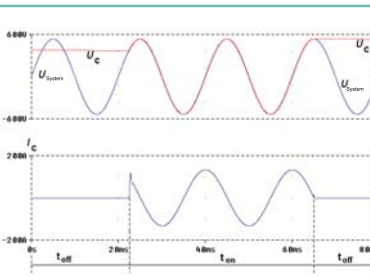
When reactive power variations are relatively slow - in the order of seconds.

Banks operated by thyristors (real time)

These are recommended when instant reactive power has to be counteracted as a result of rapid load variations.
Typical examples would be lifting equipment, cranes and welding lines.

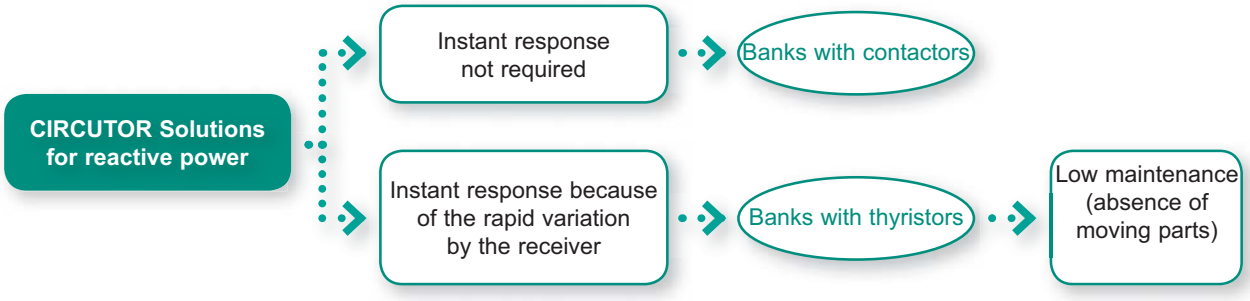
FIG. 1





The advantages of this form of correction system are:

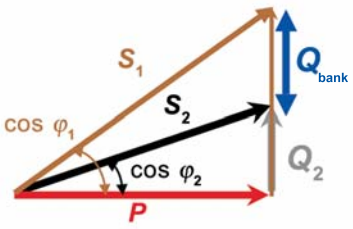
- Eliminating switch-on transients caused by the connection of the capacitor. Connection occurs at the precise moment when the mains voltage coincides with the capacitor voltage, being the capacitor partially or completely loaded. See figure 1
- The absence of transients on connection allows dips, flicker and any other disturbance generated by the connection transients to be eliminated.
- Unlimited cadence of operations
- Immediate response to the correction request. Response time for power factor correction may only be one system cycle, meaning that correction is almost instant
- Less capacitor and operating switch wear due to the removal of transients and the complete absence of moving mechanical parts. The useful life of the equipment is therefore considerably increased when compared to conventional equipment with electro-mechanical contactors.



DETERMINING THE POWER OF A CAPACITOR BANK

THEORETICAL CALCULATION

The required capacitor bank can be calculated using the initial and end cos φ and the active power consumed by the installation.

Calculation formula	
$\Delta Q = Q_{bank}(kvar) = P(kW) \cdot (\tan\varphi_{ini} - \tan_{final})$ $\Delta Q = Q_{bank} = P(kW) \cdot (Q_1 - Q_2) = P(kW) \cdot K$	

K factor table

The following table provides the calculations for the *K* factor.
The value of *K* is determined by using the actual power factor and the target power factor.

	cos φ_2	0,85	0,90	0,91	0,92	0,93	0,94	0,95	0,96	0,97	0,98	0,99	1,0
	tan φ_2	0,62	0,48	0,45	0,42	0,39	0,36	0,33	0,29	0,25	0,20	0,14	0,0
cos φ_1	tan φ_1												
0,50	1,73	1,112	1,248	1,276	1,306	1,337	1,369	1,403	1,441	1,481	1,529	1,590	1,732
0,55	1,52	0,898	1,034	1,063	1,092	1,123	1,156	1,190	1,227	1,268	1,315	1,376	1,518
0,60	1,33	0,713	0,849	0,878	0,907	0,938	0,971	1,005	1,042	1,083	1,130	1,191	1,334
0,65	1,17	0,549	0,685	0,713	0,743	0,774	0,806	0,840	0,877	0,918	0,966	1,026	1,169
0,70	1,02	0,400	0,536	0,564	0,594	0,625	0,657	0,691	0,728	0,769	0,817	0,878	1,020
0,75	0,88	0,262	0,398	0,426	0,456	0,487	0,519	0,553	0,590	0,631	0,679	0,740	0,882
0,80	0,75	0,130	0,266	0,294	0,324	0,355	0,387	0,421	0,458	0,499	0,547	0,608	0,750
0,85	0,62	---	0,135	0,164	0,194	0,225	0,257	0,291	0,328	0,369	0,417	0,477	0,620
0,86	0,59	---	0,109	0,138	0,167	0,198	0,230	0,264	0,301	0,343	0,390	0,451	0,593
0,87	0,57	---	0,082	0,111	0,141	0,172	0,204	0,238	0,275	0,316	0,364	0,424	0,567
0,88	0,54	---	0,055	0,084	0,114	0,144	0,177	0,211	0,248	0,289	0,336	0,397	0,539
0,89	0,51	---	0,028	0,057	0,086	0,117	0,149	0,183	0,220	0,262	0,309	0,370	0,512
0,90	0,48	---	---	0,028	0,058	0,089	0,121	0,155	0,192	0,234	0,281	0,341	0,484
0,91	0,45	---	---	---	0,030	0,060	0,092	0,127	0,164	0,205	0,252	0,313	0,455
0,92	0,42	---	---	---	---	0,030	0,063	0,097	0,134	0,175	0,223	0,283	0,426
0,93	0,39	---	---	---	---	---	0,032	0,066	0,103	0,144	0,192	0,253	0,395
0,94	0,36	---	---	---	---	---	---	0,034	0,071	0,112	0,160	0,220	0,363
0,95	0,33	---	---	---	---	---	---	---	0,037	0,078	0,125	0,186	0,328
0,96	0,29	---	---	---	---	---	---	---	---	0,041	0,088	0,149	0,292
0,97	0,25	---	---	---	---	---	---	---	---	---	0,047	0,108	0,251

Active power: 150 kW
Start cos φ_1 value = 0,55
Target cos φ_2 value = 0,97

Table data: *K* coefficient = 1,268

Power of the bank:

$Q_{bank} = 150 \cdot 1{,}268 = 190$ kvar

	cos φ_2	0,85	0,90	0,91	0,92	0,93	0,94	0,95	0,96	0,97	0,98	0,99	1,0
	tan φ_2	0,62	0,48	0,45	0,42	0,39	0,36	0,33	0,29	0,25	0,20	0,14	0,0
cos φ_1	tan φ_1												
0,50	1,73		1,112	1,248	1,276	1,306	1,337	1,369	1,403	1,441	1,481	1,529	1,590	1,732
0,55	1,52		0,898	1,034	1,063	1,092	1,123	1,156	1,190	1,227	1,268	1,315	1,376	1,518
0,60	1,33		0,713	0,849	0,878	0,907	0,938	0,971	1,005	1,042	1,083	1,130	1,191	1,334

Measurements

This is a more efficient way of designing the required bank for an installation, both in terms of determining its power and for the type of equipment to be assembled with regard to the levels of harmonics.

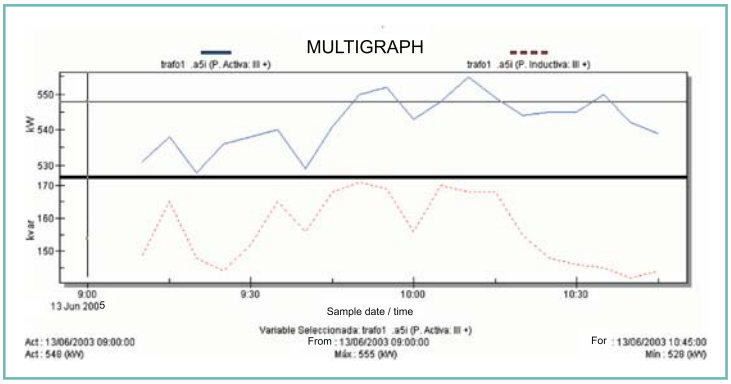
To do this, measurements should are taken with a portable instrument (**AR.5-L** type) which records over time basic parameters such as powers, voltages etc. and records harmonic currents and voltages.

Determining reactive power

The following are determined from the time graph of active and reactive powers:

- Power of the bank
- Type of regulation
- Need for a static bank

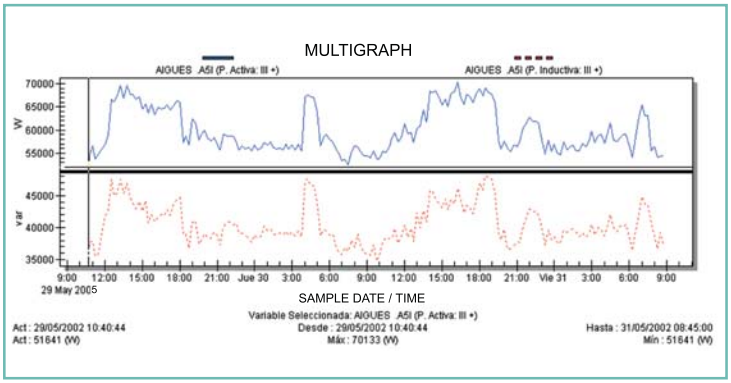
It also allows the end power factor to be estimated once the capacitor bank has been installed.



Determining the type of bank

- The following may be perfectly determined based on harmonic readings in both voltage and current:

- If the bank has to be a standard mains voltage bank (**EUB, VR**, etc.)
- If the bank has to be equipped with rejection filters (**FR, FRE** series)
- If filtering is required (**FAR, LCL.**)



Using the power utility's bills

The analysis of the electricity bill gives an estimation of the reactive power requirement in the installation.

Equipment may be estimated using contracted power and calculating cos φ.

Using the CIRCALC calculation program

CIRCALC is the latest generation capacitor bank calculation program.

CIRCALC calculates reactive power required when building an installation, based on different suppositions:

- Theoretical calculation
- Electricity bills

It also allows the type of equipment to be installed in terms of the harmonic currents present in the installation.

DETERMINING THE TYPE OF EQUIPMENT

As a last step, once the type and power of the bank to be installed have been determined, the type of equipment has to be defined.

There are basically two possibilities:

- **Standard Bank**

Banks equipped with capacitors with the appropriate voltage and power for the system

- **Bank with rejection filters**

Banks equipped with capacitors oversized in voltage and power with reactors tuned in series in each step.
Tuning frequency (189 Hz at 50 Hz is usual) gives two aims if harmonics are present in the system:

- Protecting the capacitors
- Avoiding the phenomenon of amplifying existing harmonics

Selection criteria

Three criteria have to be borne in mind when selecting the type of bank:

• The presence of harmonics in la installation
• The possibility that there resonances between transformer and bank
• The analysis of the installation's measurements

The presence of harmonics depend s on the type and quantity of existing equipment which may generate harmonics. As an example, the range of harmonics generated by the more common receivers is listed:

• 6 pulse speed selectors: 5th and 7th harmonic
• UPS's: 5th and 7th harmonic
• Spot welding equipment: 3rd harmonic
• Discharge lamps: 3rd harmonic

If measurements are taken by the portable AR.5-L, the complete spectrum present in the installation may be seen and above all in the general switchboard where the capacitor bank is connected.

Once this has been noted, the possibility that the bank enters into resonance has to be calculated. The following expression is used to do this:

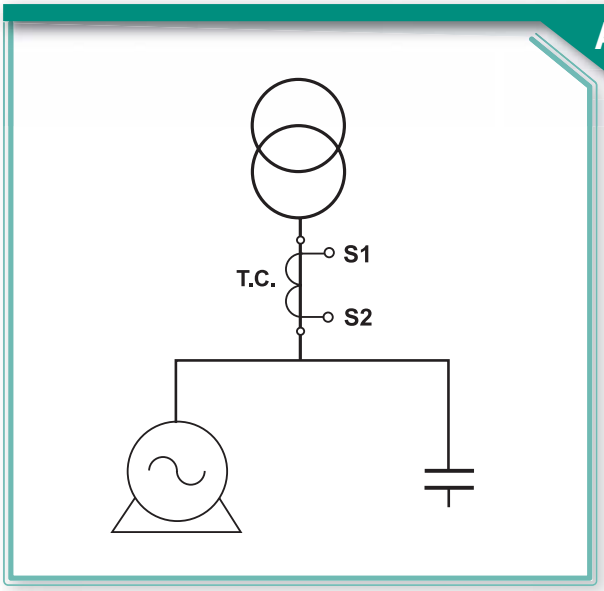
$$n = \sqrt{\frac{S_{cc}}{Q}}$$

where Scc is the short circuit power of la installation and Q the power of the capacitor bank.

The following table is given for practical criteria once measurements have been taken:

THD (U) - (%)	THD (I) - (%)	Equipment type	Comments
< 2	< 15	Standard bank	Check resonances
2 < THD (U) < 3	15 < THD (I) < 30	Rejection filter	Tuned to 189 Hz (50 Hz network)
THD (U) > 4	THD (I) < 15	Rejection filter	Tuned to 189 Hz (50 Hz network)
THD (U) > 4	THD (I) > 30	Filtering	Detailed study of the installation

AUXILIARY EQUIPMENT AND INSTALLATION OF CAPACITOR BANKS



When a capacitor bank is to be installed, the corresponding area of the installation has to be taken into account. This includes:

• Current measuring transformer for the regulator operation
• Connecting cables
• Switch
• Circuitt breaker

The IEC 60831-1 standard gives general advices on the size of the equipment for a maximum of 1.5 times the rated current of the capacitor banks. This is applicable for equipment and cabling.

Regarding measuring transformers, we recommend:

- Primary current: should be equal to the main switch one
- Location: Downsfream from the switch

Input power cables

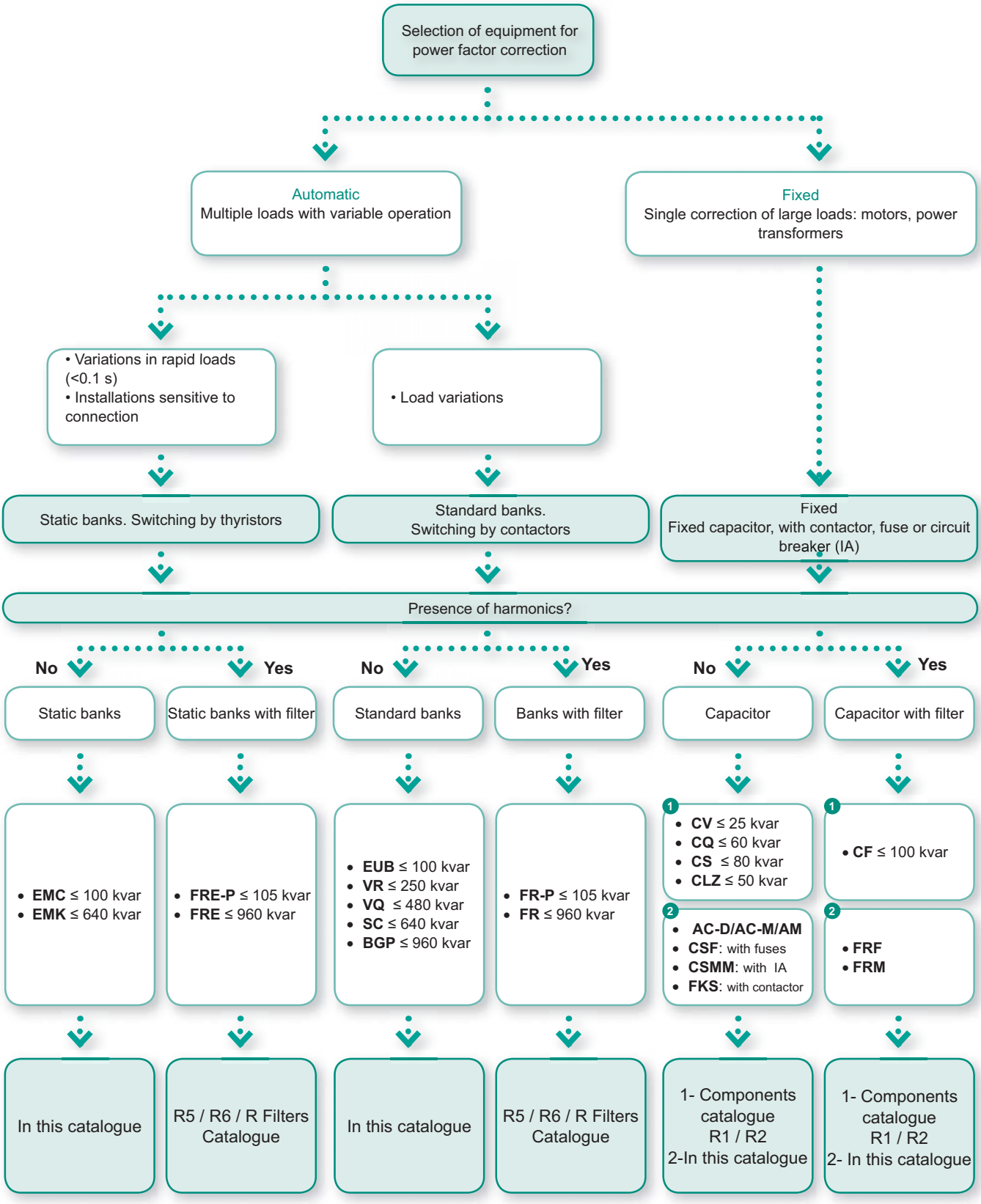
In this catalogue we show the cable sizes to connect the capacitor banks to power. The criteria for if are:

- Current oversize: 1,43 times nominal current
- Data is given per phase
- Data is given for unippolar cupper cable, with XLPE isolation, air type (Ftype, hole type try, ICT-BT-19)
- Ambient temperature 40ºC
- 15 m distance from capacitor bank and connection point
- It is recommended that the cable diameter is calculated in terms of the actual length, type of channel and cable used

Other conditions require further study

QUICK SELECTION GUIDE

In order to make selection easier, a summarised chart is attached. Also included are tables to make the selection easier, and the catalogue where they appear.



FEATURES

FIXED CAPACITORS

Description

• Capacitors equipped with protection device:
- **CSF**: protected by APR fuses
- **AM**: protected by miniature circuit breaker
- **CSM**: protected by circuit breaker
- **CSMM**: protected by high rupture capacity circuit breaker

• Capacitors equipped with control and protection device:
- **AC-D**: equipped with contactor, circuit breaker: and reactive power regulator. Requires current transformer for regulator measurement
- **AC-M**: equipped with contactor and circuit breaker
- **FKS**: equipped with operating contactor and HRC power fuses
• IP 21 protection grade
• Natural ventilation (cooling)

Electrical features

• Operating voltage, 400 V. Others on request
• Insulating voltage, 3 /15 kV
• Frequency: 50 Hz. 60 Hz, on request

Types of capacitors

The capacitors used are prismatic (**CS**) and cylindrical (**CLZ**) (see R1/2 components catalogue). Use the following types in terms of cabinet power and therefore size:

Type	Capacitor	Mounting	Maximum power
CSF, CSM, FKS	CS	Ground	80 kvar
CSMM	CS	Ground	100 kvar
AC	CLZ	Panel	25 kvar

AUTOMATIC BANKS

The **CIRCUTOR** range of banks covers powers from 7.5 kvar up to 960 kvar (at 400 V – 50 Hz)

Description

• Treated and painted steel cabinets with epoxy paint, basic colour RAL 1013 and RAL 3005 for doors
• IP 21 protection grade
• Equipped with set of keys and lock
• Natural ventilation
• Mounting:
- Wall type for **EUB3** and **EUB4**
- On=floor type for other cabinets

Electrical features

• Operating voltage, 400 V (others on request).
• Insulating voltage, 3 /15 kV
• Frequency: 50 Hz (60 Hz on request).
• 230 V Auxiliary voltage required

Components

The whole range of banks is prismatic **CS** technology (see R1/2 components catalogue).
Use the following types in terms of cabinet power and therefore size:

Family of banks	Type of capacitor	Maximum power
VR	CV	25 kvar
VQ	CQ	60 kvar
BGP , SC	CS	80 kvar
EMK	CS	80 kvar

Power factor regulators

All **CIRCUTOR** banks are equipped with a power factor regulator which differs according to the unit of power.

Family of banks	Type of regulator
EUB, VR, VQ, SC, BGP	MAGIC
EMK, ECK	computer 8df / 14df

Options

All families of banks may be equipped with different options on request:

- Transformer for auxiliary supply
- Switch
- Circuit breaker
- Forced ventilation
- Earth leakage protection
- Direct protection contacts on door covers IP 20
- Other power factor regutators

DESCRIPTION OF CABINETS

Operating conditions:
- Operating temperature -10 ºC / 35 ºC
- Admissible over-voltage of 1.1 U_n, 8 hours every 24 hours
- Permanent current overload of 1.3 I_n

STANDARDS

Banks are designed and manufactured according to the following standards:

- **CEI 60831-1**
- **CEI 60439-1**

REQUIRED INFORMATION TO CHOICE A CAPACITOR BANK

The information required for the correct definition of a capacitor bank is as follows

General features

Type		
Power		kvar
Frequency		Hz
Rated voltage		V
Regulation	☐ 1.1.1	☐ 1.2.2
	☐ 1.2.4	☐ 1.2.4.8

Equipment

Switch	☐ Yes	☐ No
	☐ Manual	
	☐ Automatic	
	☐ Automatic + Earth leakage protection	

Other options

Auxiliary supply transformer	☐ Yes	☐ No
Forced ventilation	☐ Yes	☐ No
Polycarbonate plate (IP20 Protection)	☐ Yes	☐ No
Other regulator		

FIXED CORRECTION

Fixed correction

- **Power transformers** → **CSF:** with fuses
  AM: low power
  CSM: medium power
  CSMM: high power
- **Motors** → **AC-M:** low power
  FKS: medium and high power
- **Small installations** → **AC-D:** equipment with only one step controlled by reactive power relay
  connection when reactive power is detected
  Current transformer required
- **Individual loads**

CSF

CS CAPACITOR WITH FUSES

CSF 400 V / 50 Hz								
kvar	Cut off power	A	Fuses (A)	Cable (2)	Weight kg	Dimensions (mm)	Type	Code
5	50 kA	7	16	6	9	280 x 420 x 140	CSF- 5 - 400	**R20638**
7,5	50 kA	11	20	6	9	280 x 420 x 140	CSF- 7,5 - 400	**R2063A**
10	50 kA	14	25	6	9	280 x 420 x 140	CSF- 10 - 400	**R2063C**
12,5	50 kA	18	35	6	9,5	280 x 420 x 140	CSF- 12,5 - 400	**R2063D**
15	50 kA	22	50	6	9,5	280 x 420 x 140	CSF- 15 - 400	**R2063E**
20	50 kA	29	50	10	10,5	280 x 420 x 140	CSF- 20 - 400	**R2063F**
25	50 kA	36	50	10	10,5	280 x 420 x 140	CSF- 25 - 400	**R2063G**
30	120 kA	43	80	16	12	280 x 420 x 140	CSF- 30 - 400	**R2063H**
40	120 kA	58	100	25	13,5	280 x 420 x 140	CSF- 40 - 400	**R2063J**
50	120 kA	72	125	35	16	280 x 420 x 140	CSF- 50 - 400	**R2063K**
60	120 kA	87	160	50	17	280 x 644 x 140	CSF- 60 - 400	**R2063L**
80	120 kA	116	160	70	19	280 x 644 x 140	CSF- 80 - 400	**R2063P**

(2) Cable section in mm^2. See also page 12 'input power cables'

CSM

CS CAPACITOR WITH MCB /MCCB

CSM 400 V / 50 Hz								
kvar	Cut off power	A	Fuses (A)	Cable (2)	Weight kg	Dimensions (mm)	Type	Code
5	10 kA	7	10	6	9	280 x 420 x 140	CSM- 5 - 400	**R20738**
7,5	10 kA	11	16	6	9	280 x 420 x 140	CSM- 7,5 - 400	**R2073A**
10	10 kA	14	20	6	9	280 x 420 x 140	CSM- 10 - 400	**R2073C**
12,5	10 kA	18	25	6	9,5	280 x 420 x 140	CSM- 12,5 - 400	**R2073D**
15	10 kA	22	32	6	9,5	280 x 420 x 140	CSM- 15 - 400	**R2073E**
20	10 kA	29	40	10	10,5	280 x 420 x 140	CSM- 20 - 400	**R2073F**
25	10 kA	36	50	10	10,5	280 x 420 x 140	CSM- 25 - 400	**R2073G**
30	10 kA	43	63	16	11	280 x 420 x 140	CSM- 30 - 400	**R2073H**
40	16 kA	58	80	25	12	280 x 420 x 140	CSM- 40 - 400	**R2073J**
50	16 kA	72	100	35	16,5	280 x 420 x 140	CSM- 50 - 400	**R2073K**
60	16 kA	87	160	50	17,5	280 x 644 x 140	CSM- 60 - 400	**R2073L**

(2) Cable section in mm^2. See also page 12 'input power cables'

CSMM

CS CAPACITOR WITH HIGHT CUT OFF POWER AUTOMATIC SWITCH

CSMM 400 V / 50 Hz								
kvar	Cut off power	A	Fuses (A)	Cable (2)	Weight kg	Dimensions (mm)	Type	Code
30	36 kA	43	63	16	16	360 x 794 x 140	CSMM- 30 - 400	**R2163H**
40	36 kA	58	80	25	17	360 x 794 x 140	CSMM- 40 - 400	**R2163J**
50	36 kA	72	100	35	21	360 x 1019 x 140	CSMM- 50 - 400	**R2163K**
60	36 kA	87	125	50	22	360 x 1019 x 140	CSMM- 60 - 400	**R2163L**
80	36 kA	116	160	70	27	360 x 1169 x 140	CSMM- 80 - 400	**R2163M**
100	36 kA	145	200	95	29	360 x 1169 x 140	CSMM- 100 - 400	**R2163N**

(2) Cable section in mm^2. See also page 12 'input power cables'

FKS

CS CAPACITOR WITH CONTACTOR AND FUSES

FKS 400 V / 50 Hz								
kvar	Cut off power	A	Fuses (A)	Cable (2)	Weight kg	Dimensions (mm)	Type	Code
30	120 kA	43	80	16	21,5	430 x 1000 x 165	FKS - 30 - 400	**R3C361**
40	120 kA	58	100	25	25	430 x 1000 x 165	FKS - 40 - 400	**R3C381**
50	120 kA	72	125	35	25,5	430 x 1000 x 165	FKS - 50 - 400	**R3C391**
60	120 kA	87	160	50	26,5	430 x 1000 x 165	FKS - 60 - 400	**R3C3A1**
80	120 kA	116	160	70	28,5	430 x 1000 x 165	FKS - 80 - 400	**R3C3C1**

(2) Cable section in mm^2. See also page 12 'input power cables'

AC-D

CLZ CAPACITOR WITH CONTACTOR, MCCB AND REACTIVE RELAY

(2) Cable section in mm². See also page 12 'input power cables'

	AC-D 400 V / 50 Hz						
kvar	Cut off power (kA)	A	Cable(2)	Weight (kg)	Dimensions (mm)	Type	Code
2	10	3	6	8,5	254 x 503 x 141	ACD-2-400	R3Q211
2,5	10	3,5	6	8,5	254 x 503 x 141	ACD-2,5-400	R3Q221
3	10	4,5	6	8,5	254 x 503 x 141	ACD-3-400	R3Q231
4	10	5,5	6	9,5	254 x 503 x 141	ACD-4-400	R3Q241
5	10	7	6	9,5	254 x 503 x 141	ACD-5-400	R3Q251
6,25	10	9	6	9,5	254 x 503 x 141	ACD-6,25-400	R3Q2C1
7,5	10	10,5	6	9,5	254 x 503 x 141	ACD-7,5-400	R3Q261
8	10	11,5	6	9,5	254 x 503 x 141	ACD-8-400	R3Q2D1
10	10	14	6	10,5	254 x 503 x 141	ACD-10-400	R3Q271
12,5	10	18	6	10,5	254 x 503 x 141	ACD-12,5-400	R3Q281
15	10	21,5	6	10,5	254 x 503 x 141	ACD-15-400	R3Q291
20	10	29	10	11,5	254 x 503 x 141	ACD-20-400	R3Q2A1
25	10	36	10	12,5	254 x 503 x 141	ACD-25-400	R3Q2B1
Auxiliary power supply 230 V a.c.							

AC-M

CLZ CAPACITOR WITH CONTACTOR AND MCCB

(2) Cable section in mm². See also page 12 'input power cables'

	AC-M 400 V / 50 Hz						
kvar	Cut off power (kA)	A	Cable(2)	Weight (kg)	Dimensions (mm)	Type	Code
2	10	3	6	8	254 x 503 x 141	ACM-2-400	R3P211
2,5	10	3,5	6	8	254 x 503 x 141	ACM-2,5-400	R3P221
3	10	4,5	6	8	254 x 503 x 141	ACM-3-400	R3P231
4	10	5,5	6	9	254 x 503 x 141	ACM-4-400	R3P241
5	10	7	6	9	254 x 503 x 141	ACM-5-400	R3P251
6,25	10	9	6	9	254 x 503 x 141	ACM-6,25-400	R3P2C1
7,5	10	10,5	6	10	254 x 503 x 141	ACM-7,5-400	R3P261
8	10	11,5	6	10	254 x 503 x 141	ACM-8-400	R3P2D1
10	10	14	6	10	254 x 503 x 141	ACM-10-400	R3P271
12,5	10	18	6	10	254 x 503 x 141	ACM-12,5-400	R3P281
15	10	21,5	6	11	254 x 503 x 141	ACM-15-400	R3P291
20	10	29	10	11	254 x 503 x 141	ACM-20-400	R3P2A1
25	10	36	10	12	254 x 503 x 141	ACM-25-400	R3P2B1
Auxiliary power supply 230 V AC.							

AM

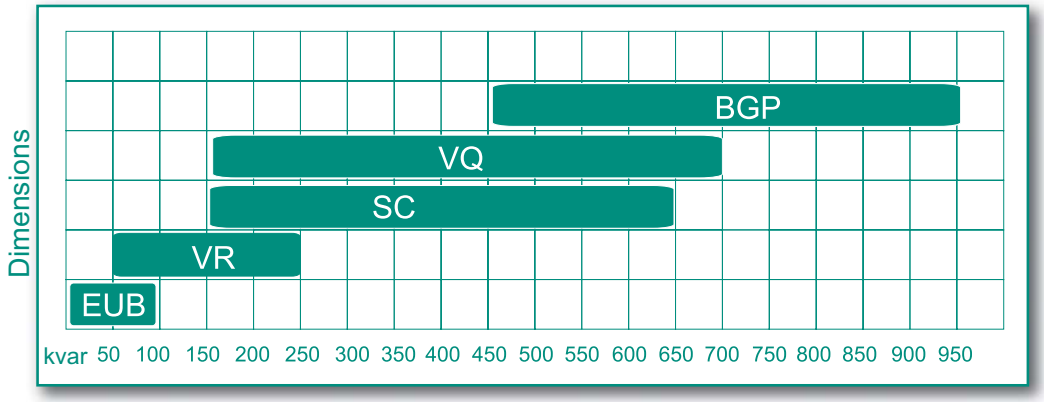
CLZ CAPACITOR WITH MCCB

(2) Cable section in mm². See also page 12 'input power cables'

	AC-M 400 V / 50 Hz						
kvar	Cut off power (kA)	A	Cable(2)	Weight (kg)	Dimensions (mm)	Type	Code
2	10	3	6	8	254 x 503 x 141	AM-2-400	R3N211
2,5	10	3,5	6	8	254 x 503 x 141	AM-2,5-400	R3N221
3	10	4,5	6	8	254 x 503 x 141	AM-3-400	R3N231
4	10	5,5	6	9	254 x 503 x 141	AM-4-400	R3N241
5	10	7	6	9	254 x 503 x 141	AM-5-400	R3N251
6,25	10	9	6	9,3	254 x 503 x 141	AM-6,25-400	R3N2C1
7,5	10	10,5	6	9,5	254 x 503 x 141	AM-7,5-400	R3N261
8	10	11,5	6	9,5	254 x 503 x 141	AM-8-400	R3N2D1
10	10	14	6	10	254 x 503 x 141	AM-10-400	R3N271
12,5	10	18	6	10	254 x 503 x 141	AM-12,5-400	R3N281
15	10	21,5	6	10	254 x 503 x 141	AM-15-400	R3N291
20	10	29	10	11	254 x 503 x 141	AM-20-400	R3N2A1
25	10	36	10	12	254 x 503 x 141	AM-25-400	R3N2B1

AUTOMATIC BANKS

The following table shows the rapid checking of the most suitable **CIRCUTOR** range of automatic banks for the required power. For superimposed powers the option chosen will be the most appropriate option in terms of the dimensions and required types..



EUB

EUB-3 400 V / 50 Hz								
kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
5	1,66+3,33	7	63 A	6	28	290 x 433 x 182	EUB-3-5-400	**R31405**
7,5	2,5+5	11	63 A	6	28	290 x 433 x 182	EUB-3-7,5-400	**R31410**
10	3x3,33	14,5	63 A	6	29	290 x 433 x 182	EUB-3-10-400	**R31415**
12,5	2,5+(2 x 5)	18	63 A	6	29	290 x 433 x 182	EUB-3-12,5-400	**R31420**
17,5	2,5+5+10	25	63 A	6	30	290 x 433 x 182	EUB-3-17,5-400	**R31425**
18,75	3x6,25	27	63 A	6	30	290 x 433 x 182	EUB-3-18,75-400	**R31430**
25	5+(2 x 10)	36	63 A	10	31	290 x 433 x 182	EUB-3-25-400	**R31435**
30	3x10	43	63 A	16	31	290 x 433 x 182	EUB-3-30-400	**R31440**
31,25	6,25 x (2 x 12,5)	45	63 A	16	32	290 x 433 x 182	EUB-3-31,25-400	**R31445**
EUB-4 400 V / 50 Hz								
kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
35	5+(3 x 10)	51	200 A	25	34	460 x 850 x 172	EUB-4-35-400	**R32405**
43,75	6,25+(3 x 12,5)	63	200 A	25	36	460 x 850 x 172	EUB-4-43,75-400	**R32410**
50	10+(2 x 20)	72	200 A	35	37	460 x 850 x 172	EUB-4-50-400	**R32415**
55	5+10+(2 x 20	79	200 A	35	40	460 x 850 x 172	EUB-4-55-400	**R32420**
68,75	6,25+12,5+(2x25)	99	200 A	50	40	460 x 850 x 172	EUB-4-86,75-400	**R32425**
70	10+(3 x 20)	101	200 A	50	41	460 x 850 x 172	EUB-4-70-400	**R32430**
80	4 x 20	116	200 A	70	41	460 x 850 x 172	EUB-4-80-400	**R32435**
87,5	12,5+(3 x 25)	126	200 A	70	41	460 x 850 x 172	EUB-4-87,5-400	**R32440**
100	4 x 25	145	200 A	95	42	460 x 850 x 172	EUB-4-100-400	**R32445**

(0) On request, other voltage / frequencies
(1) Optional

(2) Cable section in mm^2. See also page 12 'input power cables'

VR

kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
VR-6 400 V / 50 Hz								
45	5+(4 x 10)	65	200 A	35	65	615 x 1230 x 280	VR-6/5-45-400	**R3M420**
50	10+(2 x 20)	72	200 A	35	60	615 x 1230 x 280	VR-6/3-50-400	**R3M422**
55	5+(5 x 10)	79	200 A	35	67	615 x 1230 x 280	VR-6/6-55-400	**R3M424**
60	3 x 20	87	200 A	50	62	615 x 1230 x 280	VR-6/3-60-400	**R3M426**
62,5	12,5+(2 x 25)	90	200 A	50	65	615 x 1230 x 280	VR-6/3-62,5-400	**R3M428**
70	10+(3 x 20)	101	200 A	50	69	615 x 1230 x 280	VR-6/4-70-400	**R3M430**
75	3 x 25	108	200 A	70	70	615 x 1230 x 280	VR-6/3-75-400	**R3M432**
80	4 x 20	116	200 A	70	71	615 x 1230 x 280	VR-6/4-80-400	**R3M434**
87,5	12,5+(3 x 25)	126	200 A	70	73	615 x 1230 x 280	VR-6/4-87,5-400	**R3M436**
90	10+(4 x 20)	130	200 A	70	74	615 x 1230 x 280	VR-6/5-90-400	**R3M438**
100	5 x 20	145	200 A	95	76	615 x 1230 x 280	VR-6/5-100-400	**R3M440**
100	4 x 25	145	200 A	95	78	615 x 1230 x 280	VR-6/4-100-400	**R3M442**
110	10+(5 x 20)	159	250 A	95	80	615 x 1230 x 280	VR-6/6-110-400	**R3M444**
112,5	12,5+(4 x 25)	163	250 A	95	82	615 x 1230 x 280	VR-6/5-112,5-400	**R3M446**
120	6 x 20	173	250 A	95	84	615 x 1230 x 280	VR-6/6-120-400	**R3M448**
125	5 x 25	181	400 A	95	90	615 x 1230 x 280	VR-6/5-125-400	**R3M450**
137,5	12,5+(5 x 25)	199	400 A	120	96	615 x 1230 x 280	VR-6/6-137,5-400	**R3M452**
150	6 x 25	217	400 A	120	108	615 x 1230 x 280	VR-6/6-150-400	**R3M454**
VR-10 400 V / 50 Hz								
130	10+(6 x 20)	188	400 A	120	111	1000 x 1230 x 280	VR-10/7-130-400	**R3M456**
140	7 x 20	202	400 A	120	114	1000 x 1230 x 280	VR-10/7-140-400	**R3M458**
150	10+(7 x 20)	217	400 A	120	117	1000 x 1230 x 280	VR-10/8-150-400	**R3M460**
160	8 x 20	231	400 A	150	120	1000 x 1230 x 280	VR-10/8-160-400	**R3M462**
162,5	12,5+(6 x 25)	235	400 A	150	121	1000 x 1230 x 280	VR-10/7-162,5-400	**R3M464**
170	10+(8 x 20)	246	400 A	150	125	1000 x 1230 x 280	VR-10/9-170-400	**R3M466**
175	7 x 25	253	400 A	150	126	1000 x 1230 x 280	VR-10/7-175-400	**R3M468**
180	9 x 20	260	400 A	150	129	1000 x 1230 x 280	VR-10/9-180-400	**R3M470**
187,5	12,5+(7 x 25)	271	630 A	185	130	1000 x 1230 x 280	VR-10/8-187,5-400	**R3M472**
190	10+(9 x 20)	275	630 A	185	132	1000 x 1230 x 280	VR-10/10-190-400	**R3M474**
200	10 x 20	289	630 A	185	134	1000 x 1230 x 280	VR-10/10-200-400	**R3M476**
200	8 x 25	289	630 A	185	136	1000 x 1230 x 280	VR-10/8-200-400	**R3M478**
212,5	12,5+(8x25)	307	630 A	185	141	1000 x 1230 x 280	VR-10/9-212,5-400	**R3M482**
225	9 x 25	325	630 A	240	147	1000 x 1230 x 280	VR-10/9-225-400	**R3M486**
237,5	12,5+(9 x 25)	343	630 A	240	148	1000 x 1230 x 280	VR-10/10-237,5-400	**R3M490**
250	10 x 25	361	630 A	240	150	1000 x 1230 x 280	VR-10/10-250-400	**R3M494**

(0) On request, other frequencies
(1) Optional
(2) Cable section in mm^2. See also page 12 'input power cables'

VQ

kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
VQ-6 400 V / 50 Hz								
150	(2 x 25) + (2 x 50)	217	400 A	120	118	650 x 1910 x 400	VQ-6/4 150-400	**R37395**
175	25 + (3 x 50)	253	400 A	150	120	650 x 1910 x 400	VQ-6/4 175-400	**R37401**
187,5	12,5+25+(3 x 50)	271	630 A	185	124	650 x 1910 x 400	VQ-6/5 187,5-400	**R37405**
200	(2 x 25) + (3 x 50)	290	630 A	185	126	650 x 1910 x 400	VQ-6/4 200-400	**R37412**
225	25 + (4 x 50)	325	630 A	240	129	650 x 1910 x 400	VQ-6/5 225-400	**R37416**
250	(2 x 25) + (4 x 50)	361	630 A	240	140	650 x 1910 x 400	VQ-6/6 250-400	**R37420**
275	25 + (5 x 50)	397	630 A	2 x 120	144	650 x 1910 x 400	VQ-6/6 275-400	**R37425**
300	(6 x 50)	434	630 A	2 x 150	146	650 x 1910 x 400	VQ-6/6 300-400	**R37430**
VQ-8 400 V / 50 Hz								
287,5	12,5+25+(5 x 50)	415	630 A	2 x 150	183	850 x 1910 x 400	VQ-8/7 287,5-400	**R38399**
300	(2 x 25) + (5 x 50)	433	1 000 A	2 x 150	185	850 x 1910 x 400	VQ-8/7 300-400	**R38404**
325	25 + (6 x 50)	469	1 000 A	2 x 150	195	850 x 1910 x 400	VQ-8/7 325-400	**R38406**
337,5	12,5+25+(6 x 50)	488	1 000 A	2 x 185	188	850 x 1910 x 400	VQ-8/8 337,5-400	**R38409**
350	(2 x 25) + (6 x 50)	506	1 000 A	2 x 185	194	850 x 1910 x 400	VQ-8/8 350-400	**R38407**
375	25 + (7 x 50)	541	1 000 A	2 x 185	196	850 x 1910 x 400	VQ-8/8 375-400	**R38410**
400	(8 x 50)	578	1 000 A	2 x 240	199	850 x 1910 x 400	VQ-8/8 400-400	**R38419**
VQ-12 400 V / 50 Hz								
425	25 + (8 x 50)	614	1 000 A	2 x 240	258	1750 x 1910 x 400	VQ-12/9 425-400	**R39403**
450	(9 x 50)	650	1 000 A	2 x 240	260	1750 x 1910 x 400	VQ-12/9 450-400	**R39404**
475	25 + (9 x 50)	686	1 000 A	2 x 240	270	1750 x 1910 x 400	VQ-12/10 475-400	**R39406**
500	(10 x 50)	723	1 600 A	3 x 185	275	1750 x 1910 x 400	VQ-12/10 500-400	**R39407**
525	25 + (10 x 50)	759	1 600 A	3 x 185	280	1750 x 1910 x 400	VQ-12/11 525-400	**R39408**
550	(11 x 50)	795	1 600 A	3 x 185	285	1750 x 1910 x 400	VQ-12/11 550-400	**R39409**
575	25 + (11 x 50)	831	1 600 A	3 x 240	290	1750 x 1910 x 400	VQ-12/12 575-400	**R39411**
600	(12 x 50)	867	1 600 A	3 x 240	300	1750 x 1910 x 400	VQ-12/12 600-400	**R39415**
VQ-14 400 V / 50 Hz								
625	25 + (12 x 50)	903	1 600 A	3 x 240	350	1950 x 1910 x 400	VQ-14/13 625-400	**R3A425**
650	(13 x 50)	939	1 600 A	3 x 240	355	1950 x 1910 x 400	VQ-14/13 650-400	**R3A430**
675	25 + (13 x 50)	975	1 600 A	3 x 240	365	1950 x 1910 x 400	VQ-14/14 675-400	**R3A435**
700	(14 x 50)	1012	1 600 A	4 x 185	370	1950 x 1910 x 400	VQ-14/14 700-400	**R3A440**

(0) On request, other frequencies
(1) Optional
(2) Cable section in mm^2. See also page 12 'input power cables'

BGP

kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
			BGP - 6 400 V / 50 Hz					
440	40+(5 x 80)	636	1 000 A	2 x 240	275	1050 x 2050 x 500	BGP-6/6-440-400	**R3K148**
480	6 x 80	694	1 000 A	2 x 240	280	1050 x 2050 x 500	BGP-6/6-480-400	**R3K150**
			BGP - 8 400 V / 50 Hz					
480	(2 x40)+(5 x 80)	694	1 000 A	2 x 240	348	1350 x 2050 x 500	BGP-8/7-480-400	**R3K276**
520	40+(6 x 80)	751	1 600 A	3 x 185	353	1350 x 2050 x 500	BGP-8/7-520-400	**R3K278**
560	7 x 80	809	1 600 A	3 x 185	358	1350 x 2050 x 500	BGP-8/7-560-400	**R3K280**
560	(2 x 40)+(6 x 80)	809	1 600 A	3 x 185	365	1350 x 2050 x 500	BGP-8/8-560-400	**R3K282**
600	40+(7 x 80)	867	1 600 A	3 x 240	370	1350 x 2050 x 500	BGP-8/8-600-400	**R3K284**
640	8 x 80	925	1 600 A	3 x 240	375	1350 x 2050 x 500	BGP-8/8-640-400	**R3K286**
			BGP -12 400 V / 50 Hz					
640	(2 x 40)+(7 x 80)	925	1 600 A	3 x 240	500	2100 x 2050 x 500	BGP-12/9-640-400	**R3K370**
680	40+(8 x 80)	983	1 600 A	3 x 240	505	2100 x 2050 x 500	BGP-12/9-680-400	**R3K372**
720	9 x 80	1 040	1 600 A	4 x 185	510	2100 x 2050 x 500	BGP-12/9-720-400	**R3K374**
720	(2 x 40)+(8 x 80)	1 040	1 600 A	4 x 185	516	2100 x 2050 x 500	BGP-12/10-720-400	**R3K376**
760	40+(9 x 80)	1 098	2 000 A	4 x 185	521	2100 x 2050 x 500	BGP-12/10-760-400	**R3K378**
800	10 x 80	1 156	2 000 A	4 x 240	526	2100 x 2050 x 500	BGP-12/10-800-400	**R3K380**
800	(2 x 40)+(9 x 80)	1 156	2 000 A	4 x 240	533	2100 x 2050 x 500	BGP-12/11-800-400	**R3K382**
840	40+(10 x 80)	1 214	2 000 A	4 x 300	538	2100 x 2050 x 500	BGP-12/11-840-400	**R3K384**
880	11 x 80	1 272	2 000 A	4 x 300	543	2100 x 2050 x 500	BGP-12/11-880-400	**R3K386**
880	(2 x 40)+(10 x 80)	1 272	2 000 A	4 x 300	550	2100 x 2050 x 500	BGP-12/12-880-400	**R3K388**
920	40+(11 x 80)	1 329	2 000 A	4 x 300	555	2100 x 2050 x 500	BGP-12/12/-920-400	**R3K390**
960	12 x 80	1 387	2 000 A	4 x 300	560	2100 x 2050 x 500	BGP-12/12-960-400	**R3K392**

(0) On request, other frequencies
(1) Optional
(2) Cable section in mm^2. See also page 12 'input power cables'

SC

SC 400 V / 50 Hz								
kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
165	15+(5 x 30)	238	-	150	150	880 x 1780 x 360	SC-165-15-400	**R3D160**
180	6 x 30	260	-	150	160	880 x 1780 x 360	SC-180-30-400	**R3D162**
220	20+(5 x 40)	318	-	240	165	880 x 1780 x 360	SC-220-20-400	**R3D164**
240	6 x 40	347	-	240	165	880 x 1780 x 360	SC-240-40-400	**R3D166**
275	25+(5 x 50)	397	-	2 x 120	170	880 x 1780 x 360	SC-275-25-400	**R3D168**
300	6 x 50	434	-	2 x 150	170	880 x 1780 x 360	SC-300-50-400	**R3D170**
330	30+(5 x 60)	477	-	2 x 150	175	880 x 1780 x 360	SC-330-30-400	**R3D172**
360	6 x 60	520	-	2 x 185	180	880 x 1780 x 360	SC-360-60-400	**R3D174**
412,5	37,5+(5 x 75)	596	-	2 x 240	185	880 x 1780 x 360	SC-412,5-37,5-400	**R3D176**
440	40+(5 x 80)	636	-	2 x 240	190	880 x 1780 x 360	SC-440-40-400	**R3D178**
450	6 x 75	650	-	2 x 240	190	880 x 1780 x 360	SC-450-75-400	**R3D180**
480	6 x 80	694	-	2 x 240	200	880 x 1780 x 360	SC-480-80-400	**R3D182**
SC 8 400 V / 50 Hz								
325	25+(6 x 50)	470	1 000 A	2 x 150	230	1180 x 1780 x 360	SC 8 -325-25-400	**R3D260**
350	7 x 50	506	1 000 A	2 x 185	235	1180 x 1780 x 360	SC 8 -350-50-400	**R3D262**
375	25+(7 x 50)	542	1 000 A	2 x 185	245	1180 x 1780 x 360	SC 8 -375-25-400	**R3D264**
390	30+(6 x 60)	564	1 000 A	2 x 185	240	1180 x 1780 x 360	SC 8 -390-30-400	**R3D266**
400	8 x 50	578	1 000 A	2 x 240	250	1180 x 1780 x 360	SC 8 -400-50-400	**R3D268**
420	7 x 60	607	1 000 A	2 x 240	245	1180 x 1780 x 360	SC 8 -420-60-400	**R3D270**
450	30+(7 x 60)	650	1 000 A	2 x 240	255	1180 x 1780 x 360	SC 8 -450-30-400	**R3D272**
480	8 x 60	694	1 000 A	2 x 240	260	1180 x 1780 x 360	SC 8 -480-60-400	**R3D274**
520	40+(6 x 80)	751	1 600 A	3 x 185	270	1180 x 1780 x 360	SC 8 -520-40-400	**R3D276**
560	7 x 80	809	1 600 A	3 x 185	275	1180 x 1780 x 360	SC 8 -560-80-400	**R3D278**
600	40+(7 x 80)	867	1 600 A	3 x 240	288	1180 x 1780 x 360	SC 8 -600-40-400	**R3D280**
640	8 x 80	925	1 600 A	3 x 240	295	1180 x 1780 x 360	SC 8 -640-80-400	**R3D282**

(0) On request, other frequencies
(1) Optional
(2) Cable section in mm2. See also page 12 'input power cables'

AUTOMATIC BANKS WITH STATIC SYSTEM

ECK

ECK 400 V/50 Hz								
kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
12,5	2,5+(2 x 5)	18	125 A	6	49	615 x 700 x 245	ECK-12,5-400	**R44405**
17,5	2,5+5+10	25	125 A	6	50	615 x 700 x 245	ECK-17,5-400	**R44410**
25	5+(2 x 10)	36	125 A	10	51	615 x 700 x 245	ECK-25-400	**R44415**
27,5	2,5+5+(2 x 10)	40	125 A	10	52	615 x 700 x 245	ECK-27,5-400	**R44420**
31,25	6,25+(2 x 12,5)	45	125 A	16	52	615 x 700 x 245	ECK-31,25-400	**R44425**
35	5+10+20	51	125 A	25	52	615 x 700 x 245	ECK-35-400	**R44430**
43,75	6,25+12,5+25	63	125 A	35	54	615 x 700 x 245	ECK-43,75-400	**R44435**
50	10+(2 x 20)	72	125 A	35	55	615 x 700 x 245	ECK-50-400	**R44440**
55	5+10+(2 x 20)	79	125 A	35	56	615 x 700 x 245	ECK-55-400	**R44445**
62,5	12,5+(2 x 25)	90	125 A	50	56	615 x 700 x 245	ECK-62,5-400	**R44450**
68,75	6,25+12,5+(2 x 25)	99	200 A	50	58	615 x 700 x 245	ECK-68,75-400	**R44455**
70	10+(3 x 20)	101	200 A	50	59	615 x 700 x 245	ECK-70-400	**R44460**
80	4 x 20	116	200 A	70	60	615 x 700 x 245	ECK-80-400	**R44465**
87,5	12,5+(3 x 25)	126	200 A	70	61	615 x 700 x 245	ECK-87,5-400	**R44470**
100	4 x 25	145	200 A	95	63	615 x 700 x 245	ECK-100-400	**R44475**

(0) On request, other frequencies
(1) Optional
(2) Cable section in mm². See also page 12 'input power cables'

EMK

EMK-4 400 V/50 Hz								
kvar	Composition	A	Switch (1)	Cable (2)	Weight (kg)	Dimensions (mm)	Type	Code
105	15+30+60	152	250 A	95	140	1050 x 2015 x 520	EMK-4-105-400	**R45405**
140	20+40+80	202	400 A	120	147	1050 x 2015 x 520	EMK-4-140-400	**R45410**
165	15+30+(2 x 60)	238	400 A	150	150	1050 x 2015 x 520	EMK-4-165-400	**R45415**
200	40+(2 x 80)	289	630 A	185	153	1050 x 2015 x 520	EMK-4-200-400	**R45420**
220	20+40+(2 x 80)	318	630 A	240	157	1050 x 2015 x 520	EMK-4-220-400	**R45425**
280	40+(3 x 80)	405	630 A	2 x 120	160	1050 x 2015 x 520	EMK-4-280-400	**R45430**
EMK-6 400 V/50 Hz								
330	30+(5 x 60)	477	1 000 A	2 x 150	163	1400 x 2015 x 520	EMK-6-330-400	**R45435**
360	40+(4 x 80)	520	1 000 A	2 x 185	165	1400 x 2015 x 520	EMK-6-360-400	**R45440**
440	40+(5 x 80)	636	1 000 A	2 x 240	168	1400 x 2015 x 520	EMK-6-440-400	**R45445**
480	6 x 80	694	1 000 A	2 x 240	179	1400 x 2015 x 520	EMK-6-480-400	**R45450**
EMK-8 400 V/50 Hz								
520	40+(6 x 80)	751	1 600 A	3 x 185	185	1750 x 2015 x 520	EMK-8-520-400	**R45455**
540	20+40+(6 x 80)	780	1 600 A	3 x 185	190	1750 x 2015 x 520	EMK-8-540-400	**R45460**
600	40+(7 x 80)	867	1 600 A	3 x 240	195	1750 x 2015 x 520	EMK-8-600-400	**R45465**
640	8 x 80	925	1 600 A	3 x 240	200	1750 x 2015 x 520	EMK-8-640-400	**R45470**

(0) On request, other frequencies
(1) Optional
(2) Cable section in mm². See also page 12 'input power cables'

Accessories

SPLIT CORE CURRENT TRANSFORMER

A	TP-23	TP-58	TP-88	TP-812	TP-816
100/5	M70111				
150/5	M70112				
200/5	M70113				
250/5	M70114	M70121	M70131		
300/5	M70115	M70122	M70132		
400/5	M70116	M70123	M70133		
500/5		M70124	M70134	M70141	
600/5		M70125	M70135	M70142	
750/5		M70126	M70136	M70143	
800/5		M70127	M70137	M70144	
1 000/5		M70128	M70138	M70145	M70151
1 200/5				M70146	
1 250/5				M70147	
1 500/5				M70148	M70152
2 000/5					M70153
2 500/5					M70154
3 000/5					M70155
4 000/5					M70156
5 000/5					M70157

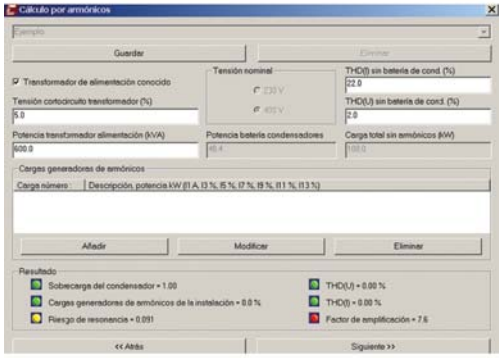
POWER FACTOR REGULATORS

Catalogue: R.1/2

PORTABLE POWER ANALYZERS

Catalogue: M.8

CIRCALC *Software*



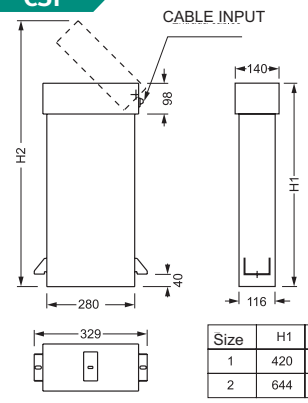
Software designed to calculate and select reactive equipment using:

- Power utility bills
- Powers
- Data for electrical power consumption in the installation
- etc.

code: M90441

Dimensions

CSF



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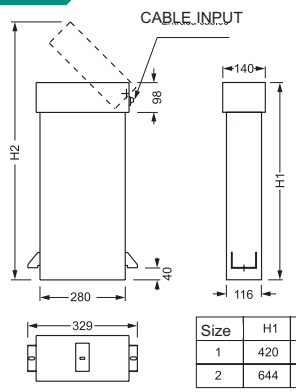
2	644	916

CSM



Size	H1	H2
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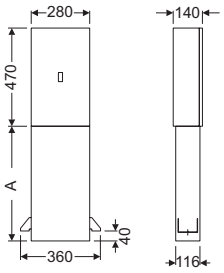
2	644	916

CSMM



Type	A
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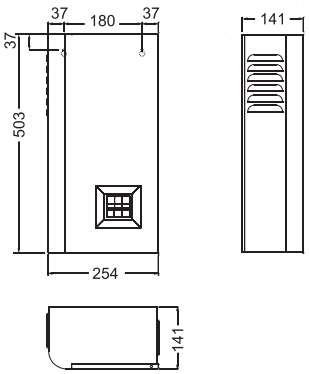
CSMM-60	549
CSMM-100	699

AC-D



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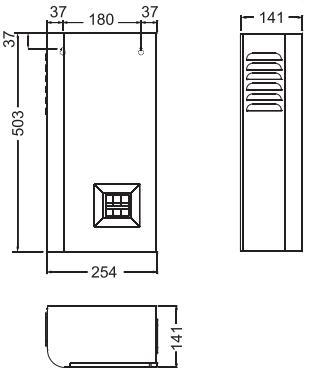

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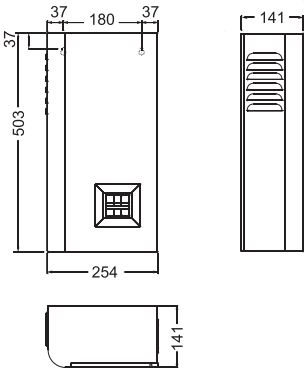

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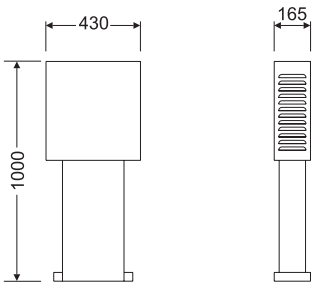
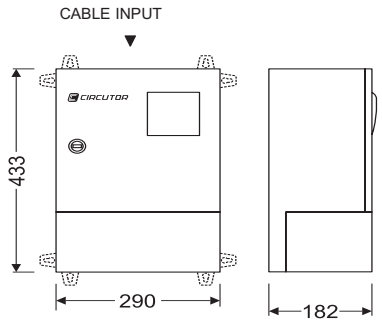


EUB-3



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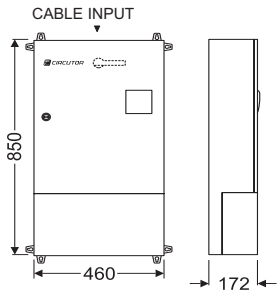
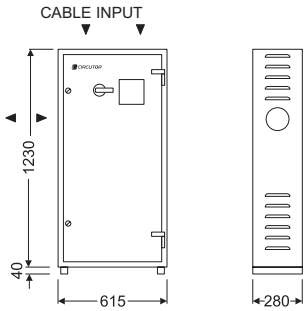
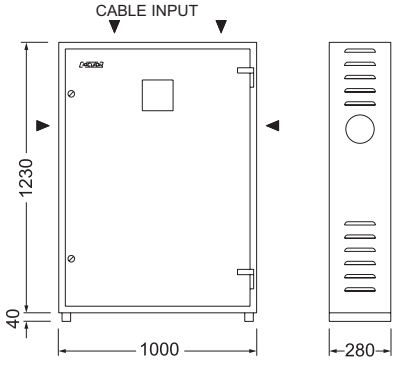


VR-6



VR-10



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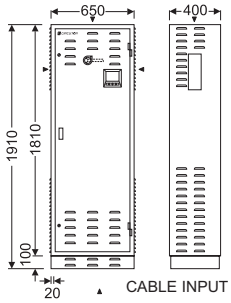

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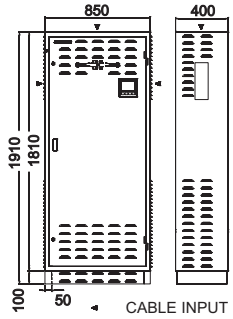

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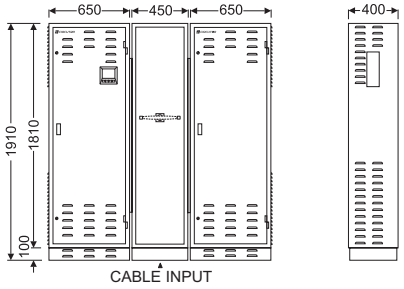

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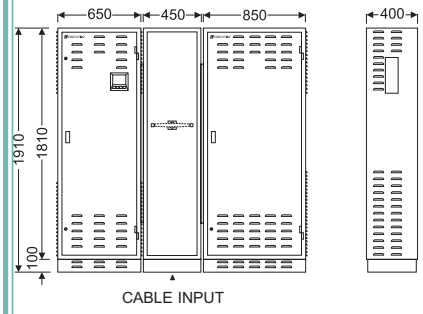

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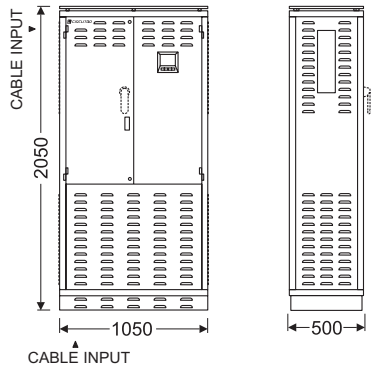

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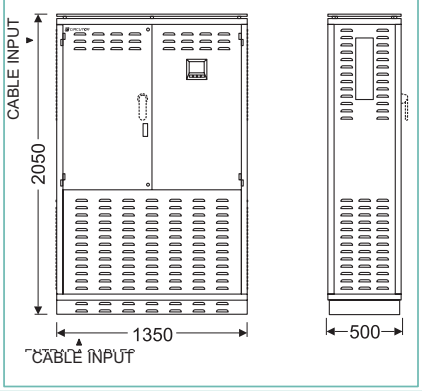

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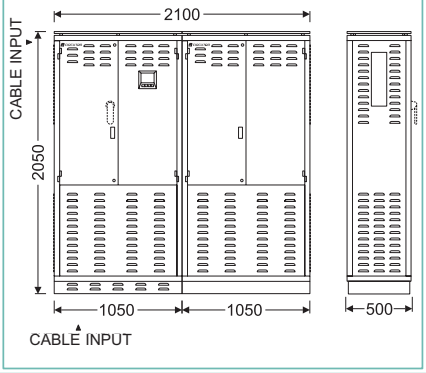

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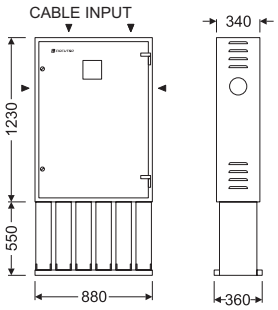

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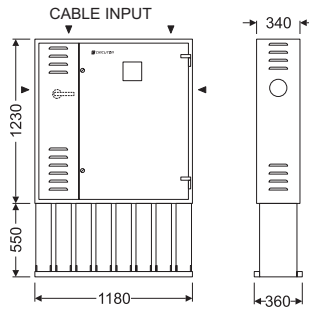

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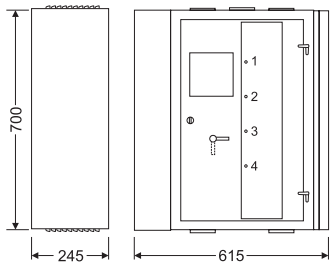

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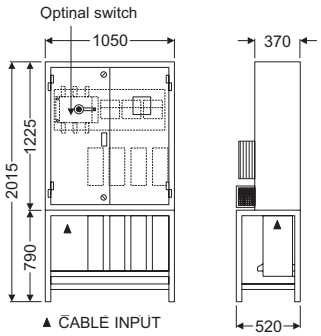

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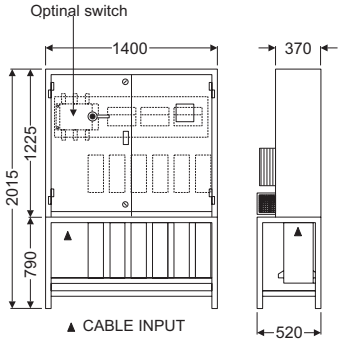

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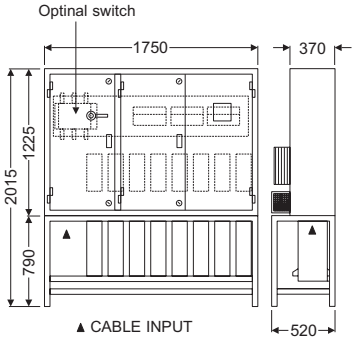

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