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功率因數調整用電容器型錄

KEY COMPONENTS FOR POWER FACTOR CORRECTION

FACTORY MATCHED TO OPERATE IN PERFECT HARMONY

ELECTRONICON®

100% 德國原裝進口防爆型電容器 *always in charge*

Rated Voltage U_N

Root mean square of the max. permissible value of sinusoidal AC voltage in continuous operation.

The rated voltage of the capacitors indicated in the data charts must not be exceeded even in cases of malfunction. Bear in mind that capacitors in detuned equipment are exposed to a higher voltage than that of the rated mains voltage; this is caused by the connection of detuning reactor and capacitor in series. Consequently, capacitors used with reactors must have a voltage rating higher than that of the regular mains voltage.

The voltage at a detuned capacitor's terminals can be calculated as follows:

$$U_C = \frac{U_N}{\left(1 - \frac{p}{100\%}\right)}$$

U_N = rated mains voltage 額定系統電壓
U_C = capacitor voltage 電容器端電壓
p = detuning factor 電抗器/電容器 匹配比(%)

額定電壓U_N

在連續操作下，正弦曲線交流電壓所允許的最大均方根電壓值。
在資料表中所指示的電容器額定電壓值，就算在故障時，也必須不能被超過。
切記，在失調的設備中，電容器是暴露在較高的電壓下。(高於額定電壓)；這是由於電容器與電抗器串連所導致。在電容器搭配電抗器使用時，必須使用高於標準電壓的額定電壓，這是必然的結果。
使用中的電容器，其端子的電壓可以利用下列公式來換算：

Test Voltage Between Terminals U_{BB}

Routine test of all capacitors conducted at room temperature, prior to delivery. A further test with 80 % of the test voltage stated in the data sheet may be carried out once at the user's location.

端子間測試電壓U_{BB}

在出貨前，會於室溫下針對所有電容器的端子進行例行性的試驗。進一步的測試，會在使用者的所在地進行一次，利用80%的測試電壓來完成，並在資料頁中敘述之。

Voltage test between terminals and case U_{BG}

Routine test of all capacitors between short-circuited terminals and case, conducted at room temperature. May be repeated at the user's location.
Capacitors Un<660V must test in 3.6KV for 2s or 3KV for 10s based on IEC60831. Our capacitors applied 3.6KV for 2s.

端子與外殼間測試電壓U_{BG}

所有電容器均在室溫下將端子與外殼短接後進行例行性測試。可在使用者所在地進行重複測試。
根據IEC60831，電壓低於660V，需通過3.6KV/2s或3KV/10s測試，我們產品採前者測試標準。

Rated Power Q_C

Reactive power resulting from the ratings of capacitance, frequency, and voltage.

額定功率Q_C

根據電容值、頻率和電壓的規格，會形成不同的虛功。

Current Rating I_N

RMS value of the current at rated voltage and frequency, excluding harmonic distortion, switching transients, and capacitance tolerance.

額定電流I_N

在額定電壓與頻率下的均方根電流值。不考慮諧波分佈、開關切換瞬間電流和電容值誤差。

Maximum RMS Current Rating I_{max}

Maximum rms value of permissible current in continuous operation. The maximum permitted rms current for each particular capacitor is specif ed in the data charts and is related to either construction features or the current limits of the terminals. In accordance with IEC 60831 all ELECTRONICON capacitors are rated at least $1.3 \times I_N$, allowing for the current rise from permissible voltage and capacitance tolerances as well as harmonic distortion. The exact value for each capacitor can be found in the data charts. Higher rms values than stated in the data charts require adjustments in construction and are available on request.

最大RMS額定電流I_{max}

在連續操作下的允許最大均方根電流值。每個品項的電容器最大允許均方根電流規範均在資料表中，且與不同的構造特色或端子台的電流限制有關。
所有ELECTRONICON的電容器均根據 IEC60831標準，在允許電壓與電容誤差值以及諧波失真下，可耐受電流升高最少也有 1. 3倍額定電流，亦即所謂的耐諧波防爆型電容器。
詳細的數值可從資料表中查到。若需要高於資料表中所述的均方根值，可根據結構判斷特別訂製。

Continuous currents that exceed these values will lead to a build-up of heat in the capacitor and - as a result - reduced lifetime or premature failure. Permanent excess current may even result in failure of the capacitor's safety mechanisms, i.e. bursting or fire

假如連續電流超過這些數值，將會導致電容器過熱，也因此會減少電容器壽命或提早發生故障。固定超額的電流也會導致電容器的安全機構故障，諸如：爆裂或起火。

Care must be taken not to exceed the maximum voltage and current ratings when installing capacitors in close-tuned or detuned equipment (see data sheets for maximum ratings). The thermal monitoring of reactors, or the use of overcurrent protection relays in the capacitor circuit is recommended to protect against overloads.

安裝電容器在需協調的設備時，請注意不可超過最大電壓與電流額定值。(詳見資料表或最高額定值)
建議在電容電路上外加電抗器的熱監控或過電流保護電驛，針對過載來做保護。

Pulse Current Strength I_S

耐衝擊電流強度I_S

Depending on construction and voltage rating, the design of our capacitors permits short term inrush currents of 300...400 x I_N and – in accordance with IEC 60831 –up to 5000 switching operations per annum as standard. However, when switching capacitors in automatic capacitor banks without detuning reactors, higher loads are very often the case. This may have a negative effect on the operational life, especially of capacitors which are frequently connected and disconnected (e.g. primary stages). Moreover, even detuned capacitors may experience switching currents exceeding the permissible maximum current of the reactor and causing consequential damage.

根據結構與電壓範圍，我們的電容器設計符合IEC 60831之標準，可允許瞬間衝擊電流300　400倍額定電流和每年5000次的開關動作。
但是，當電容器的自動切換沒有搭配電抗器時，會時常發生較高的負載。這點對電容器的壽命有負面的影響，尤其是電容器組非常頻繁的做投入與跳脫動作時(如：主盤)。更甚者，電容器可能頻繁的切換電抗器所允許的最高電流，從而導致受損。

We therefore strongly recommend the use of special capacitor contactors with inrush limiting resistors, or other adequate devices for limitation of the peak inrush currents.

因此，我們強烈建議使用特殊的、具有衝擊電流阻抗的電容器專用電磁接觸器，或者其他可以滿足限制峰值衝擊電流的設備。

Temperature Category

溫度種類

The average useful life of a capacitor depends very much on the ambient temperatures it is operated at. The permissible operating temperatures are def ned by the temperature class stated on label which contains the lower limit temperature (-50°C for all CAPAGRIP™ power capacitors) and a letter, which describes the values of the upper limit temperatures. The following chart details the maximum permitted ambient temperatures for capacitors for each temperature category based on IEC 60831.

電容器的平均有效壽命與其工作的環境溫度有著非常大的關係。允許的工作溫度乃是由溫度的等級來定義，包含最低溫度限制(-50°C為所有CAPGRIP電容器通用)和一個代表最高溫度限制的字母。
左邊的圖表詳細的列出電容器允許的最高環境溫度，每個溫度的種類乃是根據IEC 60831所制訂。

溫度種類 temperature category	環境溫度限制 ambient temperature limits		
	最高 maximum	24小時最高平均 max. average 24 hrs	一年最高平均 max. average 365 days
B	45°C	35°C	25°C
C	50°C	40°C	30°C
D	55°C	45°C	35°C
60	60°C	50°C	40°C
65	65°C	55°C	45°C
70	70°C	60°C	50°C

注意：
不遵守此用法說明，會導致嚴重的工作壽命減短和電容器故障，更嚴重時，可能會由於安全裝置故障而導致爆炸或失火的情形。

安裝方法說明
MOUNTING INSTRUCTIONS
VORSCHRIFTEN ZU EINBAU UND BETRIEB

ZVEI: Starkstromkondensatoren

see also pg 78
siehe auch Seite 78

Safe operation of the capacitors can be expected only if all electrical and thermal specif cations as stated on the label, in the data sheets or catalogues and the following instructions are strictly observed.

僅有在所有電氣和熱能規範如標示所示時，於資料頁或目錄中，直接遵守下列的使用方法，才可預期電容器可安全的工作。

ELECTRONICON does not accept responsibility for whatever damage may arise out of a non-observance.

ELECTRONICON不承認由於不遵守使用方法而導致電容器損傷的相關責任。

Mounting Position

安裝位置

Resin-f lled MKP-276-capacitors shall be installed upright with terminals facing upwards. Gas-f lled MKPg-265-capacitors can be mounted in any position without restrictions, however, a position with terminals pointing downwards shall be avoided!

填充(Resin)樹脂的MKP-276電容器，安裝時必須將端子朝上安裝。填充氣體(N_2)氮氣的MKPg-265電容器則沒有限定安裝的方向。然而，將壓接端子朝下安裝的方式還是要避免。

Mounting Location/Cooling

安裝地點/散熱

The useful life of a capacitor may be reduced dramatically if exposed to excessive heat. Typically an increase in the ambient temperature of 7°C will halve the expected life of the capacitor.

The permitted temperature category of the capacitor (B,C or D) is stated on the label. If extenuating circumstances give cause for doubt, special tests should be conducted to ensure that the permitted maximum ambient temperature of the capacitor is not exceeded. It should be noted that the internal heat balance of large capacitors is only reached after a couple of hours.

假如電容器暴露在極度的溫度中，其有效壽命會戲劇性的降低。一般來說，環境溫度增加7度將會使電容器的壽命減半。
電容器的允許溫度種類(B,C,D)會標示在標籤上。假如因為懷疑而企圖降低環境溫度，應該要實施特殊的測試來確保電容器允許的最高環境溫度沒有被超過。大型電容器要特別注意內部的熱平衡，其僅需要幾個小時就會達到限制的溫度。

To avoid overheating the capacitors must be allowed to cool unhindered and should be shielded from external heat sources. We recommend forced ventilation for all applications with detuning reactors. Give at least 20mm clearance between the capacitors for natural or forced ventilation.
Do not place the capacitors directly above or next to heat sources such as detuning or tuning reactors, bus bars, etc.

為了防止電容器過熱，必須考慮未受阻撓的冷卻和隔離外部熱源。我們建議對外加通風和電抗器。在自然環境下每個電容器之間至少保持20mm的距離，或者外加通風設備。
請勿直接將電容器放置在發熱源旁邊或上面。諸如電抗器、銅排...等等。

Vibration stress according to DIN IEC 68-2-6

根據DIN IEC68-2-6震動應力

Please consult us for details of permitted vibration stress in your application. Note that capacitors f tted with the EL-Dr discharge reactor must not be exposed to any vibration stress at all.

All cylindrical capacitors can be f xed suff ciently using the mounting stud at the bottom of the can. It is recommended to insert the washer which is delivered together with the mounting nut before f xing the nut.

詳細的允許震動應力運用請與我們商量。要注意的是，電容器搭配EL-Dr放電電抗器時，必須防止暴露在任何震動應力之下。
所有圓柱型的電容器均可充分的利用下方的螺栓固定安裝在盤內。我們建議要外加原廠所隨配的墊片於使用螺帽安裝固定時。

Connection

接線

Fuses and cross section of the leads shall be sized for at least 1.5 times of the rated capacitor current (I_N). Please note that the permitted maximum current according to data chart (I_{max}) must not be exceeded. Do not exceed

保險絲和引線的截面尺寸至少要是電容器額定電流的1.5倍。請注意根據資料表所允許的最大電壓值必須不能超過。

Fixing torque

Do not exceed the permitted torque of the terminal screws (design K, L, M) and the mounting studs. The test values specif ed by IEC must be guaranteed as a minimum value.

All cylindrical capacitors are f tted with a "break action" safety mechanism (see page 9) which may cause the case to expand, especially at the crimp and at the lid.

- The capacitors shall only be connected with flexible cables or elastic copper bands.
- The folded crimps must not be held by retaining clamps.
- A clearance of at least 35mm above the terminations shall be accommodated.

Required clearances according to applicable voltage category must be maintained even after a prolongation of the can.

The hermetic sealing of the capacitors is extremely important for a long operating life and for the correct functioning of the beak action mechanism. Please pay special attention not to damage the following critical sealing points:

- the bordering of the lid
- the connection between screw terminal and lid (design K, L, M)
- the rubber seal at the base of the tab connectors (design D)
- the soldering at the base of the tab connectors (design D)

The soldering must not be exposed to excessive heat. It is not recommended to solder cables to the terminals (design D). Where possible use appropriate tab connectors (6.3mm) to connect the cables. The connection terminals (design K, L, M) and the tab connectors (design D) must not be bent, turned or moved in any way.

The bordering and the connection terminals must not be hit with heavy or sharp objects or tools (e.g. hammer, screw driver).

固定扭力

請勿超過端子螺絲和安裝螺桿的最大允許扭力值(K,L,M型式)。IEC所規範的測試值必須是最小的保證值。

所有的圓柱型電容器均配置"啟斷動作"安全機構(如9頁所示)。會因為外殼膨脹，特別是縐折處和瓶蓋處，而動作。

· 電容器應該只能連接到軟性的電纜和有彈性的銅排上。
· 瓶蓋處必須不能被固定夾住或限制住。
· 端子座上方應該要考量保持至少35mm的空間。

根據可以使用的電壓種類，必須保持一定的空間，就算在罐子在拉開啟斷延長之後。

電容器的密封對長期工作壽命和電容器機械運作的正確功能是非常的重要的。請特別注意，不要使下列的重要密封點受到損傷：

· 蓋子邊緣處。
· 端子螺絲和蓋子的連接點(K,L,M型式)。
· 突出接點底部的橡膠密封處(D型式)。
· 突出接點底部的焊接處(D型式)。

焊接處請勿暴露在極高的溫度下。也不建議將導線直接焊在端子台上(D型)。盡可能使用合適的突出接點(6.3mm)來連接導線。
至於連接端子座(K,L,M型式)和突出接點(D型式)，請勿使用任何型式使其彎曲、轉向或移動。

電容器的邊緣和端子台請勿使用重物或尖銳的物品、工具來敲擊，諸如：榔頭、螺絲起子。

design Ausführung	max mm² 線徑	Imax A 最大電流	max Nm 扭力
端子型式			
D	6	16 each plug _ je Stecker	
K	6* 10**	30	1.2 ... 2.0
L,L4	25*	43	2.5 ... 3.0
M	35* 50**	80	3.2 ... 3.7

*(with ferrule_mit Aderendhülse) **(without ferrule _ohne Aderendhülse)

Discharge

Capacitors should be discharged to ≤10% of the rated voltage prior to being re-energised. For this purpose, special discharge modules are offered which can be selected in accordance with the applied operating voltage and the desired discharge period. Standard IEC 60831 requires a discharge to 75V or less within 3 minutes. Note that in automatic capacitor banks shorter discharge cycles may be required.

Use rapid discharge reactors or switchable discharge resistors for very short discharge cycles (see chapter "Acessories", pgs. 45ff).

Capacitors must be discharged and short-circuited before working on the terminals.

Discharge Modules

For capacitors in **design L/M**, six separate discharge modules (3 x 68kΩ, 82 kΩ, 100 kΩ, 120 kΩ, 180 kΩ, 300 kΩ) are available for the discharge of single capacitors or groups of several connected capacitors. The resistors are allocated in a f nger-proof housing (IP20).

The correct size of the module to be applied can be taken from the recommendations given in the capacitor data charts. The values recommended there have been designed for a discharge below 50V within no more than 60 seconds.

For **design D** capacitors, similar discharge sets are available (IP00). The correct size of the module to be applied can be taken from the recommendations given in the capacitor data charts. The values recommended there have been designed for a discharge below 50V within no more than 70 seconds.

Capacitors in **design K** are provided with internal discharge resistors for a discharge below 50V within no more than 60 seconds as standard.

Alternatively, the resistors to be used can be calculated with the following formula:

t	discharge period 放電時間 in (s)	U_B	operating voltage 工作電壓
C_T	partial capacitance of one phase 單相的部分電容值	U_E	maximum permissible voltage after period t 經過時間t後允許的最大電壓
C_{total}	total capacitance 全部的電容值	R	module resistance value 模組電阻值

1. three-phase capacitors 三相電容器

$$R = \frac{t}{C_T \times \ln \frac{U_B \times \sqrt{2}}{U_E}}$$

In all cases, the closest smaller discharge module shall be applied.

2. single-phase capacitors 單相電容器

$$R = \frac{t \times 1.5}{C_{total} \times \ln \frac{U_B \times \sqrt{2}}{U_E}}$$

Sollte das Ergebnis nicht mit den o. g. Standardwerten übereinstimmen, dann ist immer das nächstkleinere Entlademodul auszuwählen.

- The discharge resistors may become very hot (up to 200°C) during continuous operation.
- For design L/M only: Remove the lid of the discharge module if applying protective caps to the capacitors.

放電

電容器必須在再次投入動作之前將電壓放電到額定電壓的10%以下。因此，我們提供特殊的放電模組，針對使用的額定電壓和所需的放電時間提供不同的選擇。根據IEC 60831標準，要求必須在3分鐘內放電到75V以下。需注意的是，在一般自動電容器組上，會要求更短的放電時間。

使用快速放電電抗器或可開關的放電電阻，來達成非常短的放電時間(另行提供資料)

在開始端子台接線動作前，請先將電容器放電和短接。

放電模組

針對電容器L/M型式，有六個不同的放電模組可供選擇(3x68KΩ,82KΩ,100KΩ,120KΩ,180KΩ,300KΩ)。
可用在單一電容器或是數個電容器所組成的群組。電阻被配置在具有手指保護的外殼中(IP20)。
正確的電阻大小，可以根據電容器資料表得到建議的數值來做選擇。
在資料表中所建議的數值乃是基於能在60秒內將電容器放電至50V以下的設計。
至於電容器D型式，可以使用類似的放電模組(IP00)。
正確的電阻大小，可以根據電容器資料表得到建議的數值。在資料表中所建議的數值乃是基於能在70秒內將電容器放電至50V以下的設計。
至於電容器K型式，乃是內建放電電阻，標準的配置乃是設計為能在60秒內將電容器放電到50V以下。

或者，使用電阻的大小可以利用下列公式來算出：

- 在電容器連續操作下，放電電阻的溫度會變的非常的高。(約高達200°C)
- 僅有L/M型式才可使用：如果有在電容器上使用保護蓋，則請移除放電模組的蓋子。

Earthing

Capacitors with a metal case must be earthed at the mounting stud or by means of a separate metal strap or clamp.

Environment

Our capacitors do not contain PCB, solvents, or any other toxic or banned materials. They do not contain hazardous substances acc. to „Chemische Verbotsverordnung" (based on European guidelines 2003/53/EG and (76/769/EWG), „Gefahrstoffverordnung" (GefStoffV) and „Bedarfsgegen-staendeverordnung (BedGgstV)".

Not classif ed as „dangerous goods" acc. to transit rules. The capacitors do not have to be marked under the Regulations for Hazardous Goods. They are rated WGK 0 (water risk category 0 "no general threat to water").

No danger for health if applied properly. In case of skin contact with f lling liquids, clean with water and soap.

All capacitors manufactured after 1st January, 2006 are made with lead-free solder tin.

Disposal

The impregnants and f lling materials contain vegetable oil or polyurethane mixtures. The gas-f lled MKPg capacitors contain only neutral, ecologically sound insulation gasses. A data sheet about the impregnant utilised can be provided by the manufacturer on request.
We recommend disposing of the capacitors through professional recycling centres for electric/electronic waste.

The capacitors can be disposed of as follows:

- Disposal acc. to waste catalogue 160205 (capacitors f lled with plant oil/resin).
- Solid f lling materials: acc. to EWC No. 080404 ("Solid adhesives and sealants").
- Liquid f lling materials which may have emerged from the capacitor shall be absorbed by proper granules and disposed of in accordance with European Waste Catalogue 080410 (PUR resin residues, not solidif ed).

Caution: When touching or wasting capacitors with activated breakaction mechanism, please consider that even after days and weeks these capacitors may still be charged with high voltages !

Consult your national rules and restrictions for waste and disposal.

接地

因電容器為金屬外殼，故必須要在底部安裝螺絲或外加的金屬帶或金屬夾來接地。

環境

我們的電容器不含PCB、溶劑或任何其他有毒或禁用的材料。根據《Chemische Verbotsveror dnung》，沒有含有危險性物質。[根據歐盟方針2003/53/EG和76/769/EWG》，《Gefahrsoffverordn ung(GefStoffV)和《Bedarfsgegen-staendeverord nung》(BedGgstV)。
根據運送法，並非歸類為"危險物品"。
電容器不需要在規範下標示危害性物品。規範為WGK0（防水等級為0,沒有一般防水功能）。
正確的使用下不會有危害健康的危險。當肌膚接觸到填充的液體時，使用清水和肥皂清洗即可。

所有2006年1月1號後所生產的電容器均為無鉛產品。

棄置

溶劑與填充材料包含植物油或聚氨酯混合物。而氣體填充的MKPg電容器僅包含中性、生態安全的絕緣氣體。相關溶劑的內容，如果需要，原廠可以提供。
我們建議棄置廢棄的電容器給專業的電子/電力垃圾回收廠商。

電容器可依下列規範棄置：

- 根據垃圾分類160205（電容器使用植物油/合成樹脂填充）來棄置。
- 固體填充材料根據EWC No.080404（固體黏著劑與密封劑）。
- 液體填充材料可能從電容器內溢出，該被合適的顆粒吸收並根據歐盟垃圾分類080410(PUR合成樹脂殘渣，非凝固物)。

注意：當接觸或丟棄啟斷動作機構已經做動過的電容器時，請注意，就算已經經過幾天或幾個禮拜，這些電容器可能還是保有相當高的電壓。

請參考您國家的垃圾與棄置法律和限制。

Protection against Overvoltages and Short Circuits: Self-Healing Dielectric

All dielectric structures used in our power capacitors are "self-healing": In the event of a voltage breakdown the metal layers around the breakdown channel are evaporated by the temperature of the electric arc that forms between the electrodes. They are removed within a few microseconds and pushed apart by the pressure generated in the centre of the breakdown spot. An insulation area is formed which is reliably resistive and voltage proof for all operating requirements of the capacitor. The capacitor remains fully functional during and after the breakdown.

For voltages within the permitted testing and operating limits the capacitors are short-circuit- and overvoltage-proof.

They are also proof against external short circuits as far as the resulting surge discharges do not exceed the specif ed surge current limits.

針對過壓和短路的保護：自愈性介電性

我們的電容器所使用的所有介電結構均具有“自愈”：當發生電壓擊穿金屬層的事件時，擊穿的通道會因為兩極間電弧的溫度而蒸發。他們會在幾微秒之內被移除，並藉由擊穿點中心所產生的壓力被推走。此時便形成一個具可靠阻抗性和對電容器內所有工作原件的電壓保護絕緣的區域。因此，電容器可以在擊穿事件發生時或發生後維持完全的功能。

在允許的測試與工作電壓限制下，電容器具有短路和過電壓保護。
也針對沒有超過額定電湧電流限制的電湧所導致的外部短路做保護。

Protection Against Accidental Contact

All capacitors are checked by routine test (voltage test between shorted terminations and case: $U_{BG} \geq 2 \times U_N + 2000V$ (at least 3000V) in accordance with IEC 60831. Accessible capacitors must be earthed at the bottom stud or with an additional earthing clamp.

意外接觸保護

根據IEC60831所有電容器均經過例行性測試確認(短接端子和外殼電壓測試：Ubg>2xUn +2000V(最少3000V))。
組裝的電容器必須要在底部接地或是外加接地夾。

IP20
CAPA**GRIP**™

The CAPAGRIP™ terminal blocks are rated IP20, i.e. they are protected against accidental fi nger contact with live parts. The discharge modules are designed in the same way (compare page 47). Unused contact cages of design M terminal blocks must be covered by a proper blank (available as standard accessory, see page 48).

CAPAGRIP™ 型端子台設計防護等級為IP20。針對手指可能接觸到活線中的部分進行意外防護。放電電阻模組也是針對相同的方法作設計。
M型式的端子台在沒有使用接點防護籠時，必須保持適當的空間來做保護。

IP00

Capacitors in design D are not provided with protection against accidental contact as standard. They are available with protective caps on request (see page 50).

D型式的電容器並沒有針對意外碰觸提供標準的保護。但可以依需求外加保護蓋來進行保護。

Protection against Overload and Failure at the end of Service Life

工作壽命終點的過載與故障保護

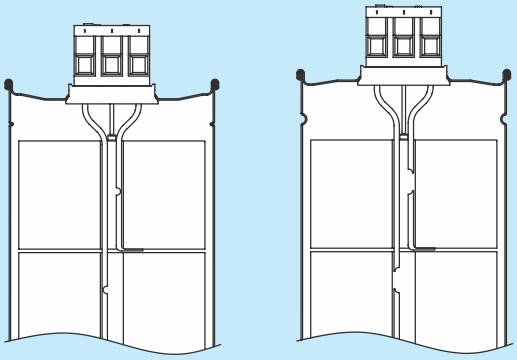
BAM

In the event of overvoltage or thermal overload or ageing at the end of the capacitor's useful service life, an increasing number of self-healing breakdowns may cause rising pressure inside the capacitor. To prevent it from bursting, the capacitor is f tted with an obligatory **«break action mechanism» (BAM)**. This safety mechanism is based on an attenuated spot at one, two, or all of the connecting wires inside the capacitor. With rising pressure the case begins to expand, mainly by opening the folded crimp and pushing the lid upwards. As a result, the prepared connecting wires are separated at the attenuated spot, and the current path is interrupted irreversibly. It has to be noted that this safety system can act properly only within the permitted limits of loads and overloads.

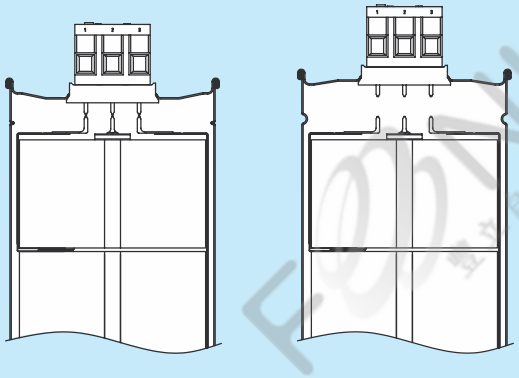
在發生過壓或過熱或老化事件於電容器的壽命終點時，自愈的次數會增加且引起電容器內部壓力增高。
為了防止電容器發生爆炸，每顆電容器內部均安裝防爆裂安全裝置〈熔斷機構〉(BAM)。此一安全機構乃是基於一較細的點於單相、兩相或所有電容器內部接線。因為壓力的增加會使電容器開始擴張，主要會使縐折處拉開和將上蓋向上推出。因此，準備的連接線會因為較細的點被拉斷而分離，進而使電路被中斷。
必須注意的地方是，此一機構必須在允許的負載與過載限制下才可以正常的運作。

Principle of the break action mechanism (exemplaric sketch)
熔斷動作機構的原理

BAM 1



BAM 2



BAM動作前的電容器

BAM動作後的電容器(中間凸起)

All capacitors with diameters < 85 mm as well as some traditional models with large diameters are provided with BAM 1 mechanism.
All new models with diameters ≥ 85 mm will be provided with BAM 2 mechanism.

所有直徑小於85mm與一些傳統型式之大直徑產品電容器乃是使用 BAM 1 熔斷保護結構。
所有新型式且直徑大於85mm之電容器則採用新的BAM2 熔斷保護結構。

Mind hazards of explosion and fire

Capacitors consist mainly of polypropylene (up to 90%), i.e. their energy content is relatively high. They may rupture and ignite as a result of internal faults or external overload (e.g. temperature, over-voltage, harmonic distortion). It must therefore be ensured, by appropriate measures, that they do not form any hazard to their environment in the event of failure or malfunction of the safety mechanism.

Fire Load: approx. 40 MJ/kg

Extinguish with: dry extinguisher (CO_2, foam)

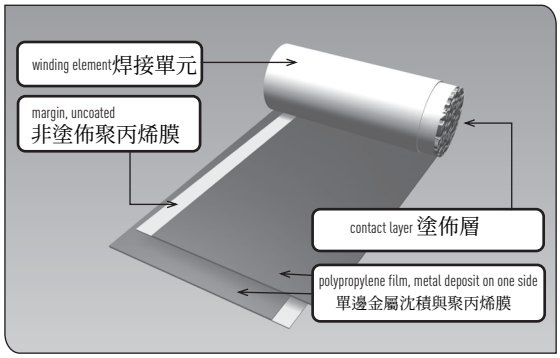
注意爆炸與失火的危害

電容器主要內容包含聚丙烯(高於90%)，其能量容量相對較高。此物質會因為內部故障或外部過載(諸如：溫度、過壓、諧波失真)而破裂和燃燒。
因此，必須藉由合適的量測來確認，這些物質不會在安全機構故障或異常發生時，形成足以產生危害的環境。

火災承受：接近40MJ/Kg

滅火方式：乾式滅火器(二氧化碳,泡沫)

內部結構
INTERNAL CONSTRUCTION



Dielectric

MKP-/MKPg-/MKPS-type capacitors are based on a low-loss dielectric formed by pure polypropylene f lm. A thin self-healing mixture of zinc and aluminium is metallized directly on one side of the PP-f lm under vacuum. Our long-term experience as well as on-going research and improvements in this technology ensure the excellent self-healing characteristics of the dielectric and a long operating life of our capacitors.

The plastic f lm is wound into stable cylindrical windings on the most modern automated equipment. The ends of the capacitor windings are contacted by spraying with a metal contact layer, facilitating a high current load and ensuring a low-inductance connection between the terminals and windings.

The link between PP-f lm and zinc contact layer is highly stressed during high surge or rms currents and therefore considered very critical for operating life and reliability of the capacitor. By cutting the fi lm for selected types in a wavelike manner, our SINECUT™ technology increase the contact surface between fi lm and zinc layer which substantially reduces this strain.

Impregnants

The use of impregnants and/or f lling materials in capacitors is necessary in order to insulate the capacitor electrodes from oxygen, humidity, and other environmental interference. Without such insulation, the metal coating would corrode, an increasing number of partial discharges would occur, the capacitor would lose more and more of its capacitance, and suffer increased dielectric losses and a reduced operating life. Therefore, an elaborate vacuum-drying procedure is initiated immediately after insertion of the capacitor elements into the aluminium case and dried insulation gas (MKPg 275), or biologically degradable plant oil (MKP 276), is introduced. Both protect the winding from environmental inf uence and provide an extended life-expectancy and stable capacitance.

MKPg 265– Leakage Proof and Environmentally Friendly

The gas in our MPKg-Capacitors is inert and entirely harmless to environment. When disposing of the capacitors, no liquids or toxic gasses need to be considered.

A leakage of gas is extremely unlikely if the capacitors are handled and operated properly. It is possible to mount these capacitors in any desired position. However, should leakage occur, the leaking gas would escape into the atmosphere causing no undesirable effects to the adjacent equipment, e.g. damage, pollution, or staining. In the long run, such an unlikely event would result in a degradation of the capacitance; however, this process would take many months, during which the capacitor remains functional.

By using gas, we are reducing the weight of a capacitor on average by 15...20% compared with resin or oil f lled capacitors. This makes transportation and handling of the units easier. It also supports the new concept of mounting the capacitors in almost any position.

介電性

MKP-/MKPg-/MKPS型電容器均是以低損失介電材質：純聚丙烯膜所製造。一層薄的自愈層乃是在真空下，直接在PP膜的一邊金屬化濺鍍上鋅與鋁的混合物。
根據我們長期的經驗和不斷研究與進步的技術，可確保電容器長時間操作下的壽命以及介電質完美的自愈功能。使用最先進的自動化工具將塑膠膜捲曲到穩定的直桶狀繞組。電容器的捲曲終點乃是藉由金屬噴灑接觸層，可幫助高電流負載和確保端子座與接點的低電感性。

鋅層與PP膜之間的連接上在高電湧或電流時具有高應力，因此也非常嚴苛的考量了電容器的工作壽命和可靠度。藉由選擇的波浪型式來裁切薄膜，我們的SINECUT™技術增加了鋅層與PP膜之間的接觸面積，可以幫助降低這些應力。

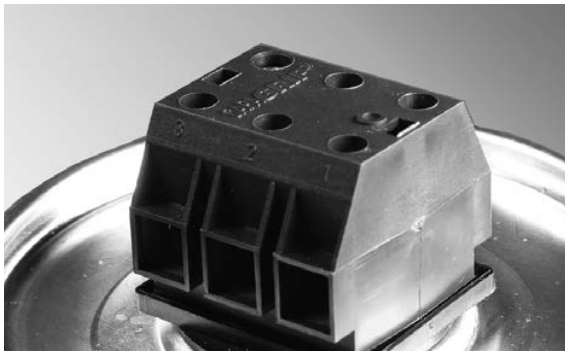
溶劑

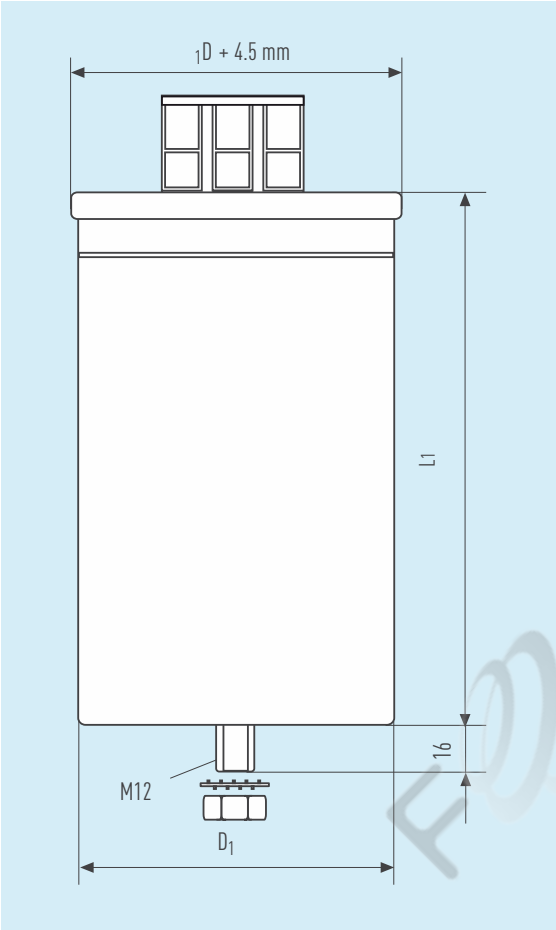
為了使電容器的電極絕緣和抗氧化、濕度和其他環境的影響，電容器內填充溶劑或填充材料是必須的。
如果沒有這層絕緣保護，金屬的塗佈將會腐蝕，進而導致局部放電的發生次數大量增加。電容器便會損失越來越多的電容值，並會增加介電性的損失和減少工作壽命。
因此，在一開始電容器安裝進鋁質外殼時，必須馬上使用抽真空的乾式製程，且灌入想要的絕緣氣體N_2氮氣(MKPg 275)或可生物分解的植物油Resin軟性樹脂(MKP 276)。
兩者都可以保護不受環境影響和提供更長的預期使用壽命、穩定的電容值。

MKPg265-洩漏保護和環境無害

我們的MKPg電容器使用的填充氣體N_2為惰性氣體且完全對環境無害。當要廢棄電容器時，沒有任何液體或有毒氣體需要被考量。
如果電容器在正常的操作與處理之下，是不會發生氣體洩漏的情形。電容器可以被安裝在任何位置。如果氣體洩漏還是發生了，氣體會洩漏到大氣之中，不會對器材造成任何的影響(諸如：損傷、污染或變色)。
在長期使用下，這種不願意發生洩漏事件會造成電容值降低，但是，這個電容值降低的過程需要好幾個月的時間，因此在這一期間電容器依舊保有正常的工作功能。

藉由使用氣體，相較於合成樹脂或油式電容器而言，我們可以減輕電容器平均的重量約15~20%。
這也使的運送與使用上更加方便。
另外也提供新的安裝方式：電容器沒有方向性，可以安裝在各種位置。





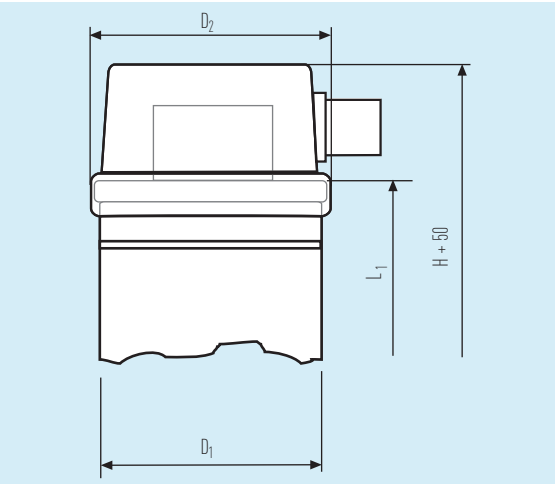
CAPAGRIPTM K, L, M AND CAPAGRIP IITM: Ease of Assembly with High Degree of Protection

高保護等級且易於安裝之端子

The CAPAGRIP™ terminals guarantee optimum sealing of the ca-pacitors, and offer convenient connection of cables up to 50mm². A special spring system guarantees reliable and durable operation of the clamp.
Whilst CAPAGRIP™ K and CAPAGRIP II™ ("L4") incorporate bleeding resistors, designs L and M also permit the direct connection of discharge reactors and discharge resistor modules, as well as easy parallel connection of additional capacitors.
For single phase versions the central screw has no contact.

CAPGRIP的端子台可以保證電容器的最佳密閉性，且提供接線時的便利性，最大可到50mm^{2}的電纜線。
特殊的彈簧設計系統可以確保夾頭操作時的可靠性和耐用性。
除了K型與L4型端子台是內含放電電阻外，L型與M型端子可以允許連接放電電阻和放電電抗模組，也易於併聯額外的電容器組。
針對單相電容器，端子座中間的螺絲是沒有接點的。

Series 系列	MKPg 275, MKP 276, MKP-UHD
Protection 保護等級	IP20
Humidity class 濕度等級	C
Creepage distance 爬電距離	16 mm
Air clearance 氣隙	16 mm



D1 (mm)	D2 (mm)	order no. Bestell-Nr.
85	93.5	275.157-10010
95	104	275.167-10010
100	109	275.177-10010
116	125	275.187-10010

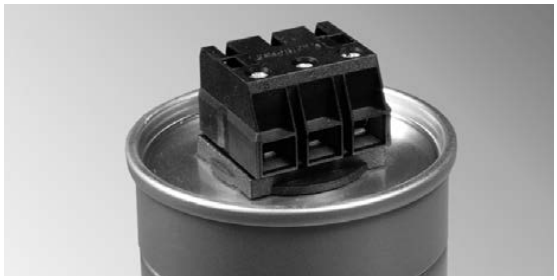
CAPAGRIP™ K, L, L4, M Capacitors

For capacitors with diameters of 85, 95, 100, and 116mm, the caps are supplied loose if ordered. Note that these caps do not comply with an IP classif cation.

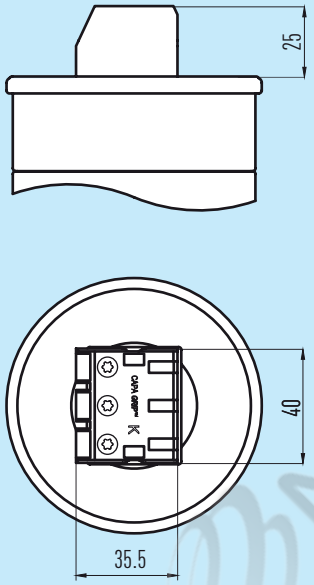
CAPAGRIP™ K, L,L4, M 防塵保護蓋

針對直徑85、95、100和116mm產品，可以額外訂購防塵保護蓋。提供高IP等級的保護。

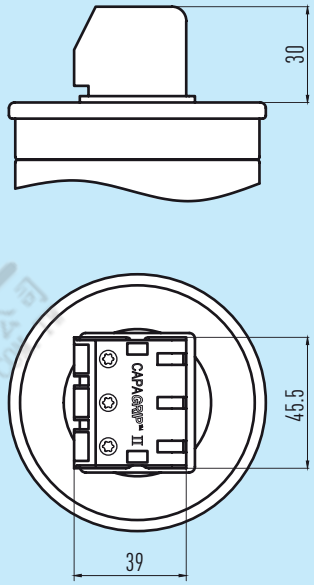
※ 於台灣通過TAF認證之台灣電子檢驗中心測試，符合IP54保護等級。報告號碼：13-10-VAA-080。



CAPA**GRIP**™ K



CAPA**GRIP**™ II™L4



Design K

CAPACITORS WITH A DIAMETER OF 60...85 mm.

Case: e xtruded aluminium with base mounting stud M12, hermetically sealed by aluminium lid (folded edge)

Terminal block
Steel clamp with T20 M4 screws in flame retardant plastic body (UL94:V0)
max. cable cross section: 1 × 10 mm² per phase
max. terminal rating: 39 A/phase
Internal resistors for discharge < 50 V within < 60 s

直徑在60　85mm之電容器

外殼：擠壓成型並具備安裝螺絲M12之鋁殼，並利用鋁蓋密封(折邊法)

端子座
為防火塑膠材質(UL94:V0)利用T20 M4螺絲固定於鋼板上
最大電線截面：..... 1 x 10 mm² 每個相
電流In: 最高到39A/相
放電電阻： ..... 內含(根據放電時間標準，在60秒內低於50V所設計安裝。)

Design L4

CAPACITORS WITH A DIAMETER OF 85...136 mm.

Case: extruded aluminium with base mounting stud M12, hermetically sealed by aluminium lid (press-rolled)

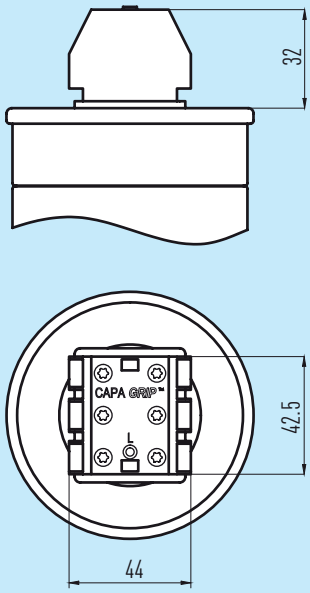
Terminal block
Steel clamp with T20 M5 screws in flame retardant plastic body (UL94:V0)
max.cable cross section: 1 × 25 mm² per phase
max. terminal rating: 56 A/phase
Internal resistors for discharge < 50 V within < 60 s

直徑在85　136mm之電容器

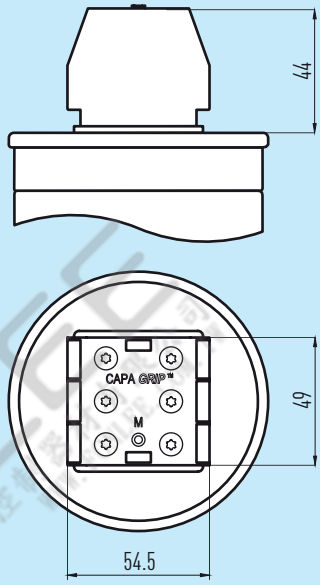
外殼：擠壓成型並具備安裝螺絲M12之鋁殼，並利用鋁蓋密封(折邊法)

端子座：
為防火塑膠材質(UL94:V0)利用T20 M4螺絲固定於鋼板上
最大電線截面：..... 1 x 25 mm 每相
電流In: 最高到56A/相
放電電阻： ..... 內含(根據放電時間標準，在60秒內低於50V所設計安裝。)

CAPA*GRIP*™ L



CAPA*GRIP*™ M



Design L

CAPACITORS WITH A DIAMETER OF 85...136 mm.

Case: extruded aluminium with base mounting stud M12, hermetically sealed by aluminium lid (press-rolled)

Terminal block
Steel clamp with T20 M6 screws in flame retardant plastic body (UL94:V0)
max. cable cross section: 2 × 25 mm² per phase
max. terminal rating: 56 A/phase
discharge resistors: available as separate item.

直徑在85　136mm之電容器

外殼：擠壓成型並具備安裝螺絲M12之鋁殼，並利用鋁蓋密封(折邊法)

端子座：
為防火塑膠材質(UL94:V0)利用T20 M4螺絲固定於鋼板上
最大電線截面：..... 2 x 25 mm² 每相
電流In: 最高到56A/相
放電電阻： ..... 可允許外加獨立的放電模組

Design M

CAPACITORS WITH A DIAMETER OF 95...136 mm.

Case: extruded aluminium with base mounting stud M12, hermetically sealed by aluminium lid (press-rolled)

Terminal block
Steel clamp with T20 M6 screws in flame retardant plastic body (UL94:V0)
max. cable cross section: 2 × 50 mm² per phase
max. terminal rating: 104 A/phase
discharge resistors: available as separate item.

直徑在95　136mm之電容器

外殼：擠壓成型並具備安裝螺絲M12之鋁殼，並利用鋁蓋密封(折邊法)

端子座：
為防火塑膠材質(UL94:V0)利用T20 M4螺絲固定於鋼板上
最大電線截面：..... 2 x 50 mm² 每相
電流In: 最高到104A/相
放電電阻： ..... 可允許外加獨立的放電模組

通用技術資料
GENERAL TECHNICAL DATA

製造標準
Standards ..... IEC 60831 (2003), VDE 0560-46/47
..... CSA C22.2 No. 190-M1985
..... UL Standard No. 810
..... GOST 1282-88

approval marks 認證標章

*only design K/L/M 5...60kvar, ≤660V_*nur Bauform K/L/M 5...60kvar, ≤660V

CE Conformity CE認證
All capacitors in this brochure are declared to conform to the following European Directives:
本目錄中所有電容器均經公開確認依循下列歐盟指令：

2014/35/EU	Low-Voltage Directive
93/68/EWG	Directive for amendment of directive 73/23/EWG (CE-Conformity Mark)

CE

rated voltages 額定電壓 ..... 230 ... 850 V, 50/60 Hz
rated overvoltages 允許連續過電壓 ..... >110% rating continuum voltage
maximum permissible current 最大允許電流
MKPg, MKP ..... > 2 x IN
Fault current test 故障電流測試 ..... at less 10KA

details see data charts, higher values on request
詳細資料請參考資料表，更高的需求可訂製

tolerance of capacitance 電容值誤差 ..... - 5 ... + 10%, ± 5%, 0 ... + 10%
internal connection 內部接線 ..... delta 三角接

filling material 填充材質
MKPg 275 ..... inert insulation gas (N_2) 絕緣氣體(氮氣)
MKPg 265 ..... inert insulation gas (N_2) 絕緣氣體(氮氣)
All our capacitors are gas insert (dry type dielectric) without oil inside structure.
本電容器為氣體填充(乾式介質)無油式構造。

dissipation losses 耗能
dielectric 介電值 ..... < 0.2 W/kvar
total capacitor 整組電容器組 ..... 0.25 ... 0.4 W/kvar

temperature class 溫度等級 **
MKP/MKPg ≤ 20 kvar ..... -40°C/60
MKP/MKPg > 20 kvar ..... -40°C/D
higher values on request

humidity 濕度 95%
altitude abv.s.l. 海拔 ..... ≤ 4000m

life expectancy 壽命 *
MKPg, MKP ..... > 150 000 h
MKPc ..... > 100 000 h

*(permitted failure rate ≦3%) (允許的誤差值≦3%)

**(see page 3) (請參考第3頁)

Torx T20 CAPAGRIP 10000 AFC *only ≥ 75 × 230

Three-phase power capacitors, dry self-healing dielectric, gas-filled (N_2)
For detuned and non-detuned PFC equipment in mains with standard operating conditions

三相電力電容器，乾式自癒介電材質，無油式氣體填充(氮氣)
適合運用在具調配電抗與無調配電抗之功因改善系統上

Permitted operating voltages 允許工作電壓

24h:	280 V
8h/d:	308 V
30min/d:	320 V
5min (200x):	335 V
1min (200x):	365 V
max. peak rating 最大峰值額定	850 V

Test voltages 測試電壓

U_{BB}	605 V AC/10s
U_{BG}	3600 V AC/2s

Temperature class 溫度等級 :

≤ 20 kvar	-50°C/60
> 20 kvar	-50°C/D

Dissipation losses 損失

Dielectric 介電質 :	< 0.2 W/kvar
Total capacitor 整個電容器 :	0.25 ... 0.4 W/kvar

容量誤差
Capacitance tolerance -5% ... +10%

Life expectancy 預期壽命 * 230V > 150000 h
280V > 130000 h
*(permitted failure rate_bei einer Ausfallrate ≤3%)

CAPA***GRIP***™K and II (L4) including discharge resistors. For L and M see resistor modules on pages 19.

Q_C (kvar)	C_N (µF)	I_{max} (A)	$D_1 \times L_1$ (mm)	m (kg)	CAPA GRIP	order no.	packg.lot / box
230V 60Hz							
5	3 × 84	3 × 31	85 × 164	1	L4	265.255-308400	5/FB8
10	3 × 167	3 × 47	75 × 230	1.3	K	265.546-216700	5/FB9
15	3 × 251	3 × 56	100 × 230	1.7	L4	265.276-325100	3/FB9
20	3 × 333	3 × 80	116 × 230	2.3	M	265.386-333300	3/FB12
260V 60Hz							
5	3 × 63	3 × 30	75 × 164	0.7	K	265.545-306300	5/FB8
10	3 × 131	3 × 36	75 × 230	1	K	265.546-313100	5/FB9
15	3 × 196	3 × 54	85 × 230	1.5	L4	265.256-219600	3/FB9
20	3 × 262	3 × 70	100 × 245	1.8	M	265.378-326200	3/FB9
25	3 × 333	3 × 80	116 × 230	2.3	M	265.386-333300	3/FB12
280V 60Hz							
15	3 × 167	3 × 47	75 × 230	1.3	K	265.546-216700	5/FB9
30	3 × 333	3 × 80	116 × 230	2.3	M	265.386-333300	3/FB12

Other sizes and ratings are available on request. Single phase capacitors are available on request in same dimensions and design.
Mind Mounting and Operating Instructions on pages 5.

for latest edition and updates
check www.powercapacitors.info

265.***
GAS-FILLED
400V...480V

Three-phase power capacitors, dry self-healing dielectric, gas-filled (N_2)
For detuned and non-detuned PFC equipment in mains with standard operating conditions

三相電力電容器，乾式自癒介電材質，無油式氣體填充(氮氣)
適合運用在具調配電抗與無調配電抗之功因改善系統上

Permitted operating voltages 允許工作電壓

24h:	480 V
8h/d:	530 V
30min/d:	555 V
5min (200x):	580 V
1min (200x):	625 V
max. peak rating 最大峰值額定	1425 V

Test voltages 測試電壓

U_{BB}	1030 V AC/10s
U_{BG}	3600 V AC/2s

Temperature class 溫度等級 :

≤ 20 kvar	-50°C/60
> 20 kvar	-50°C/D

Dissipation losses 損失

Dielectric 介電質 :	< 0.2 W/kvar
Total capacitor 整個電容器 :	0.25 ... 0.4 W/kvar

容量誤差
Capacitance tolerance ..... -5% ... +10%

Life expectancy 預期壽命 *..... 400V...440V > 150000 h
480V > 100000 h

*(permitted failure rate_bei einer Ausfallrate ≤3%)

CAPA***GRIP***™K and II (L4) including discharge resistors. For L and M see resistor modules on pages 19.

Q_C (kvar)	C_N (µF)	I_{max} (A)	$D_1 \times L_1$ (mm)	m (kg)	CAPA GRIP	order no.	packg.lot / box
400V 60Hz							
5	3 × 28	3 × 15	60 × 196	0.7	K	265.523-502800	10/FB9
10	3 × 55	3 × 26	75 × 230	1.0	K	265.546-505500	5/FB9
15	3 × 83	3 × 40	85 × 230	1.5	L4	265.256-508300	5/FB12
20	3 × 111	3 × 52	85 × 280	1.5	L4	265.259-511100	3/FB9
25	3 × 137	3 × 56	85× 280	1.8	L4	265.259-413700	3/FB12
30	3 × 166	3 × 56	116× 230	2.3	L4	265.286-516600	3/FB9
40	3 × 221	3 × 75	116× 280	2.6	M	265.389-522100	3/FB10
440V 60Hz							
10	3 × 46	3 × 25	85 × 164	1.0	L4	265.255-504600	5/FB8
15	3 × 68	3 × 32	75 × 245	1.0	K	265.548-506800	10/FB12
20	3 × 92	3 × 43	85 × 245	1.5	L4	265.258-509200	5/FB12
30	3 × 137	3 × 56	85× 280	1.8	L4	265.259-413700	3/FB12
40	3 × 185	3 × 68	116× 280	2.6	M	265.389-518500	3/FB10
480V 60Hz							
15	3 × 58	3 × 27	75 × 230	1.0	K	265.546-505800	5/FB9
20	3 × 77	3 × 36	85 × 230	1.3	L4	265.256-507700	5/FB9

Other sizes and ratings are available on request. Single phase capacitors are available on request in same dimensions and design.
Mind Mounting and Operating Instructions on pages 5.

for latest edition and updates
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Three-phase power capacitors, dry self-healing dielectric, gas-filled (N_2)
For detuned and non-detuned PFC equipment in mains with standard operating conditions
三相電力電容器，乾式自癒介電材質，無油式氣體填充(氮氣)
適合運用在具調配電抗與無調配電抗之功因改善系統上

Permitted operating voltages 允許工作電壓

24h:	525 V
8h/d:	580 V
30min/d:	600 V
5min (200x):	630 V
1min (200x):	680 V
max. peak rating 最大峰值額定	1600 V

Test voltages 測試電壓

U_{BB}	113 0V AC/10s
U_{BG}	4500 V AC/2s

Temperature class 溫度等級 :

≤ 20 kvar	-50°C/60
> 20 kvar	-50°C/D

Dissipation losses 損失

Dielectric 介電質 :	< 0.2 W/kvar
Total capacitor 整個電容器 :	0.25 ... 0.4 W/kvar

容量誤差
Capacitance tolerance ..... -5% ... +10%

Life expectancy 預期壽命 * ..... > 150000 h

*(permitted failure rate_bei einer Ausfallrate ≤3%)

CAPA***GRIP***™ K and II (L4) including discharge resistors. For L and M see resistor modules on pages 19.

Q_C (kvar)	C_N (µF)	I_{max} (A)	$D_1 \times L_1$ (mm)	m (kg)	CAPA GRIP	order no.	packg.lot / box
440V 60Hz							
5	3 × 24	3 × 14	65 ×164	1.0	K	265.535-502400	5/FB8
25	3 × 115	3 × 56	116 × 230	2.3	L	265.186-611500	3/FB9
480V 60Hz							
5	3 × 19	3 × 11	65 × 164	0.5	K	265.535-601900	10/FB8
10	3 × 38	3 × 20	65 × 245	0.9	K	265.538-603800	10/ FB9
25	3 × 96	3 × 50	95× 245	1.8	L4	265.268-609600	3/FB12
30	3 × 115	3 × 56	116× 230	2.3	L	265.186-611500	3/FB9
40	3 × 154	3 × 80	136× 230	3.7	M	265.396-715401	2/FB12
525V 60Hz							
15	3 × 48	3 × 25	75 × 230	1.0	K	265.546-604800	5/ FB9
20	3 × 64	3 × 33	95 × 230	1.5	L4	265.266-706400	3/FB9
25	3 × 79	3 × 39	85 × 245	1.5	L4	265.258-607900	5/FB12
30	3 × 96	3 × 50	95 × 245	1.8	L4	265.268-609600	3/FB12
40	3 × 128	3 × 65	136× 230	2.9	M	265.396-712800	2/FB9

Other sizes and ratings are available on request. Single phase capacitors are available on request in same dimensions and design.
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for latest edition and updates
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265.***
GAS-FILLED
480V...800V

Three-phase power capacitors, dry self-healing dielectric, gas-filled (N_2)
For detuned and non-detuned PFC equipment in mains with standard operating conditions
三相電力電容器，乾式自癒介電材質，無油式氣體填充(氮氣)
適合運用在具調配電抗與無調配電抗之功因改善系統上

Permitted operating voltages 允許工作電壓

24h:	800 V
8h/d:	840 V
30min/d:	875 V
5min (200x):	915 V
1min (200x):	990 V
max. peak rating 最大峰值額定	2300 V

Test voltages 測試電壓

U_{BB}	1720V AC/10s
U_{BG}	4500 V AC/2s

Temperature class 溫度等級 :

≤ 20 kvar	-50°C/60
> 20 kvar	-50°C/D

Dissipation losses 損失

Dielectric 介電質 :	< 0.2 W/kvar
Total capacitor 整個電容器 :	0.25 ... 0.4 W/kvar

Capacitance tolerance 容量誤差 -5% ... +10%

Life expectancy 預期壽命 *

	600V > 150000 h
*(permitted failure rate_bei einer Ausfallrate ≤3%)	690V > 130000 h

CAPA***GRIP***™ K and II (L4) including discharge resistors. For L and M see resistor modules on pages 19.

Q_C (kvar)	C_N (µF)	I_{max} (A)	$D_1 \times L_1$ (mm)	m (kg)	CAPA *GRIP*	order no.	packg.lot / box
600V 60Hz							
15	3 × 37	3 × 38	116 × 230	2.3	L	265.186-503700	3/FB9
20	3 × 49	3 × 49	116 × 280	2.6	L	265.189-504900	3/FB10
25	3 × 62	3 × 47	116 × 280	2.6	L	265.189-406200	3/FB10
30	3 × 74	3 × 54	116× 280	2.6	L	265.189-407400	3/FB10
690V 60Hz							
10	3 × 19	3 × 15	75 × 230	1.0	K	265.546-401900	5/ FB9
15	3 × 28	3 × 21	95 × 230	1.5	L	265.166-502800	3/FB9
20	3 × 37	3 × 38	116 × 230	2.3	L	265.186-503700	3/FB9
25	3 × 46	3 × 35	116 × 230	2.3	L	265.186-404600	3/FB9
33.3	3 × 62	3 × 47	116 × 280	2.6	L	265.189-406200	3/FB10
40	3 × 74	3 × 54	116× 280	2.6	L	265.189-407400	3/FB10
50	3 × 93	3 × 55	136× 280	3.7	M	265.399-409300	2/FB10

Other sizes and ratings are available on request. Single phase capacitors are available on request in same dimensions and design.
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for latest edition and updates
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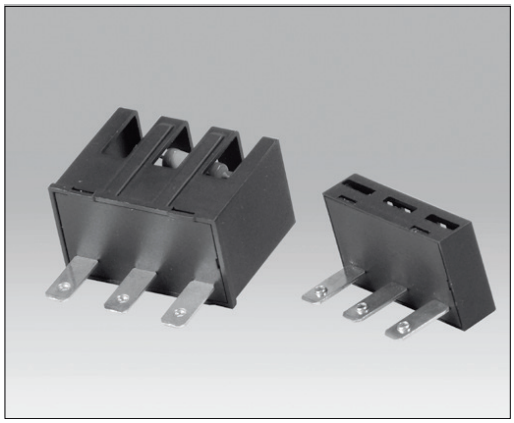
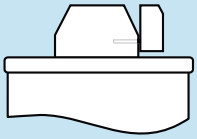
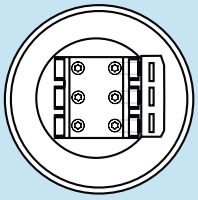
DISCHARGE DEVICES

放電設備







Resistor Modules

Capacitors with CAPAGRIP K and CAPAGRIP II terminals are equipped with discharge resistors for a discharge from their highest nominal voltage rating to less than 50 V within < 60 seconds. For capacitors with CAPAGRIP L and M we offer separate resistor modules. The correct size of the module to be applied can be selected from the data charts.
Based on applied voltage, required discharge period, and capacitance to be discharged.

Alternatively, the resistors to be used for a given capacitance and operating voltage can be calculated by means of the following formula:

放電模組

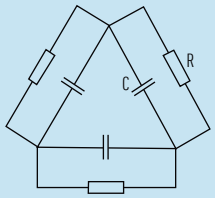
使用CAPAGRIP K 和 CAPAGRIP II (L4) 端子頭的電容器，本身即內建有放電電阻，可以在電容器切離後60秒內將電容器殘餘電壓從其最高額定電壓值降低至50V以下。

電容器若是使用LCAPAGRIP L和M型端子頭，我們提供分離式的放電模組，可依照產品使用的電壓、需要的放電時間、電容器容量資料選擇適合的放電電阻安裝。

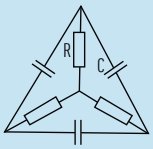
也可以利用下面電容值與工作電壓的公式，計算出所需的放電電阻大小：

three-phase: $R \leq \dfrac{t}{k \times C_T \times \ln \dfrac{U_B \times \sqrt{2}}{U_E}}$

single-phase: $R \leq \dfrac{t \times 1.5}{C_{total} \times \ln \dfrac{U_B \times \sqrt{2}}{U_E}}$



k = 1



k = 3

t	... Discharge period in (s)	U_B	... Operating voltage
C_T	... Partial capacitance of one phase	U_E	... Maximum permissible voltage after period t
C_{total}	... Total capacitance	R	... Module resistance value

In all cases, the closest smaller discharge module available shall be applied.

在所有使用情況下，均需安裝最接近需求的最小放電電阻

The discharge resistors may become very hot (up to 200°C) during continuous operation!
For design L/M only: Remove the lid of the discharge module if applying protective caps to the capacitors!

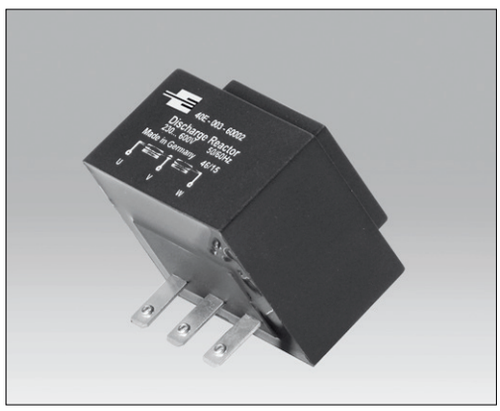
請注意：放電電阻在連續工作時溫度會變的很高(高於200度C)!

使用L/M型端子時請注意：當電容器安裝了防塵保護蓋時，請移除放電模組的外殼，改善散熱！

EL-DR DISCHARGE REACTOR
40E.003-60002

放電電抗器

The increasing demand for shorter discharge periods cannot be satisfied by traditional discharge means (fixed resistors). The installation of additional fast discharge resistors at the capacitor contactor results in an increase in material and installation costs. Our discharge reactor replaces the compulsory fixed resistors and additional rapid discharge resistors, and at the same time it reduces the heat dissipation losses inside the capacitor bank. It further avoids additional heating of the capacitor terminals by standard discharge resistors.



Discharge reactors must NOT be used in combination with thyristor switches. Frequent switching and the charging function of many switches will damage the reactor.

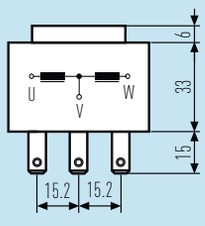
當有需要更短的放電時間需求時，傳統的放電電阻並不能滿足此一需求。外加快速放電電阻在電容器接點上不但增加體積也增加了成本。我們的放電電抗器可以取代強制性的固定放電電阻以及額外的快速放電電阻，在此同時也可以減少電容器內部因熱耗造成的損失，它進一步的避免了傳統放電電阻在電容器端子上造成的加熱情形。

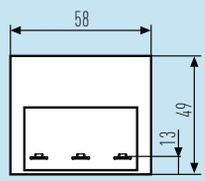
放電電抗不可與靜態切換開關搭配使用，頻繁的切換以及許多靜態切換開關的充電功能會使放電電抗器受損。

General Technical Data
通用技術資料

design 設計	two controlled phases (semi-controlled) 兩相控制
construction 架構	dual reactor with iron core in plastic housing
DC resistance per coil 每線圈直流阻抗	7600 Ohm
duty cycle 責務時間	continuous operation 連續運轉
rated voltage 額定電壓	230 ... 600 V 3ph, 50/60Hz
capacitor ob e discharged 可使用的電容器容量	5 ... 50kvar
connection 接線方式	direct mounting on capacitor terminal (design L/M)
vibration stress 震動	not permitted 不允許
dissipation losses 耗能	< 1W
ambient temperature 環境溫度	max. 40° C
degree of protection 保護等級	IP20
dimensions W × H × D 產品尺寸	58 × 49 × 39 mm
weight 重量	290 g
insulation 絕緣等級	class B (135°C)
standard 製造標準	IEC 61558-2-20
CE conformity CE認證	2014/35/EU Low-Voltage Directive

Dimension Drawings
產品尺寸





Q_c (kvar)	permitted no. of discharges/min at 40°C 每分鐘允許放電次數		discharge period (sec) 放電時間(秒)					
	400...525 V	230 V/600 V	230 V	400 V	440 V	480 V	525 V	600 V
12.5	5	4	12	5	4	4	4	2.6
25	4	3	24	10	9	8	7	5
30	3	2	-	12	10	9	8	6
50	2	1	-	20	17	15	14	10.5

POWER FACTOR CONTROLLERS
PFR-X+ **R / PFR-M **T

BECAUSE EXCELLENT CAPACITORS ARE NOT ENOUGH

Our PFR-series calculate the active and reactive power in the mains from the measured current and voltage. Their intelligent control algorithm optimizes the switching sequences and guarantees for short regulation times with a minimum number of switchings. At the same time, equal distribution of switchings for capacitors of equal size extends the lifetime of the capacitors. The integrated connection control immediately detects in which phases voltage and current are measured, and adapts the entire system auto-matically. The very low current threshold of 15 mA allows for very reliable and exact PF control. 1 A as well as 5 A current transformers can be used without additional manual adjust-ments and can adjust phase angle by software.
The power supply of PFR-X covers a voltage range of 90...550 V, the PFR-M supply is rated for a voltage range of 207- 253 V; it can easily be modified to 100-132 V by a jumper setting.

PFR 系列功率因數控制器可藉由量測一次側電流與電壓來計算出系統實功率與虛功率。藉由微處理型電腦控制演算，最佳化且最小化電容器自動投入跳脫的時序跟數量。在此同時，自動平均分配相同大小電容器之投入、跳脫可以延長電容器的使用壽命。完善的接線控制可以在量測到相電壓與電流的同時進行偵測並自動調整適應整個系統。極低的15mA電流靈敏度提供了非常可靠與正確的功率因數控制。 CT二次側電流1A或5A均可以使用且不需要額外手動調整，且控制器本身具備相角調整功能。
PFR-X系列控制電源電壓範圍為90～550V，PFR-M系列則為207~253V，且可利用切換開關非常容易的切換到100~132V使用。

Reported mains conditions

PFR-XP+: Voltage, THD U,THD I, current, active power, reactive power, apparent power, frequency, ΔQ (power to be compensated) , detailed current/voltage harmonics 3...19, temperature and cosφ
PFR-M: Voltage, THD U, current, THD I, active power, reactive power, apparent power, frequency, ΔQ (power to be compensated), detailed voltage and current harmonics 3...30, cosφ, temperature and counters

Reported information on the equipment

Passed operation time (hours), number of switchings per branch, max temperature in the equipment, average power factor, actual power per branch, actual percentage of originally installed branch power.The cosφ and status of branches are displayed permanently.

Monitoring

The monitoring functions ensure long and reliable operation of the capacitor equipment:
- zero-voltage tripping to avoid contactor fibrillation
- overvoltage protection
- over-temperature protection
- harmonic monitoring of voltage and current
- detection of defect branches (with adjustable threshold value)
- alarm at under-compensation
- maintenance reminder
- fan control output (can also be used as additional capacitor output)
- overcurrent & no current

PFR-M only: cosφ alarm - frequency alarm - overload Q
- overload P - P export

Malfunctions and status signals of the equipment are indicated in the LC-Display. Malfunctions can also be transmitted through the isolated alarm relay (PFR-X: N-O contact, PFR-M: S-P-D-T contact) or to the digital output (PFR-M only).

顯示系統主要狀況

PFR-X+：
電壓、THD U、THD I、電流、實功、虛功、視在功率、頻率、補償功率、詳細的3...19次電壓/電流諧波、功率因數和溫度。

PFR-M：
電壓、THD U、電流、THD I、實功、虛功、視在功率、頻率、補償功率、詳細的2...30次電壓/電流諧波、功率因數、溫度和計數器。

顯示設備資訊

已工作總時數(小時)、每一段之投切次數、設備最高溫度、平均功率因數、每一段之電容器容量、每一段電容其的目前實際容量百分比資訊。功率因數與段數狀態是永遠顯示在畫面上的。

監控

監控功能可以確保設備長時且可靠的操作電容器：

- 零相電壓跳脫避免接點老化
- 過電壓保護
- 過溫保護
- 電壓與電流諧波監控
- 故障電容器段數偵測(可設定最低限制值)
- 低補償警報
- 保養提醒
- 風扇控制(可當作額外一組輸出接點)
- 過電流&無電流

PFR-M獨有功能：功因警報、頻率警報、虛功過載、實功過載、實功輸出

設備故障和狀態訊號會在LCD顯示銀幕上指示出來，故障訊號也可以經由獨立的警報電驛(PFR-X：常開接點；PFR-M：S-P-D-T接點)傳送，PFR-M還可經由數位輸出接點傳輸。

POWER FACTOR CONTROLLERS
PFR-X+ **R / PFR-M **T

General Technical Data
通用技術資料

Feature 產品特色	PFR-X+	PFR-M
Operation voltage 工作電壓	90-550 V rms, 45...65 Hz, 5 VA, 1 ph	230 V (optional 115 V) rms, 45...65 Hz
Measuring voltage 量測電壓	90-550 V rms	50-530V rms
No. of output relays 輸出段數	6, 12	6, 12
Output rating 輸出接點容量	250 V AC / 5 A 400 V AC / 1 A	8 ... 32 V DC hybrid option: also 250 V / 5 A
Switching delay 動作延遲時間	1 s ... 6500 s	1s ... 1200s
Display 顯示	LCD	graphic LCD 可圖形LCD
Operating elements 操作單元	rubber buttons 橡膠按鍵	foil keyboard 貼膜按鍵
Measuring current 量測電流	5 mA ... 6 A	15 mA ... 6 A
Adjustable transformer ratio CT比	1 ... 9600	1 ... 6500
External Alarm contact 警報接點	isolated relay, closed contact 獨立常閉	isolated relay, changeover contact multiple
Terminals 接線端子	contact plug (2.5 mm²) to be installed	contact plug (2.5 mm²) to be installed
Fuses 保護熔絲	externally 外加	externally 外加
Fan control 風扇控制	output 輸出接點	digital output (DO) 數位輸出接點
Interface 通訊介面	MODBUS RS485 (選配)	MODBUS RS485 (選配)
Ambient temperature 工作溫度	-20°C ... 70°C	0°C ... 70°C
Storage temperature 儲存溫度	-40°C ... +85°C	-20°C ... +85°C
Humidity 濕度	0 % ... 95 % (no condensation)	
Temperature measurement 溫度量測	NTC	
Protection class 保護等級 Front 前	IP50 (IP54 with special gasket 選配特殊防水墊)	
Back 後	IP20	
PF setting range 功因設定範圍	From 0.7cap to 0.7 ind	
4-quadrrant operation 四象限偵測	Standard 標配	
Case 外殼 Front 前方	plastic (UL94: V0) 塑膠	
Back 背面	metal 金屬	
Dimensions H × W × D 尺寸	144 × 144 × 58 mm (window size 開孔尺寸138 × 138 mm)	
Weight 重量	ca. 0.6 kg	
Standards 依循標準	DIN VDE 0110 1 (IEC 60664-1:1992) VDE 0411 1 (IEC/DIN EN 61010-1:2001) VDE 0843 20 (IEC/DIN EN 61326: 1997 + A1:1998 +A2: 2000) GOST 15150-69 UL 508 – Industrial Control Equipment CSA C22.2 No. 14-M95 - Industrial Control Equipment	
Approval marks 認證標記	UL, Rostest, c-UL	
Control methods 控制程序	Best Fit, LIFO,FIFO,progressive,manual (自動最佳化、後進先出、先進先出、累進式、手動)	
C/K setting C/K值設定	Auto adjust (manual setting) 自動判斷(可手動設定)	

CE **CE Conformity** 通過CE認證
The controller is declared to conform to the following European Directives:
2014/35/EU Low-Voltage Directive
2004/108/EG EMC directive

CERTIFICATES
相關認證

Certificate of Compliance

Certificate Number 20110111-E211978
Report Reference E211978, 2011 January 11
Issue Date 2011 January 11
Page 1 of 1

Underwriters Laboratories

Issued to: ELECTRONICON KONDENSATOREN GMBH

KEPLERSTRASSE 2
07549 GERA GERMANY

This is to certify that representative samples of CAPACITORS
MKP, MKPg, MKPc

Have been investigated by Underwriters Laboratories Inc.® (UL) or any authorized licensee of UL in accordance with the Standard(s) indicated on this Certificate..

Standard(s) for Safety: Standard for Capacitors, UL 810, Fifth Edition
CSA C22.2 No. 190-M1985, The Standard for Capacitor for Power Factor Correction, 1st Edition

Additional Information: See UL On-Line Certification Directory at www.UL.com for additional information.

Only those products bearing the UL Recognized Component Marks for the U.S. and Canada should be considered as being covered by UL's Recognition and Follow-Up Service and meeting the appropriate U.S. and Canadian requirements.

The UL Recognized Component Mark for the U.S. generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark may be used in conjuction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions. The UL Recognized Component Mark for Canada consists of the UL Recognized Mark for Canada and the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory.

Look for the UL Recognized Component Mark on the product

William R. Carney
Director, North American Certification Programs
Underwriters Laboratories Inc.

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.
For questions, please contact a local UL Customer Service Representative at http://www.ul.com/global/eng/pages/corporate/contactus/

CSA INTERNATIONAL

Certificate of Compliance

Certificate: 1133696 **Master Contract:** 185634 (LR 105375)

Project: 1264904 **Date Issued:** January 3, 2002

Issued to: Electronicon Kondensatoren GmbH
Keplerstrasse 2
Gera, 07549
GERMANY
Attention: Mr. Stefan Hochsattel

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US'

C SA US

Issued by: N. Graham

Authorized by: Brian Rossborough
Operations Manager

PRODUCTS
CLASS 9071 01 - CAPACITORS - For Power Factor Correction
CLASS 9071 81 - CAPACITORS - For Power Factor Correction - CERTIFIED TO U.S. STANDARDS

Series MPP , MKP, and LEYDEN, SYSTEM ELECTRIC, EKG, AENER, ELSPEC, 600V ac max, indoor type, 1 and 3 phase, 5kVar to 25kVar, delta and wye connection, smallest size 50mm x 176mm, largest size 116mm x 320mm.

Note: The above devices are Certified as components for use only in other Certified equipment where the suitability of the combination is to be determined by CSA International.

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No.	0-M91	-	General Requirements - Canadian Electrical Code, Part II
CSA Std C22.2 No.	190-M1985	-	Capacitors for Power Factor Correction
UL Std No	810	-	Capacitors

The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and ANSI/UL Standards, for use in Canada and the U.S., respectively. This 'US' indicator includes products eligible to bear the 'NRTL' indicator. NRTL, i.e. National Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories which have been recognized to perform certification to U.S. Standards.

DQD 507 ED 2001/07/29

ELECTRONICON

EU-Konformitätserklärung
Declaration of Conformity
Three phase Power capacitors

Dokument-Nr. *No. of Document:* EKG KON 007

Produktbezeichnung *Name of Product* **Leistungskondensatoren**
Typenreihen 275, 276, 277, E62-3ph
Power Capacitors
Ranges 275, 276,277, E62-3ph

Hersteller *Manufacturer* **ELECTRONICON**
Kondensatoren GmbH
Keplerstraße 2
Germany – 07549 Gera

CE

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein:
The conformity is declared with the following directives of the European Union:

2006/95/EC **Niederspannungs-Richtlinie** (kodifizierte Fassung von 73/23/EWG + 93/68/EWG)
Low Voltage Directive on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (codified version of 73/23/EWG + 93/68/EWG)

Die Übereinstimmung des bezeichneten Produkts mit den Vorschriften der vorgenannten Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen:
The compliance of the aforementioned products with the directives listed above is documented by their accordance with the following standards:

EN 60831-1
EN 60831-2 **Selbstheilende Leistungs-Parallelkondensatoren für Wechselstromanlagen mit einer Nennspannung bis 1000 V**
1.Teil: Allgemeines, Leistungsanforderungen, Prüfung und Bemessung, Sicherheitsanforderungen, Anleitung für Bemessung und Betrieb
2.Teil: Alterungsprüfung, Selbstheilprüfung und Zerstörungsprüfung
Shunt power capacitors in self-healing technology for a.c. systems having a rated voltage of not more than 1000V
Part 1: General-Performance, testing and rating – Safety requirements – Guide for installation and operation
Part 2: Ageing test, self-healing test and destruction test

Anbringung der CE-Kennzeichnung: *Year in which „CE" marking was applied first* **1997**

Aussteller *Issuer* **siehe Hersteller**
see "manufacturer"

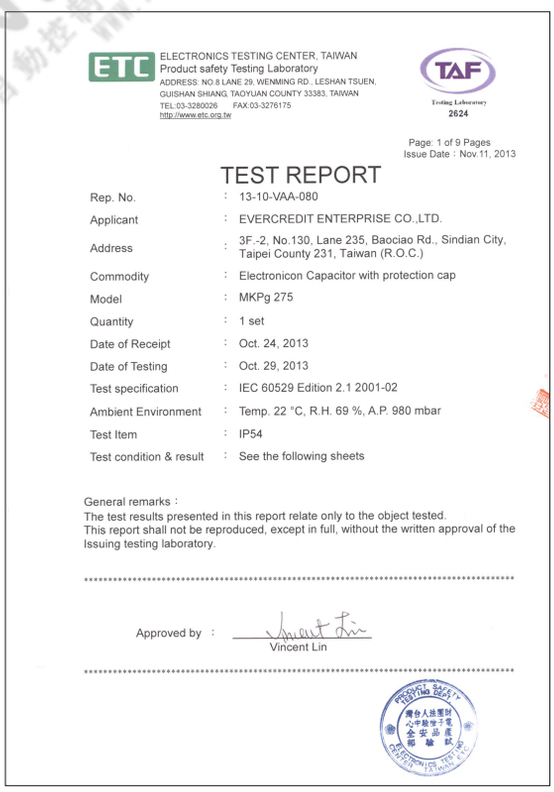
Ort, Datum *Place, Date* **Gera, 16th December, 2009**

Rechtsverbindliche Unterschrift *Signature of authorized person*

ELECTRONICON
ELECTRONICON Kondensatoren GmbH
Germany - Kepplerstrasse 2 - 07549 Gera
T (03 65) 7346-0 F (03 65) 7346110

Stefan Hochsattel
Leiter Marketing & Vertrieb
Manager of Marketing & Sales

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.
This Declaration documents the compliance with the aforementioned directives. It does not perform any assurance of characteristics.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
Please obey the safety instructions provided with the products.



ETC ELECTRONICS TESTING CENTER, TAIWAN
Product safety Testing Laboratory
ADDRESS: NO.8 LANE 29, WENMING RD., LESHAN TSUEN, GUISHAN SHIANG, TAOYUAN COUNTY 33383, TAIWAN
TEL:03-3280026 FAX:03-3276175
http://www.etc.org.tw

TAF Testing Laboratory 2624

Page: 1 of 9 Pages
Issue Date：Nov.11, 2013

TEST REPORT

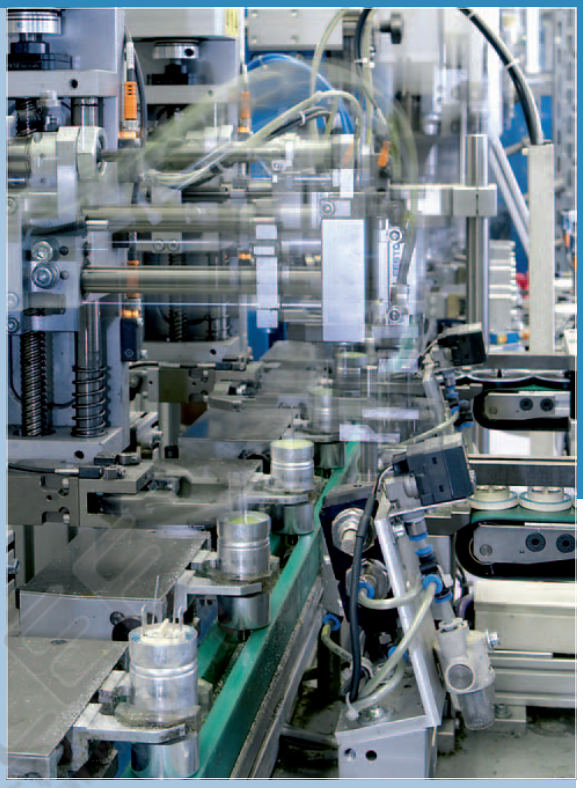
Rep. No.	:	13-10-VAA-080
Applicant	:	EVERCREDIT ENTERPRISE CO.,LTD.
Address	:	3F.-2, No.130, Lane 235, Baociao Rd., Sindian City, Taipei County 231, Taiwan (R.O.C.)
Commodity	:	Electronicon Capacitor with protection cap
Model	:	MKPg 275
Quantity	:	1 set
Date of Receipt	:	Oct. 24, 2013
Date of Testing	:	Oct. 29, 2013
Test specification	:	IEC 60529 Edition 2.1 2001-02
Ambient Environment	:	Temp. 22 °C, R.H. 69 %, A.P. 980 mbar
Test Item	:	IP54
Test condition & result	:	See the following sheets

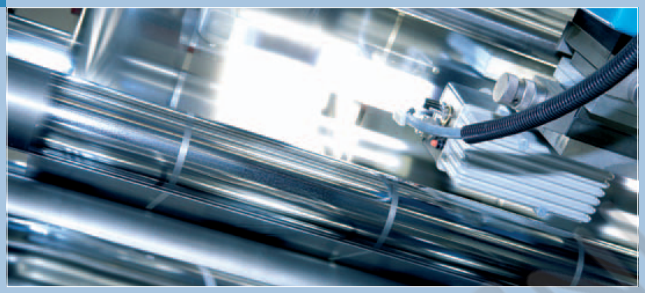
General remarks：
The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

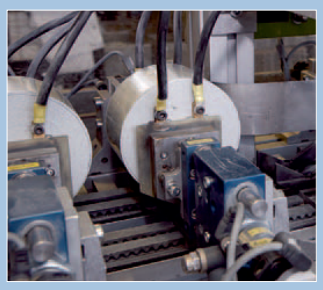
Approved by : Vincent Lin

超過70年的電容器製造經驗

德國格拉市自1938年以來，已經成為電容器製造的中心。
西元1992年，由原本的RFT/VEB ELECTRONIK Gera公司改名為ELECTRONICON公司，並成為歐洲電容器的領導品牌之一，供應分佈全球的顧客群，成為功率因數矯正儀器、傳動設備、電力電子、家用設備和電力工業製造商與使用者的開放且稱職的合作伙伴。
透過持續的投資以及提升對環境友善的噪音防制技術的發展，ELECTRONICON確保了高度水平的製造與品質標準，並通過領導認證單位的認證與監控。







在今日全球化競爭之下，我們藉由下列特點與其他廠牌作區分，我們的產品提供絕對的可靠度與安全性。
製造原廠與客戶間密切的合作關係，以達到雙方在技術上以及商業上的需求。
改進與發展本身對電容器設計與製造的相關科技知識，同時也重視薄膜塗佈技術的發展。在MKPg(氮氣充填)部分，更是付出特別多的心力於相關技術的發展。
具遠見的早期認證與採納新的電容器製造相關的新趨勢與新方法，具彈性且可以正確履行的業務責任。

我們經驗豐富的產品開發工程師對於最新技術潮流運用與確保我們的產品可以適應傳統市場或新市場的挑戰方面，是非常有能力和非常可靠的。
在市場與銷售部門、研究開發部門和產品部門之間密切且積極的合作之下，奠定了我們之所以會成功的基石。
ELECTRONICON也持續努力的在我們國內與國外市場的經銷商和直接客戶之間建立一個相同的密切與積極的關係，為了成為不僅僅是您眾多供應商之一，而是您的理念與解決方案的最佳伙伴。

MADE IN GERMANY 100%

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