

## Installation, Operation & Maintenance Instructions

Thanks for choosing our products. Before installation, read this notice carefully and keep it at disposal of people in charge of installation, maintenance and operation.

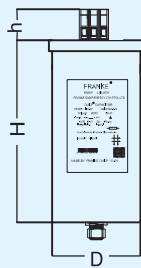
**WARNING!** Wait 5 min. after isolating supply before handling. After the 5 min. wait and as an additional precaution before commencing work, carefully proceed with DC voltage measurement on the terminals and make sure of the capacitor discharge.

For a safe use of capacitor units, please ensure

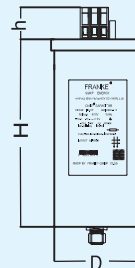
- Installation and maintenance are undertaken only by authorized and qualified personnel, in accordance with current local regulations;
- Isolate the equipment from the supply before attempting to gain access.
- The Q (total Non-line load capacity / the total load capacity system) is less 30%, pure capacitor model, if  $30% < Q < 50%$ , detuned capacitor model, if  $Q > 50%$ , filter with capacitor model.

• Inspection on reception: Unpack the capacitor and check that: the capacitor quantity

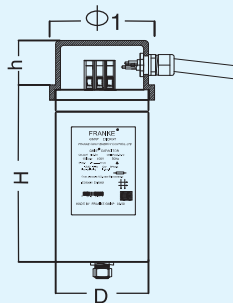
- Data on the label correspond to those of your purchase order and local regulations.
  - The capacitor is not damaged. The series GMKP capacitors are including:
    - GMKP capacitor.
    - GMKPd Multi-protection capacitor.
    - GMKPw outdoor mounting capacitor.
    - GMKPf pure filter capacitor.
    - GMKP 3P/4N 3 phase & 4 line capacitor.
- Any loss or damage should be notified immediately to your closest our agent.



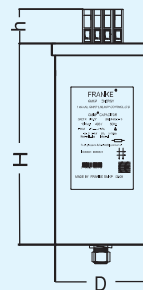
GMKP&GMKPg, GMKPf capacitors



GMKPd capacitor



GMKPw capacitor



GMKP3P/4N capacitor

- Storage:Indoor, in dry, dust free and non-corrosive environments,protected from vibrations or shocks. Storage temperature: minimum: -40°C/-40°F, maximum:75°C/167°F.
- Transportation and handling:In case severe conditions of transportation are expected, make sure the fixation points are strong enough to withstand weight of the capacitor and vibrations that may occur.

WARNING! Failure to respect the installation rules may lead to premature failure, other material damage to installations or bodily injury.

- Environment: The capacitor do not contain PCB,or any other toxic or banned materials.you can disposal it as the normal industry wastes.
- Installation:Applicable standards:IEC 60831 Parts 1 and 2. Current local regulations.Protection:IP00 by default and IP20 & IP54 with optional top cover.Installation and use:Indoor installation on firm foundation or fixed on a rigidplate/frame in well-ventilated situations where the air temperature around the capacitor does not exceed 35°C/95°F over one year, 45°C/113°F over 24 hours and 55°C/131°F (according to IEC 60831 Parts 1 and 2 for the temperature category product).Always refer to the nameplate for exact specifications.

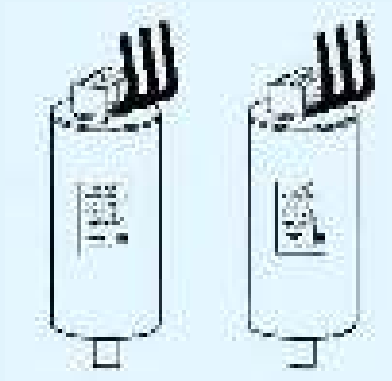
WARNING! The ambient temperature for capacitors inside a cubicle is the temperature around the capacitors and not around the cubicle.

WARNING! Like other standard capacitor units, capacitor discharge devices are not suitable for use with rapid switching rates like thyristor switched banks. The minimum off time of capacitor is 40~60 sec. Additional external resistors are not a solution for such cases. Only specially designed capacitors must be used in such applications.

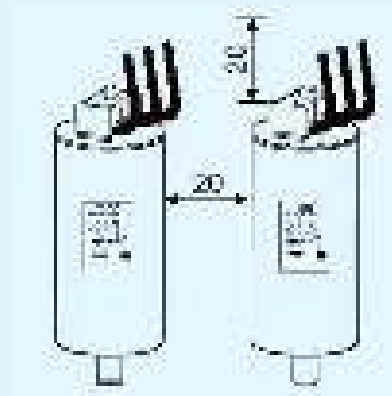
- Vertical and horizontal mounting:WARNING! Following instructions on mounting must be strictly followed. Incorrect mounting could damage the capacitors.The capacitors must be fixed in such a way as to ensure a natural airflow from bottom to top.The minimum free necessary space between groups of in-line adjacent units is 20-25 mm (Fig.).In case of vertical mounting, use a punched mounting plate or support bars to allow free airflow around capacitors units (Fig.).
- Installation in a cubicle:WARNING! Guidelines only apply if the following limits are respected:
  - Maximum room temperature: 40°C (1 hour).
  - Average maximum room temperature over 24 hours: 35°C.
  - Average maximum room temperature over 1 year: 25°C.

When the capacitors are installed in a cubicle the components should be placed in such a way as to optimize the cooling. Do preferably place devices with high heat dissipation above the capacitors to avoid overheating them. When reactors are used they should be placed in such a way that they do not radiate heat directly on the capacitors. A thermal barrier is recommended. Reactors do in general dissipate much more heat, so their thermal impact through convection must also be taken into account.

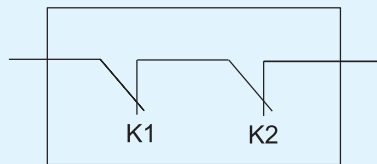
- Natural air circulation: The difference in height between air inlet and air outlet should be large enough to improve the air circulation. The airflow should be channeled in such a way as to well cool the hottest spots in the cubicle. Air should flow from the bottom to the top of the cubicle. The cross-section of the top air outlet should be at least equal to 1.2-1.5 times the cross-section of the bottom air inlet.
- Forced ventilation: Forced cooling using a fan is sometimes required.Please refer to the following recommendations:
  - Consider the maximum ambient temperature of the installation site including the heating effect of the capacitor installation itself.
  - Consider the heat dissipated from all the components and apparatus in the cubicle:reactors,capacitors, contactors, fuses, etc.
  - Consider the maximum permissible temperatures for all the components and apparatus.
  - Consider how to direct the airflow with respect to the position of the capacitors (Fig.).
- The use of an overtemperature protection is recommended in order to switch the bank off in case of fan failure or overtemperature due to other cause.
- Regular maintenance and cleaning of any filters is necessary. Without regular cleaning the cooling system may become inefficient. capacitor fixation (Fig.) Four fixation stud are provided for M12 screws (included)..Make sure that the rigidity of the support and the screws are sufficient to bear the weight of the capacitor unit.
- Electrical connection: Cables should be rated at minimum 1.5~1.7 times the nominal capacitor current. Appropriate cable shoes must be used in accordance with good common practice of electrical installation.When you connect the supply cables with the terminals,please above the Max. permissible torque is 1.2Nm.Periodically check that connections and terminals are right.



connection cables  
group capacitors



necessary space 20mm



K1: capacitor failure protection

K2: capacitor over temperature protection

Internal terminals GMKPd capacitor

- Earthing: Earthing is achieved through fixation points of the capacitor enclosure. Remark: this implies that an extra cable between the capacitor enclosure and the earthing contact of the installation is required in case the capacitor unit is fixed on an isolating material.
  - Harmonics: Installation of capacitors on networks disturbed by harmonics may require special precautions especially when there is a risk of resonance phenomena.
  - Commissioning: With the equipment isolated from the supply, check:
    - Cabling is properly connected (earthing may be considered).
    - Ambient ventilation is adequate.
    - Correct tightness of the connections.
    - Ip20 top cover is well fixed, if any (see section "Optional accessories").
  - Optional accessories: The optional top cover allows the capacitor unit to get IP20 or IP54 protected as per the IEC 60529 provided that appropriate glands or grommets are used.
  - Discharge resistor The capacitor unit is delivered with factory-installed discharge resistors to comply with IEC 60831 and allow a decrease of the residual voltage to less than 50V after 1 min. disconnection from supply. Make sure the delay before the capacitor is re-energized is not shorter than 40~60 sec. Failure to follow this rule may cause damage and reduce the lifetime of the capacitor.
  - Disposal: The impregnants and filling materials contain resin or polyurethane mixtures. The gas filled capacitors contain only pure neutral. You can disposal it as the normal industry wastes. Please make sure that if the capacitor may still be charged with high voltage!
  - Maintenance:
    - Ensure safety procedures are completed
    - Yearly maintenance should include
      - Removal of dust deposits, cleaning of all parts
      - Check of tightness of all electrical connections
      - Check of ambient temperature
      - Check condition of discharge resistors
  - System components : Always use our series components for your system including are as following:
    - GMKPc series automatic control of 6, 7, 12, 12, 14 steps.
    - GMKP GMC capacitor contactor of 5 to 30Kvar 400 to 690V.
    - GMKP r series detuned/filter reactor of 5 to 120Kvar.
    - GMKPs fuse load switch of 60 to 450A.
- You can download the "Component Selection Table for the Low Voltage Power Factor Correction" at our website.

### Selection table for detuned/filter capacitor banks(7%&14%)

Detuning factor (%)	Effective filter output (kvar)	Voltage increase on capacitor (V)	Recommended min. capacitor voltage (V)	Capacitor output (kvar)	Reactor inductivity (mH)	Cable cross-section (mm <sup>2</sup> )	Fuse rating (A)
7	10.0	430	440	11	3.835	6	25
7	12.5	430	440	14	3.068	6	35
7	20.0	430	440	22	1.918	10	50
7	25.0	430	440	28	1.534	16	63
7	40.0	430	440	45	0.959	25	100
7	50.0	430	440	56	0.767	35	125
7	75.0	430	440	84	0.511	50	200
7	100.0	430	440	112	0.384	70	250
14	10.0	465	480	12	8.295	6	25
14	12.5	465	480	15	6.636	6	35
14	20.0	465	480	24	4.148	10	50
14	25.0	465	480	30	3.318	16	63
14	40.0	465	480	49	2.074	25	100
14	50.0	465	480	61	1.659	35	125
14	75.0	465	480	92	1.106	50	200
14	100.0	465	480	123	0.830	70	250