# ESTAdry®
# D-Type Capacitor

**Vishay Electronic GmbH**
Geschäftsbereich Roederstein
ESTA und Hybride
Hofmark-Aich-Strasse 36
D-84030 Landshut
Germany
**Phone:** + 49 871 860
**Fax:** + 49 871 862512
**www.vishay.com**

The products listed in this catalog are not generally recommended for use in life support systems where a failure or malfunction of the component may directly threaten life or cause injury.

The user of products in such applications assumes all risks of such use and will agree to hold Vishay Intertechnology, Inc. and all the companies whose products are represented in this catalog, harmless against all damages.

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Vishay ESTA

# ESTAdry® D-Type Capacitor

## PhMKDg SERIES ESTAdry® D-TYPE METALLIZED POLYPROPYLENE, DRY DIELECTRIC

3-phase Power Factor Correction Capacitors in triangular aluminium casing

### APPLICATION

The new PhMKDg series capacitor in a triangular aluminium case with a standard rating of 50Kvar, augments our broad line of reliable three-phase power capacitors. The new PhMKDg series is preceded by our ESTAprop® (Metallized Polypropylene, Impregnated) PhMKP series and the ESTAdry® (Metallized Polypropylene, Dry Dielectric) PhMKPg series in aluminium tubular casings, with outputs up to 30 Kvar, depending on their rated voltage.

The standard PhMKDg series capacitor is designed for indoor application, with externally arranged discharge resistors. For outdoor application, the discharge resistors can be incorporated internally. Also, our pure aluminium welded cases render these capacitors perfectly suitable for outdoor use.

The PhMKDg capacitor can be used for both controlled equipment and for stationary or mobile fixed compensation, e.g. for induction-motor-operated conveyer belts in the mining industry.

This capacitor can be supplied with the option of a small protective cover for each individual connection or with an IP54-type overall protective cover.

### PhMKDg DESIGN OBJECTIVES

The following requirements led to the development of the PhMKDg design:

- 3-phase symmetric construction
- Maintain a small case design winding element diameter of the 84mm round, which has proved its reliability in thermal behavior and life expectancy, to avoid hot spots in the winding core. For the interconnection between winding elements, no additional transmission lines shall run within the winding core.
- Avoid the insulation risks of high energy short circuits between line terminals, that might be caused by using concentric winding elements. Using individual winding elements with end-covers to assure highest strength against internal short circuits.
- Low profile construction height of 210mm (+ 68mm for terminals) with minimal winding element diameters, output performance of 50kvar and the possibility of increasing the element height to allow for an increase in the output. Therefore, the winding elements are all arranged on one plane and not one above the other, as typically found in our tubular can designs.
- Enlarged surface area achieves optimal heat dissipation by arranging the winding elements in the three “corners” of the triangular case.
- Thermal balance is maintained through the use of a resin with excellent thermal conductance.
- A stable and elastic position for the winding elements is provided, allowing them to withstand strong vibrations. In addition, our casting technique allows for the installation and operation of the PhMKDg capacitor in any position.
- Perfect functioning of the THREE-phase tear-off fuse system by the channel formation between the casting unit and the casting wall, to accomplish the pressure build-up required at the capacitor’s cover. By use of vault surfaces at the flat casing walls versus round casings, this design incorporates an internal venting system, which facilitates the reliable functioning of the THREE-phase tear-off fuse system.

The triangular case and corresponding triangular arrangement of the winding elements allows for simple connection in parallel of several units (IN-LINE). The joint insulation created by means of a solid ceramic terminal base with high surface-creepage resistance and very long tracking paths establishes an additionally superior mechanical stability for the three solid connector bolts.

**With a resin filled pure aluminium case offering superior mechanical stability, low profile design, excellent thermal conductance, easy paralleling and a complete three-phase tear-off fuse system incorporated into the PhMKDg design, this series is the ideal first choice for new designs and applicable retrofit requirements.**

# ESTAdry® D-Type Capacitor For Indoor Use

**ESTAdry® D-TYPE THREE PHASE MK-POWER CAPACITOR ACCORDING TO DIN EN 60831-1/-2 FOR INDOOR APPLICATION**

MK = Metallized Plastic Film Dielectric.

ESTAdry® MK-type capacitor for power factor correction in low voltage systems.

**RATED VOLTAGES**
400V, 415V, 440V, 460V, 525V, 690V, 760V

**RATED FREQUENCY**
50Hz*

**RATED OUTPUT**
50kvar, other outputs upon request

**CASING**
Aluminum, welded and hermetically sealed

**DEGREE OF PROTECTION**
IP00, Indoor (higher degrees of protection up to IP54 upon request)

**STANDARDS**
DIN EN 60831-1/-2, IEC60831-1/-2 (VDE 0560-46/-47)

**LOSSES (INCLUDING DISCHARGE RESISTORS)**
Less than 0.45 watt per kvar at upper temperature limit

**DIELECTRIC**
Polypropylene film

**IMPREGNANT**
Without, dry type, NON-PCB, NON-toxic

**ELECTRODES**
Self-healing

**SAFETY DEVICES**
Self-healing dielectric and overpressure tear-off fuses external discharge resistors for U≤50V, t = 60s (for IP00 version)

**TEMPERATURE CLASS**
- 25/D (max. 55°C), (- 40/D upon request)

**SHELF TEMPERATURE**
- 40/+ 70°C

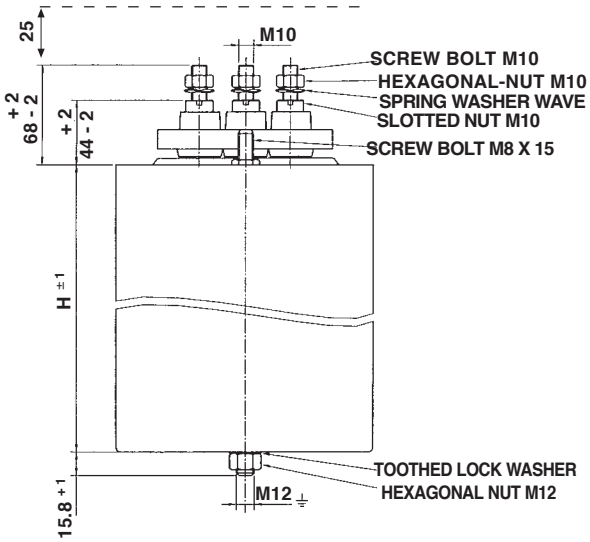
**SWITCH-IN-CURRENT**
Max.300 x $I_N$

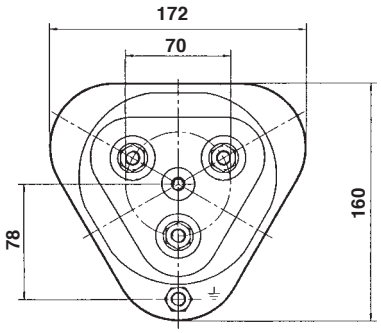
**INSULATION**
6/15kV

**TESTS**
Terminal/Terminal: 2.15 x $U_N$/2 seconds
Terminal/Casing: 6000V/10 seconds

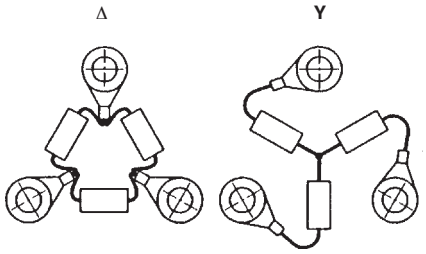
*Can also be used for 60Hz. The output will be 1.2 times higher. A lower class of temperature might be taken into account.

**REQUIRED SPACE FOR BULGING**




**DISCHARGE RESISTORS**




| TYPE | RATED VOLTAGE [V] | RATED OUTPUT [kvar] | CAPACITANCE [μF] | CURRENT [A] | WEIGHT [kg] | HEIGHT H [mm] |
|---|---|---|---|---|---|---|
| PhMKDg 400.3.50 | 400 | 50 | 3 x 331.6 Δ | 72 | app. 4.9 | 210 |
| PhMKDg 415.3.40 | 415 | 40 | 3 x 246.4 Δ | 56 | app. 4.9 | 210 |
| PhMKDg 415.3.50 | 415 | 50 | 3 x 308.0 Δ | 70 | app. 4.9 | 210 |
| PhMKDg 440.3.50 | 440 | 50 | 3 x 274.0 Δ | 66 | app. 4.9 | 210 |
| PhMKDg 440.3.56, 2 | 440 | 56.2 | 3 x 308.0 Δ | 74 | app. 4.9 | 210 |
| PhMKDg 460.3.50 | 460 | 50 | 3 x 250.7 Δ | 63 | app. 4.9 | 210 |
| PhMKDg 525.3.50 | 525 | 50 | 3 x 192.5 Δ | 55 | app. 4.9 | 210 |
| PhMKDg 690.2.50 | 690 | 50 | 3 x 334.3 Y | 42 | app. 4.9 | 210 |
| PhMKDg 760.2.50 | 760 | 50 | 3 x 275.5 Y | 38 | app. 4.9 | 210 |

# ESTAdry® D-Type Capacitor For Outdoor Use

**ESTAdry® D-TYPE THREE PHASE MK-POWER CAPACITOR ACCORDING TO DIN EN 60831-1/-2 FOR OUTDOOR APPLICATION**

MK = Metallized Plastic Film Dielectric.

ESTAdry® MK-type capacitor for power factor correction in low voltage systems.

**RATED VOLTAGES**
400V, 415V, 440V, 460V, 525V, 690V, 760V

**RATED FREQUENCY**
50Hz*

**RATED OUTPUT**
50kvar, other outputs upon request

**CASING**
Aluminum, welded and hermetically sealed

**DEGREE OF PROTECTION**
IP00, Outdoor

**STANDARDS**
DIN EN 60831-1/-2, IEC60831-1/-2 (VDE 0560-46/-47)

**LOSSES (INCLUDING DISCHARGE RESISTORS)**
Less than 0.40 watt per kvar at upper temperature limit

**DIELECTRIC**
Polypropylene film

**IMPREGNANT**
Without, dry type, NON-PCB, NON-toxic

**ELECTRODES**
Self-healing

**SAFETY DEVICES**
Self-healing dielectric and overpressure tear-off fuses internal discharge resistors for U≤75V, t = 180s

**TEMPERATURE CLASS**
- 25/D (max. 55°C), (- 40/D upon request)

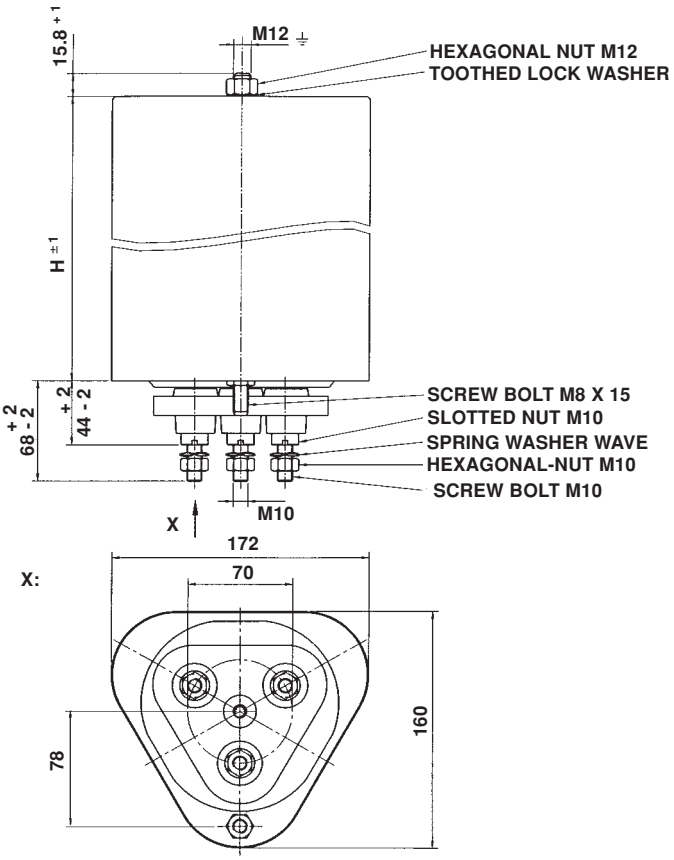
**SHELF TEMPERATURE**
- 40/+ 70°C

**SWITCH-IN-CURRENT**
Max.300 x $I_N$

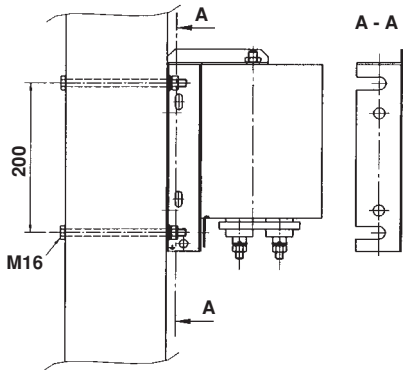
**INSULATION**
6/25kV

**TESTS**
Terminal/Terminal: 2.15 x $U_N$/2 seconds
Terminal/Casing: 6000V/10 seconds

*Can also be used for 60Hz. The output will be 1.2 times higher. A lower class of temperature might be taken into account.




**ACCESSORIES: SUPPORT FOR POLE AND WALL MOUNTING**




Available types same as for indoor use, different type designation “F”.
For example:

| TYPE | RATED VOLTAGE [V] | RATED OUTPUT [kvar] | CAPACITANCE [μF] | CURRENT [A] | WEIGHT [kg] | HEIGHT H [mm] |
|---|---|---|---|---|---|---|
| PhMKDgF 460.3.50 | 460 | 50 | 3 x 250.7 Δ | 63 | app. 4.9 | 210 |