

# HV/LV distribution transformers

ground-mounted, mineral oil-immersed transformers  
from 50 to 2500 kVA  
insulation voltage  $\leq 24$  kV – EN 50464-1, losses **E<sub>0</sub>** **D<sub>k</sub>**



## standards

These transformers comply with standards:

- EN 50464-1
- EN 60076-1 to 10

Products assembled using new components, PCB-free guaranteed

## description

Mineral oil-immersed, 50 Hz, three-phase distribution transformers with the following characteristics:

- hermetically sealed with integral filling
- cover bolted to the tank
- ONAN-type natural cooling
- Indoor/outdoor use (depending on selected fittings and options)
- anti-corrosion surface treatment : corrosivity category C3, "Medium" durability (according to ISO 12944-2)
- final colour grey RAL 7033
- protection index IP00 (coverless version)

## liquid dielectric

- new insulating mineral oil
- tested in accordance with IEC 60296
- compatible with all the transformer's components

## standard fittings

- one 3 or 5 positions off-circuit tap changer on the cover, with padlocking
- 3 HV plug-in bushings (250 A / 24 kV) on the cover
- 4 LV flat-bars (from 250 kVA)
- 4 LV porcelain bushings (from 50 to 160 kVA)
- 4 bi-directional flat rollers
- 2 lifting and untanking lugs
- 2 pulling eyelets on the frame
- 2 earthing terminals on the cover (M12 studs)
- 1 filling plug
- 1 draining device (according to EN 50216-4)
- 1 aluminium rating plate

## optional fittings

- protection relays (DMCR<sup>®</sup> or DGPT2<sup>®</sup>) on the filling plug
- 1 free, thermometer pocket
- control device in the thermometer pocket (pointer thermometer with 0 or 2 contacts max, 2-contact thermostat, etc.)
- 3 HV, 250 A porcelain bushings
- 4 LV porcelain bushings (from 250 kVA)
- LV, sealable cover, rated IP21 or IP54 (only with plug-in bushings on the HV side)
- locking device for plug-in bushings (with or without lock)



- 3 mobile connectors for plug-in bushings – straight or elbow (cable characteristics must be specified)
- liquid retention container

| No-load losses performance<br>Minera oil-immersed transformers<br>according to EN 50464-1 | Load losses performance<br>Minera oil-immersed transformers<br>according to EN 50464-1 |
|---|--|
| Optimum efficiency<br><b>A<sub>0</sub></b>  | Optimum efficiency<br><b>A<sub>k</sub></b>   |
| <b>B<sub>0</sub></b>  | <b>B<sub>k</sub></b>   |
| <b>C<sub>0</sub></b>  | <b>C<sub>k</sub></b>   |
| <b>D<sub>0</sub></b>  | <b>D<sub>k</sub></b>   |
| <b>E<sub>0</sub></b> <b>E<sub>0</sub></b><br>Standard efficiency                          | <b>D<sub>k</sub></b> <b>D<sub>k</sub></b><br>Standard efficiency                       |

## electrical characteristics

| rated power (kVA)                             | 50   | 100                           | 160                           | 250                           | 315                           | 400                           | 500                           | 630                           | 630                           | 800                           | 1000                          | 1250                          | 1600                          | 2000                          | 2500                          |                               |       |
|---|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------|
| rated voltage primary                         | 15 and/or 20 kV  |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |       |
| secondary at no-load                          | 400 to 433 V between phases, 231 to 250 V phase to neutral |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |       |
| rated insulation level <sup>(1)</sup> primary | 17,5 kV for 15 kV<br>24 kV for 20 kV                       |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |       |
| MV tapping range (off-circuit)                | $\pm 2,5$ % and/or $\pm 5$ %                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |       |
| vector group                                  | Yzn 11 (50 kVA version only)<br>Dyn 11                     |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |       |
| losses (W)                                    | no-load  | 190                           | 320                           | 460                           | 650                           | 770                           | 930                           | 1100                          | 1300                          | 1200                          | 1400                          | 1700                          | 2100                          | 2600                          | 3100                          | 3500                          |       |
|   | due to load at 75°C  | 1350                          | 2150                          | 3100                          | 4200                          | 5000                          | 6000                          | 7200                          | 8400                          | 8700                          | 10500                         | 13000                         | 16000                         | 20000                         | 26000                         | 32000                         |       |
|   | combination of losses according to EN 50464                | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> | E <sub>0</sub> D <sub>k</sub> |       |
| rated impedance voltage (%)                   | 4 4 4 4 4 4 4 4 4 6 6 6 6 6 6 6                            |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |       |
| no-load current (%)                           | 5 4 3,5 3 3 2,5 2,5 2 2 2 2 2 2 2 2 1,5                    |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |                               |       |
| switching current                             | le/ln peak value   | 12                            | 11,5                          | 11                            | 10,5                          | 10,5                          | 10,5                          | 10,5                          | 10                            | 7,5                           | 7,5                           | 7                             | 7                             | 7                             | 7                             | 7                             |       |
|   | time constant  | 0,1                           | 0,15                          | 0,15                          | 0,15                          | 0,15                          | 0,15                          | 0,15                          | 0,2                           | 0,25                          | 0,25                          | 0,25                          | 0,25                          | 0,3                           | 0,3                           | 0,3                           |       |
| voltage drop at full load (%)                 | P.F. = 1   | 2,74                          | 2,21                          | 2,00                          | 1,75                          | 1,65                          | 1,57                          | 1,51                          | 1,40                          | 1,55                          | 1,48                          | 1,47                          | 1,45                          | 1,42                          | 1,47                          | 1,45                          |       |
|   | P.F. = 0,8   | 3,93                          | 3,75                          | 3,66                          | 3,54                          | 3,49                          | 3,45                          | 3,41                          | 3,35                          | 4,68                          | 4,64                          | 4,63                          | 4,62                          | 4,60                          | 4,63                          | 4,62                          |       |
| efficiency (%)                                | 100 % load   | P.F. = 1                      | 97,01                         | 97,59                         | 97,82                         | 98,10                         | 98,20                         | 98,30                         | 98,37                         | 98,48                         | 98,45                         | 98,53                         | 98,55                         | 98,57                         | 98,61                         | 98,57                         | 98,60 |
|   |  | P.F. = 0,8                    | 96,29                         | 97,00                         | 97,29                         | 97,63                         | 97,76                         | 97,88                         | 97,97                         | 98,11                         | 98,07                         | 98,17                         | 98,20                         | 98,22                         | 98,27                         | 98,21                         | 98,26 |
|   | 75 % load  | P.F. = 1                      | 97,53                         | 98,00                         | 98,20                         | 98,42                         | 98,51                         | 98,59                         | 98,65                         | 98,74                         | 98,73                         | 98,80                         | 98,81                         | 98,83                         | 98,86                         | 98,83                         | 98,87 |
|   |  | P.F. = 0,8                    | 96,93                         | 97,51                         | 97,76                         | 98,03                         | 98,14                         | 98,24                         | 98,31                         | 98,43                         | 98,41                         | 98,50                         | 98,52                         | 98,54                         | 98,58                         | 98,54                         | 98,59 |
| noise level dB(A) <sup>(2)</sup>              | acoustic power L <sub>WA</sub>                             | 55                            | 59                            | 62                            | 65                            | 67                            | 68                            | 69                            | 70                            | 70                            | 71                            | 73                            | 74                            | 76                            | 78                            | 81                            |       |
|   | acoustic pressure L <sub>PA</sub> at 1 m                   | 47                            | 51                            | 53                            | 56                            | 58                            | 58                            | 59                            | 60                            | 60                            | 60                            | 62                            | 63                            | 65                            | 66                            | 69                            |       |

(1) reminder of insulation levels:

| rated insulation level (kV) | 7,2 | 12 | 17,5 | 24  |
|-----------------------------|-----|----|------|-----|
| kV eff. 50 Hz - 1 mn        | 20  | 28 | 38   | 50  |
| kV choc. 1,2/50 $\mu$ s     | 60  | 75 | 95   | 125 |

(2) measurements according to IEC 60076-10

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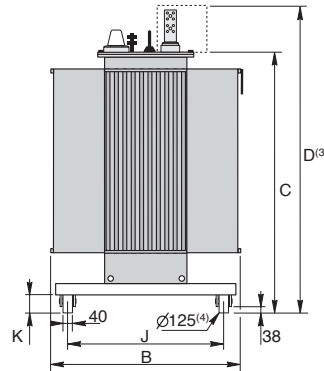
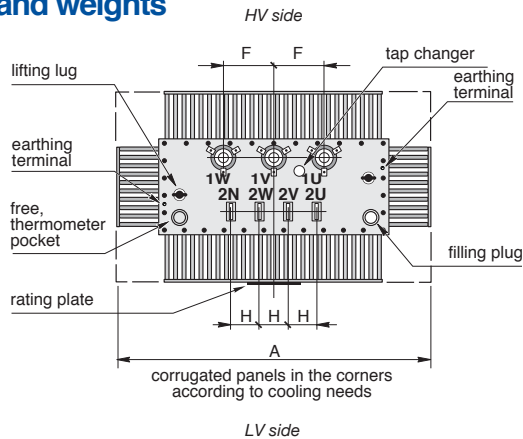
ground-mounted, mineral oil-immersed transformers

from 50 to 2500 kVA

insulation voltage  $\leq 24$  kV – EN 50464-1, losses  $E_0$   $D_k$



## dimensions and weights



**Note :** Bushings are marked according to the IEC 60616 standard.

<sup>(3)</sup> D : Height over LV cable box (optional accessory, compatible with HV plug-in bushings only).

<sup>(4)</sup>  $\varnothing$  80 mm for the 50 kVA version.

<sup>(5)</sup> Dimensions and weights are for guidance only, and are provided for a single-voltage transformer with the following electrical characteristics: 20 kV (HV) / 400 V (LV) – 3-position tap changer,  $\pm 2.5\%$

| rated power (kVA)                    | 50   | 100  | 160  | 250  | 315  | 400  | 500  | 630  | 630  | 800  | 1000 | 1250 | 1600 | 2000 | 2500 |
|--------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>dimensions<sup>(5)</sup> (mm)</b> |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| A                                    | 750  | 950  | 1050 | 1180 | 1300 | 1370 | 1450 | 1370 | 1550 | 1600 | 1650 | 1800 | 1900 | 1890 | 2350 |
| B                                    | 650  | 650  | 780  | 820  | 900  | 950  | 970  | 1000 | 1000 | 1000 | 1000 | 1250 | 1270 | 1230 | 1310 |
| C                                    | 800  | 900  | 920  | 1000 | 1000 | 1080 | 1130 | 1150 | 1150 | 1250 | 1300 | 1270 | 1370 | 1555 | 1605 |
| D                                    | 1080 | 1180 | 1200 | 1340 | 1340 | 1420 | 1470 | 1490 | 1490 | 1590 | 1640 | 1675 | 1775 | 2055 | 2105 |
| F                                    | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  | 265  |
| H                                    | 80   | 80   | 75   | 150  | 150  | 150  | 150  | 150  | 150  | 150  | 150  | 150  | 170  | 170  | 170  |
| J                                    | 520  | 520  | 520  | 520  | 670  | 670  | 670  | 670  | 670  | 670  | 670  | 820  | 820  | 820  | 820  |
| K                                    | 105  | 105  | 105  | 105  | 105  | 105  | 105  | 105  | 105  | 105  | 85   | 85   | 85   | 85   | 85   |
| <b>weights<sup>(5)</sup> (kg)</b>    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| dielectric (mineral oil)             | 70   | 120  | 145  | 200  | 200  | 240  | 280  | 300  | 360  | 440  | 450  | 560  | 680  | 830  | 965  |
| total                                | 320  | 510  | 640  | 850  | 950  | 1120 | 1300 | 1500 | 1580 | 1900 | 2050 | 2550 | 3050 | 3830 | 4515 |

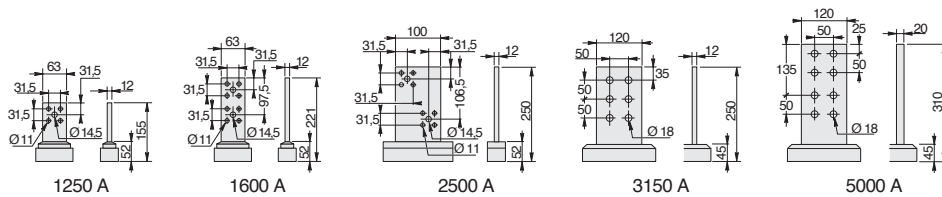
## connections

### maximum intensity (A)

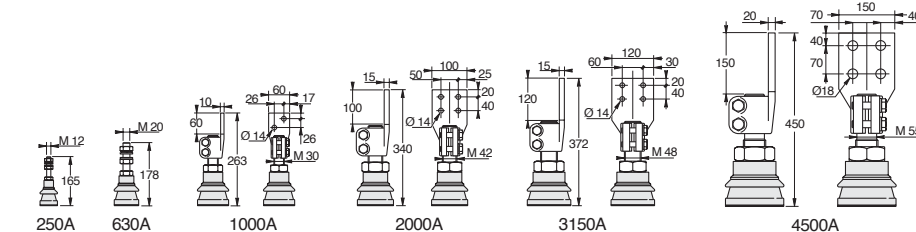
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|-----------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| LV flat-bars          | -   | -   | -   | 1250 | 1250 | 1250 | 1250 | 1250 | 1250 | 1250 | 1600 | 2500 | 2500 | 3150 | 5000 |
| LV porcelain bushings | 250 | 250 | 250 | 630  | 630  | 630  | 1000 | 1000 | 1000 | 2000 | 2000 | 2000 | 3150 | 3150 | 4500 |

### LV connections

flat-bars according to EN 50387 (standard from 250 kVA)

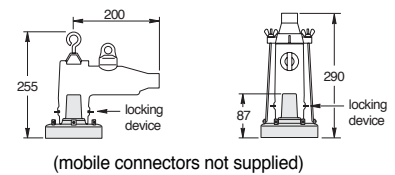


porcelain bushings according to EN 50386 (standard from 50 to 160 kVA – optional for other powers)



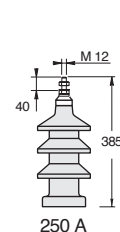
### HV connectors according to EN 50180

250 A plug-in bushings (standard)



(mobile connectors not supplied)

250 A porcelain bushings (option)



Routine fittings such as bar and cable supports, flexible connectors, etc. will be supplied by the contractor, who will ensure that the transformer bushings are not subject to mechanical stresses.

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Due to the evolution of standards and materials, the present document will bind us only after confirmation from the technical department.