

Installation calculation report

Obliczenia zwarciaowe
Full



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1 Project description

1.1 Project general settings

| | |
|--------------------------|-------------|
| Installation standard | IEC60364 |
| Calculation standard | TR50480 |
| Circuit breaker standard | IEC 60947-2 |
| Frequency | 50 Hz |

1.2 Settings for wiring device calculation

Maximal CSA 300 mm²

1.3 List of loads

1.3.1 Generic loads

| Name | Sr (kVA) | Pr (kW) | Ir (A) | cosφ | Nbr | Polarity | Non linear load | THDi 3 (%) |
|-----------------|----------|---------|--------|------|-----|----------|-----------------|------------|
| Przycho dnia | 42.4 | 36 | 61.1 | 0.85 | 1 | 3Ph+N | No | 0 |

2 Installation general design

2.1 List of devices

2.1.1 MV/LV transformer

| Name | Nbr | Range | Insulation | Sr (kVA) | ukrT (%) | Connection | U2 (V) | SEA | Rb (mΩ) |
|-------------------|-----|--------|------------|----------|----------|------------|--------|------|---------|
| Transformator B-6 | 1 | Trihal | Resin | 1000 | 6 | D | 420 | TN-S | 10000 |

2.1.2 LV switchboards and busbar

| Switchboard name | Range | Rating (A) | IP |
|----------------------|---------------|------------|-----------|
| Rozdzielnica bud B-6 | No preference | 0.00 | Undefined |
| Rozdzielnica bud D-4 | No preference | 0.00 | Undefined |

| Busbar name | Switchboard name | Ks | Polarity | SEA | Equipotential bounding |
|-------------|----------------------|----|----------|------|------------------------|
| B-6 | Rozdzielnica bud B-6 | 1 | 3Ph+N | TN-S | With |
| D-4 | Rozdzielnica bud D-4 | 1 | 3Ph+N | TN-S | Without |

2.1.3 Circuit breaker

| Name | Nbr | Range - Designation | Rating (A) | Poles | Trip unit/Curve | RCD | RCD class | PowerTag Energy Designation | PowerTag Energy ConnectionType |
|------|-----|-----------------------------|------------|-------|------------------|-----|-----------|-----------------------------|--------------------------------|
| QA 0 | 1 | Masterpact MTZ1 - MTZ1 16H1 | 1600 | 4P4d | Micrologic 5.0 X | | | | |

2.1.4 Fuse combination unit

| Name | Nbr | Carrier range | Poles | Fuse Rating (A) | Fuse technology | RCD | RCD class | PowerTag Energy Designation | PowerTag Energy ConnectionType |
|----------------|-----|---------------|-------|-----------------|-----------------|-----|-----------|-----------------------------|--------------------------------|
| Zab bud D4 | 1 | Fupact | 4P4f | 630 | DIN/gG | | | | |
| Zab przychodni | 1 | Fupact | 4P4f | 63 | DIN/gG | | | | |

2.1.5 Cable schedule

| Name | Nbr | Incomer | Feeder | Type | Insulation | L (m) | L1/L2/L3 | N | PE/PEN |
|--------------|-----|-------------------|--------------|------------|------------|-------|--------------|--------------|--------------|
| B6 -> D4 | 1 | Zab bud D4 | D-4 | Multi-core | PVC | 94 | 2x240 Copper | 2x240 Copper | 2x120 Copper |
| D-4 -> RG-nN | 1 | Zab przychodni | Przycho dnia | Multi-core | XLPE | 20 | 1x35 Copper | 1x35 Copper | 1x16 Copper |
| WD 0 | 1 | Transformator B-6 | QA 0 | Multi-core | XLPE | 5 | 3x300 Copper | 3x300 Copper | 3x150 Copper |

NOTICE

RISK OF INACCURATE DATA RESULTS

- Make sure that you have provided all the required inputs for the conductor sizing.
- It is recommended to refer to the cable manufacturer's catalogue before making the selection.

Failure to follow these instructions can result in incorrect bill of material and loss of business.

2.1.6 MV Cable

| Name | Nbr | Designation | CSA (mm ²) | I _{cc} (A) | I _n (A) | U _n (kV) |
|--------|-----|-------------|------------------------|---------------------|--------------------|---------------------|
| MVWD 0 | 1 | NA | 1 x 240 Al | 21.3 | 418 | 24 |

3 Calculation notes

3.1 Source circuits

3.1.1 Circuit Source 0

| | |
|------------------------------------|---|
| MV power supply | W 0 |
| Max. upstream short circuit power | 500 MVA |
| Min. upstream short circuit power | 250 MVA |
| MV Cable | MVWD 0 |
| Parameters | |
| Length | 10 m |
| Type of cable | Single core |
| Ib | 38 A |
| Nb of conductor per phase | 1 |
| Cross section area | 1 x 240 Al mm ² |
| Core | Aluminium |
| Short circuit withstand | 21.3 kA |
| Assigned voltage | 15 kV |
| Insulation voltage | 24 kV |
| MV/LV transformer | Transformer B-6 |
| Range | Trihal |
| Technology | Resin |
| Rated power | 1000 kVA |
| ukrT | 6 % |
| Type of losses | AoAk |
| PkrT | 9 kW |
| System earthing arrangement | TN-S |
| MV Connection | D |
| LV Connection | yn |
| No load secondary voltage Ur0 | 420V |
| Ur LV | 400V |
| Rb (neutral grounding) | NA |
| Ra (mass grounding) | NA |
| Sizing information | UkrT and PkrT calculated by system |
| Cable | WD 0 |
| Parameters | |
| Length | 5 m |
| Max length | NA |
| Installation method | 31 |
| | E |
| | Multi-core cables on horizontal perforated tray |
| Type of cable | Multi-core |
| Nb of additional touching circuits | NA |
| Insulation | XLPE |
| Ambient temperature | 30 °C |
| Level of third harmonic THDI | NA % |
| Ib | 1443 A |
| Sizing constraint | Iz |
| Sizing Information | Sized with Ir |
| Correction factors | |
| Temperature factor | 1 |
| Standard table reference | B-52-14 |
| Soil thermal resistivity factor | 1 |
| Standard table reference | B-52-16 |
| Loaded neutral factor | 1 |
| Standard table reference | E-52-1 |

| | |
|---------------------------|---------|
| Touching conductor factor | 0.82 |
| Standard table reference | B-52-20 |
| User correction factor | 1 |
| Overall factor | 0.82 |

| | |
|--------------------------------------|-----------------------|
| Selected phase | |
| Cross section area | 3x300 mm ² |
| Core | Copper |
| I _z under real conditions | 1528 A |
| I _z ' | 1863 A |

| | |
|--------------------------------------|-----------------------|
| Selected neutral | |
| Cross section area | 3x300 mm ² |
| Core | Copper |
| I _z under real conditions | 1528 A |
| I _z ' | 1863 A |

| | |
|--------------------|-----------------------|
| Selected PE | |
| Cross section area | 3x150 mm ² |
| Core | Copper |

| Short circuit current | | | | | | | | |
|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|
| | I _{k3max} | I _{k2max} | I _{k1max} | I _{k2min} | I _{k1min} | I _{efmin} | I _{ef2min} | I _{efmax} |

| Operating mode Normal | | | | | | | | |
|-----------------------|-------|-------|-------|-------|-------|-------|----|-------|
| (kA) | 22.92 | 19.85 | 22.62 | 16.60 | 18.91 | 19.17 | NA | 22.19 |

| Synthesis for all operating mode | | | | | | | | |
|----------------------------------|-------|-------|-------|-------|-------|-------|----|-------|
| (kA) | 22.92 | 19.85 | 22.62 | 16.60 | 18.91 | 19.17 | NA | 22.19 |

Calculation results in accordance with CENELEC technical report TR50480.
All assumptions and device choices are the user's responsibility.

| Circuit breaker | | QA 0 |
|--------------------------------|------------------------|------|
| Ib | 1443 A | |
| Distance from origin | NA | |
| | | |
| Sizing Information | Sized by system | |
| Range | Masterpact MTZ1 | |
| Designation | MTZ1 16H1 | |
| Circuit breaker rating | 1600 A | |
| Breaking capacity | 42 kA | |
| TNS One pole breaking capacity | 42 kA | |
| IT One pole breaking capacity | NA | |
| Reinforced breaking capacity | NA | |
| Pole & protected pole | 4P4d | |
| Trip unit designation | Micrologic 5.0 X | |
| Trip unit rating | 1600 A | |
| Long delay settings | | |
| Ir | 1472 (Setting: 0.92) A | |
| Tr | 24 s | |
| Short delay settings | | |
| I _{sd} current | 11776 A | |
| T _{sd} | 0.4 s | |
| Instantaneous tripping | | |
| I _i current | 19200 (Setting: 12) A | |
| T _i current | 0.05 s | |

| | |
|----------------------------|-------------------|
| Selectivity Results | |
| UpStream | Selectivity Limit |

Operating mode Normal

NA

Selectivity can't be determinated : no upstream Lv Breaker

Design current

| IL1 | IL2 | IL3 | IN |
|-----|-----|-----|----|
|-----|-----|-----|----|

Operating mode Normal

| | | | | |
|-----|--------|--------|--------|---|
| (A) | 61.131 | 61.131 | 61.131 | 0 |
|-----|--------|--------|--------|---|

Synthesis for all operating mode

| | | | | |
|-----|--------|--------|--------|----|
| (A) | 61.131 | 61.131 | 61.131 | NA |
|-----|--------|--------|--------|----|

Voltage drop

| Cumulated from upstream | Circuit |
|-------------------------|---------|
|-------------------------|---------|

Operating mode Normal

| | | |
|-----------------------|-------|-------|
| ΔU_{3L} (%) | 0.114 | 0.114 |
| ΔU_{L1L2} (%) | 0.131 | 0.131 |
| ΔU_{L2L3} (%) | 0.131 | 0.131 |
| ΔU_{L3L1} (%) | 0.131 | 0.131 |
| ΔU_{L1N} (%) | 0.114 | 0.114 |
| ΔU_{L2N} (%) | 0.114 | 0.114 |
| ΔU_{L3N} (%) | 0.114 | 0.114 |

3.2 Feeder circuits

3.2.1 Circuit Zab D-4

Fuse carrier and fuse**Zab bud D4**

| | |
|-----------------------|----------------|
| Ib | 630 A |
| Sizing Information | Seized by user |
| Range | Fupact |
| Designation | GSD630 |
| Icm (making capacity) | 100 kA. |
| Pole & protected pole | 4P4f |
| Fuse carrier type | Fuse-switch |

Fuse

| | |
|---------------------------|---------|
| Technology | DIN/gG |
| Size | NH3 |
| Line rating | 630 A |
| Line breaking capacity | 100 kA |
| Neutral rating | |
| Neutral breaking capacity | |
| Fusing time If | 0.365 s |
| Fusing time Ikmin | 0.236 s |

Selectivity Results**UpStream****Selectivity Limit****Operating mode Normal**

QA 0 Total Selectivity

MTZ1 16H1

Micrologic 5.0 X

1600 A / 4P4d

| Cable | B6 -> D4 |
|------------------------------------|--|
| Parameters | |
| Length | 94 m |
| Max length | NA |
| Installation method | 31 E Multi-core cables on horizontal perforated tray |
| Type of cable | Multi-core |
| Nb of additional touching circuits | NA |
| Insulation | PVC |
| Ambient temperature | 30 °C |
| Level of third harmonic THDI | NA % |
| Ib | 630 A |
| Sizing constraint | Iz |
| Sizing Information | Sized with In |
| Correction factors | |
| Temperature factor | 1 |
| Standard table reference | B-52-14 |
| Soil thermal resistivity factor | 1 |
| Standard table reference | B-52-16 |
| Loaded neutral factor | 1 |
| Standard table reference | E-52-1 |
| Touching conductor factor | 0.88 |
| Standard table reference | B-52-20 |
| User correction factor | 1 |
| Overall factor | 0.88 |

Selected phaseCross section area 2x240 mm²

Core Copper

Iz under real conditions 688 A

Iz' 782 A

Selected neutralCross section area 2x240 mm²

Core Copper

Iz under real conditions 688 A

Iz' 782 A

Selected PECross section area 2x120 mm²

Core Copper

Short circuit current

| | Ik3max | Ik2max | Ik1max | Ik2min | Ik1min | Iefmin | Ief2min | Iefmax |
|--|--------|--------|--------|--------|--------|--------|---------|--------|
|--|--------|--------|--------|--------|--------|--------|---------|--------|

Operating mode Normal

| | | | | | | | | |
|------|-------|-------|-------|-------|------|------|----|-------|
| (kA) | 16.23 | 14.06 | 12.27 | 11.50 | 9.80 | 8.70 | NA | 10.07 |
|------|-------|-------|-------|-------|------|------|----|-------|

Synthesis for all operating mode

| | | | | | | | | |
|------|-------|-------|-------|-------|------|------|----|-------|
| (kA) | 16.23 | 14.06 | 12.27 | 11.50 | 9.80 | 8.70 | NA | 10.07 |
|------|-------|-------|-------|-------|------|------|----|-------|

Calculation results in accordance with CENELEC technical report TR50480.
All assumptions and device choices are the user's responsibility.

Design current

| IL1 | IL2 | IL3 | IN |
|-----|-----|-----|----|
|-----|-----|-----|----|

Operating mode Normal

| | | | | |
|-----|--------|--------|--------|---|
| (A) | 61.131 | 61.131 | 61.131 | 0 |
|-----|--------|--------|--------|---|

Synthesis for all operating mode

| | | | | |
|-----|--------|--------|--------|----|
| (A) | 61.131 | 61.131 | 61.131 | NA |
|-----|--------|--------|--------|----|

Voltage drop

| Cumulated from upstream | Circuit |
|-------------------------|---------|
|-------------------------|---------|

Operating mode Normal

| | | |
|-----------------------|-------|-------|
| ΔU_{3L} (%) | 0.264 | 0.150 |
| ΔU_{L1L2} (%) | 0.305 | 0.174 |
| ΔU_{L2L3} (%) | 0.305 | 0.174 |
| ΔU_{L3L1} (%) | 0.305 | 0.174 |
| ΔU_{L1N} (%) | 0.264 | 0.150 |
| ΔU_{L2N} (%) | 0.264 | 0.150 |
| ΔU_{L3N} (%) | 0.264 | 0.150 |

3.3 Generic load circuits

3.3.1 Circuit Rozdzielnica RG-nN

| Fuse carrier and fuse | Zab przychodni |
|---------------------------|-------------------|
| Ib | 63 A |
| Sizing Information | Seized by user |
| Range | Fupact |
| Designation | GSD63 |
| Icm (making capacity) | 100 kA. |
| Pole & protected pole | 4P4f |
| Fuse carrier type | Fuse-switch |
| Fuse | |
| Technology | DIN/gG |
| Size | NH000 |
| Line rating | 63 A |
| Line breaking capacity | 100 kA |
| Neutral rating | |
| Neutral breaking capacity | |
| Fusing time If | 0.1 s |
| Fusing time Ikmin | 0.1 s |
| Selectivity Results | |
| UpStream | Selectivity Limit |
| Operating mode Normal | |
| Zab bud D4 | Total Selectivity |
| GSD630 | |
| DIN/gG | |
| 630 A / 4P4f | |

| Cable | D-4 -> RG-nN |
|------------------------------------|---|
| Parameters | |
| Length | 20 m |
| Max length | 122 m |
| Installation method | 31 |
| | E |
| | Multi-core cables on horizontal perforated tray |
| Type of cable | Multi-core |
| Nb of additional touching circuits | NA |
| Insulation | XLPE |
| Ambient temperature | 30 °C |
| Level of third harmonic THDI | NA % |
| Ib | 63 A |
| Sizing constraint | Iz |
| Sizing Information | Sized with In |
| Correction factors | |
| Temperature factor | 1 |
| Standard table reference | B-52-14 |
| Soil thermal resistivity factor | 1 |
| Standard table reference | B-52-16 |
| Loaded neutral factor | 1 |

| | |
|---------------------------|---------|
| Standard table reference | E-52-1 |
| Touching conductor factor | 1 |
| Standard table reference | B-52-20 |
| User correction factor | 1 |
| Overall factor | 1 |

Selected phase

| | |
|--------------------------------------|----------------------|
| Cross section area | 1x35 mm ² |
| Core | Copper |
| I _z under real conditions | 144 A |
| I _z ' | 144 A |

Selected neutral

| | |
|--------------------------------------|----------------------|
| Cross section area | 1x35 mm ² |
| Core | Copper |
| I _z under real conditions | 144 A |
| I _z ' | 144 A |

Selected PE

| | |
|--------------------|----------------------|
| Cross section area | 1x16 mm ² |
| Core | Copper |

Short circuit current

| | I _{k3max} | I _{k2max} | I _{k1max} | I _{k2min} | I _{k1min} | I _{efmin} | I _{ef2min} | I _{efmax} |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|

Operating mode Normal

| | | | | | | | | |
|------|-------|------|------|------|------|------|----|------|
| (kA) | 11.14 | 9.65 | 6.82 | 6.68 | 4.42 | 3.04 | NA | 3.52 |
|------|-------|------|------|------|------|------|----|------|

Synthesis for all operating mode

| | | | | | | | | |
|------|-------|------|------|------|------|------|----|------|
| (kA) | 11.14 | 9.65 | 6.82 | 6.68 | 4.42 | 3.04 | NA | 3.52 |
|------|-------|------|------|------|------|------|----|------|

Calculation results in accordance with CENELEC technical report TR50480.
All assumptions and device choices are the user's responsibility.

Charge **Przychodnia**

| | |
|-----------------------------|----------|
| U | 400 V |
| S | 42.4 kVA |
| P | 36 kW |
| I | 61.1 A |
| cosφ | 0.85 |
| Polarity | 3Ph+N |
| Phase connection | |
| Number of circuit | 1 |
| K _u (Normal) | 1 |
| Harmonic generator | No |
| THDI3 | NA |
| Sensitivity to over voltage | NA |

Design current

| IL1 | IL2 | IL3 | IN |
|-----|-----|-----|----|
|-----|-----|-----|----|

Operating mode Normal

| | | | | |
|-----|--------|--------|--------|---|
| (A) | 61.131 | 61.131 | 61.131 | 0 |
|-----|--------|--------|--------|---|

Synthesis for all operating mode

| | | | | |
|-----|--------|--------|--------|----|
| (A) | 61.131 | 61.131 | 61.131 | NA |
|-----|--------|--------|--------|----|

Voltage drop

| Cumulated from upstream | Circuit |
|-------------------------|---------|
|-------------------------|---------|

Operating mode Normal

| | | |
|-----------------------|-------|-------|
| ΔU_{3L} (%) | 0.591 | 0.327 |
| ΔU_{L1L2} (%) | 0.682 | 0.378 |
| ΔU_{L2L3} (%) | 0.682 | 0.378 |
| ΔU_{L3L1} (%) | 0.682 | 0.378 |
| ΔU_{L1N} (%) | 0.591 | 0.327 |
| ΔU_{L2N} (%) | 0.591 | 0.327 |
| ΔU_{L3N} (%) | 0.591 | 0.327 |

Synthesis for all operating mode

| | |
|-----------------------|-------|
| ΔU_{3L} (%) | 0.591 |
| ΔU_{L1L2} (%) | 0.682 |
| ΔU_{L2L3} (%) | 0.682 |
| ΔU_{L3L1} (%) | 0.682 |
| ΔU_{L1N} (%) | 0.591 |
| ΔU_{L2N} (%) | 0.591 |
| ΔU_{L3N} (%) | 0.591 |

3.4 Busbar circuits

3.4.1 Circuit B-6

| Busbar | | | B-6 | | |
|-------------------|--|----------------------|-----|-----------------|--|
| Parameters | | | | | |
| Switchboard Name | | Rozdzielnica bud B-6 | | | |
| Switchboard Range | | No preference | | | |
| Rating (A) | | NA | | | |
| IP | | Undefined | | | |
| Feeder | | | | | |
| Circuit name | | Protection name | | Protection type | |
| Zab D-4 | | Zab bud D4 | | GSD630 | |

| Short circuit current | | | | | | | | |
|-----------------------|--------|--------|--------|--------|--------|--------|---------|--------|
| | Ik3max | Ik2max | Ik1max | Ik2min | Ik1min | Iefmin | Ief2min | Iefmax |

| Operating mode Normal | | | | | | | | |
|-----------------------|-------|-------|-------|-------|-------|-------|----|-------|
| (kA) | 22.92 | 19.85 | 22.62 | 16.61 | 18.92 | 19.18 | NA | 22.20 |

| Synthesis for all operating mode | | | | | | | | |
|----------------------------------|-------|-------|-------|-------|-------|-------|----|-------|
| (kA) | 22.92 | 19.85 | 22.62 | 16.61 | 18.92 | 19.18 | NA | 22.20 |

Calculation results in accordance with CENELEC technical report TR50480.
All assumptions and device choices are the user's responsibility.

3.4.2 Circuit D-4

| Busbar | | D-4 |
|--------------------|----------------------|-----------------|
| Parameters | | |
| Switchboard Name | Rozdzielnica bud D-4 | |
| Switchboard Range | No preference | |
| Rating (A) | NA | |
| IP | Undefined | |
| Feeder | | |
| Circuit name | Protection name | Protection type |
| Rozdzielnica RG-nN | Zab przychodni | GSD63 |

| Short circuit current | | | | | | | | |
|-----------------------|--------|--------|--------|--------|--------|--------|---------|--------|
| | Ik3max | Ik2max | Ik1max | Ik2min | Ik1min | Iefmin | Ief2min | Iefmax |

| Operating mode Normal | | | | | | | | |
|-----------------------|-------|-------|-------|-------|-------|------|----|-------|
| (kA) | 16.23 | 14.06 | 12.27 | 11.68 | 10.10 | 9.15 | NA | 10.60 |

| Synthesis for all operating mode | | | | | | | | |
|----------------------------------|-------|-------|-------|-------|-------|------|----|-------|
| (kA) | 16.23 | 14.06 | 12.27 | 11.68 | 10.10 | 9.15 | NA | 10.60 |

Calculation results in accordance with CENELEC technical report TR50480.
All assumptions and device choices are the user's responsibility.

NOTICE

RISK OF INACCURATE DATA RESULTS.

- Configure the software correctly to get accurate reports and/or data results.
- Do not rely solely on software messages and reports to determine if the system is functioning correctly.
- Make sure that you have entered the correct inputs for the required components.
- Review the calculated results and solutions provided by the software before submitting the report.

Failure to follow these instructions can result in incorrect bill of material and loss of business.