- They react to both alternating sine-wave residual current and pulsating direct current (type A)
- For protection:
- against accidental contact of live parts ( $\left(\mathrm{I}_{\Delta \mathrm{n}} \leq 30 \mathrm{~mA}\right)$
- against accidental contact of exposed conductive parts
- against fire or short-circuit at decrease of insulating capacity of electric equipment
■ Possibility of additional mounting of auxiliary switches PS-0FI11 on the right side of the device
- Possibility interconnection with miniature circuit breakers LSN (LSE) by means of busbars


## OFI20, OFI40

- Standard type for common use in building and industrial installations up to $80 \mathrm{~A}, 230 / 400 \mathrm{~V}$ a.c.
- Surge resistance up to $250 \mathrm{~A}(8 / 20 \mu \mathrm{~S})$


## 0FI41

- Special residual current circuit breakers that reduce undesirable releases
- It is recommended to install them before the equipment causing short-time (up to 10 ms ) stray currents - heavy
induction motors, large heating bodies, interference suppressors, surge voltage arresters etc.
- Identification: G
- Surge resistance: $3 \mathrm{kA}(8 / 20 \mu \mathrm{~s})$
- Release delay: 10 ms


## OFI42

■ Special residual current circuit breakers that reduce undesirable releases and enable selective switching of residual current circuit breakers

- It is recommended to install them before the equipment causing short-time (up to 40 ms ) stray currents - heavy induction motors, large heating bodies, interference suppressors, surge voltage arresters etc.
- Identification: $S$
- Surge resistance: $5 \mathrm{kA}(8 / 20 \mu \mathrm{~s})$
- Release delay: 40 ms



## Residual current circuit breakers 2-pole

| $\begin{aligned} & \mathrm{I}_{\mathrm{n}} \\ & {[\mathrm{~A}]} \\ & \hline \end{aligned}$ | $\begin{aligned} & I_{\Delta n} \\ & {[A]} \\ & \hline \end{aligned}$ | Type |  | Product code | Weight $[\mathrm{kg}]$ | Packing [pcs] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 16 | 0.01 | OFI 16/2/010 | OFI20 | 12366 | 0.24 | 1 |
| 25 | 0.03 | OFI 25/2/030 | OFI20 | 12367 | 0.24 | 1 |
|  | 0.1 | OFI 25/2/100 | OFI20 | 13933 | 0.24 | 1 |
|  | 0.3 | OFI 25/2/300 | OFI20 | 12368 | 0.24 | 1 |
| 40 | 0.03 | OFI 40/2/030 | OFI20 | 12369 | 0.24 | 1 |
|  | 0.1 | OFI 40/2/100 | OFI20 | 13934 | 0.24 | 1 |
|  | 0.3 | OFI 40/2/300 | OFI20 | 12370 | 0.24 | 1 |

## Residual current circuit breakers 4-pole

| $\begin{aligned} & \mathrm{I}_{\mathrm{n}} \\ & {[\mathrm{~A}]} \\ & \hline \end{aligned}$ | $\begin{aligned} & \mathrm{I}_{\Delta \mathrm{n}} \\ & {[\mathrm{~A}]} \\ & \hline \end{aligned}$ | Type |  | Product code | Weight <br> [kg] | Packing [pcs] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 25 | 0.03 | OFI 25/4/030 | OFI40 | 12373 | 0.46 | 1 |
|  | 0.1 | OFI 25/4/100 | OFI40 | 12374 | 0.46 | 1 |
|  | 0.3 | OFI 25/4/300 | OFI40 | 12375 | 0.46 | 1 |
| 40 | 0.03 | OFI 40/4/030 | OFI40 | 12376 | 0.46 | 1 |
|  | 0.1 | OFI 40/4/100 | OFI40 | 12377 | 0.46 | 1 |
|  | 0.3 | OFI 40/4/300 | OFI40 | 12378 | 0.46 | 1 |
|  | 0.5 | OFI 40/4/500 | OFI40 | 12379 | 0.46 | 1 |
| 63 | 0.03 | OFI 63/4/030 | OFI40 | 12380 | 0.46 | 1 |
|  | 0.1 | OFI 63/4/100 | OFI40 | 12381 | 0.46 | 1 |
|  | 0.3 | OFI 63/4/300 | OFI40 | 12382 | 0.46 | 1 |
|  | 0.5 | OFI 63/4/500 | OFI40 | 12383 | 0.46 | 1 |
| 80 | 0.3 | OFI 80/4/300 | OFI40 | 12384 | 0.46 | 1 |

## Residual current circuit breakers 4-pole, surge resistant, selective

| $\begin{aligned} & I_{n} \\ & {[A]} \\ & \hline \end{aligned}$ | $\begin{aligned} & \mathrm{I}_{\mathrm{Ln}} \\ & {[\mathrm{~A}]} \\ & \hline \end{aligned}$ | Surge resistant-G |  | Selective - S |  | Weight <br> [kg] | Packing [pcs] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Type | Product code | Type | Product code |  |  |
| 25 | 0.03 | OFI 25/4/030/G 0FI41 | 13935 | - | - | 0.46 | 1 |
|  | 0.1 | OFI 25/4/100/G OFI41 | 13936 | - | - | 0.46 | 1 |
| 40 | 0.03 | OFI 40/4/030/G OFI41 | 12389 | - | - | 0.46 | 1 |
|  | 0.1 | OFI 40/4/100/G OFI41 | 12390 | - | - | 0.46 | 1 |
|  | 0.3 | - | - | OFI 40/4/300/S OFI42 | 12391 | 0.46 | 1 |
| 63 | 0.1 | OFI 63/4/100/G OFI41 | 13937 | - | - | 0.46 | 1 |
|  | 0.3 | - | - | OFI 63/4/300/S OFI42 | 12393 | 0.46 | 1 |

## OFI accessories

| Auxiliary switch | PS-0FI11 | page 34 |
| :--- | :--- | :--- |
| Interconnecting busbar | G-2L-1000/16, G-4L-1000/16 | page 93 |
| Connecting adapters | AS/25-GN, AS/25-SN | page 95 |

## RESIDUAL CURRENT CIRCUIT BREAKERS OFI (10 kA)

## Specification

| Type |  |  | OFI20 | OFI40 | OFI41 | OFI42 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standards |  |  | EN 61008 , IEC 755 | EN 61 008, IEC 755 | EN 61 008, IEC 755 | EN 61 008, IEC 755 |
| Approval marks |  |  | $(E C) \quad D S E$ |  |  |  |
| Number of poles |  |  | 2 | 4 | 4 | 4 |
| Type |  |  | $\approx$ | A <br> $\approx$ | $\begin{aligned} & \mathrm{A} / \mathrm{G} \\ & \approx \end{aligned}$ /G | $\approx / \mathrm{A} / \mathrm{S}$ |
| Surge resistance ( $8 / 20 \mu \mathrm{~s}$ ) |  |  | 0.25 kA | 0.25 kA | 3 kA | 5 kA |
| Release delay |  |  | - | - | 10 ms | 40 ms |
| Rated operating voltage |  | $U_{\text {e }}$ | 230 V a.c. | 230/400 V a.c. | 230/400 V a.c. | 230/400 V a.c. |
| Min. operating voltage |  | $U_{\text {min }}$ | 100 V a.c. | 100 V a.c. | 100 V a.c. | 100 V a.c. |
| Rated current |  | $\mathrm{I}_{\mathrm{n}}$ | 16, 25, 40 A | 25, 40, 63, 80 A | 25,40,63 A | 40,63 A |
| Rated residual current |  | $\mathrm{I}_{\text {an }}$ | 0.01; 0.03; 0.1;0.3 A | 0.03; 0.1;0.3; 0.5 A | 0.03; 0.1 A | 0.3 A |
| Rated frequency |  | $\mathrm{f}_{\mathrm{n}}$ | $50 / 60 \mathrm{~Hz}$ | $50 / 60 \mathrm{~Hz}$ | 50/60 Hz | $50 / 60 \mathrm{~Hz}$ |
| Mechanical and electrical endurance |  |  | > 10000 operating cycles | $>10000$ operating cycles | > 10000 operating cycles | $>10000$ operating cycles |
| Mounting on the rail DIN EN 50022 - width |  |  | 35 mm | 35 mm | 35 mm | 35 mm |
| Rated conditional short-circuit current | with backup fuse $\mathrm{I}_{\mathrm{n}} \leq 63 \mathrm{AgG}$ | $\mathrm{I}_{\mathrm{nc}}$ | 10 kA | - |  |  |
|  | with backup fuse $\mathrm{I}_{\mathrm{n}} \leq 100 \mathrm{AgG}$ | $\mathrm{I}_{\mathrm{nc}}$ | - | 10 kA | 10 kA | 10 kA |
|  | with backup circuit breaker LSN, LST with $I_{n}$ max. 1:1 | $\mathrm{I}_{\mathrm{nc}}$ | 6 kA | 10 kA | 10 kA | 10 kA |
|  | with backup circuit breaker LSE with $\mathrm{n}_{\mathrm{n}}$ max. 1:1 | $\mathrm{I}_{\mathrm{nc}}$ | 6 kA | 6 kA | 6 kA | 6 kA |
| Connection | conductor |  | $1 \div 16 \mathrm{~mm}^{2}$ | $1 \div 25 \mathrm{~mm}^{2}$ | $1 \div 25 \mathrm{~mm}^{2}$ | $1 \div 25 \mathrm{~mm}^{2}$ |
|  | busbar |  | $16 \mathrm{~mm}^{2}$ | $16 \mathrm{~mm}^{2}$ | $16 \mathrm{~mm}^{2}$ | $16 \mathrm{~mm}^{2}$ |
|  | opposite |  | yes | yes | yes | yes |
| Operating conditions | ambient temperature |  | $-25 \div 45^{\circ} \mathrm{C}$ | $-25 \div 45^{\circ} \mathrm{C}$ | $-25 \div 45^{\circ} \mathrm{C}$ | $-25 \div 45^{\circ} \mathrm{C}$ |
|  | seismic immunity ( $8 \div 50 \mathrm{~Hz}$ ) |  | 3 g | 3 g | 3 g | 3 g |
|  | operating position |  | arbitrary | arbitrary | arbitrary | arbitrary |

## Dimensions

OFI20



## Diagram

OFI20


OFI40, OFI41, OFI42


## AUXILIARY SWITCHES



H001

- Accessories to LFI and LFE
- Installation: on the right side
- The auxiliary switch is designed for signalling the position of the main contacts of residual current circuit breakers with overcurrent protection


## PS-0FI11

- Accessories to residual current circuit breakers OFI and OFE
- Installation: on the right side
- The auxiliary switch is designed for signalling the position of the main contacts of residual current circuit breakers


## Auxiliary switches

| Type | Contact <br> sequence ${ }^{1)}$ | Product <br> code | Packing <br> $[p c s]$ | Weight <br> $[\mathrm{kg}]$ |
| :--- | :---: | :---: | :---: | :---: |
| H001 | 001 | 13138 | 1 | 0.06 |
| PS-0FI11 | 11 | 12395 | 1 | 0.06 |

${ }^{1)}$ Each digit indicates successively the number of make, break and break-make contacts

## Specification

| Type |  | H001 | PS-0FI11 |
| :---: | :---: | :---: | :---: |
| Approval marks |  | (EC) E CS CPG |  |
| Contact sequence ${ }^{1)}$ |  | 001 | 11 |
| Rated operating voltage / current | $U_{e} / I_{n}$ | $230 \mathrm{Va.c}. / 5 \mathrm{~A}$ | $230 \mathrm{Va.c}. / 6 \mathrm{~A}$ |
|  |  | 220 V d.c. $/ 0,5 \mathrm{~A}$ | 220 V d.c. $/ 1 \mathrm{~A}$ |
|  |  | $24 \mathrm{Vd.c} / 4 \mathrm{~A}$ |  |
| Degree of protection |  | IP20 | IP20 |
| Mounting |  | on right side | on right side |

${ }^{1)}$ Each digit indicates successively the number of make, break and break-make contacts

## Dimensions



PS-OFI11


## Diagram



Interconnecting systems

## INTERCONNECTING BUSBARS AND END CAPS



Interconnecting busbars

- For interconnection of 1 to 4 -pole circuit breakers, tumbler power switches, residual current circuit breakers, lightning current arresters and surge voltage arresters
- For interconnection of a series of single-phase or three-phase circuit breakers and tumbler power switches, on which an auxiliary switch is mounted
- Busbars $\mathrm{G}-\ldots$ with forks into the head part of the device Busbars S-... with pins into the clip part of the device


## End cap EK-C-3:

- To cover end of busbar G-3L-1000/10C


## Interconnecting busbars

| Phase | Cross - <br> section <br> [ $\mathrm{mm}^{2}$ ] | Max. current at power supply of [A/phase] |  | $\begin{aligned} & \text { Length } \\ & {[\mathrm{mm}]} \end{aligned}$ | Type | Product code | Accessories to | Weight [kg] | Packing [pcs] |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | end | middle |  |  |  |  |  |  |
| 1 | 12 | 65 | 110 | 1000 | G-1L-1000/12 | 00171 | LSN, LSE, ASN | 0.22 | 50 |
|  |  |  |  |  | G-1L-1000/12g ${ }^{1)}$ | 00170 | LSN, LSE, ASN | 0.1 | 50 |
|  | 16 | 80 | 130 | 210 | S-1L-210/16iso | 13012 | LSN, LSE, SVL, SJL, ASN | 0.045 | 50 |
|  | 20 | 90 | 150 | 1000 | G-1L-1000/20 | 00172 | LSN, LSE, SJB, SVM, ASN | 0.36 | 50 |
|  | 24 | 100 | 180 | 1000 | G-1L-27-1000/24 ${ }^{\text {2) }}$ | 11001 | LSN, LSE, ASN | 0.3 | 50 |
| 2 | 16 | 80 | 130 | 1000 | G-2L-1000/16 | 11179 | LSN, LSE, LFI, LFE, OFI, OFE, ASN | 0.46 | 20 |
| 3 | 10 | 63 | 100 | 1000 | G-3L-1000/10C | 00173 | LSN, LSE, ASN | 0.44 | 20 |
|  | 16 | 80 | 130 | 1000 | G-3L-1000/16C | 00174 | LSN, LSE, OFI, OFE, SJB, SVM, ASN | 0.72 | 20 |
|  |  |  |  |  | G-3L+9-1000/16 ${ }^{\text {2) }}$ | 11002 | LSN, LSE, ASN | 0.66 | 10 |
|  |  |  |  |  | S-3L-27-1000/16 ${ }^{\text {3) }}$ | 11864 | LSN, LST, LSE, ASN, AST | 0.52 | 20 |
|  | 25 | 100 | 180 | 1000 | S-3L-27-1000/25 ${ }^{3)}$ | 11865 | LSN, LST, LSE, ASN, AST | 0.96 | 10 |
| 4 | 16 | 80 | 130 | 1000 | G-4L-1000/16 | 11180 | LSN, LSE, OFI, OFE, ASN | 0.96 | 15 |

${ }^{11}$ The busbar is uninsulated
${ }^{2)}$ For 1-pole or 3-pole devices with an auxiliary switch
${ }^{3)}$ For 3-pole LST; for 1-pole LSN, LSE, ASN with an auxiliary switch

End caps

| Type | Product <br> code | Accessories to | Weight <br> $[\mathrm{kg}]$ | Packing <br> $[\mathrm{pcs}]$ |
| :--- | :---: | :--- | :---: | :---: | :---: |
| EK-C-3 | 00178 | G-3L-100/10C | 0.001 | 10 |
| EK-C-2+3 | 00181 | G-2L-1000/16, G-3L-1000/16C, S-3L-27-1000/16 | 0.001 | 10 |
| EK-C-3/36 | 11176 | S-3L-1000/25 | 0.002 | 10 |
| EK-C-4/16 | 11181 | G-4L-1000/16 | 0.002 | 10 |

## Specification

| Type | G-1L, G-2L, G-3L, G-4L, S-1L, S-3L |  |
| :--- | :--- | :--- |
| Rated operating voltage | $\mathrm{U}_{\mathrm{e}}$ | $230 / 400 \mathrm{~V}$ a.c., 220/440 V d.c. |
| Load current | $63 \div 180 \mathrm{~A}$ |  |
| Length | $210,1000 \mathrm{~mm}$ |  |
| Cross-section | $10 \div 25 \mathrm{~mm}^{2}$ |  |

## Diagram

G-1L, S-1L
G-3L, S-3L

L1 L2 L3 N

## End cap EK-C-2+3:

- To cover end of busbar G-2L-1000/16, G-3L-1000/16C, S-3L-27-1000/16


## End cap EK-C-3/36:

■ To cover end of busbar S-3L-27-1000/25

## End cap EK-C-4/16:

To cover end of busbar G-4L-1000/16

## INTERCONNECTING BUSBARS AND END CAPS

## Dimensions

## G-1L-1000/12



## G-1L-1000/12g



## G-1L-1000/20



G-2L-1000/16


## G-3L-1000/10C



G-3L-1000/16C


## G-3L+9-1000/16C



S-3L-27-1000/25


## CONNECTING ADAPTERS AND BLOCKS



## BASIC TERMS AND SYMBOLS

- Rated residual current $\mathrm{I}_{\Delta \mathrm{n}}$ is the value of residual current $I_{\Delta}$ specified by the manufacturer at which the residual current circuit breaker must switch out under specified conditions. Alternating residual current must release the residual current circuit breaker within $(0.5 \div 1) I_{\Delta n}$
- Rated current $I_{n}$ is the value of current specified by the manufacturer, which can be transferred by the residual current circuit breaker continuously. So the current $I_{n}$ can pass through the contacts for an unlimited time. Therefore it is, for instance, possible to use a residual current circuit breaker with $I_{n}=25 \mathrm{~A}$ in 16 A circuit. For protection against overload of the residual current circuit breakers OFI, OFE, it is recommended to use the miniature circuit breakers LSN, LST, LSE with rated current $I_{\text {nMB }} \leq I_{\text {n RCB }}$
- Rated operating voltage $\mathbf{U}_{e}$ is the voltage the residual current circuit breaker is to be connected to and which properties are related to. The connected voltage has no effect on the device function but on the function of the test circuit and isolation properties.
- Rated frequency $f_{n}$ is the frequency the residual current circuit breaker is designed for and at which it works correctly under stated conditions. Majority of residual current circuit breakers are designed for $\mathrm{f}=50$ to 60 Hz . As the residual current circuit breaker function is based on the induction principle, the residual current behaviour and frequency show an effect upon tripping. When using a device designed for $50 / 60 \mathrm{~Hz}$ in a network with a different frequency, the user must count on a change of the tripping threshold i.e. a change of $I_{\Delta n}$
- Rated conditional short-circuit current $\mathrm{I}_{\mathrm{nc}}$-short-circuit strength. The function and design principle does not allow for the residual current circuit breaker use for protection against short-circuit. For circuit protection it is necessary to use a circuit breaker or a fuse. These elements cut the short-circuited circuit safely off. The residual current circuit breaker must only withstand the through-going short-circuit current. The amplitude of the maximum through current is defined as rated conditional short-circuit current $\mathrm{I}_{\mathrm{nc}}$. The short-circuit strength is then expressed by the current $I_{n c}$. For example, on the rating plate, $I_{n c}=10 \mathrm{kA}$ is expressed by the following symbol:

$$
\square-10000
$$

- Ambient temperature $\mathbf{T}$ for the residual current circuit breakers is $(-5 \div+40)^{\circ} \mathrm{C}$ according to almostall international standards. Some residual current circuit breakers work in an extended range $(-25 \div+40)^{\circ}$. This possibility is identified by the following symbol on the rating plate.

Residual current circuit breaker - type AC - reacts to sine-wave residual current - it is used in conventional AC networks.


- Residual current circuit breaker - type A - reacts to sine-wave alternating and pulsating direct residual currents - it is used in conventional AC networks and the networks with phase power regulation etc.

- Residual current circuit breaker - type G - special residual current circuit breaker reducing the number of undesirable releases. It is mainly installed before the devices causing short-time (up to 10 ms ) stray currents. Identification: G
Surge resistance: $3 \mathrm{kA}(8 / 20 \mu \mathrm{~s})$
Release delay: 10 ms


■ Residual current circuit breaker - type S - special residual current circuit breaker, which is mainly intended for selective switching of residual current circuit breakers and reduction of undesirable releases. It is installed before the devices causing short-time (up to 40 ms ) stray currents.
Identification: S
Surge resistance: $5 \mathrm{kA}(8 / 20 \mu \mathrm{~s})$
release delay: 40 ms


Selective (discriminating) switching means that if the residual current circuit breakers are connected in series, only the device in which circuit a failure occurs will release. More specifically, only the device in which the release residual current appears due to a failure in the protected circuit will release. The advantage consists in maintaining the power supply in the other circuits not affected by the failure.

Such function of the protected circuit is achieved by connection of the selective residual current circuit breaker (see Fig. 1) before the standard or G type residual current circuit breaker, with the following ratio of rated residual currents:

$$
I_{\Delta n s} \geq 3 x I_{\Delta n, G}
$$

$I_{\text {ans }}$ rated residual of the selective residual current circuit breaker
$\mathrm{I}_{\mathrm{\Delta n} ; \mathrm{G}}$ maximum rated residual current of G type residual current circuit breaker

The main reason of selective switching is higher time delay of the selective residual current circuit breakers in releasing (compared to standard or G type ones).


Fig. 1: Simplified example of selective connection of residual current circuit breakers.

- Residual current circuit breaker with overcurrent protection - the device is a combination of residual current circuit breaker and miniature circuit breaker with 2-module width - it saves the space in the switchboard compared to conventional connection of two separate devices (3 modules). This eliminates the problem of primary protection and interconnection. The disadvantage of such a design compared to conventional ones is that it is not possible to identify whether the release was actuated by the residual current circuit breaker or by overcurrent release of the circuit breaker.


Fig. 2: Example of interconnection of the residual current circuit breaker OFI with miniature circuit breaker LSN by busbar G-4L

