

Technical information

Short-circuit protection diagrams to IEC

Short-circuit protection diagrams to IEC/EN 60 439-1

Type testing to IEC/EN 60 439-1

During the course of system type-testing, the following tests were conducted on the Rittal busbar systems and on representative Rittal RiLine60 top-mounting components:

Proof of insulating properties (to IEC/EN 60 439-1, 8.2.2)

Test piece: Representative system configuration.
Test with surge voltage 1.2/50 μ s, 9.8 kV.

Proof of short-circuit resistance (to IEC/EN 60 439-1, 8.2.3)

see short-circuit resistance diagrams below.

Proof of creepage distances and clearance (to IEC/EN 60 439-1, 8.2.5)

Test piece: Representative system configuration.

Mini-PLS busbar support

up to 250 A, 3-pole

Catalogue 33, page 270

Model No. SV 9600.000

40 mm bar centre distance, for Mini-PLS special busbars.

Rated operating voltage: up to 690 V AC

Level of contamination: 3

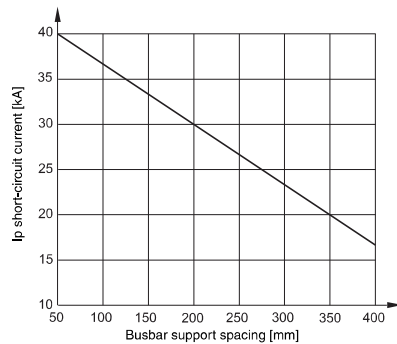
Rated frequency: 50/60 Hz

Basis of test:

VDE 0660, part 500/IEC 60 439.

Test implemented:

Rated surge current resistance I_{pk}



Busbar support

up to 800 A, 3-pole

Catalogue 33, page 276

Model No. SV 9340.000/SV 9340.010

60 mm bar centre distance, for busbars 15 x 5 – 30 x 10 mm.

Rated operating voltage: up to 690 V AC

Rated insulation voltage: 1000 V AC

Rated surge voltage: 8 kV

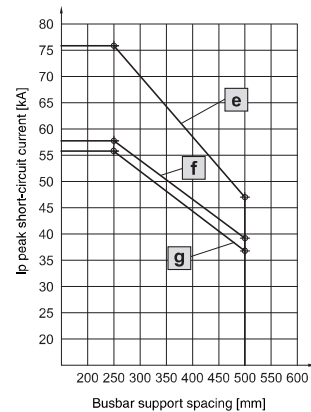
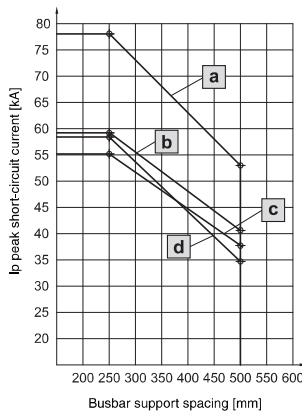
Overtoltage category: IV

Level of contamination: 3

Rated frequency: 50/60 Hz

Test implemented:

- Rated surge current resistance I_{pk}
- Rated short-time current resistance I_{cw}



Busbar mm	l mm	$I_{cw}^{1)}$ kA
30 x 10	250	37.6
30 x 5	250	36.0
20 x 10	250	29.0

¹⁾ For 1 sec.

l = Busbar support spacing

Busbar mm	Curve
30 x 10	a
20 x 10	b
25 x 5	c
15 x 5	d

Busbar mm	Curve
30 x 5	e
20 x 5	f
15 x 10	g

Short-circuit protection diagrams to IEC

PLS busbar support

up to 800 A/1600 A, 3-pole

Catalogue 33, page 278/279

Model No. SV 9341.000/SV 9342.000

60 mm bar centre distance,
for Mini-PLS special busbars.

Rated operating voltage: up to 690 V AC

Rated insulation voltage: 1000 V AC

Rated surge voltage: 8 kV

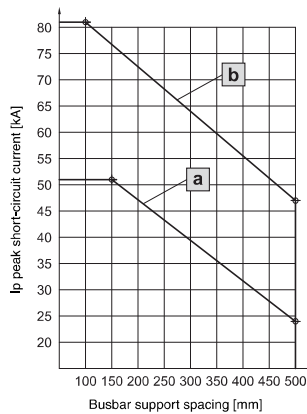
Overtoltage category: IV

Level of contamination: 3

Rated frequency: 50/60 Hz

Test implemented:

- Rated surge current resistance I_{pk}
- Rated short-time current resistance I_{cw}



Model No. SV	Busbar mm	I mm	$I_{cw}^{1)}$ kA
a 9341.000	PLS 800	150	25.9
b 9342.000	PLS 1600	150	37.5

¹⁾ For 1 sec.

I = Busbar support spacing

Busbar support

up to 800 A, 4-pole

Catalogue 33, page 277

Model No. SV 9340.004/SV 9342.014

60 mm bar centre distance,
for 30 x 10 mm busbars.

Rated operating voltage: up to 690 V AC

Rated insulation voltage: 1000 V AC

Rated surge voltage: 8 kV

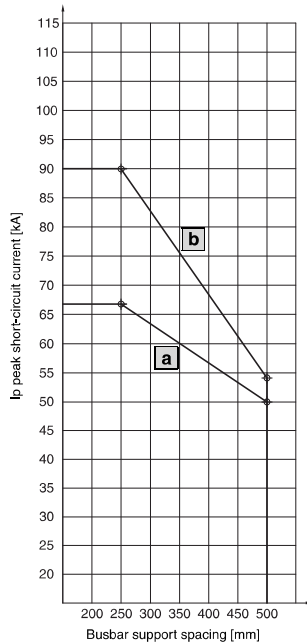
Overtoltage category: IV

Level of contamination: 3

Rated frequency: 50/60 Hz

Test implemented:

- Rated surge current resistance I_{pk}
- Rated short-time current resistance I_{cw}



Model No. SV	Busbar mm	I mm	$I_{cw}^{1)}$ kA
a 9340.004	30 x 10	250	29
		500	23
b 9342.014	30 x 10	250	42
		500	25

¹⁾ For 1 sec.

I = Busbar support spacing

PLS busbar support

up to 1600 A, 4-pole

Catalogue 33, page 279

Model No. SV 9342.004

60 mm bar centre distance,
for Mini-PLS special busbars.

Rated operating voltage: up to 690 V AC

Rated insulation voltage: 1000 V AC

Rated surge voltage: 8 kV

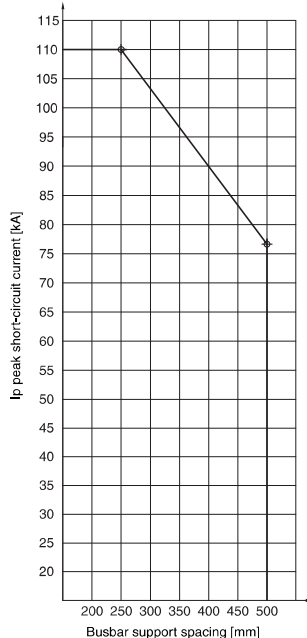
Overtoltage category: IV

Level of contamination: 3

Rated frequency: 50/60 Hz

Test implemented:

- Rated surge current resistance I_{pk}
- Rated short-time current resistance I_{cw}



Busbar mm	I mm	I_{cw} kA
PLS 1600	250	50 ¹⁾
	250	53 ²⁾
	500	38 ²⁾

¹⁾ For 3 sec.

²⁾ For 1 sec.

I = Busbar support spacing

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Busbar support

up to 1250 A, 3-pole

Catalogue 33, page 340

Model No. SV 3073.000

100 mm bar centre distance,
for busbars 30 x 10 – 60 x 10 mm.

Rated operating voltage:

up to 1000 V AC

Level of contamination: 3

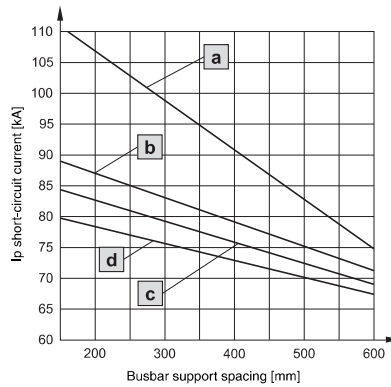
Rated frequency: 50/60 Hz

Basis of test:

VDE 0660, part 500/IEC 60 439.

Test implemented:

Rated surge current resistance I_{pk}



Busbar E-Cu mm	Rated current up to A	Curve
30 x 10	800	d
40 x 10	850	c
50 x 10	1000	b
60 x 10	1250	a

Busbar support

up to 1600 A, 3-pole

Catalogue 33, page 340

Model No. SV 3052.000

185 mm bar centre distance,
for busbars 50 x 10 – 80 x 10 mm.

Rated operating voltage:

up to 1000 V AC

Level of contamination: 3

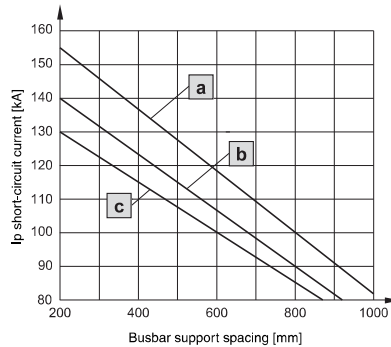
Rated frequency: 50/60 Hz

Basis of test:

VDE 0660, part 500/IEC 60 439.

Test implemented:

Rated surge current resistance I_{pk}



Busbar E-Cu mm	Rated current up to A	Curve
50 x 10	1000	c
60 x 10	1250	b
80 x 10	1600	a

Busbar support

up to 2500 A/3000 A, 3-pole

Catalogue 33, page 340

150 mm bar centre distance.

Rated operating voltage:

up to 1000 V AC

Level of contamination: 3

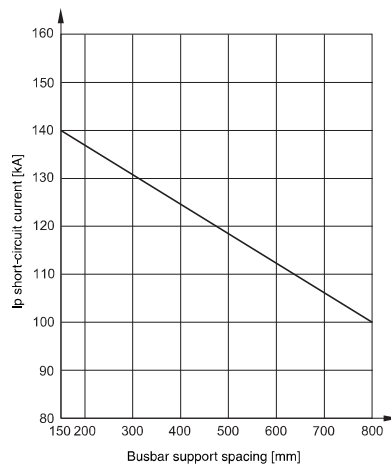
Rated frequency: 50/60 Hz

Basis of test:

VDE 0660, part 500/IEC 60 439.

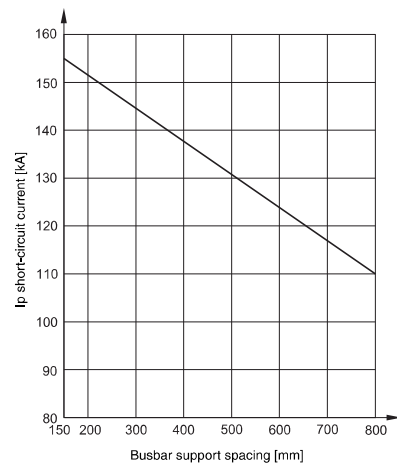
Test implemented:

Rated surge current resistance I_{pk}



Model No. SV 3055.000 (2500 A),
bar accommodation
3 x 2 x 80 x 10 mm.

Model No. SV 3057.000 (3000 A),
bar accommodation
3 x 2 x 100 x 10 mm.



Busbar support Flat-PLS 60

1- to 4-pole

Catalogue 33, page 332

Model No. SV 9676.002/SV 9676.020

120 mm bar centre distance,
for busbars 40 x 10 – 60 x 10 mm.
Population: 2, 3 or 4 bars per support

Rated operating voltage: up to 690 V AC
Rated insulation voltage: 1000 V AC
Rated surge voltage: 8 kV

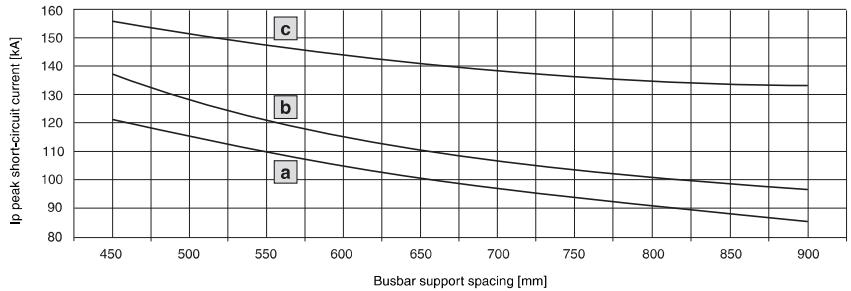
Overtoltage category: IV
Level of contamination: 3
Rated frequency: 50/60 Hz

Test implemented:

- Rated surge current resistance I_{pk}
- Rated short-time current resistance I_{cw}

Busbar mm	l mm	I_{cw} kA/1 sec.	Curve
4 x 60 x 10	450	55.0	a
4 x 60 x 10	900	40.0	
4 x 60 x 10	450	60.0	b
4 x 60 x 10	900	45.0	
4 x 60 x 10	450	70.0	c
4 x 60 x 10	900	60.0	

l = Busbar support spacing



Curve	Design of busbar attachment
a	basic version ¹⁾
b	with busbar claws ²⁾
c	with busbar stabilisers and busbar claws ²⁾

¹⁾ Basic version consists of system attachment with fitted busbar support.

²⁾ Version see page 161.

Busbar support Flat-PLS 100

1- to 4-pole

Catalogue 33, page 332

Model No. SV 9676.004/SV 9676.021

165 mm bar centre distance,
for busbars 80 x 10 – 100 x 10 mm.
Population: 2, 3 or 4 bars per support

Rated operating voltage: up to 690 V AC
Rated insulation voltage: 1000 V AC
Rated surge voltage: 8 kV

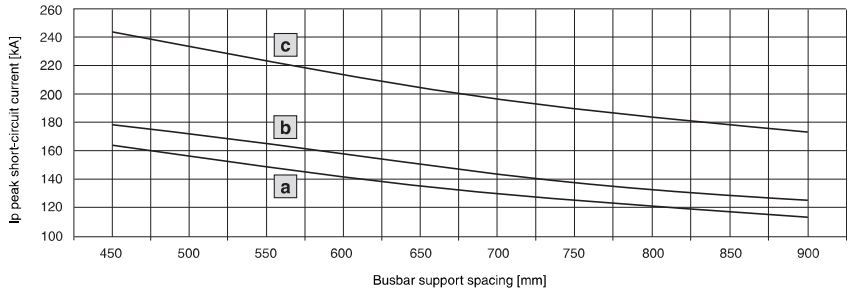
Overtoltage category: IV
Level of contamination: 3
Rated frequency: 50/60 Hz

Test implemented:

- Rated surge current resistance I_{pk}
- Rated short-time current resistance I_{cw}

Busbar mm	l mm	I_{cw} kA/1 sec.	Curve
4 x 100 x 10	450	75.0	a
4 x 100 x 10	900	52.0	
4 x 100 x 10	450	81.6	b
4 x 100 x 10	900	55.9	
4 x 100 x 10	450	110.0	c
4 x 100 x 10	900	78.0	

l = Busbar support spacing



Curve	Design of busbar attachment
a	basic version ¹⁾
b	with busbar claws ²⁾
c	with busbar stabilisers and busbar claws ²⁾

¹⁾ Basic version consists of system attachment with fitted busbar support.

²⁾ Version see page 161.

Busbar claws

2-, 3- or 4-way

Catalogue 33, page 333

Model No. SV 9676.017 to SV 9676.019

Supplementary information on Flat-PLS short-circuit protection diagrams

Mounting distance of busbar claws:

In order to achieve the cited short-circuit protection, the busbar claws must be fitted at a spacing of 300 mm. If there is a busbar support, a contact maker or a longitudinal connector located within this 300 mm, there is no need to fit a claw at this point.

Max. distance	mm
Busbar claw – Busbar claw	≤ 300
Busbar claw – Busbar support	≤ 300
Busbar claw – Contact maker	≤ 300
Busbar claw – Longitudinal connector	≤ 300

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Short-circuit protection diagrams to IEC



Laminated copper bars

Catalogue 33, page 314

Configuration ¹⁾ mm	I _n for 70 K ²⁾	I _n for 50 K ²⁾	I _n for 30 K ²⁾	Curve (short-circuit resistance)	Installation type	Model No. SV
8 x 6 x 0.5	195 A	165 A	125 A	–	–	3565.015
6 x 9 x 0.8	285 A	240 A	180 A	–	–	3565.005
4 x 15.5 x 0.8	330 A	275 A	210 A	–	–	3567.005
6 x 15.5 x 0.8	415 A	350 A	265 A	a	1	3568.005
10 x 15.5 x 0.8	575 A	480 A	365 A	a	1	3569.005
5 x 20 x 1	525 A	435 A	330 A	a	1	3570.005
5 x 24 x 1	605 A	510 A	385 A	a	1	3571.005
10 x 24 x 1	920 A	770 A	585 A	b	1	3572.005
5 x 32 x 1	770 A	645 A	485 A	b	2/3	3573.005
10 x 32 x 1	1155 A	965 A	730 A	c	2/3	3574.005
5 x 40 x 1	930 A	780 A	590 A	b	2/3	3575.005
10 x 40 x 1	1370 A	1145 A	865 A	c	2/3	3576.005
5 x 50 x 1	1125 A	940 A	710 A	b	2/3	3577.005
10 x 50 x 1	1635 A	1365 A	1030 A	c	2/3	3578.005
10 x 63 x 1	1950 A	1610 A	1230 A	d	2/3	3579.005

¹⁾ Number of lamina x lamina width x lamina thickness

²⁾ The conductor temperature of the laminated copper bar is derived by adding the ambient temperature and the temperature increase together.

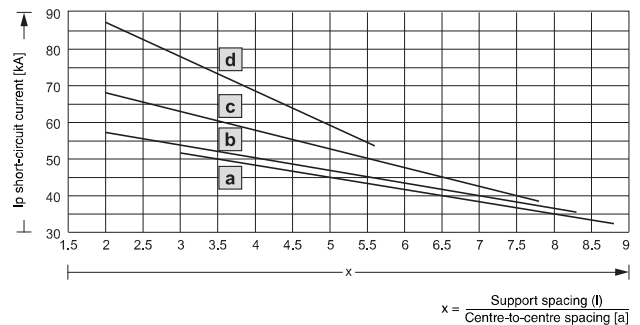
Example:

SV 3565.005 carrying 180 A, i.e. the temperature increases by 30 K. At an ambient temperature of 35°C, this produces a resultant conductor temperature of 35°C + 30 K = 65°C.

Short-circuit resistance diagrams

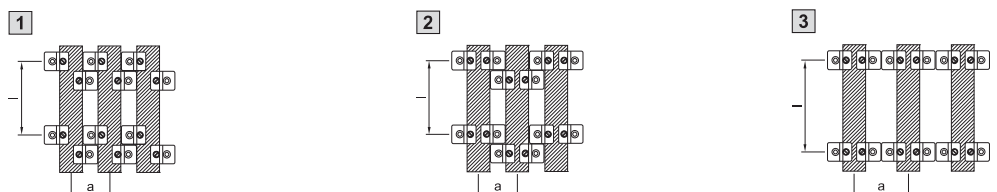
Basis of test:
VDE 0660, part 500/IEC 60 439-1.
Test implemented:
Dynamic short-circuit resistance
to IEC 60 439-1.

The dimensions for the support spacing (l) and for the centre-to-centre spacing (a) must be within the specified min./max. limits. The quotients of l/a can be used to determine the permissible short-circuit current I_p by using curves a to d. The prescribed installation type must be taken into account.



Curve	Support spacing (l) mm		Centre-to-centre spacing (a) mm	
	min.	max.	min.	max.
a	150	300	34	60
w	150	350	42	85
c	200	400	51	85
d	200	450	81	100

Type of assembly with universal support SV 3079.000



Short-circuit protection diagrams to UL 508

The short-circuit resistance of Rittal RiLine60 has been extensively tested. Short-circuit resistance to UL criteria is assessed via the root-mean-square value of the short-circuit current (I_{RMS}), which must be applied for at least 3 periods (60 ms).

During the course of testing, the test equipment has been adjusted to the respective root-mean-square values (I_{RMS}). The resultant peak short-circuit currents I_p are shown in the short-circuit protection diagrams below.

Busbar support

for feeder circuits 700 A, 3-pole

Catalogue 33, page 276

60 mm bar centre distance,
for busbars 15 x 5 – 30 x 10 mm.

Note:

SV 9340.050 with E-Cu 30 x 5/10 mm

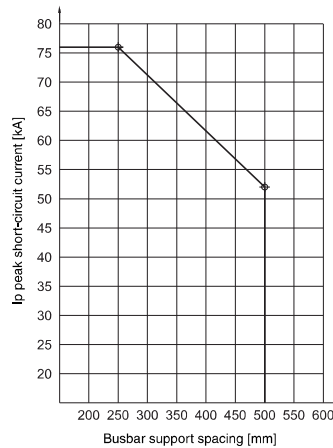
With a pre-fuse, the following short-circuit value can be achieved:

- Support spacing: 350 mm
- Fuse: Class L 800 A
- I_{RMS} : 50 kA

Settings I_{RMS} ($I_{eff.}$) of the test equipment without pre-fuse:

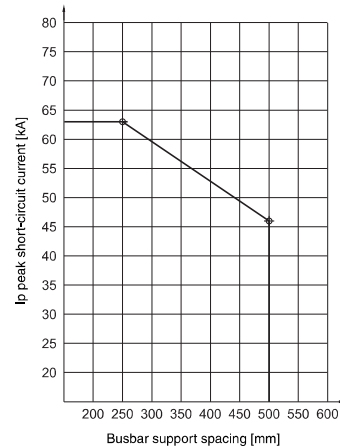
Support spacing mm	I_{RMS} kA
250	35
500	25

SV 9340.050
with 30 x 5/10 mm



Support spacing mm	I_{RMS} kA
250	30
500	22

SV 9340.050
with 25 x 5 mm
20 x 5/10 mm
15 x 5/15 mm



Busbar support

for feeder circuits

700 A (PLS 800)/1400 A (PLS 1600), 3-pole

Catalogue 33, page 278/279

60 mm bar centre distance,
for PLS special busbars.

Note:

SV 9342.050 (PLS 1600)

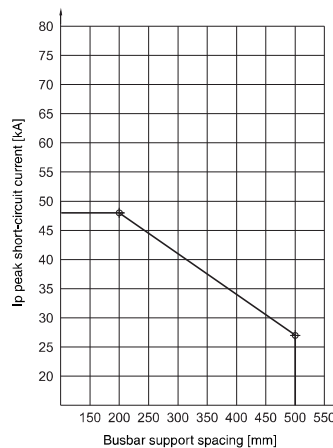
With a pre-fuse, the following short-circuit value can be achieved:

- Support spacing: 250 mm
- Fuse: Class L 1400 A
- I_{RMS} : 65 kA

Settings I_{RMS} ($I_{eff.}$) of the test equipment without pre-fuse:

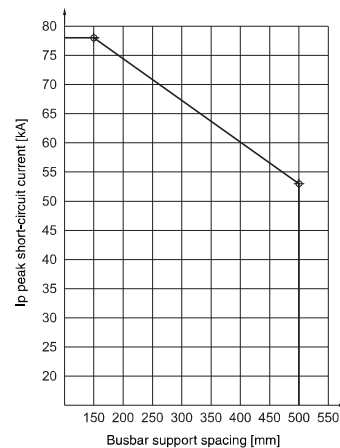
Support spacing mm	I_{RMS} kA
200	22
500	14

SV 9341.050 (PLS 800)



Support spacing mm	I_{RMS} kA
150	35
500	25

SV 9342.050 (PLS 1600)



Technical information

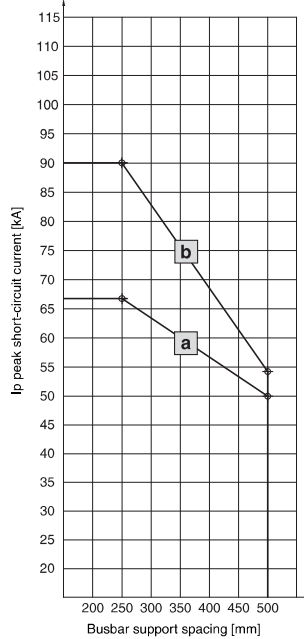
Short-circuit protection diagrams to UL 508/System data

Busbar support

for feeder circuits up to 700 A, 4-pole
Catalogue 33, page 277

Model No. SV 9340.004/SV 9342.014

60 mm bar centre distance.



Settings I_{RMS} ($I_{eff.}$) of the test equipment without pre-fuse:

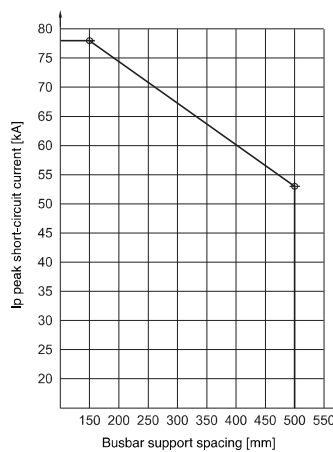
Model No. SV	Busbar mm	Support spacing mm	I_{RMS}
a) 9340.004	15 x 5 – 30 x 10	250	30
		500	22
b) 9342.014	30 x 10	250	42
		500	25

Busbar support

for feeder circuits up to 1400 A, 4-pole
Catalogue 33, page 279

Model No. SV 9342.004

60 mm bar centre distance,
for PLS special busbars.



Settings I_{RMS} ($I_{eff.}$) of the test equipment without pre-fuse:

Busbar mm	Support spacing mm	RMS kA
PLS 1600	150	35
	500	25

Operating and ambient conditions for Ri4Power switchgear assemblies

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The siting conditions for Ri4Power systems are identical for all field types. Any requirements which deviate from this should be agreed with the product management team.

Operating and ambient conditions	Ambient temperature	Short-term peak	+40°C	EN 61 439-1 EN 61 439-2
		Maximum on a 24 h average	+35°C	
		Low	-5°C	
	Atmospheric conditions	Normal climatic stress		EN 61 439-1 EN 61 439-2
Relative humidity		50% at 40°C 90% at 20°C (without condensation due to temperature fluctuations)		
		Operation up to 2000 m above sea level		

Additional field-specific technical data for the tested field types is listed in detail on the following pages. This data represents the maximum, tested figures.

For optimum adaptation of customer requirements to the possible system assemblies, we recommend use of the latest version of the Rittal Power Engineering software.