

# Protective Devices

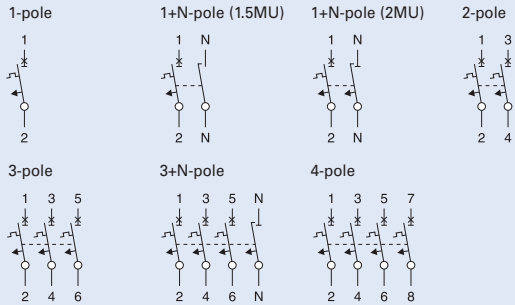
## Miniature Circuit Breakers PLS..., PLZ...

- High selectivity between MCB and back-up fuse due to low let-through energy
- Compatible with standard busbar
- Twin-purpose terminal (lift/open-mouthed) above and below
- Busbar positioning optionally above or below
- Meets the requirements of insulation co-ordination, distance between contacts  $\geq 4$  mm, for secure isolation
- Suitable for applications up to 48 V DC (use PLS6-DC for higher DC voltages)

### Accessories:

Auxiliary switch for subsequent installation	ZP-IHK	286052
Tripping signal contact for subsequent installation	ZP-NHK	248437
Remote control and automatic switching device	Z-FW/LP	248296
Shunt trip release	ZP-ASA/..	248438, 248439
Undervoltage release	Z-USA/..	248288-248291
Compact enclosure	KLV-TC-2	276240
	KLV-TC-4	276241
Additional terminal 35mm <sup>2</sup>	Z-HA-EK/35	263960
Switching interlock	Z-IS/SPE-1TE	274418

### Connection diagrams



### Technical Data

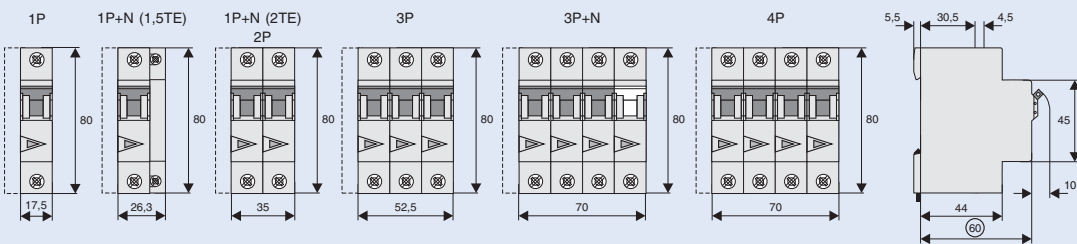
#### Electrical

Design according to	IEC/EN 60898-1
Current test marks as printed onto the device	
Rated voltage	AC: 230/400V DC: 48V (per pole, max. 2 poles)
Rated frequency	50/60 Hz
Rated breaking capacity according to IEC/EN 60898-1	
PLSM, PLZM	10 kA
PLS6, PLZ6	6 kA
PLS4, PLZ4	4.5 kA
Characteristic	B, C, D
Back-up fuse	
PLSM	max. 125 A gL
PLS6	max. 100 A gL
PLS4	max. 80 A gL
Selectivity class	3
Rated peak withstand voltage $U_{imp}$	4 kV (1.2/50 $\mu$ s)
Endurance	electrical comp. $\geq 4,000$ operating cycles mechanical comp. $\geq 20,000$ operating cycles
Line voltage connection	optional (above/below)

#### Mechanical

Frame size	45 mm
Device height	80 mm
Device width	17.5 mm per pole (1MU) 26.3 mm: device 1P+N (1.5MU)
Mounting	quick fastening with 3 lock-in positions on DIN rail IEC/EN 60715
Degree of protection	IP20
Upper and lower terminals	open mouthed/lift terminals
Terminal protection	finger and hand touch safe, BGV A3, ÖVE-EN 6
Terminal capacity	1-25 mm <sup>2</sup> (1p+N, 1.5MU)
Terminal fastening torque	2-2.4 Nm (1p+N, 1.5MU)
Busbar thickness	0.8 - 2 mm (except N 0.5 MU)
Mounting	independent of position

### Dimensions (mm)



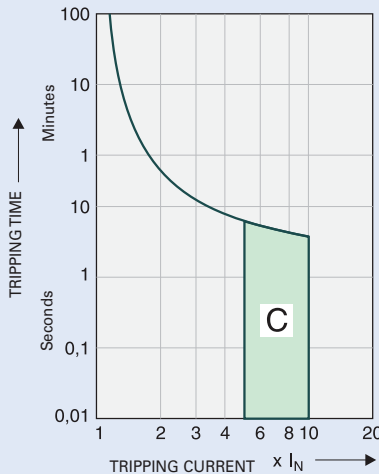
# Protective Devices

## Tripping Characteristics (IEC/EN 60898-1)

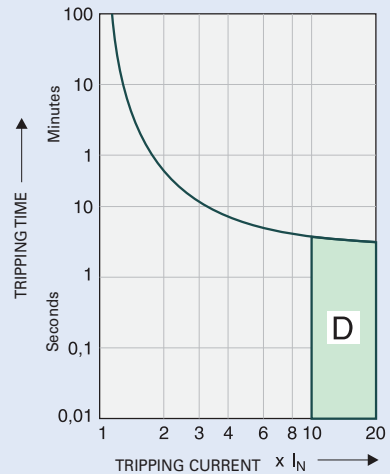
Tripping characteristic B



Tripping characteristic C



Tripping characteristic D



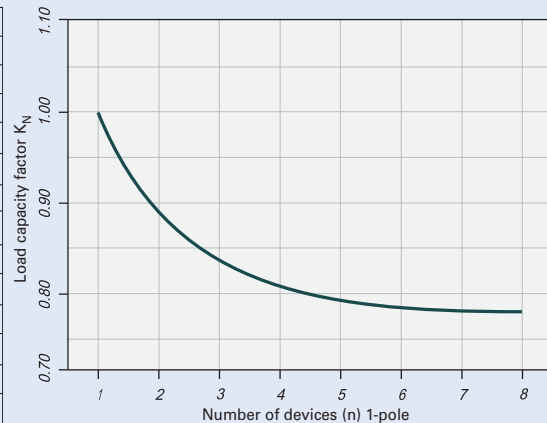
Quick-acting (B), slow (C), very slow (D)

## Effect of the Ambient Temperature on Thermal Tripping Behaviour

Adjusted rated current values according to the ambient temperature

I <sub>n</sub> [A]	Ambient temperature T [°C]															
	-25	-20	-10	0	10	20	30	35	40	45	50	55	60	65	70	75
0.16	0.20	0.19	0.19	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13
0.25	0.31	0.30	0.29	0.28	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21
0.5	0.61	0.60	0.58	0.56	0.54	0.52	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.42	0.41
0.75	0.92	0.90	0.87	0.84	0.81	0.78	0.75	0.74	0.73	0.71	0.69	0.68	0.66	0.65	0.64	0.62
1	1.2	1.2	1.2	1.1	1.1	1.0	1.0	0.99	0.97	0.95	0.93	0.90	0.89	0.87	0.85	0.83
1.5	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2
1.6	2.0	1.9	1.9	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3
2	2.4	2.4	2.3	2.2	2.2	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7
2.5	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1
3	3.7	3.6	3.5	3.4	3.3	3.1	3.0	3.0	2.9	2.8	2.8	2.7	2.7	2.6	2.5	2.5
3.5	4.3	4.2	4.1	3.9	3.8	3.7	3.5	3.4	3.4	3.3	3.2	3.2	3.1	3.0	3.0	2.9
4	4.9	4.8	4.7	4.5	4.3	4.2	4.0	3.9	3.9	3.8	3.7	3.6	3.5	3.5	3.4	3.3
5	6.1	6.0	5.8	5.6	5.4	5.2	5.0	4.9	4.8	4.7	4.6	4.5	4.4	4.3	4.2	4.1
6	7.3	7.2	7.0	6.7	6.5	6.3	6.0	5.9	5.8	5.7	5.6	5.4	5.3	5.2	5.1	5.0
8	9.8	9.6	9.3	9.0	8.7	8.4	8.0	7.9	7.7	7.6	7.4	7.2	7.1	6.9	6.8	6.6
10	12	12	12	11	11	10	10	9.9	9.7	9.5	9.3	9.0	8.9	8.7	8.5	8.3
12	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10
13	16	16	15	15	14	14	13	13	13	12	12	12	12	11	11	11
15	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12
16	20	19	19	18	17	17	16	16	15	15	15	14	14	14	14	13
20	24	24	23	22	22	21	20	20	19	19	19	18	18	17	17	17
25	31	30	29	28	27	26	25	25	24	24	23	23	22	22	21	21
32	39	38	37	36	35	33	32	32	31	30	30	29	28	28	27	26
40	49	48	47	45	43	42	40	39	39	38	37	36	35	35	34	33
50	61	60	58	56	54	52	50	49	48	47	46	45	44	43	42	41
63	77	76	73	71	68	66	63	62	61	60	58	57	56	55	53	52

## Load Capacity of Series Connected Miniature Circuit Breakers



## Effect of Power Frequency

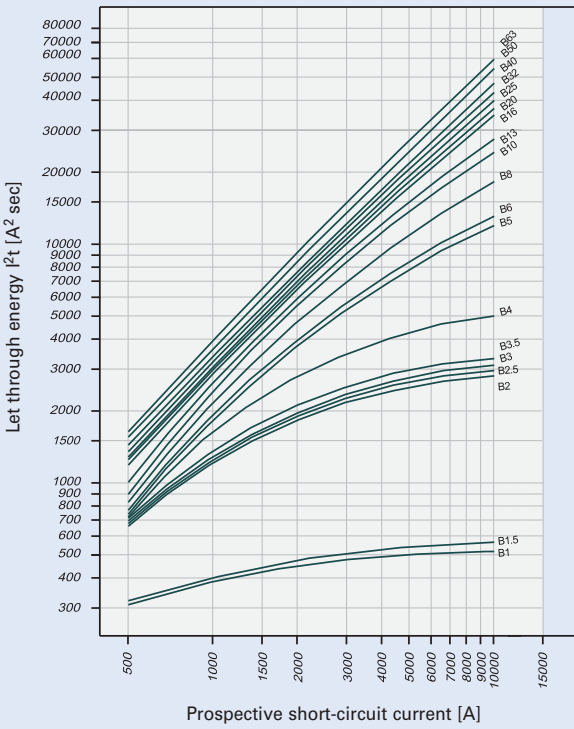
Effect of power frequency on the tripping behaviour  $I_{MA}$  of the quick release

	Power frequency f [Hz]						
	16 <sup>2/3</sup>	50	60	100	200	300	400
$I_{MA}(f)/I_{MA}(50Hz)$ [%]	91	100	101	106	115	134	141

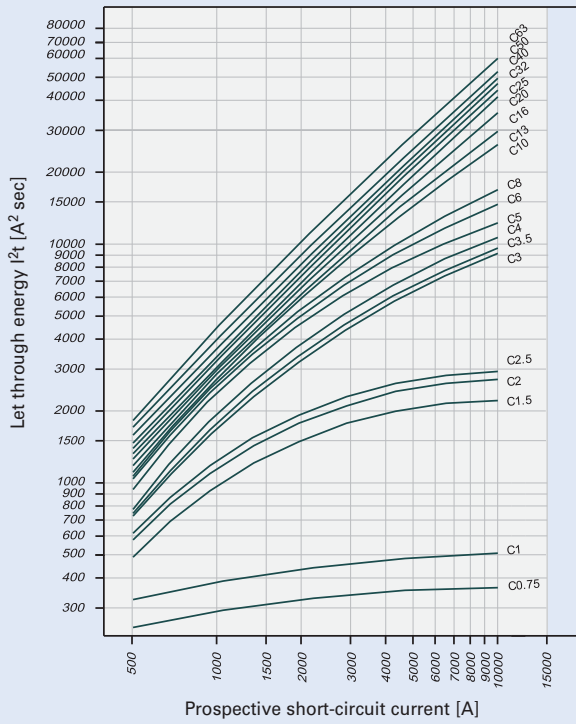
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## Let-through Energy PLSM

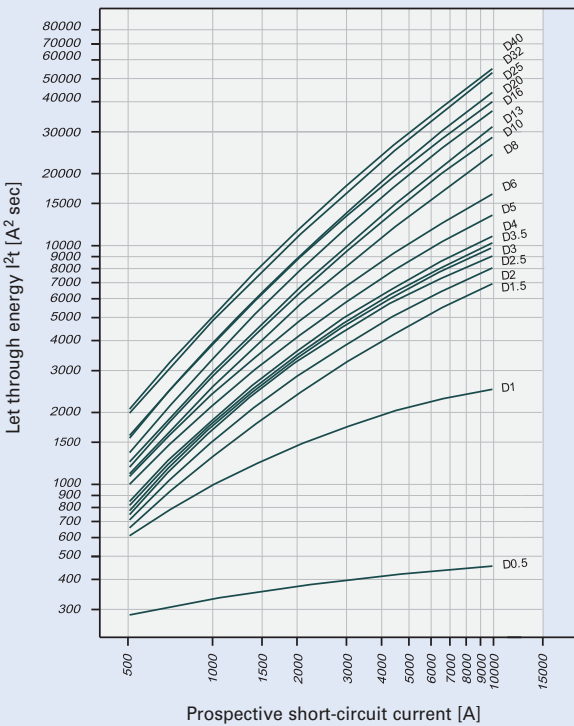
Let-through energy PLSM, characteristic B, 1-pole



Let-through energy PLSM, characteristic C, 1-pole



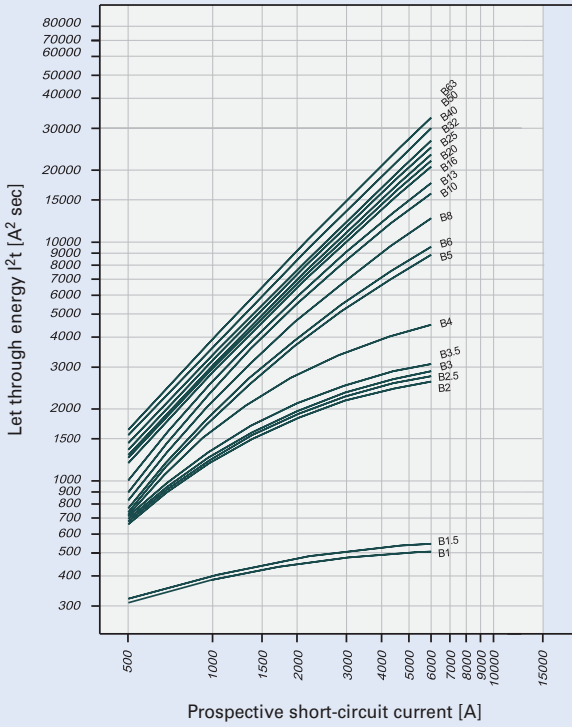
Let-through energy PLSM, characteristic D, 1-pole



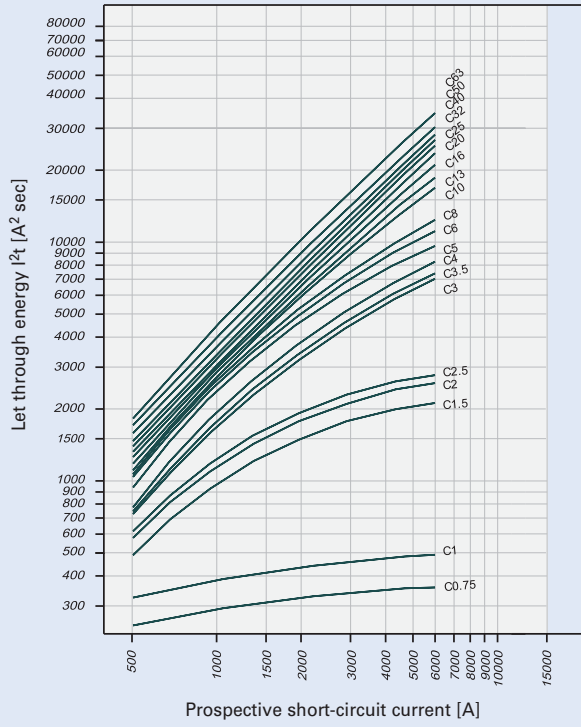
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## Let-through Energy PLS6

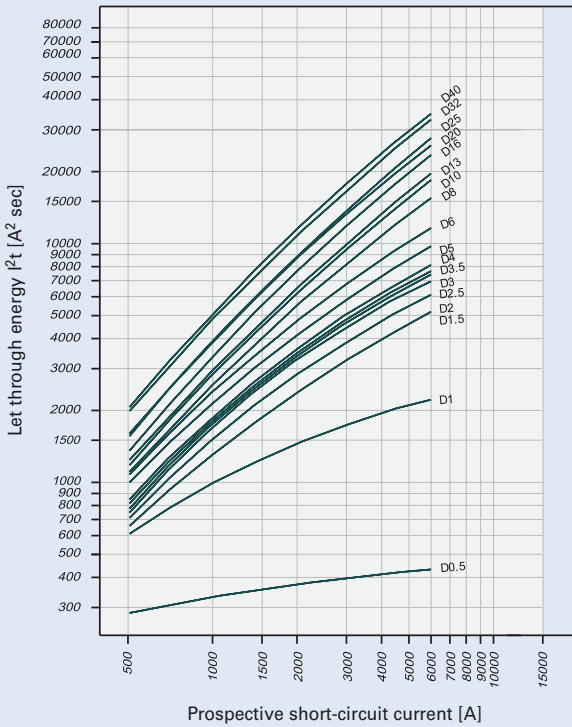
Let-through energy PLS6, characteristic B, 1-pole



Let-through energy PLS6, characteristic C, 1-pole



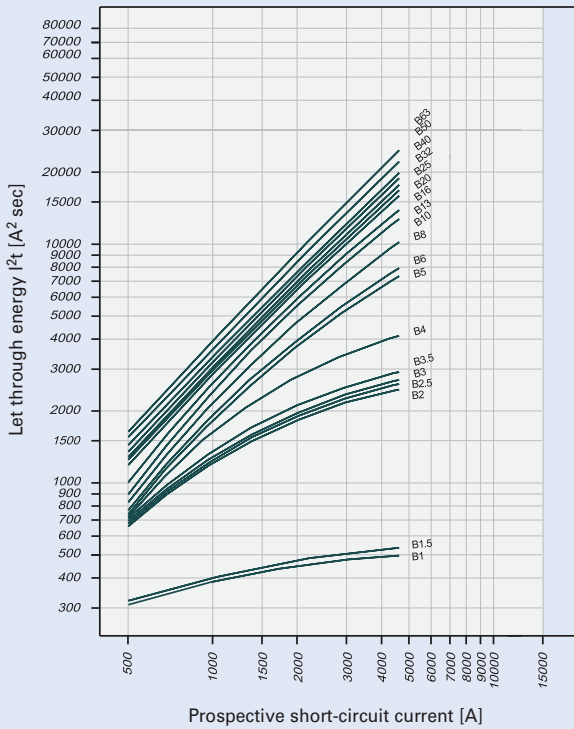
Let-through energy PLS6, characteristic D, 1-pole



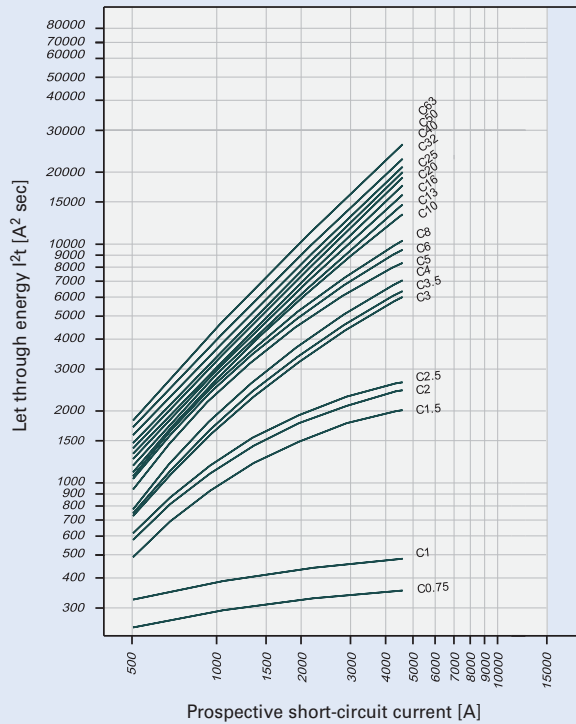
# Protective Devices

## Let-through Energy PLS4

Let-through energy PLS4, characteristic B, 1-pole



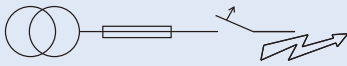
Let-through energy PLS4, characteristic C, 1-pole



## Short Circuit Selectivity PLS4 towards DII-DIV fuse link

In case of short circuit, there is selectivity between the miniature circuit breakers PLS4 and the upstream fuses up to the specified values of the selectivity limit current  $I_s$  [kA] (i. e. in case of short-circuit currents  $I_{ks}$  under  $I_s$ , only the MCB will trip, in case of short circuit currents above this value both protective devices will respond).

\*) basically in accordance with EN 60898-1 D.5.2.b



1) Selectivity limit current  $I_s$  under 0.5 kA

2) Selectivity limit current  $I_s$  = rated breaking capacity  $I_{cn}$  of the MCB

no selectivity

Short circuit selectivity **characteristic B** towards fuse link **DII-DIV\***

PLS4 $I_n$ [A]	DII-DIV gL/gG								
	10	16	20	25	35	50	63	80	100
1.0	<0.5 <sup>1)</sup>	1.2	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
1.5	<0.5 <sup>1)</sup>	1.0	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
2.0	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.8	1.6	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
2.5	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.8	1.5	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
3.0	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.8	1.4	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
3.5	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.7	1.3	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
4	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.6	1.0	3.6	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
5	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.6	0.9	2.0	3.5	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
6		<0.5 <sup>1)</sup>	0.6	0.9	1.8	3.2	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
8		<0.5 <sup>1)</sup>	0.5	0.8	1.6	2.6	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
10			0.5	0.8	1.4	2.2	3.9	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
13			0.5	0.7	1.3	2.0	3.6	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
16				0.6	1.2	1.9	3.2	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
20					1.2	1.8	3.1	4.4	4.5 <sup>2)</sup>
25					1.2	1.8	3.0	4.2	4.5 <sup>2)</sup>
32						1.7	2.8	3.9	4.5 <sup>2)</sup>
40							2.7	3.8	4.5 <sup>2)</sup>
50							2.5	3.5	4.5 <sup>2)</sup>
63									4.5 <sup>2)</sup>

Short circuit selectivity **characteristic C** towards fuse link **DII-DIV\***

PLS4 $I_n$ [A]	DII-DIV gL/gG								
	10	16	20	25	35	50	63	80	100
0.75	1.0	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
1.0	<0.5 <sup>1)</sup>	1.2	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
1.5	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	1.0	2.2	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
2.0	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.8	1.6	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
2.5	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.8	1.4	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
3.0	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.8	0.9	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
3.5	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.6	0.9	2.2	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
4	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.6	0.8	1.8	3.6	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
5	<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.6	0.7	1.5	2.7	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
6		<0.5 <sup>1)</sup>	0.5	0.6	1.4	2.4	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
8		<0.5 <sup>1)</sup>	<0.5 <sup>1)</sup>	0.6	1.3	2.2	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
10			<0.5 <sup>1)</sup>	0.6	1.3	2.0	3.6	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
13					1.3	1.9	3.3	4.5 <sup>2)</sup>	4.5 <sup>2)</sup>
16					1.2	1.8	3.2	4.4	4.5 <sup>2)</sup>
20					1.2	1.8	3.1	4.1	4.5 <sup>2)</sup>
25						1.7	2.8	3.8	4.5 <sup>2)</sup>
32							2.7	3.7	4.5 <sup>2)</sup>
40								3.5	4.5 <sup>2)</sup>
50									4.5 <sup>2)</sup>
63									