Overview

Specimen text for tenders

Item	Quantity	Description	Unit price		Amount	
	... m	Busbar trunking system for small loads and lighting installations • As type-tested low-voltage switchgear and controlgear assembly (TTA) according to IEC/EN 60439-1 and -2 • Rated current, corresponds to thermal rated current at max. +40 °C and +35 °C on a 24 h average for indoor installation • Rated insulation voltage U_i = 400 V AC, 400 V DC; overvoltage category/pollution degree III/3 • Operational voltage ... V, ... Hz • Rated peak withstand current of busbar trunking system, ... kA tested to IEC/EN 60439-1 • Degree of protection IP54, increase to IP55 with accessories • 3-, 4-, 5- , 1 × 5- + 1 × 3- or 2 × 5-conductor system • Copper conductor, insulated along its whole length • Trunking units, sheet steel enclosed, with paint finish • Halogen-free • Tap-off points at 0.5 m and 1 m intervals per side • Supplied ready for connection with all assembly parts • Made by Siemens • Type CD-... Comprising:				

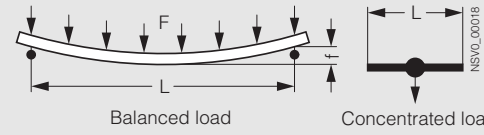
Engineering information

Design

Determining the fixing intervals

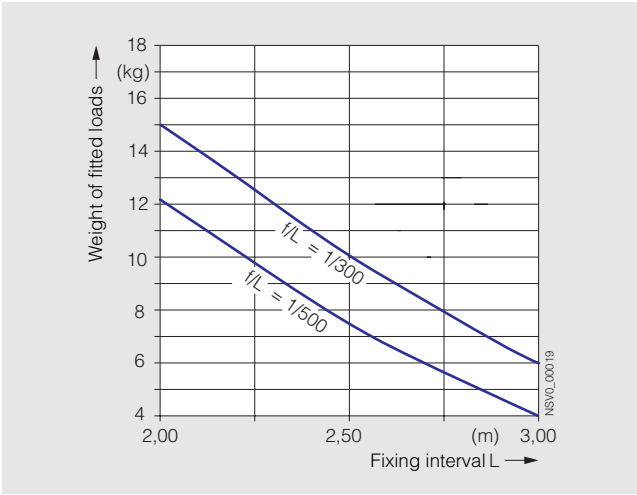
The closed section of the CD system has a high degree of mechanical strength. The load diagrams show the maximum permissible loading in relation to the fixing interval (distance between suspension points).

Deflection f of the busbar trunking unit should not be greater than 1/300 of the distance (L) between supports.
F = balanced load.

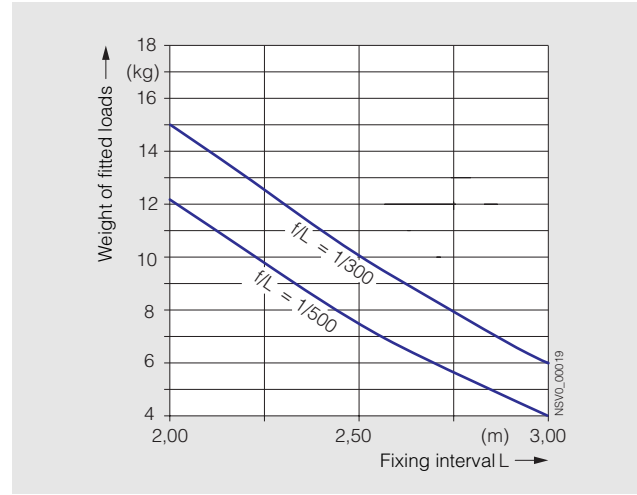


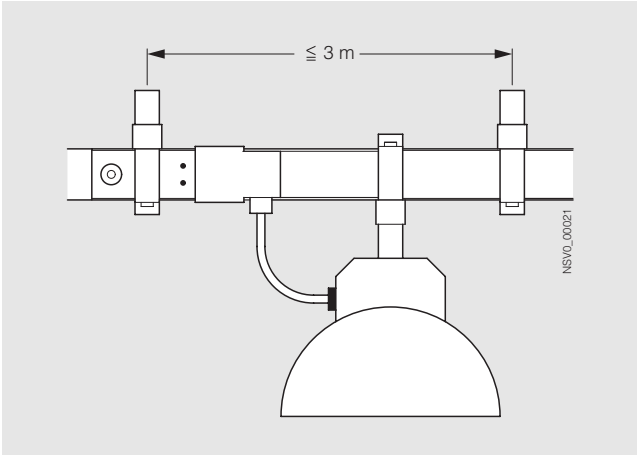
Concentrated and balanced loads in relation to suspension point interval

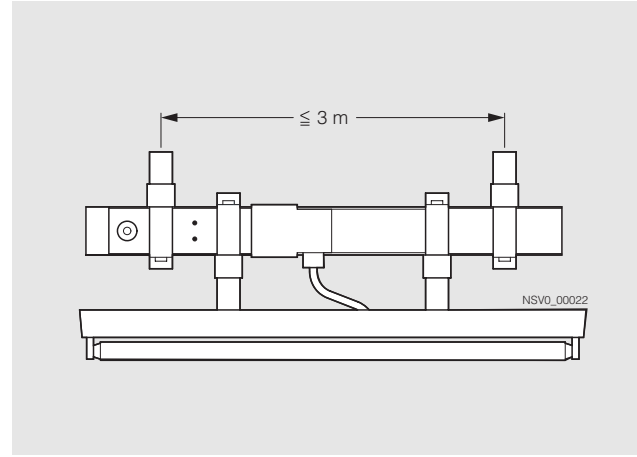
Concentrated load



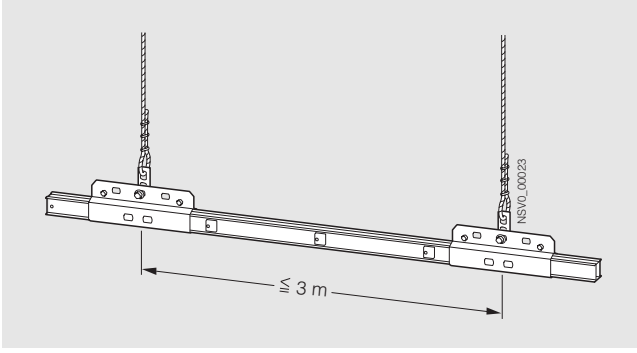
Balanced load



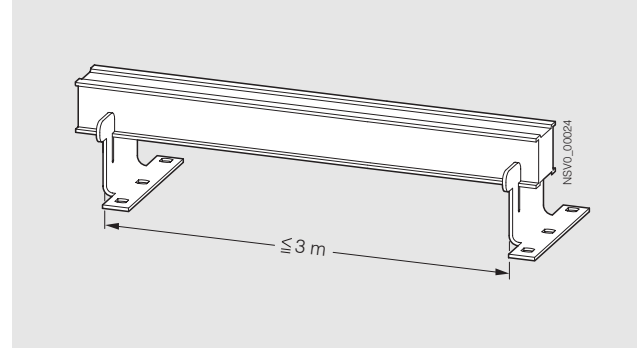




Pendant fixing using CD-BA



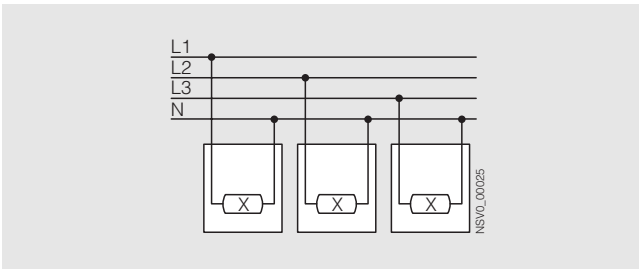
Underfloor mounting with CD-BUF



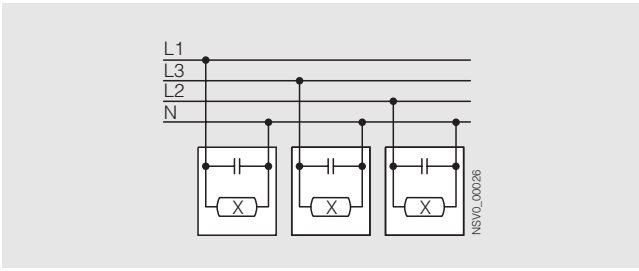
Arrangement of luminaires

The numbers, e.g. ①, indicate the corresponding position of the luminaires in the table below.

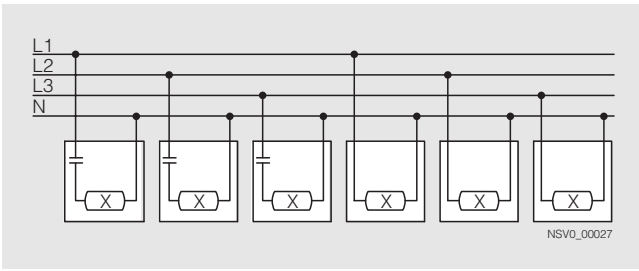
Single lamp



① = single lamp, non-compensated, p.f. = 0.5

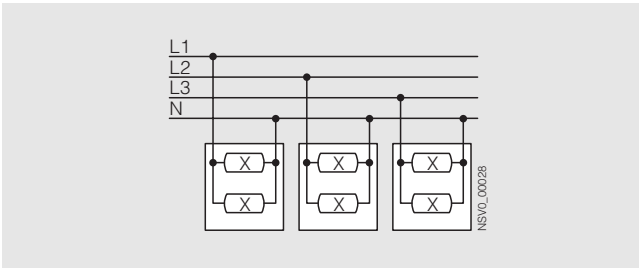


② = single lamp, parallel-compensated, p.f. = 0.9

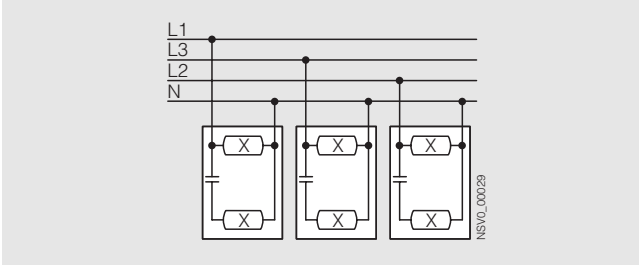


③ = single lamp, alternately series-compensated, p.f. = 0.1

Two lamps

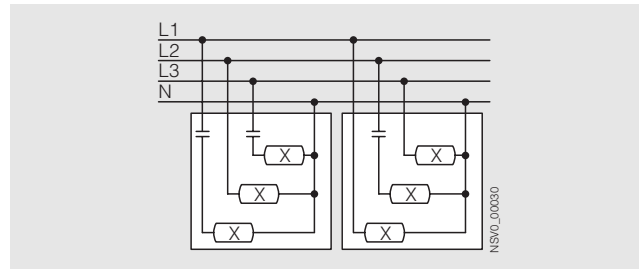


④ = two lamps, non-compensated

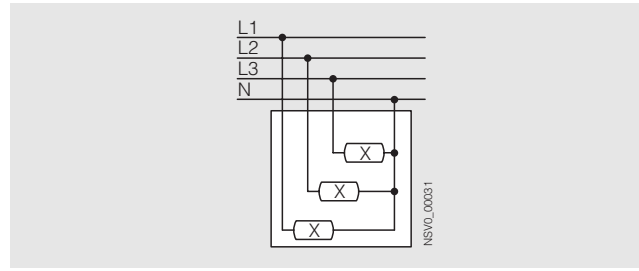


⑤ = two lamps, Duo circuit, p.f. = 1

Three lamps



⑥ = three lamps, alternately series-compensated



⑦ = three lamps, non-compensated

Engineering information

Connectable luminaires without consideration of voltage drop

Lamp voltage per luminaire (linear fluorescent lamp)	Arrangement of luminaires	Rated current with choke	Length of light fixture	Connectable luminaires with protection by miniature circuit-breaker at 16 A		at 20 A		at 25 A		at 32 A	
				Units/ phase	Total length for connection to 3 phases	Units/ phase	Total length for connection to 3 phases	Units/ phase	Total length for connection to 3 phases	Units/ phase	Total length for connection to 3 phases
		A	m,approx.		m, approx.		m, approx.		m, approx.		m, approx.
1 × 36 W		0.44	1.25	33	128	42	163	52	202	66	248
1 × 58 W		0.70	1.55	20	96	25	120	32	153	40	186
Non-compensated, single-phase	①										
1 × 36 W		0.25	1.25	30	117	37	144	47	183	59	222
1 × 58 W		0.40	1.55	19	91	24	115	30	144	37	173
Parallel-compensated, single-phase	②										
1 × 36 W		0.23	1.25	48	187	60	234	75	292	96	360
1 × 58 W		0.35	1.55	32	153	40	192	50	240	64	298
Alternately compensated, single-phase	③										
2 × 36 W		0.88	1.25	16	62	21	81	26	101	41	124
2 × 58 W		1.40	1.55	10	48	12	57	16	76	20	93
Non-compensated, single-phase	④										
2 × 36 W		0.46	1.25	24	93	30	117	37	144	47	177
2 × 58 W		0.71	1.55	16	76	20	96	25	120	32	149
Duo circuit, single-phase	⑤										
3 × 36 W		0.23	1.25	48	62	60	78	75	97	96	125
3 × 58 W		0.35	1.55	32	51	40	64	50	80	64	103
Alternately compensated, three-phase	⑥										
3 × 36 W		0.44	1.25	33	42	42	54	52	67	66	86
3 × 58 W		0.70	1.55	20	32	25	40	32	51	40	64
Non-compensated, three-phase	⑦										

Lamp voltage per luminaire (linear fluorescent lamp)	Arrangement of luminaires	Rated current with choke A	Length of light fixture m, approx.	Connectable luminaires with protection by gL fuses at 16 A: Units/phase	at 16 A: Total length for connection to 3 phases m, approx.	at 20 A: Units/phase	at 20 A: Total length for connection to 3 phases m, approx.	at 25 A: Units/phase	at 25 A: Total length for connection to 3 phases m, approx.	at 35 A: Units/phase	at 35 A: Total length for connection to 3 phases m, approx.
1 × 36 W		0.44	1.25	33	128	42	163	52	202	72	280
1 × 58 W		0.70	1.55	20	96	25	120	32	153	44	211
Non-compensated, single-phase	①										
1 × 36 W		0.25	1.25	36	140	44	171	60	234	90	351
1 × 58 W		0.40	1.55	23	110	28	134	38	182	56	268
Parallel-compensated, single-phase	②										
1 × 36 W		0.23	1.25	48	187	60	234	75	292	105	409
1 × 58 W		0.35	1.55	32	153	40	192	50	240	70	336
Alternately compensated, single-phase	③										
2 × 36 W		0.88	1.25	16	62	21	81	26	101	36	140
2 × 58 W		1.40	1.55	10	48	12	57	16	76	22	105
Non-compensated, single-phase	④										
2 × 36 W		0.46	1.25	24	93	30	117	37	144	51	198
2 × 58 W		0.71	1.55	16	76	20	96	25	120	35	168
Duo circuit, single-phase	⑤										
3 × 36 W		0.23	1.25	48	62	60	78	75	97	105	136
3 × 58 W		0.35	1.55	32	51	40	64	50	80	70	112
Alternately compensated, three-phase	⑥										
3 × 36 W		0.44	1.25	33	42	42	54	52	67	72	93
3 × 58 W		0.70	1.55	20	32	25	40	32	51	44	64
Non-compensated, three-phase	⑦										

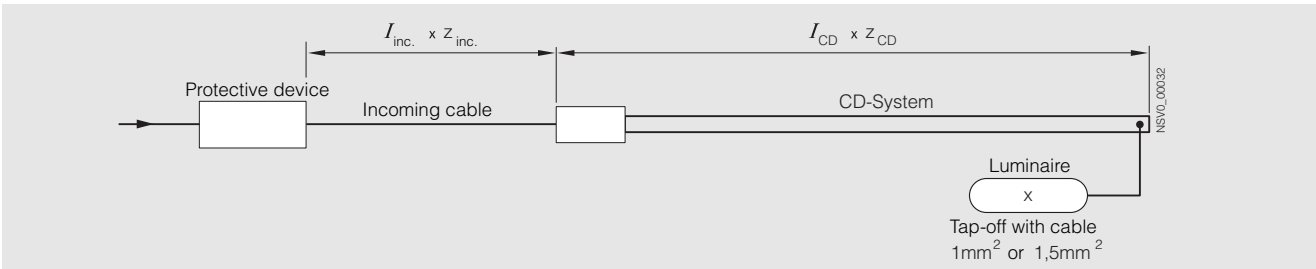
Engineering information

Function

Short-circuit protection

The lengths of the CD busbar runs given in the guide value tables on page 3/18 and 3/19 take into account only the rated current of the connectable luminaires.

To determine the precise length of the busbar run, voltage drops and short-circuit protection must be taken into account.



Voltage drop ΔU

According to the technical literature, the voltage drop should lie between 3 % and 5 % when the load is evenly split in light networks.

$$\Delta U(\%) = \frac{\Delta U(V)}{U_e(V)} \times 100\ \%$$

with ΔU(V) according to page 3/21

Fault protection according to DIN VDE 0100 Part 410

Calculation of the current resulting in automatic interruption, taking into account the incoming supply cable and the outgoing circuit.

$$I_a = \frac{U_o}{Z_s} = \frac{U_o}{Z_{Source} + Z_{Inc} + Z_{CD} + Z_{Out}}\ (A) = \frac{U_o}{Z_{Source} + Z_{Inc} \times l_{Inc} + Z_{CD} \times l_{CD} + Z_{Out} \times l_{Out}}\ (A)$$

with

I_a	=	Current resulting in automatic interruption	(A)
U_o	=	Voltages to earth	(V)
Z_s	=	Fault loop impedance. Can be measured,calculated or determined using the network model.	(Ω)
Z_{Source}	=	Source impedance	(Ω)
l_{Inc}	=	Single length of incoming supply cable	(m)
l_{CD}	=	Single length of CD system	(m)
l_{Out}	=	Length of outgoing circuit	(m)
Z_{Inc}	=	Loop impedance of incoming supply cable	(Ω/m)
Z_{CD}	=	Loop impedance of CD system	(Ω/m)
Z_{Out}	=	Loop impedance of outgoing circuit	(Ω/m)

For example:

Z_{Inc}	=	22×10^{-3} Ω/m at 2.5 mm²
Z_{CD}	=	8.25×10^{-3} Ω/m at CD 30 A 5.67×10^{-3} Ω/m at CD 40 A 7.51×10^{-3} Ω/m at CD 2 × 25 A
Z_{Out}	=	54×10^{-3} Ω/m at 1 mm² 36×10^{-3} Ω/m at 1.5 mm²

Provided that the protective element is positioned immediately upstream of the CD system feeder unit, Z_{Inc} can be ignored.

The admissible opening delay is as specified in DIN VDE 0100 Part 430:

$$t = \left(115 \times \frac{S}{I_a}\right)^2 (s)$$

with

t	=	Admissible opening delay	(s)
S	=	Smallest conductor cross-section to be protected (outgoing circuit) 1 mm² or 1.5 mm²	(mm²)
I_a	=	Current according to above calculation	(A)

The total opening delay of the selected protective device must not exceed the determined admissible opening delay and must not be greater than 5 s.

Short-circuit protection alone

A system can be protected against start circuit alone, by fitting low-voltage LV HRC fuse links (gL) into the incoming supply; the fuse size to be appropriate for the prospective short-circuit current at the point of installation.

System	Protective device per circuit I_{cf} = 25 kA[1)]
CD-K-130.	NH00 32 gL
CD-K-140. (-240.)	NH00 40 gL
CD-K-225.	NH00 25 gL

1) I_{cf} = Rated short-circuit current of the busbar trunking system and its outgoing circuits when protected by fuses

Overcurrent protective devices for overload and short-circuit protection

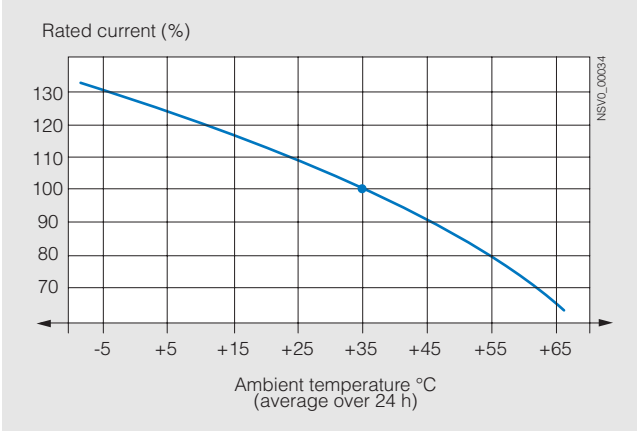
Due to their high response threshold (1.3 to 1.6 times rated current) and their long rupturing times at small overcurrents, fuses are not suitable for overload protection.

For protecting the CD busbar trunking system and its outgoing circuits, we recommend miniature circuit-breakers and motor-protective circuit-breakers.

System	Protective device per circuit		
	I_{cc} = 15 kA[1)]	I_{cc} = 20 kA	I_{cc} = 25 kA
CD-K-130.	3SY4 332-6	3SY8 332-7	PKZ 2/ZM-32-8
CD-K-140. (-240.)	3SY4 340-6	3SY8 340-7	PKZ 2/ZM-40-8
CD-K-225.	3SY4 325-6	3SY8 325-7	PKZ 2/ZM-25-8

1) I_{cf} = Rated short-circuit current of the busbar trunking system and its outgoing circuits when protected by circuit-breakers

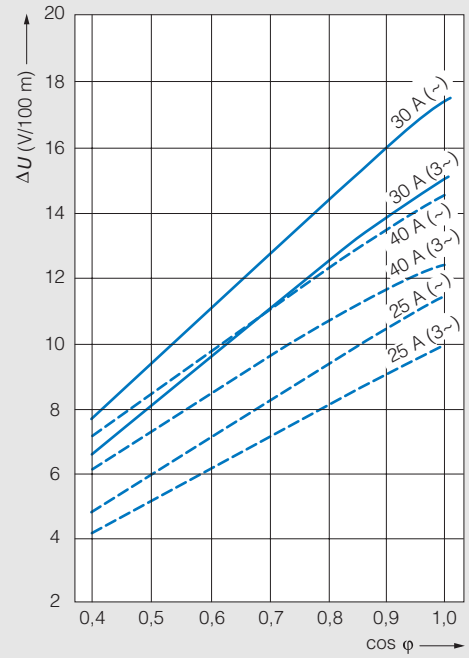
Temperature characteristic of CD systems



Voltage drop

Voltage drop at rated current

(Load distribution factor a = 0.5 for lighting systems)
Three-phase current (3 ~), alternating current (~)



Calculation of the voltage drop

For long busbar runs, it may be necessary to calculate the voltage drop.

Alternating current:

$$\Delta U = a \times I \times 2l \times (R \times \cos\varphi + X \times \sin\varphi) \times 10^{-3} \quad \text{(V)}$$

Three-phase current:

$$\Delta U = a \times \sqrt{3} \times I \times l \times (R \times \cos\varphi + X \times \sin\varphi) \times 10^{-3} \quad \text{(V)}$$

with

ΔU	=	Voltage drop	(V)
I	=	Load current	(A)
l	=	Length	(m)
a	=	Load distribution factor	*see Table*
R	=	Ohmic resistance R_{20}	(mΩ/m)
X	=	Inductive resistance X_{20}	(mΩ/m)
cos φ	=	Power factor	

Factor a used in the equation for calculating the voltage drop is dependent on the load distribution.

Load distribution		Factor a
A → B	Supply at A, one tap-off at B	1
A → B C D E	Supply at A, tap-offs at B, C, D, E	0.5
A → B ← C D E F	Supply at A, B, tap-off at C, D, E, F	0.25