

# HL - HIGH LIGHTING

## 25 - 40A



## SECTION CONTENTS

- 38 General features**
- 44 HLs Trunking components: 2 and 4 conductors elements**
- 47 HLs plugs**
- 49 HLd Trunking components: 4, 6 and 8 conductors elements**
- 52 HLd plugs**
- 55 Fixing supports**
- 57 Cable channel and accessories**
- 168 Technical information**
- 174 Determination of the operating current of a busbar**

# HL High Lighting

## ■ GENERAL FEATURES

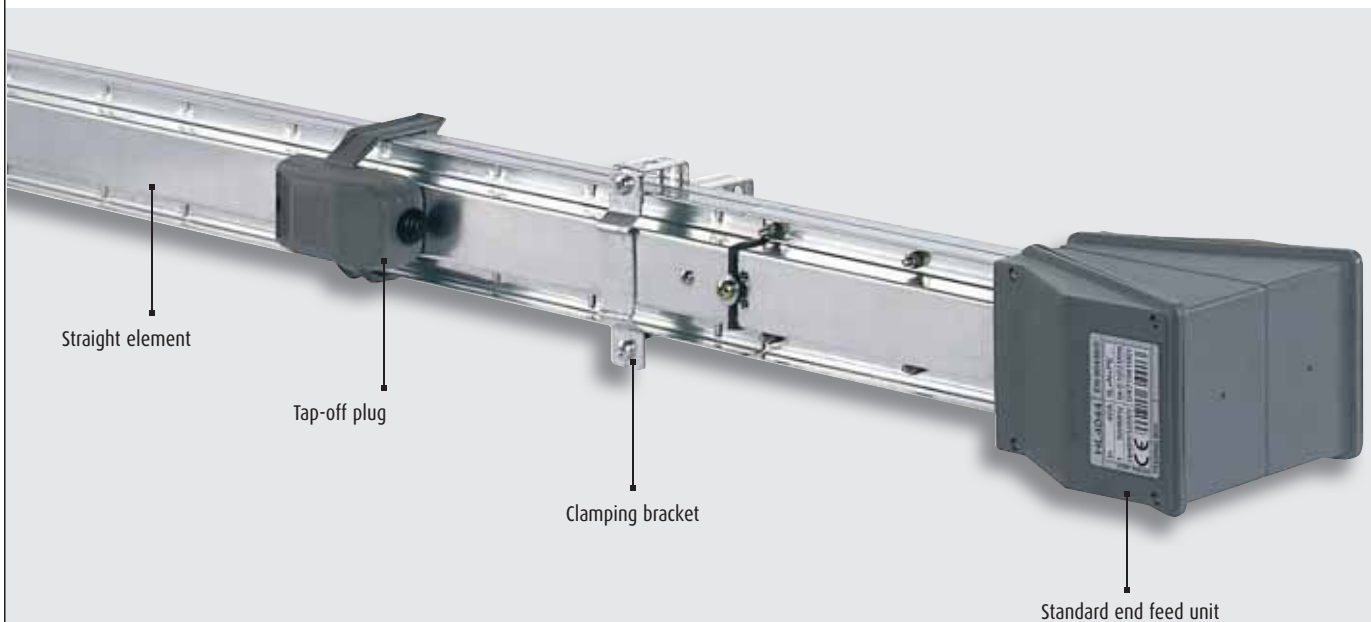
The HL busbar line is ideal for powering lighting fixtures wherever it is necessary to hang heavy accessories onto the busbar. The main features of the HL range are:

- speed, simplicity and flexibility when installing and planning the lines;
- high mechanical rigidity obtained by the particular “beam-type configuration” and by an increased thickness of the metal casing;

- capable of being installed in systems with a distance of up to 6m between suspension brackets;
- compliance with Standard IEC 60439-1 and 2;
- rated at average room temperature of 40°C for a higher performance level compared to the 35°C rating required by the standard.

HL is available in two dimensions:

- **HLs** single version for 2 and 4 conductors
- **HLD** dual version for 2+2; 4+2; 4+4 and 2x4 conductors.



Exhibition pavilions



Car parks

## ■ STRAIGHT ELEMENTS

The components and the features of the HL straight elements are:

- a beam-shaped casing, made with hot galvanized steel (Senzimir) (due to its cross-section and electrical continuity, it also serves as the protective earth).
- HLs busbar dimensions: 26x62mm; HLd: 40x70mm;
- upon request, the straight elements are also available in the Aisi 304 stainless steel version;
- number of conductors: 2, 4, 6 or 8 rigid copper conductors with a 99.9% purity;
- conductor section: 3.14 mm<sup>2</sup> for 25A and 6.15 mm<sup>2</sup> for 40A.;
- separation between the conductors by using a V0 (according to UL94) self-extinguishing insulating plastic sheathe and in compliance with the glow-wire test according to IEC 60695-2-10;
- tap-off outlets equidistant every 1m (3 outlets every 3m) or 0.5m (6 outlets every 3m), receiving the corresponding tap-off plugs (in the LB 6 conductor version the outlets are arranged on both sides of the busbar: 3+3 or 6+6 outlets);

- a junction block automatically ensuring electrical continuity

The connection between two straight elements is quick; with one operation the mechanical and the electrical connection is ensured between two joined elements; at the same time, an IP55 degree of protection is guaranteed without using additional sealing accessories.

The continuity of the protective conductor (casing) is guaranteed by tightening the special connection screw.

The whole busbar is fire retardant in compliance with the Standard IEC 60332-3.

In the HLd (dual) version, the straight elements are separated over their entire length by a metal plate divider (thickness 0.8 mm) which separates the straight elements in two parts making the two circuits totally independent. Because of this division the HLd busbar can be used for powering "normal" and "emergency" loads.

The HLd line is designed so as to provide two separate rated circuits (25A+25A or 40A+40A) on without a derating factor, and not one one 25 or 40A incoming divided into two circuits.



Small/medium industries



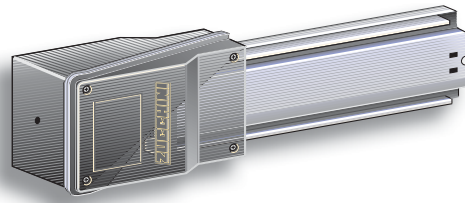
Gyms

# HL High Lighting

## ■ FEED UNITS

Allows you to electrically power the HL line through one (HLs) or two separate lines (HLd); the installation is carried out with a quick junction connection as with the straight elements.

The feed units have terminals for the connection of flexible cables for sections of up to 25 mm<sup>2</sup>. There is an anti-pullout cable clamp inside the feed unit. The entrance point for the incoming cable is positioned on the end of the feed unit.



Standard end feed unit

## ■ END COVER

The end cover ensures the IP55 protection degree at the end of the line.



Standard end cover

## ■ FIXING DEVICES

Specific accessories are available for attaching the busbar to the structure of the building (directly or with a steel chain or cable). The accessories for overhead fixing are:

- snap clamp: the snap-on installation is extremely fast. This bracket is suitable both for overhanging the busbar to the ceiling and for hanging products such as fluorescent lamps, tap-off boxes, etc., to the busbar itself;
- snap clamp with ring or hook: the ring or the hook enables to hang lamps easily;
- simple bracket: used with the ceiling bracket holder, it enables the installation the busbar directly onto the ceiling at a distance of about 25cm;
- wall bracket: enables the fixing of the busbar directly onto the wall of a building, setting it at the required distance enabling the installation of the necessary components.



Fixing accessories for fastening the busbar run to the structure and hanging the lamps onto the busbar

## ■ TAP-OFF PLUGS

Used for connecting and energizing light fixtures; their features include:

- can be inserted and removed when the busbar is energized and when the fixture is under load;
- the PE contact (protective earth) is the first to make an electrical connection when inserting the plug into the outlet and it is the last to disconnect when pulling it out;
- all insulating plastic components are in compliance with the glow-wire test (IEC 60695-2-10) with V1 self-extinguishing degree (UL94);
- standard IP55 degree of protection without using additional accessories according to Standard IEC 60529;
- in the HLd line, the plugs are polarized, in other words the plug which is busbar on one side of the element cannot be installed on the other side due to a mechanical lock on the outlet;
- the tap-off plugs are different for the HLs 2, 4 and

HLd 2+2, 4+2, 4+4; 2x4 conductors offer. They include:

- a) 16A phase selection tap-off plugs, pre-wired with 1m of 3x1.5mm<sup>2</sup> FROR cable;
- b) 16A phase selection tap-off plugs, with terminals for connecting a cable;
- c) 16A phase selection tap-off plugs, with  $\varnothing 5 \times 20$ mm cylindrical ceramic fuse and with terminals for connecting an L+N+PE cable;
- d) 16A three-phase tap-off plugs, with a set of three cylindrical fuse carriers (8.5x31.5mm) with terminals for connecting a 3L+N+PE cable.



Single-phase selection plug



Plug with fuse carrier

## Trunking components and additional elements

Depending on the different installation requirements Zucchini can provide various technical solutions:

a) flexible joint: used to make changes of direction or to avoid possible interferences that may be found on the path of the busbar.

Their main technical features are:

- same connection method as the straight elements;
- electrical and mechanical connection with one operation;
- standard degree of protection: IP55;
- continuity of the protective conductor, made from the casing of the element itself, guaranteed by tightening the special connection screw;

b) cable trunking with cover: this accessory, which can be positioned in the upper part of the busbar, can be used to distribute auxiliary circuits, it is an integral part of the busbar run using special spacers and brackets which support the busbar trunking system firmly. The trunking part is 3 m long and its dimensions are 28x28 mm;

c) intermediate feed unit: it can power the busbar from an intermediate point of the line, thus reducing the voltage drop at the end of the line and/or making the installation easier when the electric energy supply point is near the middle of the line.



The end cap completes the installation of the lines and guarantees the IP55 degree of protection of the line.

Straight elements, with tap-off outlets every 1000 mm on both sides, with pre-installed blanking accessory.

Phase selection tap-off plugs, also available with fuses.

Ring for suspending a lamp or for suspending other accessories of the busbar. (boxes, loudspeakers, etc.)

Hook for suspending a lamp or for suspending busbar itself and other devices (lamps, etc)

Snap-on bracket that can be used for suspending the line and devices

### ■ PARTS OF THE LINE



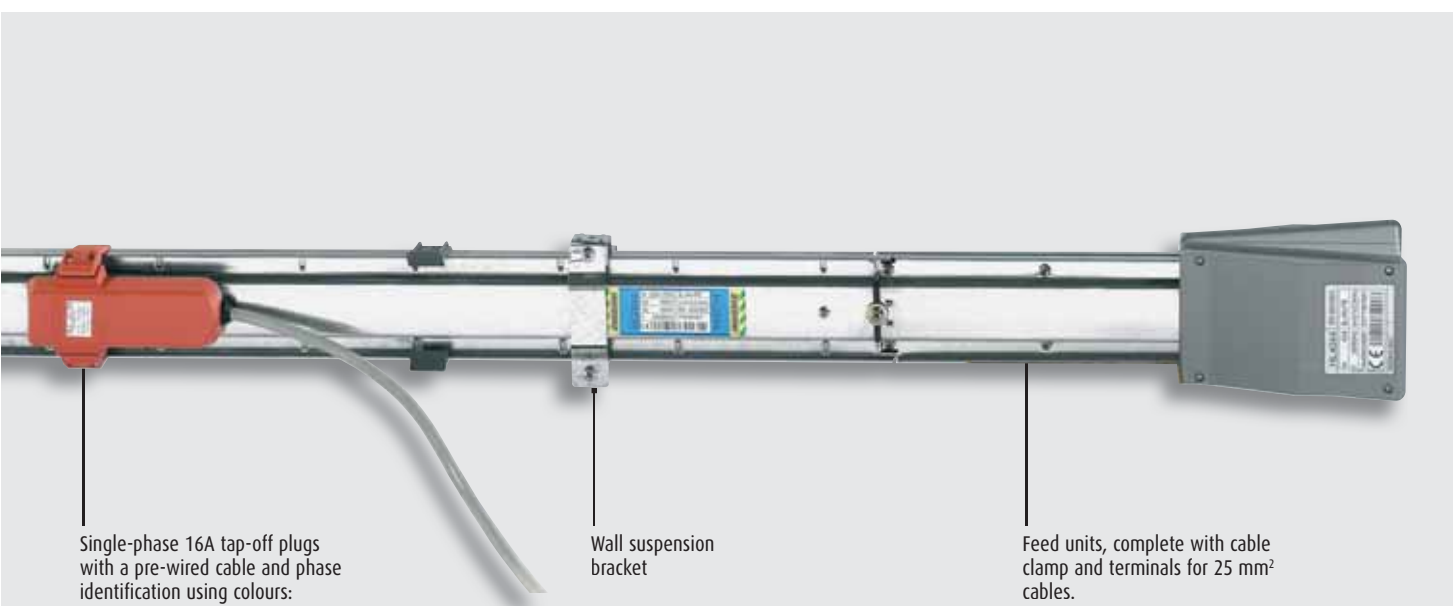
Single-phase selection plug



Plug with fuse carrier



Ceiling suspension bracket



Single-phase 16A tap-off plugs with a pre-wired cable and phase identification using colours:  
 N - L1 = grey  
 N - L2 = orange  
 N - L3 = blue  
 for L+N circuit  
 and  
 N3 - L3 = blue  
 N2 - L2 = black  
 for single-phase dual circuit.

Wall suspension bracket

Feed units, complete with cable clamp and terminals for 25 mm<sup>2</sup> cables.



Wall mounting bracket



Simple suspension bracket

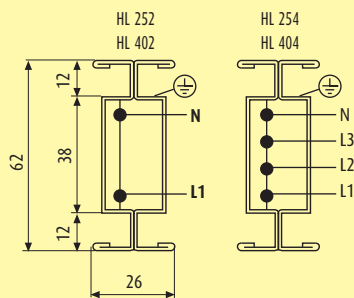
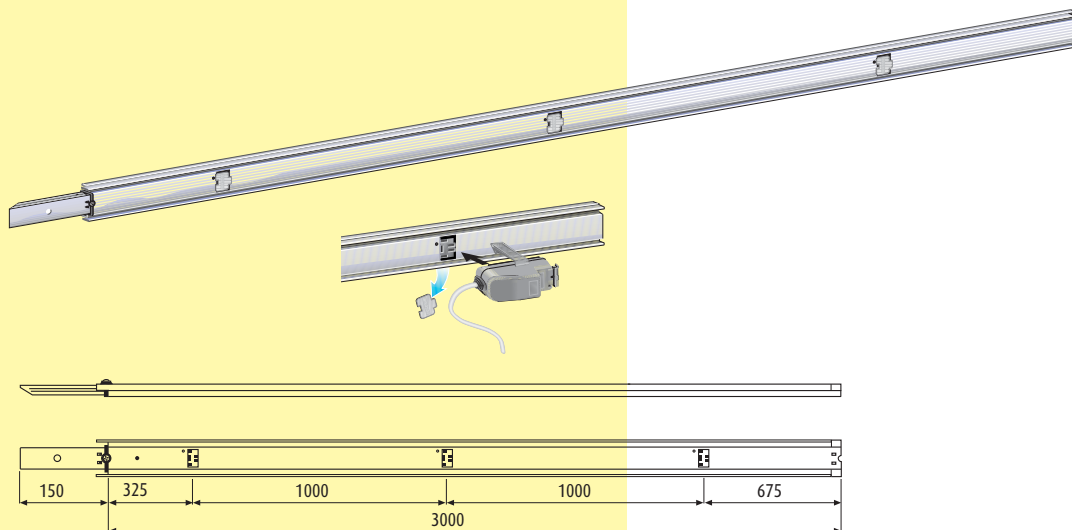


Snap-on stainless steel hook, ring and bracket



Outlet cover (spare)

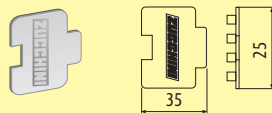
## HL Trunking components - single



### STRAIGHT ELEMENT

Elements with pre-installed outlet covers.

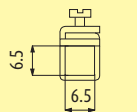
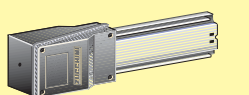
Model	Item	Length (m)	Rating (A)	Conductors	No. of outlets	Weight (kg)
HL 252	71010151	3	25	2	3	4.5
HL 252	71010161	1.5	25	2	2	2.25
HL 402	71030151	3	40	2	3	4.8
HL 402	71030161	1.5	40	2	2	2.4
HL 254	71020151	3	25	4	3	4.8
HL 254	71020161	1.5	25	4	2	2.4
HL 404	71040151	3	40	4	3	5.1
HL 404	71040161	1.5	40	4	2	2.55



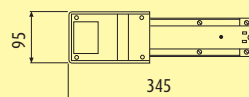
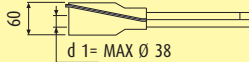
### OUTLET COVER (Spare)

The straight elements are supplied with outlet cover pre-installed on the outlets.

Model	Item	Colour	Weight (kg)
All	71023601	grey	0.011



Max. cable section 25 mm<sup>2</sup>

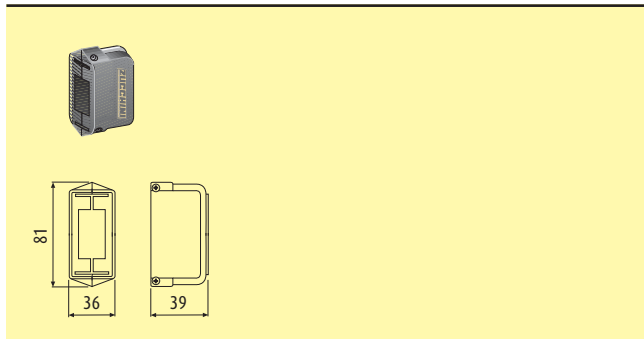


### STANDARD FEED UNIT

Supplied without an electric and mechanical bayonet connection. It must be installed on one side of the element, located near the linking bayonet.

Model	Item	Weight (kg)
All	71041001	0.800

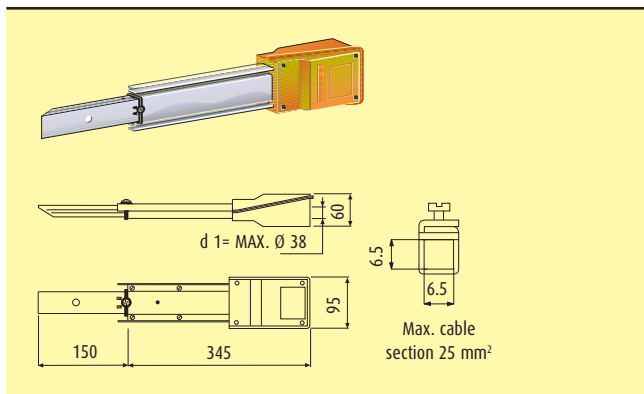
For cable glands see page 175



### STANDARD END COVER

To be used with standard feed units

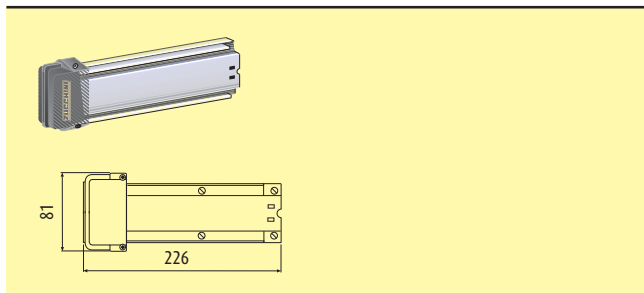
Model	Item	Weight (kg)
All	71041301	0.050



### END-LINE FEED UNIT

Supplied with an electric and mechanical bayonet connection. It must be installed on the extremity of the element without the bayonet. Can be used when power feed is needed at both ends of a run (less voltage drop) or cabled in association with a standard feed unit to create a flexible element to bypass large obstacles (beams, air ducts, etc)

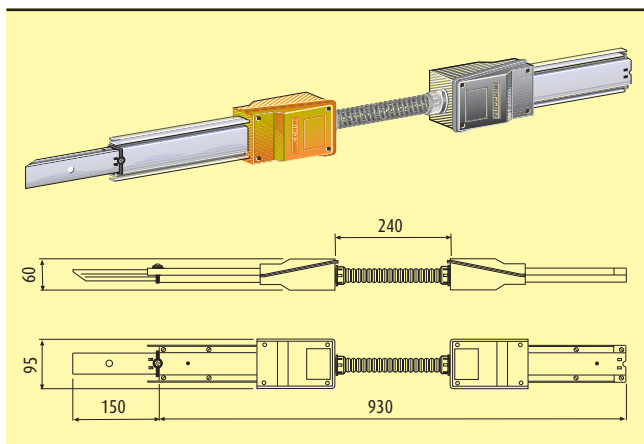
Model	Item	Weight (kg)
All	71041002	1.000



### END COVER

To be used with end-line feed unit.

Model	Item	Weight (kg)
All	71041302	0.360

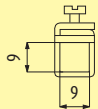
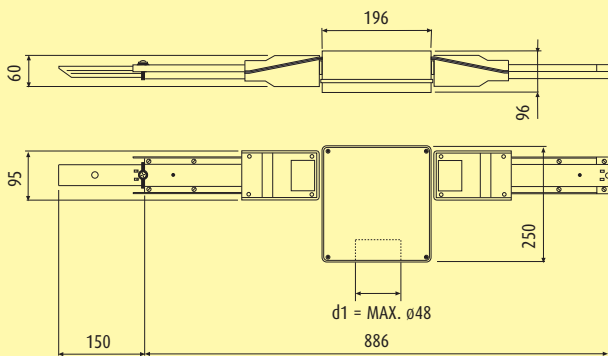
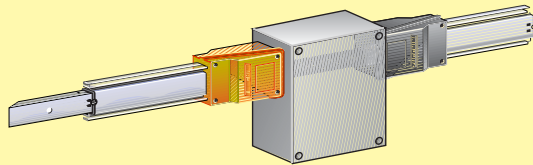


### FLEXIBLE JOINT

Used to make changes of direction.

Model	Item	Weight (kg)
All	71041261	2.500

## HLs Trunking components



Max. cable section 35 mm<sup>2</sup>

### CENTRE FEED UNIT 25/40A

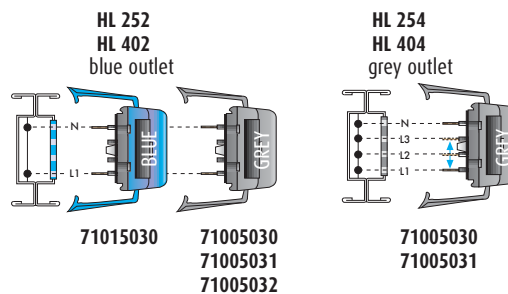
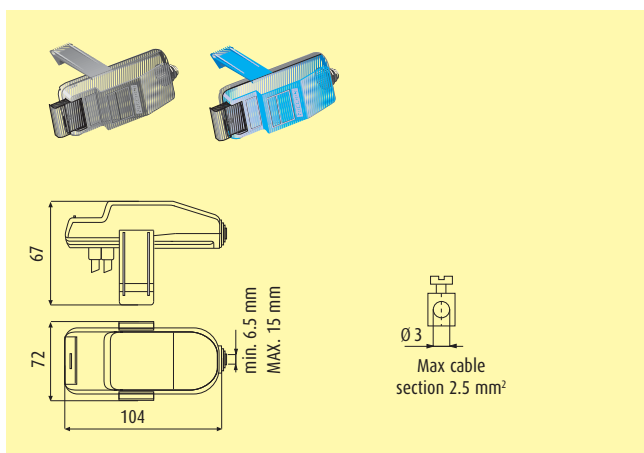
Used to power a busbar from an intermediate point. The intermediate power box is also used for reducing the voltage drop of the line.

Model	Item	Weight (kg)
All	71041151	2.900

# HLs plugs

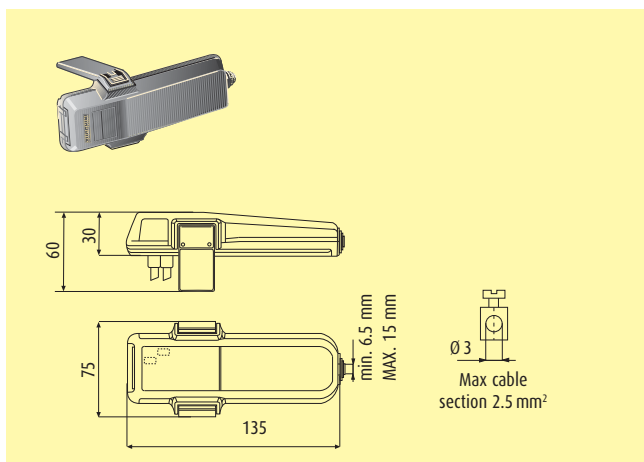
## PHASE SELECTION SAFETY PLUGS

Model		Item	Rating	Fuse	Phase	Cable length	Cable type	Colour
252 402	254 404							
•	•	71005030	16A	Ø5x20	selectable	-	-	grey
•	•	71005031	16A	-	selectable	-	-	grey
•	•	71005032	16A	-	selectable	1m	FROR	grey
•	•	71015030	16A	Ø5x20	L1-N	-	-	blue

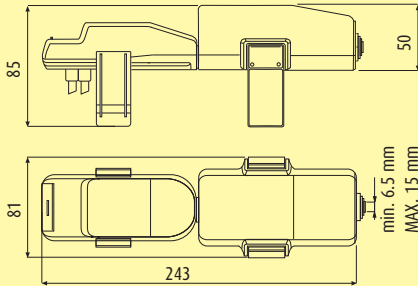
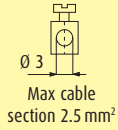
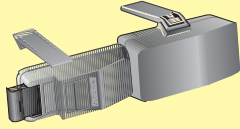


## SINGLE-PHASE PLUGS WITH FUSE CARRIER

Model		Item	Rating	Fuse	Phase	Cable length	Cable type	Colour
252 402	254 404							
•	•	71005068	16A	Ø8.5x31.5	selectable	-	-	grey
•	•	71005070	16A	Ø8.5x31.5	L1-N	1m	FROR	grey
•	•	71005071	16A	Ø8.5x31.5	L2-N	1m	FROR	orange
•	•	71005072	16A	Ø8.5x31.5	L3-N	1m	FROR	blue



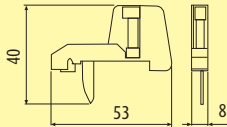
## HLs plugs



### THREE-PHASE PLUGS WITH FUSE CARRIER

Model	Item	Rating	Fuse	Phase	Colour
252	254				
402	404				
	• 71005035	16A	Ø8.5x31.5 *	L1-L2-L3-N	grey

\* Fuse not included



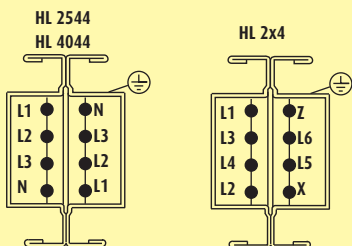
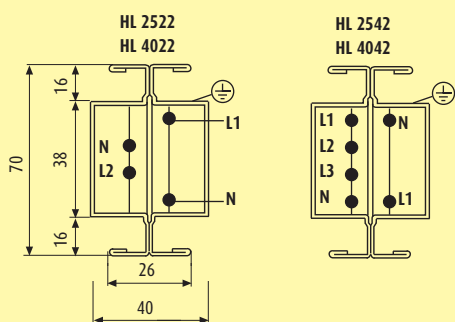
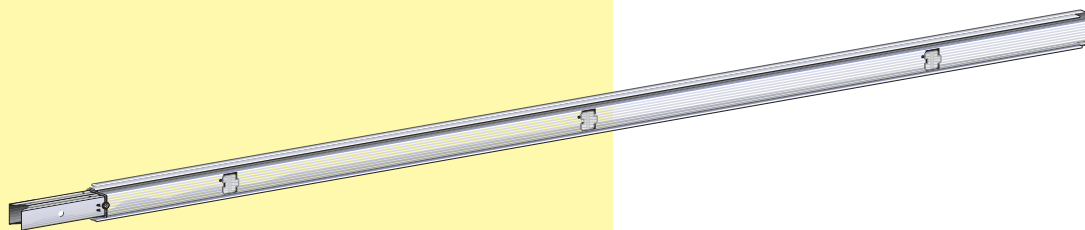
### MOVABLE CONTACT

To be added when creating three-phase versions of the safety tap-off plugs (2 for each plug).

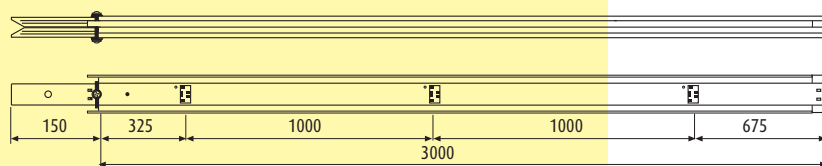
Item	Capacity	Fuse	Weight (kg)
71005028	** 16 A	1	0.010
71005029	16 A	0	0.010

\*\* 16A contact with 6.3 A fuse

# HLd Trunking components



HL 2x4 to create  
4 interlocked single-phase circuits



## STRAIGHT ELEMENT

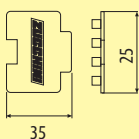
Elements with pre-installed outlet covers.

Model	Item	Length (m)	Rating (A)	Conductors	No. of outlets	Weight (kg)
HL 2522	71510151	3	25+25	2 + 2	6	8.4
HL 2522	71510161	1.5	25+25	2 + 2	4	4.2
HL 4022	71540151	3	40+40	2 + 2	6	8.7
HL 4022	71540161	1.5	40+40	2 + 2	4	4.35
HL 2542	71520151	3	25+25	4 + 2	6	8.7
HL 2542	71520161	1.5	25+25	4 + 2	4	4.35
HL 4042	71550151	3	40+40	4 + 2	6	9.3
HL 4042	71550161	1.5	40+40	4 + 2	4	4.65
HL 2544	71530151	3	25+25	4 + 4	6	8.7
HL 2544	71530161	1.5	25+25	4 + 4	4	4.35
HL 4044	71560151	3	40+40	4 + 4	6	9.6
HL 4044	71560161	1.5	40+40	4 + 4	4	4.8
HL 2x4	71570151	3	25+25	2+2+2+2	6	8.7
HL 2x4	71570161	1.5	25+25	2+2+2+2	4	4.35

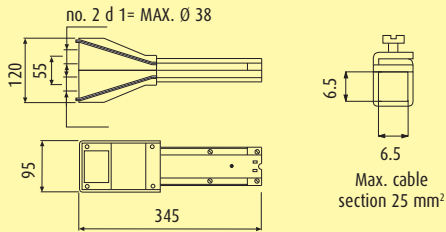
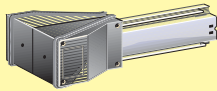
## OUTLET COVER (spare)

The elements are supplied with outlet covers pre-installed on the outlet covers.

Model	Item	Colour	Weight (kg)
All	01150048	grey	0.011



## HLd Trunking components

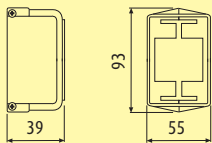


### STANDARD FEED UNIT 25/40A

Supplied without an electric and mechanical bayonet connection. It must be installed on one side of the element, located near the linking bayonet. The feed unit has two separate cable inputs and the terminals are totally separated and independent.

Model	Item	Weight (kg)
All	71561001	1.100

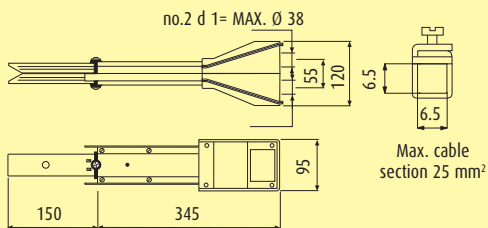
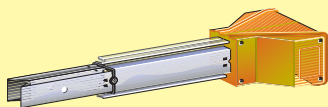
Cable gland selection page 175.



### STANDARD END COVER

To be used with the standard feed unit

Model	Item	Weight (kg)
All	71561301	0.090

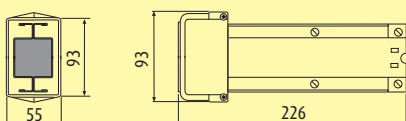
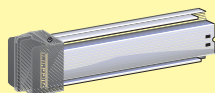


### END-LINE FEED UNIT 25/40A

Supplied with an electric and mechanical bayonet connection. It must be installed on one side of the element, not located near the linking bayonet. The feed unit has two separate cable inputs and the terminals are totally separated and independent.

Model	Item	Weight (kg)
All	71561002	1.600

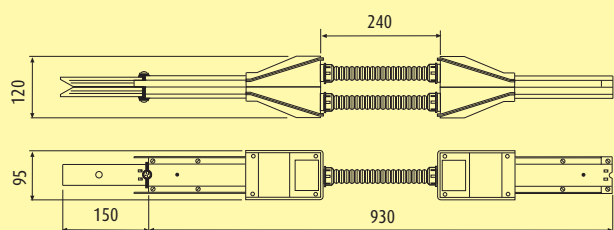
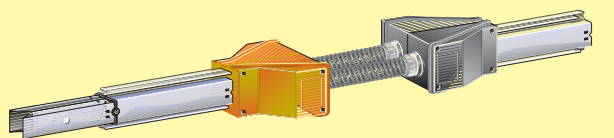
Cable gland selection page 175.



### END COVER

To be used with the end-line feed unit.

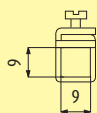
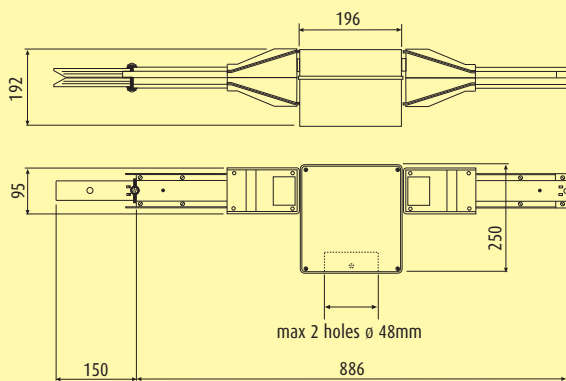
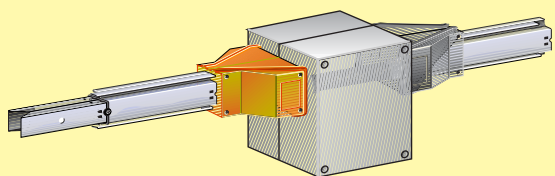
Model	Item	Weight (kg)
All	71561302	0.786



### FLEXIBLE JOINT 25/40A

Used to make changes of direction.

Model	Item	Weight (kg)
All	71561261	3.000



Max. cable section 35 mm<sup>2</sup>

### CENTRE FEED UNIT 25/40A

Used to power a busbar from an intermediate point. The intermediate power box is also used for reducing the voltage drop of the line.

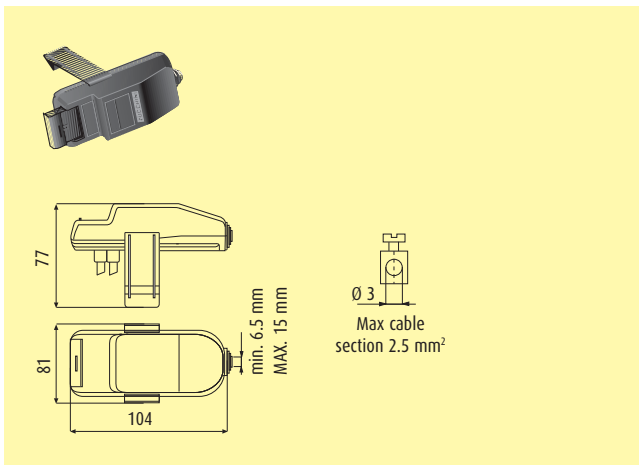
Model	Item	Weight (kg)
All	71561151	3.800

## HLd plugs

### HLd PLUGS

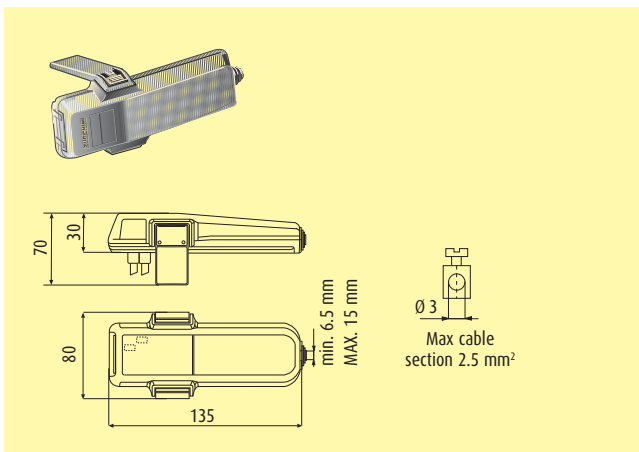
	Model				Item	Rating	Fuse	Phase	Cable length	Cable type	Colour
	2522 4022	2542 4042	2544 4044	2x4							
=>	•	•	•	•	71505030	16A	Ø5x20	selectable	-	-	grey
=>	•	•	•	•	71505031	16A	-	selectable	-	-	grey
	•	•	•	•	71505032	16A	-	selectable	1m	FROR	grey
	•	•			71515030	16A	Ø5x20	L1-N	-	-	blue
	•				71515031	16A	Ø5x20	L2-L3	-	-	orange
			•		71575030	16A	Ø5x20	L1-L2	-	-	blue
			•		71575031	16A	Ø5x20	L3-L4	-	-	black
			•		71575032	16A	Ø5x20	L5-L6	-	-	orange
			•		71575033	16A	Ø5x20	X-Z	-	-	brown

=> Specifies the most frequently used plugs.



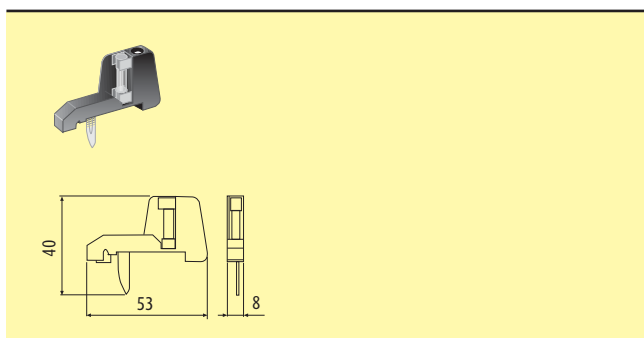
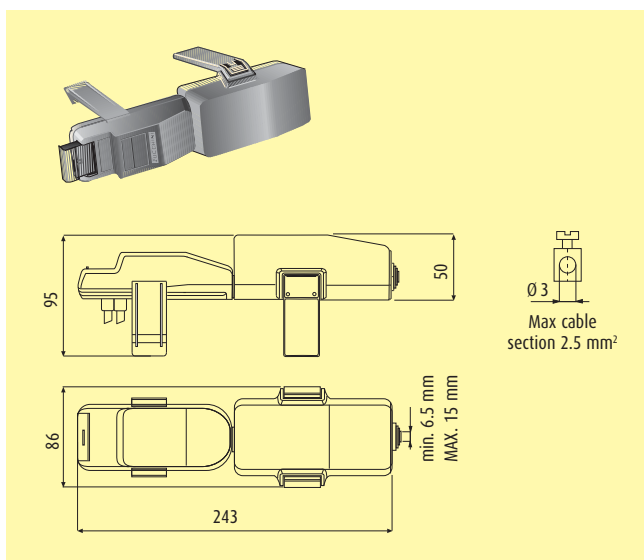
### SINGLE-PHASE PLUGS WITH CH8 FUSE CARRIER

	Model				Item	Rating	Fuse	Phase	Cable length	Cable type	Colour
	2522 4022	2542 4042	2544 4044	2x4							
	•	•	•	•	71505059	16A	Ø8.5x31.5	selectable	-	-	grey
		•	•		71505070	16A	Ø8.5x31.5	L1-N	1m	FROR	grey
		•	•		71505071	16A	Ø8.5x31.5	L2-N	1m	FROR	orange
		•	•		71505072	16A	Ø8.5x31.5	L3-N	1m	FROR	blue



**THREE-PHASE PLUGS WITH FUSE CARRIER**

Model				Item	Rating A	Fuse	Phase	Colour
2522	2542	2544	2x4	71505035	16A	Ø8.5x31.5	L1-L2-L3-N	grey
4022	4042	4044						



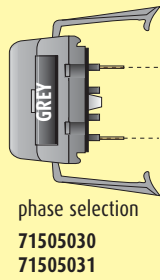
**MOVABLE CONTACT**

To be added to create three-phase versions of the safety tap-off plugs (2 for each plug).

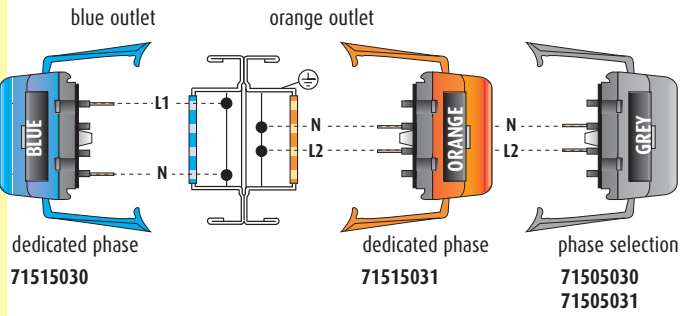
Item	Rating A	Fuse	Weight (kg)
71005028*	16	1	0.010
71005029	16	0	0.010

\* 16A contact with 6.3 A fuse

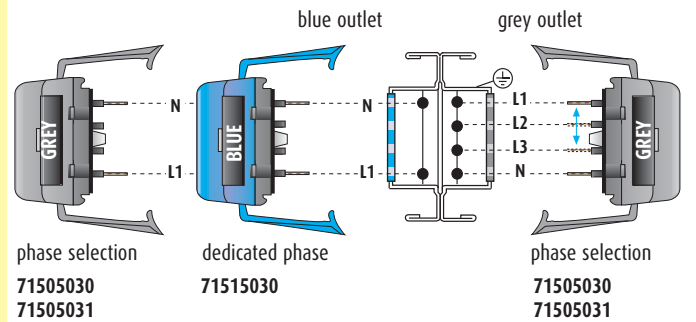
## HLd plugs



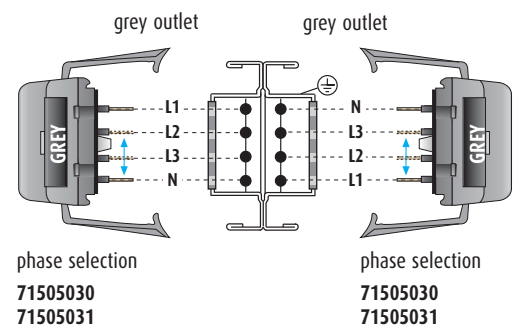
### HL 2522 - HL 4022



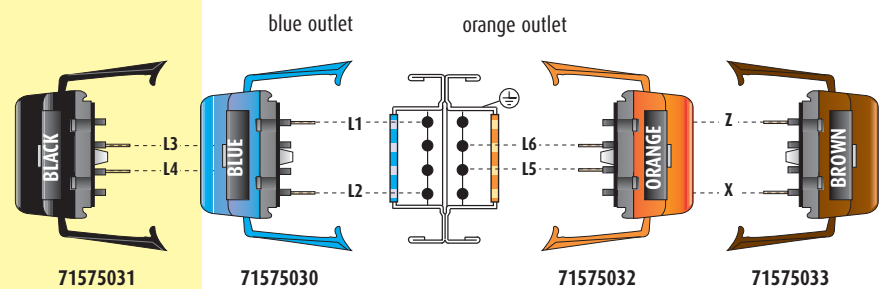
### HL 2542 - HL 4042



### HL 2544 - HL 4044

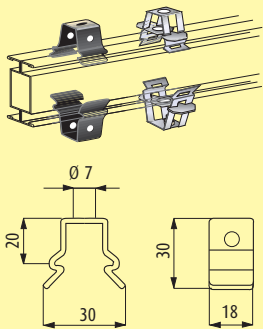


### HL 2 X 4



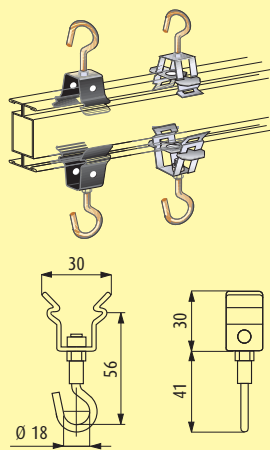
4 INDEPENDENT single-phase circuits

# Fixing supports



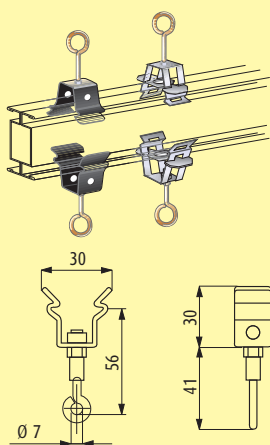
## SNAP-ON BRACKET (MAX. 15 kg)

Model	Item	Weight (kg)
Burnished Steel	71003003	0.021
STAINLESS STEEL	71203701	0.021



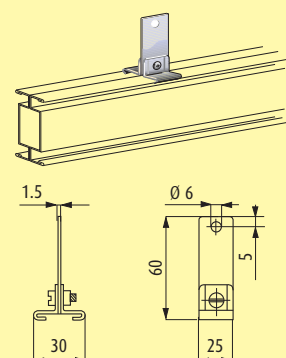
## SUSPENSION HOOK (MAX. 15 kg)

Model	Item	Weight (kg)
Burnished Steel	71005002	0.025
STAINLESS STEEL	71203702	0.025



## SUSPENSION RING (MAX. 15 kg)

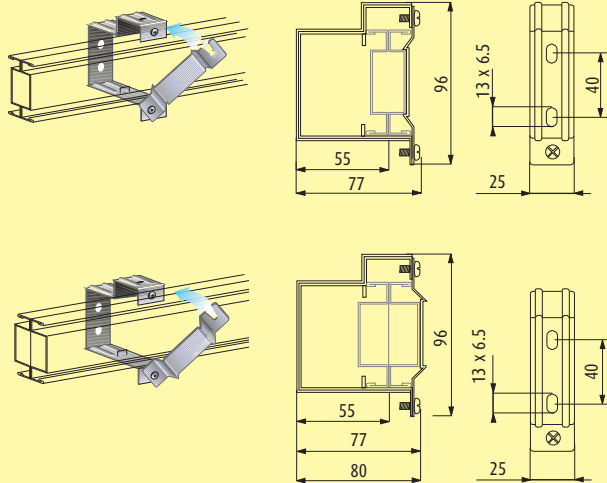
Model	Item	Weight (kg)
Burnished Steel	71005015	0.025
STAINLESS STEEL	71203703	0.025



## SUSPENSION BRACKET (MAX. 15 kg)

Item	Weight (kg)
71003001	0.033

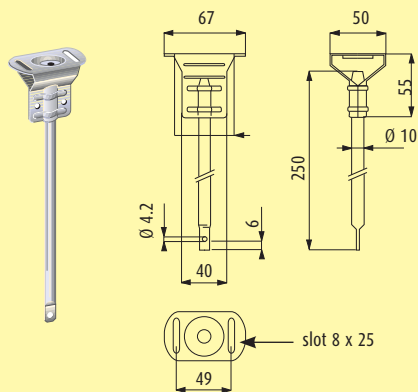
## Fixing elements



### WALL SUSPENSION BRACKET

For wall mounting of the HLD elements, it is possible to connect the plug on the internal side only if the busbar is taken out of the wall bracket, inserted, and replaced afterward.

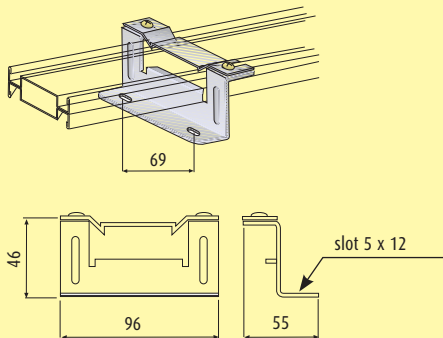
Item	Weight (kg)
<b>71003009</b>	0.090



### CEILING BRACKET HOLDER

Must be used with the code 71003001 suspension bracket.

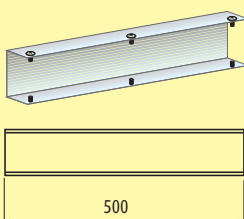
Item	Weight (kg)
<b>73003312</b>	0.136



### FLOOR FIXING BRACKET

Only for the HLDs single version. Suitable for horizontal HLDs floor fastening.

Item	Weight (kg)
<b>71003018</b>	0.090
Compatible with: HL 252, HL 402, HL 254, HL 404	

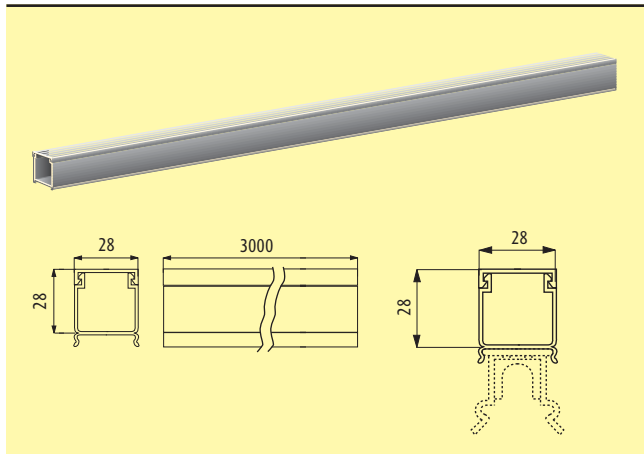


### JUNCTION STIFFENER

To be used for strengthening bracket links with suspension centre distances that are over 5m.

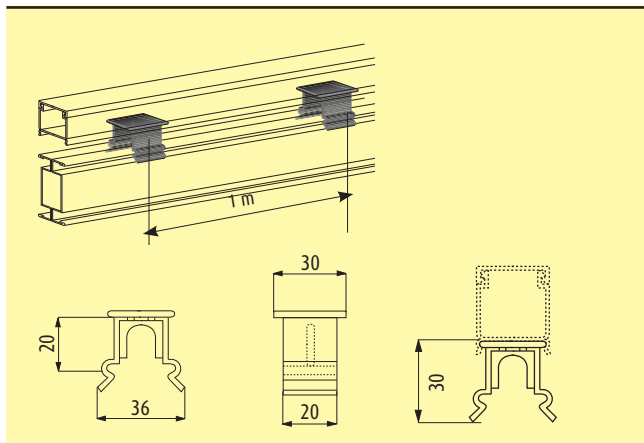
Model	Item	Weight (kg)
<b>for single-type</b>	<b>71042024</b>	0.200
<b>for dual-type</b>	<b>71042025</b>	0.200

## Cable channel and accessories



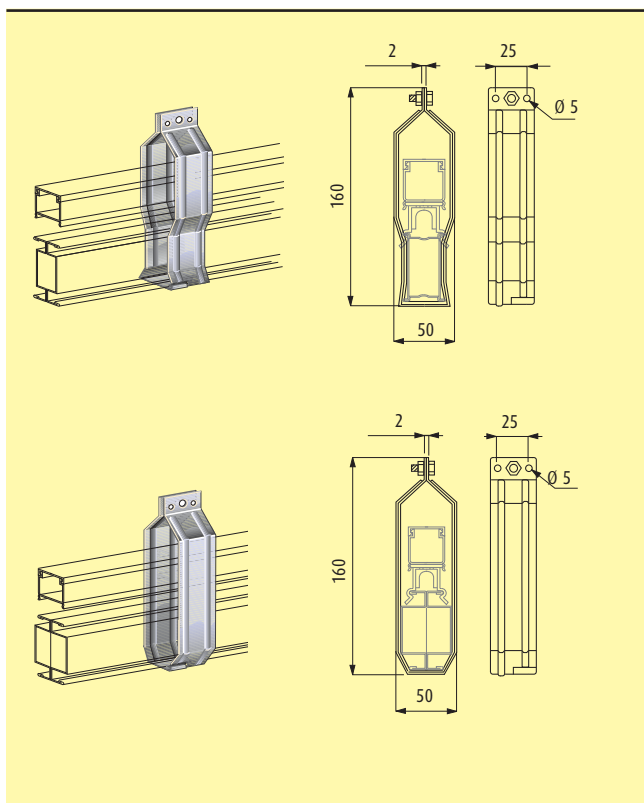
### CABLE CHANNEL WITH COVER (RIGID PVC)

Model	Length [m]	Weight (kg)
71000104	3	0.884



### SPACER FOR CABLE CHANNEL

Item	Weight (kg)
71003007	0.006



### HLd - SUSPENSION BRACKET FOR CABLE CHANNEL

Overhead bracket to be used when the cable trunking is used above the busbar.

Item	Weight (kg)
71003006	0.108

Compatible with:  
HL 252, HL 402, HL 254, HL 404

### HLd - SUSPENSION BRACKET FOR CABLE CHANNEL

Suspension bracket to be used when the cable trunking is used above the busbar.

Item	Weight (kg)
71503006	0.108

Compatible with:  
HL 2522, HL 4022, HL 2544, HL 4044, HL 2542, HL 4042, HL 2 x 4

## Technical information HL

Model	HLs single						HLd double						
	252	402	254	404	2522	4022	2542		4042		2544	4044	2x4
Number of live conductors	No. 2	2	4	4	2+2	2+2	side	side	side	side			
Casing overall dimensions	A x B [mm]	26x62	26x62	26x62	26x62	40.4x70	40.4x70	40.4x70		40.4x70		40.4x70	40.4x70
Rated current	I <sub>n</sub> [A]	25	40	25	40	25	40	25		40		25	40
Cross-section of conductors (3P+N)	S [mm <sup>2</sup> ]	3.14	6.15	3.14	6.15	3.14	6.15	3.14		6.15		3.14	6.15
Cross-section of protective conductor eq. Cu	S <sub>PE</sub> [mm <sup>2</sup> ]	17	17	17	17	20	20	20		20		20	20
Operating voltage	U <sub>e</sub> [V]	400	400	400	400	400	400	400		400		400	400
Insulation voltage	U <sub>i</sub> [V]	500	500	500	500	500	500	500		500		500	500
Rated frequency	f [Hz]	50/60	50/60	50/60	50/60	50/60	50/60	50/60		50/60		50/60	50/60
Rated short-time current (0.1 s)	I <sub>cw</sub> [kA]rms	2.5	3.2	2.5	3.2	2.5	3.2	2.5		3.2		2.5	3.2
Allowable peak current	I <sub>pk</sub> [kA]	10	10	10	10	10	10	10		10		10	10
Thermal limit	I <sup>2t</sup> [A <sup>2</sup> s x 10 <sup>6</sup> ]	0.64	1.00	0.64	1.00	0.64	1.00	0.64		1.00		0.64	1.00
Phase resistance	R <sub>20</sub> [mΩ/m]	5.73	2.93	5.73	2.93	5.73	2.93	5.73 • 5.73		2.93 • 2.93		5.73	2.93
Phase reactance (50Hz)	X [mΩ/m]	1.40	1.58	1.27	0.77	1.40	1.58	1.27 • 1.40		0.77 • 1.58		1.27	0.77
Phase impedance	Z [mΩ/m]	5.90	3.33	5.87	3.03	5.90	3.33	5.87 • 5.90		3.03 • 3.33		5.87	3.03
Resistance of the protective conductor	R <sub>PE</sub> [mΩ/m]	1.06	1.06	1.06	1.06	0.90	0.90	0.90 • 0.90		0.90 • 0.90		0.90	0.90
Reactance of the protective conductor (50Hz)	X <sub>PE</sub> [mΩ/m]	1.10	1.10	1.10	1.10	1.00	1.00	1.00 • 1.00		1.00 • 1.00		1.00	1.00
Resistance of the fault loop	R <sub>0</sub> [mΩ/m]	6.79	3.99	6.79	3.99	6.63	3.83	6.63 • 6.63		3.83 • 3.83		6.63	3.83
Reactance of the fault loop (50Hz)	X <sub>0</sub> [mΩ/m]	2.50	2.68	2.37	1.87	2.40	2.58	2.27 • 2.40		1.77 • 2.58		2.27	1.77
Impedance of the fault loop	Z <sub>0</sub> [mΩ/m]	7.24	4.80	7.19	4.40	7.05	4.62	7.01 • 7.05		4.22 • 4.62		7.01	4.22
	ΔV [V/m/A]10 <sup>3</sup> cosφ =	0.70	5.01	3.18	4.26	2.25	5.01	3.18		4.26 • 5.01		2.25	5.01
	=	0.75	5.23	3.24	4.45	2.34	5.23	3.24		4.45 • 5.23		2.34	5.23
ΔV <sub>if</sub> = $\frac{1}{2} (2 R_{20} \cos \varphi + 2 X \sin \varphi)$	=	0.80	5.43	3.29	4.63	2.43	5.43	3.29		4.63 • 5.43		2.43	5.35
Voltage drop with distributed load (k)	=	0.85	5.61	3.32	4.80	2.51	5.61	3.32		4.80 • 5.61		2.51	5.54
	=	0.90	5.77	3.32	4.95	2.57	5.77	3.32		4.95 • 5.77		2.57	5.71
ΔV <sub>3f</sub> = $\frac{\sqrt{3}}{2} (R_{20} \cos \varphi + X \sin \varphi)$	=	0.95	5.88	3.27	5.06	2.62	5.88	3.27		5.06 • 5.88		2.62	5.84
	=	1.00	5.73	2.93	4.96	2.53	5.73	2.93		4.96 • 5.73		2.53	5.73
Straight element weight	p [kg/m]	1.5	1.6	1.6	1.7	2.8	2.9	2.9		3.1		2.9	2.9
Fire load	[kWh/m]	0.82	0.82	0.82	0.82	1.64	1.64	1.64		1.64		1.64	1.64
Degree of protection	IP	55	55	55	55	55	55	55		55		55	55
Joule effect losses at rated current	P [W/m]	7.2	9.4	10.7	14.0	7.2	9.4	10.7 • 7.2		14.0 • 9.4		10.7	14.0
Ambient temperature min./MAX.	t [°C]	-5/+50	-5/+50	-5/+50	-5/+50	-5/+50	-5/+50	-5/+50		-5/+50		-5/+50	-5/+50

**Short circuit protection for Zucchini's product ranges (In ≤ 100A)**  
Zucchini busbar trunking systems with a rated current lower than or equal to 100A (LB-HL-SL-MS 63 and 100) are properly protected through an MCB (Modular Circuit Breaker) with a nominal current lower than or equal to that of the busbar. This protection is guaranteed up to the MCB breaking capacity.

The busbar trunking systems are FIRE RETARDANT in compliance with IEC 20-22 (IEC 332-3: 1992).

**Product fully in compliance with the following Standards: IEC 439-1 and 2, IEC 60439 part 1 and 2, DIN VDE 0660 part 500 and 502**

Product suitable for these climates:  
Constant humid climate (DIN IEC 68 / 2- 3)  
Cyclical humid climate (DIN IEC 68 / 2- 30)

### Temperature rating schedule according to the room temperature

Room temperature [°C]	15	20	25	30	35	40	45	50	55	60
K1 Factor	1.15	1.12	1.08	1.05	1.025	1	0.975	0.95	0.93	0.89

multiplier coefficient of rated current for room temperature values different from 40° C

### Table for mechanical loads permitted (with busbar installed on edge)

When distributing loads, if any, the maximum weight (kg) that can be supported is given in the tables below:

For point loads, multiply the values in the table below by 0.6.

	fixing centres (distance) m.							
maximum deflection = 1/250 x distance m	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
kg	82.3	71.1	52.2	40.0	31.6	25.6	21.1	17.8



## Determination of the operating current of a busbar

In order to determine the current whereby it is necessary to choose the busbar, the following planning data must be known:

- type of load inputs: three-phase or single-phase;
- type of circuit input: from one end, from both ends, central input, etc.;
- nominal input voltage;
- number, power and  $\cos\varphi$  of loads which are to be fed by the busbar;
- load diversity factor;
- load use nominal factor;
- assumed short circuit current at the input point;
- room temperature;
- type of busbar installation (edgewise, flat, vertical).

When using a three-phase power supply, the operating current is determined by the following formula:

$$I_b = \frac{P_{TOT} \cdot \alpha \cdot \beta \cdot d}{\sqrt{3} \cdot U_e \cdot \cos\varphi_{medium}} \quad [A]$$

where:

- $I_b$  operating current [A];
- $\alpha$  load diversity factor [..];
- $\beta$  load use factor [..];
- $d$  feed factor [..];
- $P_{TOT}$  sum of the total active power of installed loads [W];
- $U_e$  operating voltage [V];
- $\cos\varphi_{medium}$  average load power factor [..];

The "d" input factor has a value of 1 when the busbar is fed from one end only. The value is 1/2 if fed from the centre or if it is fed from each end.

Once the operating current has been determined, choose the busbar with a rated current immediately higher than the one calculated.

All Zucchini products have been designed and tested for an average room temperature of 40°C; should they be installed in rooms with average daily temperatures different from 40 °C the rated current of the busbar should be multiplied by a  $k_1$  factor that is greater than the unit for temperatures lower than 40°C and lower than the unit if the room temperature is higher than 40°C.

Room temperature [°C]	15	20	25	30	35	40	45	50	55	60
$k_1$ thermal correction factor [..]	1.15	1.12	1.08	1.05	1.025	1	0.975	0.95	0.93	0.89

Finally, the following should be considered for the most appropriate busbar choice:

$$I_{nt} \geq I_b \quad \Rightarrow \quad I_{nt} = k_1 \cdot I_n$$

where  $I_{nt}$  represents the maximum current loaded by a busbar for an indefinite time at the specified room temperature.

### JOULE EFFECT LOSSES

Losses due to the Joule effect are essentially caused by the electrical resistance of the busbar. Lost energy is transformed into heat and contributes to the heating of the conduit.

#### Three-phase rating

$$P = 3 \cdot R_t \cdot I_b^2 \cdot 10^{-3} [W/m]$$

#### Single phase rating

$$P = 2 \cdot R_t \cdot I_b^2 \cdot 10^{-3} [W/m]$$

### VOLTAGE DROP

If the length of the line is particularly long (>100m) it is necessary to check the voltage drop (hereinafter specified as v.d.). If the installation is a three phase system and the power factor is not lower than  $\cos\varphi = 0.7$  the v.d. may be calculated with the coefficients of the voltage drop specified in the technical data table.

$$\Delta v\% = b \cdot \frac{k \cdot I_b \cdot L}{V_n} \cdot 100$$

defined

- $I_b$  = the current that supplies the busbar [A]
- $V_n$  = the voltage power supply of the busbar [V]
- $L$  = the length of the busbar [m]
- $\Delta v\%$  = the voltage drop percentage
- $b$  = the distribution factor of the current [..]
- $k$  = corresponding voltage drop factor a  $\cos\varphi$  [V/m/A] (see technical data table)

The current distribution factor "b" depends on how the circuit is fed and on the distribution of the electric loads along the busbar:

$b=2$	supplies at one end and load at the end of the line	
$b=1$	supplies at one end and with load evenly distributed	
$b=0.5$	supplies at both ends and with load evenly distributed	
$b=0.5$	central supply with loads at both ends	
$b=0.25$	central supply with load distributed evenly	

ex: MR 160

$I_b = 80A$  operating current

$b=1$  supply from one end

$k=0.608$  see technical data table

$\cos\varphi = 0.85$

$L = 100m$  line length

$V_n = 400V$  operating voltage

$$\Delta v\% = b \cdot \frac{k \cdot I_b \cdot L}{V_n \cdot 10^3} \cdot 100 =$$

$$\frac{0.608 \cdot 80 \cdot 100}{400 \cdot 10^3} \cdot 100 = 1.22\%$$

### SHORT-CIRCUIT CURRENT

The short circuit current value  $I_{cw}$  that can be supported by our busbar trunking systems allows for both electrodynamic stress and thermal energy dissipated during the fault. The busbars must be able to sustain the short circuit current for the entire duration of the fault - i.e. for the time required for the protective device (circ. breaker) to start operating, cutting off the metal continuity and extinguishing the electric arc.