



Legrand Group Belgium
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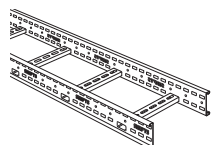
SWIFTS Kabelladder industrie

H100 - H125
H150

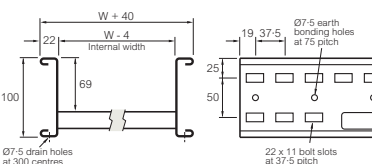
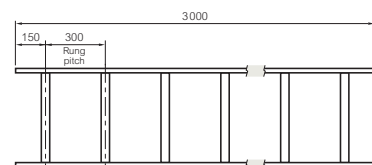
150 - 1000 mm

3 - 6 m

SPORTAFSTAND:
300 mm



Ref.: ZL200G



Hoogte 100 - Medium duty Topaz

Breedte (mm)	Hoogte (mm)	Sportafstand (mm)	Gewicht (Kg)	Ref.	Ref.	Ref.	Ref.
				GC		316L	
			Lengte 3 m	Lengte 3 m	Lengte 6 m	Lengte 3 m	Lengte 6 m
150	100	300	12,000	ZL150G	ZL150G6M	ZL150S	ZL150S6M
200	100	300	12,538	ZL200G	ZL200G6M	ZL200S	ZL200S6M
300	100	300	13,352	ZL300G	ZL300G6M	ZL300S	ZL300S6M
400	100	300	14,572	ZL400G	ZL400G6M	ZL400S	ZL400S6M
450	100	300	14,836	ZL450G	ZL450G6M	ZL450S	ZL450S6M
500	100	300	15,805	ZL500G	ZL500G6M	ZL500S	ZL500S6M
600	100	300	16,854	ZL600G	ZL600G6M	ZL600S	ZL600S6M

MATERIAALSOORTEN

EZ Elektrolytisch verzinkt
Norm EN ISO 2081

GS Sendzimir verzinkt
Norm EN 10346

RAL 2202 Poedercoat (gelakt)

GC Thermisch verzinkt
Norm EN ISO 1461

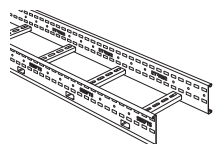
DC Geomet bescherming

304L RVS 304 L (Inox)
Norm EN 10088-2

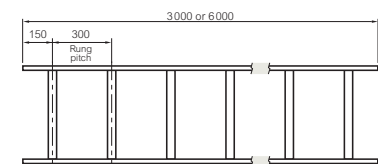
316L RVS 316 L (Inox)
Norm EN 10088-2

GEM. Gemenied

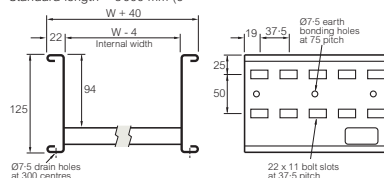
ALU Aluminium



Ref.: PL200G

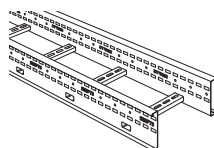


Standard length = 3000 mm (6

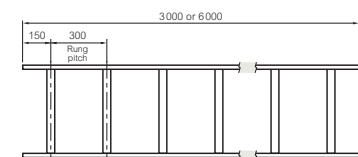


Hoogte 125 - Heavy duty Sapphire

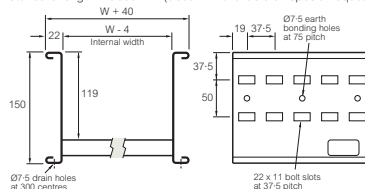
Breedte (mm)	Hoogte (mm)	Sportafstand (mm)	Gewicht (Kg)	Ref.	Ref.	Ref.	Ref.
				GC		316L	
			Lengte 3 m	Lengte 3 m	Lengte 6 m	Lengte 3 m	Lengte 6 m
150	125	300	13,688	PL150G	PL150G6M	PL150S	PL150S6M
200	125	300	14,226	PL200G	PL200G6M	PL200S	PL200S6M
300	125	300	15,040	PL300G	PL300G6M	PL300S	PL300S6M
400	125	300	15,854	PL400G	PL400G6M	PL400S	PL400S6M
450	125	300	16,261	PL450G	PL450G6M	PL450S	PL450S6M
500	125	300	17,552	PL500G	PL500G6M	PL500S	PL500S6M
600	125	300	18,542	PL600G	PL600G6M	PL600S	PL600S6M
750	125	300	21,977	PL750G	PL750G6M	PL750S	PL750S6M
800	125	300	22,602	PL800G	PL800G6M	PL800S	PL800S6M
900	125	300	23,853	PL900G	PL900G6M	PL900S	PL900S6M
1000	125	300	25,104	PL1000G	PL1000G6M	PL1000S	PL1000S6M



Ref.: EL200G



Standard length = 3000 mm (6000 mm available on special request)

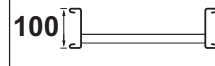


Hoogte 150 - Extra heavy duty Emerald

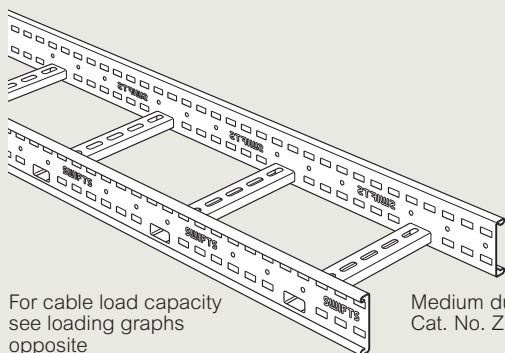
Breedte (mm)	Hoogte (mm)	Sportafstand (mm)	Gewicht (Kg)	Ref.	Ref.	Ref.	Ref.
				GC		316L	
			Lengte 3 m	Lengte 3 m	Lengte 6 m	Lengte 3 m	Lengte 6 m
150	150	300	20,635	EL150G	EL150G6M	EL150S	EL150S6M
200	150	300	20,820	EL200G	EL200G6M	EL200S	EL200S6M
300	150	300	21,449	EL300G	EL300G6M	EL300S	EL300S6M
400	150	300	22,265	EL400G	EL400G6M	EL400S	EL400S6M
450	150	300	22,670	EL450G	EL450G6M	EL450S	EL450S6M
500	150	300	23,961	EL500G	EL500G6M	EL500S	EL500S6M
600	150	300	24,951	EL600G	EL600G6M	EL600S	EL600S6M
750	150	300	28,386	EL750G	EL750G6M	EL750S	EL750S6M
800	150	300	29,010	EL800G	EL800G6M	EL800S	EL800S6M
900	150	300	30,262	EL900G	EL900G6M	EL900S	EL900S6M
1000	150	300	31,513	EL1000G	EL1000G6M	EL1000S	EL1000S6M

Bovenstaande artikelnummers zijn standaard beschikbaar. Voor afwijkende kleuren, lengtes, breedtes of vormen (bijvoorbeeld afwijkend perforatiepatroon) informeer voor mogelijkheden bij Salesupport van Legrand.

Swifts® straight lengths medium duty (Topaz)



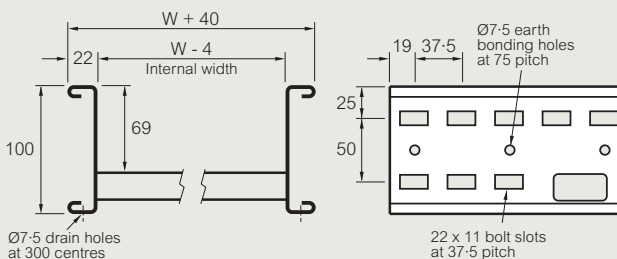
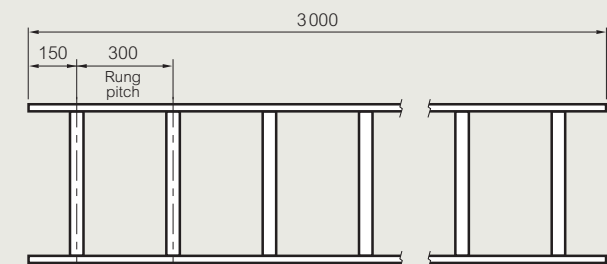
■ Dimensions and weights



For cable load capacity
see loading graphs
opposite

Medium duty (Topaz)
Cat. No. ZL **W F**

Dimensions



Weights

Width (W)	Cat. Nos.	Weight (kg)
150	ZL 150 F	12.1
300	ZL 300 F	13.4
450	ZL 450 F	14.6
600	ZL 600 F	16.9
750	ZL 750 F	20.3
900	ZL 900 F	22.2

All weights given are in kilograms (kg) and are for a 3 m straight length in hot dip galvanised G finish
To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :
Deep galvanised (D) x 1.07
Stainless steel (S) x 0.94
Powder coated (E) x 0.97

Gauge

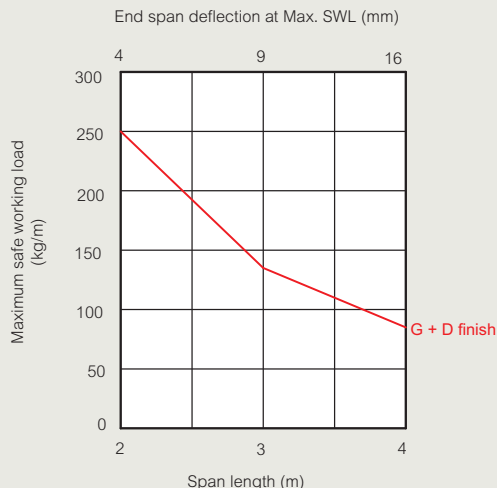
Standard side rail = 1.5 mm

Key : Replace the letter shown in red with your choice from the following options :

F = Finish : **G** (hot dip galvanised after manufacture)
D (deep galvanised)
S (stainless steel)
E (powder coated)

■ Loading graphs

Load tests carried out to BS EN 61537 test type 1 (safety factor 1.7+ and joint in middle of span) or test type 4 (safety factor 1.7+ and joint in middle of span with rung slot over support)
Load tests carried out over 2 m, 3 m and 4 m spans using 3 m lengths
Safe working load should include all cable loads and any other additional loads (e.g. wind, snow)
When installed, inner span deflection will vary depending on joint positions but will typically be about half of test end span deflection shown below



Graph showing safe working load vs span with deflections shown at SWL

■ Finishes

Standard stocked finish :

G Hot dip galvanised after manufacture to BS EN ISO 1461 : 2009

Additional finishes :

- D** Deep galvanised high silicon steel made from BS EN 10025-5 : 2004 Grade S355JOWP
- S** Stainless steel to BS EN 10088 – 2 grade 1.4404 (equivalent to 316L31)
Pickle and passivation is available to special order
- E** Powder coated (to customer's specification)



Sheared steel (particularly stainless steel) does have relatively sharp edges and protective gloves must be worn during handling

All dimensions (mm) are nominal

→ Rung details : see p. 6

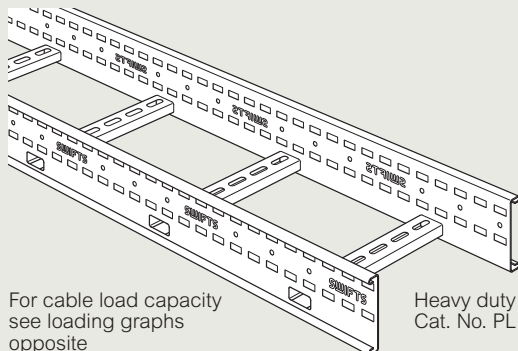
→ Coupler sets : see p. 7-13

Swifts® straight lengths

heavy duty (Sapphire)

125

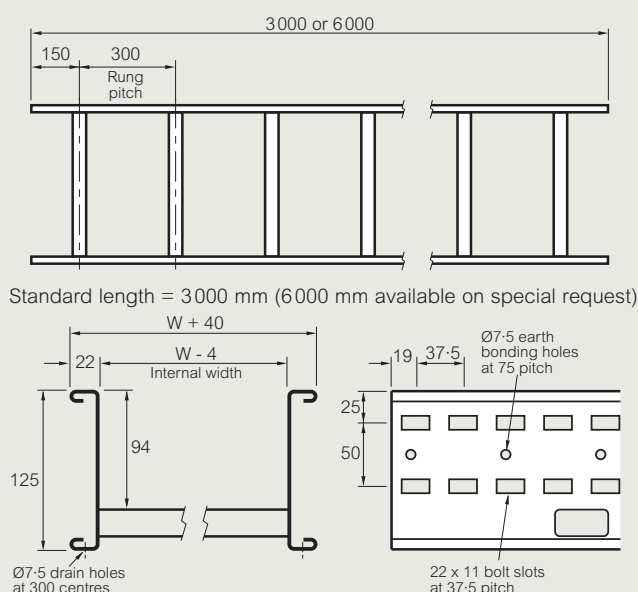
■ Dimensions and weights



For cable load capacity
see loading graphs
opposite

Heavy duty (Sapphire)
Cat. No. PL **W F**

Dimensions



Weights

Width (W)	Cat. Nos.	Weight (kg)
150	PL 150 F	13.8
300	PL 300 F	15.0
450	PL 450 F	16.3
600	PL 600 F	18.5
750	PL 750 F	22.0
900	PL 900 F	23.9

All weights given are in kilograms (kg) and are for a 3 m straight length in hot dip galvanised G finish

To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :

Deep galvanised (D)	x 1.07
Stainless steel (S)	x 0.94
Powder coated (E)	x 0.97

Gauge

Standard side rail = 1.5 mm
Non-standard side rail = 2.0 mm

Key : Replace the letter shown in red with your choice from the following options :

F = Finish : **G** (hot dip galvanised after manufacture)
D (deep galvanised)
S (stainless steel)
E (powder coated)

■ Loading graphs

Load tests carried out to BS EN 61537 test type 1 (safety factor 1.7+ and joint in middle of span) or test type 4 (safety factor 1.7+ and joint in middle of span with rung slot over support)

Load tests carried out over 3 m, 4 m and 5 m spans using 3 m lengths and 6 m spans using 6 m lengths

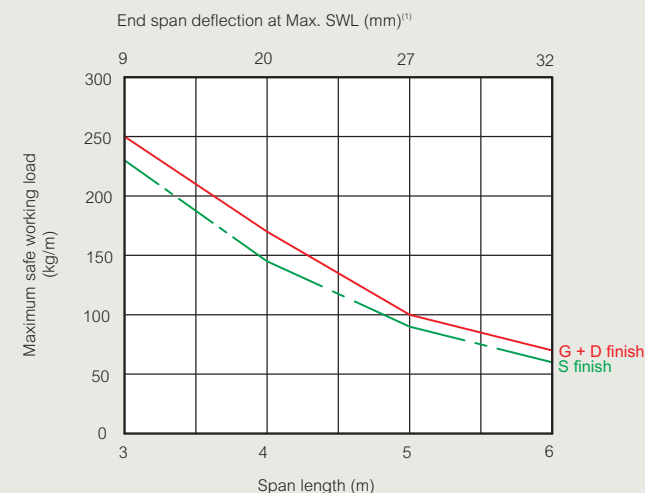
Safe working load should include all cable loads and any other additional loads (e.g. wind, snow)

For spans greater than 5 m : data is for 6 m long ladders only

For spans 5 m and less : data can be used for 3 m or 6 m long lengths

For spans greater than 5 m : ladder is not suitable for use with dynamic loads (e.g. wind, snow)

When installed, inner span deflection will vary depending on joint positions but will typically be about half of test end span deflection shown below



Graph showing safe working load vs span with deflections shown at SWL

(1) Deflections shown for G finish. D and S finish deflections on application, please contact Legrand

■ Finishes

Standard stocked finish :

G Hot dip galvanised after manufacture to BS EN ISO 1461 : 2009

Additional finishes :

D Deep galvanised high silicon steel made from BS EN 10025-5 : 2004 Grade S355JOWP

S Stainless steel to BS EN 10088 - 2 grade 1.4404 (equivalent to 316L31)

Pickle and passivation is available to special order

E Powder coated (to customer's specification)



Sheared steel (particularly stainless steel) does have relatively sharp edges and protective gloves must be worn during handling

All dimensions (mm) are nominal

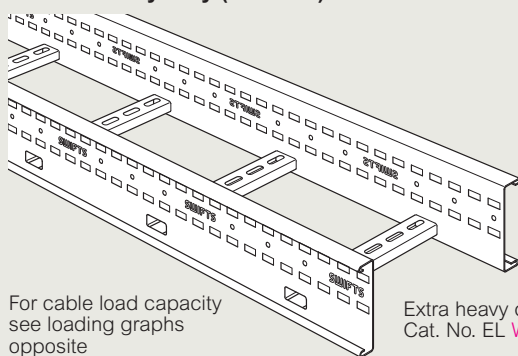
→ Rung details : see p. 6

→ Coupler sets : see p. 7-13

Swifts® straight lengths extra heavy duty (Emerald)

150

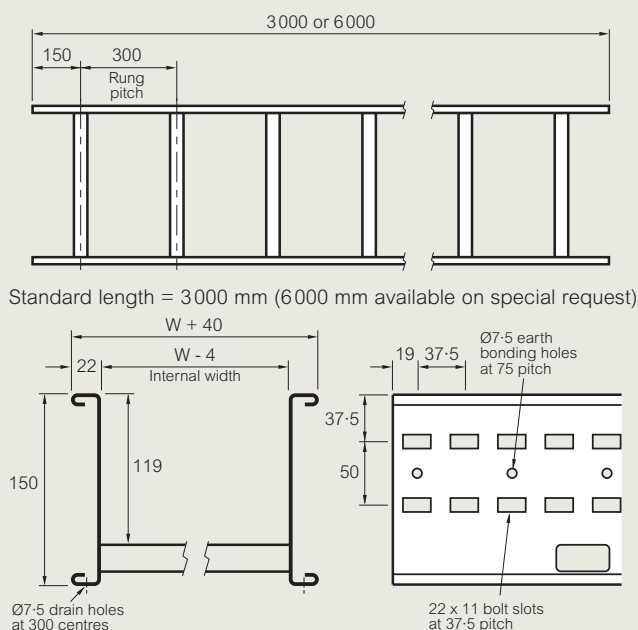
■ Extra heavy duty (Emerald)



For cable load capacity
see loading graphs
opposite

Extra heavy duty (Emerald)
Cat. No. EL **W F**

Dimensions



Weights

Width (W)	Cat. Nos.	Weight (kg)
150	EL 150 F	20.7
300	EL 300 F	22.1
450	EL 450 F	23.5
600	EL 600 F	25.0
750	EL 750 F	28.8
900	EL 900 F	30.8

All weights given are in kilograms (kg) and are for a 3m straight length in hot dip galvanised G finish

To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :

Deep galvanised (D)	x 1.07
Stainless steel (S)	x 0.94
Powder coated (E)	x 0.97

Gauge

Standard side rail = 2.0 mm

Key : Replace the letter shown in red with your choice from the following options :

F = Finish : **G** (hot dip galvanised after manufacture)
D (deep galvanised)
S (stainless steel)
E (powder coated)

■ Loading graphs

Load tests carried out to BS EN 61537 test type 1 (safety factor 1.7+ and joint in middle of span) or test type 4 (safety factor 1.7+ and joint in middle of span with rung slot over support)

Load tests carried out over 3 m, 4 m and 5 m spans using 3 m lengths and 6 m spans using 6 m lengths

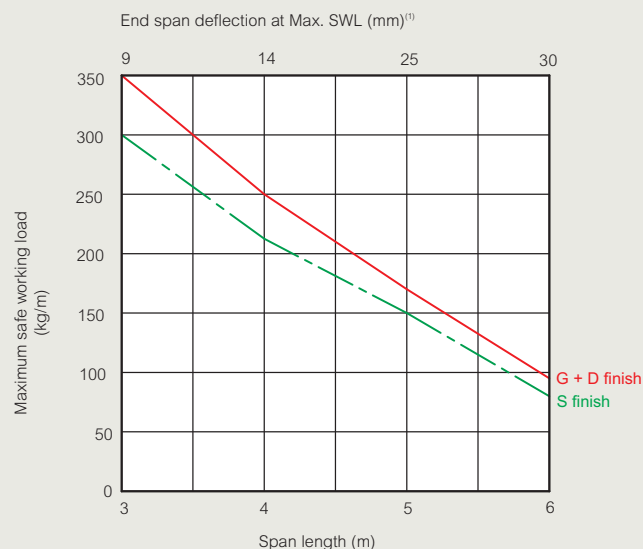
Safe working load should include all cable loads and any other additional loads (e.g. wind, snow)

For spans greater than 5 m : data is for 6 m lengths only

For spans 5 m and less : data can be used for 3 m or 6 m lengths

For spans greater than 5 m : ladder is not suitable for use with dynamic loads (e.g. wind, snow)

When installed, inner span deflection will vary depending on joint positions but will typically be about half of test end span deflection shown below



Graph showing safe working load vs span
with deflections shown at SWL

(1) Deflections shown for G finish. D and S finish deflections on application, please contact Legrand

■ Finishes

Standard stocked finish :

G Hot dip galvanised after manufacture to BS EN ISO 1461 : 2009

Additional finishes :

D Deep galvanised high silicon steel made from BS EN 10025-5 : 2004 Grade S355JOWP

S Stainless steel to BS EN 10088 – 2 grade 1.4404 (equivalent to 316L31)

Pickle and passivation is available to special order

E Powder coated (to customer's specification)



Sheared steel (particularly stainless steel) does have relatively sharp edges and protective gloves must be worn during handling

All dimensions (mm) are nominal

→ Rung details : see p. 6

→ Coupler sets : see p. 7-13

Swifts® cable ladder rungs for straight lengths and fittings

■ Rung details

Type 1 rungs are used as standard

Type 2 and 3 are only available to special order

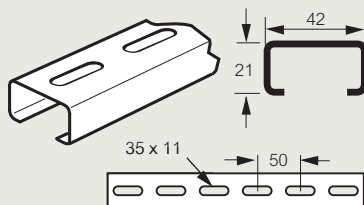
Type 3 is not available in deep galvanised finish

Types 1 and 3 can be supplied in any combination to special order

■ Options and dimensions

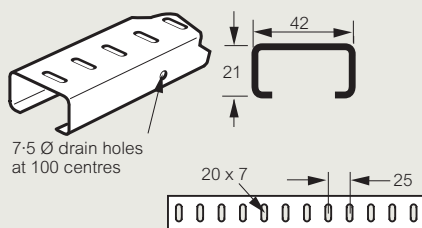
Standard

Type 1

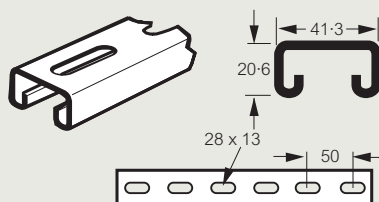


Special order only

Type 2



Type 3



Slot pattern may differ on stainless steel type 3 rungs
Contact Legrand

All dimensions (mm) are nominal

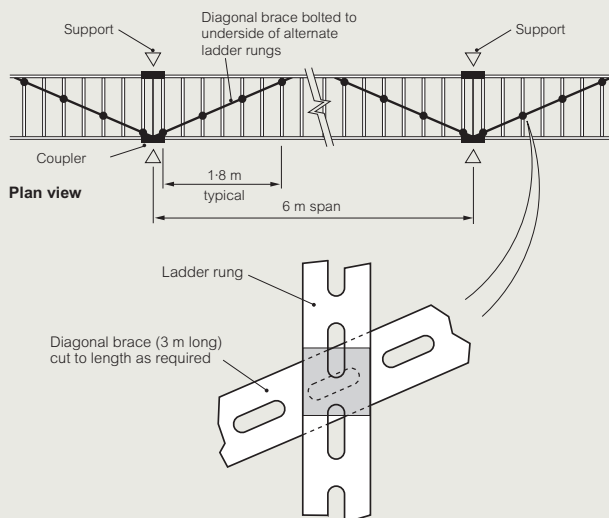
Swifts® cable ladder systems diagonal bracing – straight lengths

■ Diagonal bracing

The effect of lateral loads on spans over 5 m or 6 m can be much reduced by adding diagonal bracing

Bracing is achieved by fitting a ladder Type 1 rung section, cut to length from a 3 m length supplied, diagonally across the underside of the ladder as shown in the illustration below. Diagonal bracing can be fitted to either heavy duty (Sapphire) or extra heavy duty (Emerald) ladders – medium duty (Topaz) is not suited to these long spans

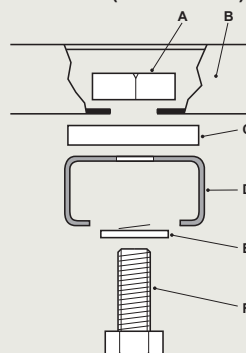
■ Installation (typical)



Couplers are best located over the point of support to provide additional local reinforcement of the ladder side rails. Details on long span installations are given on p. 129

■ Assembly

Fasteners (not included)



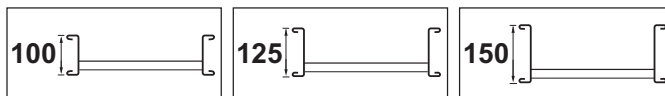
- A M10 Swiftack channel nut (PN 100)
- B Ladder rung
- C 40 x 40 x 6 square washer, Cat. No. SB506/10
- D Diagonal brace (type 1 rung)
- E M10 form A washer
- F M10 x 25 Grade 8.8 setscrew hot dip galvanised

Fastener finishes

For ladders with S finish, fasteners are corrosion resistant stainless Grade A470

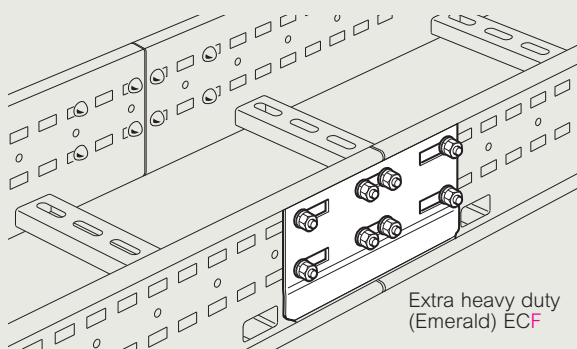
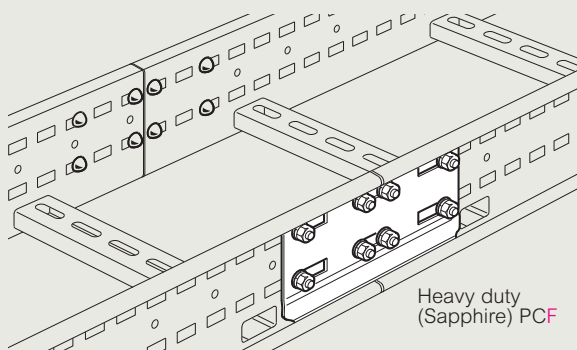
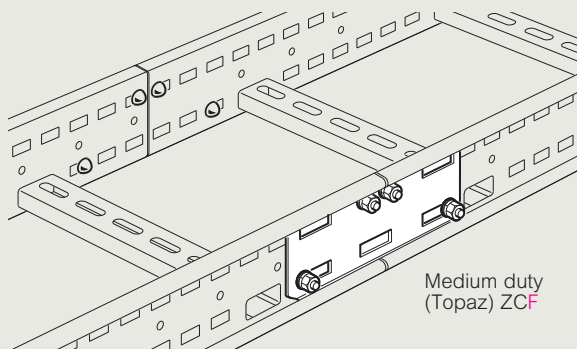
Swifts® cable ladder couplers and fasteners

straight length to straight length couplers



Couplers are used for joining together straight lengths in the medium duty (Topaz), heavy duty (Sapphire) and extra heavy duty (Emerald) ranges
 Fittings in these ranges have integral couplers. See p. 7 for more information
 Even when ladders are cut to length, the slots in the coupler will always align with the slots in the ladder side rail
 Supplied in pairs with the appropriate quantity of fasteners

■ Installation (typical)



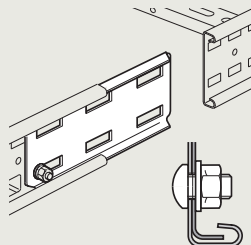
Joggles are formed in the bottom of PC and EC couplers to allow easy installation of ladder cut lengths

Key : Replace the letter shown in red with your choice from the following options :

F = Finish : G (hot dip galvanised after manufacture)
 D (deep galvanised)
 S (stainless steel)
 E (powder coated)

■ Assembly

Slide the couplers under the return flanges of one ladder side rail and loosely fit a single fastener to each coupler to hold it in place
 Slide the second ladder over both couplers, adjust each coupler position to align the slots with the side rail slots and secure with all fasteners



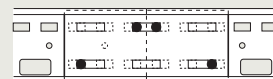
Note

Bolts should be inserted through the side rail first
 For location of coupler and position of fasteners, see below

Fastener positioning

Medium duty (Topaz)

Supplied in pairs, with fasteners (4 per coupler)



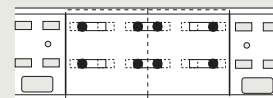
When bolting to cut ends adjust coupler to ensure 4 bolts can be inserted

Note

When connecting straight lengths to straight lengths even when ladder is cut to length, the slots in the coupler will always align with slots in the ladder side rail

Heavy duty (Sapphire) and extra heavy duty (Emerald)

Supplied in pairs, with fasteners (8 per coupler)



When bolting to cut ends adjust coupler to ensure 8 bolts can be inserted

Note

When connecting straight lengths to straight lengths even when ladder is cut to length, the slots in the coupler will always align with slots in the ladder side rail

	Topaz	Ladder range	
		Sapphire	Emerald
Cat. Nos.	ZCF	PCF	ECF
Quantity of fasteners per coupler	4	8	8

When connecting straight lengths to fittings, use fastener sets, see p. 44

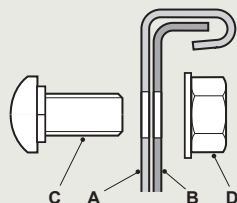
For additional types of straight length to straight length couplers and fasteners, see p. 7-13

All dimensions (mm) are nominal

→ Finishes and standards : see p. 14-16

■ Assembly (continued)

Fasteners (included)



- A Side rail
- B Coupler
- C M10 x 20 coachbolt
- D M10 flange nut

**Recommended Torque
Setting (M10): 40Nm**

Fastener finishes

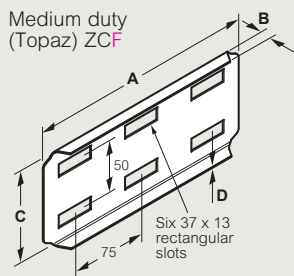
For ladders with G, D and E finishes, fasteners are high tensile Grade 8.8 hot dip galvanised

For ladders with S finish, fasteners are corrosion resistant stainless Grade A470

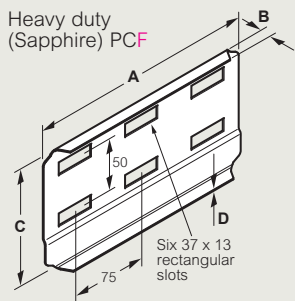
An alternative material for fasteners may be required depending on the installation environment - contact Legrand

■ Dimensions and weights

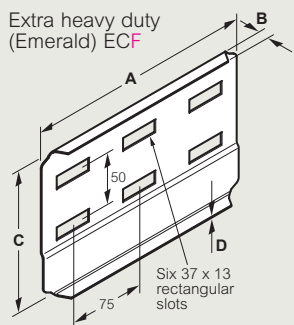
Medium duty
(Topaz) ZCF



Heavy duty
(Sapphire) PCF



Extra heavy duty
(Emerald) ECF



Cat. Nos.	A	B	C	D	Weight (kg)
ZCF	220	13	95	1.5	0.6
PCF	220	13	119	2.0	1.0
ECF	220	13	144	2.0	1.2

Weights

All weights given are in kilograms (kg) and are for a pair of couplers in hot dip galvanised G finish

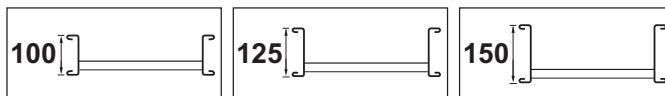
To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :

- Deep galvanised (D) x 1.07
- Stainless steel (S) x 0.94
- Powder coated (E) x 0.97

All dimensions (mm) are nominal

Swifts® cable ladder couplers and fasteners

flexible expansion couplers



Flexible expansion couplers can be used to :

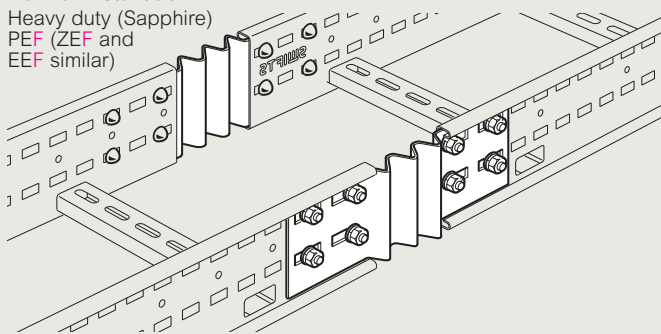
- provide a semi-flexible joint where ladder runs span separate structures between which some relative movement is possible
- provide compensation for changes in the length of a straight cable ladder run due to temperature variations

Supplied in pairs with fasteners

■ Installation (typical)

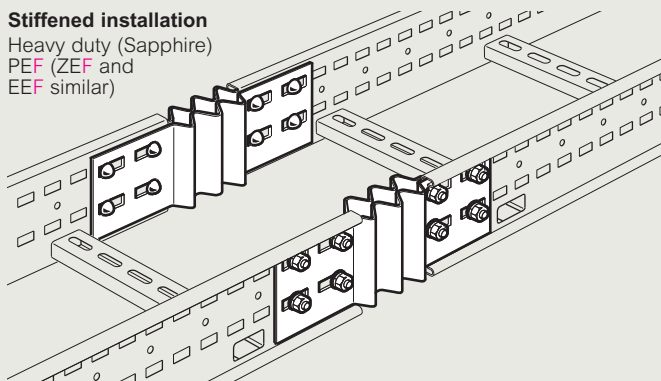
Normal installation

Heavy duty (Sapphire)
PEF (ZEF and
EEF similar)



Stiffened installation

Heavy duty (Sapphire)
PEF (ZEF and
EEF similar)



Flexible expansion couplers should normally be installed with the ridges facing outward, away from the bed of the ladder. If necessary, the stiffness of each joint can be increased by mounting pairs of couplers back-to-back (with one set of ridges facing inwards and the other set facing outwards as shown above) on either side of the cable ladder. The allowance for differential movement remains unchanged (see below)

Note

Rigid support for the cable ladder should be provided on both sides adjacent to each joint

■ Assembly

Each joint formed by flexible expansion couplers provides for up to 10 mm of linear movement between the two adjacent ladders

To calculate the ideal distance between flexible expansion coupler installations use the formula : $L = \frac{K_S}{T}$

Where : L = distance between flexible expansion couplers, in metres
K_S = 909 for mild steel, 625 for stainless steel
T = temperature range (in °C) for which allowance is to be made

Note

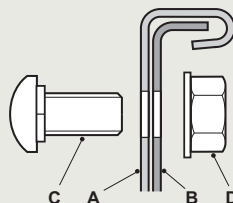
Coefficients of linear expansion : mild steel = $11 \times 10^{-6}/^{\circ}\text{C}$
stainless steel = $16 \times 10^{-6}/^{\circ}\text{C}$

Key : Replace the letter shown in red with your choice from the following options :

F = Finish : G (hot dip galvanised after manufacture)
D (deep galvanised)
S (stainless steel)
E (powder coated)

■ Assembly (continued)

Fasteners (included)



- A Side rail
- B Coupler
- C M10 x 20 coachbolt
- D M10 flange nut

Recommended Torque Setting (M10): 40Nm

Fastener finishes

For ladders with G, D and E finishes, fasteners are high tensile Grade 8.8 hot dip galvanised

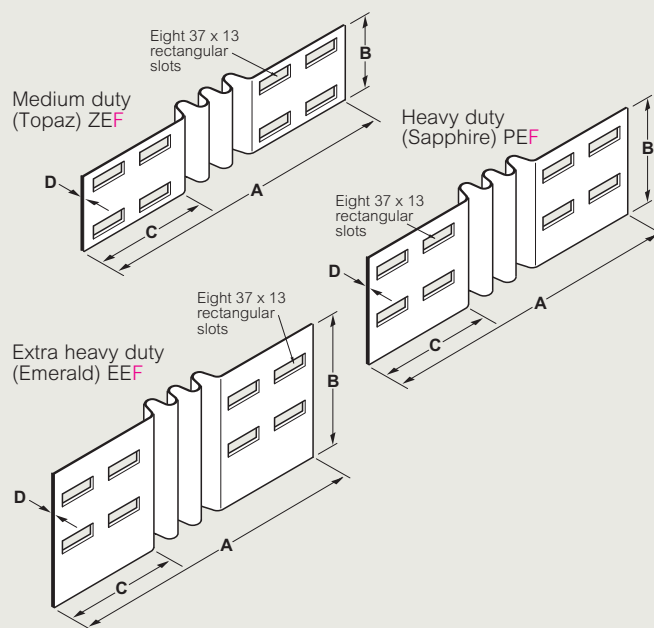
For ladders with S finish, fasteners are corrosion resistant stainless Grade A470

An alternative material for fasteners may be required depending on the installation environment - contact Legrand

	Topaz	Ladder range	
		Sapphire	Emerald
Cat. Nos.	ZEF	PEF	EEF
Quantity of fasteners per coupler ⁽¹⁾	4	8	8

(1) for normal installation, or per pair (each side) for stiffened installation

■ Dimensions and weights



Cat. Nos.	A	B	C	D	Weight (kg)
ZEF	320	84	113.0	1.0	0.6
PEF	317	115	111.5	1.5	1.1
EEF	317	138	111.5	1.5	1.4

Weights

All weights given are in kilograms (kg) and are for a pair of couplers in hot dip galvanised G finish

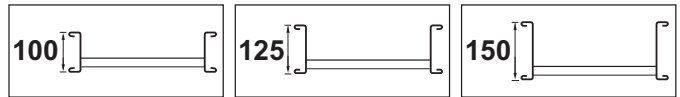
To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :

Deep galvanised (D) x 1.07
Stainless steel (S) x 0.94
Powder coated (E) x 0.97

All dimensions (mm) are nominal

→ **Finishes and standards : see p. 14-16**

Swifts® cable ladder couplers and fasteners bendable connectors



Bendable connectors can be used for :

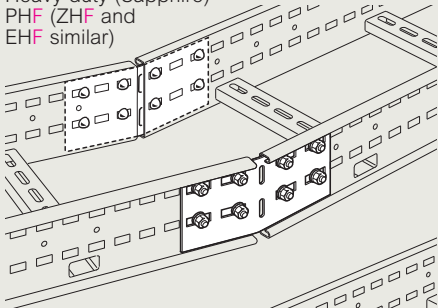
- a. fabricating fittings on site from cut lengths of cable ladder
- b. reducing width of a run to the next size down when a properly manufactured reducer is not available
- c. correcting minor mis-alignment problems
- d. coupling lengths of ladder to form articulated bends

Bendable connectors are supplied in pairs with fasteners

■ Installation (typical)

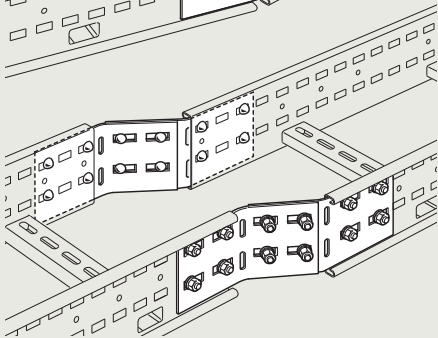
Heavy duty (Sapphire)
PHF (ZHF and
EHF similar)

Bending the run

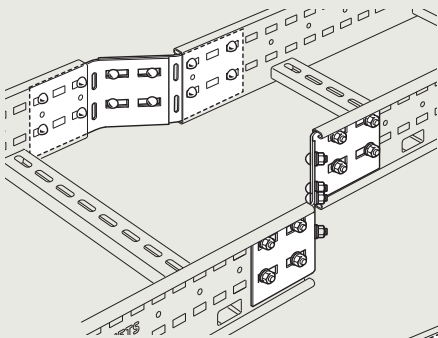


Bending the run

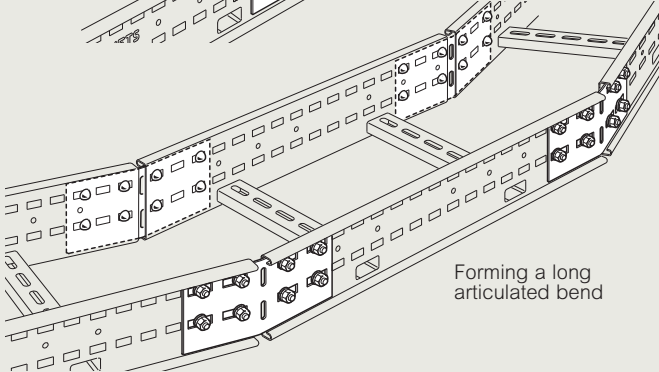
Re-aligning the run



Reducing width of run



Forming a long articulated bend



Note

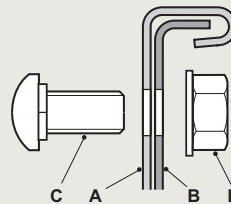
Rigid support for the cable ladder should be provided on both sides adjacent to each joint

Key : Replace the letter shown in red with your choice from the following options :

F = Finish : G (hot dip galvanised after manufacture)
D (deep galvanised)
S (stainless steel)
E (powder coated)

■ Assembly

Fasteners (included)



- A Side rail
- B Coupler
- C M10 x 20 coachbolt
- D M10 flange nut

Recommended Torque Setting (M10): 40Nm

Fastener finishes

For ladders with G, D and E finishes, fasteners are high tensile Grade 8.8 hot dip galvanised

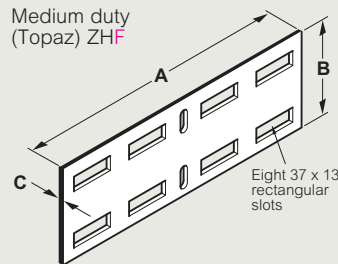
For ladders with S finish, fasteners are corrosion resistant stainless Grade A470

An alternative material for fasteners may be required depending on the installation environment - contact Legrand

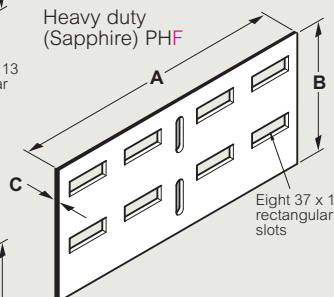
Cat. Nos.	Ladder range		
	Topaz	Sapphire	Emerald
	ZHF	PHF	EHF
Quantity of fasteners per connector	4	8	8
per additional connector	2	4	4

■ Dimensions and weights

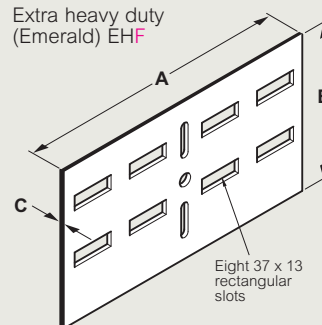
Medium duty
(Topaz) ZHF



Heavy duty
(Sapphire) PHF



Extra heavy duty
(Emerald) EHF



Eight 37 x 13 rectangular slots

Eight 37 x 13 rectangular slots

Eight 37 x 13 rectangular slots

Cat. Nos.	A	B	C	Weight (kg)
ZHF	250	84	1.5	0.5
PHF	250	115	1.5	0.7
EHF	250	140	1.5	0.8

Weights

All weights given are in kilograms (kg) and are for a pair of couplers in hot dip galvanised G finish

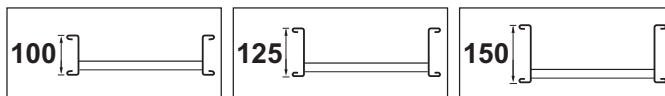
To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :

- Deep galvanised (D) x 1.07
- Stainless steel (S) x 0.94
- Powder coated (E) x 0.97

All dimensions (mm) are nominal

→ Straight lengths : see p. 14-16

Swifts® cable ladder couplers and fasteners vertical hinged connectors



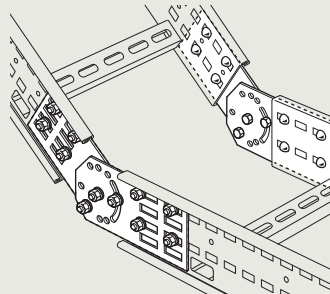
Vertical hinged connectors can be used for :

- fabricating fittings on site from cut lengths of cable ladder
- solving minor vertical mis-alignment problems
- coupling articulated risers to adjacent ladders

Supplied in sets comprising four plates and fasteners

■ Installation (typical)

Heavy duty (Sapphire)
PVF (ZVF and EVF
similar)



■ Assembly

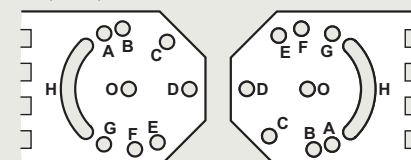
Vertical hinged connectors can either be connected together to form pre-set angles or pre-assembled for adjustment in situ

Assembly to a pre-set angle

- identify the correct outer fixing holes for the required pre-set angle (see table and illustration below)
- insert a fastener through the identified holes in both plates and fit a locking washer and nut but do not fully tighten
Do not insert fasteners through the centre hole first, this makes identification of the outer holes very difficult
- move the two connectors to align the centre holes. Insert a fastener through the holes and fit a locking washer and nut **but do not fully tighten**
- insert a third fastener through a slot in one connector and an aligning hole in the other. Fit a locking washer and nut
- tighten all fasteners

Cat. Nos.	15°	18°	22.5°	30°	45°
ZVF, PVF, EVF	G : C	A : F	E : B	B : G	F : C

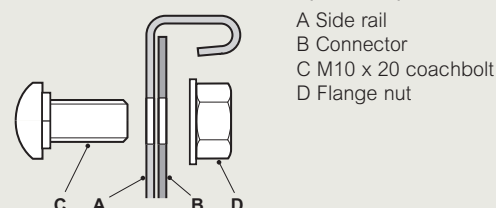
ZVF, PVF, EVF



Pre-assembly for adjustment in-situ

- insert a fastener through the outer hole of both connectors. Fit a locking washer and nut and tighten sufficiently to hold the assembly together while it is carried to the installation position
- fit the assembly to the installed ladders
- insert a second fastener through the slot in one connector and an aligning hole and fit a locking washer and nut
- if possible, insert a third fastener through either the alternate slot and an aligning hole, or two aligning holes. Fit a locking washer and nut
- tighten all fasteners

Connector to ladder fasteners (included)



- A Side rail
B Connector
C M10 x 20 coachbolt
D Flange nut

Key : Replace the letter shown in red with your choice from the following options :

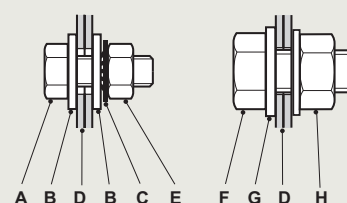
F = Finish : **G** (hot dip galvanised after manufacture)
D (deep galvanised)
S (stainless steel)
E (powder coated)

■ Assembly (continued)

Connector to connector fasteners (included)

ZVF

PVF, EVF



- A M6 x 16 setscrews
B M6 washer
C M6 shakeproof washer
D Connector
E M6 nut
F M10 x 20 setscrews
G M10 form A washer
H Flange nut

Recommended Torque

Setting (M10): 40Nm

Fastener finishes

For ladders with G and D finishes, fasteners are high tensile Grade 8.8

For ladders with S finish, fasteners are corrosion resistant stainless Grade A470

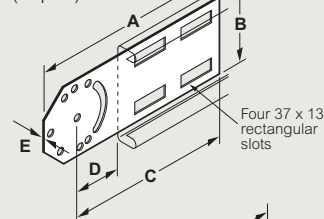
For ladders with E finish, the fasteners are Grade 8.8 hot dip galvanised

An alternative material for fasteners may be required depending on the installation environment - contact Legrand

	Topaz	Ladder range	
		Sapphire	Emerald
Cat. Nos.	ZVF	PVF	EVF
Quantity of fasteners per connector to ladder	2 x M10	4 x M10	4 x M10
per connector to connector	3 x M6	3 x M10	3 x M10

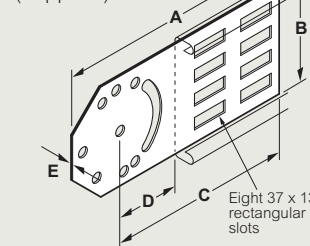
■ Dimensions and weights

Medium duty
(Topaz) ZVF



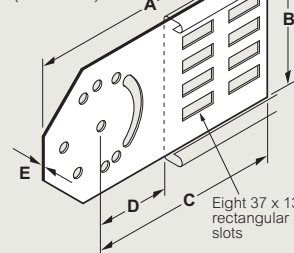
Four 37 x 13 rectangular slots

Heavy duty
(Sapphire) PVF



Eight 37 x 13 rectangular slots

Extra heavy duty
(Emerald) EVF



Eight 37 x 13 rectangular slots

Cat. Nos.	A	B	C	D	E	Weight (kg)
ZVF	212	80	172.0	50.0	1.5	0.8
PVF	250	115	192.5	71.0	2.0	1.5
EVF	270	140	201.0	79.5	2.0	2.0

Weights

All weights given are in kilograms (kg) and are for a set of four plates in hot dip galvanised G finish

To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :

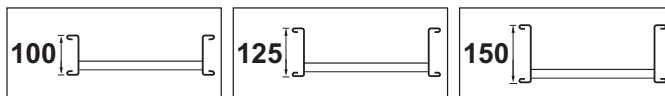
Deep galvanised (D) x 1.07
Stainless steel (S) x 0.94
Powder coated (E) x 0.97

All dimensions (mm) are nominal

→ Finishes and standards : see p. 14-16

Swifts® cable ladder couplers and fasteners

integral fitting couplers and fitting to fitting couplers



■ Integral fitting couplers

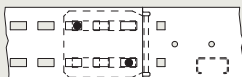
All ladder fittings have integral couplers
For straight length to fitting connections, see below
For fitting to fitting connections, see opposite

■ Assembly

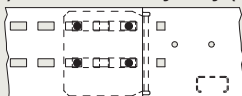
For straight length to fitting connections, use fasteners sets, see table below for number of fasteners required per fitting type
For fitting to fitting couplers, see opposite

Fastener positioning

Medium duty (Topaz)



Heavy duty (Sapphire) and extra heavy duty (Emerald)



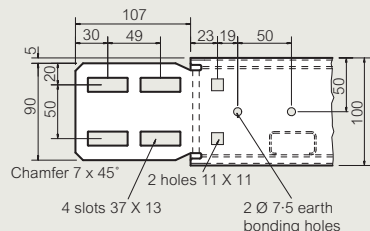
Fastener sets comprise 50 of each of the following : M10 coach bolt and flange nut

Number of fasteners required per fitting type	Topaz	
	Topaz	Sapphire and Emerald
Flat bends	8	16
Inside / outside risers	8	16
Reducers	8	16
Tees	12	24
4 way crosspieces	16	32

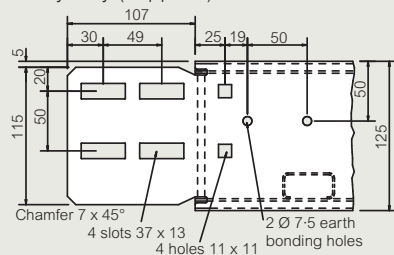
Fastener detail and finishes, see opposite

■ Dimensions

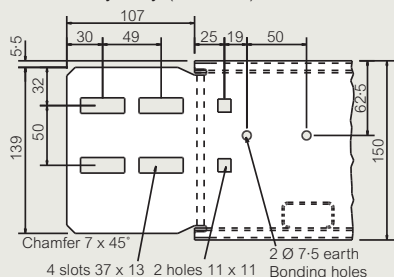
Medium duty (Topaz) end detail



Heavy duty (Sapphire) end detail



Extra heavy duty (Emerald) end detail

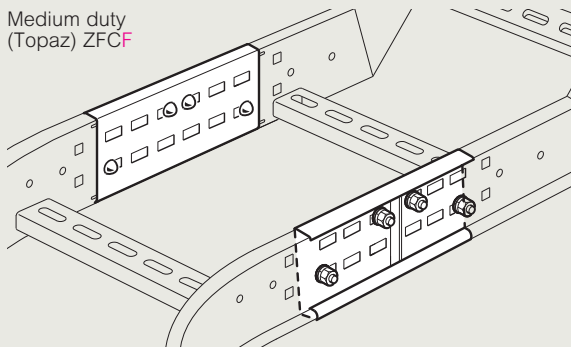


■ Fitting to fitting couplers

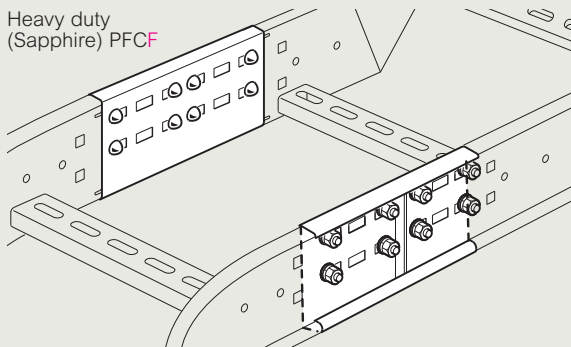
Fitting to fitting couplers are used for joining together cable ladder fittings (bends, tees, risers etc) in the medium duty (Topaz), heavy duty (Sapphire) and extra heavy duty (Emerald) ranges. Fittings in these ranges have integral couplers. See opposite for more information.
Supplied in pairs with the appropriate quantity of fasteners

■ Installation (typical)

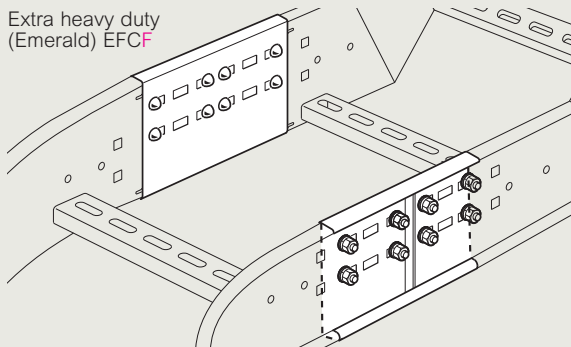
Medium duty
(Topaz) ZFCF



Heavy duty
(Sapphire) PFCF



Extra heavy duty
(Emerald) EFCF



Key : Replace the letter shown in red with your choice from the following options :

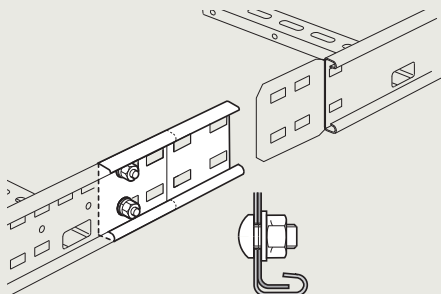
F = Finish : G (hot dip galvanised after manufacture)
D (deep galvanised)
S (stainless steel)
E (powder coated)

All dimensions (mm) are nominal

→ Finishes and standards : see p. 14-16

■ Assembly

Slide the couplers under the return flanges of one ladder side rail and loosely fit a single fastener to each coupler to hold it in place. Slide the second ladder over both couplers, adjust each coupler position to align the slots with the side rail slots and secure with all fasteners.



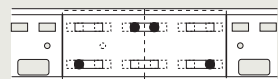
Note

For location of coupler and position of fasteners, see below

Fastener positioning

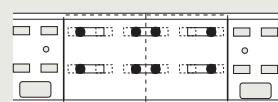
Medium duty (Topaz)

Supplied in pairs, with fasteners (4 per coupler)



Heavy duty (Sapphire) and extra heavy duty (Emerald)

Supplied in pairs, with fasteners (8 per coupler)

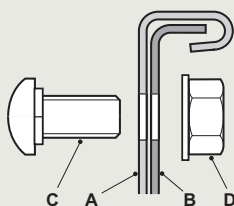


	Topaz	Ladder range	
		Sapphire	Emerald
Cat. Nos.	ZFCF	PFCF	EFCF
Quantity of fasteners per coupler	4	8	8

Note

When connecting straight lengths to fittings, use fastener sets, see opposite

Fasteners (included)



- A Side rail
- B Coupler
- C M10 x 20 coachbolt
- D M10 flange nut

Recommended Torque Setting (M10): 40Nm

Fastener finishes

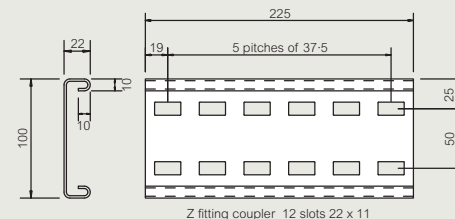
For ladders with G, D and E finishes, fasteners are high tensile Grade 8.8 hot dip galvanised

For ladders with S finish, fasteners are corrosion resistant stainless Grade A470

An alternative material for fasteners may be required depending on the installation environment - contact Legrand

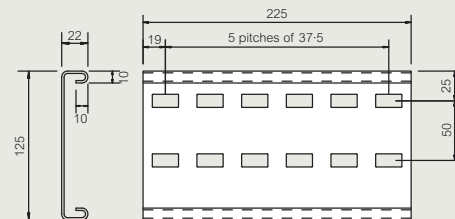
■ Dimensions and weights

Medium duty (Topaz) ZFCF



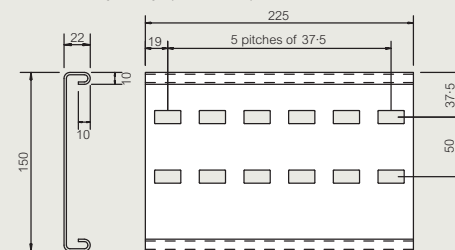
Z fitting coupler 12 slots 22 x 11

Heavy duty (Sapphire) PFCF



P fitting coupler 12 slots 22 x 11

Extra heavy duty (Emerald) EFCF



E fitting coupler 12 slots 22 x 11

Cat. Nos.	Weight (kg)
ZFCF	0.6
PFCF	1.1
EFCF	1.4

Weights

All weights given are in kilograms (kg) and are for a pair of couplers in hot dip galvanised G finish

To obtain the appropriate component weight in other finishes, multiply the given weight by the following factors :

- Deep galvanised (D) x 1.07
- Stainless steel (S) x 0.94
- Powder coated (E) x 0.97

Finishes

IN THIS SECTION...

1. British standards
2. Hot dip galvanised (G) = thermisch verzinkt
3. Deep galvanised (D)
4. Pre-galvanised (PG) = sendzimir verzinkt
5. Stainless steel (S)
6. Powder coated (E)

1 British standards

Legrand ensures that all of the materials used during the construction and finishing of their products conform to the relevant standards.

In particular, the relevant standards for steel are :

Finish	Product	Current standard/grade
G	Ladder less than 1.5mm thick	BS EN 10130 : 2006 Grade DC01
G	Ladder 1.5mm and thicker	BS EN 10111 : 1998 Grade 1.0332 / BS EN 10025 : 2004 Grade S275JRC
G	Swiftrack channel	BS EN 10025 : 1993 Grade S235JRC (Ys = 250N/mm ² min)
G	Swiftrack brackets	BS EN 10025 : 2004 Grade S275JRC
PG	Swiftrack channel	BS EN 10346 : 2009 Grade S250GD + Z275
D	Ladder	BS EN 10025-5 : 2004 Grade S355JOWP
S	Ladder and Swiftrack	BS EN 10088 : 2005 Grade 1.4404 (equivalent to S316L31)

Finishes :

G = hot dip galvanised after manufacture

PG = pre-galvanised

D = deep galvanised

S = stainless steel

E = powder coated

2 Hot dip galvanised (G)

Hot dip galvanising after manufacture is an excellent, economical protective finish used on support systems in many industrial and commercial applications.

Background

The galvanised coating is applied as a final manufacturing process by immersing a steel component (after various pre-treatments) in a large bath of molten zinc; the zinc forms an alloy with the steel substrate and protects the steel from corrosion in two ways.

Firstly, the zinc coating surrounds the base steel with a total, tough physical barrier preventing corrosion of the steel by the surrounding atmosphere. Secondly, if steel does become exposed, e.g. at a cut edge, the zinc coating acts as a sacrificial anode and will be gradually corroded in preference to the underlying steel. Corrosion products from the zinc will also be deposited onto the steel, effectively re-sealing the surface and maintaining the integrity of the barrier.

The life of a zinc coating is directly proportional to its thickness but in different environments this life does vary. However because hot dip galvanising has been used for many years its life in diverse environments has been well established. The most comprehensive guide to the design life of protective systems in different environments is contained in BS EN ISO 12944-5 : 2007 'Paints and varnishes' and BS EN ISO 14713 : 2009 'Parts 1 + 2 - zinc coatings'. In the presence of certain atmospheric pollutants (such as sulphur dioxide in industrial areas) or when installed in an aggressive coastal or marine environment the rate of dissipation of the zinc will be accelerated; however in most situations hot dip galvanising remains an extremely effective and economical corrosion resistant finish.

Specification

BS EN ISO 1461 provides the specification for a hot dip galvanised coating. Heavier gauges of steel will usually take up a thicker coating of zinc than lighter gauges so the standard defines the coating for different steel gauges in terms of the weight of zinc per square metre of surface area. Ensuring compliance with this standard is obviously important. Unfortunately it is not reasonable to use this weight principle for checking the coating weight on components which have already been galvanised as it involves calculating the surface area then weighing a component, destructively removing the coating by chemical means and then re-weighing the component. It is therefore usual to measure instead the coating thickness (which can be done non-destructively using magnetic or electronic instruments) at a number of points on the surface of a component. The coating thicknesses given in the standard and their equivalent coating weights are shown in table 1.

Table 1

Galvanising standard BS EN ISO 1461 : 2009

Minimum average zinc thickness

Steel thickness	Minimum average zinc thickness (microns)
Less than 1.5 mm	45
1.5 mm and thicker up to 3 mm	55
3 mm and thicker but less than 6 mm	70
6 mm and thicker	85

Note

For threaded and very small components which are spun galvanised, thinner coatings are used as recommended by BS EN ISO 1461.

It is important to distinguish between 'hot dip galvanised after manufacture to BS EN ISO 1461' and less precise descriptions such as 'galvanised', 'mill galvanised' or even the term 'hot dip galvanised', when used without reference to any standard. Mill galvanised steel is frequently used as an alternative finish for many support system components (see 'pre-galvanised steel', p. 120), and is available from Legrand, but this material does have a much thinner zinc coating which renders it unsuitable for exposed applications.

Suggested specification text : "All components should be hot dip galvanised after completed manufacture to the requirements of BS EN ISO 1461."

3 Deep galvanised (D)

A deep galvanised finish has all of the characteristics of hot dip galvanising but with a much thicker coating of zinc. This gives 2-3 times the life of the standard hot dip galvanised (BS EN ISO 1461) finish.

Background

The life of a galvanised coating depends very much upon the degree of pollution of the surrounding atmosphere; in an industrial or marine environment corrosion of the zinc may take place at double or treble the rate which would occur in an inland environment. Thus, if heavy atmospheric pollution or aggressive conditions exist in the vicinity of an installation, it is well worth considering the benefits provided by deep galvanising.

Since this finish is produced in the same basic process as normal hot dip galvanising the initial cost premium of the material is relatively low; however the site installation costs will remain unchanged. Therefore, for a relatively modest premium on the overall installed cost the life of the installation can be increased dramatically.

Specification

Although the appropriate British Standard for deep galvanising is BS EN ISO 1461 (the same as for hot dip galvanising after manufacture) the process requires the use of steel containing a slightly higher proportion of silicon; often referred to as high silicon steel. When galvanising normal mild steel the process effectively ceases after a short immersion time in the galvanising bath, giving, depending on the gauge of the steel, the coating thicknesses laid down within BS EN ISO 1461. However with silicon bearing steels the chemistry of the galvanising process changes, resulting in the zinc coating continuing to increase in thickness as long as the steel remains immersed in the zinc.

Coatings up to three times as thick as the minimum requirements of BS EN ISO 1461 are both possible and practical to achieve. However the most cost effective coating thickness is usually twice the thickness required by BS EN ISO 1461.

4 Pre-galvanised (PG)

A zinc coating can be economically applied to steel sheet immediately after its manufacture; the result, pre-galvanised steel (to BS EN 10346) can be an attractive, bright material which is suitable for non-arduous environments.

Background

Pre-galvanised (or mill galvanised) steel is produced by unwinding steel coil and passing it continuously through a bath of molten zinc and then past air jets to remove excess zinc from the surface. The process is closely controlled to produce a thin, even and ripple-free zinc coating with very few imperfections.

Because this pre-galvanised steel coil must then be cut to shape during subsequent manufacture of support equipment, the edges of the finished components will have no zinc coating; this aspect, together with the relatively light zinc coating provided by the process, make pre-galvanised services supports suitable for indoor, non-corrosive environments (particularly where an aesthetically attractive appearance is important) but unsuitable for humid indoor or outdoor applications.

Specification

For steel for Swiftrack channel, steel grade is BS EN 10346 : 2009 Grade S250GD + Z275

5 Stainless steel (S)

For all practical purposes most stainless steel services supports can be regarded as maintenance free and suffering no corrosion. Inevitably there is a relatively high price to pay for these attractive properties but, in aggressive environments or where the cost or inconvenience of gaining subsequent maintenance access is prohibitive, this initial cost premium may well be justified.

Background

Stainless steel contains a high proportion of chromium (usually at least 17%) and the steel's remarkable immunity to corrosive attack is conferred by the chromium-rich oxide film which occurs naturally on its surface. This invisible film is not only inert and tightly bonded to the surface, it also re-forms quickly if the surface is damaged in any way.

The fire resistance of stainless steel is particularly noteworthy; tests have demonstrated that stainless steel cable supports can be expected to maintain their integrity for considerable periods even when exposed to direct flame temperatures exceeding 1,000°C. This may be an important consideration where the electrical circuits being supported provide for emergency power or control systems.

Stainless steel is also used where hygiene is a major consideration. Its advantages in such applications are again its excellent resistance to the various chemicals and washes which are frequently used for cleaning purposes and the smoothness of surface (depending on the finish specified) which minimises the soiling or contamination that can take place.

Specification

Many grades of stainless steel are available but the one generally used in aggressive marine environments is BS EN 10088 Grade 1-4404 (equivalent to S316L31, BS 1449: Part 2). This grade has improved corrosion resistance (particularly in the presence of chlorides) and high temperature strength. It is much used in the chloride-laden marine conditions which exist on offshore installations and in coastal regions.

For less aggressive environments BS EN 10088 Grade 1-4301 (equivalent to 304, BS 1449: Part 2) is the normal grade. This grade offers good corrosion resistance in internal applications and also has a good aesthetic quality, often used in the dairy and food industries. Final finishes with mechanical brushing or polishing are often used to provide a good looking and robust surface finish.

Pickling and passivation

A stainless steel surface will have excellent corrosion resistance due to the chromium oxide layer on the surface of the product.

With some stainless steels however, the surface areas can become subject to corrosion due to the depletion of chromium during welding, or the introduction of iron during a machining process (not applicable to most cable management products).

Where a uniform appearance is important after carrying out welding processes, it is often specified that all surfaces should be pickled and passivated to remove the smoke stain from the welding process. Also where extreme corrosion resistance is called for, this process may help to remove crevice corrosion from around the welding area. Experience has shown that this is not normally necessary for the majority of cable management products.

Pickling

The pickling process involves the article being immersed in a blend of acids which dissolve iron and iron oxides which adhere to, or are embedded in, the surface of the stainless steel. These acids cause a removal of the surface layer of between 1 and 3 microns. The article is finally rinsed with water to complete this stage of the process.

Passivation

Passivation of the stainless steel will occur naturally after pickling when the oxygen in the air will react with the surface of the steel to form a passive chromium oxide layer. However it is usual for this passivation process to be speeded up by immersing the article in a nitric acid or other passivating agent.

Pickle and passivation is available as a special order finish, for more information please contact us on +44 (0) 845 605 4333.

Electropolishing

In various industries such as food, pharmaceutical and electronics, there is a requirement for easier cleaning and reduced bacterial growth on the surface of the stainless steel. This increased surface smoothness is achieved by a process called electropolishing.

Electropolishing is, in principle, a reversal of the electroplating process. The article is submerged in a special acid electrolyte and a DC current passed into the article and through the electrolyte. This process removes the high spots from the surface micro roughness leaving a surface which is bright and smooth.

6 Powder coated (E)

Powder coated finishes give excellent protection against scratches as they are normally between 50 - 100% harder than the equivalent wet paint finishes.

They are available in a wide range of colours and can have matt or various gloss finishes. In addition to the aesthetic qualities powder coating are available in various grades to cope with different site conditions. Grades are produced to cope with exterior applications where there can be high levels of ultra violet light or low smoke and fume applications for fire risk areas such as occur in tunnels.

Because powder coated finishes are inherently resilient and resistant to chemical or corrosive attack, these finishes are frequently used for protection only where there is no aesthetic requirement.

Background

The process of powder coating is carried out by applying the electrostatically charged powder to the article, and then passing the article into an oven where the powder is baked onto the surface of the article.

The application of the powder, and the associated stoving, can vary with different types of finish so the careful control of the process is required.

Specification

With such a wide variety of types of powder available it is necessary to specify in addition to the colour what the finish is required to do.

The colour can be specified by BS or RAL number, or by exact colour match if a sample of the colour is provided. The required gloss level should also be given.

The usual finish is for aesthetic indoor use, but if other qualities are required they should be clearly indicated at the outset as the powder cost and application cost can vary considerably between different types of powder.

Epoxy coated

Epoxy coatings are based on thermo-setting epoxy resins and give a very hard, durable finish suitable for internal applications. Epoxy coatings are usually quite thin but they have good chemical resistance with excellent adhesion and coating flexibility.

Polyester epoxy mix

Some modern coating developments consist of both polyester and epoxy. These give properties which are very suitable for use with cable support systems. The finish is thick and fairly soft and gives good protection to the cables being installed. The coating has strong adhesive properties and in cases of fire is halogen free with low smoke and fume characteristics. There are many types and grades of these materials and when using them advice should be sought from our technical sales support team, please contact us on +44 (0) 845 605 4333.

Architectural powder coatings

These powder coatings are formulated to meet the particular requirements of exterior environments. They are inherently resilient and resistant to damage and chemical or corrosive attack, providing maximum protection to the substrate. When subjected to high levels of ultra violet light present within sunlight the coatings have excellent gloss retention and resistance to chalking. These coatings would normally be applied over a galvanised finish.