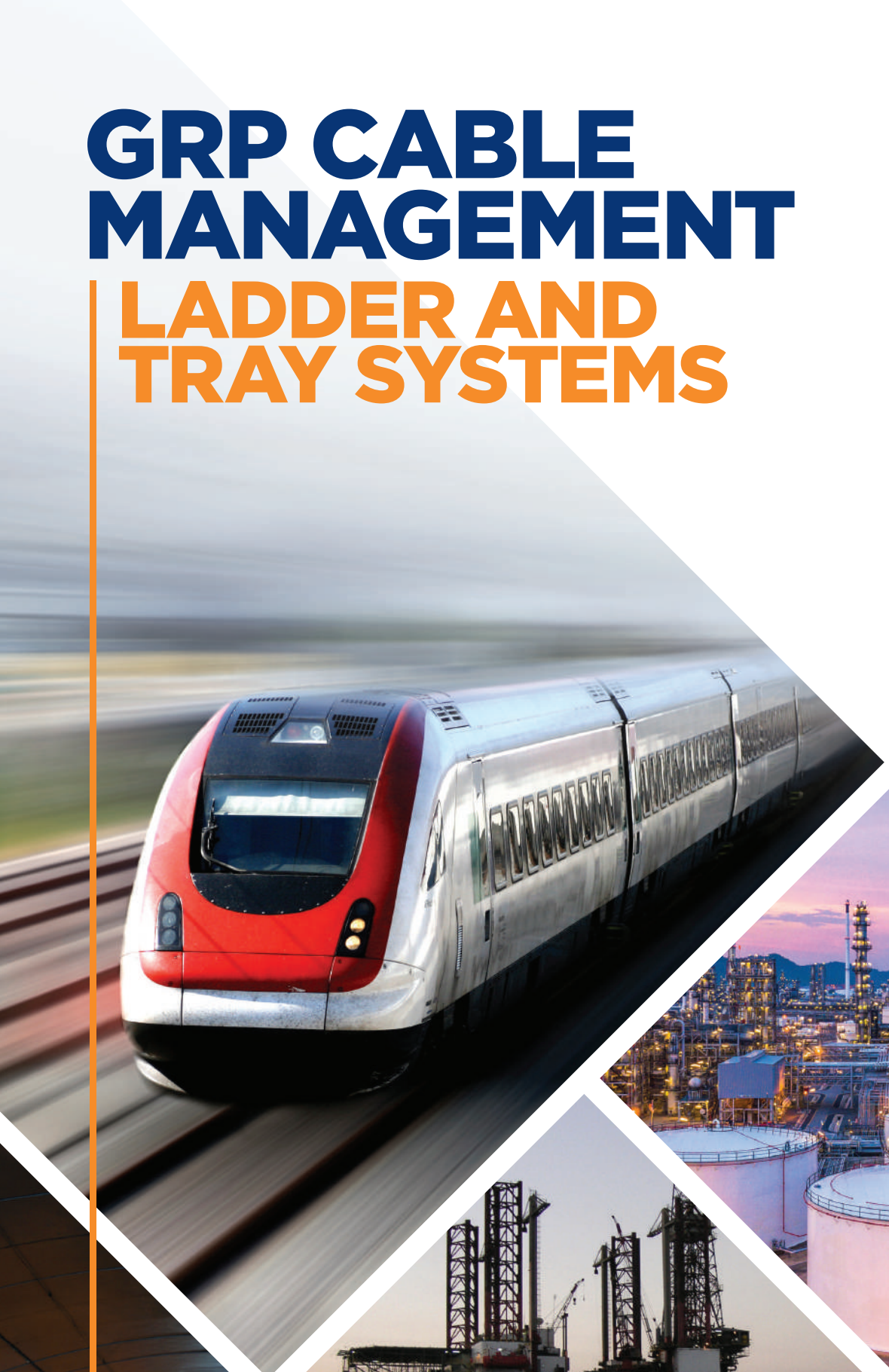
GRP CABLE MANAGEMENT

LADDER AND TRAY SYSTEMS



DELIVERING INNOVATION
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UK OWNED
UK MANUFACTURER

Marshall Tufflex

GLASS REINFORCED POLYESTER (GRP)

Glass reinforced polyester (GRP) cable management systems are vitally important for use in the transport, petrochemical and construction industries where it is used to provide lightweight yet mechanically strong materials which replace heavier, more energy consuming materials such as aluminium, steel and concrete. It is a highly competent engineering material, capable of being specified for a large number of construction applications.

GRP cable management systems are well suited to aggressive environments where there might be extreme weather or high temperatures. They are extremely robust, considerably lighter than aluminium or steel, and have excellent resistance against fire and corrosion resulting in a very long life span. GRP systems have a large cable capacity, and offer fast and flexible installation solutions, with the ability of on-site assembly and configuration.

Marshall-Tufflex can offer a wide range of GRP systems including trays, ladders, ground ducts, troughing, accessories and fittings, fixings and supports.

What is RISQS?

RISQS, formerly known as Achilles Link-up, has been developed to provide a service for the qualification of suppliers for all products and services that are procured by the industry. RISQS supports Network Rail, LUL/Transport for London, train operators and other rail products and services providers in the management of supply chain risk. RISQS is an independent, third party qualification assessment of a supplier's capability to supply products and services.

Marshall-Tufflex is registered with the RISQS Railway Industry Supplier Qualification scheme

Approvals

Mechanical Behaviour

- Breaking point to NEMA FG1
- Tensile strength at break point to ISO 527-5
- Modulus of elasticity to ISO 527-5
- Accelerated aging to ISO 4892-2 & ISO 9227
- IEC 61537

Electrical behaviour

- Surface resistivity to IEC 6079-0
- Breakage voltage to IEC 60243-1
- Comparative tracking index IEC 60112
- IEC 60093

Fire resistance to DIN 4102 part 12

Linear Thermal Expansion to DIN 53752

Water Absorption to ISO 62

Environmental & sustainability

- Analysis shows GRP to have one of the best environmental impact profiles of any strong building material.
- GRP is easily dismantled and cut up to use in road metalling and can be re-used in other buildings.
- Buildings using GRP within their infrastructure are lighter and require less energy to heat; with building performance life of 40 to 50 years.
- Light weight and easy handling can result in considerable fuel savings.
- Reduction in the need for motorised cranes and platform lift vehicles.
- Use of acetone has been eliminated.
- Recycling trials for composite parts are progressing satisfactorily in several European programmes, using GRP as a source of heat energy and the resultant residue as raw material in cement manufacture.

Fire performance

- Excellent fire performance. GRP is a self-extinguishing composition, halogen-free and with low smoke and fume properties.

Fire Behaviour

- Inflammability to IEC 60695-2-12/ UL94
- Spread of flame to BS 476 part 7 class 2 / ASTM E84 (Up to Class 1 on request)
- Fire propagation to BS 476 Part 6
- Smoke emissions to BS 6853 App B53
- Fire standard to DIN 4102 part 12
- UL 723

Marshall-Tufflex LS0H GRP systems are very robust and particularly suitable for interior and exterior areas where resistance to corrosion is a requirement. They are considerably lighter than aluminium or steel and have excellent fire performance.

Pressed tray

50 x 50mm to 400 x 80mm

A complete range of pressed GRP trays for extended support span up to 3 metres.

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Pultruded ladder

200 x 53mm to 900 x 150mm

A pultruded ladder system for installation into tunnels, bridges, railways, underground, offshore and marine environments.

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GRP industrial support systems

for supporting large power cables

Brackets, bolts and rails for use with other GRP systems.

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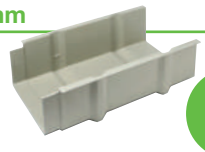
Ground ducts

250 x 140mm to 450 x 176mm

Self-supporting systems ideal for railway applications.



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Cable troughing

150 to 250 x 150mm

Suited to railway applications where cable ducts cannot be buried.

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Case Study

GRP is the material of choice for a wide range of cable management projects in the rail network.

With more than 200 million passenger journeys a year, durability and ease of installation were key considerations for contractors leading a multi-million pound upgrade of a high profile UK rail station.

Rail projects have some of the most challenging cable management requirements due to the harsh, and sometimes hazardous, environment of their locations. With its lightweight construction, long life span and resistance to fire and corrosion, Marshall-Tufflex's Glass Reinforced Polyester (GRP) cable management system provided the perfect solution. More than 700m of perforated GRP tray with standard covers has helped deliver power and data provision for station signalling, lighting, tannoys and surveillance systems. The installation formed part of renovations to bring old platforms back into use and extend current platforms to accommodate longer trains.

The robust product is specifically designed for challenging environments with the material effective at temperatures from -80°C to over 130°C. It is both corrosion and fire resistant with low thermal conductivity and self-extinguishing properties that make it fully compliant with fire standards and regulations.

Weighing 40% less than steel it is also easier to move around and install. The trays require fewer fasteners and benefit from interlocking and self-adjusting couplings making them quick and easy to assemble and configure on site. The flexibility of the system helped save time and labour costs, both critical in ensuing platforms were reopened on time and within budget.

GRP cable management systems incorporate non-conductive and self-extinguishing properties, as well as stability, wherever they are subjected to high levels of UV and extreme temperatures. GRP systems are ideal solutions for installation in tunnels, bridges, railways, underground, offshore and marine environments.

Rail:

Optimum safety:

- Self-extinguishing UL94 - V0
- In the event of fire, no halogen toxic fumes (fire classification: M1, i0, F0; ASTM E84, Class 2 or Class 1; BS 476 Part 7, Class 2 or 1)
- No sharp edges or burrs, from cutting or drilling

Flexibility and easy mounting:

- Reduces installation costs with unique self coupling mechanism
- No earthing required
- Very strong mechanical resistance, even with high temperature variation
- 10 times lighter than concrete
- Excellent vibration resistance

Sea:

Resists corrosion: atmospheric, UV, saline

Save installation time and costs:

- Reduces use of bolts with clip-on splice plates and fixings
- No expensive protection accessories or coatings necessary
- No sharp edges or burrs, from cutting or drilling
- Ensures strong mechanical resistance with a lighter weight than metal
- Excellent vibration resistance

Road:

Resists corrosion: combustion gas, salt

Optimum safety:

- Self-extinguishing UL94 - V0
- Does not emit halogen or smoke (fire classification: M1, i0, F0; ASTM E84, Class 2 or Class 1; BS 476 Part 7, Class 2 or 1)
- No sharp edges or burrs, from cutting or drilling

Flexibility and easy mounting:

- Reduces installation costs with unique self coupling mechanism
- Save time and money as no earthing is required
- Ensures strong mechanical resistance with a lighter weight than metal
- No expensive protection accessories or coatings necessary
- Excellent vibration resistance

Petrochemical and Process Plant Industries:

Cut down corrosion and maintenance costs
Reduce installation costs

- No earthing required
- No expensive protection accessories or coating
- No sharp edges or burrs, from cutting or drilling

Ensures strong mechanical resistance and a lighter weight
Reduces weight of structure

- Saves 40% against stainless steel
- Saves 15% against aluminium

Energy Distribution:

Very strong mechanical resistance, even with high temperature variation
No expensive protection accessories or coating necessary

Optimum safety:

- Self-extinguishing UL94 - V0
- No toxic fumes or halogen in case of fire (fire classification: M1, i0, F0; ASTM E84, Class 2 or Class 1; BS 476 Part 7, Class 2 or 1)
- No sharp edges or burrs, from cutting or drilling

STANDARD SPAN PRESSED TRAY

GRP standard span cable tray and fittings are pressed from glass reinforced polyester resin, using hot moulding technology and facilitating the manufacture of smooth intricate shapes. The system is ideal for installation into tunnels, bridges, railways, underground, offshore and marine environments.

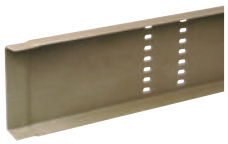
Product information

- A variety of sizes from 50 x 50mm to 400 x 80mm
- 2.5 times lighter than steel
- Completely corrosion resistant against salt spray, H25, acid build up from exhaust gases and brake dust along roads and railways
- No need for painting or protective coating
- Classified LS0H material
- Self-extinguishing
- Low conductivity
- Earthing not required
- Antimagnetic and resistant to electromagnetic pulses
- Effective at temperatures between -80˚C to +130˚C
- Lower life cycle cost
- Fast installation with fewer fasteners
- Easy to cut and drill
- Load characteristics in accordance with IEC 61537 (for load or other calculations and values, please refer to the technical section)

Reduced use of bolts

GRP is a non-conductive material with excellent fire performance and high corrosion resistance

Basic components



Non-perforated pressed tray – 3 metres

code	size	pack
KK5050	50 x 50mm	1 x 3m
KK10050	100 x 50mm	1 x 3m
KK15050	150 x 50mm	1 x 3m
KK20050	200 x 50mm	1 x 3m
KK30050	300 x 50mm	1 x 3m
KK10080	100 x 80mm	1 x 3m
KK15080	150 x 80mm	1 x 3m
KK20080	200 x 80mm	1 x 3m
KK30080	300 x 80mm	1 x 3m
KK40080	400 x 80mm	1 x 3m

Perforated pressed tray – 3 metres

code	size	pack
KKL5050	50 x 50mm	1 x 3m
KKL10050	100 x 50mm	1 x 3m
KKL15050	150 x 50mm	1 x 3m
KKL20050	200 x 50mm	1 x 3m
KKL30050	300 x 50mm	1 x 3m
KKL10080	100 x 80mm	1 x 3m
KKL15080	150 x 80mm	1 x 3m
KKL20080	200 x 80mm	1 x 3m
KKL30080	300 x 80mm	1 x 3m
KKL40080	400 x 80mm	1 x 3m

Tray cover – 3 metres

code	to fit	pack
KKD50	50 x 50mm	1 x 3m
KKD100	100 x 50/80mm	1 x 3m
KKD150	150 x 50/80mm	1 x 3m
KKD200	200 x 50/80mm	1 x 3m
KKD300	300 x 50/80mm	1 x 3m
KKD400	400 x 80mm	1 x 3m

Tray divider – 3 metres

code	tray height	pack
KKT50	50mm	1x3m
KKT80	80mm	1x3m

* Requires 3 x M616/V4A per length (Nut bolt and washer)

Fittings

Tray cover clip

code	size	pack
DF50	50mm	50
DF80	80mm	50

Tray end cap

code	to fit	pack
KKKE5050	50 x 50mm	1
KKKE10050	100 x 50mm	1
KKKE15050	150 x 50mm	1
KKKE20050	200 x 50mm	1
KKKE30050	300 x 50mm	1
KKKE10080	100 x 80mm	1
KKKE15080	150 x 80mm	1
KKKE20080	200 x 80mm	1
KKKE30080	300 x 80mm	1
KKKE40080	400 x 80mm	1

Tray internal bend base

code	to fit	pack
KKBI5050	50 x 50mm	1
KKBI10050	100 x 50mm	1
KKBI15050	150 x 50mm	1
KKBI20050	200 x 50mm	1
KKBI30050	300 x 50mm	1
KKBI10080	100 x 80mm	1
KKBI15080	150 x 80mm	1
KKBI20080	200 x 80mm	1
KKBI30080	300 x 80mm	1
KKBI40080	400 x 80mm	1

Tray internal bend cover

code	to fit	pack
KKBID5050	50 x 50mm	1
KKBID10050	100 x 50mm	1
KKBID15050	150 x 50mm	1
KKBID20050	200 x 50mm	1
KKBID30050	300 x 50mm	1
KKBID10080	100 x 80mm	1
KKBID15080	150 x 80mm	1
KKBID20080	200 x 80mm	1
KKBID30080	300 x 80mm	1
KKBID40080	400 x 80mm	1

Tray external bend base

code	to fit	pack
KKBA5050	50 x 50mm	1
KKBA10050	100 x 50mm	1
KKBA15050	150 x 50mm	1
KKBA20050	200 x 50mm	1
KKBA30050	300 x 50mm	1
KKBA10080	100 x 80mm	1
KKBA15080	150 x 80mm	1
KKBA20080	200 x 80mm	1
KKBA30080	300 x 80mm	1
KKBA40080	400 x 80mm	1

Tray external bend cover

code	to fit	pack
KKBAD5050	50 x 50mm	1
KKBAD10050	100 x 50mm	1
KKBAD15050	150 x 50mm	1
KKBAD20050	200 x 50mm	1
KKBAD30050	300 x 50mm	1
KKBAD10080	100 x 80mm	1
KKBAD15080	150 x 80mm	1
KKBAD20080	200 x 80mm	1
KKBAD30080	300 x 80mm	1
KKBAD40080	400 x 80mm	1

Tray flat angle base (small radius)

code	to fit	pack
KKW5050	50 x 50mm	1
KKW10050	100 x 50mm	1
KKW15050	150 x 50mm	1
KKW20050	200 x 50mm	1
KKW30050	300 x 50mm	1
KKW10080	100 x 80mm	1
KKW15080	150 x 80mm	1
KKW20080	200 x 80mm	1
KKW30080	300 x 80mm	1

Tray flat angle cover (small radius)

code	to fit	pack
KKWD50	50 x 50mm	1
KKWD100	100 x 50/80mm	1
KKWD150	150 x 50/80mm	1
KKWD200	200 x 50/80mm	1
KKWD300	300 x 50/80mm	1

Tray flat angle base (large radius)

code	to fit	pack
KKB15050	150 x 50mm	1
KKB20050	200 x 50mm	1
KKB30050	300 x 50mm	1
KKB10080	100 x 80mm	1
KKB15080	150 x 80mm	1
KKB20080	200 x 80mm	1
KKB30080	300 x 80mm	1
KKB40080	400 x 80mm	1

Tray flat angle cover (large radius)

code	to fit	pack
KKBD150	150 x 50/80mm	1
KKBD200	200 x 50/80mm	1
KKBD300	300 x 50/80mm	1
KKBD100	100 x 80mm	1
KKBD400	400 x 80mm	1

Tray flat angle 135˚ base (large radius)

code	to fit	pack
KKC10080	100 x 80mm	1
KKC15080	150 x 80mm	1
KKC20080	200 x 80mm	1
KKC30080	300 x 80mm	1
KKC40080	400 x 80mm	1

Tray flat angle 135˚ cover (large radius)

code	to fit	pack
KKCD100	100 x 80mm	1
KKCD150	150 x 80mm	1
KKCD200	200 x 80mm	1
KKCD300	300 x 80mm	1
KKCD400	400 x 80mm	1

Tray flat tee base (small radius)

code	to fit	pack
KKSS5050	50 x 50mm	1
KKSS10050	100 x 50mm	1
KKSS15050	150 x 50mm	1
KKSS20050	200 x 50mm	1
KKSS30050	300 x 50mm	1
KKSS10080	100 x 80mm	1
KKSS15080	150 x 80mm	1
KKSS20080	200 x 80mm	1
KKSS30080	300 x 80mm	1

Tray flat tee cover (small radius)

code	to fit	pack
KKSSD50	50 x 50mm	1
KKSSD100	100 x 50mm	1
KKSSD150	150 x 50mm	1
KKSSD200	200 x 50mm	1
KKSSD300	300 x 50mm	1
KKSSD100	100 x 80mm	1
KKSSD150	150 x 80mm	1
KKSSD200	200 x 80mm	1
KKSSD300	300 x 80mm	1

Tray flat tee base (large radius)

code	to fit	pack
KKST10050	100 x 50mm	1
KKST15050	150 x 50mm	1
KKST20050	200 x 50mm	1
KKST30050	300 x 50mm	1
KKST10080	100 x 80mm	1
KKST15080	150 x 80mm	1
KKST20080	200 x 80mm	1
KKST30080	300 x 80mm	1
KKST40080	400 x 80mm	1

Tray flat tee cover (large radius)

code	to fit	pack
KKSTD100	100 x 50/80mm	1
KKSTD150	150 x 50/80mm	1
KKSTD200	200 x 50/80mm	1
KKSTD300	300 x 50/80mm	1
KKSTD400	400 x 80mm	1

Fittings

Tray offset base set

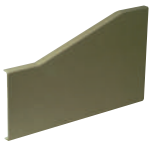
code	to fit	pack
KKET10080	100 x 80mm	1
KKET15080	150 x 80mm	1
KKET20080	200 x 80mm	1
KKET30080	300 x 80mm	1
KKET40080	400 x 80mm	1

Tray offset cover set

code	to fit	pack
KKETD10080	100 x 80mm	1
KKETD15080	150 x 80mm	1
KKETD20080	200 x 80mm	1
KKETD30080	300 x 80mm	1
KKETD40080	400 x 80mm	1

Tray reducer LH base

code	reduction	pack
KKRL20080	200 to 100	1
KKRL30080	300 to 200	1
KKRL40080	400 to 300	1



Tray reducer LH cover

code	reduction	pack
KKRLD200	200 to 100	1
KKRLD300	300 to 200	1
KKRLD400	400 to 300	1

Tray reducer RH base

code	reduction	pack
KKRR20080	200 to 100	1
KKRR30080	300 to 200	1
KKRR40080	400 to 300	1

Tray reducer RH cover

code	reduction	pack
KKRRD200	200 to 100	1
KKRRD300	300 to 200	1
KKRRD400	400 to 300	1

Cover clips

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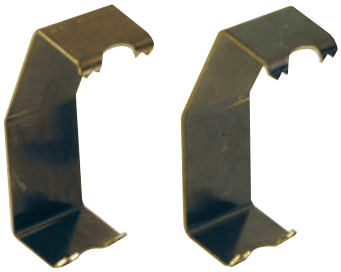
Because GRP expands in heat these unique clips have been developed to ensure the lid remains firmly in place, even when subjected to extreme heat expansion. The clips are for use with the GRP tray and ladder systems and will prevent the lid from being displaced.



GRP cover clips

code	pack
DF50	50
DF80	50

PULTRUDED LADDER

GRP pultruded ladders are manufactured by pultrusion, a process using layers of mats and rovings injected with resin and pulled through a die in a continuous operation. The system is ideal for installation into tunnels, bridges, railways, underground, offshore and marine environments.

Product information

- A variety of sizes from 200 x 53mm to 900 x 150mm
- 2.5 times lighter than steel
- Completely corrosion resistant against salt spray, H25, acid build up from exhaust gases and brake dust along roads and railways
- No need for painting or protective coating
- Classified LS0H material
- Self-extinguishing
- Low conductivity
- Earthing not required
- Antimagnetic and resistant to electromagnetic pulses
- Effective at temperatures between -80˚C to +130˚C
- Lower life cycle cost
- Fast installation with fewer fasteners
- Easy to cut and drill
- Load characteristics in accordance with IEC 61537
  (for load or other calculations and values, please refer to the technical section)

Basic components

Ladder

code	size	pack
UL20053	200 x 53mm	1x3m
UL20080	200 x 80mm	1x3m
UL150100	150 x 100mm	1x3m
UL300100	300 x 100mm	1x3m
UL400100	400 x 100mm	1x3m
UL600100	600 x 100mm	1x3m
UL900100	900 x 100mm	1x3m
UL150150	150 x 150mm	1x3m
UL300150	300 x 150mm	1x3m
UL400150	400 x 150mm	1x3m
UL600150	600 x 150mm	1x3m
UL900150	900 x 150mm	1x3m

Ladder cover

code	to fit	pack
KKD200	200 x 53mm	1x3m
KKD200	200 x 80mm	1x3m
KKD150	150 x 100mm	1x3m
KKD300	300 x 100mm	1x3m
KKD400	400 x 100mm	1x3m
KKD600	600 x 100mm	1x3m
KKD900	900 x 100mm	1x1.5m
KKD150	150 x 150mm	1x3m
KKD300	300 x 150mm	1x3m
KKD400	400 x 150mm	1x3m
KKD600	600 x 150mm	1x3m
KKD900	900 x 150mm	1x1.5m

Fittings

Ladder cover clip

code	pack
DF50	50
DF80	50
DF100	50
DF150	50

Ladder horizontal coupler* (Set of 2 pieces)

code	pack
ULIH53	1
ULIH80	1
ULIH100	1
ULIH150	1

* Foldable splice plate requires 4 x M616/V4A (Nut, bolt and washer) Please note M616/V4A is sold in packs of 100

Ladder int/ext angle base

code	to fit	pack
ULBA20053	200 x 53mm	1
ULBA20080	200 x 80mm	1
ULBA150100	150 x 100mm	1
ULBA300100	300 x 100mm	1
ULBA400100	400 x 100mm	1
ULBA600100	600 x 100mm	1
ULBA900100	900 x 100mm	1
ULBA150150	150 x 150mm	1
ULBA300150	300 x 150mm	1
ULBA400150	400 x 150mm	1
ULBA600150	600 x 150mm	1
ULBA900150	900 x 150mm	1

Ladder int/ext angle cover

code	to fit	pack
ULBAD20053	200 x 53mm	1
ULBAD20080	200 x 80mm	1
ULBAD150100	150 x 100mm	1
ULBAD300100	300 x 100mm	1
ULBAD400100	400 x 100mm	1
ULBAD600100	600 x 100mm	1
ULBAD900100	900 x 100mm	1
ULBAD150150	150 x 150mm	1
ULBAD300150	300 x 150mm	1
ULBAD400150	400 x 150mm	1
ULBAD600150	600 x 150mm	1
ULBAD900150	900 x 150mm	1

Fittings

Ladder flat angle 90° base

code	to fit	pack
ULB20053	200 x 53mm	1
ULB20080	200 x 80mm	1
ULB150100	150 x 100mm	1
ULB300100	300 x 100mm	1
ULB400100	400 x 100mm	1
ULB600100	600 x 100mm	1
ULB900100	900 x 100mm	1
ULB150150	150 x 150mm	1
ULB300150	300 x 150mm	1
ULB400150	400 x 150mm	1
ULB600150	600 x 150mm	1
ULB900150	900 x 150mm	1

Ladder flat angle 90° cover

code	to fit	pack
ULBD200	200 x 53/80mm	1
ULBD150	150 x 100/150mm	1
ULBD300	300 x 100/150mm	1
ULBD400	400 x 100/150mm	1
ULBD600	600 x 100/150mm	1
ULBD900	900 x 100/150mm	1

Ladder flat tee base

code	to fit	pack
ULTE20053	200 x 53mm	1
ULTE20080	200 x 80mm	1
ULTE150100	150 x 100mm	1
ULTE300100	300 x 100mm	1
ULTE400100	400 x 100mm	1
ULTE600100	600 x 100mm	1
ULTE900100	900 x 100mm	1
ULTE150150	150 x 150mm	1
ULTE300150	300 x 150mm	1
ULTE400150	400 x 150mm	1
ULTE600150	600 x 150mm	1
ULTE900150	900 x 150mm	1

Ladder flat tee cover

code	to fit	pack
ULTED200	200 x 53/80mm	1
ULTED150	150 x 100/150mm	1
ULTED300	300 x 100/150mm	1
ULTED400	400 x 100/150mm	1
ULTED600	600 x 100/150mm	1
ULTED900	900 x 100/150mm	1

Ladder flat crossover base

code	to fit	pack
ULX20053	200 x 53mm	1
ULX20080	200 x 80mm	1
ULX150100	150 x 100mm	1
ULX300100	300 x 100mm	1
ULX400100	400 x 100mm	1
ULX600100	600 x 100mm	1
ULX900100	900 x 100mm	1
ULX150150	150 x 150mm	1
ULX300150	300 x 150mm	1
ULX400150	400 x 150mm	1
ULX600150	600 x 150mm	1
ULX900150	900 x 150mm	1

Ladder flat crossover cover

code	to fit	pack
ULXD200	200 x 53/80mm	1
ULXD150	150 x 100/150mm	1
ULXD300	300 x 100/150mm	1
ULXD400	400 x 100/150mm	1
ULXD600	600 x 100/150mm	1
ULXD900	900 x 100/150mm	1

Ladder reducer

code	to fit ladder depth	Reduction achieved	pack
ULR15053	53mm	150mm	1
ULR15080	80mm	150mm	1
ULR100100	100mm	100mm	1
ULR200100	100mm	200mm	1
ULR300100	100mm	300mm	1
ULR200150	150mm	200mm	1
ULR300150	150mm	300mm	1
ULR500150	150mm	500mm	1

Vertical variable angle plate (Set of 2 pieces)

code	size	pack
ULIV53	53mm	1
ULIV80	80mm	1
ULIV100	100mm	1
ULIV150	150mm	1

Components

Ladder hold down clamp+

code	pack
ULKGHA	1

+ ULKGHA requires 1 x M1040V4AHEX

SUPPORT SYSTEMS

FPAM Bracket

code	size	pack
FPAM100	100mm	1
FPAM200	200mm	1
FPAM250	250mm	1
FPAM300	300mm	1

Bracket

code	size	pack
FPAP100AC	100mm	1
FPAP150AC	150mm	1
FPAP200AC	200mm	1
FPAP250AC	250mm	1
FPAP300AC	300mm	1

Bracket

code	size	pack
FPAP400AC	400mm	1
FPAP500AC	500mm	1
FPAP600AC	600mm	1

Adjustable strut/rail (GRP) 45 x 45 mm

code	size	pack
FPAR2000AC	2m	1
FPAR3000AC	3m	1

Clamp bolt assembly S/S M10 x 30mm

code	pack
FPBGV10/V4A	1

H/D Bracket Type 'A' S/S

code	size	pack
AV200S	200mm	1
AV250S	250mm	1
AV300S	300mm	1
AV400S	400mm	1
AV500S	500mm	1
AV600S	600mm	1

Clamp bolt assembly S/S M10 x 30mm

code	pack
BGSV	1

Nut, bolt and washers

code	pack
M616/V4A*	100
M1040/4AHEX***	100

* For use with Tray divider KKT50 / KKT80 or Ladder horizontal coupler ULIH

*** For use with Ladder hold down clamp ULKGHA

GROUND DUCTS AND PROFILES

GRP ground ducts and profiles are ideal for railway applications wherever below ground installations are required.

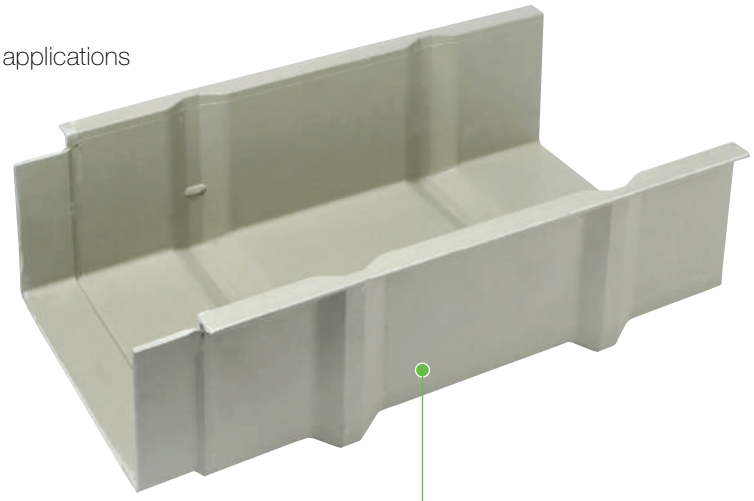
Product information

Ducts

- 250 x 140mm to 450 x 176mm
- Rigid and self-supporting
- 3 times lighter than GRC (Glass fibre Reinforced Concrete)
- 10 times lighter than concrete
- 2.5 times lighter than steel
- Impact and frost resistant
- Easy to handle and load

Profile

- 36 x 35mm to 143 x 53mm
- Avoids ballast falling into ducts
- Ensures perfect positioning of ground duct covers
- Increases capacity of existing concrete ground ducts
- High mechanical and corrosion performance



GRP is a non-conductive material with excellent fire performance and high corrosion resistance.

Ground ducts and profiles

Duct base 2500mm

code	size	pack
BK200140	250 x 140mm	1
BK300176	350 x 176mm	1
BK400176	450 x 176mm	1

Cover 1250mm

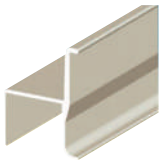
code	to fit	pack
BKDR200	250 x 140mm	1
BKDR300	350 x 176mm	1
BKDR400	450 x 176mm	1

Clip for cover mounting

code	to fit	pack
DF94/4	250 x 140mm	1
DF94/4	350 x 176mm	1
DF94/4	450 x 176mm	1

Set of clips and hinge for articulate cover mounting

code	to fit	pack
DF94/C	250 x 140mm	1
DF94/C	350 x 176mm	1
DF94/C	450 x 176mm	1



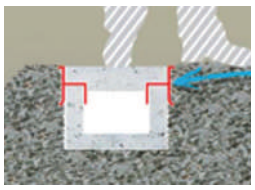
Ground duct profile

code	to fit	pack
PR3635	36 x 35mm	1
PR5045	50 x 45mm	1
PR5555	55 x 55mm	1

Ground duct A profile

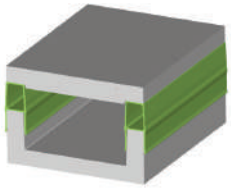
code	to fit	pack
PR5080	143 x 53mm	1

Ground duct profile



Ground duct A profile

- Increases cable capacity of existing concrete ground ducts
- High mechanical and corrosion performance
- Highly effective at minimum cost



Product shown in green for illustration purposes only

CABLE TROUGHING

GRP cable troughing is ideally suited to railway applications where cable ducts cannot be buried.

Product information

- 150 and 250 x 150mm
- Self-supporting base
- High mechanical loading capacity
- One post every 6m
- Lightweight product
- Only one person required for installation

GRP is a non-conductive material with excellent fire performance and high corrosion resistance

Basic components

Base and pre–mounted connector 6M

code	size	pack
SP150150	150 x 150mm	1
SP250150	250 x 150mm	1

U–Shaped connector

code	to fit	pack
SPIH150150	150 x 150mm	1
SPIH250150	250 x 150mm	1

Splice plate

code	to fit	pack
KKIH50	150 x 150mm	1

Cable trough covers 3m

code	to fit	pack
KKDL150	150 x 150mm	1
KKDL250	250 x 150mm	1

Fittings

Internal vertical elbow 15˚

code	size	pack
SPBI150	150 x 150mm	1
SPBI250	250 x 150mm	1

Cover for internal vertical elbow 15˚

code	to fit	pack
SPBID150	150 x 150mm	1
SPBID250	250 x 150mm	1

External vertical elbow 15˚

code	size	pack
SPBA150	150 x 150mm	1
SPBA250	250 x 150mm	1

Cover for external vertical elbow 15˚

code	to fit	pack
SPBAD150	150 x 150mm	1
SPBAD250	250 x 150mm	1

Horizontal elbow 15˚

code	size	pack
SPB150	150 x 150mm	1
SPB250	250 x 150mm	1

Cover for horizontal elbow 15˚

code	to fit	pack
SPBD150	150 x 150mm	1
SPBD250	250 x 150mm	1

Steel post for 150/250 x 150mm

code	length	pack
SPP100150	1500mm	1
SPP100200	2000mm	1
SPP100250	2500mm	1

Steel mounting plate

code	to fit	pack
SPC100150	150 x 150mm	1
SPC100250	250 x 150mm	1

HDG steel cable out fitting with bolts

code	to fit	pack
SPKA	150/250 x 150mm	1

Bolts, nuts and washers

code	material	pack
SPM1025*	Stainless steel	1
SPM1025/HDG	HDG steel	1

* for SPIH/KKIH

GRP ladder and tray

Overview

GRP (Glass Reinforced Polyester) has, good stability to UV, great mechanical strength and is 40% lighter than steel. GRP is a non-conductive insulating material, resistant to temperatures from -80ºC to +130ºC and has excellent resistance to fire and corrosion being self-extinguishing and zero halogen.

Standards and Approvals

- IET Wiring Regulations BS 7671
- (LVD) 2014/35/EU
- Low Voltage Directive

Mechanical Behaviour

- Breaking point to NEMA FG1
- IEC 61537
- Tensile strength at break point to ISO 527-5
- Modulus of elasticity to ISO 527-5
- Accelerated aging to ISO 4892-2 & ISO 9227

Electrical Behaviour

- Surface resistivity to IEC 6079-0
- IEC 60093
- Breakage voltage to IEC 60243-1
- Comparative tracking index IEC 60112

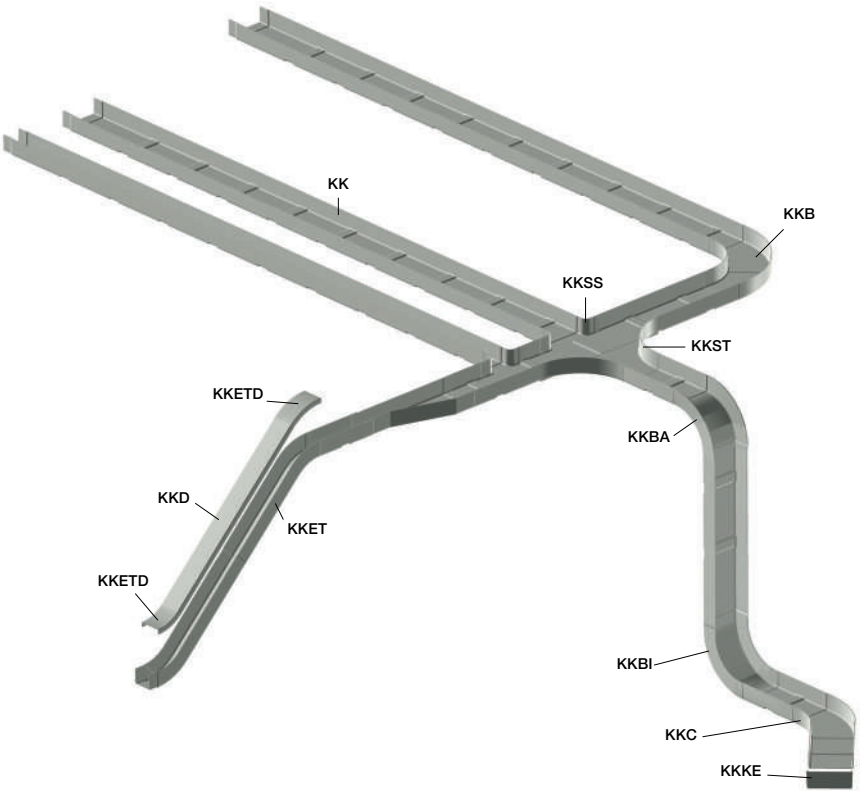
Density to DIN 53479

- Linear Thermal Dilatation to DIN 53752
- Water Absorption to ISO 62

Fire Behaviour

- Inflammability to IEC 60695-2-12/ UL94
- UL 723
- DIN 5510-2
- NF-F-16101
- Spread of flame to BS 476 part 7 class 2/ ASTM E84 (Up to Class 1 on request)
- Fire propagation to BS 476 Part 6
- Smoke emissions to BS 6853 App B53
- Fire standard to DIN 4102 part 12
- Reaction to fire classification: M1

GRP tray



KKB

During installation care must be taken to position a support at each end of the cable tray fitting. It is also recommended that the large radius fitting is fixed laterally to each end of adjoining cable tray.

KK

Each length of tray comes complete with built in, self adjusting coupler. An expansion gap of 8mm must be considered for thermal movement.

KKSS

During installation care must be taken to position a support at each end of the cable tray fitting.

KKST

During installation care must be taken to position a support at each end of the cable tray entry.

KKRR

During installation every reducer must be supported at each end. It is also recommended that the reducer fitting is fixed laterally to each end of adjoining cable tray.

KKBA

During installation care must be taken to position a support at each end of the cable tray entry. It is also recommended that the outside elbow fitting is fixed laterally to each end of adjoining cable tray.

KKETD

Covers are attached using either DF50/DF80 stainless steel cover clips. In strong winds the quantity of clips should be increased.

KKD

For a stronger assembly, covers with a width greater than 400mm are strengthened. Strengthening ribs are visible on the outside of the cover. Covers are attached using either DF50/DF80 stainless steel cover clips. Under normal conditions use 3 clips alternatively on each side per 3 metres of ladders/trays. Under extreme conditions (strong winds >60km/h) use 7 clips per 3 metres of ladder/tray.

KKET

During installation all fittings must be supported at every cable entry, and central support for all fittings with a radius greater than 250mm, and/or with width greater than 400mm. It is also recommended that the change in elevation fitting is fixed laterally to each end of adjoining cable tray.

KKBI

During installation care must be taken to position a support at each end of the cable tray entry. It is also recommended that the inside elbow fitting is fixed laterally to each end of adjoining cable tray.

KKC

To ensure correct installation, the horizontal elbow must be fixed laterally to each end of the adjoining cable tray.

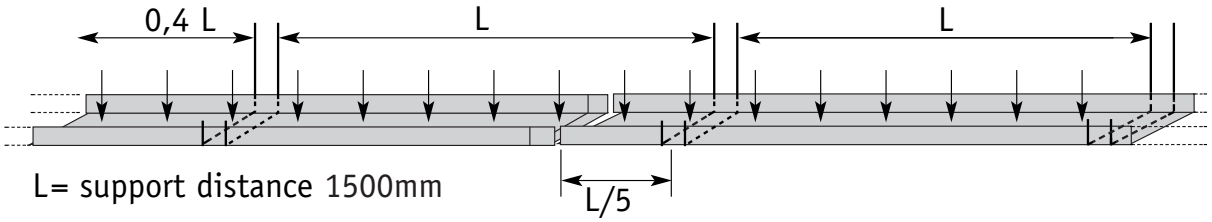
KKKE

Mounting accessories required for this fitting – 2 x M6x16 Bolts (to be ordered separately).

Standard span pressed tray

Load characteristics

Coefficient of safety > 1.7 (in accordance with IEC 61537) this data is given for ladders coupled with splice plates and bolts.



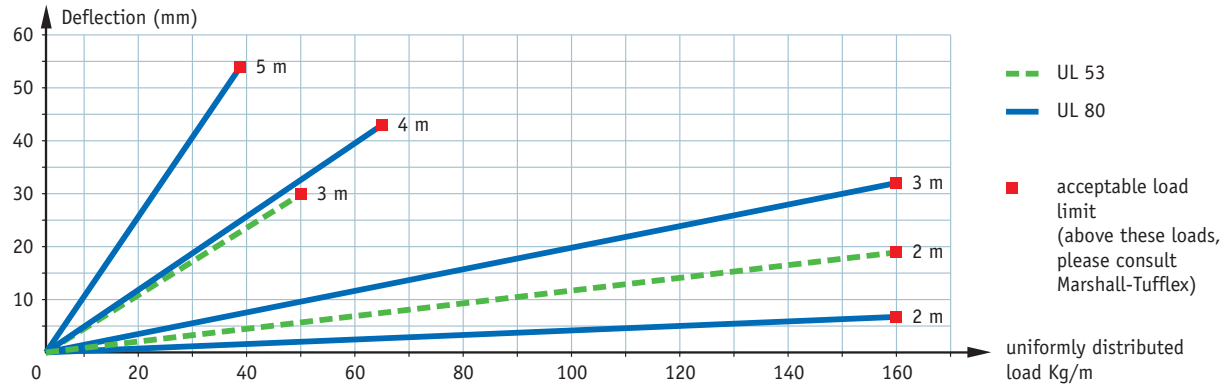
The deflection values are measured with the position of the junction between 2 ladders at a distance L/5 from a support. If this distance is not respected, it is necessary to raise the deflection values by about 30% when fully loaded.

		Useful area (mm²)	Weight of cables kg/m	Maximum admissable load kg/m according to the distance between supports				
				2m	3m	4m	5m	6m
UL...53	150 – 300	4420 – 9520	= 250	160	50			
	400 – 600	12920 – 19720	= 550		50			
UL...80	150 – 300	7690 – 16840	= 450	160	160	60	30	
	400 – 600	22940 – 35140	= 1000			60	30	

Optimal conditions, for cost reduction on your installation.

Series UL load diagram: supporting distances from 2 to 5m.

For 100mm and 150mm wall height refer to Marshall-Tufflex.



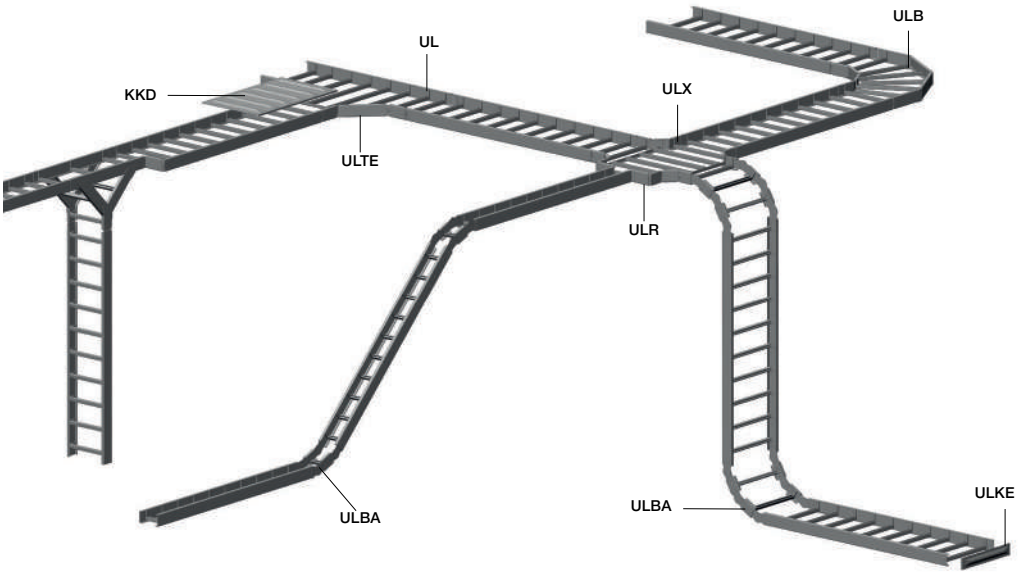
Localised loads

To be able to compare this to a uniformly distributed load it is necessary to double the value of the localised load. Example: A 60kg local load at the centre of a ladder with 3m of support distance. Equivalent load: 60 x 2 = 120kg uniformly distributed along 3m (ie 40kg/m).

Loading characteristics

- Defection <5mm (1/300).
- Coefficient of safety >1.7 (in accordance with IEC 61537) using the interlocking and self-adjustable coupling without fasteners.
- Loading diagram details (below) in accordance with IEC 61537, at an ambient temperature of 25°C.

GRP pultruded ladder



ULB
During installation you must take care to position a support under each elbow at each cable ladder end. If the bending radius is greater than 250mm and/or the width greater than 400mm, an additional intermediary support is necessary.

UL
Cable ladders are supplied with non-perforated rungs. Should you require perforated ladder rungs please contact a member of the technical team who will be happy to assist in your enquiry.

ULX
During installation all fittings must be supported at every cable entry. A central support is required for all fittings with a bend radius greater that 250mm and/or the width greater than 400mm

ULR
During installation the stainless steel splice plates must be fixed on each cable ladder end using 8 x M6 x 16 bolts. (to be ordered separately)

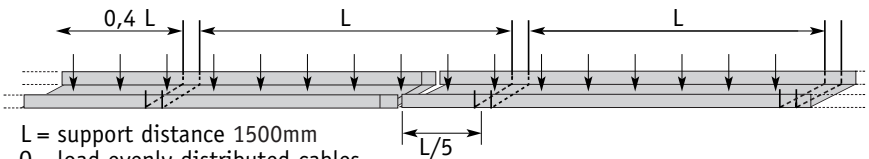
KKD
For a stronger assembly, covers with a width greater than 400mm are strengthened. Strengthening ribs are visible on the outside of the cover. Covers are attached using either DF50/DF80 stainless steel cover clips. In strong winds the quantity of clips should be increased.

ULTE
During installation all fittings must be supported at every cable entry. A central support is required for all fittings with a bend radius greater that 250mm and/or the width greater than 400mm

ULBA
During installation the metallic splice plates must be fixed at each cable ladder end using 4 x M6 x 16 bolts. (to be ordered separately). If the bending radius is greater than 250mm and/or the width greater than 400mm, an additional intermediary support is necessary.

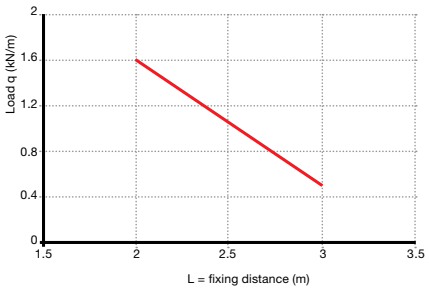
ULKE
Mounting this accessory requires 2 x M6 x 16 bolts. (to be ordered separately)

Load characteristics

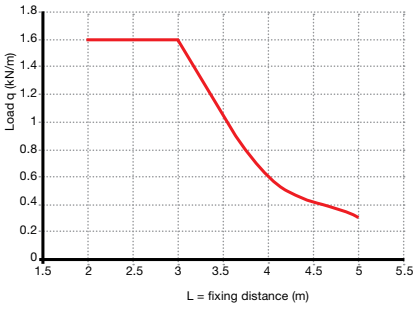


L = support distance 1500mm
Q = load evenly distributed cables
(according to DIN EN IEC 61537 standard)

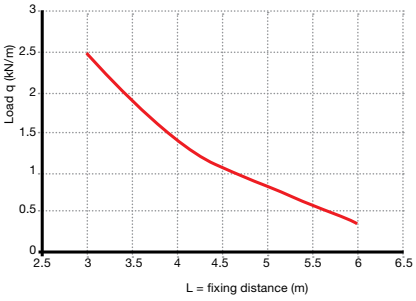
53mm High Cable Ladder



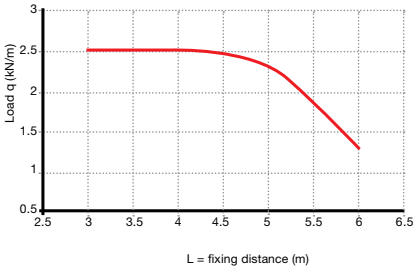
80mm High Cable Ladder



100mm High Cable Ladder



150mm High Cable Ladder



Warning: the deflection is measured with a junction position between 2 cable trays at a distance of L/5 from the support. If this distance is not respected, it is necessary to raise the deflection values by approx 30%.

GRP ground ducts

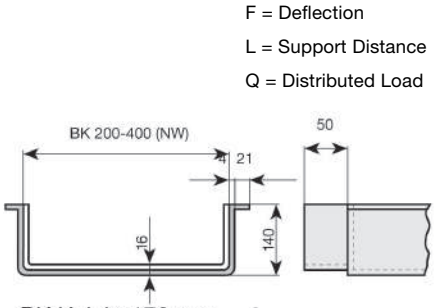
Load characteristics of ground duct

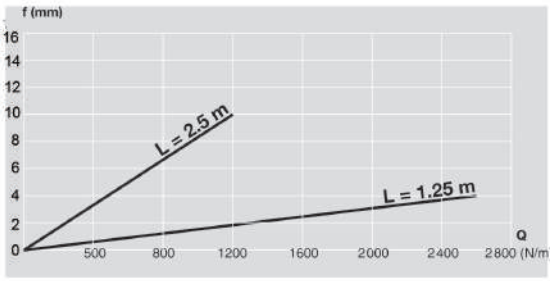
BK Height 140 mm

F = Deflection

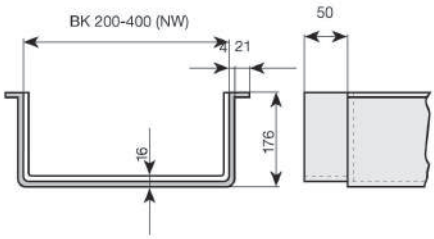
L = Support Distance

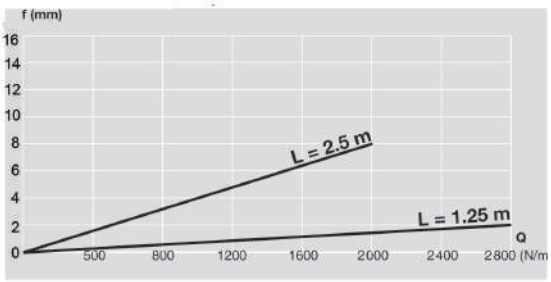
Q = Distributed Load



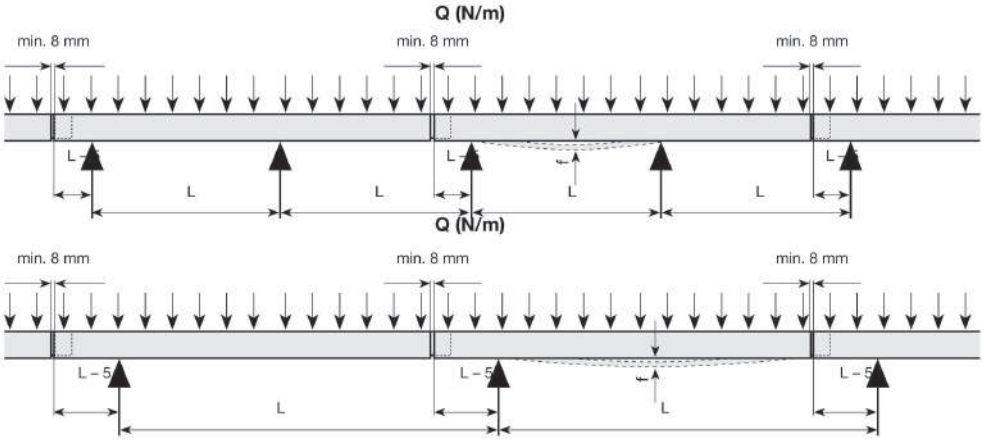


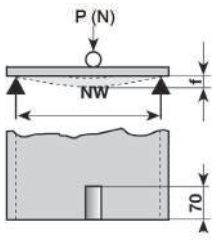
BK Height 176 mm





Tested in normal conditions of use





Load at edge of piece

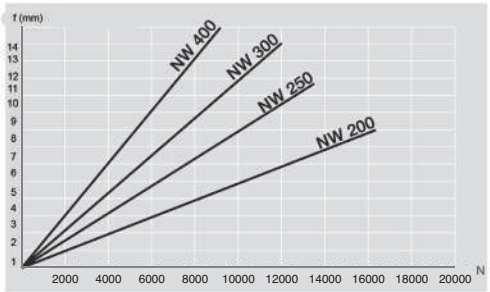
Load diagrams of plate covers

P = Load in N

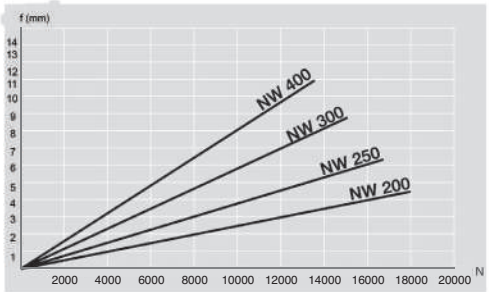
f = Deflection

NW = Nominal width BK

BKDR 5mm



BKDR 8mm



GRP ladder and tray material data

Fire behaviour

Properties	Standard references	Press Moulded Fittings	Pultruded Extrusions	Units
Flammability	**ASTM D 6194 / IEC 60695-2-12** Glow-wire flammability index (GWFI) test method for materials.	960	960	°C
Flammability	**UL 94** Test for flammability of plastic materials.	V0	V0	–
Fire propagation	**NF P 92-501** Fire behaviour of building materials.	Not tested	Not tested	–
Flame spread & smoke developed index	**ASTM E84 / UL 723**	FSI = 25	FSI = 35	Index
	Surface burning characteristics of building materials.	SDI = 350	SDI = 450	Index
	Class following the Uniform Building Code.	Class I	Class II	–
Flammability & smoke index	**NF F 16-101**	I2	I2	Index
	Fire behaviour of materials for rolling stock.	F0	F1	Index
Limiting oxygen index	**ASTM D 2863 / ISO 4589-2** Plastics – Determination of burning behaviour by oxygen index. Part 2 : Ambient – temperature test.	> 32%	> 32%	%
Flammability & smoke index	**VKF** Materials and building parts. Part B : Test methods.	5.3	5.3	Index
Fire behaviour	**DIN 4102-1** Fire behaviour of building materials and elements. Part 1: Classification of building materials.	B2	B2	–
Fire behaviour	**DIN 5510-2** Preventive fire protection in railway vehicles.	S4 / SR2 / ST2	S4 / SR2 / ST2	Index
	Part 2 : Fire behaviour and fire side effects of materials and parts.	FED(30 min.) = 0,09	FED(30 min.) = 0,04	Index
	Appendix C : FED (30 min.) < 1			
Fire behaviour	**EN 45545-2** Railway applications – Fire protection on railway vehicles. Part 2 : Requirements for fire behaviour of materials and components. Applicable requirement : R6	None	None	HL
	ISO 5660-1 Parameter MARHE	103,7	101,3	kW/m²
	EN ISO 5659-2 (50 kW/m²) Parameter DS(4)	376,2	331,2	–
	EN ISO 5659-2 (50 kW/m²) Parameter VOF4	454,6	488,5	–
	EN 45545-2 Appendix C (50kW/m²) Parameter CITG at 4 min.	0,016	0,015	–
	EN 45545-2 Appendix C (50kW/m²) Parameter CITG at 8 min.	0,068	0,064	–

GRP ladder and tray material data – continued

Mechanical behaviour

Properties	Standard references	Press Moulded Fittings	Pultruded Extrusions	Units
Tensile strength at break point	**ISO 527-5** Plastics – Determination of tensile properties. Part 5 : Unidirectional fibre-reinforced plastic composites.	~ 55	~ 187	MPa
Tensile modulus	**ISO 527-5** Plastics – Determination of tensile properties. Part 5 : Unidirectional fibre-reinforced plastic composites.	~ 7200	~ 11900	MPa
Accelerated ageing test by UV exposure	**ISO 4892-2 / ISO 527-5** Methods of exposure to laboratory light sources – Part 2 : Xenon-arc sources.	Good mechanical and chromatic behaviour	Good mechanical and chromatic behaviour	–
Accelerated ageing test by salt spray exposure	**ISO 9227 / ISO 527-5** Corrosion tests in artificial atmospheres – Salt spray tests.	Good mechanical and chromatic behaviour	Good mechanical and chromatic behaviour	–
Accelerated ageing test by UV and salt spray exposure	**ISO 4892-2 / ISO 9227 / ISO 527-5** UV and salt spray exposure.	Good mechanical and chromatic behaviour	Good mechanical and chromatic behaviour	–

Electrical behaviour

Properties	Standard references	Press Moulded Fittings	Pultruded Extrusions	Units
Measure of surface resistivity & discharge	**IEC 60079-0** Explosive atmospheres.	~ 4.10^9	> 10^{11}	Ω
	Part 0 : Equipment – General requirements.	IIA, IIB, IIC	IIA, IIB, IIC	–
Dielectric strength	**IEC 60243-1** Electric strength of insulating materials. Part 1 : Tests at power frequencies.	~ 6,5	Not tested	kV/mm
Proof tracking index	**IEC 60112** Method for the determination of the proof and the comparative tracking indices of solid insulating materials.	575	600	V

Marine approval

Properties	Standard references	Press Moulded Fittings	Pultruded Extrusions	Units
Approval for vessels and drilling platforms	**ABS** (American Bureau of Shipping)	KK Approved	UL Approved	

Others

Properties	Standard references	Press Moulded Fittings	Pultruded Extrusions	Units
Density		1,8	1,8	g/cm³
Thermal conductivity		0,3	0,3	W/m.K
Coefficient of linear thermal expansion	ISO 11359-2 Plastics – Thermo mechanical analysis (TMA). Part 2 : Determination of coefficient of linear thermal expansion.	~ 36 x 10-6	~ 10 x 10-6	cm/cm/K
Water absorption	ISO 62 Plastics – Determination of water absorption.	0,16	0,3	%
Glass content		> 20%	> 45%	%
Linear shrinkage		0,1	0,1	%
Rockwell hardness		not tested	not tested	HRm
Barcol hardness		> 50	> 50	Barcol
Material temperature range*		-80°C to +130°C	-80°C to +130°C	°C
Continuous operating temperature range		-50°C to +80°C	-50°C to +80°C	°C
Material resistance to high temperatures		good, no flexion	good, no flexion	°C

* Reduced mechanical resistance when ambient temperature is increasing.

GRP Material Chemical Resistance Table

Chemical	Concentration	Performance
Water	–	Good Performance
Acids	10%	Medium Performance
Base	10%	Good Performance
Ethanol	–	Good Performance
Benzine	–	Good Performance
Benzol	–	Medium Performance
Mineral Oil	–	Good Performance
Vegetable and animal fat	–	Good Performance
Chemical products	–	Good Performance

Storage of GRP material

It is best to store GRP products prior to installation at temperatures higher than 0°C and less than 40°C. However the GRP products may be stored at temperatures between -60°C to over 130°C

Information on recycling and environmental impact for the GRP products

Thermoset composite material is made of glass and polyester resin. It can be recycled in waste treatment stations for a further waste processing. This material is inert and has no environmental impact as GRP waste can be re-used in outside applications as raw material for the road building or in cement production.

GRP cable ladders pultruded

Resin types (all zero halogen)

Polyester (standard)	good all round performance, mechanical strength, corrosion resistance, fire behaviour, temperature rating
Acrylic (on request)	excellent resistance to fire in a corrosive environment
Vymilester (on request)	highly resistant to a specific range of chemical agents (H2SO4HC1…)
Carbon loaded polyester (on request)	anitistatic properties for highly explosive atmospheres

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