

# WIRE ROPES

## Handling Steel Wire Rope

**Unreeling and Uncoiling Wire Rope** When removing wire rope from the reel on which it was received, or from the coil if it is a coil shipment, it is imperative that the reel or coil rotates as the rope unwinds. Attempts to unwind rope from stationary coils or reels will result in kinking the rope, and once a kink is formed the rope at that point is ruined beyond repair.

**Unreeling** If the rope is to be unwound from a reel, there are three correct methods of unreeling. 1) The reel may be mounted on a shaft supported by two jacks. The rope is then pulled from the reel by operators holding the end of the rope and walking away from the reel which rotates as the rope unwinds. This is the common approved method of unreeling wire rope. Care should be taken to avoid over-running. 2) The reel may be mounted on a turntable. It is then unwound in the same manner as described above. Care must be exercised to keep the rope from dropping below the lower reel head. Again avoid over-running. 3) The end of the rope may be held and the reel rolled along the ground.

**Uncoiling** If the rope is to be removed from a coil, there is only one correct method of uncoiling. The end of the rope should be held and the coil rolled on the ground like a hoop.

**Terminations** Wire Rope terminations should be suitable for their purpose and should have a strength of not less than 80% of the minimum breaking load of the rope. Any free end of the rope should be seized to prevent unlaying. The ends of any wire rope other than that on a lifting device, hoist or winch should be fixed to the suspension point with a thimble-eye splice or ferrule-secured eye termination or bulldog-grip fixing [to DIN 1142] or other rope coupling device giving a strength of not less than 80% of the breaking load of the wire rope. The ends of any wire rope feeding onto a reeling winch should be fastened onto the winch drum in the manner specified by the manufacturer and in addition should preferably have at least three turns left on the drum when the suspended item is at its lowest level, and in no circumstances less than two turns.

This information is reproduced with permission from the ABTT Code of Practice for Flying, 2000. See also The Lifting Engineers Handbook [page 377].



### Lifting Equipment Engineers

**Association** Flints are full members of this association. Our staff frequently attend their informative courses and obtain specialist lifting qualifications. The association also keeps us right up to date with changing regulations.



FS 539611

**ISO 9001** Flints is ISO 9001. This certification is awarded by the International Standards Organisation. Flints has chosen the prestigious British Standards Institute to verify and audit our company to rigorous standards.

## STOCK BLACK DRIFTS



Thimble eye

Soft eye



**Stock Black Drifts** Flints holds large stocks of a range of 5 mm diameter 7 x 19 construction galvanised black wire drifts designed to cover most backstage requirements. They are available with either thimble eyes at both ends or with a thimble eye on one end and 100 mm soft loop on the other end. The soft eye enables the wire to be choke hitched around appropriate materials. The Working Load Limit of all the wires is marked at 250 kg. Each wire is individually identified, CE marked and printed with the WLL. They are supplied with appropriate certification and instructions. Flints registers all the stock drift sales on our lifting database so that duplicate copies of certification can be raised [up to 2 years].



Drifts	length	thimble eye both ends	soft and thimble eye	price	10+
1 m		WIRHE1M	WIRSE1M	£23.12	£18.14
2 m		WIRHE2M	WIRSE2M	£24.83	£19.44
3 m		WIRHE3M	WIRSE3M	£26.43	£20.61
4 m		WIRHE4M	WIRSE4M	£28.14	£22.06
5 m		WIRHE5M	WIRSE5M	£29.85	£23.22
6 m		WIRHE6M	WIRSE6M	£31.44	£24.53
7 m		WIRHE7M	WIRSE7M	£33.15	£25.82
8 m		WIRHE8M	WIRSE8M	£34.16	£26.99
10 m		WIRHE10M	WIRSE10M	£37.88	£29.59

Certification Retrieval	code	price
Duplicate certification retrieval fee [up to 2 years]	WIRDCR	£10.00

For Wire Stropps see page 333.

## MADE TO ORDER WIRE ROPE ASSEMBLIES



### Wire Rope Assemblies and Crimping Charges

If our Stock Black Drifts listed left do not suit your purpose then we can make up wire rope assemblies to order.

**Non-Lifting Wire Rope Assemblies** These assemblies are constructed in the same way as lifting assemblies but will not be marked with a WLL or individual identification. They will not be supplied with certification and are therefore not suitable for lifting purposes. We are also unable to supply certification for wire ropes under 1 mm in diameter so Micro Cable Assemblies will be priced as Non-Lifting Assemblies. To price up for budget purposes, use the codes given below plus the cost of the wire, ferrules and thimbles [if required].



**Lifting Wire Rope Assemblies** For lifting purposes the assemblies need dimensionally checking, and marking with individual identification, the WLL, UKCA, and CE marks. The wires will be supplied with the appropriate certification and instructions. Wires requiring a termination on one end only will be supplied with a "Test for Inclusion in the Technical File". Soft eyes complying with BS EN 13411-3 must have a length 15 x the diameter of the wire rope and the width of the eye should be half its length. To price up for budget purposes, use the codes given below plus the cost of the wire, ferrules and thimbles [if required] then add the Certification charges.



Crimping Charge [hard or soft eye]	code	per end
0.26 - 3 mm wire rope [plus cost of thimble if req.]	WIRDRIFT03	£2.00
4 mm wire rope [plus cost of thimble if req.]	WIRDRIFT04	£2.00
5 - 8 mm wire rope [plus cost of thimble if req.]	WIRDRIFT58	£2.50

Certification Charge for wires 1 mm to 8 mm Ø	code	price
Set up charge for 1st certificate per wire Ø/length	WIRSCC	£5.00
Follow on Certification Charge for more wires of the same Ø/L	WIRCAC	£2.50

### Wire Rope Terminology

The general purpose wire ropes used in the theatre are normally 6 x 19 fibre core or 7 x 19 steel core. The first number refers to the number of "Strands" in the "Wire Rope". The second number refers to the number of "Wires" in the "Strand". A 6 x 19 construction wire rope will be slightly more flexible than a 7 x 19 rope. However, 7 x 19 ropes are slightly stronger and are better able to resist crushing and heat. They are less liable to deform when running over sheaves.

Ropes with a construction of 1 x 19 are very stiff and are used for yachts' standing rigging, architectural rigging or handrailing applications. They must be terminated with roll swagged fittings as the wire cannot be formed into loops. The advantage of this construction is that it uses thicker wires which are better able to resist chafe and they present a smoother surface. We only stock them as stainless steel, but regrettably can no longer roll swage them for you.

All the wires that we hold in stock are "R.H.R.L." which stands for Right Hand Regular Lay. Nearly all ropes are "Right Hand Lay" but rarely a rope may need to be left hand lay for a special purpose such as drilling rigs. The "Regular Lay" means that the small "Wires" in each "Strand" are left hand lay to oppose the right hand lay of the rope. Some special purpose wire ropes are made with the wires laid in the same direction as the strands. This lay is called "Lang's Lay". These ropes are not suitable for making slings or drifts as they tend to unwind under load.

All our wire ropes are "Pre-formed". Pre-formed ropes do not tend to spring apart when being cut and are much preferred for general use. Wire ropes are made from various grades of steel. There are only two general grades used for Galvanised Steel Wire Ropes and these are 1,770 N/mm<sup>2</sup> and 1,960 N/mm<sup>2</sup>. A rope made to 1,770 is manufactured from wire with tensile strengths between 1,570 and 1,960 N/mm<sup>2</sup>. A rope made to 1,960 will have a minimum strength of 1,770 and a maximum of 2,160 N/mm<sup>2</sup>. Stainless steel ropes are slightly weaker than galvanised steel ropes.

The Working Load Limit of a wire rope is based on a safety factor of 5:1 of the Minimum Breaking Load. This is industry general practice but higher safety factors may be specified for your specific application.

Flints supplies full certification for all the wires we supply above 1 mm in diameter.

Flints is a full member of the Lifting Equipment Engineers Association and is approved to ISO 9001 by British Standards Institute.

We are proud of the fact that our staff attend regular training courses and symposiums regarding lifting and working at height.



### Lifting Equipment Engineers Association

Here are Flints' staff undertaking practical assessments at LEAA training centre covering thorough examination of lifting accessories [wire rope slings, chain slings, textile slings, loose gear-shackles, eye bolts, rigging screws etc.].

Flints also supplies a wide selection of top quality Wire Rope Cutters [page 179].

### GALVANISED WIRE ROPES [TO BS EN 12385/2002]



#### Galvanised Wire Rope [BS EN 12385:2002] 6 x 19 [Fibre Core] 1,960 N/mm<sup>2</sup>

This rope is the most flexible wire rope construction that we stock. It is a right-hand regular lay wire rope consisting of 6 strands of 19 wires around a fibre core. The wires are pre-formed so the wire will not spring apart when being cut. Choose it as a general purpose wire for making drifts or slings. If you are replacing a damaged wire in a set of wires, all the wires in the set should be replaced at the same time. The Working Load Limit specified is based on a 5:1 safety factor which must not be exceeded. Sometimes, in the theatre industry, higher safety factors of times eight or ten are required. The tensile strength of these wires is 1,960 N/mm<sup>2</sup>. Supplied complete with certification. The minimum breaking load shown on the certificate may vary slightly from those given below due to fluctuations in batches.

Galvanised Wire Rope		WLL	code	1 m	code	100 m	10+
wire Ø	Min BL	5:1	per metre		per drum		per drum
3 mm	522 kg	110 kg	WIRO12	£0.44	WIRO12D	£34.00	£24.00
4 mm	982 kg	196 kg	WIRO14	£0.56	WIRO14D	£46.00	£38.00
5 mm	1,534 kg	307 kg	WIRO16	£0.69	WIRO16D	£59.00	£42.00
6 mm	2,209 kg	442 kg	WIRO18	£0.79	WIRO18D	£73.00	£63.00
8 mm	3,927 kg	785 kg	WIRO20	£0.99	WIRO20D	£89.00	£73.00



#### Galvanised Wire Rope [BS EN 12385:2002] 7 x 19 [Steel Core] 1,960 N/mm<sup>2</sup>

This rope is slightly stiffer than 6 x 19 construction wire rope but it is better at resisting crushing and less liable to deform when running around sheaves. The steel core also makes it a slightly stronger rope. It is a right-hand regular lay wire rope consisting of 6 strands of 19 wires around a steel core. The wires are pre-formed so the wire will not spring apart when being cut. Choose this rope for running rigging and when terminations state that they should only be used on steel core ropes [Gripples and Nicopress are examples]. If you are replacing a damaged wire in a set of wires, all the wires in the set should be replaced at the same time. The Working Load Limit specified is based on a 5:1 safety factor which must not be exceeded. Sometimes, in the theatre industry, higher safety factors of times eight or ten are required. The tensile strength of these wires is 1,960 N/mm<sup>2</sup>. These ropes are supplied complete with certification. The minimum breaking load shown on the certificate may vary slightly from those given below due to fluctuations in batches. If you require these wires in 1,770 N/mm<sup>2</sup> then please add N17 to the code and allow five days.

Galvanised Wire Rope		WLL	code	1 m	code	100 m	10+
wire Ø	Min BL	5:1	per metre		per drum		per drum
3 mm	651 kg	130 kg	WIRO23	£0.44	WIRO23D	£34.00	£27.00
4 mm	1,158 kg	232 kg	WIRO24	£0.65	WIRO24D	£53.50	£43.00
5 mm	1,809 kg	362 kg	WIRO25	£0.80	WIRO25D	£68.00	£59.00
6 mm	2,605 kg	521 kg	WIRO26	£0.79	WIRO26D	£72.00	£66.00
8 mm	4,630 kg	926 kg	WIRO28	£1.32	WIRO28D	£118.00	£99.00

A wide variety of other ropes are available to order. Please phone for a quote if you require special cables.

**Low Rotation Wire Rope** These ropes are specially wound in contrary directions to reduce rotation to a minimum. Used mainly for single-point hanging of chandeliers etc. If using these wires with wedge sockets ensure the tail exceeds 20 times the diameter of the rope. Available to order only. Please phone our Rigging Department for details.

## BLACK WIRE ROPES



**Black PVC-Covered Wire Rope 6 x 19 [BS EN 12385-2002] [Fibre Core] 1,770 N/mm<sup>2</sup>** This is a 6 x 19 construction galvanised wire rope with a black PVC sheath. These covered wires are useful for disguising suspension lines. They can also be used for handrail and lanyard applications. This type of wire is not suitable for running rigging. It is essential that the PVC sheath is removed where terminations are made. We can also supply these wires coated in white PVC in 100 m drums POA. Please allow five days.

Black PVC-Covered Wire Rope				code	1 m	code	100 m
wire Ø	finished Ø	Min BL	WLL 5:1	per metre	per drum	per drum	
3 mm	to 4 mm	499 kg	100 kg	WIRO32	£0.73	WIRO32D	£63.00
4 mm	to 5 mm	887 kg	177 kg	WIRO34	£0.82	WIRO34D	£72.00
5 mm	to 6 mm	1,385 kg	277 kg	WIRO36	£1.00	WIRO36D	£89.00



**Black Wire Rope [BS EN 12385-4] [Steel Core] 1,770 N/mm<sup>2</sup>** These popular matt black flexible wire ropes are suitable for use as running rigging whereas the PVC-coated cables listed above should not be used over pulley sheaves. Not suitable for use outdoors.

Black Wire Rope				code	1 m	code	100 m
wire Ø	construction	Min BL	WLL 5:1	per metre	per drum	per drum	
2 mm	7 x 7	280 kg	56 kg	WIRO02	£0.99	WIRO02D	£53.73
3 mm	7 x 7	630 kg	126 kg	WIRO03	£1.05	WIRO03D	£59.77
4 mm	7 x 7	1,120 kg	224 kg	WIRO04	£1.37	WIRO04D	£77.99
5 mm	7 x 19	1,633 kg	327 kg	WIRO05	£2.65	WIRO05D	£169.00
6 mm	7 x 19	2,352 kg	470 kg	WIRO06	£3.15	WIRO06D	£239.00
8 mm	7 x 19	4,182 kg	836 kg	WIRO08	£3.15	WIRO08D	£194.15

## STAINLESS WIRE ROPES

### Some observations on Stainless Steel

Stainless Steel has a lower tensile strength than ordinary steel. As a raw material it is rather weak but higher levels of strength can be obtained by the ability of austenitic stainless steel to be heavily cold worked. The two most common grades of stainless steel are AISI 304 and AISI 316. AISI stands for the American Iron and Steel Institute. They are often referred to as A2 and A4 grade. As a general rule, A2 is used for architectural purposes and A4 is used for marine purposes. A2 [304] is stronger but not so well suited to withstand salt water corrosion. Although A4 [316] is weaker it is virtually always specified for marine use. All our stainless wire ropes are made from A4 [316] grade except for the very small micro cables where the extra strength of 304 grade is essential. N.B. BS EN 13414-1: 2003 + A2: 2008 standard permits rope of both 1,770 N/mm<sup>2</sup> and 1,960 N/mm<sup>2</sup> to be used for Lifting. Our stainless steel rope (1,570 N/mm<sup>2</sup>) falls outside the standard.

Stainless steel resists corrosion by forming an oxide layer on its outer surface. If oxygen is prevented from getting to the steel to form this layer it will corrode rapidly. For this reason stainless steel is not suitable for underwater marine fastenings although it is perfect for standing rigging exposed to both salt water and oxygen. Do not expose stainless steel to hydrochloric acid of any concentration.

When using stainless steel wire ropes a rigorous regime of inspection should be employed as they will tend to look new even when they are old! Care should also be taken with stainless rigging screws which can suffer from cold welding. This is the phenomenon where screw threads can spontaneously weld themselves together without heat. Normally a little Anhydrous Lanolin will prevent this [page 190].

## STAINLESS STEEL WIRE ROPES



**Flexible Stainless Steel Wire Rope [BS EN 12385-2002] [Steel Core] 1,570 N/mm<sup>2</sup>**

These flexible cables are made from 316 marine-grade stainless steel. They are suitable for running over sheaves or for forming thimble eyes. Ideal when high resistance to corrosion is needed or when the cables are being used for display purposes. Unlike galvanised wire, stainless wire will show no tell-tale signs of wear such as rust streaks, but as no cables last for ever it is a wise precaution to enforce a schedule of replacement depending on the wire's application.



Flexible Stainless Steel Wire Rope				code	1 m	code	100 m
wire Ø	construction	Min BL	WLL 5:1	per metre	per drum	per drum	
1 mm	7 x 7	61 kg	12 kg	-	N/A	WIRO49D	£35.00
1.2 mm	7 x 7	90 kg	18 kg	WIRO59	£0.45	WIRO59D	£37.50
1.5 mm	7 x 7	140 kg	28 kg	WIRO50	£0.52	WIRO50D	£40.00
2 mm	7 x 7	248 kg	50 kg	WIRO51	£0.56	WIRO51D	£43.00
2.5 mm	7 x 7	388 kg	78 kg	WIRO54	£0.70	WIRO54D	£54.00
3 mm	7 x 19	522 kg	104 kg	WIRO56	£0.78	WIRO56D	£60.00
4 mm	7 x 19	927 kg	185 kg	WIRO55	£1.45	WIRO55D	£92.50
5 mm	7 x 19	1,449 kg	290 kg	WIRO57	£1.74	WIRO57D	£142.00
6 mm	7 x 19	2,086 kg	417 kg	WIRO58	£2.46	WIRO58D	£195.00



**Non-Flexible Stainless Steel Wire Rope [BS EN 12385-2002] [Steel Core] 1,570 N/mm<sup>2</sup>**

These wire ropes are most typically used for standing rigging on yachts and for architectural and handrailing applications. They have a smoother appearance and are relatively stiff. Because the wires are thicker they are much less susceptible to surface wear which could cause sharp stray strands. They are NOT suitable for running over sheaves or for forming thimble eyes. 316-grade wire. These wire ropes being "Non Flexible" means they are not suited for general lifting purposes. Unlike galvanised wire, stainless wire will show no tell-tale signs of wear such as rust streaks, but as no cables last for ever it is a wise precaution to enforce a schedule of replacement depending on the wire's application. Regrettably we can no longer roll swage these for you in house, but we may be able to help point you in the right direction - please do email rigging@flints.co.uk with your enquiry.

Non-Flexible Stainless Steel Wire Rope				code	1 m	code	100 m
wire Ø	construction	Min BL	WLL 5:1	per metre	per drum	per drum	
3 mm	1 x 19	756 kg	151 kg	WIRO81	£0.90	WIRO81D	£72.00
4 mm	1 x 19	1,345 kg	269 kg	WIRO82	£1.40	WIRO82D	£116.00
5 mm	1 x 19	2,101 kg	420 kg	WIRO83	£3.28	WIRO83D	£173.00
6 mm	1 x 19	3,026 kg	605 kg	WIRO84	£2.78	WIRO84D	£229.00

### Current Technical Data

We have tried to include as much technical data as we can in this edition of our catalogue.

We will always try to match products as closely as possible to the specifications listed but if you are using a product with very tight tolerances then we would advise that you give us a ring and we will be happy to check the dimensions and load ratings for you.

# MICRO CABLES & THEIR TERMINATIONS



## Micro Cables

These very fine stainless steel micro cables have many uses. They will form virtually invisible suspension wires which are ideal for display or theatre use. They make excellent small control

wires for animatronics and special effects. The wires are made from two grades of stainless steel. The smaller wires are made from the stronger 304 grade. The 1 mm wire is made from the more corrosion-resistant 316 grade. Two of the wires that Flints stocks have a fine transparent nylon coating which is almost invisible but provides a very smooth finish and holds the strands neatly together when the wire is being cut.

Certification is not issued with Stainless Steel Micro cables. We would recommend that you carry out your own tests to establish a minimum breaking load of the finished assembly and then apply a safety factor of at least times five.

To terminate these micro cables we recommend using the Nicopress® system. Flints has had special ferrules developed by Nicopress® to solve the old problem of making secure terminations in these very small wires [see 📏]. We also supply small brass ferrules [not Nicopress®]. When using ferrules any nylon covering should be stripped back and the ferrule should be chosen to suit the actual wire diameter.

## NICOPRESS®



Really versatile tools!

**Nicopress® Micro and Small Wire Tools** Effectively terminating our very small Micro Cables used to be a problem. Flints has worked with Nicopress® to develop a range of Micro Ferrules and Stops with special hand tools which completely solve this dilemma. They are simple to use and are supplied complete with instructions. We have also found them suitable for crimping the brass ferrules listed 📏.

SPECIFICATION: Length: 210 mm. Weight: 0.3 kg.

The 17-BA size can be hired [page 380].

Nicopress® Tools		code	price	Tradeline 5+				
Micro wires tool A	17-BA 2 [A,B]	no of grooves	wire Ø	suits ferrule	suits stop			
		2	0.26 mm	NIC161A, WIR112*		NIC17BA	£71.15	£67.59
			0.51 mm	NIC162A, WIR113*				
			0.75 mm	NIC171B	NIC87132B			
			0.87 mm	NIC171B				
Small wires tool B	17-B4B 2 [B,B4]	no of grooves	wire Ø	suits ferrule	suits stop			
		2	0.75 mm	NIC171B	NIC87132B	NIC17B4B	£89.50	£85.00
			0.87 mm	NIC171B				
			1.0 mm	WIR114*				
			1.0 mm	NIC42815VB4	NIC87112B4			
		1.2 mm	NIC42815VB4	NIC87112B4				

\*Not Nicopress®

Micro Cables - Bare Stainless Steel				code	price
wire Ø mm	grade	construction	Min BL		per drum
0.26	304	1 x 3	6.8 kg	WIR047D	£45.55
0.51	304	1 x 7	34 kg	WIR048D	£46.90
1.0	316	7 x 7	61 kg	WIR049D	£35.00

Micro Cables - Nylon Covered Stainless Steel					code	price
wire Ø mm	finish Ø	grade	construction	Min BL		per drum
0.51	0.75	304	1 x 7	34 kg	WIR048ND	£64.70
0.87	1.05	304	1 x 7	90 kg	WIR049ND	£112.11

## BRASS MICRO FERRULES



### Brass Ferrules

These ferrules are too small for conventional crimpers. A substitute crimper can be made by drilling downwards through the jaws of a pair of pliers and using a vice to apply pressure.

Flints' trials have found a good termination can be made using the Nicopress® 17BA tool. These brass ferrules are not Nicopress® ferrules. Not suitable for lifting purposes.

Brass Ferrules for Micro Cables		code	price
wire Ø mm			per 100
0.26	[see 📏 for Nicopress® Tool use groove A and rotate 90° and repeat]	WIR112	£8.72
0.51	[see 📏 for Nicopress® Tool use groove A]	WIR113	£11.73
1.0	[see 📏 for Nicopress® Tool use groove B]	WIR114	£17.35

Have a look at our Nicopress videos on YouTube under FlintsTheatre channel.

## NICOPRESS MICRO FERRULES



### Nicopress® Micro Ferrules

These small ferrules have been developed by Nicopress® for Flints to provide an effective means of securing a loop in our micro cables. They are made from solid copper. They can be easily compressed

by using the tools above 📏. The combination of these economical tools and the micro ferrules solves the old problem concerning the termination of very small cables. Tests show that these terminations exceed the strength of the wire. They are ideal for invisible control and display wires. For the nylon-covered wires use a ferrule to suit the actual wire diameter. The nylon cover should be stripped back before compressing the ferrule. For non-lifting applications it is possible to make a termination with the nylon coating in place. Using ferrule NIC42815VB4 on the 1.05 mm nylon-covered wire with the nylon cover still in place we achieved results of around 20 kg before the wire slid out through the nylon coating. Although less strong with the nylon in place, they do make extremely smooth and neat assemblies which would be suitable for lightweight lanyards.

Nicopress® Micro Ferrules		code	price	100+1,000+
suits wire Ø mm	constr. finish presses	sleeve lengths before/after/shape		
0.26	1 x 3 3 copper	10 / 12 mm / round A	NIC161A	£0.10 £0.09 £0.08
0.51	1 x 7 3 copper	10 / 11 mm / round A	NIC162A	£0.11 £0.10 £0.09
0.75-0.9	1/32" 1 x 7 2 copper	6 / 8 mm / oval A,B	NIC171B	£0.17 £0.14 £0.11
1 & 1.2	3/64" 1 x 7 3 tin-plated	9 / 11 mm / oval B,D	NIC42815VB4	£0.33 £0.26 £0.24