



# Parameter Sample Book

Mining wire rope



[www.gsrgroup.cn](http://www.gsrgroup.cn)

## Company overview

GSR is a leading company specializing in research, production, processing, sales, and import-export operations of wire ropes, wires, strands, and related products, equipment, materials, and technologies. The main products include wire ropes, bridge cables, commercial wires, wire rope accessories, and prestressed steel strands. The annual production capacity reaches 600,000 tons. The company excels in producing high-strength, high-toughness, extract, extra-long, special-structure, and special-purpose wire rope products. Therefore, GSR has become a technologically strong, high-capacity and market-leading Chinese industry leader.

For over 50 years, GSR has remained committed to the steel wire rope industry and has taken the initiative to lead its development, assuming both responsibility and mission. The company boasts inherent strengths that include production of various structural steel wire ropes, ranging in diameter 1.0mm to 264mm (reaching 200mm for zinc-aluminum alloy sealed steel wire ropes), as well as PC steel strands ranging in diameter from 5.0mm to 28.6mm, various purpose wires ranging in diameter from 0.15mm to 9.0mm, and deep-processed products such as pretensioned, coated, and rigged steel wire ropes that display high-strength, high-toughness, exceptional thickness, length, and unique structures for special purposes. The "Julong" brand wire ropes produced by GSR are widely used in an array of industries and fields, such as aerospace, national defense construction, building structures, bridge engineering, cable car transport, high-speed elevators, marine engineering, water conservancy engineering, ports, machinery, steel smelting, mining, petroleum drilling and more.

GSR has research platforms such as China National Enterprise Technology Center, China National Torch Program Key High tech Enterprise, High Performance Special Cable Manufacturing Technology and Application National and Local Joint Engineering Research Center, and has undertaken and completed multiple key technological innovation projects in China. The company have independently developed a series of high-tech products, including fully sealed steel wire ropes coated with zinc aluminum rare earth alloy, 264mm large-diameter marine engineering steel wire ropes, large-span bridge steel wire ropes, large electric shovel steel wire ropes, SPC manned steel wire ropes, etc. The technical indicators of these products are higher than the industry technical standards and have reached the international leading level.

The various types of steel wire ropes developed and produced by GSR are widely used in various industries and fields. A large number of difficult and high-tech steel wire rope products have been successfully used in the Gezhouba Water Conservancy Hub Project, Three Gorges Power Station, Shenzhen Yantian Port, Tianjin Port, Guangdong Humen Bridge, Guizhou Baling River Bridge, Beipanjiang Bridge, Hunan Aizhai Bridge, Hong Kong Zhuhai Macao Bridge, Zhenhua 30, the world's largest salvage crane ship, Heidaigou large open-pit coal mine, Kongtong Mountain tourist cableway, Tongren Olympic Sports Center,

Liaoning aircraft carrier Major projects and super projects such as China's "Heavenly Eye" and "Shenzhou" manned spacecraft No. 8, 9, 10, and 11. The company's products are also exported to more than 40 countries and regions in Europe, America, Asia, Africa, Oceania, etc., and have been successfully used in projects such as the Harrogate Bridge in Norway, Maputo Bridge in Mozambique, Heima Coal Mine in Türkiye, Chambishi Mine in Central Africa, Zambia, and Singapore Container Terminal, which are highly recognized in the international market.

GSR has consistently prioritized the strengthening of its technological innovation system and the conversion of its achievements, this makes the company a leader in the industry, and from being an enforcer of rules to a rule-maker. GSR has taken lead and participated in the revision of over 40 international standards, national standards in China, military, and industry standards. In June 2017, the company led the revision of ISO 2408:2017 "Wire ropes - Requirements," an international standard that was published and distributed.

GSR places great importance on the creation, utilization, and protection of intellectual property rights. The company has filed 303 patent technology achievements, which have been accepted by the Chinese National Intellectual Property Administration. Furthermore, GSR has been granted 135 patents.

GSR has obtained ISO 9001 quality management system, ISO 14001 environmental management system, GB/T 01 occupational health and safety management system, ISO 10012 measurement management system, GJB 9001B national military standard quality management system, American Petroleum Institute (API) certification, as well as recognition, certification, and approval from ship classification societies such as CCS, LR, DNV.GL, BV, ABS, KR, among others.

The number of recognitions, certifications, and approvals received by GSR ranks top in the industry. GSR's "Julong" brand wire ropes have been rated as user products for 20 consecutive years. The company is recognized as a AAAA-level "Standardized Good Behavior Enterprise" at the level, a key high-tech enterprise in China's Torch Plan, a demonstration enterprise for China's technological innovation, a Chinese intellectual property advantage enterprise, and a demonstration enterprise for nurturing Chinese industrial brands. The company was awarded the "China Quality Nomination Award" in 2016, and its wire rope products were included in the list of "China Manufacturing Single Item Champion Demonstration Enterprises" in 2017.

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## Characteristics of steel wire rope

### Construction of steel wire rope

Wire rope is made of several strands and a rope core (metal core, fiber core or other rope core), and the strand is made of several steel rods and a core (central steel wire or fiber core).

### Rope core

Rope core is divided into fiber core and steel core fiber core.

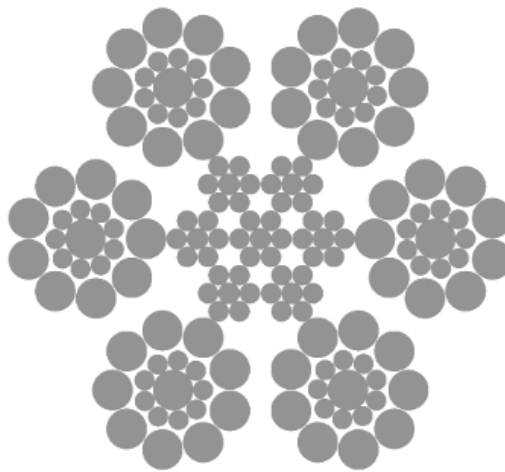
Fiber core steel rope is soft and has good bending performance. When the steel rope is subjected to collision and impact loads during work, the fiber core can play a buffering role. Fiber core is divided into natural fiber core and synthetic fiber core. Natural fiber core has more oil storage, so that the steel rope has enough lubrication internally during work and prevents corrosion of steel wire; synthetic fiber core (such as polypropylene, polyethylene) has good toughness, water absorption, acid resistance, alkali resistance, corrosion resistance, extrusion resistance and wear resistance, etc., and the steel rope is not easy to deform under dynamic load and has a stable diameter.

### Steel core

Steel core is divided into independent steel wire core (IWRC) and steel wire core (WSC). Metal and steel core steel rope has large breaking pull force, extrusion resistance and high temperature resistance, and is not easy to deform under dynamic load and has a stable diameter.

### linear contact lay wire rope

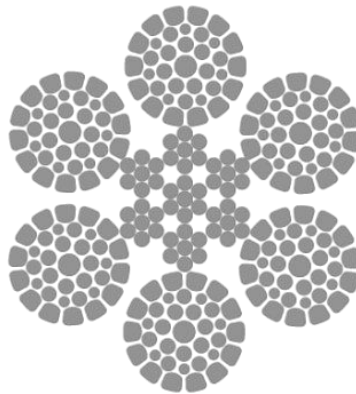
Linear contact lay wire rope the twist length of all steel wires in the rope is the same, and each layer of steel wire is placed on the groove formed between the inner layer of steel wires. The steel wires are in line contact, and the structure of the rope is close. Therefore, the line contact steel wire rope has a large breaking pull force, no secondary bending stress between the layers of steel wires when used, and good fatigue resistance.



6×19S-IWRC

### Compacted steel wire rope

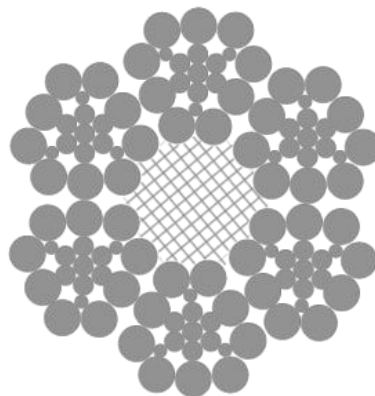
The steel wires in the rope are in surface contact, and the metal filling coefficient of the steel wire rope is large, and the structure of the rope is close. When the steel wire rope is used, the contact stress between the steel wires is small, there is no secondary bending stress, and the contact area between the steel wire rope and the wheel groove is large. Therefore, the compacted steel wire rope has good wear resistance, fatigue resistance and extrusion resistance, and is not easy to deform.



6×K36WS-IWRC

### Special-shaped steel wire rope

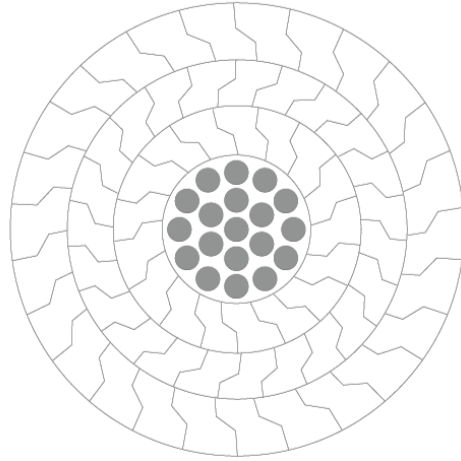
The section of the steel wire rope is not round, which is usually called special-shaped steel wire rope. The main types are triangular and fan-shaped steel wire ropes. The supporting surface of the special-shaped steel wire rope is 3-4 times larger than that of the round steel wire rope, that is, the contact area with the wheel groove is large, the contact stress is small, and the service life is 2-3 times higher than that of the round steel wire rope. The contact points between the rope and the rope of the triangular steel wire rope are increased, and the compression resistance and fatigue resistance are good. The metal effective section area of the special-shaped steel wire rope is large, and the breaking pull force of the whole rope is increased by 25% compared with that of the round steel wire rope at the same diameter and strength.



6×V19-FC

### Locked coil wire rope

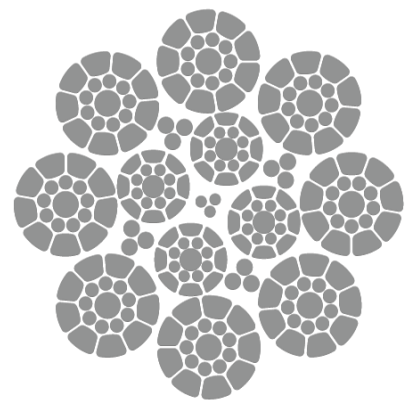
Sealed steel wire rope Sealed steel wire rope layers of special steel wire outside the core are tightly sewn together to form a smooth closed surface, the core and adjacent layers of special steel wire twist to the opposite, so the sealed steel wire rope has the advantages of large metal filling coefficient and breaking pull, good wear resistance, long service life, no rotation, small structural elongation.



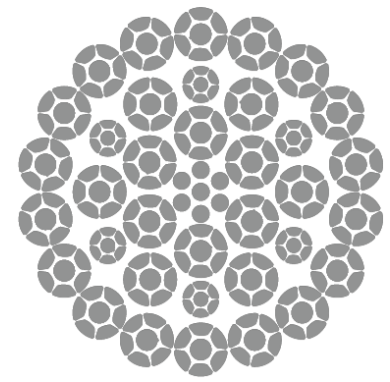
Three layers of Z-wire rope

### Resistance rotation steel wire rope

6 or 8 strands of steel wire rope for rotation of steel wire rope, when the steel wire rope is used for single or high lift lifting steel wire rope twist because of rotation, not only affect the service life of the steel wire rope, but also affect the lifting efficiency and safety of operators. By changing the structure and twist method of the steel wire rope can eliminate the rotation of the steel wire rope. The current use of micro-rotation and resistance rotation steel wire rope is multi-strand, three-strand, four-strand round or fan-shaped strand steel wire rope.



8×K19S-PWRC (Slight spin)



35(W)×K7(Stop rotation)

### Metal core coated steel wire rope

Plastic polymer coated on the surface of the metal core and between the strands of the steel wire rope, reduce the wear between the strands and the inner and outer layers of the rope, thus improving the wear resistance, fatigue resistance, impact resistance and extrusion resistance of the steel wire rope. Prolong the service life of the steel wire rope.

### Galvanized aluminum (zinc) steel wire rope

Galvanized aluminum (zinc) steel wire rope is made of electro galvanized or hot galvanized aluminum (zinc) steel wire twisted. Zinc or zinc aluminum alloy layer in the corrosive environment (such as seawater, marine atmosphere corrosion, hydrogen sulfide, sulfur dioxide atmosphere corrosion, etc.) to protect the steel wire, improve the service life of the wire rope.

### Lubrication of steel wire rope

Lubricating oil can prevent steel wire rust, make the lubrication between the steel wire, steel wire rope and pulley components reduce friction. If the user has no special requirements, we in the production of the rope core and the surface of the steel wire rope are coated with lubricating oil, and for important uses and more serious corrosion places with steel wire rope using the stock spray high drop point lubricating oil; friction improvement with steel wire rope coated with grease.

### Twisting of steel wire rope

Interactive twist: the twisting direction of the steel wire in the outer layers is opposite to the twisting direction of the outer layers in the steel wire rope. As shown in the figure below.



Right interactive twist (sZ)



Left interactive twist (zS)

Concurrent twist: the twisting direction of the steel wire in the outer layers is the same as the twisting direction of the outer layers in the steel wire rope. As shown in the figure below.



right-hand lang-lay (zZ)



left-hand lang-lay (sS)



### **Number of outer steel wires**

For the same diameter of the steel wire rope, the selection of the outer steel wire number of the steel wire rope can improve the wear resistance of the steel wire rope, and the selection of the outer steel wire number of the steel wire rope has the advantages of soft, fatigue resistance.

### **Approximate calculation of the diameter of the outermost layer of the wire rope**

Six-strand steel wire rope:  $d = D / (N + 3.5)$

Eight-strand steel wire rope:  $d = D / (N + 6.5)$

Where:

d: outer steel wire diameter, in mm.

D: nominal diameter of steel wire rope, in mm.

N: number of outer steel wires of steel wire rope.

### **Calculation formula for reference weight of steel wire rope**

Calculation formula for reference weight of steel wire rope:  $M = KD^2$

Where:

M: reference weight of steel wire rope per unit length, in kg/100m.

D: nominal diameter of steel wire rope, in mm.

K: weight coefficient of a certain type of oil-coated steel wire rope per unit length, in kg/100m\*mm<sup>2</sup>, the value of K is shown in the table below.

### **Calculation formula for minimum breaking tension of steel wire rope**

Calculation formula for minimum breaking tension of steel wire rope:

$$F = K * D^2 * R / 1000$$

Where:

F--minimum breaking tension of steel wire rope, in KN.

D--nominal diameter of steel wire rope, in mm.

R--nominal tensile strength of steel wire rope, in MPa.

K'--minimum breaking tension coefficient of a certain type of steel wire rope, the value of K' is shown in the table below.

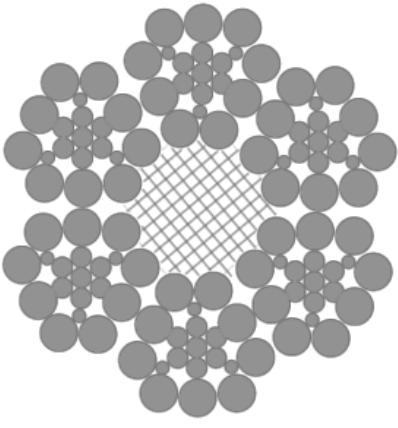
### **Structural elongation of wire rope**

The elongation of wire rope consists of elastic elongation and structural elongation, structural elongation is permanent elongation. Some applications (such as permanent suspension load-bearing structures, reciprocating load-bearing ropes, and other lengths of lifting ropes, etc.) require that the wire rope must be eliminated from the structure of the elongation of the pre-tensioning is to eliminate the effective means of the elongation of the Construction of wire rope. Our company can provide users with this service.

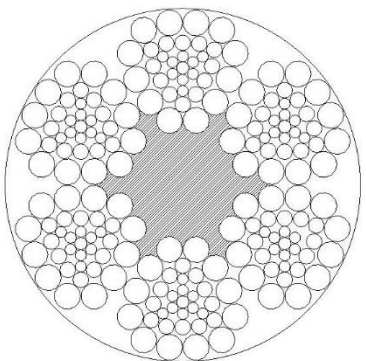
### Recommended Main Uses of Mining Wire Rope

Application	Wire rope structure
Main hoisting rope	6×V10B-FC、6×V25B-FC、6×V28B-FC、6×V34B-FC、6×V30-FC、6×25TS-FC、6×28TS-FC、6×K26WS、6×K31WS、6×K36WS、6×K41WS、35W×K7(Inner layer coated with plastic)
Wire Rope for Balancing Tail Rope	35W×7、34(M)×7、36(M)×7、P6×4×7、P8×4×7、P8×4×9、P8×4×14、P8×4×19
Steel wire rope for stabilizing ropes in vertical shafts	One layer of Z-wire、two layer of Z-wire、three layer of Z-wire、One layer of H-wire and round wire
Wire rope for inclined shaft hoisting	6×7、6×19S、6×K7、6×K19S
Wire Rope for Steel Belt Machines	6×26WS
Wire rope for well construction	18×7
Bucket shovel main hoisting rope	6×K46WS-EPIWRC、6×K52WS-EPIWRC、6×K47WS-EPIWRC
Pullback wire rope	
Bucket shovel unloading wire rope	6×K49SF-(6×7+FC)、6×K49SWS-(6×7+FC)
bucket shovel	
Electric shovel main taut rope	1×229、ZZZ+WSC
Electric shovel main hoisting wire rope	
Electric shovel main pull back wire rope	FPF8×K36WS-IWRC、FPF8×36WS-IWRC
Electric shovel main push pressure wire rope	
Electric shovel taut rope	1×181、1×229

### Shaped strand wire rope

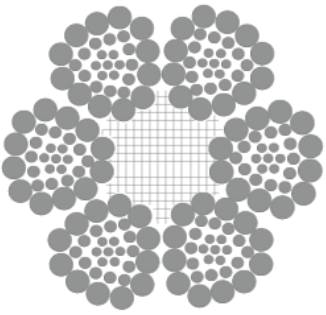
 6×V10B -FC Typical structure diagram				Typic structure						Diameter range (mm)	
				Tectonic	Structure of wire rope strand	Outer wire count					
						Total	Per share				
				6×V19(6×V10B) 6×10TS	/1×7-3/-9 V-9		54 54	9 9	20~36		
Nominal diameter of wire rope (mm)	Reference weight(kg/100m)			Nominal tensile strength of wire rope MPa							
				1570		1670		1770		1870	
	fiber core			Minimum breaking force of wire rope kN							
				natural	synthetic	steel core	fiber core	steel core	fiber core	steel core	fiber core
20	168	166	180	241	257	256	274	271	290	286	307
22	204	201	218	291	312	310	331	328	351	347	371
24	242	240	259	346	371	368	394	390	418	413	442
26	285	281	304	406	435	432	463	458	491	484	518
28	330	326	353	471	505	501	537	531	569	562	601
30	379	374	405	541	579	576	616	610	653	645	690
32	431	426	461	616	659	655	701	694	743	733	785
34	487	481	520	695	744	739	792	784	839	828	886
36	546	539	583	779	834	829	887	879	941	928	994
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.156(fiber core)1.191(steel core). The table shows the 6V×19 reference weight, and 6×10TS is 2% larger than the 6×V19 reference weight.											

### Shaped strand wire rope

 6xV25B -FC Typical structure diagram				Typic structure								Diameter range (mm)		
				Tectonic	Structure of wire rope strand		Outer wire count		Total	Per share				
				6xV25B (6xV34)	/1x7-3/-12-12		72	12	24~50					
				6xV37	/1x7-3/-12-15		90	15	28~56					
				6xV34B (6xV43)	/1x7-3/-15-18		108	18	32~60					
Nominal diameter of wire rope (mm)	Reference weight(kg/100m)			Nominal tensile strength of wire rope MPa										
				1570		1670		1770		1870				
	fiber core			Minimum breaking force of wire rope kN										
				natural	synthetic	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core
22	200	198	214	279	299	297	318	314	337	332	356			
24	238	236	255	332	355	353	378	374	401	395	423			
26	280	276	299	390	417	414	444	439	470	464	497			
28	325	321	347	452	484	481	515	509	545	538	576			
30	373	368	398	519	555	552	591	585	626	618	661			
32	424	419	453	590	632	628	672	665	712	703	753			
34	479	473	511	666	713	709	759	751	804	793	850			
36	537	530	573	747	800	794	851	842	902	889	952			
38	598	591	638	832	891	885	948	938	1004	991	1061			
40	662	654	707	922	987	981	1050	1039	1113	1098	1176			
42	730	721	780	1016	1088	1081	1158	1146	1227	1211	1296			
44	802	792	856	1116	1195	1187	1271	1258	1347	1329	1423			
46	876	865	935	1219	1306	1297	1389	1375	1472	1452	1555			
48	954	942	1018	1328	1422	1412	1512	1497	1603	1581	1693			
50	1035	1023	1105	1440	1543	1532	1641	1624	1739	1716	1837			
52	1119	1106	1195	1558	1668	1657	1775	1756	1881	1856	1987			
54	1207	1193	1289	1680	1799	1787	1914	1894	2028	2001	2143			
56	1298	1283	1386	1807	1935	1922	2058	2037	2181	2152	2305			
58	1393	1376	1487	1938	2076	2062	2208	2185	2340	2309	2472			

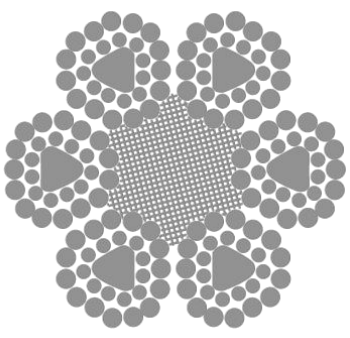
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.177(fiber core)1.213(steel core).

### Shaped strand wire rope

 6×V30+FC Typical structure diagram			Typic structure								Diameter range (mm)	
			Tectonic	Structure of wire rope strand				Outer wire count		Total		
								1570			1670	
Nominal diameter of wire rope (mm)	Reference weight(kg/100m)			Nominal tensile strength of wire rope MPa								
				Minimum breaking force of wire rope kN								
	fiber core		steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	
natural	synthetic	fiber core										steel core
22	200	198	214	251	271	267	289	283	306	299	323	
24	238	236	255	298	323	317	343	336	364	355	385	
26	280	276	299	350	379	373	403	395	427	417	451	
28	325	321	347	406	439	432	467	458	495	484	523	
30	373	368	398	466	504	496	537	526	569	555	601	
32	424	419	453	531	574	564	610	598	647	632	684	
34	479	473	511	599	648	637	689	675	730	713	772	
36	537	530	573	671	726	714	773	757	819	800	865	
38	598	591	638	748	809	796	861	843	912	891	964	
40	662	654	707	829	897	882	954	935	1011	987	1068	
42	730	721	780	914	989	972	1052	1030	1115	1089	1178	

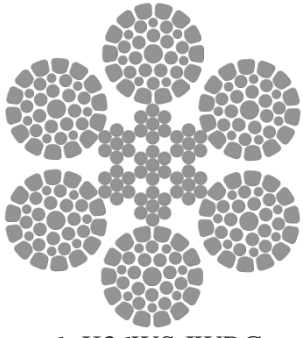
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.177(fiber core)/1.213(steel core).

### Shaped strand wire rope

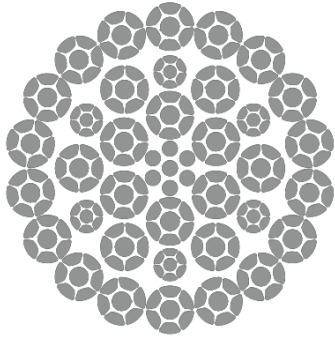
 6×28TS+FC Typical structure diagram			Typic structure						Diameter range (mm)		
			Tectonic	Structure of wire rope strand		Outer wire count					
						Total	Per share				
			Nominal diameter of wire rope (mm)	Reference weight(kg/100m)		Nominal tensile strength of wire rope MPa				Minimum breaking force of wire rope kN	
1570		1670				1770		1870			
fiber core		steel core	fiber core		steel core		fiber core		steel core		
natural	synthetic		fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	
24	246	242	262	342	366	364	390	385	413	407	436
26	289	285	308	401	430	427	457	452	485	478	512
28	335	330	357	465	499	495	530	525	562	554	594
30	384	379	410	534	572	568	609	602	645	636	682
32	437	431	466	608	651	646	693	685	734	724	776
34	494	487	526	686	735	730	782	773	829	817	875
36	553	546	590	769	824	818	877	867	929	916	982
38	617	608	657	857	918	912	977	966	1035	1021	1094
40	683	674	728	950	1017	1010	1082	1070	1147	1131	1212
42	753	743	803	1047	1122	1114	1193	1180	1265	1247	1336
44	827	815	881	1149	1231	1222	1309	1295	1388	1368	1466
46	904	891	963	1256	1345	1336	1431	1416	1517	1496	1603
48	984	970	1048	1367	1465	1454	1558	1542	1652	1629	1745
50	1068	1053	1138	1484	1590	1578	1691	1673	1792	1767	1893
52	1155	1138	1230	1605	1719	1707	1829	1809	1938	1911	2048
54	1245	1228	1327	1731	1854	1841	1972	1951	2090	2061	2208
56	1339	1320	1427	1861	1994	1980	2121	2098	2248	2217	2375
58	1436	1416	1531	1996	2139	2124	2275	2251	2411	2378	2548
60	1537	1516	1638	2136	2289	2273	2435	2409	2581	2545	2726

Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.177(fiber core)1.213(steel core).  
 The table shows the reference weight of 6V×37S. 6×25TS, 6×28TS, and 6×31TS are 2% larger than the reference weight of 6V×37S.

### Compacted strand wire rope

 6×K36WS-IWRC Typical structure diagram			Typic structure								Diameter range (mm)							
			Tectonic	Structure of wire rope strand				Outer wire count										
								Total	Per share									
			Nominal diameter of wire rope (mm)	Reference weight (kg/100m)		Nominal tensile strength of wire rope MPa												
rope (mm)	fiber core	steel core	1670					1770					1870		1960		2160	
			Minimum breaking force of wire rope kN															
			fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core
10	42.5	47.0	63.5	70.5	67.3	74.7	71.1	78.9	74.5	82.7	82.1	91.2						
12	61.2	67.7	91.4	101	96.9	108	102	114	107	119	118	131						
14	83.3	92.1	124	138	132	146	139	155	146	162	161	179						
16	109	120	162	180	172	191	182	202	191	212	210	233						
18	138	152	206	228	218	242	230	256	241	268	266	295						
20	170	188	254	282	269	299	284	316	298	331	328	365						
22	206	227	307	341	326	362	344	382	360	400	397	441						
24	245	271	366	406	387	430	409	455	429	476	473	525						
26	287	318	429	476	455	505	480	533	503	559	555	616						
28	333	368	498	553	527	586	557	619	584	648	644	715						
30	383	423	571	634	605	672	640	710	670	744	739	820						
32	435	481	650	722	689	765	728	808	763	847	840	933						
34	491	543	734	815	778	863	821	912	861	956	949	1054						
36	551	609	822	913	872	968	921	1023	965	1072	1064	1181						
38	614	679	916	1018	971	1079	1026	1140	1075	1194	1185	1316						
40	680	752	1015	1128	1076	1195	1137	1263	1192	1323	1313	1458						
42	750	829	1119	1243	1186	1318	1253	1392	1314	1459	1448	1608						
44	823	910	1229	1364	1302	1446	1376	1528	1442	1601	1589	1765						
46	899	995	1343	1491	1423	1581	1504	1670	1576	1750	1737	1929						
48	979	1083	1462	1624	1550	1721	1637	1818	1716	1906	1891	2100						
50	103	1175	1587	1762	1682	1867	1777	1973	1862	2068	2052	2279						
52	1149	1271	1716	1906	1819	2020	1921	2134	2014	2237	2219	2465						
54	1239	1371	1850	2055	1961	2178	2072	2301	2172	2412	2393	2658						
56	1333	1474	1990	2210	2109	2342	2228	2475	2336	2594	2574	2859						
58	1430	1581	2135	2371	2263	2513	2390	2655	2506	2782	2761	3066						
60	1530	1692	2285	2537	2421	2689	2558	2841	2681	2978	2955	3281						

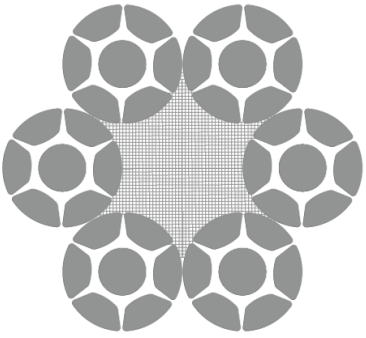
### Compacted strand wire rope

 35(W)×K7 Typical structure diagram		Typic structure				Diameter range (mm)
		Tectonic	Structure of wire rope strand	Outer wire count		
				Total	Per share	
		35(W)×K7	1-6	210	6	12~60
		40(W)×K7	1-6	240	6	20~60
		35(W)×K19S	1-9-9	315	9	50~60
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope MPa				
		1670	1770	1870	1960	2160
		Minimum breaking force of wire rope kN				
	steel core	steel core	steel core	steel core	steel core	steel core
12	73.4	101	108	114	119	131
13	86.2	119	126	133	140	154
14	100	138	146	155	162	179
16	131	180	191	202	212	233
18	165	228	242	256	268	295
20	204	282	299	316	331	365
22	247	341	362	382	400	441
24	294	406	430	455	476	525
26	345	476	505	533	559	616
28	400	553	586	619	648	715
30	459	634	672	710	744	820
32	522	722	765	808	847	933
34	590	815	863	912	956	1054
36	661	913	968	1023	1072	1181
38	736	1018	1079	1140	1194	1316
40	816	1128	1195	1263	1323	1458
42	900	1243	1318	1392	1459	1608
44	987	1364	1446	1528	1601	1765
46	1079	1491	1581	1670	1750	1929
48	1175	1624	1721	1818	1906	2100
50	1275	1762	1867	1973	2068	2279
52	1379	1906	2020	2134	2237	2465
54	1487	2055	2178	2301	2412	2658
56	1599	2210	2342	2475	2594	2859
58	1716	2371	2513	2655	2782	3066
60	1836	2537	2689	2841	2978	3281

Note: Total wire breaking tension=Minimum breaking force of wire rope×1.260.

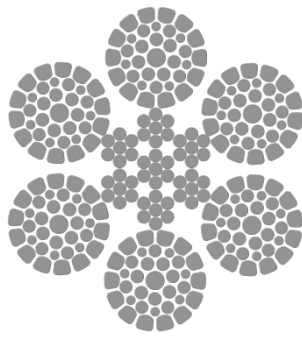


### Compacted strand wire rope

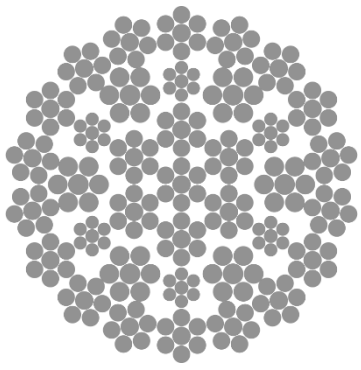
 6×K7-FC Typical structure diagram		Typic structure				Diameter range (mm)
		Tectonic	Structure of wire rope strand	Outer wire count		
				Total	Per share	
		6×K7-FC	1-6	36	6	10~40
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope MPa				
		1570	1670	1770	1870	1960
	fiber core	Minimum breaking force of wire rope kN				
		fiber core	fiber core	fiber core	fiber core	fiber core
10	41.0	60.1	64.0	67.8	71.6	75.1
12	59.0	86.6	92.1	97.6	103	108
14	80.4	118	125	133	140	147
16	105	154	164	174	183	192
18	133	195	207	220	232	243
20	164	241	256	271	286	300
22	198	291	310	328	347	363
24	236	346	368	390	413	432
26	277	406	432	458	484	507
28	321	471	501	531	562	589
30	369	541	576	610	645	676
32	420	616	655	694	733	769
34	474	695	739	784	828	868
36	531	779	829	879	928	973
38	592	868	924	979	1034	1084
40	656	962	1023	1085	1146	1201

Note: Total wire breaking tension=Minimum breaking force of wire rope×1.134 fiber core.

### Compacted strand wire rope

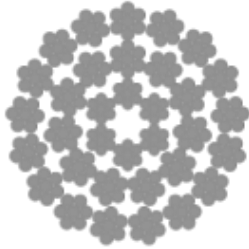
 6×K36WS-IWRC Typical structure diagram			Typic structure								Diameter range (mm)		
			Tectonic	Structure of wire rope strand				Outer wire count					
								Total	Per share				
			Nominal diameter of wire rope (mm)	Reference weight (kg/100m)		Nominal tensile strength of wire rope MPa							
1670		1770				1870		1960		2160			
Minimum breaking force of wire rope kN													
fiber core	steel core	fiber core		steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	
10	42.5	47.0		63.5	70.5	67.3	74.7	71.1	78.9	74.5	82.7	82.1	91.2
12	61.2	67.7		91.4	101	96.9	108	102	114	107	119	118	131
14	83.3	92.1		124	138	132	146	139	155	146	162	161	179
16	109	120		162	180	172	191	182	202	191	212	210	233
18	138	152	206	228	218	242	230	256	241	268	266	295	
20	170	188	254	282	269	299	284	316	298	331	328	365	
22	206	227	307	341	326	362	344	382	360	400	397	441	
24	245	271	366	406	387	430	409	455	429	476	473	525	
26	287	318	429	476	455	505	480	533	503	559	555	616	
28	333	368	498	553	527	586	557	619	584	648	644	715	
30	383	423	571	634	605	672	640	710	670	744	739	820	
32	435	481	650	722	689	765	728	808	763	847	840	933	
34	491	543	734	815	778	863	821	912	861	956	949	1054	
36	551	609	822	913	872	968	921	1023	965	1072	1064	1181	
38	614	679	916	1018	971	1079	1026	1140	1075	1194	1185	1316	
40	680	752	1015	1128	1076	1195	1137	1263	1192	1323	1313	1458	
42	750	829	1119	1243	1186	1318	1253	1392	1314	1459	1448	1608	
44	823	910	1229	1364	1302	1446	1376	1528	1442	1601	1589	1765	
46	899	995	1343	1491	1423	1581	1504	1670	1576	1750	1737	1929	
48	979	1083	1462	1624	1550	1721	1637	1818	1716	1906	1891	2100	
50	103	1175	1587	1762	1682	1867	1777	1973	1862	2068	2052	2279	
52	1149	1271	1716	1906	1819	2020	1921	2134	2014	2237	2219	2465	
54	1239	1371	1850	2055	1961	2178	2072	2301	2172	2412	2393	2658	
56	1333	1474	1990	2210	2109	2342	2228	2475	2336	2594	2574	2859	
58	1430	1581	2135	2371	2263	2513	2390	2655	2506	2782	2761	3066	
60	1530	1692	2285	2537	2421	2689	2558	2841	2681	2978	2955	3281	

### Multi-layer strand wire rope

Typical structure diagram  35(W)×7		Typic structure				Diameter range (mm)	
		Tectonic	Structure of wire rope strand	Outer wire count			
				Total	Per share		
		24(W)×7	1-6	72	6	12~50	
		35(W)×7	1-6	96	6	14~60	
		40(W)×7	1-6	108	6	30~60	
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope MPa					
		1570	1670	1770	1870	1960	2160
		Minimum breaking force of wire rope kN					
12	68.3	83.9	89.2	94.6	99.9	105	115
14	92.9	114	121	129	136	143	157
16	121	149	159	168	178	186	205
18	154	189	201	213	225	236	260
20	190	233	248	263	278	291	321
22	229	282	300	318	336	352	388
24	273	336	357	378	400	419	462
26	320	394	419	444	469	492	542
28	372	457	486	515	544	570	628
30	427	524	558	591	624	654	721
32	485	596	634	672	710	745	821
34	548	673	716	759	802	841	926
36	614	755	803	851	899	942	1039
38	684	841	895	948	1002	1050	1157
40	758	932	991	1051	1110	1163	1282
42	836	1027	1093	1158	1224	1283	1414
44	918	1128	1199	1271	1343	1408	1551
46	1003	1233	1311	1390	1468	1539	1696
48	1092	1342	1427	1513	1598	1675	1846
50	1185	1456	1549	1642	1734	1818	2003
52	1282	1575	1675	1776	1876	1966	-
54	1382	1698	1807	1915	2023	2120	-
56	1486	1827	1943	2059	2176	2280	-
58	1595	1959	2084	2209	2334	2446	-
60	1706	2097	2230	2364	2498	2618	-

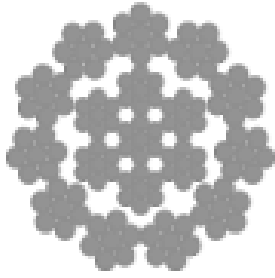
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.260.

### Multi-layer strand wire rope

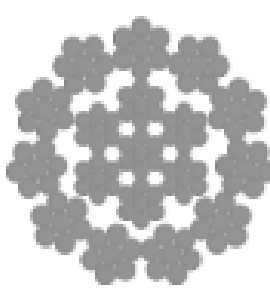
 34(M)x7-FC Typical structure diagram			Typic structure						Diameter range (mm)			
			Tectonic	Structure of wire rope strand		Outer wire count						
						Total	Per share					
			34 (M) ×7		1-6		66		6		16~60	
			36 (M) ×7		1-6		72		6		20~60	
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)		Nominal tensile strength of wire rope MPa									
			1570		1670		1770		1870			
			Minimum breaking force of wire rope kN									
	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core		
16	102	113	126	132	134	140	142	149	150	157		
18	129	144	160	167	170	177	180	188	190	199		
20	160	177	197	206	210	219	222	232	235	245		
22	193	214	239	249	254	265	269	281	284	297		
24	230	255	284	297	302	316	320	334	338	353		
26	270	299	333	348	354	370	376	392	397	415		
28	313	347	386	404	411	429	436	455	460	481		
30	359	399	444	463	472	493	500	523	528	552		
32	409	454	505	527	537	561	569	594	601	628		
34	461	512	570	595	606	633	642	671	679	709		
36	517	574	639	667	680	710	720	752	761	795		
38	576	640	712	744	757	791	803	838	848	886		
40	638	709	789	824	839	876	889	929	939	981		
42	704	781	870	908	925	966	980	1024	1036	1082		
44	772	858	954	997	1015	1060	1076	1124	1137	1187		
46	844	937	1043	1090	1110	1159	1176	1228	1242	1298		
48	919	1021	1136	1186	1208	1262	1281	1338	1353	1413		
50	998	1108	1232	1287	1311	1369	1389	1451	1468	1533		
52	1079	1198	1333	1392	1418	1481	1503	1570	1588	1659		
54	1163	1292	1438	1502	1529	1597	1621	1693	1712	1789		
56	1251	1389	1546	1615	1644	1718	1743	1821	1841	1923		
58	1342	1490	1658	1732	1764	1843	1870	1953	1975	2063		
60	1436	1595	1775	1854	1888	1972	2001	2090	2114	2208		

Note: The sum of the minimum breaking force = the minimum breaking force of the wire rope × 1.308, where 34 × 7 is 1.275.

### Multi-layer strand wire rope

 18x7-WSC Typical structure diagram		Typic structure										Diameter range (mm)	
		Tectonic	Structure of wire rope strand				Outer wire count						
							Total	Per share					
				17x7	1-6				66	6	6~40		
		18x7	1-6				72	6	6~50				
		18x19W	1-6-6+6				144	12	20~60				
		18x19S	1-9-9				108	9	16~60				
		18x19	1/6/12				144	12	20~60				
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)		Nominal tensile strength of wire rope MPa										
			1570		1670		1770		1870		1960		
			Minimum breaking force of wire rope kN										
	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	
6	14.4	15.9	17.9	19.1	19.0	20.3	20.1	21.5	21.3	22.8	22.3	23.8	
7	19.6	21.7	24.3	26.0	25.9	27.7	27.4	29.3	29.0	31.0	30.3	32.5	
8	25.5	28.4	31.8	34.0	33.8	36.1	35.8	38.3	37.8	40.5	39.6	42.4	
9	32.3	35.9	40.2	43.0	42.7	45.7	45.3	48.5	47.9	51.2	50.2	53.7	
10	39.9	44.3	49.6	53.1	52.8	56.4	55.9	59.8	59.1	63.2	61.9	66.2	
11	48.3	53.6	60.0	64.2	63.9	68.3	67.7	72.4	71.5	76.5	74.9	80.2	
12	57.5	63.8	71.4	76.4	76.0	81.3	80.5	86.1	85.1	91.0	89.2	95.4	
13	67.4	74.9	83.8	89.7	89.2	95.4	94.5	101	99.9	107	105	112	
14	78.2	86.8	97.2	104	103	111	110	117	116	124	121	130	
16	102	113	127	136	135	145	143	153	151	162	159	170	
18	129	144	161	172	171	183	181	194	191	205	201	215	
20	160	177	198	212	211	226	224	239	236	253	248	265	
22	193	214	240	257	255	273	271	290	286	306	300	321	
24	230	255	286	306	304	325	322	345	340	364	357	382	
26	270	299	335	359	357	382	378	404	399	427	419	448	
28	313	347	389	416	414	443	439	469	463	496	486	519	
30	359	399	447	478	475	508	503	538	532	569	557	596	
32	409	454	508	543	540	578	573	613	605	647	634	678	
34	461	512	574	613	610	653	647	692	683	731	716	766	
36	517	574	643	688	684	732	725	775	766	819	803	859	
38	576	640	716	766	762	815	808	864	853	913	894	957	
40	638	709	794	849	844	903	895	957	945	1011	991	1060	

### Multi-layer strand wire rope

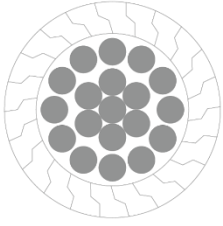
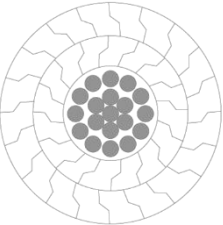
 18×7-WSC Typical structure diagram			Typic structure								Diameter range (mm)	
			Tectonic	Structure of wire rope strand				Outer wire count				
								Total	Per share			
17×7	1-6				66	6	6~40					
18×7	1-6				72	6	6~50					
18×19	1-6-6+6				144	12	20~60					
W	1-9-9				108	9	16~60					
18×19S	1/6/12				144	12	20~60					

Nominal diameter of wire rope (mm)	Reference weight (kg/100m)		Nominal tensile strength of wire rope MPa									
			1570		1670		1770		1870		1960	
			Minimum breaking force of wire rope kN									
	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core
42	704	781	875	936	931	996	987	1055	1042	1115	1093	1169
44	772	858	960	1027	1022	1093	1083	1158	1144	1224	1199	1283
46	844	937	1050	1123	1117	1194	1184	1266	1250	1337	1311	1402
48	919	1021	1143	1223	1216	1301	1289	1378	1361	1456	1427	1526
50	998	1108	1240	1327	1319	1411	1398	1496	1477	1580	1548	1656
52	1079	1198	1342	1435	1427	1526	1512	1618	1598	1709	1675	1791
54	1163	1292	1447	1547	1539	1646	1631	1745	1723	1843	1806	1932
56	1251	1389	1556	1664	1655	1770	1754	1876	1853	1982	1942	2078
58	1342	1490	1669	1785	1775	1899	1882	2013	1988	2126	2084	2229
60	1436	1595	1786	1910	1900	2032	2014	2154	2127	2275	2230	2385

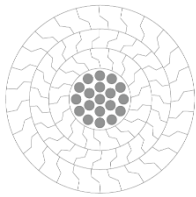
Note: The sum of the minimum breaking force = the minimum breaking force of the wire rope × 1.260, of which 17 × 7 is 1.230.

### Sealed wire rope for other applications

	Nominal diameter of wire rope (mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope MPa				
			1180	1270	1370	1470	1570
			Minimum wire breaking tension kN				
 <p>One layer of Z-wire</p>	16	144	175	188	203	218	232
	18	182	221	238	257	275	294
	20	224	273	294	317	340	363
	22	272	330	355	383	411	439
	24	323	393	423	456	489	523
	26	379	461	496	535	574	613
	28	440	535	576	621	666	711
	30	505	614	661	713	765	817
	32	574	698	752	811	870	929
	34	649	788	849	915	982	1049
	36	727	884	951	1026	1101	1176
	38	810	985	1060	1143	1227	1310
	40	898	1091	1174	1267	1359	1452
42	990	1203	1295	1397	1499	1601	
 <p>Two-layer Z-wire</p>	24	328	404	435	470	504	538
	26	385	475	511	551	591	631
	28	447	550	592	639	686	732
	30	513	632	680	734	787	841
	32	584	719	774	835	896	957
	34	659	812	874	942	1011	1080
	36	739	910	979	1056	1134	1211
	38	823	1014	1091	1177	1263	1349
	40	912	1123	1209	1304	1399	1495
	42	1005	1239	1333	1438	1543	1648
	44	1104	1359	1463	1578	1693	1809
	46	1206	1486	1599	1725	1851	1977
	48	1313	1618	1741	1878	2015	2152
50	1425	1755	1889	2038	2187	2335	
52	1541	1898	2043	2204	2365	2526	

Note: The sum of the minimum breaking tension of the wire rope x 0.87.

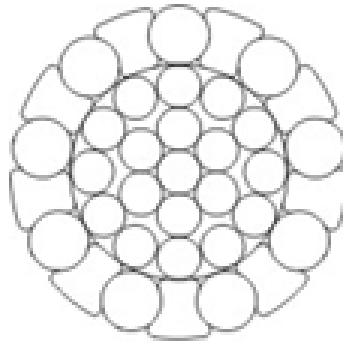
### Sealed wire rope for other applications

	Nominal diameter of wire rope (mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope					MPa
			1180	1270	1370	1470	1570	
			Minimum wire breaking tension					kN
 <p>Three or more layers of Z-wire</p>	48	1382	1645	1770	1910	2049	2188	
	50	1500	1785	1921	2072	2223	2375	
	52	1622	1930	2078	2241	2405	2568	
	54	1750	2082	2241	2417	2593	2770	
	56	1882	2239	2410	2599	2789	2979	
	58	2018	2402	2585	2788	2992	3195	
	60	2160	2570	2766	2984	3202	3419	
	62	2306	2744	2954	3186	3419	3651	
	64	2458	2924	3147	3395	3643	3891	
	66	2614	3110	3347	3610	3874	4138	
	68	2774	3301	3553	3833	4112	4392	
	70	2940	3498	3765	4061	4358	4654	
	72	3110	3701	3983	4297	4610	4924	
	74	3286	3909	4207	4539	4870	5201	
	76	3466	4123	4438	4787	5137	5486	
	78	3650	4343	4675	5043	5411	5779	
80	3840	4569	4917	5305	5692	6079		

Note: The sum of the minimum breaking tension of the wire rope x 0.87.



### Sealed wire rope for other applications

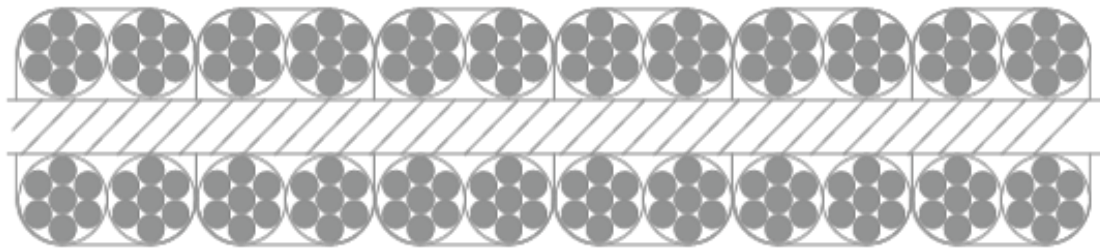


One layer of X-shaped special steel wire and round steel wire

Nominal diameter of wire rope (mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope MPa				
		1180	1270	1370	1470	1570
		Minimum wire breaking tension kN				
20	224	283	305	329	353	377
22	272	343	369	398	427	456
24	323	408	439	473	508	543
26	379	479	515	556	596	637
28	440	555	597	644	691	739
30	505	637	686	740	794	848
32	571	725	780	842	903	965
34	645	818	881	950	1020	1089
36	723	918	988	1065	1143	1221
38	806	1022	1100	1187	1274	1360
40	880	1133	1219	1315	1411	1507
42	970	1166	1255	1353	1452	1551
44	1065	1279	1377	1485	1594	1702
46	1164	1398	1505	1623	1742	1860
48	1267	1522	1639	1768	1897	2026
50	1375	1652	1778	1918	2058	2198

Note: The sum of the minimum breaking tension of the wire rope x 0.88.

### Flat wire rope for balancing

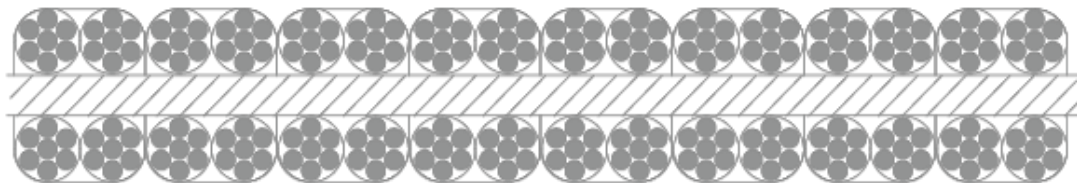


P6×4×7

Flat wire rope structure:6×4×7

Sub-rope strand structure:(1-6)

Nominal size Width × thickness	Nominal diameter of subrope wire	Sum of wire section area of sub ropes (mm <sup>2</sup> )	Flat wire rope reference weight (kg/100m)	Nominal tensile strength of wire rope MPa			Weaving method
				1370	1470	1570	
				Minimum wire breaking tension sum (kN)			
mm							
58×13	1.30	223	210	306	328	350	2 on each side of double weft rope
62×14	1.40	258	240	353	379	405	
67×15	1.50	297	280	407	437	466	
71×16	1.60	338	320	463	497	531	
75×17	1.70	381	360	522	560	598	



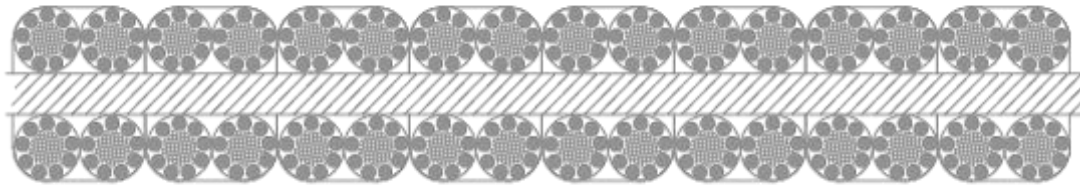
P8×4×7

Flat wire rope structure:8×4×7

Sub-rope strand structure:(1-6)

Nominal size Width x thickness	Nominal diameter of subrope wire	Sum of wire section area of sub ropes (mm <sup>2</sup> )	Flat wire rope reference weight (kg/100m)	Nominal tensile strength of wire rope MPa			Weaving method
				1370	1470	1570	
				Minimum wire breaking tension sum (kN)			
mm							
88×15	1.50	396	370	543	582	622	2 on each side of double weft rope
94×16	1.60	450	420	616	662	706	
100×17	1.70	508	470	696	747	798	
107×18	1.80	570	530	781	838	895	
113×19	1.90	635	580	870	933	997	
119×20	2.00	703	650	963	1030	1100	

### Flat wire rope for balancing

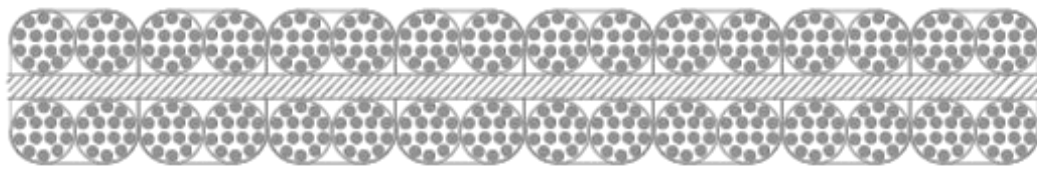


P8×4×9

Flat wire rope structure:8×4×9

Sub-rope strand structure:(FC-9)

Nominal size Width x thickness	Nominal diameter of subrope wire	Sum of wire section area of sub ropes (mm <sup>2</sup> )	Flat wire rope reference weight (kg/100m)	Nominal tensile strength of wire rope MPa			Weaving method
				1370	1470	1570	
mm				Minimum wire breaking tension sum (kN)			
132×21	1.70	653	700	895	960	1030	2 on each side of double weft rope
139×23	1.80	732	770	1000	1080	1150	
143×24	1.85	774	800	1060	1140	1220	
147×24	1.90	816	840	1120	1200	1280	
155×26	2.00	904	940	1240	1330	1420	
163×27	2.10	997	1050	1370	1470	1570	
170×28	2.20	1090	1160	1490	1600	1710	



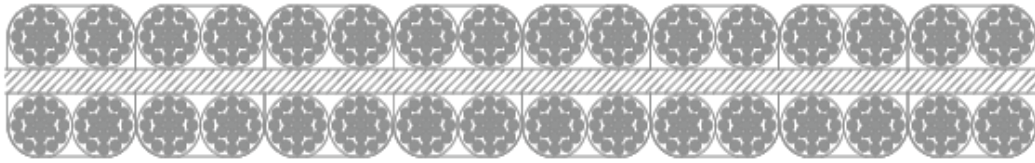
P8×4×14

Flat wire rope structure:8×4×14

Sub-rope strand structure:(4-10)

Nominal size Width x thickness	Nominal diameter of subrope wire	Sum of wire section area of sub ropes (mm <sup>2</sup> )	Flat wire rope reference weight (kg/100m)	Nominal tensile strength of wire rope MPa			Weaving method
				1370	1470	1570	
mm				Minimum wire breaking tension sum (kN)			
145×24	1.7	1020	960	1400	1500	1600	2 on each side of double weft rope
154×25	1.8	1140	1080	1560	1680	1790	
158×26	1.85	1200	1140	1640	1760	1880	
162×27	1.9	1270	1190	1740	1870	1990	
171×28	2.0	1410	1330	1930	2070	2210	
180×30	2.1	1550	1480	2120	2280	2430	
188×31	2.2	1700	1610	2330	2500	2670	

### Flat wire rope for balancing



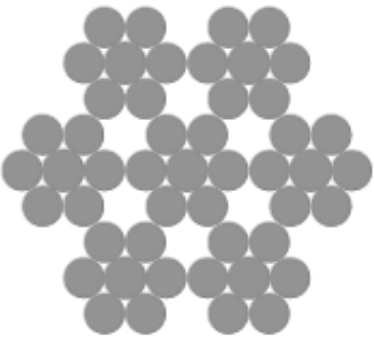
P8×4×19

Flat wire rope structure:8×4×19

Sub-rope strand structure:(1-6/12)

Nominal size Width x thickness	Nominal diameter of subrope wire	Sum of wire section area of sub ropes (mm <sup>2</sup> )	Flat wire rope reference weight (kg/100m)	Nominal tensile strength of wire rope MPa			Weaving method
				1370	1470	1570	
				Minimum wire breaking tension sum (kN)			
mm							
148×24	1.50	1070	980	1470	1570	1680	2 on each side of double weft rope
157×25	1.60	1220	1120	1670	1790	1920	
166×26	1.70	1380	1260	1890	2030	2170	
177×28	1.80	1550	1420	2120	2280	2430	
187×29	1.90	1720	1560	2360	2530	2700	
196×31	2.00	1910	1740	2620	2810	3000	
206×33	2.10	2100	1950	2880	3090	3300	
216×34	2.20	2310	2120	3160	3400	3630	

### Wire contact wire rope

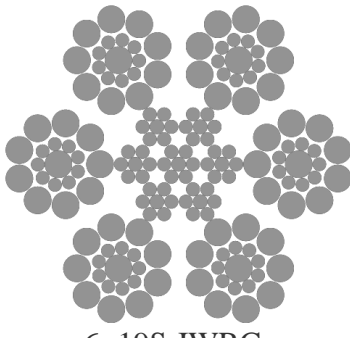
 6x7-WCS Typical structure diagram		Typic structure										Diameter range(mm)			
		Tectonic	Structure of wire rope strand				Outer wire count								
							Total	Per share							
		6x7-FC		1-6				36		6				2~48	
		6x7-WCS		1-6				36		6				2~48	

Nomin al diameter of wire rope (mm)	Reference weight (kg/100m)			Nominal tensile strength of wire rope										MPa	
				1570		1670		1770		1870		1960			
	Minimum breaking force of wire rope													kN	
	Natural fiber core	Synthesize fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core		
2	1.44	1.42	1.55	2.13	2.32	2.26	2.47	2.40	2.62	2.54	2.77	2.66	2.90		
3	3.23	3.19	3.49	4.79	5.23	5.10	5.56	5.40	5.89	5.71	6.23	5.98	6.53		
4	5.74	5.66	6.21	8.52	9.29	9.06	9.89	9.60	10.5	10.1	11.1	10.6	11.6		
5	8.98	8.85	9.70	13.3	14.5	14.2	15.4	15.0	16.4	15.8	17.3	16.6	18.1		
6	12.9	12.7	14.0	19.2	20.9	20.4	22.2	21.6	23.6	22.8	24.9	23.9	26.1		
7	17.6	17.3	19.0	26.1	28.5	27.7	30.3	29.4	32.1	31.1	33.9	32.6	35.5		
8	23.0	22.7	24.8	34.1	37.2	36.2	39.5	38.4	41.9	40.6	44.3	42.5	46.4		
9	29.1	28.7	31.4	43.1	47.1	45.9	50.0	48.6	53.0	51.3	56.0	53.8	58.7		
10	35.9	35.4	38.8	53.2	58.1	56.6	61.8	60.0	65.5	63.4	69.2	66.4	72.5		
11	43.4	42.8	47.0	64.4	70.3	68.5	74.8	72.6	79.2	76.7	83.7	80.4	87.7		
12	51.7	51.0	55.9	76.6	83.6	81.5	89.0	86.4	94.3	91.3	99.6	95.7	104		
14	70.4	69.4	76.1	104	114	111	121	118	128	124	136	130	142		
16	91.9	90.6	99.4	136	149	145	158	154	168	162	177	170	186		
18	116	115	126	172	188	183	200	194	212	205	224	215	235		
20	144	142	155	213	232	226	247	240	262	254	277	266	290		

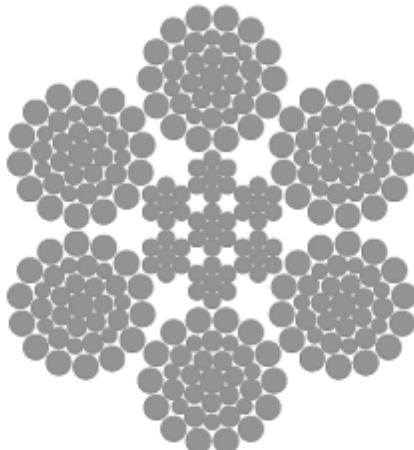
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.134(fiber core) or 1.190(steel core).

### Wire contact wire rope

 6×19S-IWRC Typical structure diagram				Typic structure									Diameter range(mm)	
				Tectonic	Structure of wire rope strand				Outer wire count					
									Total	Per share				
				6×19S-FC	1-9-9				54	9	6~40			
6×19S-IWRC	1-9-9				54	9								
6×19W-FC	1-6-6+6				72	12	6~40							
6×19W-IWRC	1-6-6+6				72	12								
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)			Nominal tensile strength of wire rope MPa										
				1570		1670		1770		1870		1960		
	Minimum breaking force of wire rope kN													
	natural fiber core	synthesize fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	
6	13.5	13.4	15.0	19.0	20.7	20.3	22.1	21.5	23.4	22.7	24.7	23.8	25.9	
7	18.4	18.2	20.4	25.9	28.2	27.6	30.0	29.2	31.8	30.9	33.6	32.4	35.2	
8	24.0	23.7	26.7	33.9	36.9	36.0	39.2	38.2	41.6	40.3	43.9	42.3	46.0	
9	30.4	30.1	33.8	42.9	46.7	45.6	49.6	48.3	52.6	51.0	55.6	53.5	58.3	
10	37.5	37.1	41.7	52.9	57.6	56.3	61.3	59.6	65.0	63.0	68.6	66.1	71.9	
11	45.4	44.9	50.5	64.0	69.7	68.1	74.2	72.2	78.6	76.3	83.0	79.9	87.0	
12	54.0	53.4	60.0	76.2	83.0	81.0	88.3	85.9	93.5	90.7	98.8	95.1	104	
13	63.4	62.7	70.5	89.4	97.4	95.1	104	101	110	107	116	112	122	
14	73.5	72.7	81.7	104	113	110	120	117	127	124	135	129	141	
16	96.0	95.0	107	135	148	144	157	153	166	161	176	169	184	
18	122	120	135	171	187	182	199	193	210	204	222	214	233	
20	150	148	167	212	230	225	245	239	260	252	275	264	288	
22	182	180	202	256	279	272	297	289	314	305	332	320	348	
24	216	214	240	305	332	324	353	344	374	363	395	380	414	
26	254	251	282	358	390	380	414	403	439	426	464	447	486	
28	294	291	327	415	452	441	481	468	509	494	538	518	564	
30	338	334	375	476	519	507	552	537	585	567	618	594	647	
32	384	380	427	542	590	576	628	611	665	645	703	676	737	
34	434	429	482	612	666	651	709	690	751	728	793	764	832	
36	486	481	540	686	747	729	794	773	842	817	889	856	932	
38	542	536	602	764	832	813	885	861	938	910	991	954	1039	
40	600	594	667	847	922	900	981	954	1039	1008	1098	1057	1151	

Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.190(fiber core) or 1.270(steel core).

### Wire contact wire rope

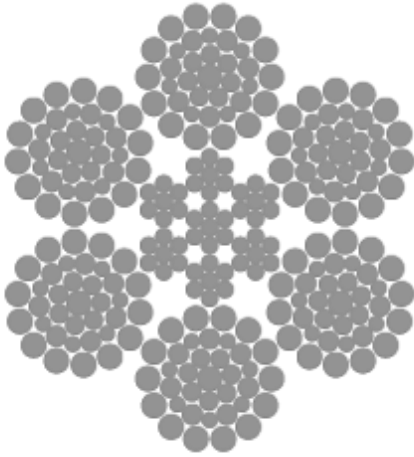
 6x36WS-IWRC Typical structure diagram				Typic structure								Diameter range(mm)	
				Tectonic	Structure of wire rope strand	Outer wire count							
						Total	Per share						
6x25Fi	1-6-6F-12	72	12	8~52									
6x26WS	1-5-5+5-10	60	10	8~52									
6x29Fi	1-7-7F-14	84	14	8~58									
6x31WS	1-6-6+6-12	72	12	8~58									
6x36WS	1-7-7+7-14	84	14	8~60									
6x37S	1-6-15-15	90	15	8~60									
6x41WS	1-8-8+8-16	96	16	36~60									
6x46WS	1-9-9+9-18	108	18	40~60									
6x49SWS	1-8-8-8+8-16	96	16	40~60									
6x55SWS	1-9-9-9+9-18	108	18	44~60									

Nominal diameter of wire rope (mm)	Reference weight (kg/100m)			Nominal tensile strength of wire rope MPa									
				1670		1770		1870		1960		2160	
	natural fiber core	synthetic fiber core	steel core	Minimum breaking force of wire rope kN									
				fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core
8	24.9	24.4	27.6	36.0	39.2	38.2	41.6	40.3	43.9	42.3	46.0	46.6	50.7
10	38.9	38.2	43.1	56.3	61.3	59.6	65.0	63.0	68.6	66.1	71.9	72.8	79.3
12	56.0	55.0	62.1	81.0	88.3	85.9	93.5	90.7	98.8	95.1	104	105	114
13	65.7	64.6	72.8	95.1	104	101	110	107	116	112	122	123	134
14	76.2	74.9	84.5	110	120	117	127	124	135	129	141	143	155
16	99.6	97.8	110	144	157	153	166	161	176	169	184	186	203
18	126	124	140	182	199	193	210	204	222	214	233	236	257
20	156	153	172	225	245	239	260	252	275	264	288	291	317
22	188	185	209	272	297	289	314	305	332	320	348	352	384
24	224	220	248	324	353	344	374	363	395	380	414	419	457
26	263	258	291	380	414	403	439	426	464	447	486	492	536
28	305	299	338	441	481	468	509	494	538	518	564	571	621
30	350	344	388	507	552	537	585	567	618	594	647	655	713

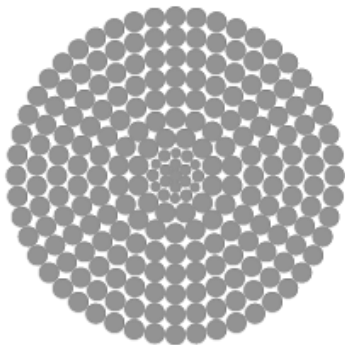
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.200(fiber core) or 1.283(steel core).

### Wire contact wire rope

 6x36WS-IWRC Typical structure diagram				Typic structure									Diameter range(mm)	
				Tectonic	Structure of wire rope strand				Outer wire count					
									Total	Per share				
6x25Fi	1-6-6F-12				72	12								
6x26WS	1-5-5+5-10				60	10								
6x29Fi	1-7-7F-14				84	14								
6x31WS	1-6-6+6-12				72	12								
6x36WS	1-7-7+7-14				84	14								
6x37S	1-6-15-15				90	15								
6x41WS	1-8-8+8-16				96	16	36~60							
6x46WS	1-9-9+9-18				108	18	40~60							
6x49SWS	1-8-8-8+8-16				96	16	40~60							
6x55SWS	1-9-9-9+9-18				108	18	44~60							
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)			Nominal tensile strength of wire rope MPa										
				1670		1770		1870		1960		2160		
	Minimum breaking force of wire rope kN													
	natural fiber core	synthesize fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	fiber core	steel core	
32	398	391	441	576	628	611	665	645	703	676	737	745	812	
34	450	442	498	651	709	690	751	728	793	764	832	841	916	
36	504	495	559	729	794	773	842	817	889	856	932	943	1027	
38	562	552	622	813	885	861	938	910	991	954	1039	1051	1145	
40	622	611	690	900	981	954	1039	1008	1098	1057	1151	1165	1268	
42	686	674	760	993	1081	1052	1146	1112	1211	1165	1269	1284	1398	
44	753	740	834	1090	1187	1155	1258	1220	1329	1279	1393	1409	1535	
46	823	808	912	1191	1297	1262	1375	1333	1452	1398	1522	1540	1677	
48	896	880	993	1297	1412	1374	1497	1452	1581	1522	1657	1677	1826	
50	973	955	1078	1407	1532	1491	1624	1575	1716	1651	1798	1820	1982	
52	1052	1033	1165	1522	1657	1613	1756	1704	1856	1786	1945	1968	2144	
54	1134	1114	1257	1641	1787	1739	1894	1838	2001	1926	2098	2123	2312	
56	1220	1198	1352	1765	1922	1871	2037	1976	2152	2071	2256	2283	2486	
58	1309	1285	1450	1893	2062	2007	2185	2120	2309	2222	2420	2449	2667	
60	1400	1375	1552	2026	2206	2147	2339	2269	2471	2378	2590	2621	2854	
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope×1.200(fiber core) or 1.283(steel core).														



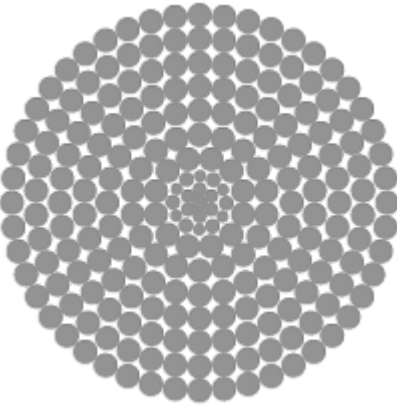
### Single strand wire rope

 1×229 Typical structure diagram		Typic structure				Diameter range (mm)
		Tectonic	Structure of wire rope strand	Outer wire count		
				Total	Per share	
1×229	1×31WS/18/24/30/36/42/48	48	48	55~101		
1×283	1×229/54	54	54	80~110		
1×343	1×229/54/60	60	60	90~120		
1×409	1×229/54/60/66	66	66	100~140		
1×481	1×229/54/60/66/72	72	72	120~160		
1×559	1×229/54/60/66/72/78	78	78	140~180		

Nominal diameter of wire rope(mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope MPa				
		1570	1670	1770	1870	1960
		Minimum breaking force of wire rope kN				
55	1485	2303	2450	2597	2744	2876
56	1540	2388	2540	2692	2844	2981
58	1652	2562	2725	2888	3051	3198
60	1768	2741	2916	3090	3265	3422
62	1887	2927	3113	3300	3486	3654
64	2011	3119	3318	3516	3715	3894
66	2139	3317	3528	3739	3951	4141
68	2270	3521	3745	3969	4194	4396
70	2406	3731	3969	4206	4444	4658
72	2545	3947	4199	4450	4702	4928
74	2689	4170	4435	4701	4966	5205
76	2836	4398	4678	4958	5239	5491
80	3142	4873	5184	5494	5804	6084
84	3464	5373	5715	6057	6399	6707
88	3802	5897	6272	6648	7023	7361
92	4156	6445	6855	7266	7676	8046
96	4525	7018	7464	7911	8358	8761
100	4910	7615	8100	8585	9070	9506
104	5311	8236	8760	9285	9810	-
108	5727	8882	9447	10013	10579	-
112	6159	9552	10160	10768	11377	-
116	6607	10246	10899	11551	12204	-
120	7070	10965	11663	12362	13060	-
124	7550	11708	12454	13200	-	-
128	8045	12476	13270	14065	-	-
132	8555	13268	14113	14958	-	-
136	9082	14084	14981	15878	-	-
140	9624	14924	15875	16826	-	-

### Single strand wire rope

 1×229 Typical structure diagram		Typic structure				Diameter range (mm)
		Tectonic	Structure of wire rope strand	Outer wire count		
				Total	Per share	
1×229	1×31WS/18/24/30/36/42/48	48	48	55~101		
1×283	1×229/54	54	54	80~110		
1×343	1×229/54/60	60	60	90~120		
1×409	1×229/54/60/66	66	66	100~140		
1×481	1×229/54/60/66/72	72	72	120~160		
1×559	1×229/54/60/66/72/78	78	78	140~180		
Nominal diameter of wire rope (mm)	Reference weight (kg/100m)	Nominal tensile strength of wire rope MPa				
		1570	1670	1770	1870	1960
		Minimum breaking force of wire rope kN				
144	10181	15789	16795	-	-	-
148	10755	16679	17741	-	-	-
152	11344	17593	18713	-	-	-
156	11949	18531	19711	-	-	-
160	12570	19493	20735	-	-	-
164	13206	20480	21784	-	-	-
168	13858	21491	22860	-	-	-
172	14526	22527	23962	-	-	-
176	15209	23587	25089	-	-	-
180	15908	24671	26242	-	-	-
Note: Minimum wire breaking force sum=Minimum breaking force of wire rope ×1.149.						

## Precautions for the use of wire rope

### Handling, storage and maintenance of wire rope

When loading and unloading the wire rope disk, it must be loaded and unloaded by crane, so as not to cause damage to the rope disk or the phenomenon of chaotic roll; ground handling, the wire rope disk is not allowed to roll on the uneven ground, resulting in the surface of the wire rope pressure injury; no packaging of the wire rope handling, the surface of the wire rope cannot be stuck with stones, clay and so on, affecting the use of the wire rope.

Steel wire rope should be stored in a dry and ventilated warehouse, to prevent direct sunlight or heat dry baking, the warehouse cannot be multi-layer stacking of steel wire rope. If the wire rope is stored in large quantities for a long time, it should be inspected frequently to prevent rusting, and should be treated in time after rusting is found and re-lubricated, such as serious corrosion, the section of wire rope should be scrapped. When the wire rope is placed outdoors, it should be cushioned with wooden boards, placed on dry ground and covered with rain cover. Wire rope storage time more than one year, should be re-sampling test, qualified before use.

Wire rope has been coated with enough lubricating oil when it is manufactured, but in the process of using, the original lubricating oil will be slowly lost and emitted, so the wire rope should be coated with lubricating oil on a regular basis to ensure rust prevention and lubrication, reduce friction and prolong the service life of the wire rope.

### Inspection of wire rope

Wire rope in the use of the process, should be in accordance with the relevant provisions of the regular inspection, and will check the results of good records. Inspection content should include the following items: the degree of wear and tear of the wire rope, wire breakage, corrosion, lubrication, deformation, rope connection part or end fastening part and other abnormal phenomena. Wire rope in the reel, pulley and over the wire wheel and other components above the sliding, through the friction components are easy to wear out grooves to make the wire rope wear faster, and sometimes the wear of the pulley will also make the wire rope deformation, increase bending fatigue. Therefore, these components must be carefully inspected, if there is unsuitable, must be immediately replaced or amended.

### Wire Rope Unwinding and Reeling Methods

See Fig. 1 for the way of wire rope release and Fig. 2 and Fig. 3 for the way of wire rope reeling.

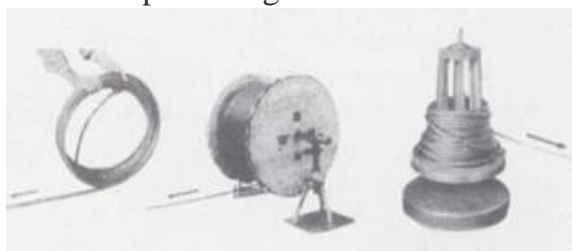


Figure 1: Rope release method Figure

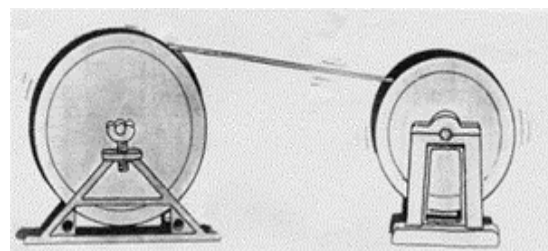


Figure 2: Rope reeling method

When the wire rope is wound in multiple layers of the reel, the tensioning device should be added to the rope release frame to ensure that the wire rope is evenly and tightly wound on the reel, as shown in Figure 3.

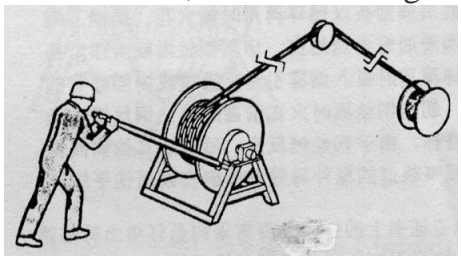


Figure 3

The direction of single-layer winding of wire rope on the reel  
 The direction of single layer winding of wire rope on the reel is shown in Fig. 4 and Fig. 5.

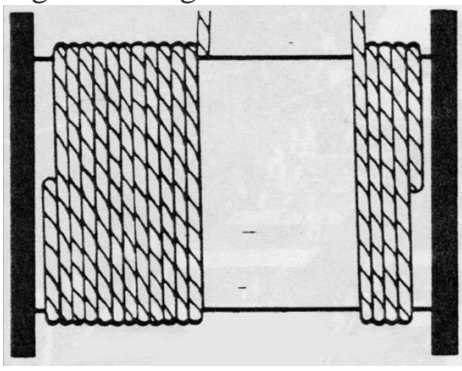


Figure 4: Left twisted wire rope

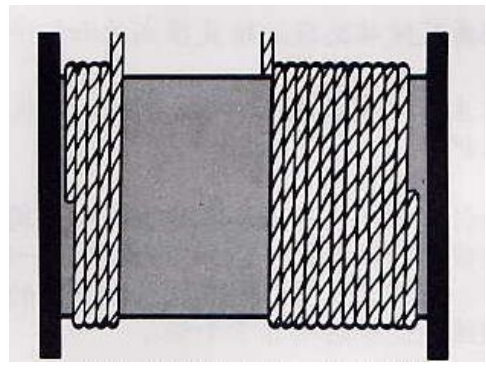


Figure 5: Right twisted wire rope

**Wire rope cutting head bundling method**

When the wire rope needs to be cut off and used, both ends of the cut head should be tied with wire or small rope strands, and the tying length should be at least 2 times the diameter of the wire rope (D), and the tying length of the parallel twisted wire rope, multi-layer stranded wire rope and single stranded wire rope should be at least 6 times the diameter of the wire rope (D), and the tying method should be as shown in Fig. 6.

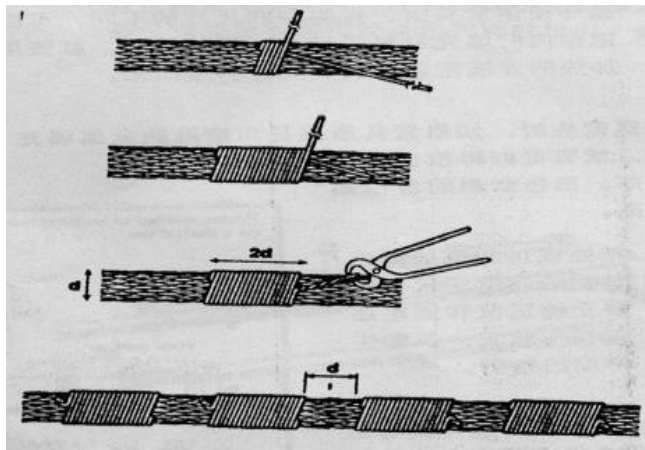


Figure 6

### Installation of wire rope

When the old rope is used as the hauling rope of the new rope, the coupling method of welding the new and old rope ends to each other cannot be used, because this method will seriously damage the structure of the new wire rope. Correct coupling method:

1. As shown in Fig. 7, weld the end of the new wire rope with a ring, pressure head, twisted head processing
2. Use fine steel wire rope or three-strand fiber rope with the same twisting direction as the new wire rope as hauling rope.

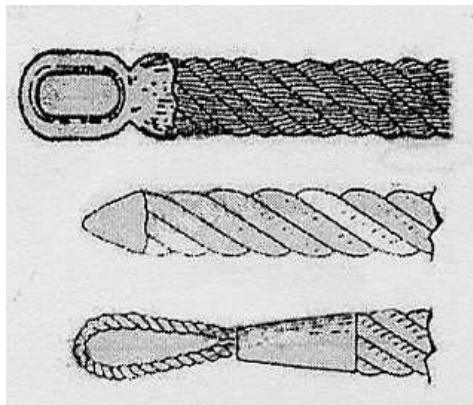


Figure 7

### The relationship between wire rope in use and sheave groove

Suitable wheel groove and wire rope contact should be as shown in Figure 8. Wheel groove is too large as shown in Figure 9 and wheel groove is too small as shown in Figure 10, in use will exacerbate the fatigue of the wire rope breakage.

Wheel groove radius (R) and the nominal diameter of the wire rope (D) ratio:  
 $R/D=0.525\sim0.550$

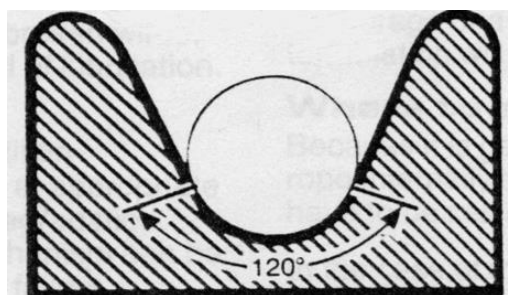


Figure 8 correct

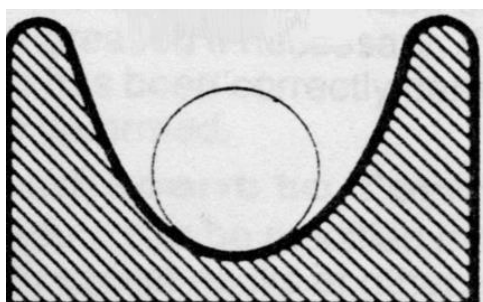


Figure 9 Error

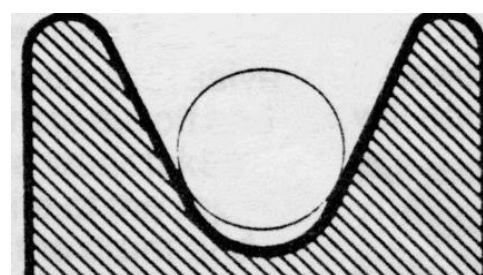


Figure 10 Error

### Rope and drum angle

The angle between the wire rope and the drum is shown in Fig. 11, the angle of the ungrooved drum is  $<1.5^\circ$ , and the angle of the grooved drum is  $<2.5^\circ$ .

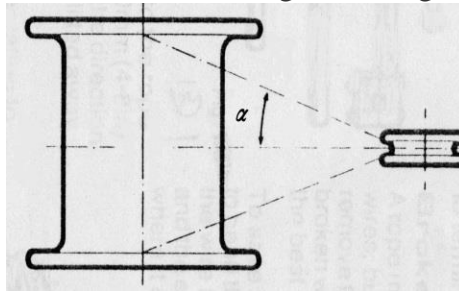


Figure 11

### How to use the wire rope clamp

The method of using the wire rope rope clip is shown in Fig. 12.



Figure 12

### Wire rope breakage treatment

Wire rope in the process of use, broken wire, wire rope can continue to run, it should be as early as possible to remove the broken wire. Although commonly used method of breaking the broken wire directly clamped off with wire cutters, but is by no means the best method, because it will leave a rough break affecting the use, you can use wire cutters to clamp the broken wire before and after bending until it breaks off, with this method so that the wire breaks in the middle of the strands will not cause harm.

### Measurement of wire rope diameter

The diameter of the wire rope is measured as shown in Fig. 14, and Fig. 15 shows the wrong measurement method.

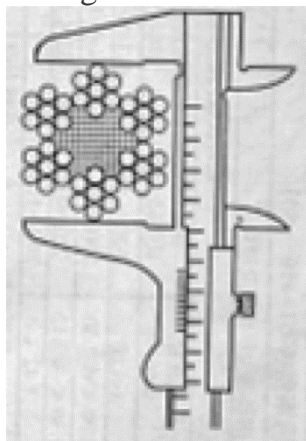


Figure 14

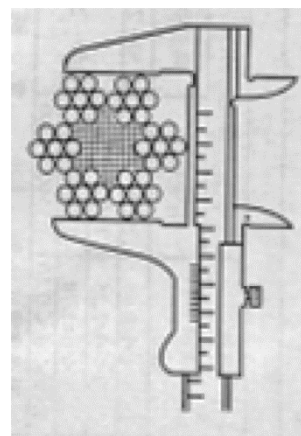


Figure 15

# Warning!

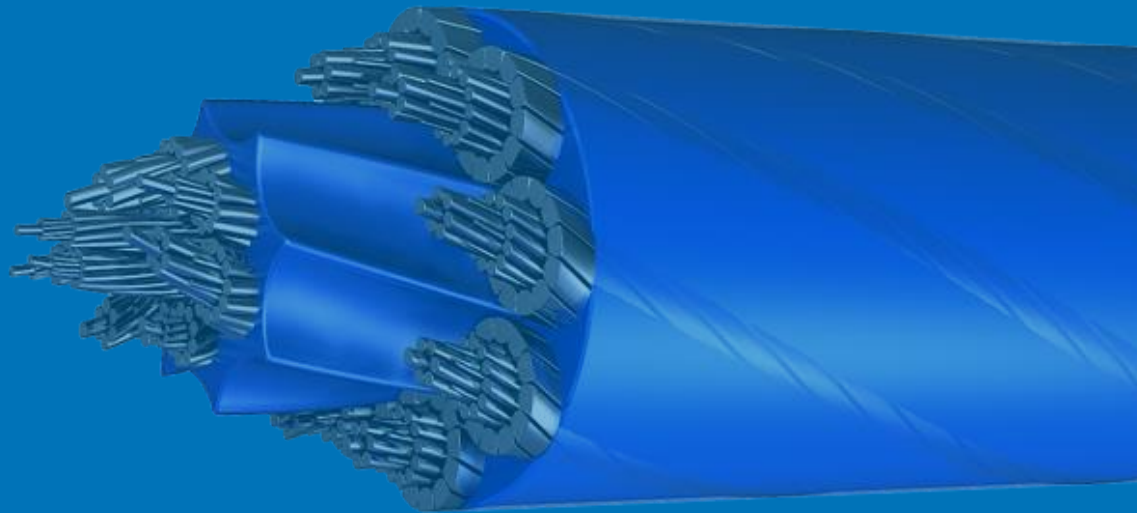
Overweight, wear and tear, misuse, damage and improper maintenance will cause the rope to fail. For your safety and the protection of other equipment.

Attention:



- Check the wire rope for wear and damage before each use.
- Never allow the use of seriously worn, damaged and scrapped wire rope.
- Never allow overloading of wire rope.

Consult the correct method of wire rope use, relevant standards and norms.



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