

Selection, Safe Use and Maintenance of Steel Wire Rope

Slings

Working Load Limit Single leg Slings

Definition: The maximum load which the sling is rated to raise, lower or suspend in straight pull

Working load limit calculation

The working load limit is defined in clause 3 shall be calculated as follows:

$$WLL = \frac{F_o \times K_e}{K_m \times K_u}$$

Where:

WLL is the working load limit of the sling, in tonnes;

F_o is the minimum breaking force of the rope, in Kilo newtons, as defined in ISO 2408;

K_e is a factor which allows for the efficiency of the form of eye (spliced or ferrule-secured);

K_u is a factor which allows for circumstances for use;

K_m is a factor relating mass to force.

The following values are assigned to the factors:

K_e : 0.8

K_u : 5

K_m : 10

Rope Diameter mm	WLL (Tonnes)
9	0.7
10	0.9
11	1.1
12	1.3
13	1.5
14	1.8
16	2.4
18	3
20	3.7
22	4.5
24	5.4
26	6.3
28	7.3
32	9.6
36	12.1
40	15
44	18.1
48	21.6
52	25.5
56	29.3
60	33.5

Table 1 – Recommended working load limit of single-leg slings

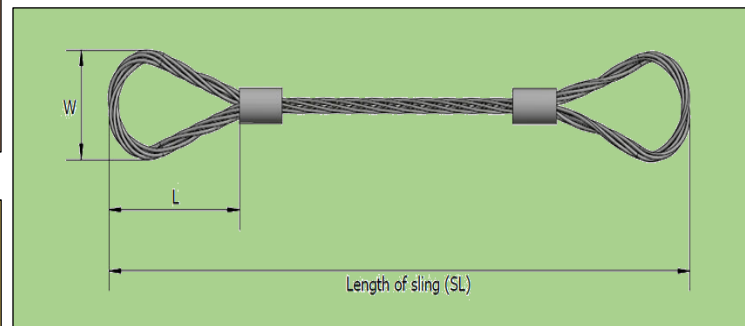


Figure 1 – Length of a sling

The nominal length of a single sling shall be the length between the bearing points of each terminal whether they are soft eye, thimbles, hooks or links. The tolerance shall not exceed +/- 2 times the rope diameter or +/- 0.5% of the desired length, whichever is the greater.

The discrepancy in length between the individual legs of any multi-legged sling under no load shall not exceed +/- 2 times the rope diameter of +/- 0.5% of the desired length, whichever is greater.

Types of Slings:



Soft Eye Hand Spliced



Thimble Eye Hand Spliced



Soft Eye Machine Swaged



Thimble Eye Machine Swaged



Steel Ferrule Machine Swaged



Closed Swag Socket



Working Load Limit of multi-legged slings

The working load limit shall be calculated by multiplying the working load limit of the single leg given in table 1 by the factors given in table 2. Table 3 shows the working load limit values of multi-legged slings calculated accordingly. The angle to the vertical, β , shall in no case exceed 60° . The angle between opposite legs, α , shall in no case exceed 120° .

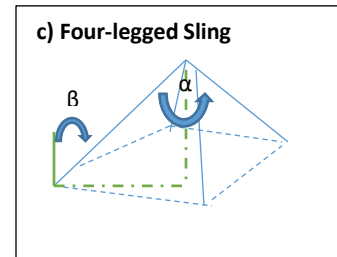
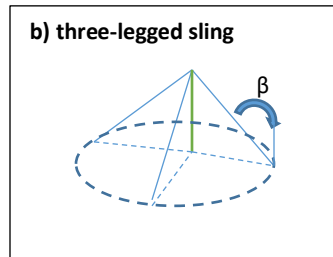
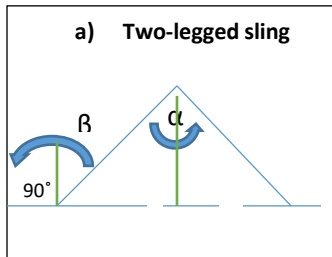


Table 2 – Factors for calculation of WLL

Angle between opposite legs (α)	Angle to the vertical (β)	Factors for calculation of WLL		
		Number of legs		
		two	three	four
$\alpha < 90^\circ$	$\beta < 45^\circ$	1.4	2.1	2.1
$90^\circ < \alpha < 120^\circ$	$45^\circ < \beta < 60^\circ$	1	1.5	1.5

Table 3 – Working load limit of multi-legged slings terminated with ferrules or splices

Rope Diameter mm	Working load limit (WLL)							
	Two-legged slings				Three- and Four-legged slings			
	$\alpha < 90^\circ$	$\beta < 45^\circ$	$90^\circ < \alpha < 120^\circ$	$45^\circ < \beta < 60^\circ$	$\alpha < 90^\circ$	$\beta < 45^\circ$	$90^\circ < \alpha < 120^\circ$	$45^\circ < \beta < 60^\circ$
9	1		0.7		1.5		1	
10	1.25		0.9		1.9		1.3	
11	1.5		1.1		2.3		1.6	
12	1.8		1.3		2.7		1.9	
13	2.1		1.5		3.1		2.2	
14	2.5		1.8		3.8		2.7	
16	3.3		2.4		5		3.6	
18	4.2		3		6.3		4.5	
20	5.2		3.7		7.8		5.5	
22	6.3		4.5		9.4		6.7	
24	7.5		5.4		11.3		8.1	
26	8.8		6.3		13.2		9.4	
28	10.2		7.3		15.3		10.9	
32	13.4		9.6		20.1		14.4	
36	16.9		12.1		25.4		18.1	
40	21		15		31.5		22.5	
44	25.3		18.1		38		27.1	
48	30.2		21.6		45.3		32.4	
52	35.7		25.5		53.5		38.2	
56	41		29.3		61.5		43.9	
60	46.9		33.5		70.3		50.2	

Selection of Steel Wire rope Slings

1. Make sure you select the correct type of sling for the application
2. Determine the mass of the load, it's center of gravity, attachment points and proposed method of attachment
3. Be sure of the working load limit for the application. With multi leg slings there will be limitations on the angle of the single legs
4. Make sure that the length is correct for the application
5. Specify the construction of the rope
6. Specify the Grade of steel required as well as the finish
7. Specify any special packing requirements
8. Specify any special lubrication requirements
9. Specify any fittings if any are required
10. Slings are manufactured to SANS7531:1987

Use of Steel Wire rope Slings

Before putting a sling into use, make sure of the following:

1. There is a manufacturers certificate
2. All information specified on the certificates is the same as the information on the sling
3. The sling has been added to the lifting equipment register
4. All staff making use of the slings is sufficiently trained and competent in the use of the sling

Safe Use of Steel Wire rope Slings

1. ALWAYS adhere to the Working load limit of the sling. Do not overload the sling and avoid shock loading.
2. ALWAYS use the sling as per the manufacturer instructions
3. Do not use slings that do not have certification from the manufacturer
4. Do not use slings that are not properly marked
5. Do not drag the sling over the ground
6. Always protect the sling from any sharp edges
7. Do not shorten a rope by tying knots into it
8. Do not wrap the rope around the hook, use proper oblongs
9. Do not use a sling that has a kink or knot in it or has any visible damage
10. Make sure that the rope is sufficiently lubricated
11. Do not drop a load on a sling
12. Do not use multi leg slings at a great angle than 120° between the slings (60° from the vertical)
13. Make sure that the load is spread evenly between all legs before lifting
14. Make sure that the user of the sling is trained competent to use the slings safely
15. When performing a lift using a sling, the area should be barricaded to avoid any entry into the area by staff or member of the public.
16. All personnel should stay clear of the load until the lift has been performed successfully
17. Once the lift is complete, the sling should be returned to proper storage.

Examination and maintenance of Steel Wore rope Slings

1. Examination should take place at intervals of no less than 3 months as per the Occupational Health and Safety Act 83 of 1995, Driven Machinery Regulation 18 (10)(d)(e) by a competent person.
2. The user may however determine additional inspections intervals taking into consideration the environment in which the sling is being used, the application, the frequency of use.
3. The sling should be cleaned prior to being returned to storage
4. Each time before use the sling should be inspected for oil, dust, rust, kinks, loose wires or any other defects on the surface
5. All sling fitting must also be inspected for any defects
6. Inspections should be recorded
7. Damaged slings should immediately be withdrawn from service and destroyed by cutting the slings using a cutting torch or grinder to avoid later use of the equipment.
- 8.

Examples of worn Steel wire rope slings:

