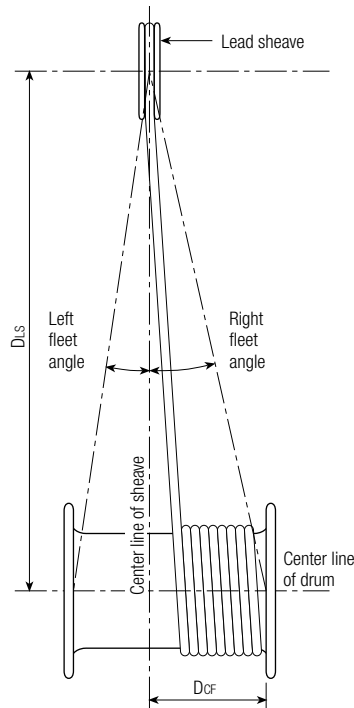


Tech Tips

Fleet angle; determining stall and line pull; wire rope selection



The importance of fleet angle

If a wire rope leads over a sheave and on to a drum, the rope will not remain in alignment with the sheave groove. Instead, it will deviate to either side depending upon the width of the drum and its distance from the fixed sheave, often called the lead sheave. The angle between the center line through the lead sheave and the centerline of the rope leading to the drum is called the fleet angle.

Experience has shown that the best wire rope service is obtained when the maximum fleet angle is not more than $1\frac{1}{2}^\circ$ for smooth drums, and 2° for grooved drums. Fleet angles of $1\frac{1}{2}^\circ$ and 2° are the equivalents of approximately 38 feet and 29 feet, respectively, of lead for each foot of drum width either side of the center line of the lead sheave.

Courtesy of Broderick & Bascom Rope Co.

Based on the above information, the correct distance (D_{LS}) a lead sheave should be located from the winch drum may be derived by using the following formula:

$$D_{LS} \text{ for } 1\frac{1}{2}^\circ \text{ fleet angle} = D_{CF} \text{ (in feet)} \times 38 \quad D_{LS} \text{ for } 2^\circ \text{ fleet angle} = D_{CF} \text{ (in feet)} \times 29$$

Example: For a winch with a smooth drum thus requiring a $1\frac{1}{2}^\circ$ fleet angle:

If $D_{CF} = 20$ inches (1.66 ft) then $D_{LS} = 1.66 \times 38 =$ approximately 63 feet, the distance that the lead sheave should be positioned away from the drum.

Determining stall and line pull

Air pressure psi	bar	Stall factor	Rope speed factor
60	4.2	0.67	0.58
70	4.9	0.78	0.72
80	5.6	0.89	0.86
90	6.3	1.00	1.00
100	7.0	1.11	1.14

To obtain performances of the winches in this catalog at operating pressures other than 90 psi, select the load or speed rating required from the applicable curve and multiply that value by the factor corresponding to the operating pressure from the table.

Example: Model BU7A with 1000 lbs (455 kg) line pull, 70 psi (4.9 bar), drum half full. Determine speed.

From performance curve at 90 psi (6.3 bar): 22 fpm (6.7 m/min) \times 0.72 (rope speed factor from chart above) = 16 fpm (4.9 m/min)

Wire rope selection

Rope size		Breaking strength		Weight		Rec'd safe working loads			
in.	mm	lbs	kg	lbs/ft	kg/m	3.5:1		5:1	
						lbs	kg	lbs	kg
1/4	6	6800	3091	0.12	.17	1943	883	1360	618
5/16	8	10540	4791	0.18	.27	3011	1369	2108	958
3/8	9	15100	6864	0.26	.39	4314	1961	3020	1373
7/16	12	20400	9273	0.35	.52	5829	2649	4080	1855
1/2	13	26600	12091	0.46	.69	7600	3455	5320	2418
5/8	15	41200	18727	0.72	1.07	11771	5351	8240	3745
3/4	19	58800	26727	1.04	1.55	16800	7636	11760	5345
7/8	22	79600	36182	1.42	2.12	22743	10338	15920	7236
1	25	103400	47000	1.85	2.76	29543	13429	20680	9400
1 1/8	28	130000	59091	2.34	3.49	37143	16883	26000	11818
1 1/4	28	159800	72636	2.89	4.31	45657	20753	31960	14527
1 3/8	28	192000	87273	3.50	5.22	54857	24935	38400	17455

Ingersoll-Rand recommends that either 6 x 19 or 6 x 37 Extra Improved Plow Steel (EIPS) with independent wire rope core (IWRC) be used. This is a higher strength rope than Improved Plow Steel (IPS) offering, on average, approximately a 15% increase in breaking strength. We recommend it, as it is readily available and offers better value overall.