Rating of Winches –SAE J706a

SAE Standard
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PREPRINT

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SAE Standard

Report of Transportation and Maintenance Technical Committee approved January 1954 and last revised April 1970.

1. Scope—This SAE Standard includes worm gear, spur gear, or other positive reduction driven winches. These winches may be driven by any power source within the limits of the manufacturer's recommendations. Power shall be supplied in both directions for hoisting or lowering. The winches are equipped with safety brakes to hold the load positively or to control it when lowering under power. The winch load may also be powered down against hydraulic flow control devices with the automatic safety brake released.

2. General Specifications

2.1 Name Plate—A name plate shall be permanently attached to the winch. It shall provide the following information.

2.1.1 Maximum Line Pull

Full Drum Layer—lb max. (See paragraph 3.2.1.)
First Layer—lb max. (See paragraph 3.2.1.)

2.1.2 Continuous Duty Rating—ft-lb/min. (See paragraph 3.2.2.) (maximum drum rpm)

2.2 Safety Brake—The safety brake must be capable of holding continuously or lowering safely the maximum first layer load based on the winch rating for a distance of 50 ft without losing its effectiveness of holding the load or other failure of the brake. The input speed shall not exceed the manufacturer's recommendations. Brakes shall automatically release and not overheat when "in-hauling". Safety brakes shall be automatically applied.

2.3 Drum Drag Brake—The drum drag brake shall be used to control "free spooling" only and shall not be relied upon to hold a load.

2.4 Drum Capacity (See paragraph 3.1.1)—The calculated wire rope capacity in feet shall be based on 90% of factors recommended by cable manufacturers for taut, uniform winding.

2.5 Drum Diameter—The minimum drum diameter shall be based on the following ratio to wire rope specified for the maximum pull rating.

$$\frac{\text{Drum diameter}}{\text{Wire rope diameter}} = 8 \text{ minimum}$$

3. Published Ratings

3.1 Drum Capacity—A chart shall be published giving the following information for the wire rope size recommended for the maximum winch rating:

3.1.1 Calculated capacity (see paragraph 2.4) in feet of wire rope for each layer. The capacity shall be cumulative from the first layer to the top layer.

3.1.2 Maximum rated line pull per layer.

3.2 Performance Ratings—Two ratings shall be published as follows:

3.2.1 Maximum Rated Line Pull—Shall be given for the full drum and first layer of cable of the size recommended for maximum winch rating.

3.2.2 Continuous Duty Rating—This rating is based on the maximum rate of work, in foot-pounds per minute, that can be done continuously without exceeding a maximum lube oil temperature rise of 175 F or a maximum oil temperature of 250 F, with the manufacturer's recommended lubricant. This rating shall be effective within the manufacturer's maximum recommended input speeds.

The name plate rating shall be expressed in foot-pounds per minute.

Example: Assume rating of 52,000 ft-lbs/min and assume first layer line speed at recommended maximum input shaft speed is 31 fpm, the computed continuous duty line pull is:

$$\frac{52{,}000}{31} = 1680 \text{ lb}$$

and at 20 fpm, it is:

$$\frac{52{,}000}{20} = 2600 \text{ lb}$$

3.2.3 Starting Input Torque—The manufacturer shall specify the minimum input torque required to start the winch at maximum rated line pull.

3.2.4 Minimum Input Torque Requirement—The manufacturer shall specify the minimum input torque required to operate the winch at maximum rated line pull.

3.2.5 Minimum Safety Factor—The minimum safety factor shall be 2.0 based on the breaking point of the winch.

4. Manufacturer's Test Procedure

4.1 Continuous duty ratings shall be established by pull tests utilizing a power absorption dynamometer.

4.2 Maximum line pull and torque ratings shall be established by pull tests. Winch test loads above 1.8 times the desired rated load shall be increased in increments of 1000 lb (1000 lb effective at first layer on drum). Each test load shall be lifted three times successfully for a distance corresponding to at least one drum revolution. If a failure occurs, the test load will be reduced by 1000 lb for rating purposes.

4.3 The breaking point is determined by the line pull registered at the time of a failure which makes it impossible to continue the tests without repairs. The 2.0:1 safety factor shall be maintained at all operating speeds from zero to maximum drum rpm.

4.4 In making the test, the winch shall be mounted on a simulated chassis frame of channel section, 34 in. back to back.

5. Acceptance Test—The design shall be sufficient to allow a static acceptance test equivalent to 1.5 times the rated load.