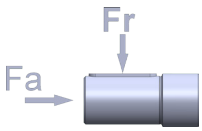


Useful Information

QUESTION

2204.00

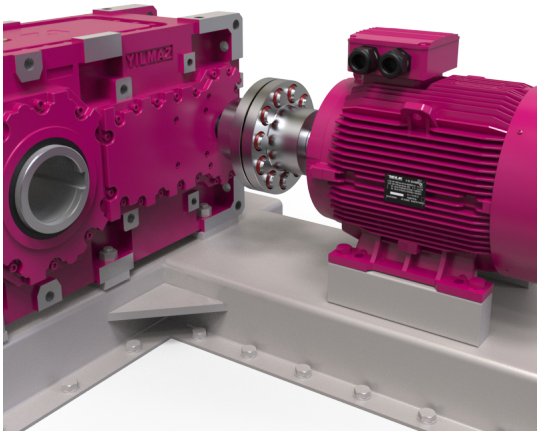
When are radial and axial load controls required ?

ANSWER

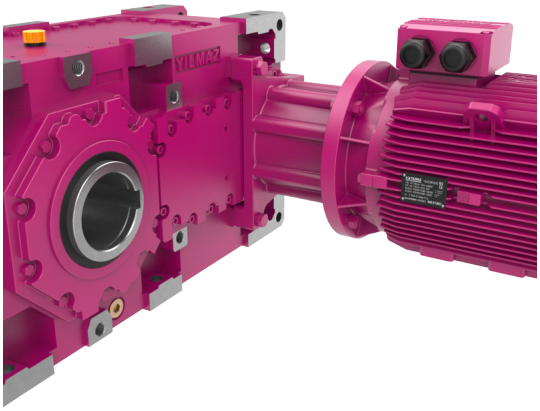
Power transfer from electric motor to gearbox and from gearbox to machine is done with different connection types. Depending on the type of connection used, radial and axial loads may occur. By calculating these loads, it should be checked whether they are above the permissible limit value specified in the catalog of the relevant product. If there is a load above the permissible value, the gearbox manufacturer should be contacted by the customer company and ask for suggestions for a solution. If the critical element is a bearing, changing the bearing type and size, and if it is the shaft switching to more durable material can be done by gearbox company. Apart from this, customer can bring the radial load to a safe state by making some changes on the connection type.

Let's talk about how and in which situations radial and axial load controls should be made.

If an elastic coupling is used as a connecting element on the input and output shaft of the gearbox, no radial and axial load will occur, so checking is not necessary. In addition, if the motor is directly coupled to the gearbox as shown below, there is no need for load control again, since radial or axial load will not occur on the input shaft.



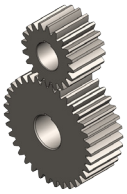
Connection with Elastic Coupling



Direct Motor Coupled

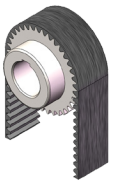
However, if the following connection types are used on the input or output shaft of the gearbox, a radial load occurs. The load calculation can be made easily by means of the formulas given next to them. For the calculation, it is sufficient to know the connecting element diameter D [mm] and the torque on the gearbox shaft [Nm].

Spur Gear



$$F_q = \frac{2100 \times M_2}{D}$$

Trigger Belt

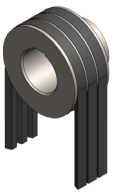


$$F_q = \frac{2500 \times M_2}{D}$$

Chain Drive

$$F_q = \frac{2100 \times M_2}{D}$$

V Belt

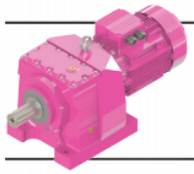


$$F_q = \frac{5000 \times M_2}{D}$$

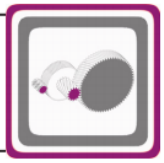
Example;

1,5kW - 20 rpm - fs= 1,2 MR373-3E90L4D the gearbox has been selected and it is planned to use a Ø300mm diameter V-belt on the output shaft of the gearbox. How to check in this case?

First of all, we know that radial load will occur due to the use of V belts and we mentioned that it can be calculated with the formulas given above. Since it is known that the diameter of the pulley is Ø300mm, we need to find output torque of the gearbox. When the 1.5kW motor page is opened from the M Series product catalogue, it can be found that the gearbox output torque is 678Nm as seen on the next page. We can also read that the allowable radial load value is 9140N.



Motorlu Güç Devir Sayfaları
Geared Motors Performance Tables
Leistung und Drehzahlübersicht von Getriebemotoren



Güç *Power* Leistung P_g [kW] P_g [HP]	IE3 Çıkış Devri *Output Speeds* Abtriebswelle Drehzahlen n_2 [r.p.m]	IE3 Çıkış Momenti *Output Torque* Abtriebswelle Drehmomente M_2 [Nm]	Çevrim Oranı *Ratio* Übersetzung i	IE3 Güv. Rad. Yük Çıkış *Per.O. Loads (Output)* Zul.Querkräfte (Abtrieb) F_{qam} [N]	IE3 Servis Faktörü *Service Factors* Betriebsfaktor f_s	Tipi *Type* Typ	Anma Akımı *Rated Current* Nennstrom [A]	Ağırlık *Weight* Gewicht ~ [kg]	Ölçü Sayfası *Dim. Page* Maße Seite	* Motor Verim Snf. *Motor Eff. Class* Motor Effizienz-klasse
1,5	15	910	**97,92**	9486	0,9	**MR373-3E90L/4D**	3,30	61	115	IE3
2,0	17	805	**86,57**	9359	1,0	**NR373-3E90L/4D**		64		
	20	678	**72,81**	9140	1,2	**MR373-2E90L/4C**	3,40	60		IE2
	23	577	**61,91**	8902	1,4	**NR373-2E90L/4C**		63		
	27	495	**53,04**	8653	1,7					
	30	448	**48,00**	8483	1,8					

When we calculate the radial load

Fq= 5000*678/300= 11.300N radial load is found.

Since the radial load exceeds the allowable value of 9.140N, the manufacturer should be informed about this situation. This problem can be solved by changing the bearing type or shaft material according to the critical element. In some cases, the user can also eliminate this situation by making a change himself. For example by increasing pulley diameter to 400 mm radial load will decrease to 8.475 N. with the help of this; solution can be found without making any changes to the gearbox. Thus, the extra cost that will occur due to the changes to be made in the gearbox will be prevented.
The permissible radial load values given in the catalogs are valid if a load is applied to the midpoint of the shaft. If the connecting element is mounted off the shaft center, the new permissible radial load value must be found by using the correction coefficients in the relevant catalog.
We talked about radial load in general above. Apart from that, axial loads may come from the machine shaft to the gear unit shaft in the direction of compression or pull. For example, in extruder machines, there is a serious axial load in the compression direction or depending on the blade angle in the mixer application, axial loads may come in the compression or pull direction. If the machine manufacturer does not put a bearing to meet these loads, the loads will come directly to the gearbox shaft and may cause a malfunction in the gearbox. For this reason, axial and radial load control is of vital importance for the gearboxes to operate smoothly for many years.