Introduction

GENERAL FEATURES

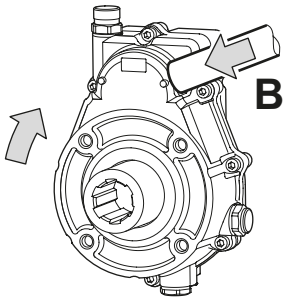
This catalog shows the characteristics of the gearboxes (speed increasers) ML and B series, and gearboxes (speed reducers) RD.
Gear boxes are gerally used for the connection of hydraulic pump with low speed tractor power take-off.

Calculation for gears was done according to UNI ISO 6336.
Calculation for bearing was done according to ISO 281.

Operating temperature is between -20 °C to + 85 °C.

Materials used for the components of gear have been chosen according to the study of different requirements of resistance to stress and wear. In particular, the gears are made of hardened steel for high endurance. Housing and cover can be made both in aluminum alloy or cast iron, depending on the required code.

Assembly of gearbox must be performed referring to the position of the level indicator, oil drain and vent/fill plug.



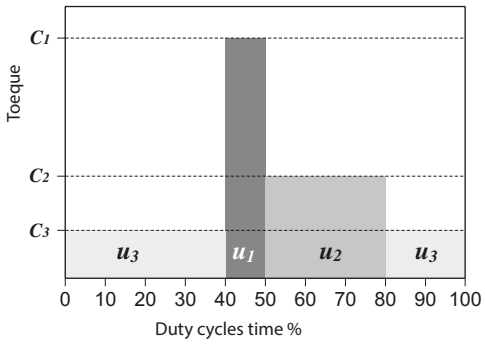
Gearbox es have different attachment points that allow an integral attachment to the equipment or machine.
If it is not possible, gearboxes should be bound with a torque arm "B" (see figure). To a void abnormal stress to the system, the torque arm "B" must be placed as close as possible to the mounting plane (PTO side) of gearbox.

Determination of the average duration of the gear
The duration of the gearboxes depends on the working conditions and the torques transmitted.

In the technical specifications of each gearbox is shown a graph that allows to verify their duration (in hours) as a function of transmitted average torque.

Graphs are output of standard calculations, they do not represent output of experimental tests, however they are a useful tool, as shown by experience achieved by our company in design and manufacture of geaboxes.
In the gearbox technical data table, we have 2 torque values. Maximum starting torque (C_1) and maximum torque for continuous duty (C_2).

If gearbox works with torque values that do not exceed C_2, the average torque C_m corresponds to value C_2 and duration of the gear is about 3500 hours. In mixed duty cycles, the transmitted torque can reach the limits of the maximum starting torque (C_1).



A typical example of mixed duty cycle is shown in the following diagram:
- 10% of the total time (u1) - C_1 torque;
- 30% of the total time (u2) - C_2 torque;
- 60% of the total time (u3) - C_3 torque.

In a mixed duty cycle the value of the average torque (C_m)

$$C_m = \sqrt[3]{\frac{C_1^3 \cdot u1 + C_2^3 \cdot u2 + C..^3 \cdot u..}{(u1 + u2 + u..)}}$$

can be calculated with a formula that takes into account the torques transmitted with different duty cycles (as required by standard).

Where:
C_m = average torque (pump side);
C_1 = maximum starting torque (pump side);
C_2 = Maximum torque for continuous duty (pump side)
C.. = .. more torque (pump side)

u_1 =% duty cycle - C_1 torque

Introduction

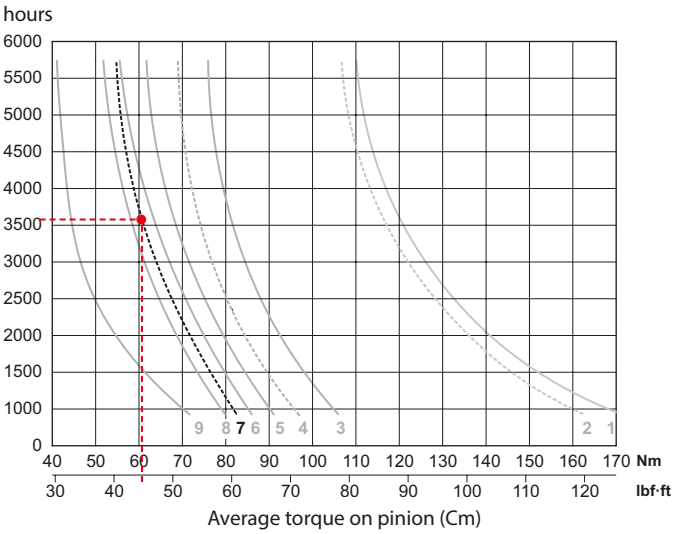
GENERAL FEATURES

u_2 =% duty cycle - C_2 torque
u.. =% duty cycles - C.. torque

Example of calculation of gearboxes duration:
Speed increaser ML32 - transmission ratio 1: 2.5 - rpm 1000

$$Cm = \sqrt[3]{\frac{100^3 \cdot 10 + 65^3 \cdot 30 + 40^3 \cdot 60}{(10 + 30 + 60)}} = 60.4\ Nm$$

Input rpm		Output (transmission ratio)					
		1 : 1,5	1 : 2	1 : 2,5	1 : 3	1 : 3,5	1 : 3,8
540	curve	1	3	5	6	8	8
	rpm	810	1080	1350	1680	1836	2052
1000	curve	2	4	7	—	—	—
	rpm	1500	2000	2500	—	—	—



Operating torque::
C_1 = 100 Nm
C_2 = 65 Nm

Duty cycles:
u_1 = 10%
u_2 = 30%

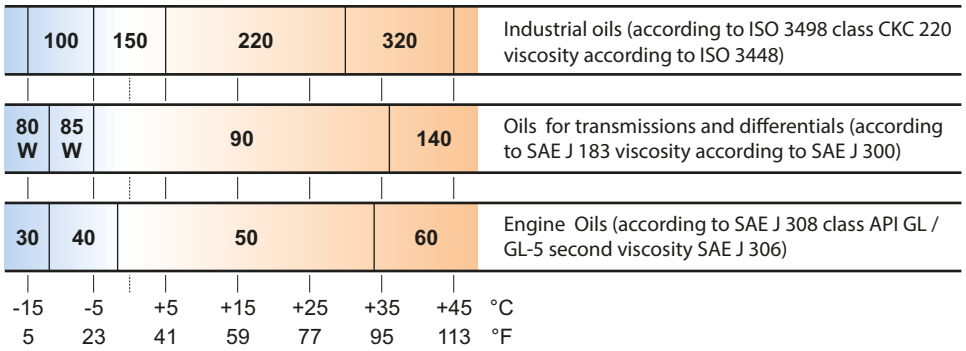
C_3 = 40 Nm u_3 = 60%

In diagram curve number 7 has to be considered (gear ratio 1: 2.5 at 1000 rpm). The estimated duration of the average torque of 60.4 Nm is approximately 3600 hours.

Lubricating oil

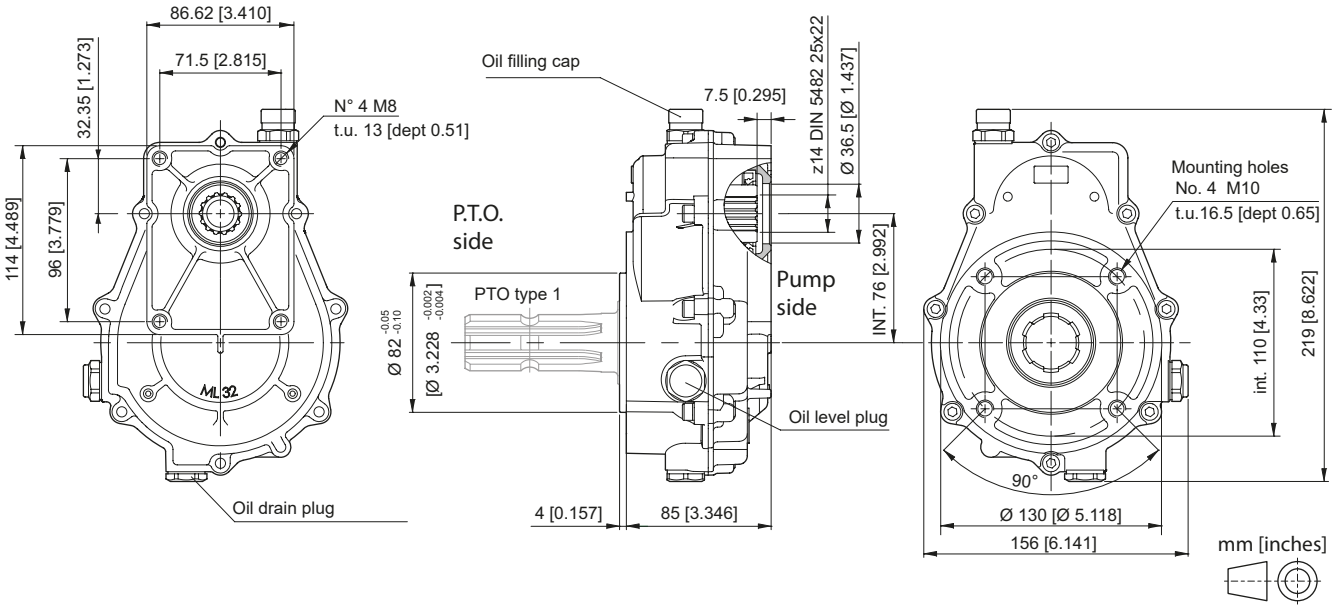
The types of oil, in the following table, are those suggested for the correct lubrication of the gears and are differentiated according to the temperature at which gearboxes have to

LUBRICATING OIL IN FUNCTION OF THE SEASONAL TEMPERATURE

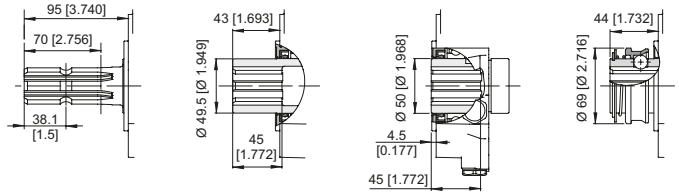


The gearboxes technical data shows the amount of oil for proper use. It is recommended to replace the lubricating oil after the first 50 hours of operation, after every 1000 hours or every 6 months.

SPEED INCREASER GEARBOX FOR PUMPS GR.2 WITH EUROPEAN UNIFIED FLANGE

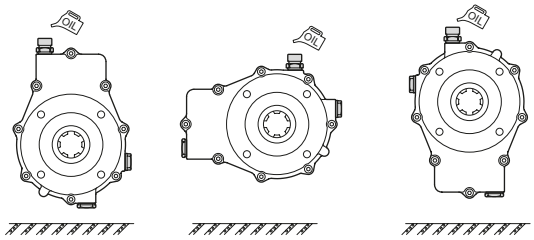


P.T.O.



1 **2-18** **12** **3-19**

Mounting positions



1 **2** **3**

ORDERING CODE

ML32 - ** -1/ *** - *

ML32 = Speed increaser (aluminium body)

P.T.O.
1 = Male 1" 3/8 DIN 9611
2 = Female 1" 3/8 DIN 9611
3 = Female 1" 3/8 DIN 9611 + tightening
12 = Female 1" 3/8 DIN 9611 short
18 = Female z21 - 16/32 DIN 9611
19=Femalez21-16/32DIN9611+tightening

Coupling for pump to be required to our sales department.

Mounting positions
1 / 2 / 3

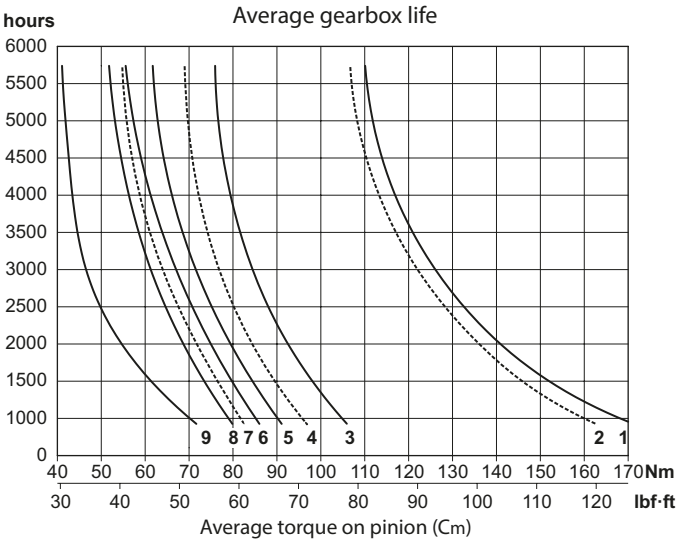
Transmission ratio
1,5 = 1 : 1,5
2 = 1 : 2.0
2,5 = 1 : 2.5
3 = 1 : 3.0
3,5 = 1 : 3.5
3,8 = 1 : 3.8

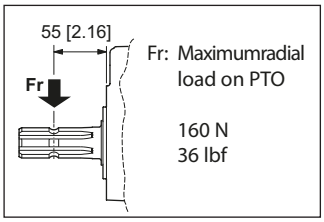
ML32

TECHNICAL DATA

Transmission ratio	Maximum torque Nm [lbf·ft]				Weight kg [lb]
	540 rpm		1000 rpm		
	C1*	C2*	C1*	C2*	
1 : 1.5	190 [140.1]	127 [93.7]	183 [135]	122 [90]	4,3 [9.5]
1 : 2.0	170 [125.4]	85 [62.7]	156 [115.1]	78 [57.5]	4,3 [9.5]
1 : 2.5	178 [131.3]	71 [52.4]	163 [120.2]	65 [47.9]	4,2 [9.3]
1 : 3.0	201 [148.2]	67 [49.4]	—	—	4,1 [9]
1 : 3.5	213 [157.1]	61 [45]	—	—	4 [8.8]
1 : 3.8	182 [134.2]	47 [34.7]	—	—	4 [8.8]

* Maximum torque on pump:
C1= maximum starting torque; C2= maximum torque for continuous duty.

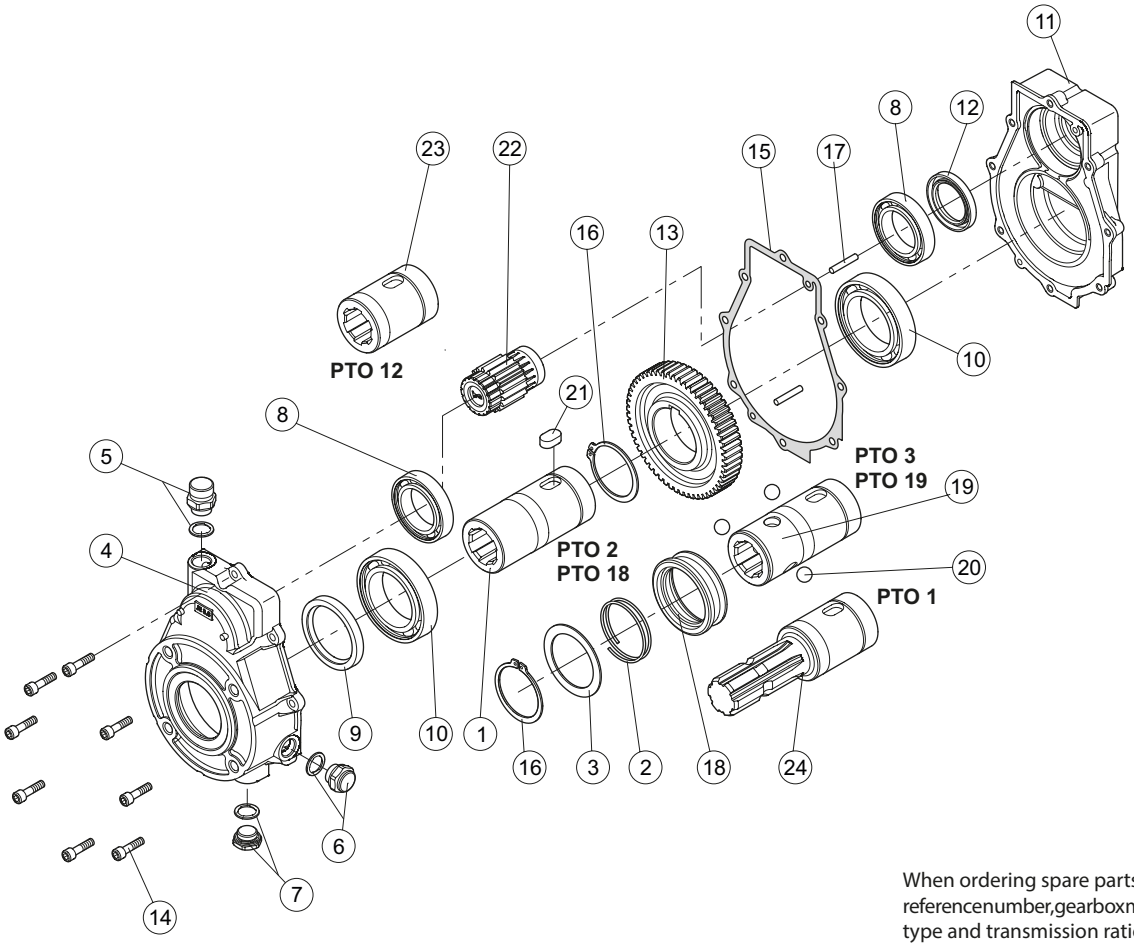




Mounting positions	Oil liters [US gallon]
1	0.15 [0.04]
2	0.11 [0.03]
3	0.09 [0.02]

Input rpm		Output (transmission ratio)					
		1 : 1.5	1 : 2.0	1 : 2.5	1 : 3.0	1 : 3.5	1 : 3.8
540	curve	1	3	5	6	8	8
	rpm	810	1080	1350	1680	1836	2052
1000	curve	2	4	7	—	—	—
	rpm	1500	2000	2500	—	—	—

SPARE PARTS



When ordering spare parts, specify referencenumber,gearboxmodel,PTO type and transmission ratio.