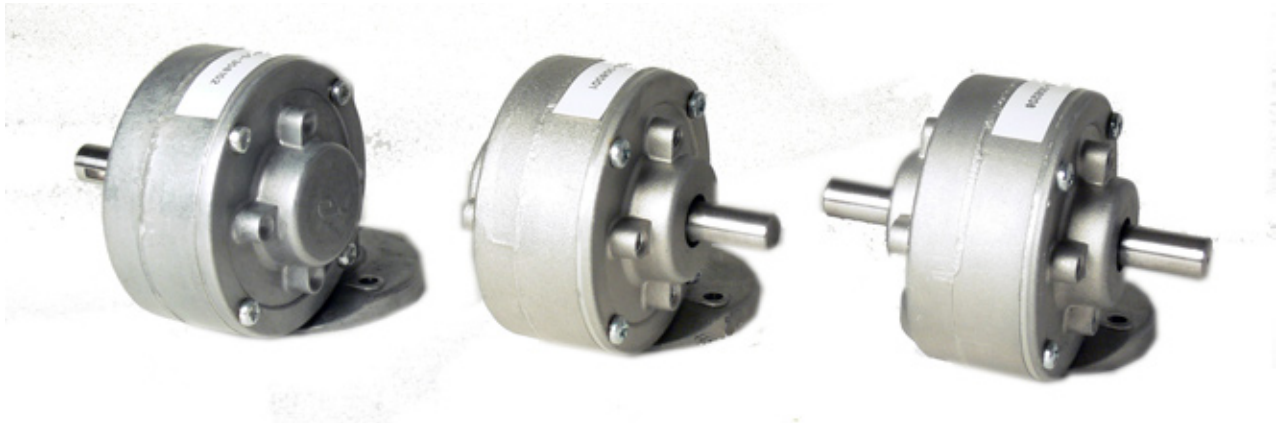


Low cost worm gears type HFOS



The HFOS gears are a series of inexpensive, very compact worm gears. By means of an adaptor Kit they can be mounted directly on motors with a NEMA23 standard flange, such as the MAC050-141 series of integrated AC servo motors and QuickStep integrated step motors. They will however also find applications with a wide range of common stepper motors with NEMA23 flanges.

These gears offer the advantage over planetary gears that they by nature are angled and gives a very short total length of motor plus gear.

The gears can be delivered both right- and left-angled as well as with output shaft to both sides. A wide range of gearing ratios, from 6:1 to 75:1 are available.

When ordering, various worm and cogwheel materials can be chosen in order to optimize the

gear for the application.

On the output side the gears can be delivered with a 30 mm machined recess for centering and 4 M5 threaded mounting holes.

A mounting fixture is available for mounting of the motor-gear combination

- Gear ratios from 6:1 to 75:1
- Small build-in length, appx. 73 mm
- Inexpensive solution for many less demanding applications
- Adaptor kit for NEMA23 flanges
- Can be adapted to customer application
- Simple and robust design
- Self-locking at gear ratios above 25:1



HFOS gear mounted on MAC integrated servo motor



HFOS gear mounted on QuickStep integrated stepper motor



Mounting of the HFOS gears on motors with NEMA23 flange

JVL can deliver these gears ready mounted on the motor.

An adaptor kit, MM3719 is available for customers own mounting of these gears on NEMA23 motors with a 20.57 mm long shaft, 6.35 mm in diameter. The adaptor kit is mounted as shown in the illustration.

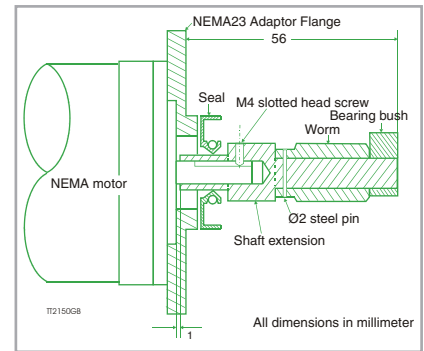
The shaft extension should be glued with Locktite 603 before it is inserted on the motor shaft and fixed with the slotted head screw. Then the worm is glued with Loctite 603 and fitted to the shaft extension and the steel pin

inserted. Worm, sealing ring and steel pin is supplied with the gear. The bearing bush is only necessary at higher loads, as can occur by start up.



Flange Kit MM3719 for NEMA 23 motors

This adaptor is only recommended for test purposes or for small series applications. For OEM use JVL can deliver



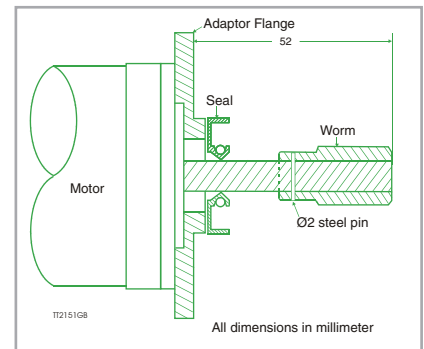
step- and servo motor with shaft and flange that fit the gears directly. (See below)

Mounting of the HFOS gears on motors with special flange

MAC141 motor and the MIS232 motor can be delivered with a special shaft and flange for direct mounting on the HFOS gear. The motors have an 8 mm shaft, 52 mm long, for direct mounting of the worm.

The worm is glued with Locktite 603, fitted to the shaft and the steel pin inserted.

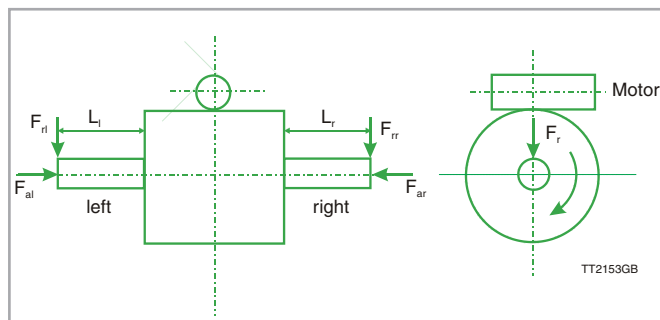
Worm, sealing ring and steel pin is supplied with the gear.



Motor and Flange Kit order numbers

Motor order no.	Flange Kit order no	Shaft
MAC141-A1AFAG	MM3716	Ø8.0 52mm long
MIS232A7M6H275	MM3715	Ø8.0 52mm long
NEMA23 flange	MM3719	Ø6.35 20mm long

Maxium radial and axial loads



The given radial loads are valid for all directions passing through the center of the shaft and in the distance L_l and L_r max. 20 mm



Flange Kit MM3716 for mounting a MAC integrated servo motor on an HFOS gear

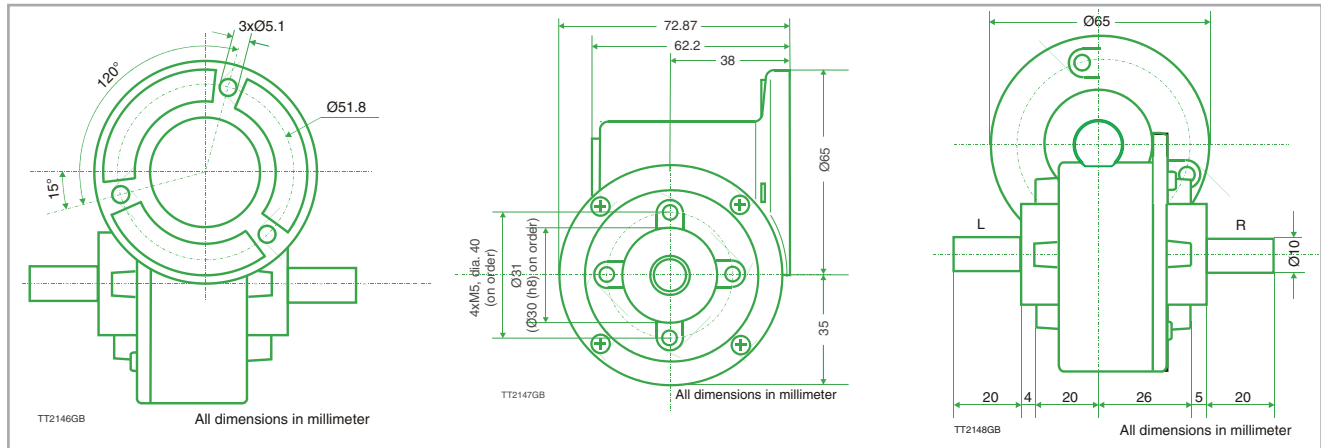


Flange Kit MM3715 for mounting a QuickStep integrated stepper motor on an HFOS gear

Gear ratio	Radial Force (N)				Axial Force (N)			
	F_{rl} alone	F_{rr} alone	$F_{rl} = F_{rr}$ simultaneous	$F_{rl} = -F_{rr}$ simultaneous	Rotational direction: CW		Rotational direction: CCW	
					F_{al} alone	F_{ar} alone	F_{al} alone	F_{ar} alone
5-20	230	120	80	230	100	900	900	100
20-50	350	170	110	350	300	700	700	300
50-70	400	200	140	400	425	575	575	425



Mechanical dimensions



Gear ratios and efficiency

Gear ratio		6:1	10:1	13:1	15:1	20:1	25:1*	30:1*	40:1*	50:1*	60:1*	75:1*
Efficiency		0.77	0.71	0.70	0.68	0.64	0.60	0.56	0.50	0.49	0.42	0.36
Input@1350 rpm	kW	0.30	0.30	0.30	0.28	0.23	0.20	0.18	0.14	0.11	0.10	0.08
	Nm	2.1	2.1	2.1	2.0	1.6	1.4	1.3	1.0	0.8	0.7	0.6
Output@1350 rpm	Nm	9.7	15.0	19.2	20.1	20.7	21.1	21.2	19.7	18.9	17.7	15.2
	rpm	227	136	105	91	68	54	45	34	27	23	18
Max. output with MAC141 motor (0.48Nm, peak torque 1.59Nm).	Nm	2.20	3.40	4.36	4.90	6.14	7.20	8.06	9.60	11.76	12.10	12.96
	Peak Nm	7.28	11.26	14.44	16.23	20.33	23.85	26.76	31.8	38.95	40.08	42.93

* self-locking

All gears are supplied with worm, $\varnothing 2$ mm steel pin and $\varnothing 8/26$ mm seal.

The values are for guidance only (No safety factor)

The values are with an even load and 80% operation
Hardened worm and bronze cogwheel (with Etronax cogwheel only 50% power).

Lifetime approximately 8000 hours depending on operating conditions. Operation in the shaded area is not recommended. If it is used, peak torque should be lowered accordingly. Lifetime depends on machine/load conditions. Lifetime will

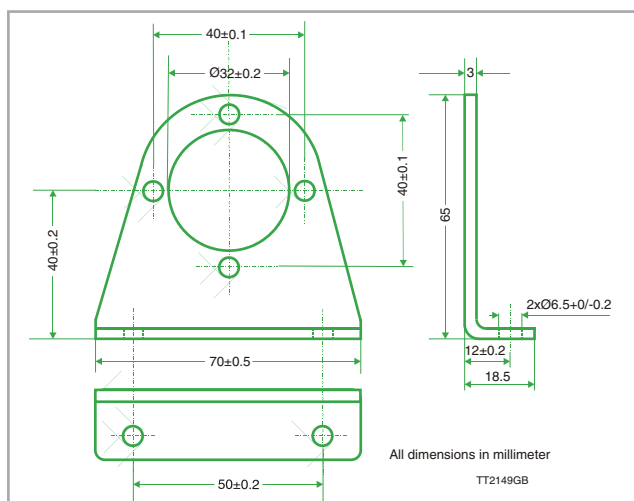
be dramatically reduced if load inertia is high. Due to gear backlash, oscillations will occur and the gear be subjected to very high pulse torques.

At rpm higher than 1500 the gear should be mounted with the worm downwards. (Opposite drawings above).

Notice that MAC motor peak torque is 1.59 Nm and peak torque x gear ratio x efficiency should be kept below Output Nm.

Recommended grease: Klüber GB00 Microlube.

Mounting Fixture for the gears



A mounting fixture can be fitted to one or both sides of the gear for firm positioning of the motor-gear combination. Ordering number is MM3749. Gear must be ordered with 4 threaded mounting holes at the output shaft for this purpose.





Ordering information

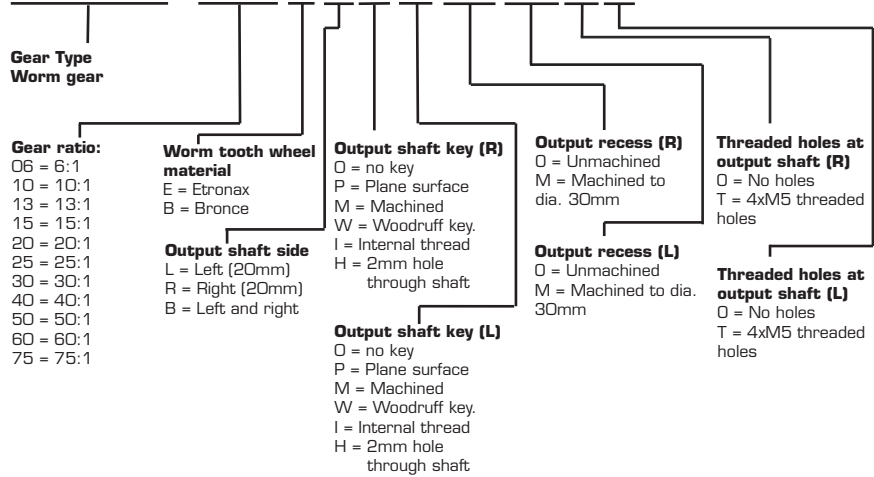
When ordering the HFOS gears the following can be chosen:

- Gearing ratio. 6:1, 10:1, 13.1, 15.1, 20:1, 25:1, 30:1, 40:1, 50:1, 60:1, 75:1.
- Worm. Soft or Hardened.
- Cogwheel material. Etronax or bronze. 1).
(Bronze is used with hardened worm wheel, Etronax with soft worm wheel.)
- Output shaft side. Left (L), Right (R) or both sides (L/R).
- Output shaft key: Plane surface, *machined, Woodruff key, *internal thread, *2mm hole through shaft.
* according to customers specification.

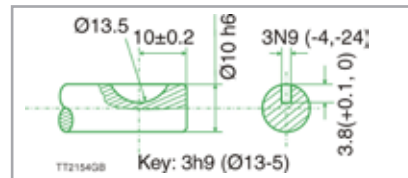
1) For highly dynamic applications and if output torque is above 50% of value in table page 3 we recommend hardened worm and bronze cogwheel. Etronax is recommended for low noise applications.

HFOS gear order number built-up

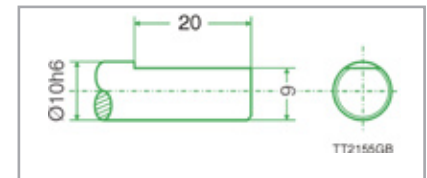
HFOS-06ELPPMTT



Shaft with Woodruff key



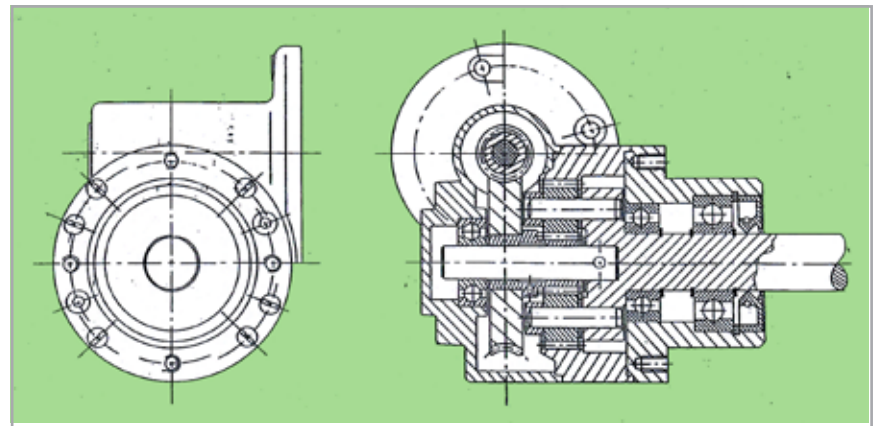
Shaft with plane surface



Worm gears with planetary gears

For very high torque and higher gear ratios the HFOS worm gears can be equipped with an additional planetary gear. Hereby gearing ratios can be multiplied by 4 and gearing up to 300:1 and torque up to 25 Nm can be obtained. (17mm shaft on planetary gear,)

For more information please contact JVL.



Gears in stock

Order number	Gear ratio	Remarks
HFOS-10ELOWOM0T	10:1	
HFOS-11EBI000T0	11:1	
HFOS-11EB0P00TT	11:1	
HFOS-45EBI000TT	45:1	R short, 10mm
HFOS-69EB0000TT	69:1	R long, 36mm



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