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Title	FCNDK Worm Reduction Gearbox Information

Summary	This document gives information on the FCNDK right angled worm reduction gearboxes

FCNDK Gearbox Information

Key to table headings:

Size: Physical size of the gearbox.

Ratio: Ratio of reduction of input speed to output speed.

N2 (rpm): Output speed of gearbox when connected to a 4 pole motor with slip speed of 1400rpm.

kW: Maximum kW that can be transferred through the gearbox to give a service factor of 1.

M2 (Nm): Maximum torque that can be transferred through the gearbox.

FR2 (N): Radial load that can be put onto the gearbox output shaft.

Motor input options: Physical size of motor and mounting that can be connected to the gearbox. Motor to gearbox connection either B14 face mount or B5 flange mount.

Physical size
Only certain sizes gearboxes and motors can physically fit together. The shaded area of the table below show which gearboxes and motors are compatible.

Also, gearboxes can only transfer a certain amount of power through them to keep a service factor of ≥1. As the ratio of the gearbox increases, the amount of power the gearbox can transfer from input to output decreases.

Service Factor
The service factor is the ratio of gearbox kW to motor kW being used. For most applications, a service factor of 1 is acceptable. For more arduous applications, a higher service factor is recommended to ensure gearbox reliability.

The service factor is : $\frac{kW\ (table\ below)}{kW\ (motor)}$

Please see further information on service factor later on in this document.

Gearbox output speed – 4 pole motor example
The synchronous of a 4 pole motor is 1500rpm (speed shaft would rotate at without any load). The motor nameplate shows the slip speed of the motor. This is the speed the shaft will rotate at when the motor is drawing full load current (nameplate current) from the supply.
Therefore the motor shaft speed will vary dependent on motor load.

The following tables give FCNDK performance data when coupled to a 4 pole, 1400rpm motor to give a service factor of 1.

Table key

	Not possible
	Standard option
	Possible using shaft reducing sleeve

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						56B14	56B5	63B14	63B5
FCNDK 30	5	280	0.65	18	654				
	7.5	187	0.41	18	683				
	10	140	0.32	18	752				
	15	93	0.23	18	861				
	20	70	0.18	18	948				
	25	56	0.18	20	1021				
	30	46	0.18	20	1085				
	40	35	0.11	18	1194				
	50	28	0.09	17	1286				
	60	23	0.08	16	1367				
	80	17	0.05	12	1504				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						56B5	63B14	63B5	71B14/B5
FCNDK 40	5	280	1.10	34	1149				
	7.5	187	0.90	40	1315				
	10	140	0.69	40	1447				
	15	93	0.48	39	1657				
	20	70	0.37	39	1824				
	25	56	0.30	38	1964				
	30	46	0.31	44	2087				
	40	35	0.23	41	2298				
	50	28	0.18	37	2475				
	60	23	0.15	35	2630				
	80	17	0.12	33	2895				
	100	14	0.09	29	3118				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						63B14/B5	71B14/B5	80B14	80B5
FCNDK 50	5	280	2.00	62	1736				
	7.5	187	1.60	71	1805				
	10	140	1.20	70	1987				
	15	93	0.88	73	2274				
	20	70	0.68	72	2503				
	25	56	0.54	69	2696				
	30	46	0.57	83	2865				
	40	35	0.42	77	3153				
	50	28	0.34	73	3397				
	60	23	0.28	68	3610				
	80	17	0.22	64	3973				
	100	14	0.16	52	4280				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						71B14	71B5	80B14/B5	90B14/B5
FCNDK 63	7.5	187	2.80	126	2359				
	10	140	2.20	129	2597				
	15	93	1.6	134	2973				
	20	70	1.20	131	3272				
	25	56	1.00	131	3524				
	30	46	1.10	164	3745				
	40	35	0.76	143	4122				
	50	28	0.60	133	4440				
	60	23	0.51	130	4719				
	80	17	0.39	119	5193				
	100	14	0.34	118	5595				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						71B5	80B14/B5	90B14/B5	100B14/B5
FCNDK 75	7.5	187	4.1	185	2785				
	10	140	3.2	190	3065				
	15	93	2.3	198	3509				
	20	70	1.9	210	3862				
	25	56	1.5	202	4160				
	30	46	1.5	233	4421				
	40	35	1.1	216	4865				
	50	28	0.9	206	5241				
	60	23	0.75	197	5569				
	80	17	0.58	187	6130				
	100	14	0.48	180	6603				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						80B14/B5	90B14/B5	100B14/B5	112B14/B5
FCNDK 90	7.5	187	6.3	287	3081				
	10	140	5.1	306	3391				
	15	93	4.1	357	3882				
	20	70	3.1	361	4273				
	25	56	2.4	332	4603				
	30	46	2.6	415	4891				
	40	35	1.8	363	5383				
	50	28	1.4	339	5799				
	60	23	1.1	307	6163				
	80	17	0.83	285	6783				
	100	14	0.67	270	7306				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						90B14/B5	100B14/B5	112B14/B5	132B14/B5
FCNDK 110	7.5	187	12.0	541	3893				
	10	140	9.8	586	4285				
	15	93	7.5	643	4905				
	20	70	5.6	631	5399				
	25	56	4.7	665	5816				
	30	46	4.5	710	6181				
	40	35	3.3	688	6803				
	50	28	2.6	647	7328				
	60	23	2.1	604	7787				
	80	17	1.4	505	8571				
	100	14	1.1	473	9232				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						90B5	100B14/B5	112B14/B5	132B14/B5
FCNDK 130	7.5	187	16.1	735	5092				
	10	140	13.5	804	5605				
	15	93	10.3	900	6416				
	20	70	7.8	892	7062				
	25	56	6.5	910	7607				
	30	46	6.4	1020	8084				
	40	35	4.9	1030	8897				
	50	28	3.8	960	9584				
	60	23	3.1	880	10185				
	80	17	2.3	825	11210				
	100	14	1.7	725	12076				

Size	Ratio	N2 (RPM)	kW	M2 (Nm)	FR2 (N)	Motor Input Options			
						100B5	112/B5	132B5	160B5
FCNDK 150	7.5	187	25.8	1175	6962				
	10	140	20.2	1215	7663				
	15	93	13.9	1225	8771				
	20	70	11.1	1275	9654				
	25	56	8.4	1175	10400				
	30	46	7.1	1175	11051				
	40	35	7.3	1520	12163				
	50	28	5.4	1370	13103				
	60	23	4.2	1235	13924				
	80	17	3.1	1130	15325				
	100	14	2.3	980	16508				

Service Factor – Further information

Gear unit selection is made by comparing actual loads with catalogue ratings. Catalogue ratings are based on a standard set of loading conditions, whereas actual load conditions vary according to type of application. Service Factors are therefore used to calculate an equivalent load to compare with catalogue ratings.

i.e. Equivalent Load = Actual Load x Service Factor

The service factor - *SF* - is a measure of periodically overload capacity at which a gearbox can operate without damage.

Usually minimum service factor of 1.0 is required when specifying a gearbox. Depending on type of the application/load etc. a higher service factor may be required to reduce the possibility of gearbox failure.

A service factor of 1.0 equates to:

- 8 hours a day operation
- Uniform load
- Mass acceleration factor fa ≤0.2
- Less than 200 start/stops per hour for bevel or helical gearboxes
- Less than 10 start/stops per hour for worm gearboxes
- An ambient operating temperature between 15 and 35^{o}C

Factors affecting service factor:

- Mechanical strength of gears
- Capacity of bearings
- Quality of gearbox oil
- Shock loading
- Number of starts and stops
- Required unit lifetime

Quality of oil
Gears run on a film of oil, if the oil breaks down and the gears are allowed to touch, the gears will wear prematurely.

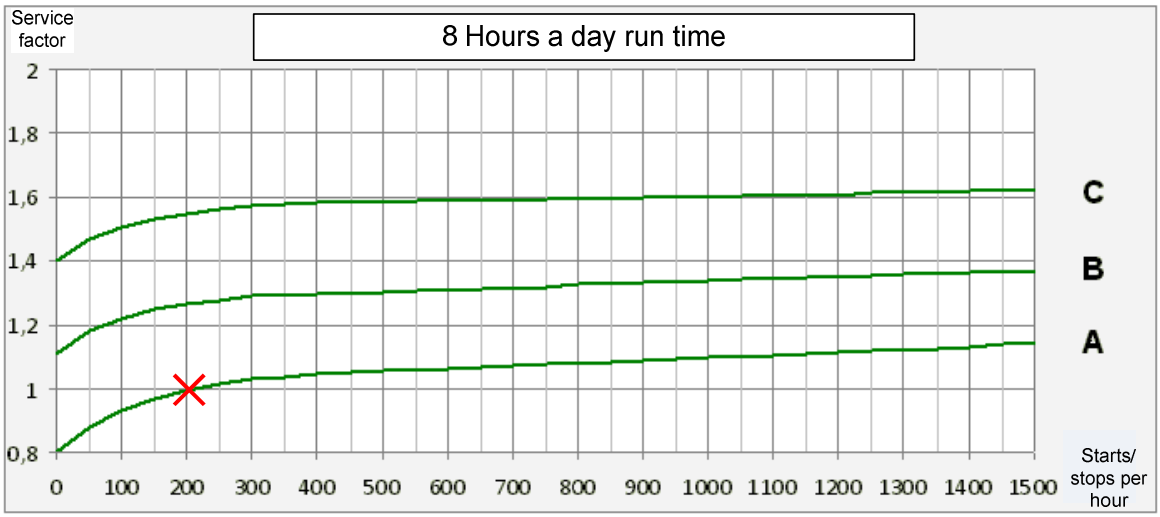
Thermal Capacity
Gearboxes do not like to run hot, the thermal rating of the unit must be considered when using 2 pole motors on low ratio's and also the ambient conditions.

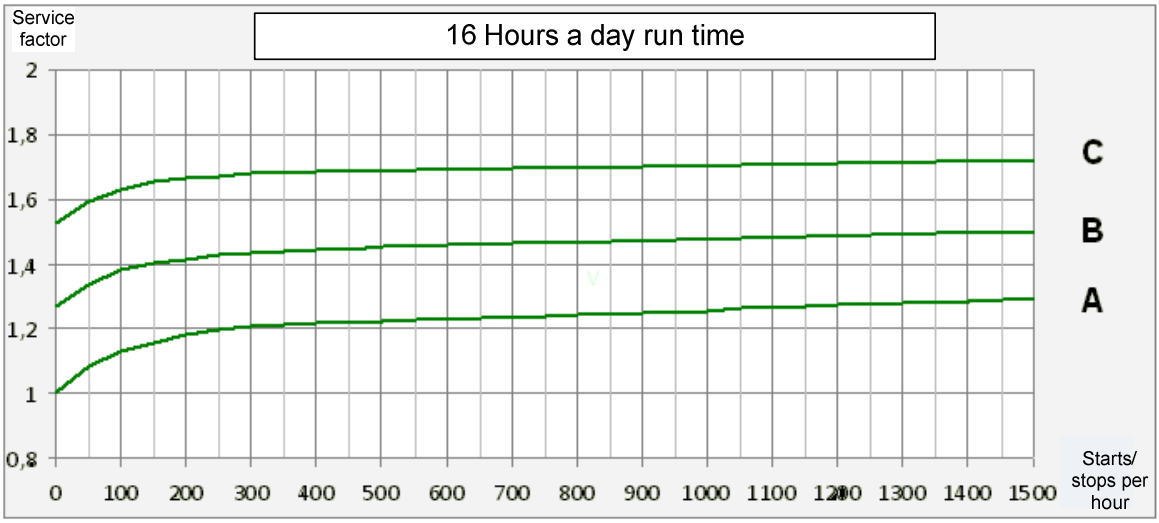
Shock loading
Heavy vibration either on the input or against the output will increase fatigue and reduce life.

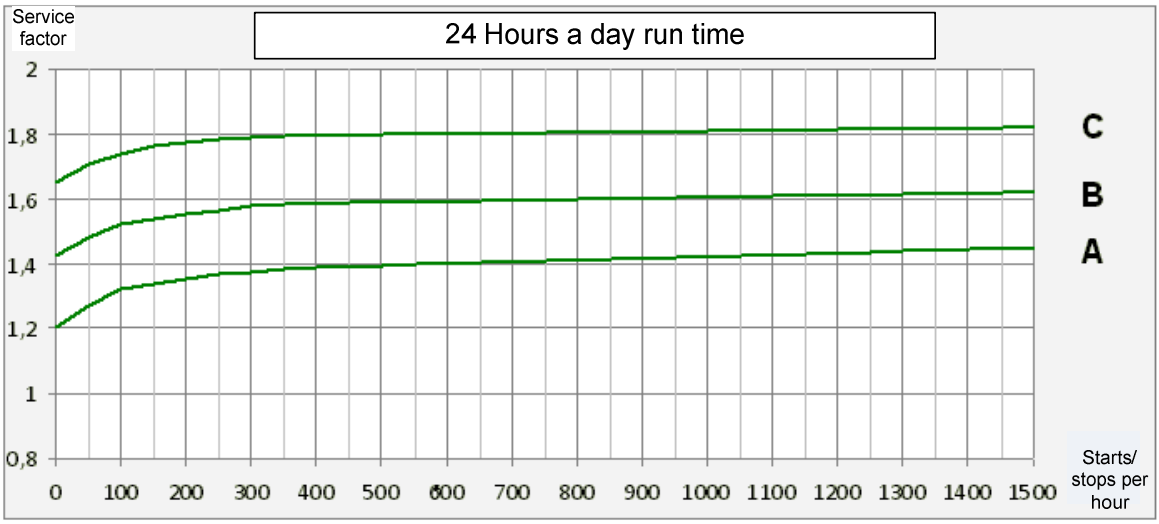
Starting characteristics

Direct online starting and full load starting will cause fatigue and the more instances of this, the greater the risk of damage.

Service factor graph







A - Uniform load with permitted mass acceleration ≤0.2
B - Moderate shock load with permitted mass acceleration ≤3
C - Heavy shock load with permitted mass acceleration ≤10

NOTE: The above graph starts/Stops per hour are for bevel or helical gearboxes. For worm gearboxes, the Starts/Stops per hour should be 5% of the above values.