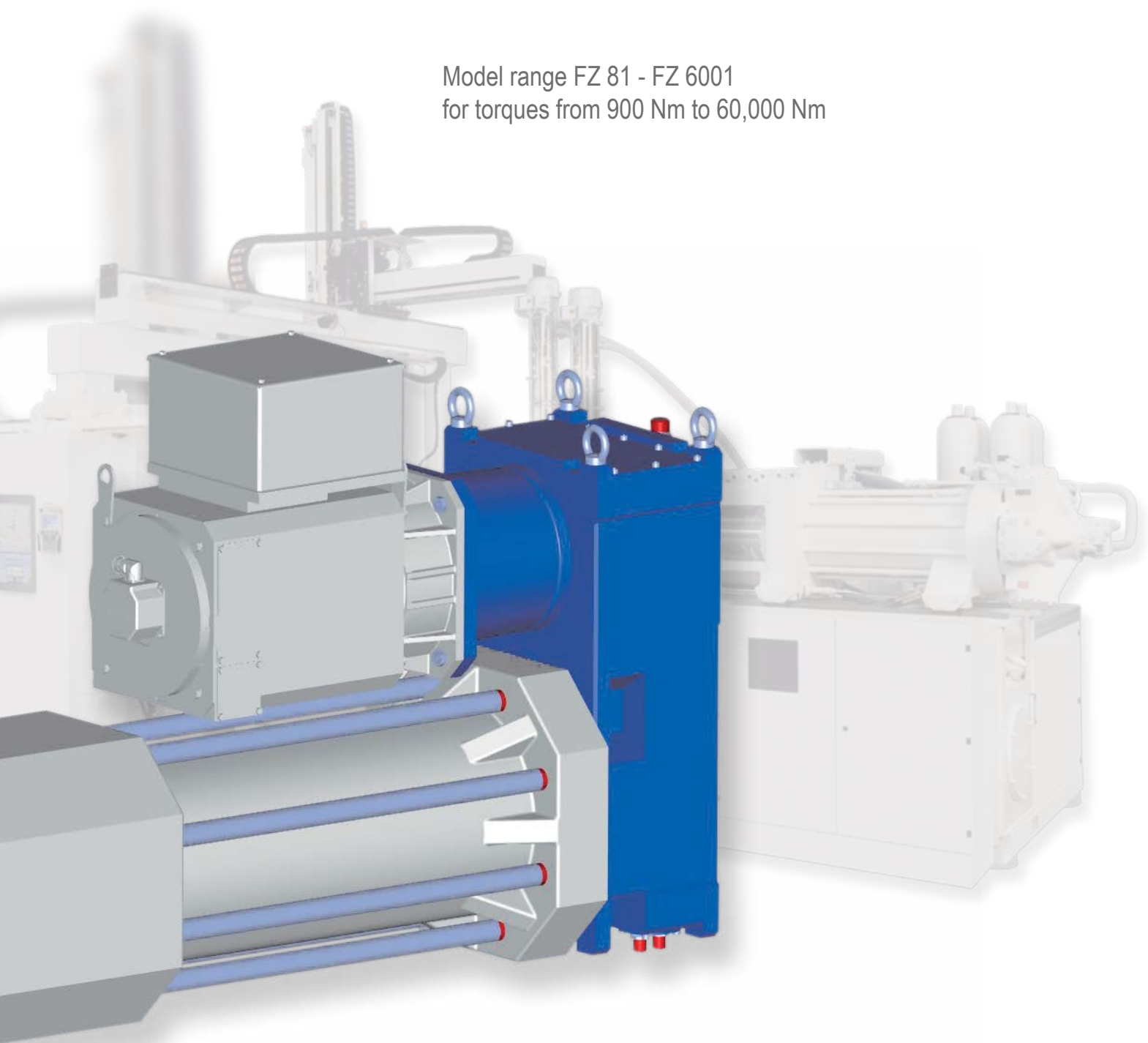


# Plasticizing Gear for Injection Moulding Machines

Model range FZ 81 - FZ 6001  
for torques from 900 Nm to 60,000 Nm



## Model range FZ 81 - FZ 6001

This gearbox series with a modern drive concept fulfils all requirements towards screw drive for electric injection moulding machines.

The development of this series began in 1995 with the first drives for hybrid machines of renowned manufacturers with the goal of achieving energy-efficient plasticizing and developing an electrical drive concept in a compact design to replace the hydraulic motor that was the standard at that time.

The main components are gearboxes with a high power density as well as water-cooled motors arranged economically in a "U"-shaped form over the injection unit.

The gears have stiff box frames with distances between axes that are suitable for the collision-free arrangement of the motors as well as especially strongly dimensioned suspensions and gear teeth in order to fulfil the required high service life expectancy. An integrated cooling system for the water cooling is included in the standard.

To this day, 12 gear frame sizes have been developed that cover a performance range of approx. 10 to 500 kW. Special features are above all the direct connection of the gear housing with cast on flange mounting as well as drive shafts with external splines for torque transmission.

The capability of our company to adjust to customer connections and to realise the necessary adaptations is essentially responsible for the success of our gear series.

### **Sure, durable and flexible**

Accessories such as overload couplings between the motor and the gear as well as temperature displays and monitors in various designs belong to the overall concept.

Especially compact units with directly attached water-cooled motors from the Knödler modular system round off the product range.

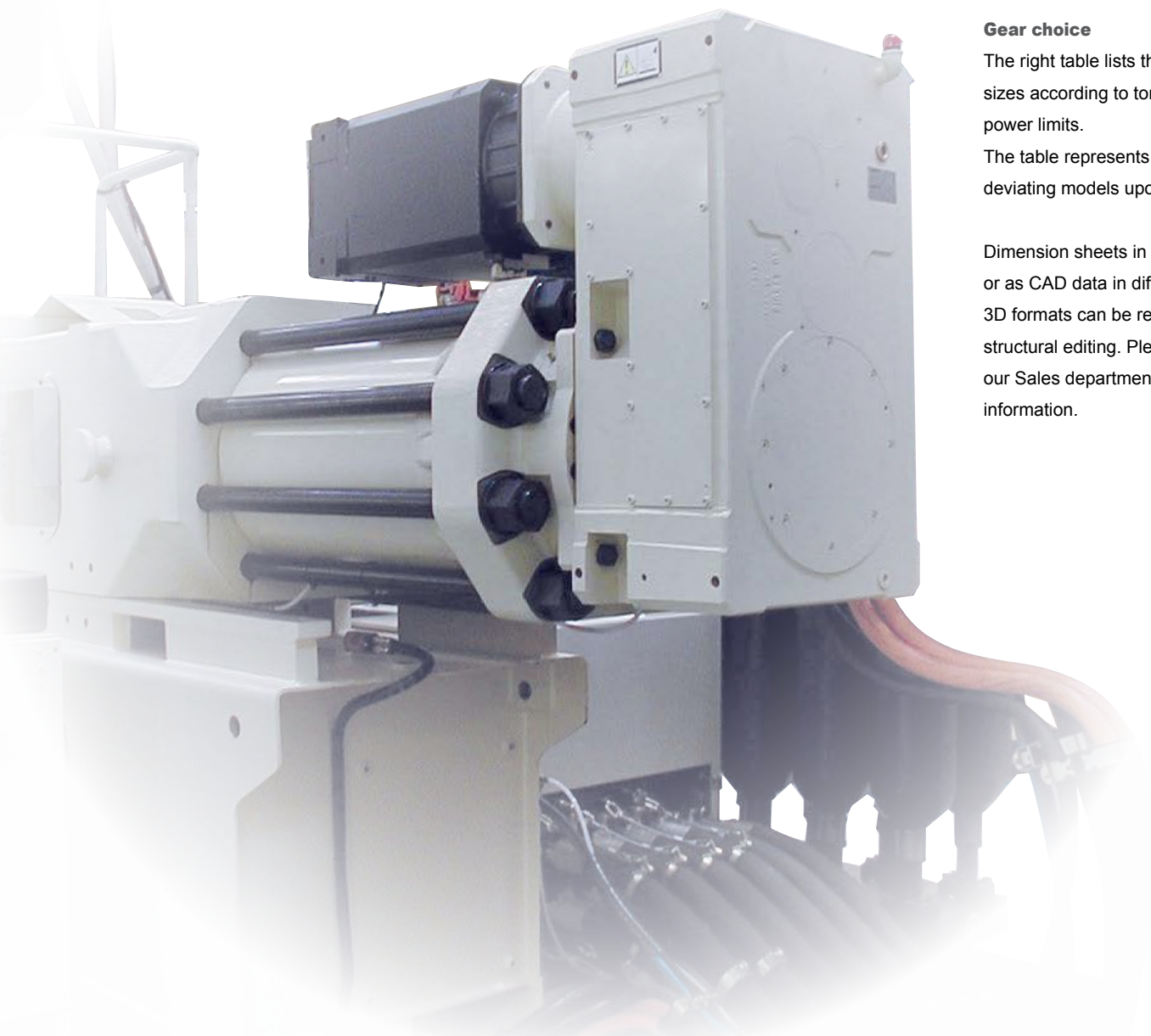
The typical nominal bearing life is calculated with more than 25,000 hours.

### **Gear choice**

The right table lists the gearbox sizes according to torques and power limits.

The table represents a selection; deviating models upon request.

Dimension sheets in PDF format or as CAD data in different 2D or 3D formats can be retrieved for structural editing. Please contact our Sales department for more information.



## Accessories · Monitoring devices · Cooling

### IEC flange and clutch for IEC standard motors

Adapter flanges and clutches are available for all current motor construction sizes.

Our modular water-cooled three-phase motors are a new variation of compact injection moulding machine drives. In these motors, the rotor is directly connected to the drive shaft of the gear.

The in-house design of the motors originates from the modular CMG concept and expands the product range.

### Overload

In the event of blockages, electrically interruptible overload couplings or slip clutches between the motor and gear offer protection against massive damage.

### Monitoring devices

For a controlled and safe operation, special importance is attached to the monitoring of the gears, especially for greater performances.

### Oil temperature

The limit monitors or temperature sensors (PT 100) serve to ensure the optimal lubricating conditions for the gear teeth and the bearings.

### Oil level

The simplest monitoring is the oil level gauge which can be expanded by the level control.

### Cooling

Due to the high power density which modern dosing gears must withstand, there are different available cooling types.

### Cooling coil

A copper cooling coil in the oil sump is the most inexpensive option of cooling the gear oil. The least effective because the heat transfer depends on the turbulence in the oil sump and thus from the speed. Still, the most frequently used additional cooling.

### Pump and plate heat exchanger

A pump that is installed directly opposite the drive shaft supplies the plate heat exchanger as a circulation pump. This cooling principle is a very effective, economical and proven solution for greater performances.



### Cooling aggregates with an electric pump

This application is used for greater performances with a corresponding cooling water control. These aggregates can satisfy all requirements in terms of optimal oil supply through filtering, degree of soiling indicator, oil temperature, oil level, etc.

### Performance data, distances between axes and weights

Gear type FZ	Torque $M_{2,max}$ (Nm)*	Power $P_{1,max}$ (kW)	Axle base (mm)	Weight (kg)**
81	900	15	235	65
121	1,200	25	287	85
151	2,000	40	328	150
251	3,000	65	358	185
501	6,000	100	405	320
601	8,000	125	425	380
901	11,500	150	482	400
1201	15,000	180	517	600
1601	18,000	200	517	605
2401	30,000	250	630	1,040
3001	38,000	300	630	1,100
6001	60,000	500	755	1,410

Greater torques and distances between axes upon request.

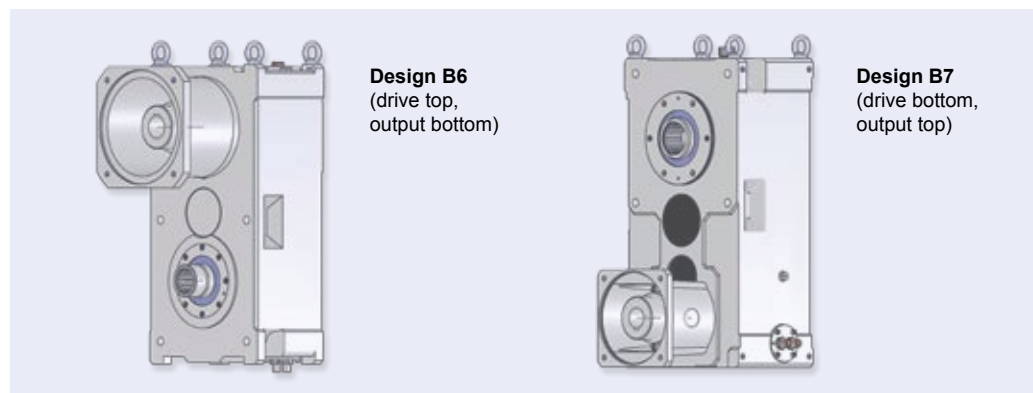
\* Maximum permissible torque at load factor  $f_b = 1$ .

\*\* The weights are approximations and can vary depending on the model.



## Model range FZ 81 - FZ 6001 – Technical data

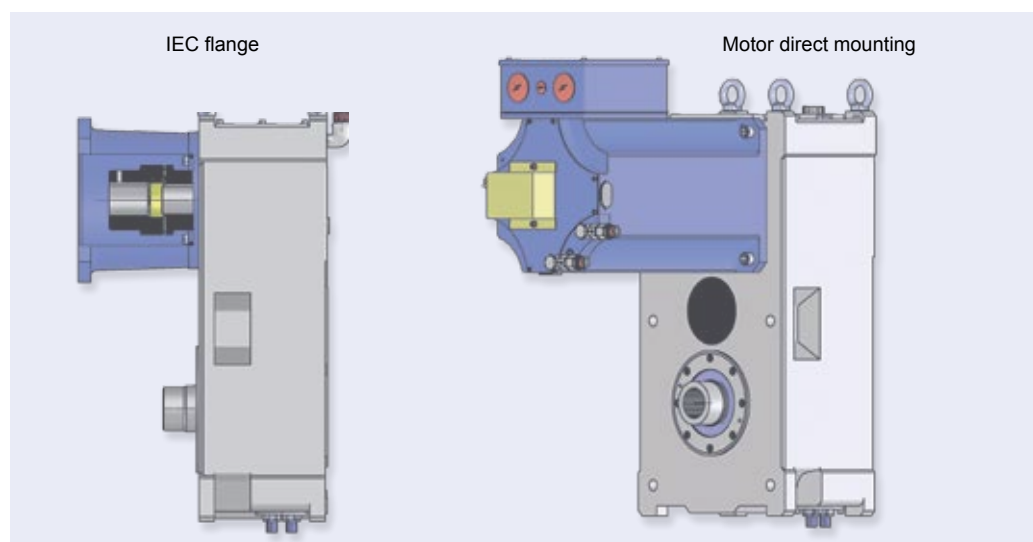
### Designs



The two U shaped designs on the left are standard for space-saving direct mounting of the motor. Other designs are possible on request.

The bearing assemblies of the drive and takeoff shafts are generally dimensioned for high power density on the injection moulding machines.

### IEC flange and clutch for IEC standard motors or motor direct mounting



The advantage of the directly mounted motor from our modular CMG series is that the motor and gear are optimally adapted to each other.

### Load factor $f_b$

Daily running time	4 hours			8 hours			16 hours			24 hours			
	Operations per hour	< 10	10 - 200	> 200	< 10	10 - 200	> 200	< 10	10 - 200	> 200	< 10	10 - 200	> 200
I	0.7	0.8	1	0.9	1	1.1	1	1.1	1.2	1.2	1.2	1.3	1.5
II	1	1.1	1.3	1.1	1.2	1.3	1.2	1.4	1.5	1.4	1.5	1.5	1.6
III	1.3	1.4	1.5	1.4	1.5	1.6	1.5	1.6	1.7	1.6	1.7	1.7	1.8

I = Even load · II = Uneven load, medium masses · III = Uneven load, greater masses

### Sound pressure level

Gear type FZ	81	121	151	251	501	601	901	1201	1601	2401	3001	6001
<b>dB(A)</b>	70	72	73	75	76	77	78	80	82	84	84	85

Medium sound pressure level measured at a distance of 1 m with a nominal load and  $n_1 = 1,400 \text{ min}^{-1}$

The load factor  $f_b$  refers to the various operating conditions of the gear, such as type of load, running time, operation frequency, output speed etc., and is therefore imperative when choosing the gear size.

Based on our experience, a load factor  $f_b=1.5$  at 24-hour operation must be considered when choosing the gear.

## Model range FZ 81 - FZ 6001 – Technical data

Reduction ratio table

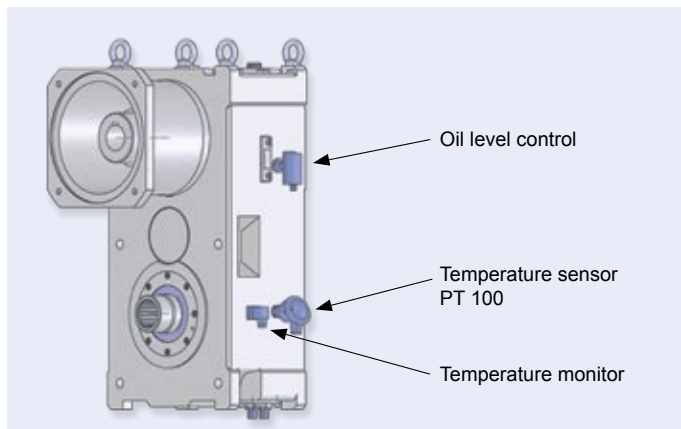
$i_N$	Gear type FZ											
	81	121	151	251	501	601	901	1201	1601	2401	3001	6001
4		4.11	4.28		4.39							
5	4.59	5.27										
5.6							5.55					
6.3	6.04	6.42	6.21	6.34	6.03							
7.1	6.98	7.49		6.82	7.20							
8	8.49	8.11	8.05			8.31	7.97					
9	9.18	8.96	8.96	8.73	8.69	8.74	8.44	8.90				
10		10.92	10.11	10.52	9.78	9.93	9.91	10.49				
11.2	10.86	11.52		11.32	11.68	11.28	10.90			11.07		
12.5	12.90	12.66	13.11	12.91		11.99	12.09	11.86	12.11			
14	14.27	14.00	14.59		14.10	14.32	12.79	13.97	14.75	13.82		
16	16.34			15.44	16.84	16.27	15.66	15.92		16.43		
18		18.01	18.91	17.78			18.38	18.32	18.27	18.01	18.65	
20	20.07				20.18	19.43	20.22	19.84	20.10	20.50		19.45
22.4	21.48	21.53		21.44		21.35	22.04	21.93	22.73	21.42	21.88	
25	25.40			25.63	24.73	25.50	23.72	24.40	25.01	25.82	24.47	26.91
28				28.57	29.11	28.03		29.42	28.93	26.72	28.72	29.05
31.5	30.20				33.74	30.80	31.66		30.45	29.55	31.60	
35.5	33.39				35.67	33.55		34.67	35.86	36.26	37.08	35.84
40					41.45		40.88	38.58	38.86	43.72		40.18
45	46.95					44.03			43.50	45.99	43.67	
50						48.40			52.06	52.29		48.24
56												53.53
63						63.53						64.27
71												
80												
90												88.89

Finely graduated reduction ratios as well as the possibility to attach different motors result in manifold combination opportunities, depending on the torque and performance requirements. The table represents a selection; other reduction ratios are possible on request.



## Model range FZ 81 - FZ 6001 – Technical data

### Monitoring devices



For a controlled and safe operation, special importance is attached to the monitoring of the gears, especially for greater performances.

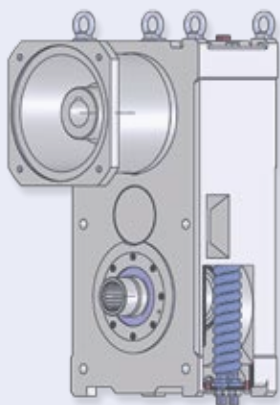
Special sensors and monitors for oil temperature, oil level, flow and speed are used for this.



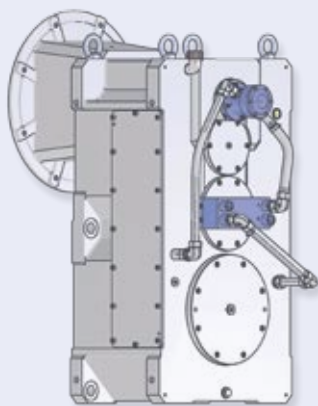
A large number of monitors, sensors and switches are available.

### Cooling

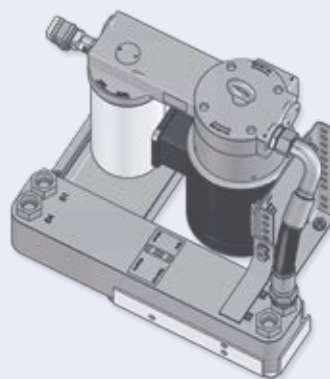
Cooling coil



Pump and plate heat exchanger



Cooling aggregates with electric pump



#### Cooling coil

This cooling system with a copper cooling coil in the oil sump is the most inexpensive option of cooling the gear oil.



#### Pump and plate heat exchanger

This cooling principle is a very effective, economical and proven solution for greater performances.



#### Cooling aggregates with an electric pump

High performances demand a suitable cooling system. The cooling is designed depending on the gear size and required performance. This ranges from the directly mounted cooler to the external cooling unit with its own tank and all the necessary monitoring devices.



Example of a pump-transfer cooler filtration unit

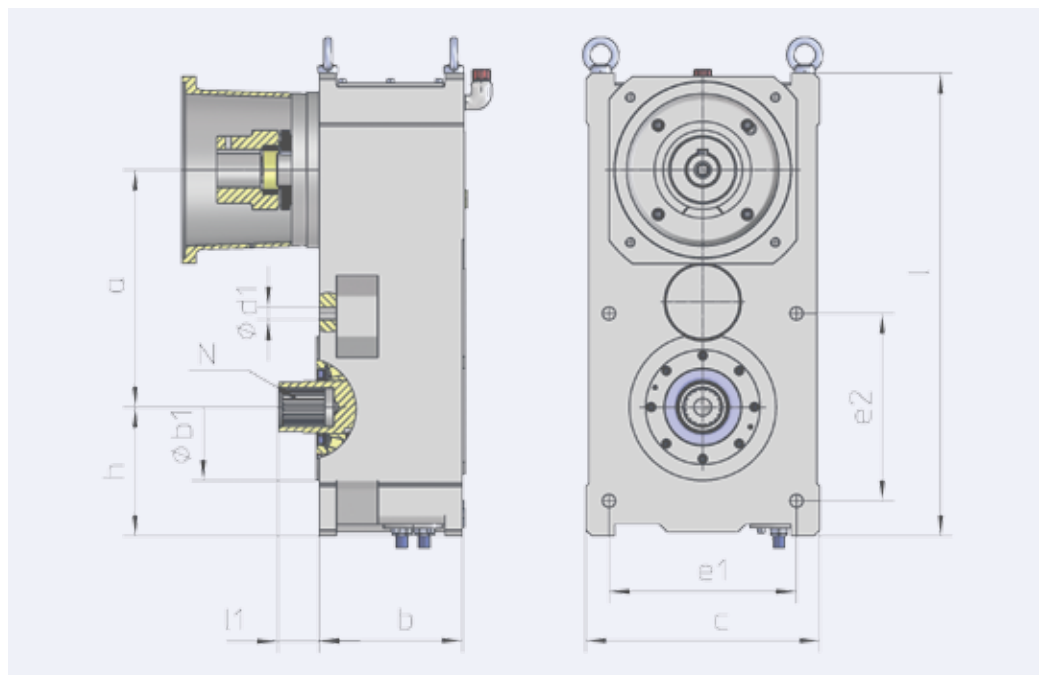
## Model range FZ 81 - FZ 6001 – Technical data

### Dimensions

Dimensions (mm) Gear type FZ	Main dimensions									Drive shaft (customer-specific)	
	a	b	c	h	l	Ø b1	Ø d1	e1	e2	l1	N (DIN 5480)
81	235	153	200	100	435	90	13.5	165	165	45	W35x2x16
121	287	155	225	114.5	506	125	11	190	190	82	W40x2x18
151	328	191	260	130	590	150	13.5	224	224	53	N45x2x21
251	358	200	320	160	650	180	17.5	280	280	40	N55x3x17
501	405	250	400	220	790	250	22	320	320	70	N65x3x20
601	425	250	400	200	790	250	22	320	320	70	N65x3x20
901	482	280	430	215	830	250	22	346.5	346.5	28	N85x3x27
1201	517	335	500	250	900	300	26	416	342	83	N85x3x27
1601	517	335	500	250	900	300	26	416	390	28	N120x5x22
2401	630	440	580	290	1,140	400	33	520	520	72	N140x5x26
3001	630	440	580	290	1,140	400	33	520	520	72	N140x5x26
6001	755	477	680	340	1,250	450	39	590	590	86	N150x5x28

Adapter flanges, pin compatible with hydraulic motors, are available for all sizes.

All dimensions refer to the standard models. The customised dimensions may vary here above all. Special requests will of course be satisfied if they are technically viable. Just ask us!



### Oil quantities

Gear type FZ	121	151	251	501	601	901	1201	1601	2401	6001
Oil quantity (liter)	6	8	14	30	29	43	60	58	115	145

The quantity of oil stated in the table is an approximation only. The markings of the dipstick / oil sight glass are decisive for the amount of oil to be filled in.

## More compact drive solutions for injection moulding machines

### Model range ZS-I for the injection and plasticizing for injection moulding machines

The ZS-I model range is available in 5 different sizes. Injection forces of 80 to 900 kN and speeds up to 500 mm/s are achieved. Components are a metering gear with motor and an injection gear with 4-fold motor.

### CMG compact drive for plasticizing

This type has been firmly established in the extrusion sector for several years. 4 three-phased motors in water-cooled version together with a special gear with a 4-fold engagement produce drive units with the highest power density. There is an own catalogue available for these units which describes all of the application possibilities.

### Rack-and-pinion gears for the mould clamping unit in injection moulding machines

4 frame sizes for mould clamping forces from 1,500 kN to 7,500 kN are currently being developed.

Designated accessories:

- ... Toothed rack connection over guide pistons
- ... Absolute value encoder or incremental encoder
- ... Brake attachment for emergency stop etc.



### Consulting service

Call us if a standard gear is unsuitable for your area of application. Our experts will gladly advise you and help you to find the right solution for every technical challenge. We will also be happy to send you dimension sheets in PDF format in advance.



### Further information

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