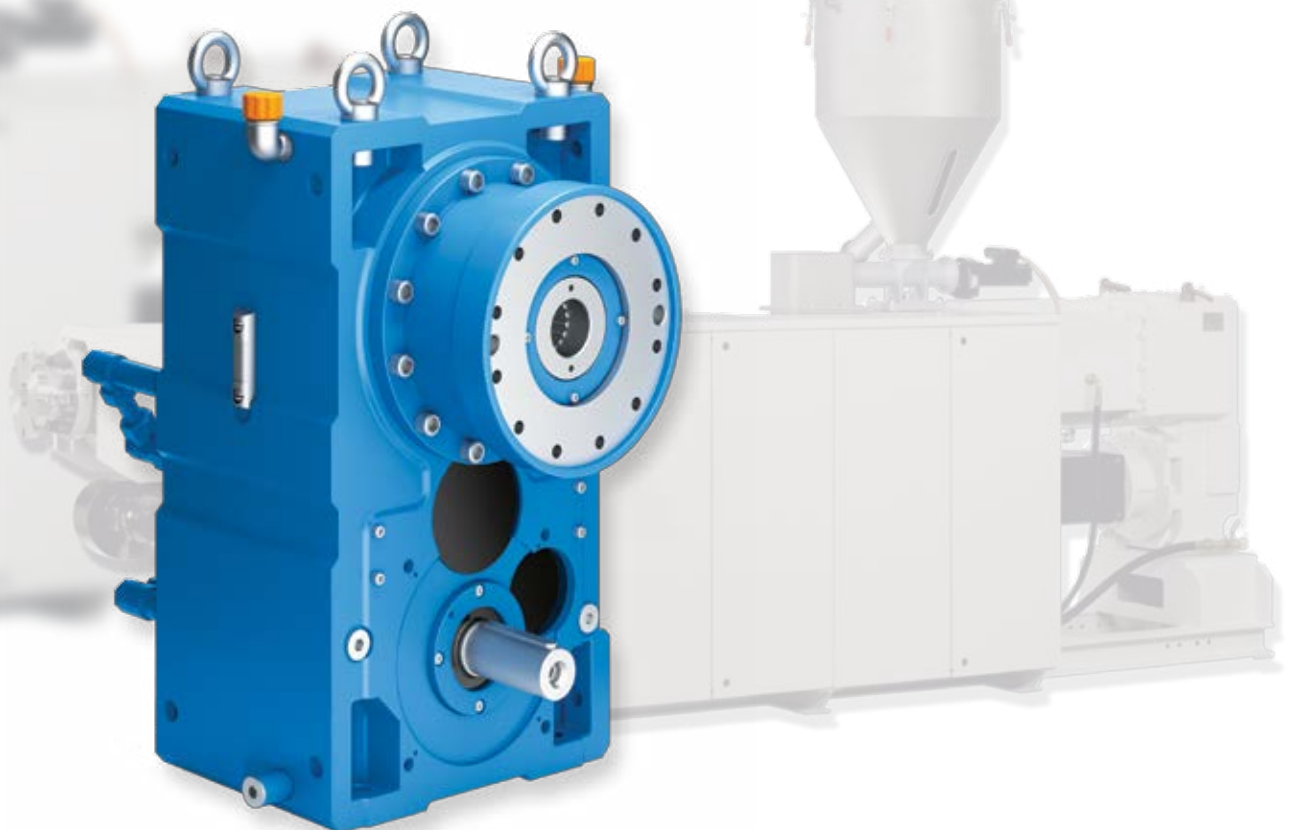


# Extruder gears

Model range FZ 50 - FZ 12000  
for torques from 600 Nm to 200,000 Nm



## Model range FZ 50 - FZ 12000

Gears of this type satisfy the extruder requirements in terms of all technical characteristics essentially arising from the preplasticating spindle and the different material and process properties.

The entire gear series has a modular structure and makes use of the Knödler modular gear system where the main components are available from stock.

### Absolute flexibility

The success of this gear model range is mainly due to the fact that Knödler does all it can to meet the customers' connection requirements and make the necessary adaptations. Above all, this includes the correct design of the axial mounting with the use of different load ratings within a gear size.

### Safety and long life

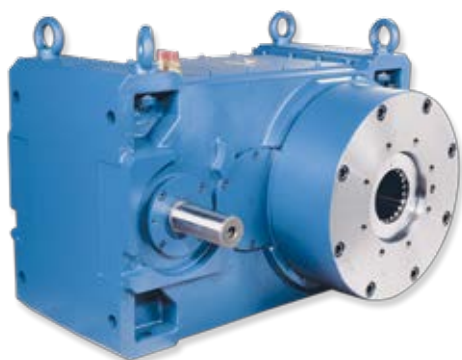
Integrated cooling concepts and monitoring devices for safe long years of multiple shift operation are designed especially for the respective gear size and operating requirements.

This gear system comprises **universal fitting positions** with fastening possibilities on all sides on the housing as well as the execution of the worm pullout to the front or back.

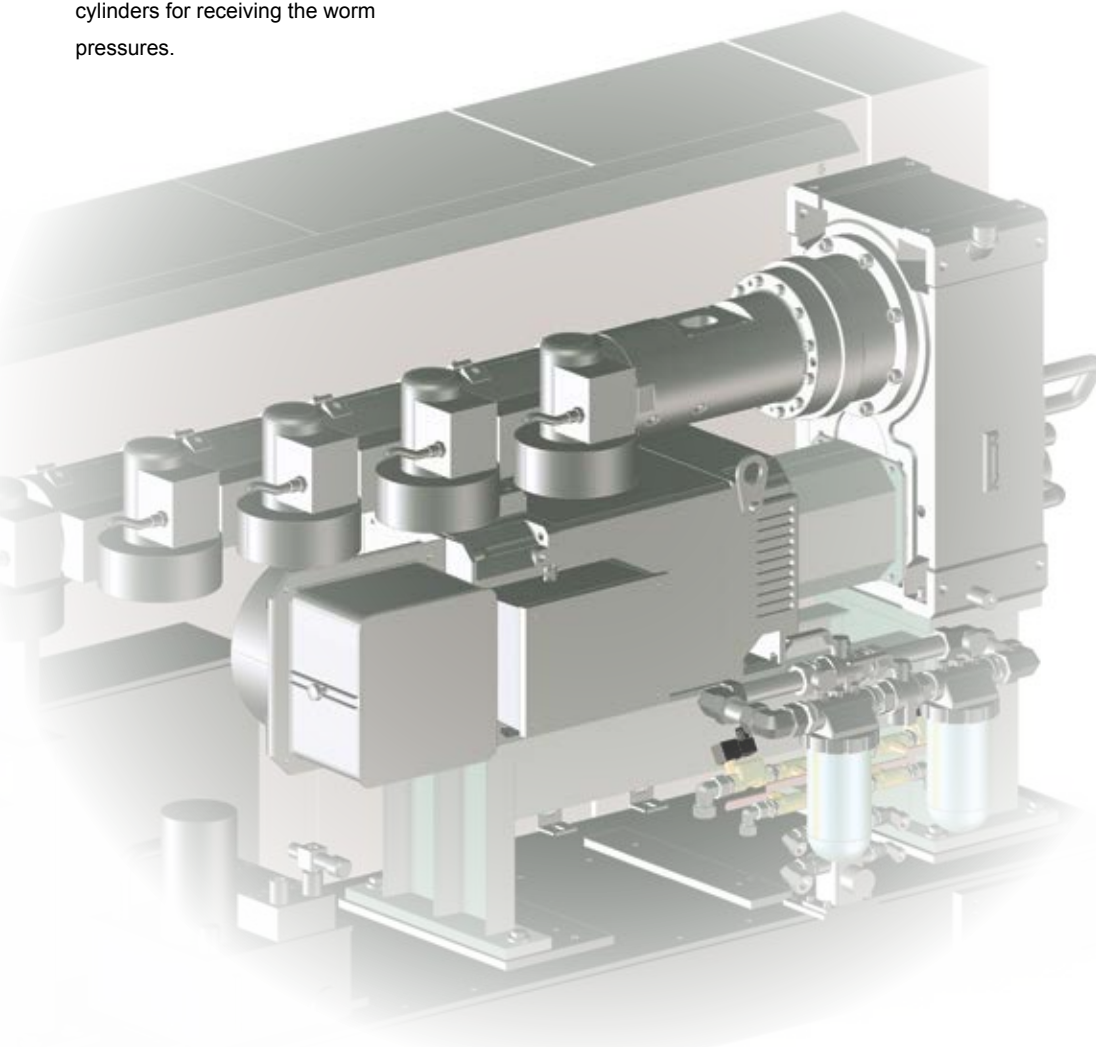
U-type or Z-type designs for the position of motor can be supplied just as easily as the direct mounting of the motors via IEC flange and clutch, alternatively with an independent drive shaft. The suspensions of the drive and output shafts are generally dimensioned for the high power density at the extruders. The typical nominal bearing life is calculated with more than 25,000 hours.

### Gear choice

The right table lists the gear sizes according to torques and power limits. They have been allocated to the typical worm diameters. 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.



The gear sizes are specially coordinated to the criteria worm diameter, pick-up profile, bearing dimensioning and adaption of the cylinders for receiving the worm pressures.



### IEC flange and clutch for IEC standard motors

Adapter flanges and clutches are available for all current motor construction sizes. The advantages over V-belt connections are the drive without radial stress, the central motor mount and a low-noise operation.

### Overload

In the event the worm is blocked in the cylinder, electrically interruptible overload couplings between the motor and the gear can protect against massive damage.

### Monitoring devices

Extruders are usually driven in continuous operation. This attaches special importance to the monitoring of the gears, especially for greater performances.

### Oil temperature

The limit monitors of temperature sensors (PT 100) serve to ensure the optimal lubrication 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.

### Speed monitor

This is given by a proximity switch to evaluate the actual speed.

### Cooling

There are different cooling types due to the high power density which modern extruder gears must withstand.

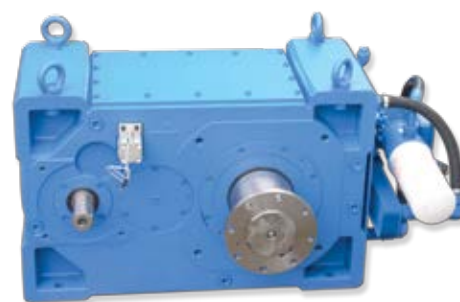
### Cooling coil

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

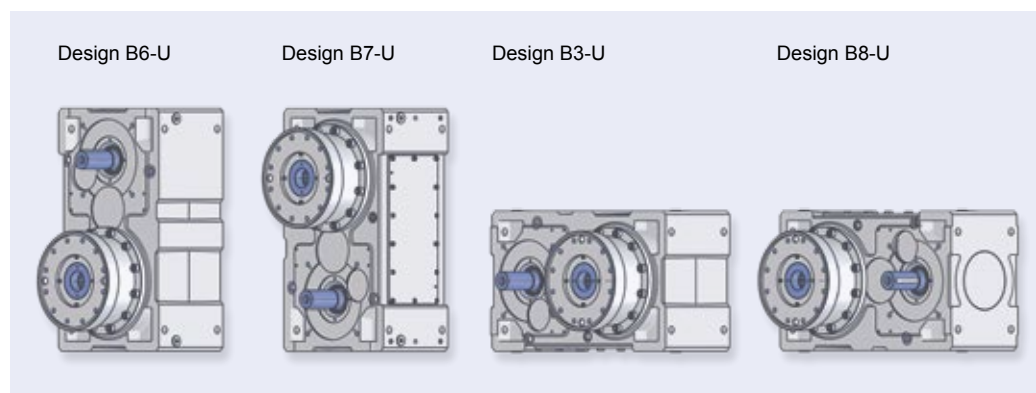
Gear type FZ	Torque $M_{2 \max}$ (Nm)*	Worm diameter (mm)	Thermal capacity (kW)		
			Standard version without additional cooling	Version with cooling coil	Version with circulation cooling (Pump and plate heat exchanger)
50	600	20 - 30	10	-	-
80	900	20 - 30	18	-	-
160	1,800	30 - 45	28	50	-
250	2,800	35 - 50	40	72	-
400	4,000	45 - 60	40	72	-
600	8,000	60 - 80	70	100	> 100
900	11,500	60 - 90	90	120	> 120
1200	15,000	80 - 105	105	150	> 150
1800	22,000	90 - 120	120	170	> 170
2400	30,000	90 - 140	140	190	> 190
4000	40,000	120 - 200	200	250	> 250
6000	60,000	120 - 200	200	250	> 250
9000	100,000	150 - 300	250	300	> 300
12000	200,000	250 - 400	300	-	> 300

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



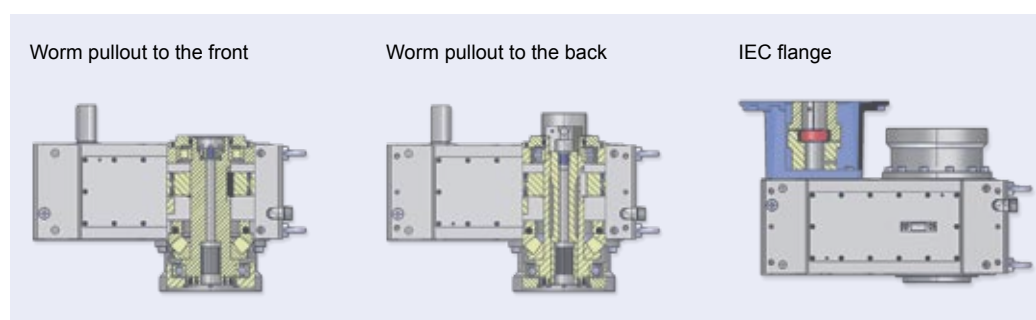
## Model range FZ 50 - FZ 12000 – Technical Data

### Designs



On the left the four most common U shaped designs B6, B7, B3 and B8. However, all U or Z shaped designs are possible for the motor position.

### Worm pullouts



The worm pullout is possible to the front or to the back. Adapter flanges and clutches are available for all current motor construction sizes.

### Load factor $f_b$

Daily running time Operations per hour	4 hours			8 hours			16 hours			24 hours		
	< 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	1.3	1.5
II	1	1.1	1.3	1.1	1.2	1.3	1.2	1.4	1.5	1.4	1.5	1.6
III	1.3	1.4	1.5	1.4	1.5	1.6	1.5	1.6	1.7	1.6	1.7	1.8

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

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.

### Sound pressure level

Gear type FZ	50	80	160	250	400	600	900	1200	1800	2400	4000	6000	9000	12000
dB(A) $i \leq 25$	67	70	73	75	75	77	78	80	80	83	85	85	85	85
dB(A) $i > 30$	64	67	70	73	73	74	76	78	78	80	83	83	83	85

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

# Model range FZ 50 - FZ 12000 – Technical data

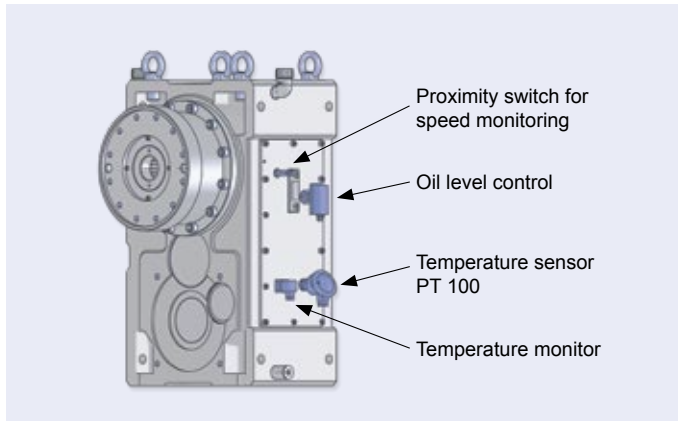
Reduction ratio table

		Gear type FZ													
$i_N$		50	80	160	250	400	600	900	1200	1800	2400	4000	6000	9000	12000
1-stage	2.8		2.75		2.45	2.45	2.95								
	3.15	3.13		3.05	3.11	3.11			3.05						
	3.55		3.62		3.88	3.88				3.5					
	4	4.0		4.4	4.29	4.29	4.0		4.07	4.33					
	5	5.0	5.08	5.1	5.17	5.17	5.25		5.33	5.2					
2-stage	5							5.11							
	6.3	5.7	5.9	5.6	5.7	5.6	6.2	6.0	6.4	5.9					
	7.1	7.3	6.9	6.1	6.2	7.3		6.7		7.3	7.2				
	8	8.2	7.7	8.1	7.9	7.7	8.5	7.9	8.5	7.9	8.7				
	9	9.1	9.0	8.8	8.9	9.3	9.0	8.7		9.8	9.7				
	10	10.2	10.8	10.2	10.3	10.0		10.2	9.5	10.3					
	11.2	11.5	11.9	10.7	10.9	11.4	11.1	11.4	11.1		11.7				
	12.5	12.7	12.7	12.6	12.2	12.1	12.2		12.7	12.4	12.6	12.9	12.9		
	14	14.6	14.2	14.6	15.0	13.6	13.0	13.6	13.1	14.0	15.2				
	16	16.4	16.7	15.4	16.8	15.7	16.0	16.0	16.6	15.3		15.8	15.8	16.9	16.0
	18	18.2	17.7	17.9	18.1	18.8	17.6	17.5	17.4	18.4	17.1	17.2	17.2		19.0
	20	20.3	19.9	19.4	20.2	20.7	20.4	20.7	21.0	20.8	20.7	21.1	21.1	20.3	
	22.4	22.9	22.2		22.7	22.7	23.1	23.1	22.9	22.8	22.5	22.6	22.6	22.1	21.5
25	25.4	24.9	25.5	25.8	25.0	26.8	27.3	27.6	27.3				26.7	25.5	
28									31.0		27.1	27.6	27.6		
3-stage	28	27.5	28.2	28.6	28.6		29.5			29.6					
	31.5	30.9	32.6	32.9	32.2	30.4	32.0	31.7	32.6	31.5	32.2	32.9	32.9		
	35.5	34.4	36.9	35.0	34.6	36.4	35.2	35.0		36.7	36.3	35.8	35.8	31.3	34.7
	40	38.3	40.8	41.3	38.9	41.9	40.8	40.9	40.7	42.7	43.7	40.2	40.2	41.1	41.2
	45	46.2	45.8	46.9	44.2	46.5	45.8	45.2	45.0	45.4	47.6	47.0	47.0		46.5
	50	52.0	51.9	50.5	51.0	50.5	50.3	53.3	49.0	52.9	52.3	53.5	53.5	49.7	48.7
	56	57.7	55.9	54.4	54.8	55.2	56.0	59.6	54.2	56.2	57.4	57.6	57.6	55.8	55.3
	63	64.3	62.8	63.5	61.7	64.1	61.6		64.3	63.4	63.0	65.5	65.5	65.3	65.0
	71	72.3	71.2	69.9	70.1	76.6	71.4	70.3	72.8	71.4	75.4	70.2	70.2	73.2	
	80	80.4	82.8	83.6	79.0	84.5	80.9	76.8	80.2	80.9	82.7	81.7	81.7	81.3	77.7
	90	87.5	92.9	87.9	89.0	92.4	93.7	90.6		91.5	90.9	88.9	88.9	88.6	87.3
	100	97.3	99.8	99.9	101.1	101.8	102.0	101.3	100.2	100.1	99.0	96.7	96.7	106.8	101.2
	112	108.3	112.1	110.0	111.5	116.0	115.5	111.7	110.5	116.0	114.8	108.9	108.9	116.3	114.3
	125	121.8	127.1	125.0	126.7	126.9		119.6	120.8	120.1	119.4	118.4	118.4		
	140	135.4	140.5	141.7	143.5	139.8	133.9	131.8	133.2	139.2		142.7	142.7	140.2	135.8
160		157.8			158.8										
180					179.9										

Finely tuned reduction stages in 1, 2 or 3-stage versions together with precise and noise-optimised gear teeth enable the use of diverse high speed motor types.

## Model range FZ 50 - FZ 12000 – Technical Data

### Monitoring devices

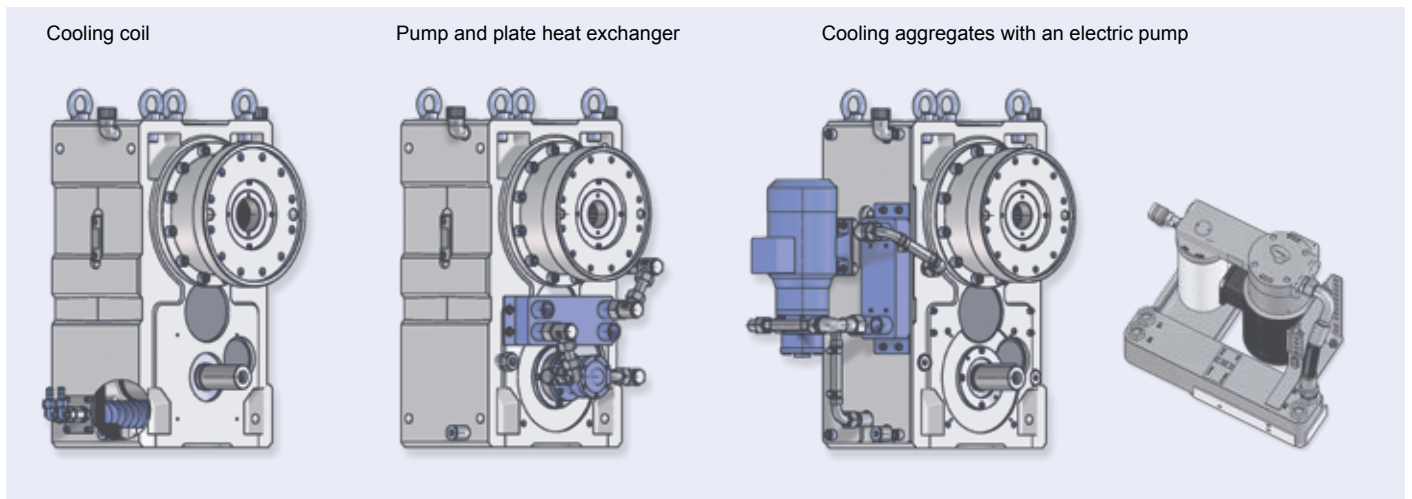


Continuous operation and high performances of extruders demand constant monitoring of the gears. Special sensors and monitors for oil temperature, oil level, flow and speed are used for this.



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

### Cooling



#### Cooling coil

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

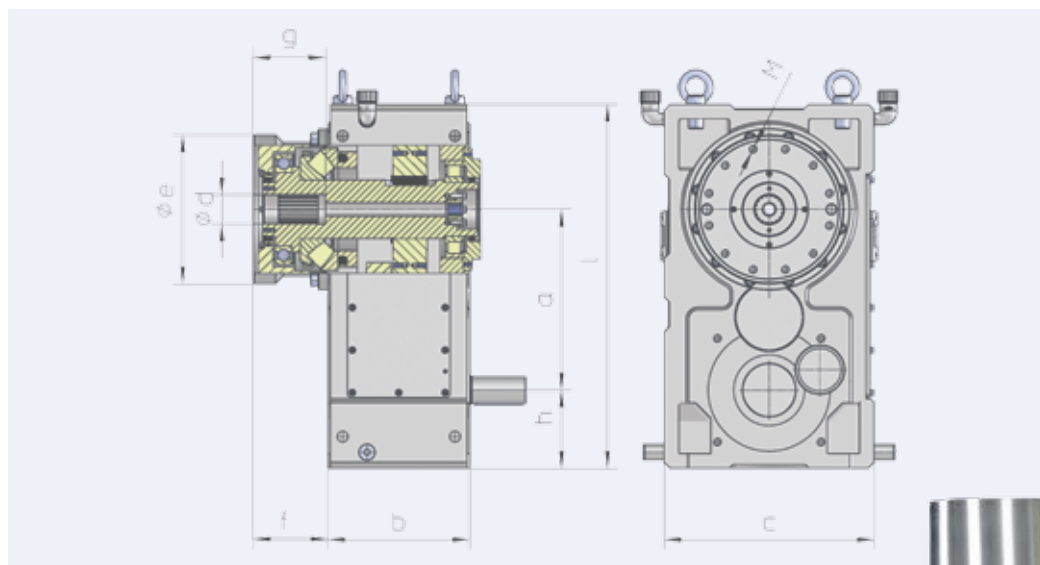
## Model range FZ 50 - FZ 12000 – Technical Data

### Dimensions and weights

Dimensions (mm) Gear type FZ	Main dimensions					Customer-specific dimensions					Weight* (kg)
	a	b	c	h	l	d	e	f	g	M	
50	143	140	170	90	318	18	155	100	52	M10	25
80	157.5	152	200	80	337.5	20	155	120	52	M10	35
160	216	180	260	95	441	35	260	118	111	M12	65
250	246	194	320	124	530	45	250	164	80	M12	120
400	272	194	320	98	530	45	260	155	130	M12	130
600	330	245	400	150	680	45	275	145	116	M12	230
900	370	290	430	160	745	60	305	153	148	M16	340
1200	405	335	480	175	820	60	350	160	130	M16	390
1800	465	440	560	135	880	75	355	165	145	M20	590
2400	500	440	640	175	995	90	460	250	187	M24	800
4000	595	482	710	255	1,205	110	500	242	231	M24	1,050
6000	595	482	710	255	1,205	110	500	242	231	M24	1,250
9000	750	550	900	300	1,500	150	610	395	220	M24	2,900
12000	850	700	1,120	400	1,810	220	980	664	445	M36	4,800

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

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	Design B3	Design B6	Design B7	Design B8
	Oil quantity (liter)			
50	2	2.7	2.7	2
80	2.5	3.7	3.7	2.5
160	6	8	8	6
250	10	12	13	10
400	10	12	13	10
600	18	23	26	18
900	22	29	33	22
1200	30	50	50	30
1800	70	75	75	70
2400	85	90	90	85
4000	120	130	130	120
6000	120	130	130	120
9000	240	250	250	240
12000	550			

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 extruder applications

### Extruder gear FZ series with a directly mounted electric motor

**Direct motor mounting:** Our modular water-cooled three-phase motors are a new variation of compact extruder gears. 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. The big advantage is that motor and gear are perfectly matched.

### CMG compact drive

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.

### Extruder gear with an increased axle base between drive and output

This variation is used for U-shaped design drives that do not have sufficient space between the extruder cylinder and the motor as standard.



### 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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