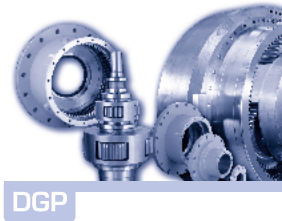


WHEN FULL POWER IS NEEDED



## DESCH Denox Planetary Gearboxes



4000 Nm - 1 000 000 Nm

The optimal basis for individual drive solutions  
Technology DX-GB 07



## DESCH Denox Planetary Gearboxes



DESCH has been constructing and continuously developing planetary gearboxes since 1954. The gearboxes are used worldwide in the most different applications. DESCH's expertise in design and operation is the basis for the new DESCH Denox gearbox series.

DESCH Denox planetary gearboxes consist of the coaxially arranged components sun gear, planet carrier and gear rim and the turnable planetary wheels aligned at a constant axis distance in the planet carrier. Multiple stage gearboxes are created by connecting this tothing arrangement in series.

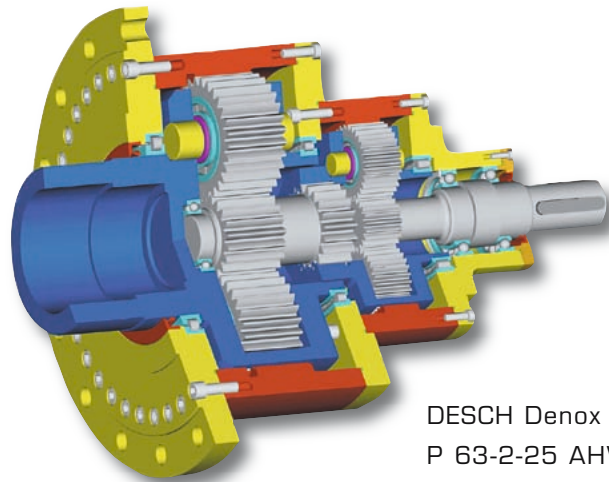
The DESCH Denox gearbox series also forms a platform for special designs adapted to specific applications. Apart from the combination of various planetary gearbox stages, further designs are possible with input bevel gear, spur gear or worm gear stages. DESCH planetary gearboxes can also be fitted with one or more shifting gear stages, if required. The shifting happens mechanically, electrically or hydraulically.

### Features

- High power density due to optimum utilisation of space by means of power distribution among up to 5 planetary wheels per gearbox level
- High efficiency
- Coaxial design and rotational symmetry enable turnable arrangements and use as overriding, distribution and summation gearbox
- Insusceptible to shock also for peak demands of the same angle
- Smooth running due to the appropriate selection of the tothing data, exact production and low relative speeds
- Adaptable to extremely difficult space requirements due to manifold combination options with bevel gear, spur gear and worm gear stages, as well as customised machine connections
- Positionally independent with appropriate oil filling or appropriate arrangement of forced oil lubrication
- Low moments of inertia for highly dynamic drives
- Variable speeds due to shifting stages
- Calculated fatigue-free tothing when subjected to the maximum catalogue torques. The calculated roller bearing service life is 10,000 operating hours at full capacity.

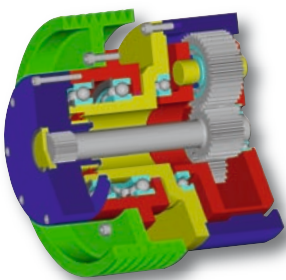
# DESCH Denox Planetary Gearbox

Variation by combination

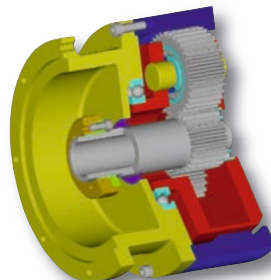


DESCH Denox  
P 63-2-25 AHW

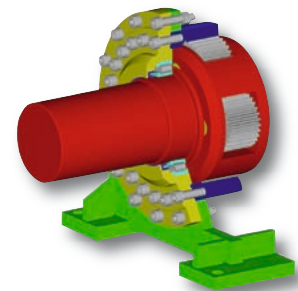
Adaption for specific applications  
for example:



V-belt pulley running  
on separate bearings



direct assembly  
to the motor



solid shaft and foot

## Type code

<b>P</b>	<b>E</b> -	<b>num.</b> -	<b>i<sub>total</sub></b>	<b>X</b>	<b>Y</b>	<b>Z</b>
planetary gearbox	size of final stage 4 - 400	no. of stages 1 - 4	ratio 25 - 2533	housing design A = flange F = foot (D = torque arm)	output side W = cylindric shaft H = cylindric hollow shaft X = toothed shaft R = pinion	input side W, H, X (as output side) M = direct assembly to the motor V = V-belt pulley on bearings K = bevel gear stage S = spur gear stage



## Design

### Sizes

The Denox gearbox series is available in 14 sizes and therefore covers a torque range of 4,100 Nm to 430,000 Nm. The transmission ratio range stretches from  $i = 25$  to  $i = 2,533$ . Further transmission ratios can be found in the standard transmission ratios table on page 6. Higher torques and divergent transmission ratios are possible on request. The modular design of the gearboxes result in a high degree of standardisation due to recurrent components and gear box levels.

### Gearbox designs

Apart from the combination of various planetary gearbox stages, further designs are possible with input bevel gear, spur gear or worm gear stages. Various combination options are illustrated on page 3.

### Materials

- **Planetary shafts, pins:**  
case-hardened steel, surface-hardened
- **Pinion shafts, planetary wheels:**  
case-hardened steel, surface-hardened
- **Gear rims: alloyed,**  
nitrided quenched and tempered steel
- **Planet carrier: spheroidal graphite**  
cast iron (DIN EN 1563)
- **Bearing covers, flanges:**  
steel or spheroidal graphite iron

### Toothings

The sun pinions and planetary wheels are case-hardened and ground. The gear rims are tempered and nitrided. The rectilinear spur gear involute face toothings has a pressure angle of  $20^\circ$ . The toothings of the Denox gearboxes is calculated as fatigue-free when subjected to the maximum torques specified in the catalogue.

### Bearings

Only roller bearings of sufficient size are used for supporting pinion shafts, planetary wheels and planet carriers. At a drive speed of 1,500 rpm 10,000 operating **hours under full capacity** are calculated.

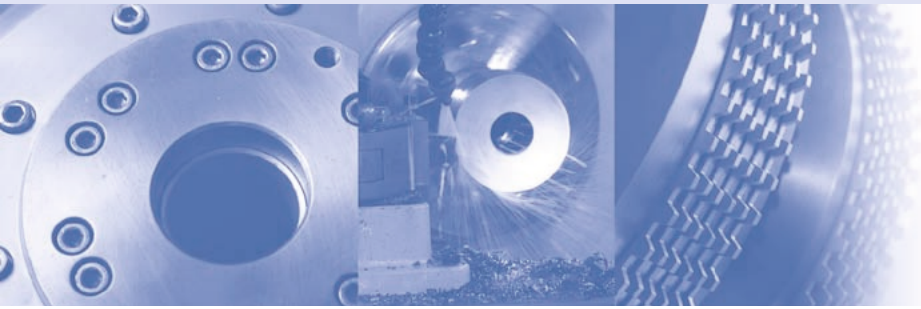
### Shafts and connections

- **Shaft designs:**  
long shape, DIN 748, sheet 1
- **Shaft centring:**  
DRM centring according DIN 332, part 2
- **Key version:**  
A shape, DIN 6885, sheet 1
- **Shaft dimensions: k6 tolerance,**  
DIN ISO 286
- **Centring diameter: h6, DIN ISO 286**
- **Axis height and positional tolerances:**  
DIN 747

The standard input shafts are designed for coupling connections. Besides the standard hollow output shafts for shrink disc connections, hollow shafts or solid shafts with splined toothings according to DIN 5480 are possible too.

### Seals

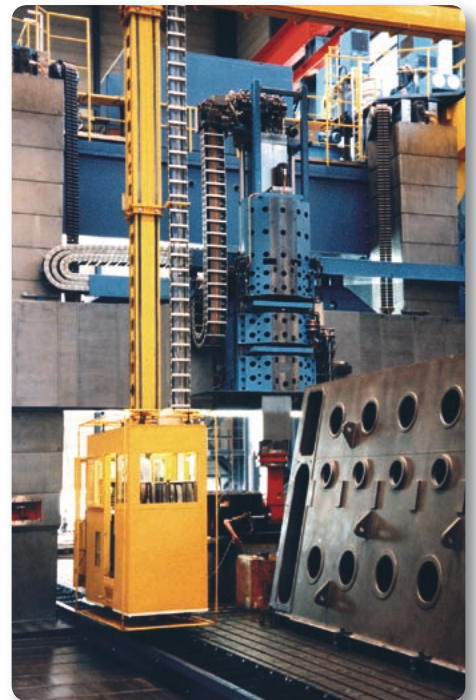
Drive and output shafts are sealed as a standard with radial shaft seal rings. Materials are selected according to the application. Depending on the application, the gearboxes may be equipped with axial face seals or regreasable, contact-free labyrinth seals.



**Examples**



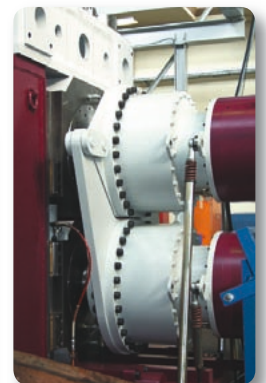
Test rig for drive lines of harvesters



Portal milling machine for workpieces of 5.3 x 4.3 x 15 m



DESCH drive station for a tension-levelling plant



DESCH planetary gearbox, Denox P250-2-25-AHM type with attached torque motors for driving the top and bottom roller of a thermoforming rolling system



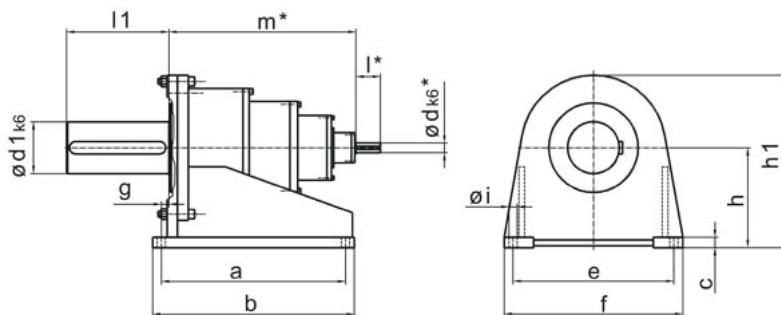
## DESCH Denox planetary gearboxes

### Dimensions

#### Torques and standard ratios

standard ratios		
2-stage	3-stage	4-stage
25	103	750
32	125	1000
41	158	1267
50	200	1604
	253	2006
	317	2533
	413	
	495	
	600	

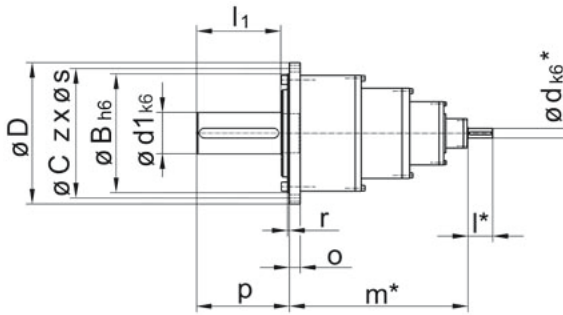
#### DESCH planetary gearbox in foot design with solid output shaft, type FWW



Dimensions in mm

size	output torque (Nm)	ød <sub>1</sub>	l <sub>1</sub>	m	2-stage			3-stage			4-stage			a	b	c	e	f	g	h	h <sub>1</sub>	i
					ød	l	m	ød	l	m	ød	l	m									
4	4 100	85	170	337	28	60	404	19	40	472	14	30	472	310	350	18	325	365	20	175	315	18
6,3	6 300	100	210	359	32	80	426	19	40	494	14	30	494	340	380	18	355	395	20	195	350	18
10	12 000	120	210	399	38	80	492	28	60	546	14	30	546	400	440	22	420	460	27	225	410	22
16	18 450	140	250	469	45	110	558	28	60	619	14	30	619	455	495	22	460	500	27	250	455	22
20	23 000	160	300	469	50	110	559	32	80	632	14	30	632	455	505	26	490	540	30	260	475	26
25	28 000	160	300	504	50	110	599	32	80	664	16	40	664	480	530	26	535	585	35	285	522,5	26
40	40 000	180	300	531	50	110	633	38	80	692	19	40	692	530	590	26	590	650	35	310	575	26
50	52 500	200	350	594	65	140	704	45	110	771	22	50	771	570	630	26	630	690	35	335	620	26
63	74 000	220	350	616	65	140	736	45	110	807	22	50	807	615	675	33	695	755	35	370	682,5	33
80	96 800	240	410	669	80	170	777	50	110	845	22	50	845	640	700	33	735	795	35	395	727,5	33
125	160 000	280	470	775	90	170	904	65	140	997	32	80	997	755	815	33	860	920	35	450	845	33
200	230 000	320	470	837	100	210	967	65	140	1063	32	80	1063	840	920	40	965	1045	50	510	947,5	39
250	324 000	360	550	914	110	210	1056	70	140	1128	38	80	1128	910	1000	40	1080	1170	65	575	1070	39
400	430 000	380	550	995	120	210	1160	80	170	1246	38	80	1246	980	1080	45	1200	1300	77	625	1175	39

\* Maximum values which may vary depending on the gearbox ratio

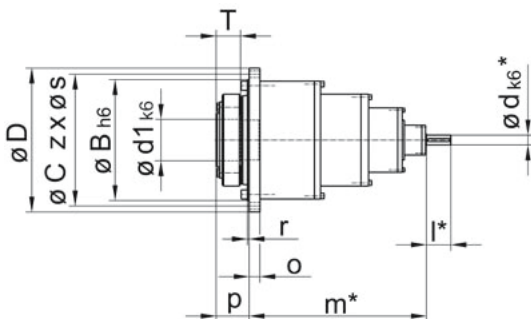


**DESCH planetary gearbox in flange design  
with solid output shaft  
type AWW**

Dimensions in mm

size	output torque (Nm)	$\varnothing D$	$\varnothing C$	$\varnothing B$	$z \times \varnothing s$ <sup>1)</sup>	$\varnothing d_1$	$l_1$	$p$	$o$	$r$	2-stage			3-stage			4-stage		
											$m$	$\varnothing d$	$l$	$m$	$\varnothing d$	$l$	$m$	$\varnothing d$	$l$
4	4 100	280	255	225	12 x 13,5	85	170	189	20	5	318	28	60	385	19	40	453	14	30
6,3	6 300	310	285	255	16 x 13,5	100	210	230	22	5	339	32	80	406	19	40	474	14	30
10	12 000	370	340	305	16 x 17,5	120	210	230	30	5	379	38	80	472	28	60	526	14	30
16	18 450	420	380	345	16 x 17,5	140	250	275	35	6	444	45	110	533	28	60	594	14	30
20	23 000	430	400	365	16 x 17,5	160	300	325	35	6	444	50	110	534	32	80	599	14	30
25	28 000	475	435	395	16 x 22	160	300	328	35	6	476	50	110	575	32	80	640	16	40
40	40 000	530	485	440	16 x 26	180	300	330	35	6	501	50	110	603	38	80	659	19	40
50	52 500	570	525	480	16 x 26	200	350	381	40	6	563	65	140	673	45	110	732	22	50
63	74 000	625	580	535	16 x 26	220	350	393	45	10	573	65	140	693	45	110	764	22	50
80	96 800	665	620	575	24 x 26	240	410	431	45	10	628	80	170	736	50	110	804	22	50
125	160 000	790	730	665	20 x 33	280	470	520	50	10	725	90	170	854	65	140	947	32	80
200	230 000	875	815	750	24 x 33	320	470	515	55	10	792	100	210	925	65	140	1021	32	80
250	324 000	990	925	850	30 x 33	360	550	595	65	10	869	110	210	1011	70	140	1083	38	80
400	430 000	1100	1025	940	30 x 39	380	550	595	65	10	950	120	210	1115	80	170	1201	38	80

\* Maximum values which may vary depending on the gearbox ratio 1) screw quality 10.9



**DESCH planetary gearbox in flange design  
with hollow output shaft and shrink disc,  
type AHW**

Dimensions in mm

size	output torque (Nm)	$\varnothing D$	$\varnothing C$	$\varnothing B$	$z \times \varnothing s$ <sup>1)</sup>	$\varnothing d_1$	$T$	$p$	$o$	$r$	2-stage			3-stage			4-stage		
											$m$	$\varnothing d$	$l$	$m$	$\varnothing d$	$l$	$m$	$\varnothing d$	$l$
4	4 100	280	255	225	12 x 13,5	75	50	65	20	5	318	28	60	385	19	40	453	14	30
6,3	6 300	310	285	255	16 x 13,5	85	60	77	22	5	339	32	80	406	19	40	474	14	30
10	12 000	370	340	305	16 x 17,5	110	65	85	30	5	379	38	80	472	28	60	526	14	30
16	18 450	420	380	345	16 x 17,5	120	80	104	35	6	444	45	110	533	28	60	594	14	30
20	23 000	430	400	365	16 x 17,5	130	80	105	35	6	444	50	110	534	32	80	599	14	30
25	28 000	475	435	395	16 x 22	135	80	108	35	6	476	50	110	575	32	80	640	16	40
40	40 000	530	485	440	16 x 26	145	100	127	35	6	501	50	110	603	38	80	659	19	40
50	52 500	570	525	480	16 x 26	160	100	130	40	6	563	65	140	673	45	110	732	22	50
63	74 000	625	580	535	16 x 26	180	110	153	45	10	573	65	140	693	45	110	764	22	50
80	96 800	665	620	575	24 x 26	200	130	173	45	10	628	80	170	736	50	110	804	22	50
125	160 000	790	730	665	20 x 33	230	150	198	50	10	725	90	170	854	65	140	947	32	80
200	230 000	875	815	750	24 x 33	260	175	218	55	10	792	100	210	925	65	140	1021	32	80
250	324 000	990	925	850	30 x 33	280	180	225	65	10	869	110	210	1011	70	140	1083	38	80
400	430 000	1100	1025	940	30 x 39	310	185	230	65	10	950	120	210	1115	80	170	1201	38	80

\* Maximum values which may vary depending on the gearbox ratio 1) screw quality 10.9



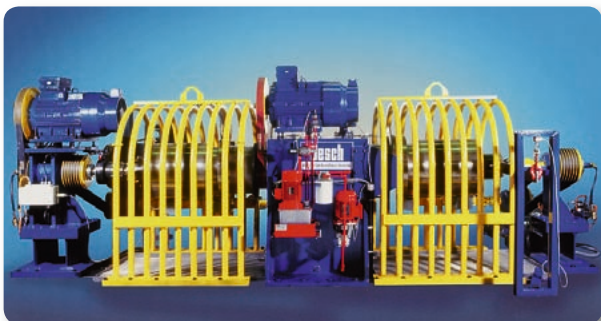
## DESCH Denox planetary gearboxes

### Weights Denox type AWW

ratio																			
size	25	32	41	50	103	125	158	200	253	317	413	495	600	750	1000	1267	1604	2006	2533
4	68	68	70	75	75	75	74	74	76	76	74	75	91	88	80	81	81	81	80
6,3	97	97	102	109	104	102	103	110	107	106	107	108	113	108	106	108	108	108	112
10	143	141	149	159	154	154	154	154	150	154	158	164	174	157	159	157	157	158	157
16	236	243	243	244	250	249	247	249	256	257	262	265	274	253	253	251	258	258	261
20	250	266	267	282	261	264	263	261	273	279	286	285	305	269	273	268	277	277	278
25	322	327	325	347	333	339	335	337	340	345	339	344	364	345	345	342	349	353	347
40	396	416	421	463	417	410	410	415	433	443	452	450	488	419	419	419	409	410	406
50	540	552	559	593	571	560	555	564	569	589	585	603	617	560	566	566	572	572	560
63	683	726	755	785	721	714	714	724	762	768	793	797	836	722	730	722	750	755	778
80	844	905	905	997	868	867	873	872	944	944	944	957	1055	876	879	886	944	953	957
125	1383	1448	1448	1570	1448	1423	1433	1433	1508	1530	1478	1503	1628	1353	1353	1383	1501	1508	1511
200	1815	1940	2000	2060	1950	1870	1885	1875	2020	2040	2060	2080	2150	1890	1890	1895	2015	2025	2035
250	2585	2745	2855	3030	2715	2645	2680	2680	3005	2855	2900	2970	3165	2675	2680	2725	2820	2850	2830
400	3315	3285	3490	3595	3465	3395	3405	3420	3405	3520	3595	3595	3715	3415	3425	3440	3490	3490	3505

weight in kg

## Examples



DESCH gearbox test rig



DESCH planetary gearbox in an eccentric shears



## Weights Denox type AHW

ratio																			
size	25	32	41	50	103	125	158	200	253	317	413	495	600	750	1000	1267	1604	2006	2533
4	60	60	62	65	67	67	66	66	68	68	68	69	80	72	73	73	73	73	73
6,3	84	84	89	96	91	89	90	97	94	89	94	95	100	95	93	95	95	95	99
10	124	122	130	140	135	135	135	135	131	135	139	145	155	138	140	138	138	139	138
16	196	203	203	204	210	209	207	209	216	217	224	225	234	213	213	211	218	218	221
20	203	215	220	235	214	217	216	214	230	232	239	238	258	226	222	221	230	230	231
25	275	280	278	300	286	292	288	290	293	298	298	297	317	298	298	295	302	306	300
40	338	358	363	405	359	352	352	357	375	385	394	392	430	361	361	361	351	352	348
50	455	457	474	508	486	475	470	479	474	494	500	518	532	475	481	481	477	477	481
63	583	626	655	685	621	614	614	624	662	668	693	713	736	622	630	622	650	655	678
80	714	775	775	867	738	737	743	742	814	814	814	827	925	746	749	756	814	823	827
125	1155	1220	1220	1342	1220	1195	1205	1205	1280	1302	1250	1275	1400	1125	1125	1155	1273	1280	1283
200	1540	1665	1725	1785	1615	1590	1595	1595	1740	1760	1780	1805	1875	1610	1610	1605	1735	1750	1755
250	2160	2320	2425	2600	2285	2215	2250	2250	2375	2425	2470	2540	2735	2245	2250	2295	2380	2410	2405
400	2825	2795	3000	3105	2975	2905	2915	2930	2915	3030	3100	3105	3220	2925	2935	2950	3000	3000	3015

weight in kg

## Weights Denox type FWW

ratio																			
size	25	32	41	50	103	125	158	200	253	317	413	495	600	750	1000	1267	1604	2006	2533
4	85	85	87	90	92	92	91	91	93	93	93	94	105	97	98	98	98	98	98
6,3	119	119	124	131	126	124	125	132	129	124	129	130	135	130	128	130	130	130	134
10	178	176	184	194	189	189	189	189	185	189	193	199	209	192	194	192	192	193	192
16	282	289	289	290	296	295	300	295	302	303	310	310	320	300	300	297	304	304	307
20	307	320	315	340	318	320	320	320	335	335	345	345	362	330	326	325	335	335	335
25	392	397	395	417	403	410	405	410	410	415	415	415	435	415	415	412	420	423	417
40	481	500	506	550	500	492	495	500	520	530	530	535	575	505	505	505	495	495	490
50	625	625	645	680	655	645	650	650	645	665	670	685	700	645	650	650	645	645	650
63	830	870	900	930	870	870	870	870	910	915	940	945	985	870	875	870	895	900	925
80	1000	1065	1065	1155	1030	1025	1035	1030	1105	1105	1105	1115	1215	1035	1040	1045	1105	1115	1115
125	1610	1675	1675	1800	1675	1650	1660	1660	1735	1760	1705	1730	1855	1580	1580	1610	1730	1735	1740
200	2150	2275	2335	2395	2230	2205	2210	2210	2355	2375	2395	2415	2485	2225	2225	2220	2350	2360	2370
250	3035	3195	3305	3480	3165	3095	3130	3130	3255	3305	3350	3420	3615	3125	3130	3175	3260	3290	3280
400	3935	3905	4110	4215	4085	4015	4025	4040	4025	4140	4210	4210	4325	4035	4045	4060	4105	4105	4125

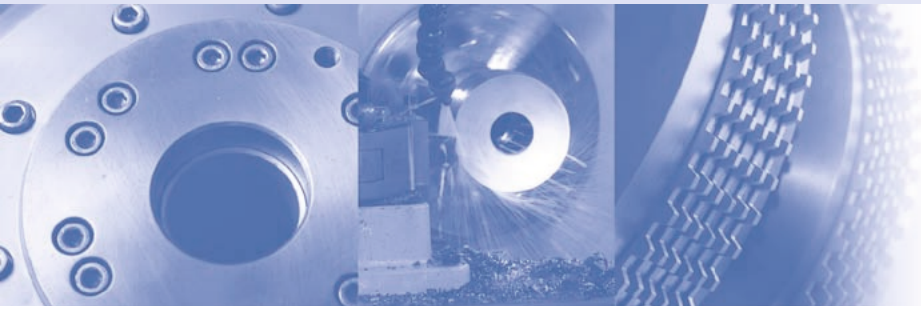
weight in kg



## Technical data

### Gearbox application factors

Application factor fK					
<b>Drive machine</b>	Smooth	Electric motor, turbine, smooth - seldom starting			
	Slight impacts	Turbine, hydraulic motor, electric motor - frequently starting			
	Moderate impacts	Multi-cylinder combustion engine			
	Hard impacts	Single-cylinder combustion engine			
<b>Driven machine</b>					
Smooth	Generator, conveyor belt, apron conveyor, screw conveyor, lift (light), packaging machine, feed machine tool, fan, centrifuge (light), centrifugal pump, stirrer/mixer (light), shears, press, slewing gear, chassis	<b>1.5</b>	<b>1.25</b>	<b>1.1</b>	<b>1.0</b>
Moderate impact	Conveyor belt/apron conveyor (loaded unevenly), main drive machine tool, lift (heavy), crane slewing gear, industrial/pit ventilator, centrifuge (heavy), centrifugal pump/stirrer/mixer (uneven-tough), multi-piston pump, extruder, calender, rotary kiln, continuous rolling mill	<b>1.75</b>	<b>1.5</b>	<b>1.35</b>	<b>1.25</b>
Medium impact	Rubber extruder, mixer (rubber, plastic), ball mill (light), wood working - (reciprocating saw/lathe), blooming mill, hoisting gear, piston pump (single cylinder)	<b>2.0</b>	<b>1.75</b>	<b>1.6</b>	<b>1.5</b>
Hard impact	Excavator (bucket-wheel, bucket, ladder), screen drive, ball mill (heavy), rubber kneader, crusher, iron and steel machine, metering pump (heavy), brick press, peeling machine/debarking, cold rolling mill, briquetting press, edge mill	<b>2.25</b>	<b>2.0</b>	<b>1.85</b>	<b>1.75</b>
<p>Applied to the nominal torque of the drive with smooth power requirements. Verification of the static stability is recommended in the event of unusually heavy loads / high start-up - intermittent operation - impact loads.                      Observe the features when controlling frequency converters. Gearboxes must not be operated within the frequency range. Depending on masses, clutches and elasticities an analysis of torsional vibrations may be required.</p>					



## Thermal power limits

size	4	6,3	10	16	20	25	40	63	80	125	200	250	400
power $P_t$ (kw)	16	19	26	34	37	43	51	62	71	82	114	137	208

Thermal power limit  $P_t$  (kW), 2-step gearbox,  
environment 20 °C, gearbox 70 °C, circulated air  
Drive and output ends thermally neutral, Ed 100 %  
Additional cooling is necessary at higher continuous output

## Design example

### Drive machine: electric motor

Power:  $P_1 = 40$  kW  
Speed:  $n_1 = 1200$  rpm  
Clutch: Elastic

### Driven machine: screw extruder for various products (Extruder)

Operating time: 24 h/day  
Speed:  $n_2 = 25$  rpm  
Installation site: Production hall,  $t = 5 - 25$  °C  
Attachment via housing flange, precisely fixed smooth cylindrical machine shaft

### Selection

Ratio:  $i = \frac{n_1}{n_2} = \frac{1200 \text{ rpm}}{25 \text{ rpm}} = 48$ ,  $i = 50$  selected

$n_2 = 24$  rpm

Input power:  $P_1 = 40$  kW

Input torque:  $T_1 = P_1 \times \frac{9550}{n_1} = 40 \text{ kW} \times \frac{9550}{1200 \text{ rpm}} = 318 \text{ Nm}$

Output torque:  $T_2 = T_1 \times i = 318 \text{ Nm} \times 50 = 15900 \text{ Nm}$

Rated torque:  $T_A = T_2 \times f_k = 15900 \times 1.5 = 23850 \text{ Nm}$   
 $f_k$  for rubber extruder/electric motor: 1.5

Selected: Denox P 25-2-50-AHW gearbox  
(flange gearbox, hollow output shaft with shrink disc  
cylindrical input shaft with key)

Output torque:  $T_k = 28000 \text{ Nm}$  (fatigue-free)

Nominal bearing lifetime:  $L_{h_n} \approx 10000 \times \frac{1500}{n_1} \times \left(\frac{T_k}{T_2}\right)^{3.33} = 10000 \times \frac{1500}{1200} \times \left(\frac{28000}{15900}\right)^{3.33} = 82000 \text{ h}$

Thermal power limit:  $P_t = 43$  kW, no additional cooling required



DRIVE TECHNOLOGY

## Product range

### Friction Clutches

Planox® friction clutches  
 Conax® friction clutches  
 Centrex® centrifugal clutches

### Flexible Couplings

Hadeflex® couplings  
 Habix® couplings  
 Orpex® couplings  
 DESCH Flex couplings  
 DESCH HRC couplings

### Rigid Couplings

### Press Drives

Lutex® clutch/brake combinations  
 Complete press drives

### Gears

Planetary gears  
 Special gears

### Complete Transmission Solutions

Flywheel back gears for no-delay units  
 Drive stations for stretcher  
 Levelling units  
 Back gears with engageable/  
 disengageable clutches

### Belt Drives

V-belt pulley drives  
 Timing belt drives  
 Flat belt drives  
 V-belt pulley drives  
 with taper bushes  
 V-belt pulley and flywheels  
 to customers' specification  
 V-belts and timings belts  
 Bolt-on-hubs  
 Weld-on-hubs

### Bearings

Grease lubricated plain bearings

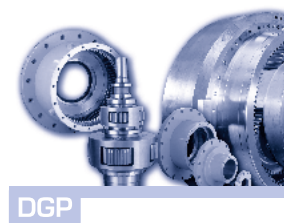
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\* with own storage



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