190 years HENSCHEL, history of a traditional company

1810

1918

1933

1957

1959

1962

1972

1974

1976

1981

1991

1995

1996

1998

2002

2003

2006

HENSCHEL **Antriebstechnik**

HENSCHEL Antriebstechnik GmbH has it´s headquarter in Kassel, located in the center of Germany.

HENSCHEL, a company with a long-standing tradition, was founded in Kassel in 1810, their activities in building gearboxes started 1918.

Henschel gearboxes are used worldwide for a variety of applications and are a synonym for quality, reliability and performance.

In many areas we are viewed as the trendsetter of the industry. Since the production of the first counter-rotating extruder gearbox in 1972 Henschel Antriebstechnik has developed in to the leading supplier for twin-screw extruder gearboxes. They did not rest here. In the meantime the company presents themselves as a system supplier for the extrusion industry with innovative concepts reaching far deeper than the clear-cut drive unit for extruders. In addition to the gearboxes for single as well as counter and co-rotating extruders, well known under the trademark DURUMAX®, further products were added over the years. Side feeder, gearbox controls systems, twin-screw ejection devices as well as complete oil plants are completing the delivery spectrum.

Precedence has been set for efficiency and reliability, yet keeping economy of scale as the highest priority.

Our quality standards and the close relationships with our customers made us a dependable partner, acknowledged worldwide. Henschel stands for power of innovation and top-notch quality project engineering. Our products are constantly improved or newly developed to set the assessment objectives for the future.

PowerTransmission with tradition - Milestones

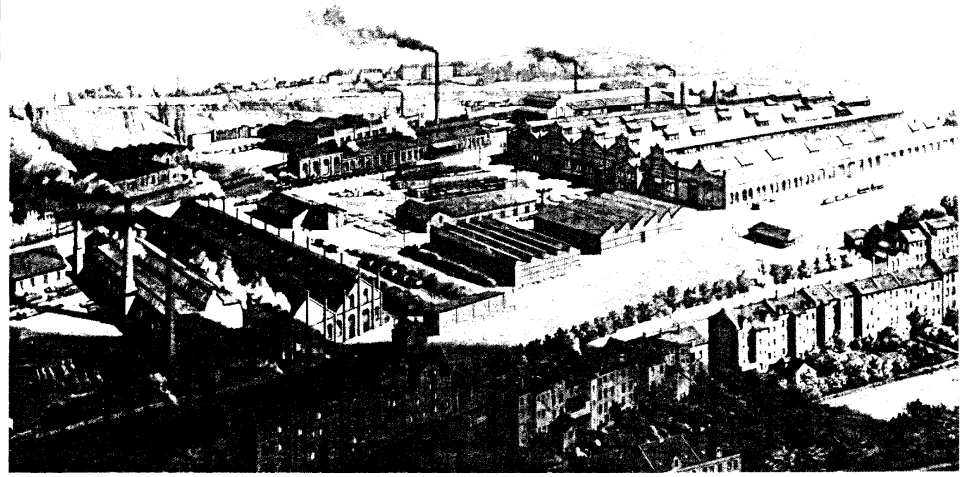
Henschel is looking back on a long history of it's company.
On the way to an industrial concern there were milestones with major influence

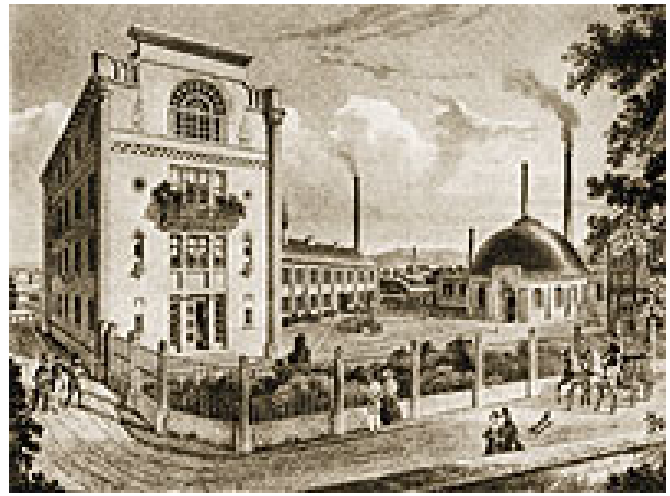
1918	1957	1962	1974	1981	1995	1998	2003	2006
Drive technology starts production in the Mittelfeld plant	The Henschel founding family leaves the company	Henschel becomes part of a group with the sale to Rheinstahl	August Thyssen-Hütte AG takes over Rheinstahl AG and thus Rheinstahl Henschel AG	Bundling of gearbo manufacturing capacity by mergin Thyssen Henschel and Thyssen Getriebe- und Kupplungswerke GmbH	Thyssen Henschel is broken down into independent decentral product divisions.	Founding of Thysse Henschel Industrietechnik GmbH with the independent produc divisions for drive technology, mixing technology and handling technology	KERO Holding AG takes over Henschel Industrietechnik GmbH from ThyssenKrupp Technologies AG	MBO of Henschel Antriebstechnik GmbH by Matthias Henke and Dr. Jörg Kremer

1810	1933	1959	1972	1976	1991	1996	2002	2004
Founding of the company by Georg Christian Carl Henschel (1750-1835).	Manufacture of the first worm gearbox under license from David Brown Ltd.	Henschel manufactures the Prodex single screw extruder under license as well as mixers for the plastics industry	Henschel develops and produces the first twin screw extruder gearbox	The company Rheinstahl Henschel AG trades under Thyssen Henschel AG Henschel	The Thyssen Henschel DURUNORM® gearbox range is sold to Flender AG, Bocholt.	The individual company divisions are converted into Thyssen Henschel GmbH with independent product divisions.	Renamed Henschel Industrietechnik GmbH	Spin-off Henschel Antriebstechnik GmbH

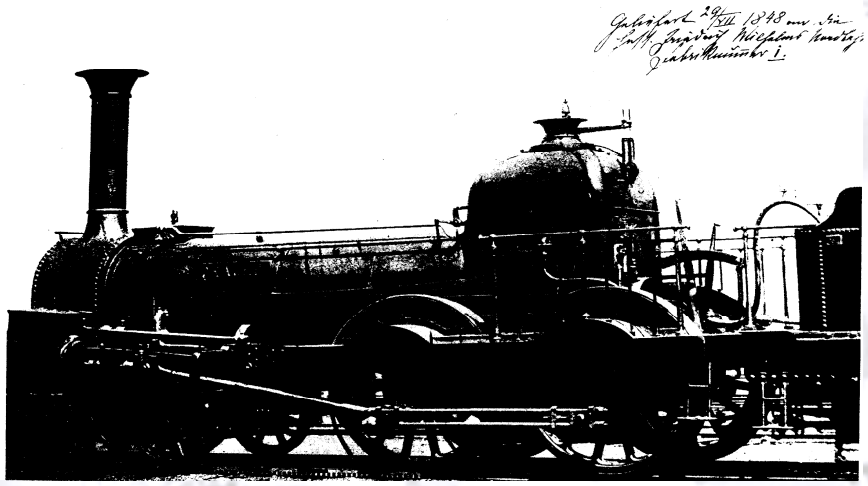
From craftsman‘s establishment into a machine factory

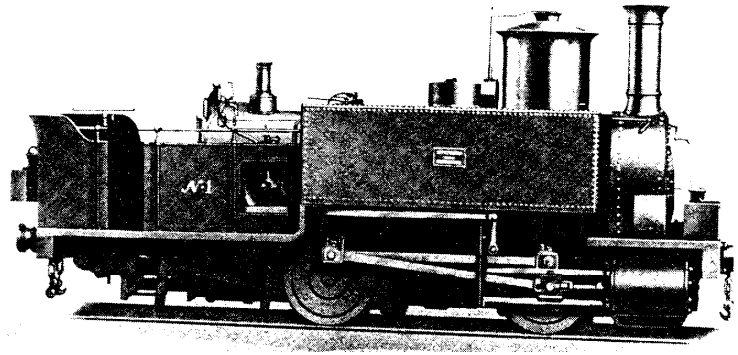
Carl Anton Henschel
1780–1861

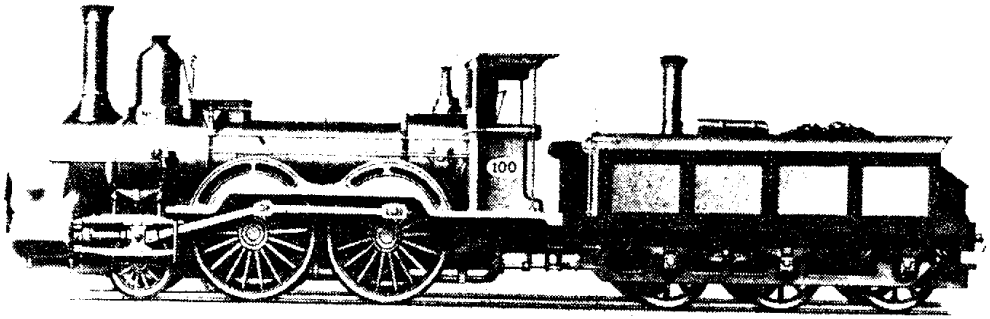


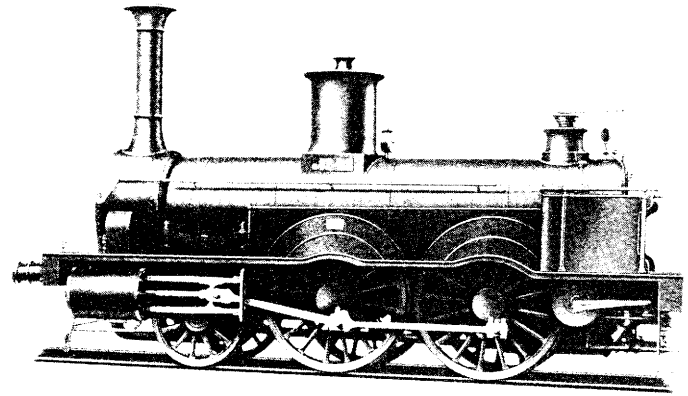


From craftsman‘s establishment into a machine factory



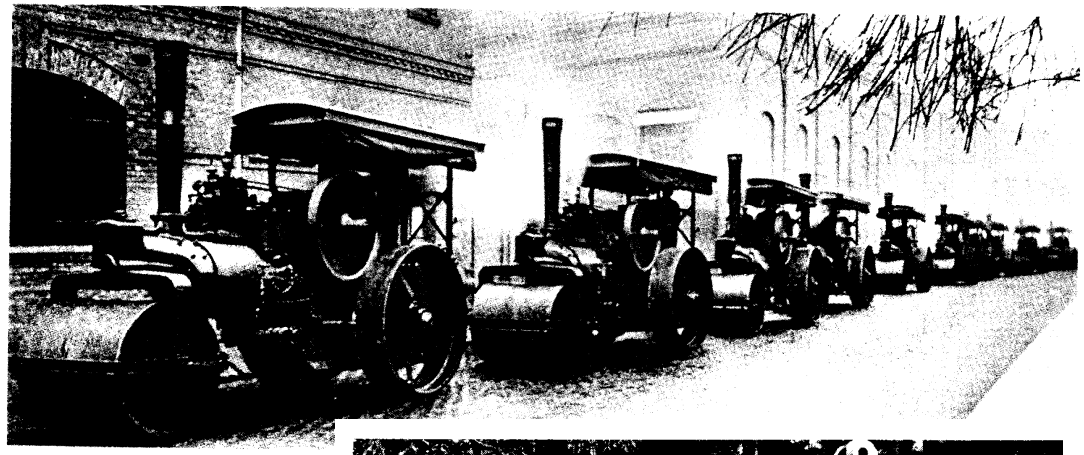






From craftsman‘s establishment into a machine factory

Dampfstraßenwalzen vor der Auslieferung im Werk Kassel. 1924



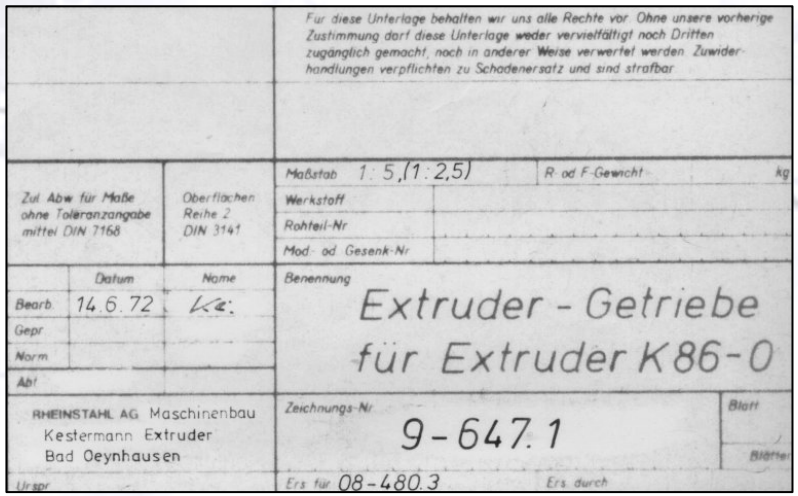
Henschel-Lastwagen und die Inhaber der Lizenzfirma Franz Brozincevic (2. von links) und Paul Brozincevic (2. von rechts). 1925

Panzerkampfwagen Tiger II („Königstiger“). Gebaut 1944/45

From craftsman‘s establishment into a machine factory

Extruder Gearbox Manufacturing with long Tradition

- First Twin Shaft Extruder Gearbox manufactured in 1972 for HENSCHEL Twin Screw Extruder K 86-0-16D



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Zul. Abw. für Maße ohne Toleranzangabe mittel DIN 7168 | Oberflächen Reihe 2 DIN 3141

Maßstab 1:5,(1:2,5) | R. od. F-Gewicht kg

Werkstoff

Rohteil-Nr

Mod. od. Gesenk-Nr

	Datum	Name
Bearb.	14.6.72	Ke:
Gepr.		
Norm		
Abt.		

Benennung: Extruder - Getriebe für Extruder K86-0

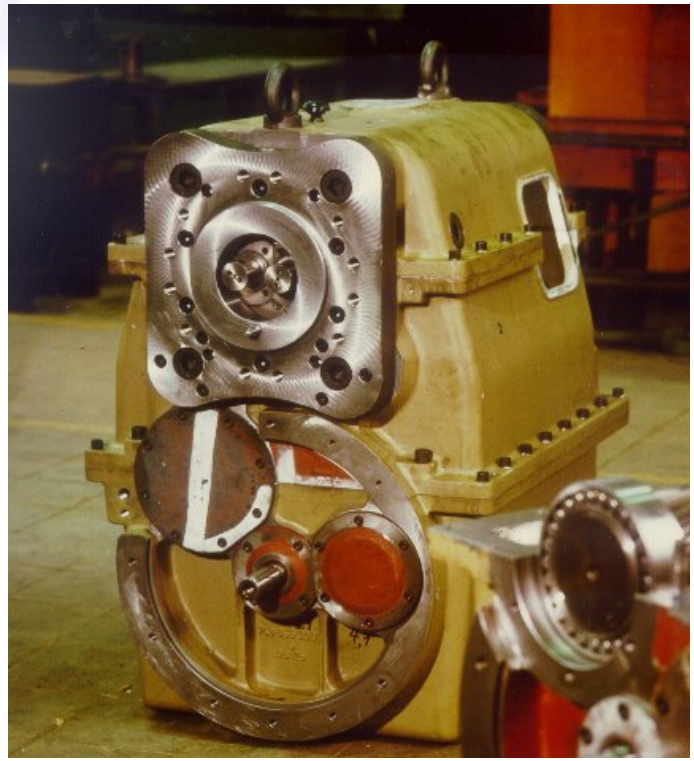
RHEINSTAHL AG Maschinenbau Kestermann Extruder Bad Oeynhausen

Zeichnungs-Nr: 9-647.1

Blatt / Blätter

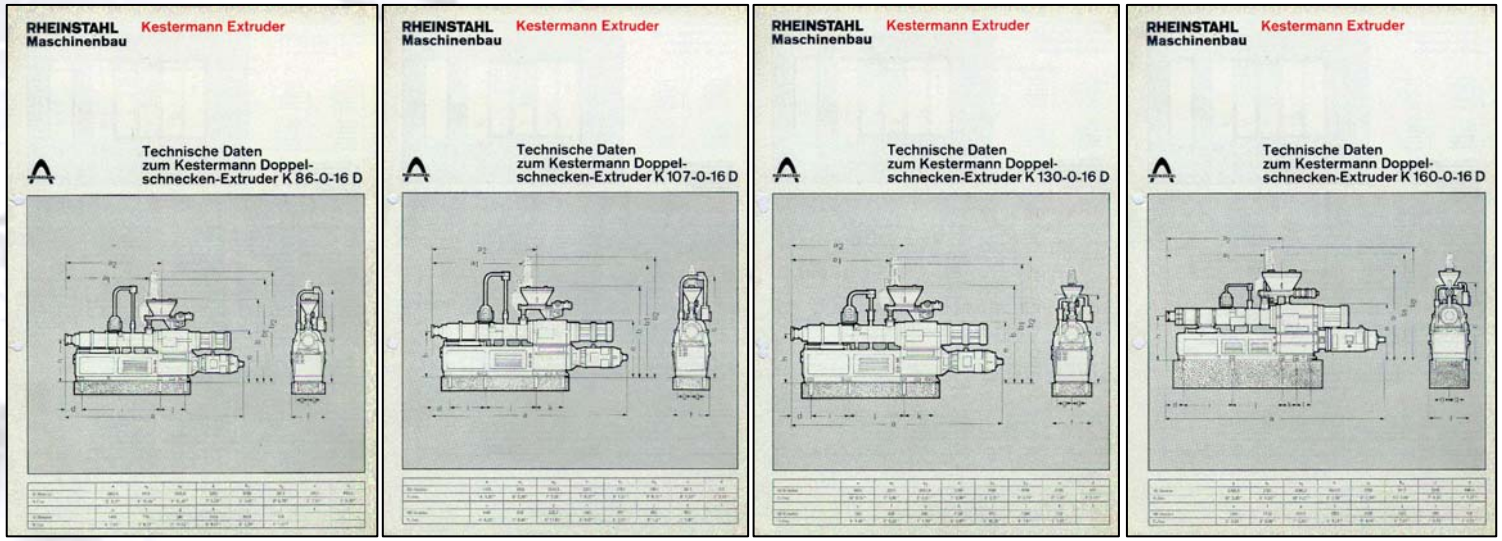
Ursprung

Ers. für 08-480.3 Ers. durch



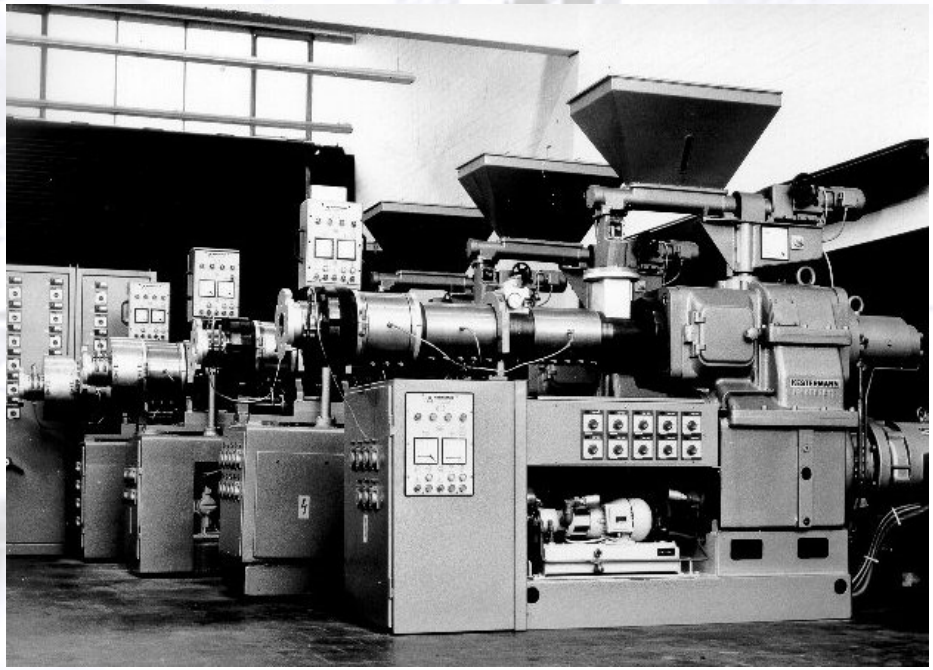
Extruder Gearbox Manufacturing with long Tradition

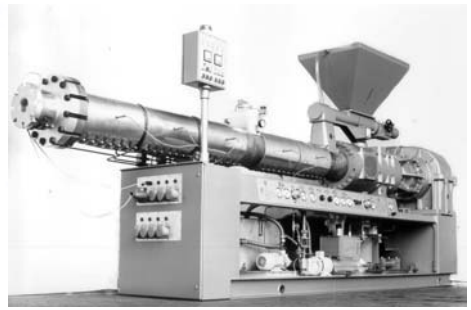
- Henschel parallel counter-rotating Extruder Line with Screw Sizes from 86 - 160 mm

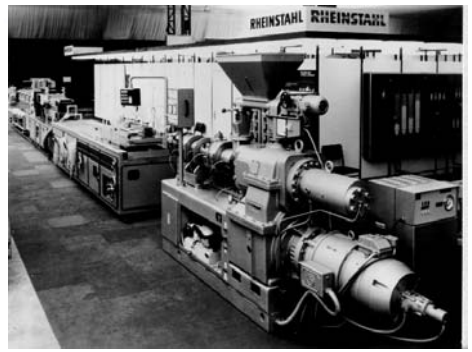


Extruder Gearbox Manufacturing with long Tradition

- Applications

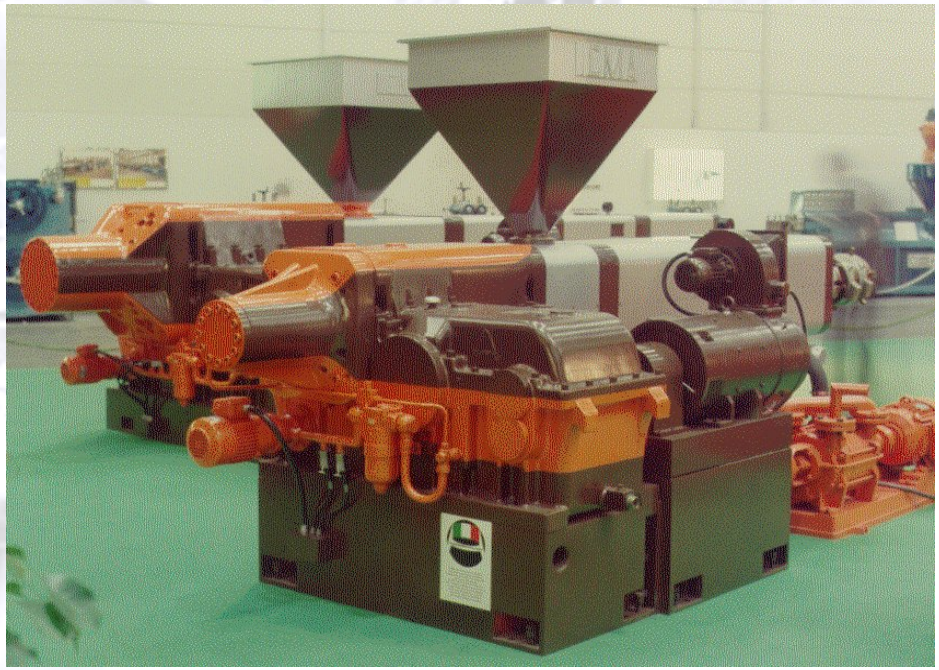


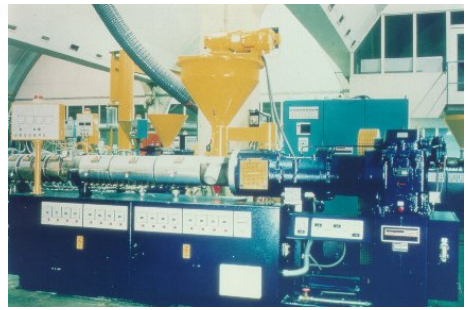


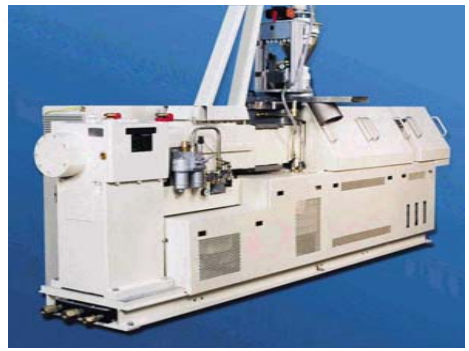


Extruder Gearbox Manufacturing with long Tradition

- Applications

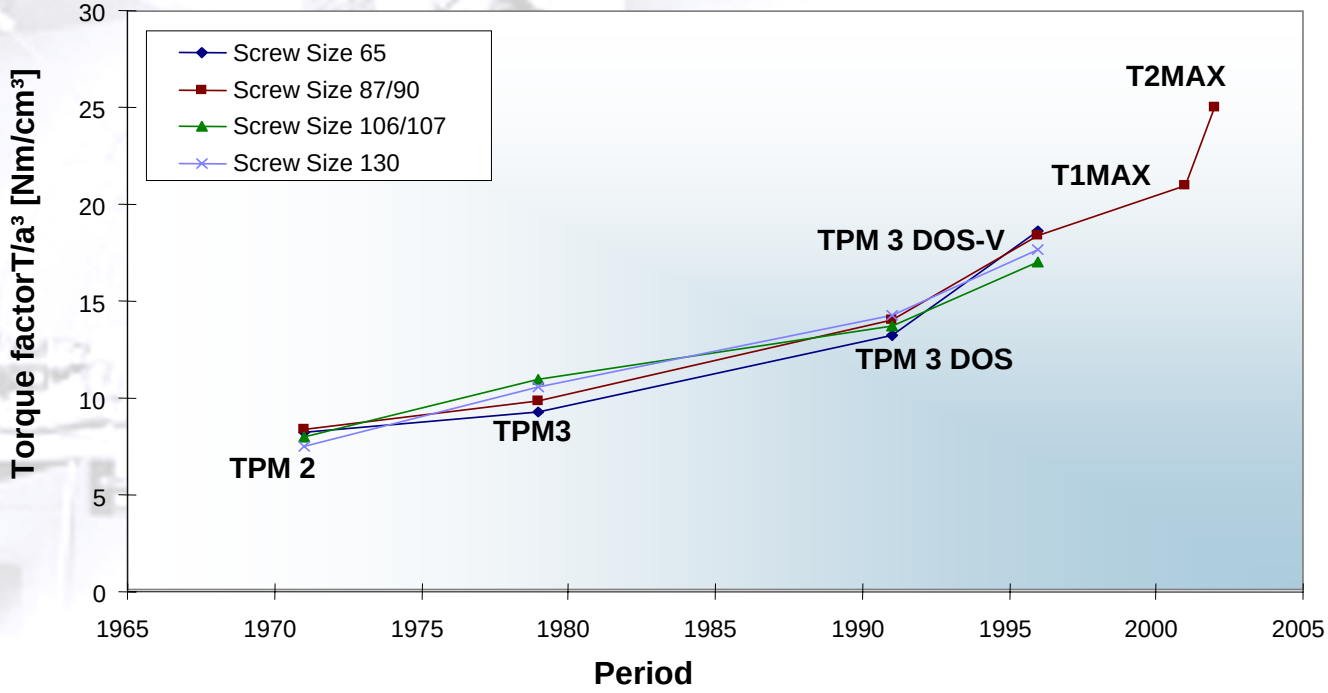






Extruder Gearbox Manufacturing with long Tradition

- Development of the Power Ratings during the Years



Product Overview

Business segments:

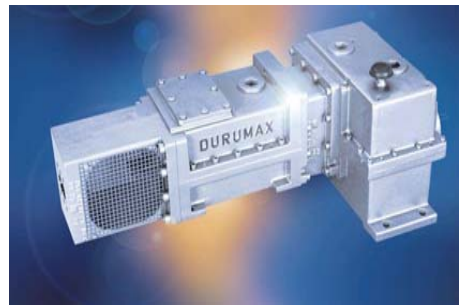
- DURUMAX® -Extruder Gearboxes
- MUTAX® Worm Gears
  MUTAX® Worm Gearboxes
- DURUTRAIL® Locomotive Gearboxes
- DURUHIT® Special Gearboxes
- Job Order Production &
  Heat Treatment

Product Overview

DURUMAX® Extruder Gearboxes

- DURUMAX-S2
- DURUMAX-TPM 3
- DURUMAX-TPM 3 DOS
- DURUMAX-TPM 3 DOSV
- DURUMAX-TGE 3 DOS
- DURUMAX T2MAX



Product Overview

MUTAX® Worm Gear Sets

- MUTAX Simplex
- MUTAX Duplex

Product Overview

MUTAX® Worm Gearboxes

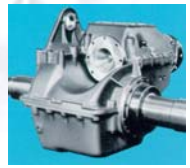
Variants

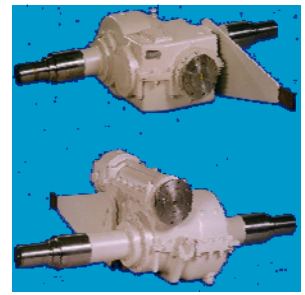
- Bolting Device for a save height adjustment of Oil-Platforms

- Center Drive of a Hay Baling Press

Product Overview

DURUTRAIL® Locomotive Gearboxes
DURUTRAM® Tram Gearboxes



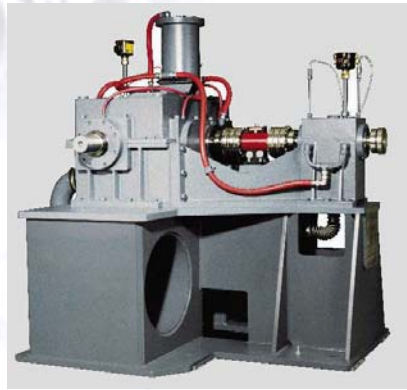



- DURUTRAIL AK
  Single-Stage Bevel Gearbox
- DURUTRAIL AKV
  Two-Stage Helical Bevel Gearbox
- DURUTRAIL ATV
  Two-Stage Helical Bevel Gearbox
- DURUTRAIL RKS
  Two-Stage Helical Bevel Gearbox
- DURUTRAIL RKS-SO/RSKS-SO
  Two/Three-Stage Helical Bevel Gearbox
- DURUTRAM Tram Gearbox

Product Overview

DURUHIT® Special Gearboxes

- DURUHIT High Speed Gearboxes for Motor Testing Benches
- DURUHIT Custom Made Gearboxes Two-Stage Helical Bevel Gearbox



High-Speed Gearbox for Formula 1 Motor Test Bench

Custom made

Renn- und Motorsport
Racing - and Motor Sports

Product Overview

Heat Treatment & Job Order Production

- Annealing
- Carburizing
- Hardening
- Tempering
- Descaling
- Straightening
- Washing

Product Overview

Heat Treatment & Job Order Production

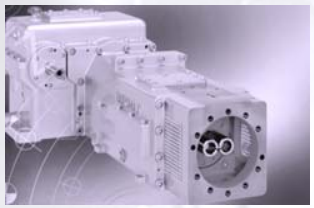
Bearbeitung	Modul	Kopfkreis-ø d_a	Abmessungen	Bemerkungen
Abwälzfräsen	1 bis 18	40		
	1 bis 18	40		
	1 bis 18	40		
	1 bis 18	40 bis 20		
	Teilung 3/8 " bis 2 "	bis		
Abwälzstoßen	0,8 bis 8	bis		
	1 bis 8	bis 300 mm	$b_{max.}$ = 200 mm	geraden Z
	0,8 bis 8	bis 600 mm	$b_{max.}$ = 200 mm $d_{max.}$ = 750 mm	Innenverzi Sonderpro Größere A auf Anfrage

Bearbeitung	Betriebsmittel	Arbeitsbereiche	Bemerkungen
Drehen	Spitzendrehmaschine	ø bis 370 mm und 1800 mm Länge, im Futter bis ø 650 mm	Größere Abmessungen auf Anfrage
	Karussel- und Plandrehmaschine	ø bis 1350 mm Werkstückhöhe 900 mm	Größere Abmessungen auf Anfrage
	CNC-Drehmaschine	ø bis 350 mm und 2000 mm Länge, im Futter ø bis 500 mm und 1000 mm Länge	Räder, Wellen, Flansche für Serienarbeiten
Bohrwerke	Bohrwerk Waagrecht-Bohr und Fräswerk		
	CNC-Bohr und Fräswerk		
Schleifen	Bohrungs- und Rundschleifmaschine		
	Flachschleifen auf Rundtisch		
	Gewindeschleifen		
Messen	Prüfmaschine Mehrkoordinatenmessmaschine		
Wuchten	Wuchten		
Nuten ziehen/-stoßen		Nutenbreite 3 bis 30 mm, Nutenlänge max. 600 mm	Sonderprofile auf Anfrage
Zahnflankenschleifen		1,5 bis 35 bis 1000 mm	$b_{max.}$ =750 mm b =abhängig vom
Schneckenräder-/wellen			Gerad- und Schrägverzahnung

Bearbeitung	Betriebsmittel	Arbeitsbereiche	Bemerkungen
Wärmebehandlung	Schachtofen	ø 800 x 1600 mm	Glühen, Aufkohlen, Härten, Vergüten (bis 950 °C)
	Kammerofen	850 x 1170 x 600 mm	Glühen, Härten, Vergüten (bis 1000 °C), auch auf Dorn
	Strahlanlage	ø 1000 x 1500 mm	Entzundern
	Presse	ø 200 x 2600 mm	Richten (bis 100 t Presskraft)
	Waschanlage	ø 800 x 1200 mm	Waschen

DURUMAX® Extruder Gearboxes

DURUMAX® TPM 3
Twin Shaft Extruder Gearbox counter-rotating



DURUMAX® TPM 3 DOS
Twin Shaft Extruder Gearbox counter-rotating

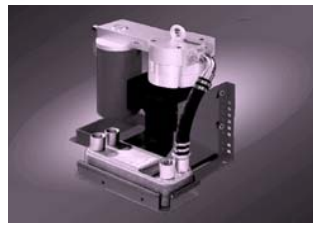
DURUMAX® T1MAX C
Twin Shaft Extruder Gearbox counter-rotating

DURUMAX® T2MAX C
Twin Shaft Extruder Gearbox counter-rotating

DURUMAX® TGE 3 DOS
Twin Shaft Extruder Gearbox co-rotating

DURUMAX® T2MAX S
Twin Shaft Extruder Gearbox co-rotating

DURUMAX® S2
Single Shaft Extruder Gearbox



TA
Oil Lubrication and cooling unit

Your Advantages

- Our extruder gearbox consists of several modules
- Our gearbox housing modules are made of vibration reducing, thick-walled, noise reducing grey cast iron
- Our gears are case-hardened, correction-ground and optimised for the highest load capacity
- Our gears run smooth with low vibration
- We determine the safety factors and application factor together with the customer
- We have optimized lubrication and highest efficiency

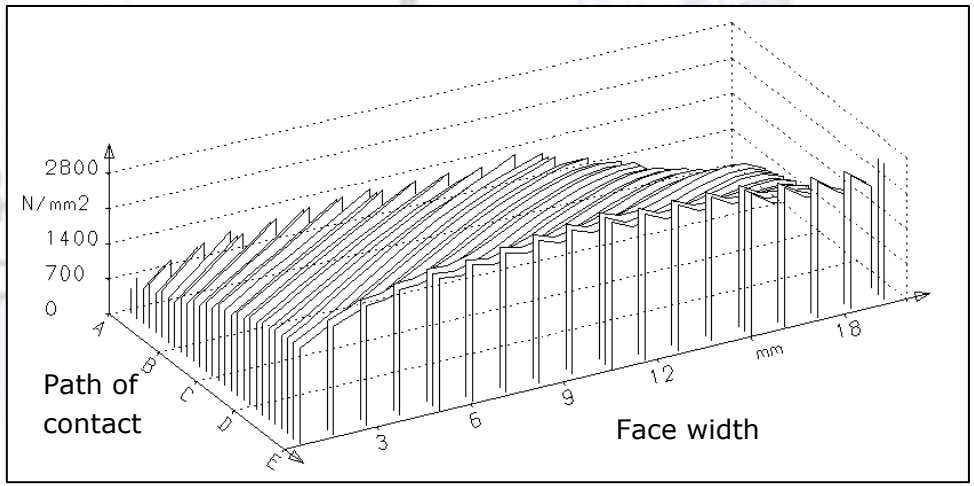
Topologically Corrected Gears

- Advantages
  - ☞ Optimisation of the fine flank geometry according to load
  - ☞ Best possible utilisation of material characteristics
  - ☞ Elimination of overloading
  - ☞ Increase in load capacity

Topologically Corrected Gears

- Standard geometry versus topological geometry

The normal standard correction (>) shows no levelled development of surface pressure:



> Tip relief

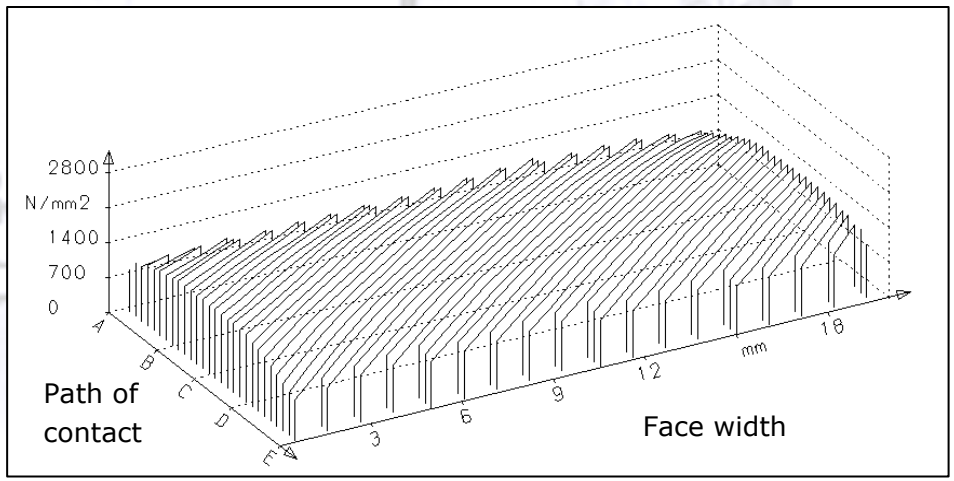
> Crowning

> Correction of helix angle

Topologically Corrected Gears

- Standard geometry versus topological geometry

We use topological geometry for a well-balanced development of surface pressure:

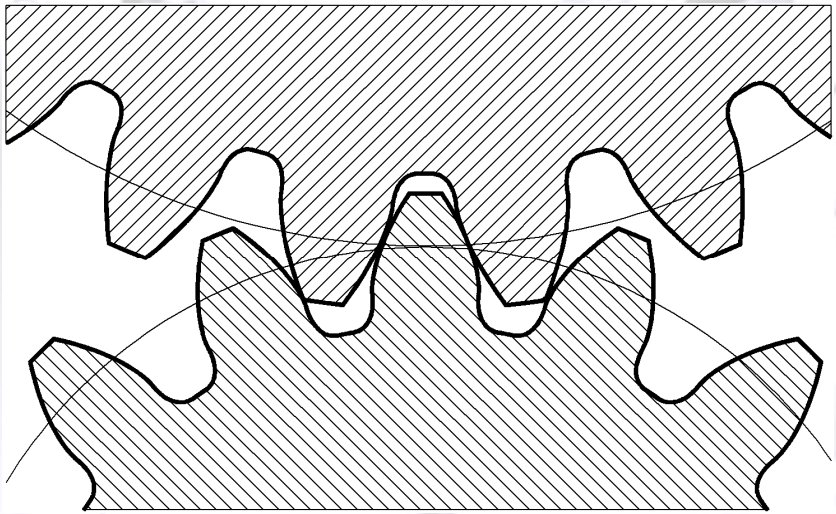


\+ Rolled geometry

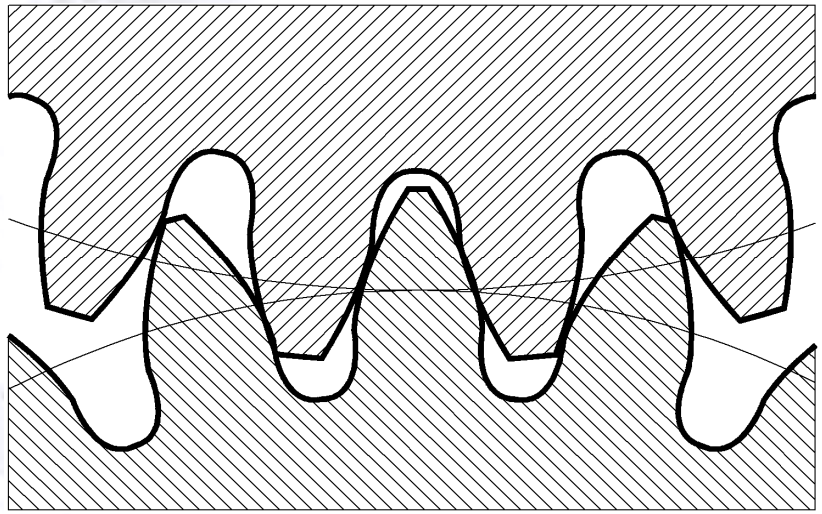
Under similar loads the pressing level is reduced via a well-balanced development of surface pressure

Advantages

Normal gears



High conjugacy gears

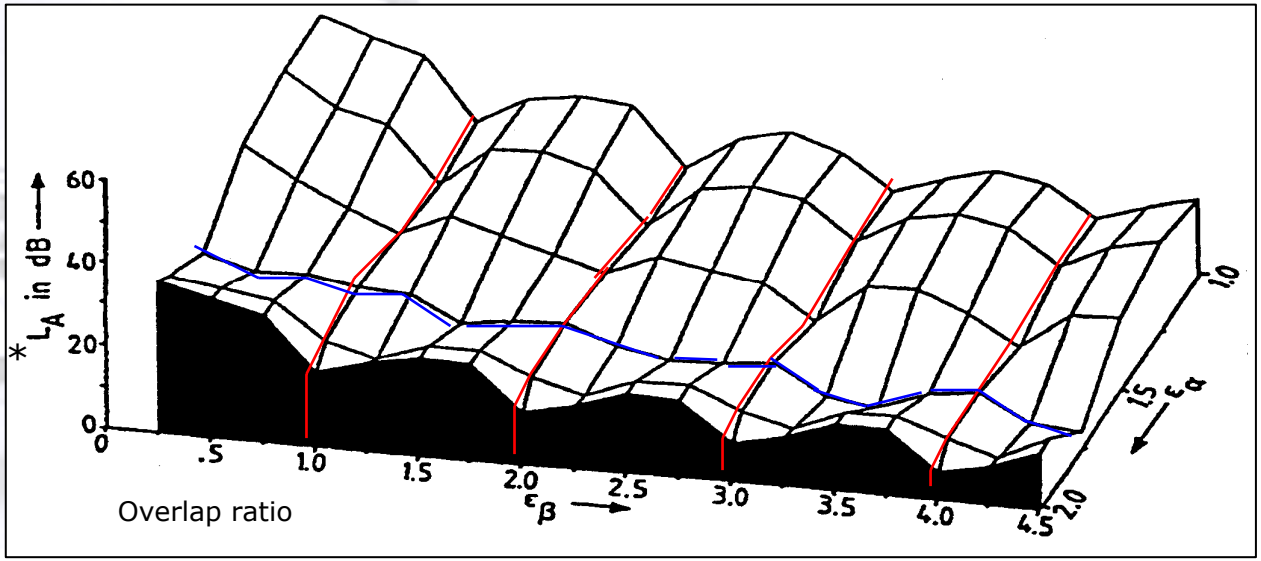


- optimized corrections

- optimized corrections
+ high load capacity
+ high conjugacy
+ low noise

Geometry of Gears

- Clever choice of Overlap Ratio ε_β leads to lower sound emission



* Incitation Level L_A is a gauge for sound emission

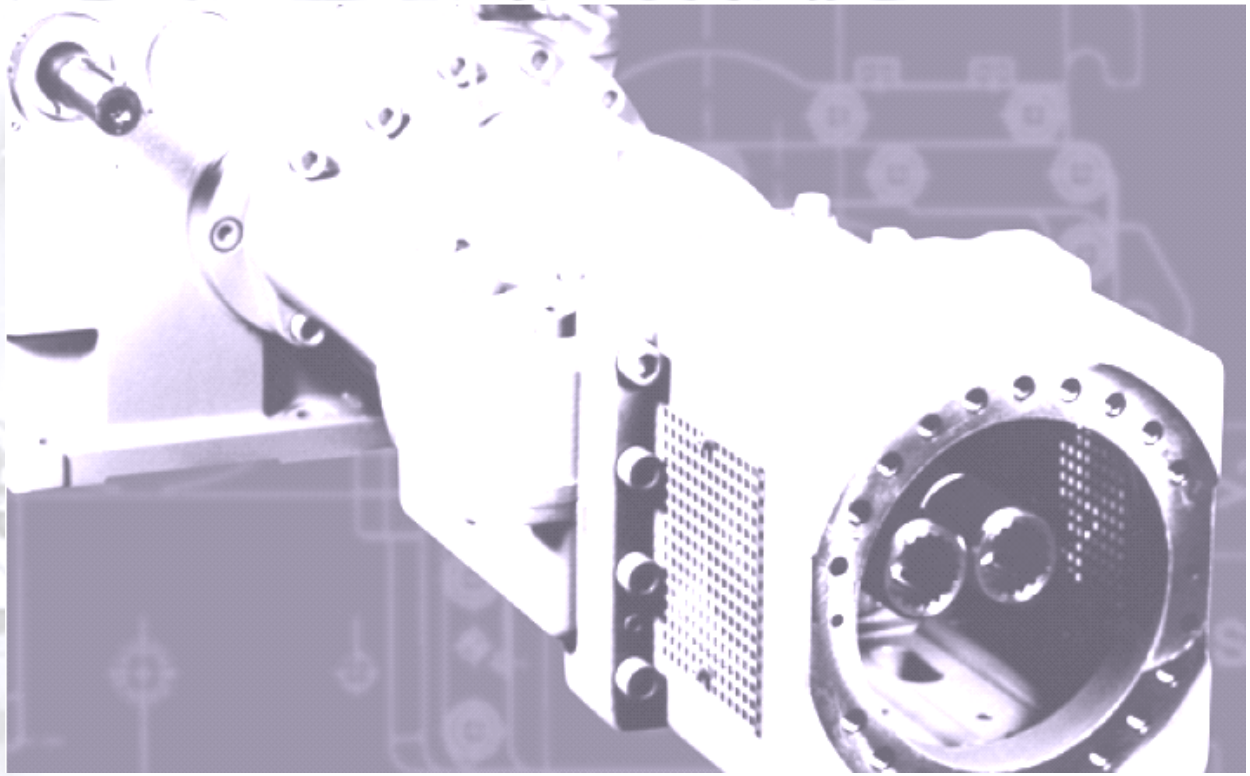
Geometry of Gears

- Advantages
  - ☞ Where it is possible, our gears are designed with whole-numbered overlap ratio
  - ☞ We choose the very best overlaps values
  - ☞ All gears from Henschel take the state-of-the-art research results from „Forschungsvereinigung Antriebstechnik e.V. (FVA)“ into account

Forschungsvereinigung Antriebstechnik e. V.

FVA

DURUMAX® TPM 3 Twin Shaft Extruder Gearbox counter-rotating



DURUMAX® TPM 3 Twin Shaft Extruder Gearbox counter-rotating

- Twin shaft extruder gearbox for counter-rotating extrusion

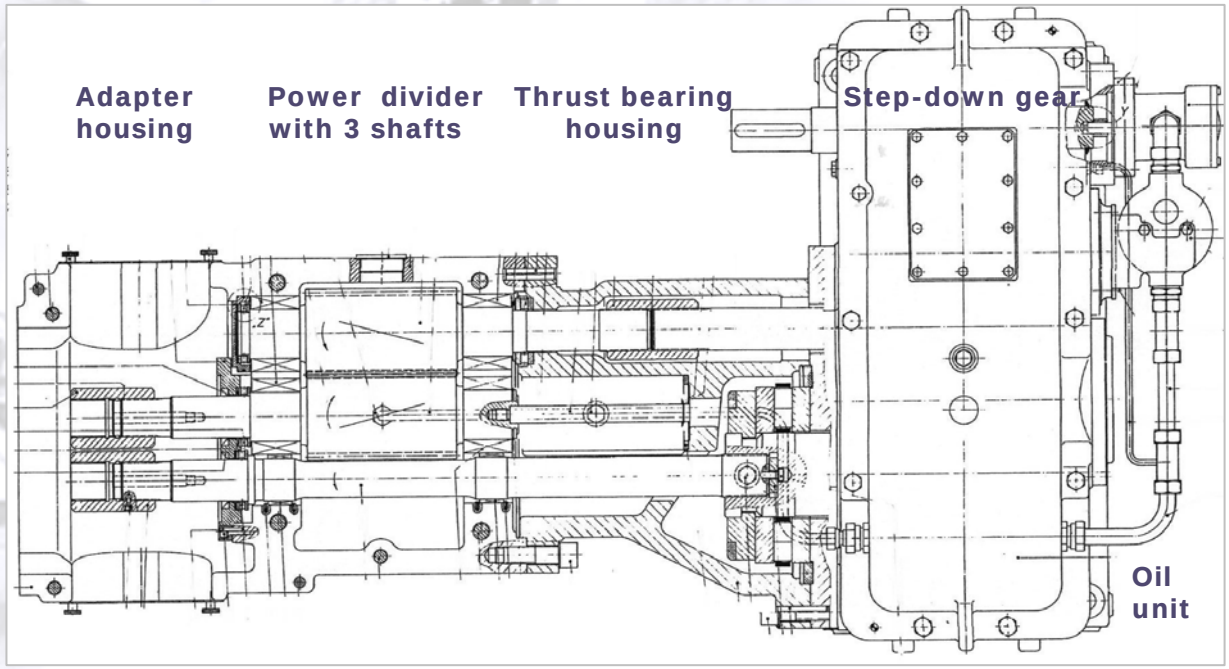
  - Since more than twenty years, HENSCHEL manufactures the reliable TPM 3 extruder gearbox series

  - The gearbox is utilised mainly in the tube extrusion with designed extruder machines, which have a LD ratio of 22

  - The gearbox design represents an economical and efficient power transmission solution

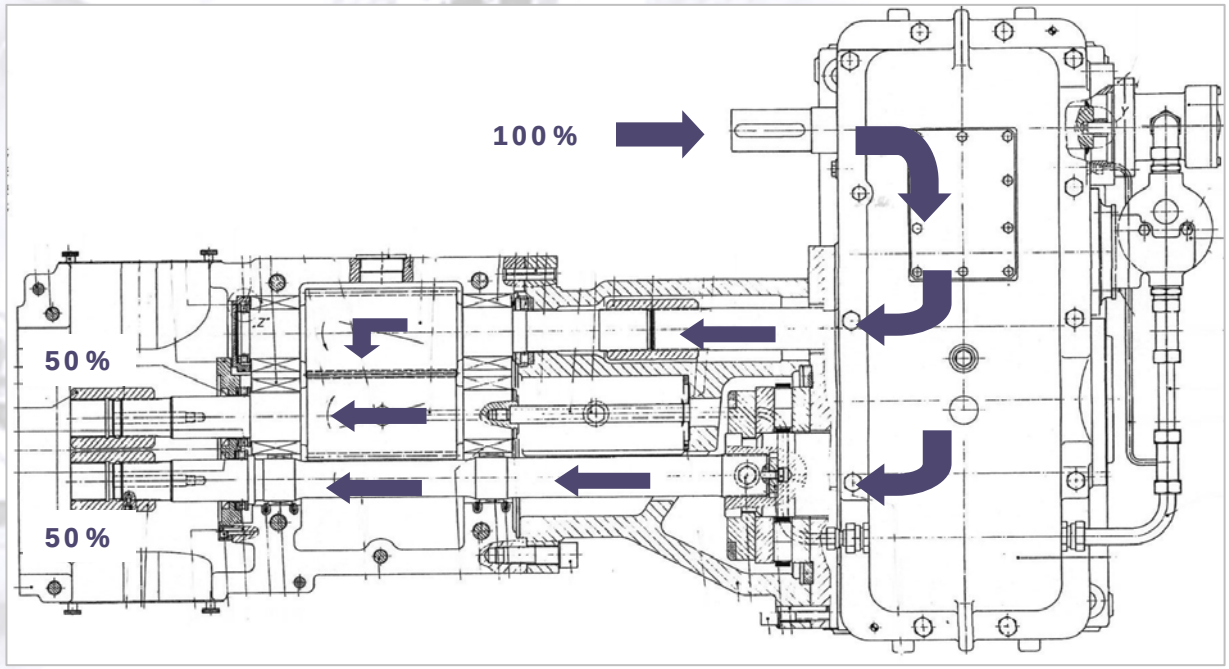
DURUMAX® TPM 3 Twin Shaft Extruder Gearbox counter-rotating

Design concept



DURUMAX® TPM 3 Twin Shaft Extruder Gearbox counter-rotating

Distribution of Torque



DURUMAX® TPM 3 Twin Shaft Extruder Gearbox counter-rotating

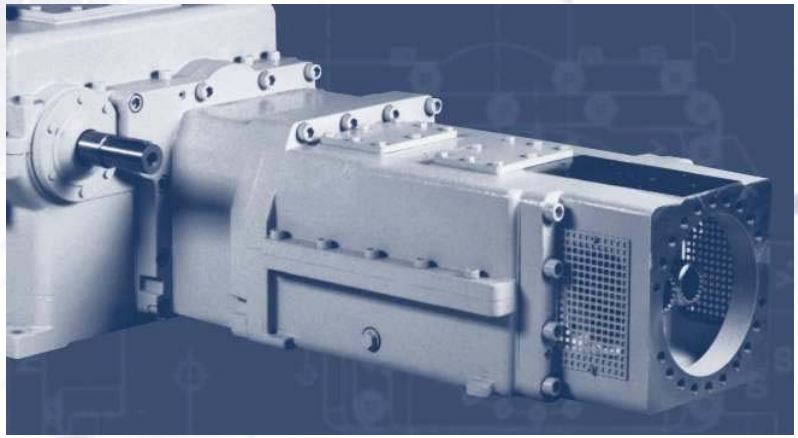
Power Ratings

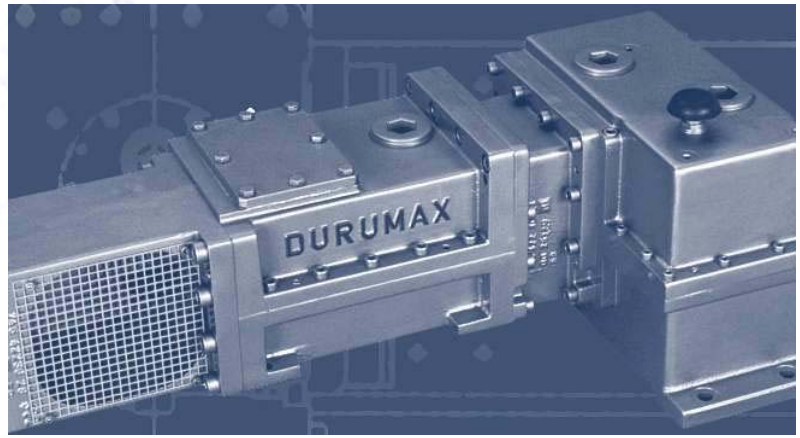
gearbox size	TPM 3-90			TPM 3-107			TPM 3-130			gearbox size
center distance	75,35 mm			90 mm			110 mm			center distance
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	n_2 [rpm]
5	4	8.435	214	8	16.000	303	15	28.165	448	5
10	9	8.435	214	17	16.000	303	29	28.165	448	10
15	13	8.435	214	25	16.000	303	44	28.165	448	15
20	18	8.435	214	34	16.000	303	59	28.165	448	20
25	22	8.435	214	42	16.000	303	73	27.820	448	25
30	26	8.435	214	50	15.840	303	83	26.340	448	30
35	31	8.435	214	55	15.120	303	92	25.150	448	35
40	35	8.240	214	61	14.525	303	101	24.160	448	40
45	37	7.955	214	66	14.020	303	110	23.320	448	45
50	40	7.705	211	71	13.585	303	118	22.595	434	50
55	43	7.485	205	76	13.200	300	126	21.955	422	55
60	46	7.295	200	81	12.860	292	134	21.390	411	60
65	48	7.120	195	85	12.555	285	142	20.885	401	65
70	51	6.965	191	90	12.280	279	150	20.425	392	70

P_M = motor power [kW]
T_{2N} = total output torque [Nm]
n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

DURUMAX® TPM 3 DOS Twin Shaft Extruder Gearbox

- High Torque Twin Shaft Extruder Gearbox
  for counter- and co-rotating extrusion
  with our DOuble Stage torque distribution design

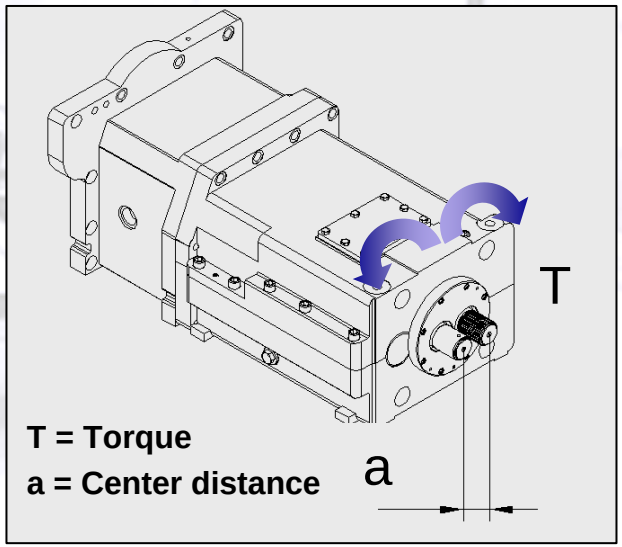




DURUMAX® TPM 3 DOS Twin Shaft Extruder Gearbox

- Design concept of the DOS torque distribution stage

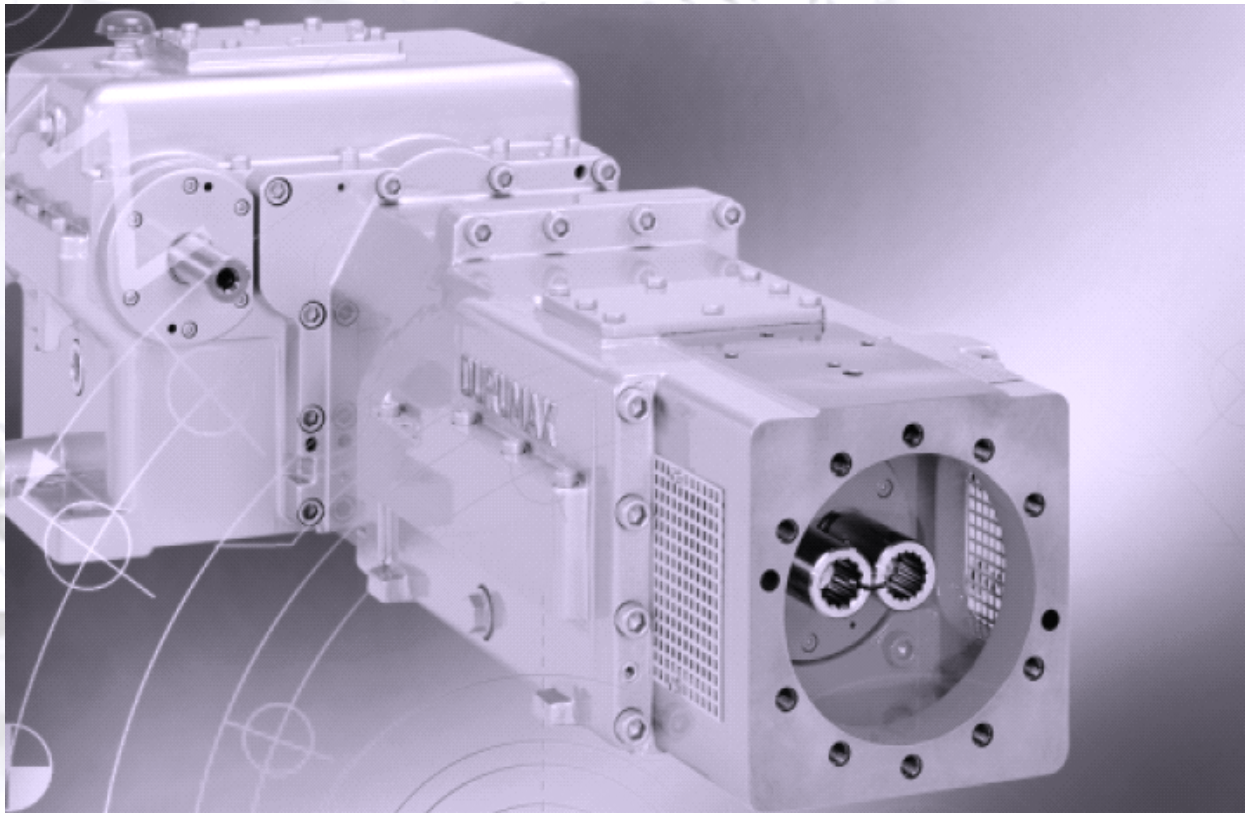
☞ Advantage:
High „Power Density“ at all used center distances



$$f = T / a^3 \quad [\,Nm / cm^3\,]$$

The torque factor f is a measurement for the “power density” of a twin shaft gearbox. This factor is independent from the gearbox size.

DURUMAX® TPM 3 DOS Twin Shaft Extruder Gearbox counter-rotating



DURUMAX® TPM 3 DOS Twin Shaft Extruder Gearbox counter-rotating

Power Ratings

gearbox size	TPM 2-52-DOS			TPM 3-63-DOS-V			TPM 3-68-DOS-V			TPM 3-70-DOS		
center distance	44 mm			54 mm			55 mm			60 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
5	1	2.000	67	3	5.800	121	3	6.200	139	3	6.200	151
10	2	2.000	67	6	5.800	121	7	6.200	139	7	6.200	151
15	3	2.000	67	10	5.800	121	10	6.200	139	10	6.200	151
20	4	2.000	67	13	5.800	121	14	6.200	139	14	6.200	151
25	5	2.000	67	16	5.800	121	17	6.200	139	17	6.200	151
30	6	2.000	67	19	5.800	121	21	6.200	139	21	6.200	151
35	7	2.000	67	23	5.800	121	24	6.200	139	24	6.200	145
40	8	2.000	67	26	5.800	121	28	6.200	139	28	6.200	140
45	9	2.000	67	28	5.600	121	30	5.985	135	30	5.985	135
50	10	2.000	67	30	5.425	121	32	5.800	131	32	5.800	131
55	11	1.945	67	32	5.270	121	35	5.635	127	35	5.635	127
60	12	1.895	63	35	5.135	121	37	5.490	124	37	5.490	124
65	13	1.850	62	37	5.015	119	39	5.360	121	39	5.360	121
70	14	1.810	61	38	4.905	116	41	5.240	118	41	5.240	118

P_M = motor power [kW]
T_{2N} = total output torque [Nm]
n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

DURUMAX® TPM 3 DOS Twin Shaft Extruder Gearbox counter-rotating

Power Ratings

gearbox size	TPM 3-75-DOS-V			TPM 3-87-DOS-V			TPM 3-92-DOS-V			TPM 3-94-DOS-V		
center distance	61 mm			74 mm			75,35 mm			76 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
5	5	9.400	168	9	15.200	230	9	15.720	254	9	17.120	264
10	11	9.400	168	17	15.200	230	18	15.720	254	18	17.120	264
15	16	9.400	168	26	15.200	230	26	15.720	254	26	17.120	264
20	21	9.400	168	34	15.200	230	35	15.720	254	35	17.120	264
25	26	9.400	168	43	15.200	230	44	15.720	254	44	17.120	264
30	31	9.305	168	51	15.200	230	53	15.720	254	53	17.120	256
35	35	8.885	168	60	15.200	230	62	15.720	244	62	17.120	244
40	38	8.535	168	68	15.200	230	70	15.720	235	70	17.120	235
45	42	8.240	168	75	14.780	227	79	15.615	226	79	17.005	226
50	45	7.980	168	80	14.320	220	85	15.130	219	85	16.475	219
55	48	7.755	164	86	13.915	213	91	14.700	213	91	16.010	213
60	51	7.555	160	91	13.560	208	96	14.320	208	96	15.595	208
65	54	7.375	156	96	13.235	203	102	13.980	203	102	15.225	203
70	57	7.215	153	102	12.945	198	107	13.675	198	107	14.890	198

P_M = motor power [kW]
T_{2N} = total output torque [Nm]
n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

DURUMAX® TPM 3 DOS Twin Shaft Extruder Gearbox counter-rotating

Power Ratings

gearbox size	TPM 3-100-DOS-V			TPM 3-106-DOS-V			TPM 3-110-DOS-V			TPM 3-114-DOS-V		
center distance	80,8			88 mm			90 mm			92,5 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
5	12	21.660	299	13	23.000	334	14	24.800	363	17	30.865	389
10	24	21.660	299	26	23.000	334	28	24.800	363	35	30.865	389
15	36	21.660	299	39	23.000	334	42	24.800	363	52	30.865	389
20	49	21.660	299	52	23.000	334	56	24.800	363	69	30.865	389
25	61	21.660	299	64	23.000	334	69	24.800	363	86	30.865	389
30	73	21.660	299	77	22.765	334	83	24.550	363	104	30.865	372
35	85	21.660	299	85	21.735	334	92	23.440	355	121	30.865	355
40	96	21.365	299	94	20.885	324	101	22.515	341	133	29.655	341
45	104	20.620	299	102	20.155	312	110	21.735	329	144	28.620	329
50	112	19.980	299	109	19.530	303	118	21.000	319	155	27.730	319
55	120	19.415	299	117	18.980	294	126	20.465	310	166	26.950	310
60	127	18.915	299	124	18.490	287	134	19.935	302	177	26.255	302
65	134	18.465	295	131	18.050	280	142	19.460	295	187	25.630	295
70	142	18.060	288	138	17.650	274	149	19.035	288	197	25.065	288

P_M = motor power [kW]
T_{2N} = total output torque [Nm]
n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

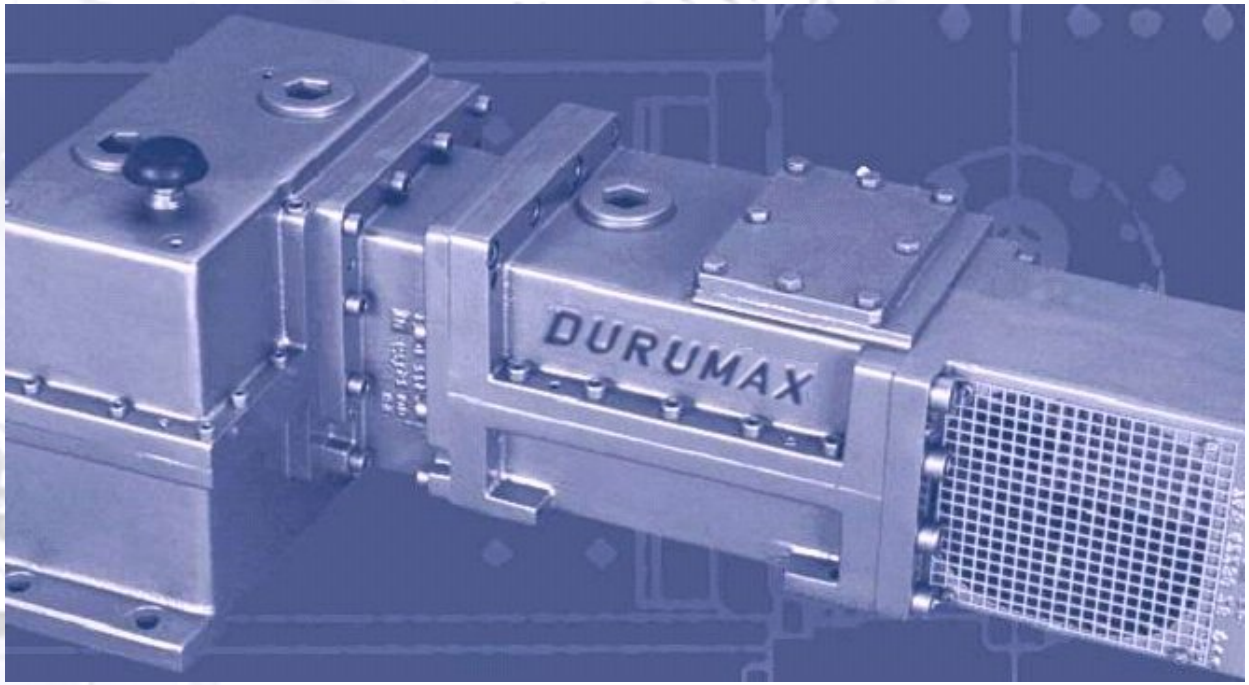
DURUMAX® TPM 3 DOS Twin Shaft Extruder Gearbox counter-rotating

Power Ratings

gearbox size	TPM 3-130-DOS-V			TPM 3-135-DOS-V			TPM 3-140-DOS-V		
center distance	105,7 mm			110 mm			114 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
5	22	39.545	506	26	47.125	546	30	54.005	587
10	44	39.545	506	53	47.125	546	61	54.005	587
15	66	39.545	506	79	47.125	546	91	54.005	587
20	89	39.545	506	106	47.125	546	121	54.005	587
25	111	39.545	506	132	47.125	546	151	54.005	555
30	126	37.440	506	158	47.125	525	182	54.005	525
35	140	35.745	502	176	44.995	502	202	51.560	501
40	154	34.340	482	194	43.225	482	222	49.535	482
45	167	33.145	465	210	41.725	465	241	47.815	465
50	180	32.115	451	226	40.425	451	260	46.325	451
55	192	31.210	438	242	39.285	438	277	45.020	438
60	204	30.405	427	257	38.270	427	295	43.855	427
65	216	29.680	417	272	37.360	417	312	42.815	416
70	228	29.030	407	287	36.540	408	328	41.875	407

P_M = motor power [kW]
T_{2N} = total output torque [Nm]
n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

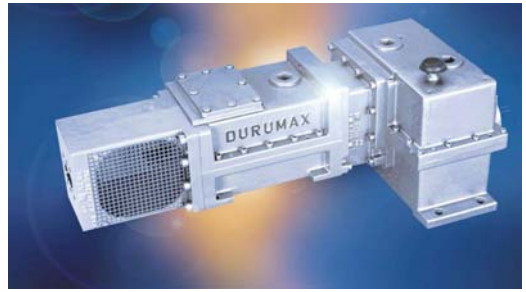
DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating



DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

- Extruder gearbox with the 3-shaft distribution concept

  Based on our most popular solution for the counter-rotating extrusion



Features:

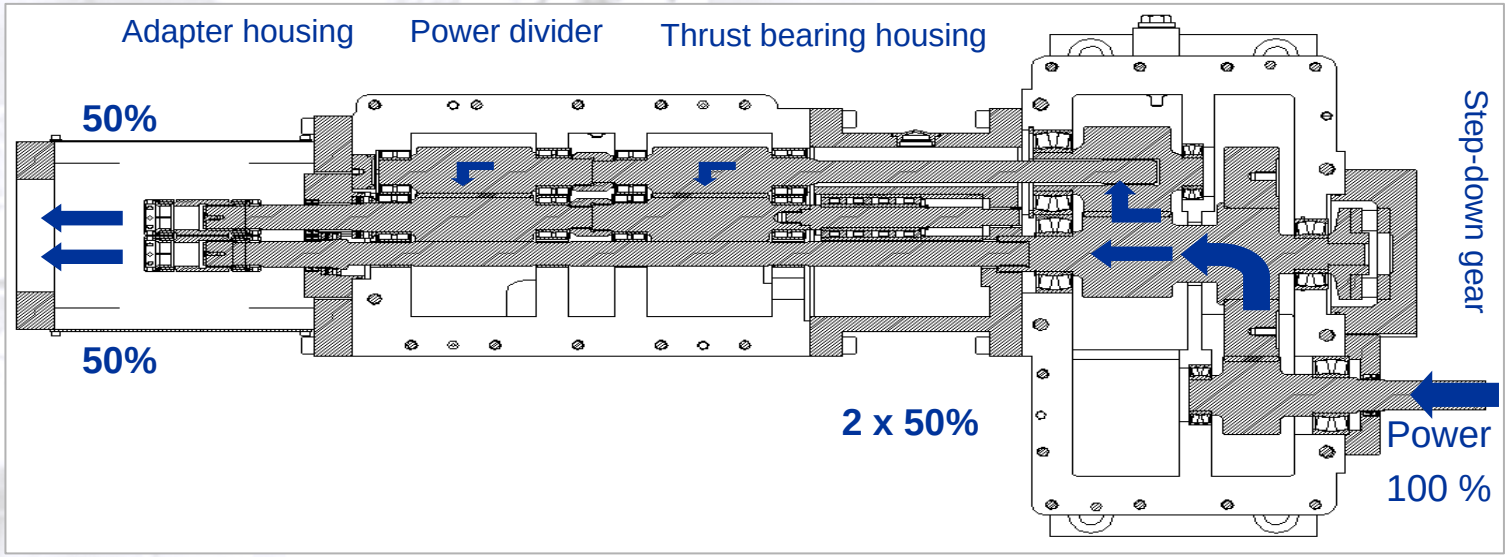
- Simple design
- High efficiency due to reduction of rotating parts
- High operational reliability
- No loss of output torque
- High power density

Gearbox Modules:

- Step-down gear
- Thrust bearing housing
- Power divider
- Adapter housing or tie rod

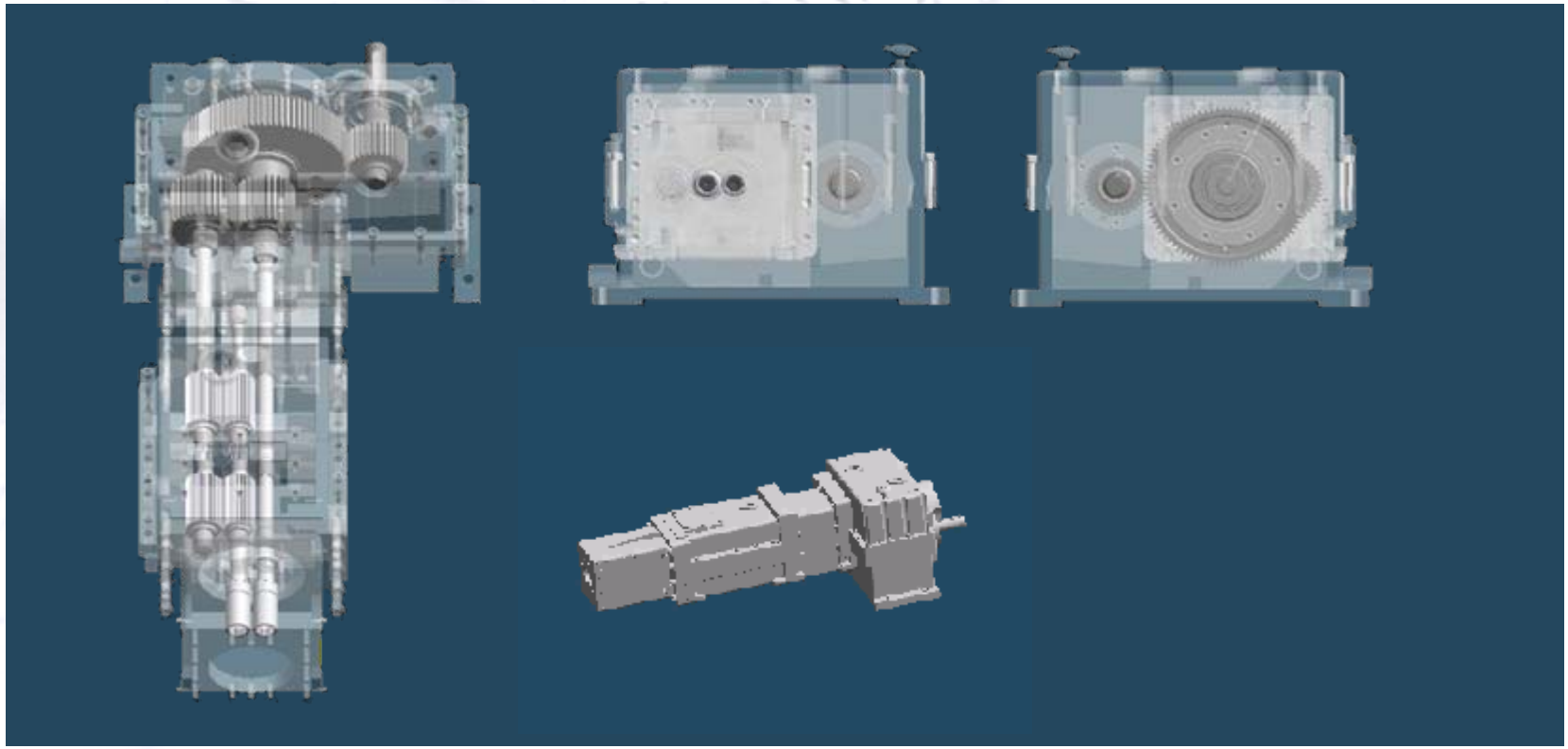
DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

- Distribution of Torque



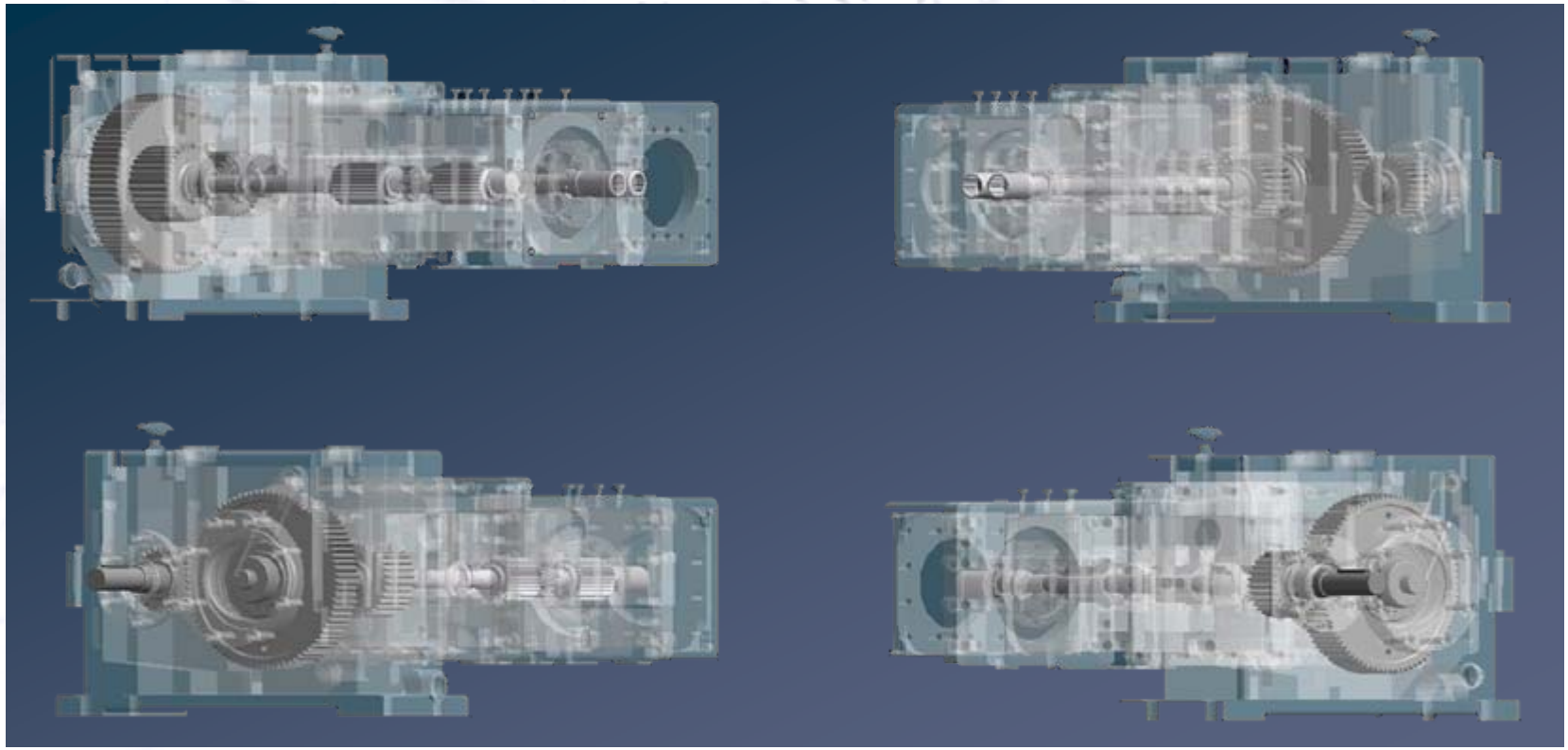
DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

Views



DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

Views



DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

- A class of his own

+ Efficient Concept for highest Energy Savings

+ High Torque Ratings

+ Unique Reliability

+ Easy Servicing and Maintenance

DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

Power Ratings

gearbox size	TGE 3-26-DOS			TGE 3-34-DOS			TGE 3-37-DOS			TGE 3-40-DOS			TGE 3-48-DOS		
center distance	22 mm			30 mm			31 mm			33,4 mm			40 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
300	8	245	2	20	620	6	23	685	16	28	850	24	49	1.470	26
350	9	245	2	24	620	5	26	685	16	33	850	24	57	1.470	26
400	11	245	2	27	620	5	30	685	16	37	850	24	65	1.470	26
450	12	245	2	31	620	5	34	685	16	42	850	24	73	1.470	26
500	13	245	2	34	620	5	38	685	16	47	850	24	81	1.470	26
550	15	245	2	38	620	5	41	685	16	51	850	24	89	1.470	26
600	16	245	2	41	620	5	45	685	16	56	850	24	97	1.470	26
650	17	240	2	43	605	5	48	670	16	60	850	24	103	1.435	26
700	18	235	2	46	595	4	50	655	16	65	850	24	108	1.405	26
800	20	225	2	50	570	4	55	630	16	75	850	24	119	1.350	26
900	21	215	2	54	550	4	60	605	16	80	810	20	129	1.305	26
1.000	23	210	2	59	535	4	65	590	16	85	780	20	139	1.265	26
1.100	25	205	2	63	520	4	69	570	16	95	780	20	148	1.225	26
1.200	26	200	2	67	505	4	73	555	16	100	780	20	158	1.195	26

P_M = motor power [kW]
T_{2N} = total output torque [Nm]

n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

Power Ratings

gearbox size	TGE 3-50-DOS			TGE 3-53-DOS			TGE 3-63-DOS			TGE 3-65-DOS			TGE 3-70-DOS		
center distance	42 mm			43 mm			51,75 mm			52 mm			58,5 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
300	55	1.655	27	60	1.830	29	105	3.190	45	105	3.190	45	152	4.605	55
350	64	1.655	27	70	1.830	29	123	3.190	45	123	3.190	45	177	4.605	55
400	73	1.655	27	80	1.830	29	140	3.190	45	140	3.190	45	203	4.605	55
450	82	1.655	27	90	1.830	29	158	3.190	45	158	3.190	45	228	4.605	55
500	91	1.655	27	101	1.830	29	175	3.190	45	175	3.190	45	253	4.605	55
550	100	1.655	27	111	1.830	29	193	3.190	45	193	3.190	45	278	4.605	55
600	109	1.655	27	121	1.830	29	210	3.190	45	210	3.190	45	304	4.605	55
650	116	1.615	27	128	1.785	29	222	3.110	45	222	3.110	45	321	4.495	55
700	122	1.580	27	134	1.745	29	234	3.045	44	234	3.045	44	338	4.395	55
800	134	1.520	27	148	1.675	29	257	2.925	43	257	2.925	43	372	4.225	55
900	145	1.465	27	160	1.620	29	279	2.820	41	279	2.820	41	403	4.075	55
1.000	156	1.420	27	173	1.570	29	301	2.735	40	301	2.735	40	434	3.950	53
1.100	167	1.380	27	184	1.525	29	321	2.660	39	321	2.660	39	464	3.840	52
1.200	177	1.345	27	196	1.485	29	342	2.590	38	342	2.590	38	493	3.740	50

P_M = motor power [kW]
T_{2N} = total output torque [Nm]

n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

DURUMAX® TGE 3 DOS Twin Shaft Extruder Gearbox co-rotating

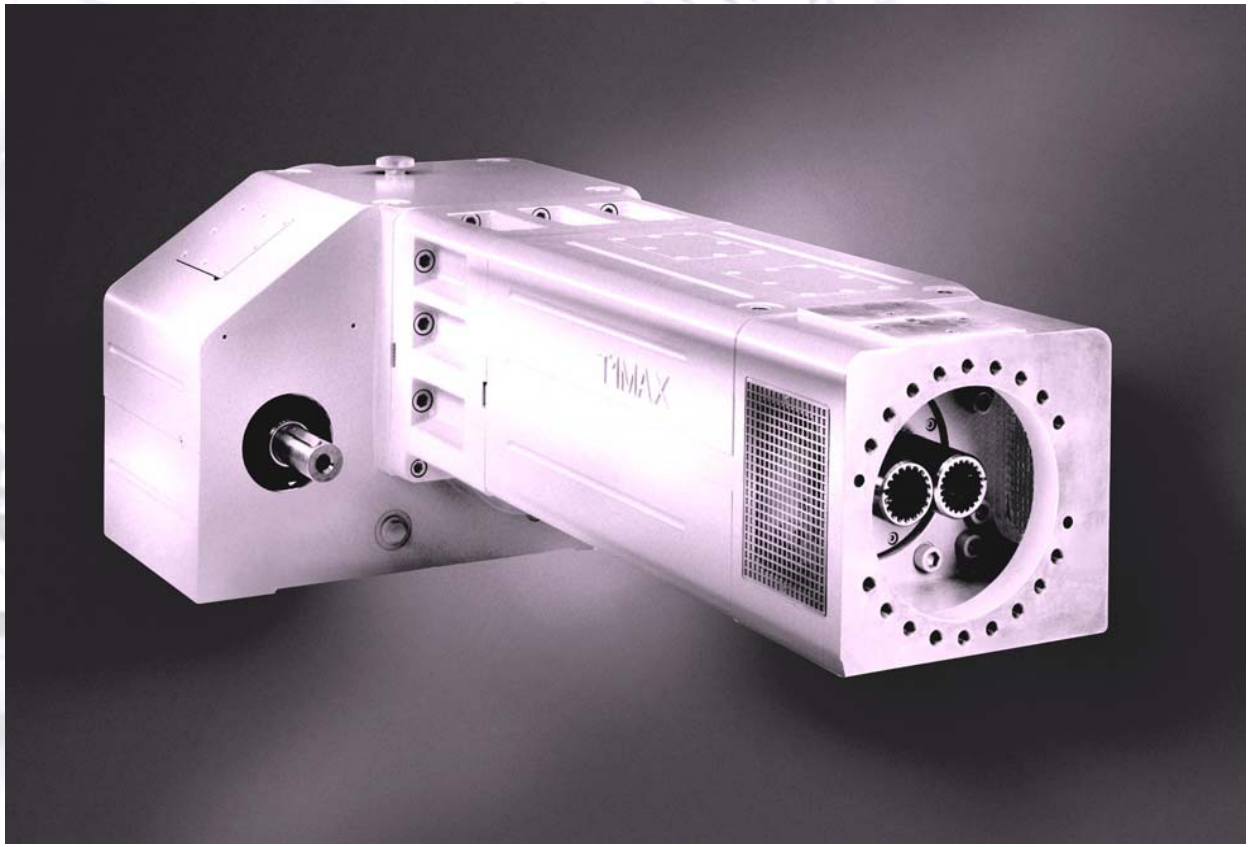
Power Ratings

gearbox size	TGE 3-72-DOS			TGE 3-75-DOS			TGE 3-85-DOS			TGE 3-95-DOS			TGE 3-130-DOS		
center distance	59,5 mm			60 mm			70 mm			78 mm			110 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
300	160	4.845	58	160	4.845	58	260	7.890	81	325	9.840	101	834	25.400	192
350	186	4.845	58	186	4.845	58	304	7.890	81	379	9.840	101	973	25.400	192
400	213	4.845	58	213	4.845	58	347	7.890	81	433	9.840	101	1.112	25.400	192
450	240	4.845	58	240	4.845	58	390	7.890	81	487	9.840	101	1.232	25.019	189
500	266	4.845	58	266	4.845	58	434	7.890	79	541	9.840	101	1.348	24.644	186
550	293	4.845	58	293	4.845	58	477	7.890	77	595	9.840	101	1.461	24.274	183
600	320	4.845	58	320	4.845	58	520	7.890	75	649	9.840	101	1.546	23.546	178
650	338	4.730	58	338	4.730	58	550	7.700	73	687	9.605	101	1.625	22.839	173
700	356	4.625	58	356	4.625	58	580	7.530	72	723	9.395	98	1.697	22.154	167
800	391	4.445	57	391	4.445	57	637	7.235	69	794	9.025	95	1.881	21.490	162
900	425	4.290	55	425	4.290	55	691	6.985	66	862	8.715	91	-	-	-
1.000	457	4.155	53	457	4.155	53	744	6.770	64	928	8.440	88	-	-	-
1.100	489	4.040	52	489	4.040	52	796	6.575	63	992	8.205	86	-	-	-
1.200	519	3.935	50	519	3.935	50	845	6.410	61	1.055	7.990	84	-	-	-

P_M = motor power [kW]
T_{2N} = total output torque [Nm]

n_2 = output speed [rpm]
FaxW = permissible axial force per shaft [kn]

DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating



DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

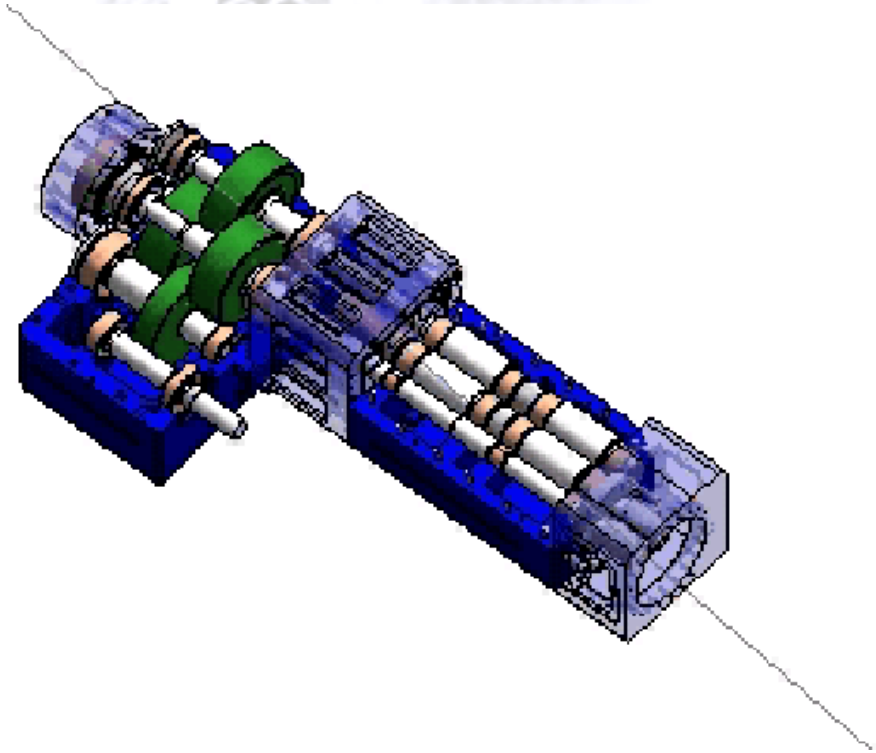
- Twin shaft extruder gearbox
  for counter-rotating extrusion

The new extruder gearbox T1MAX® is the consistent development of the extruder gearbox series TPM 3 DOS-V with the proved 3-shaft distribution concept, which is worldwide the most popular concept in counter-rotating extrusion.

With the T1MAX® we offer the most efficient concept with the highest performance in it´s category.
(Torque enhancement of more than 15%)

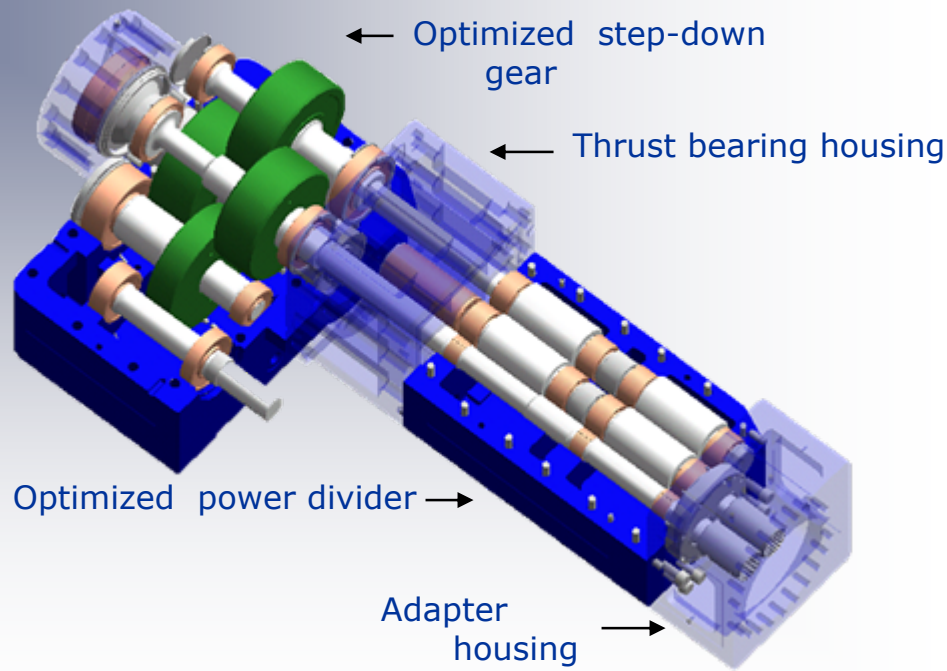
DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

- Design



DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

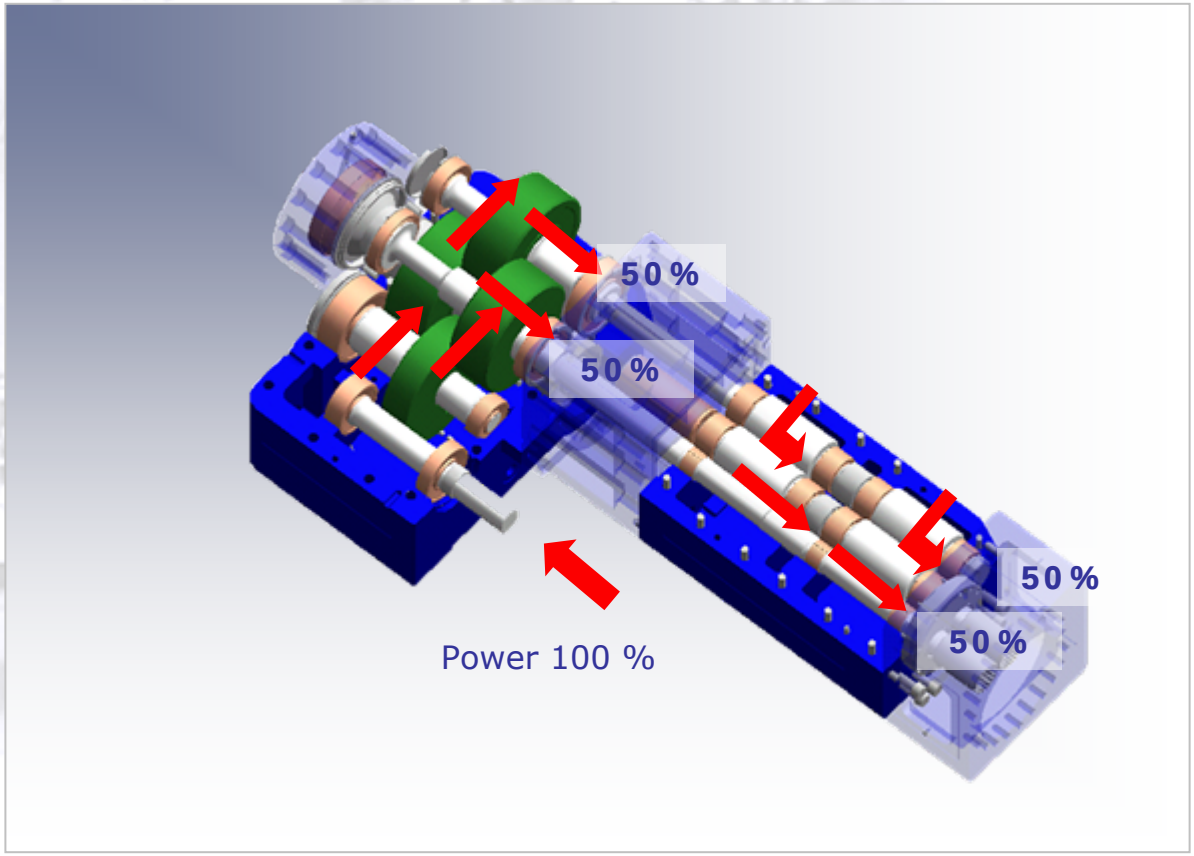
Design



Modification => higher torque factors

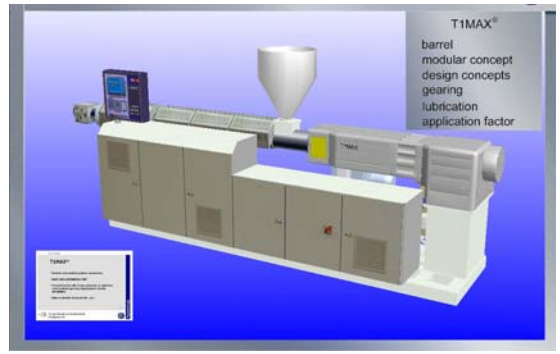
DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

- Distribution of Torque



DURUMAX® T1MAX C$_{ounter}$ Twin Shaft Extruder Gearbox counter-rotating Modular Concept

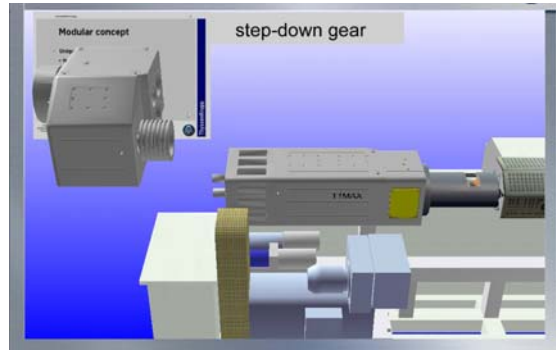
- Attributes easing your Descicion



The extruder gearbox consists of the following modules:

- Step-down gear
- Thrust bearing housing
- Power divider
- Adapter housing or tie rod

DURUMAX® T1MAX C$_{ounter}$ Twin Shaft Extruder Gearbox counter-rotating Modular Concept



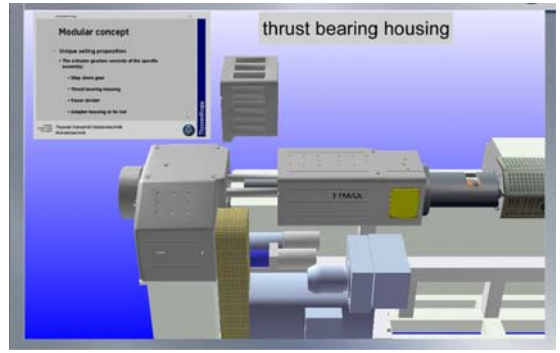
- Attributes easing your Descicion

Step-down Gear

- ☞ Easy adjustment of the gearbox ratio for meeting customer´s requirements.
- ☞ Gearbox should be driven directly instead by v-belt? Or it should be small and vertical?

  Only a new reduction gearbox is required which will connected with the existing gearbox components.

DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating Modular Concept

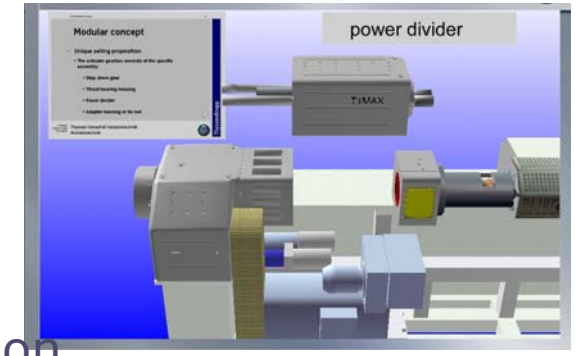


- Attributes easing your Descicion

Thrust bearing housing

☞ Adaptation of the thrust bearing housing or lid with regard to the forces of back pressure
resulting from the respective area of application for extrusion.

DURUMAX® T1MAX C$_{ounter}$ Twin Shaft Extruder Gearbox counter-rotating Modular Concept



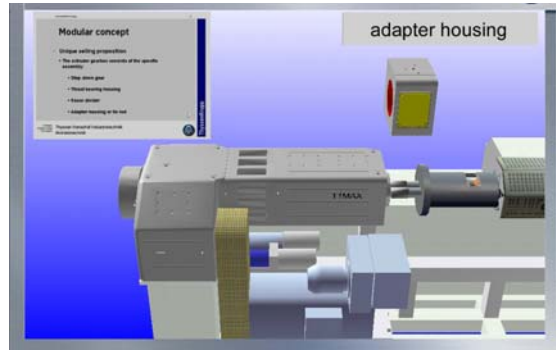
- Attributes easing your Descicion

Power Divider

☞ Centre distance variation can be realised without altering models under consideration of the geometric and torque requirements.

☞ All other gear components are designed in such a way that only the power divider has to be modified.

DURUMAX® T1MAX C$_{ounter}$ Twin Shaft Extruder Gearbox counter-rotating Modular Concept



- Attributes easing your Descicion

Adapter Housing or Tie Bar

☞ Easy adaptation of the gearbox to the fitting dimensions of the extruder.

☞ The adapter housing can be modified according to the respective fitting conditions of the barrel.

DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating Design Concept

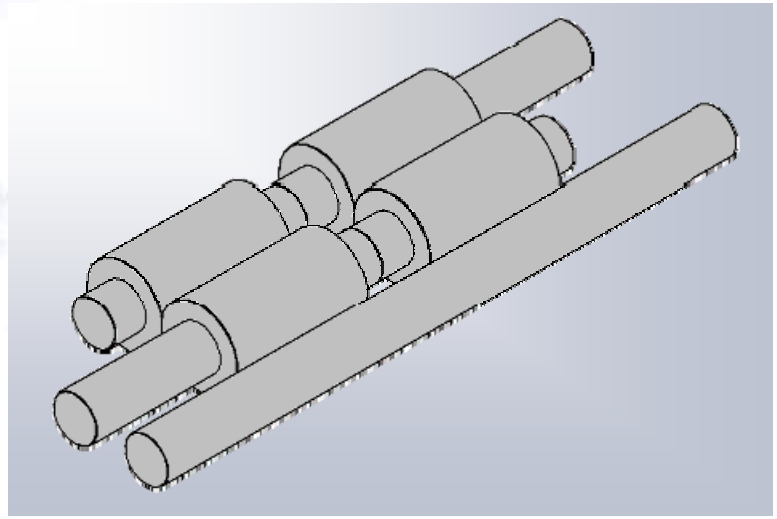
- T1MAX®

+ Simple design

+ High efficiency due to reduction of rotating parts

+ High operational reliability

+ No loss of output torque



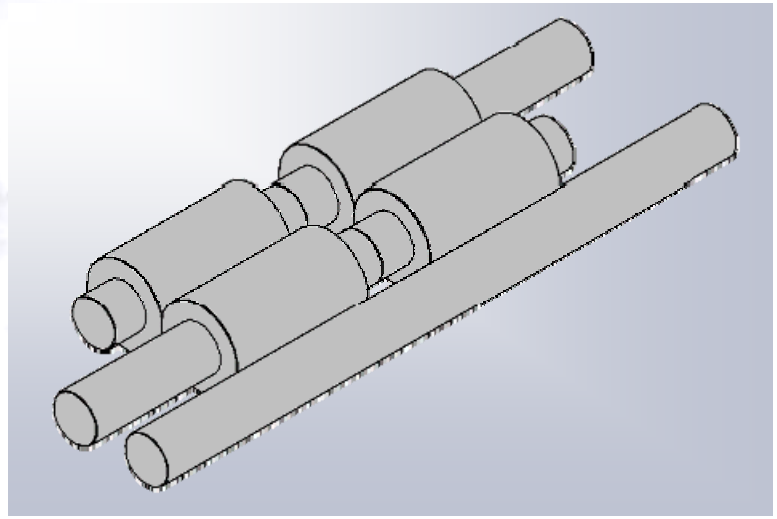
DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating Design Concept

- T1MAX®

  + Torque in line with the market requirements

  + High power density

  + Good price-performance ratio



DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating Design Concept

- T1MAX®

+ High power density at any centre distances

$$f = T / a^3 \quad [\,Nm / cm^3\,] \ (1)$$

The torque factor f is a value for the power density.

The factor is independent of the size of the unit.

(1) G. Schenkel: Plastics Extrusion Technology and Theory, 2nd ed. (Liffe books, London, 1963)

DURUMAX® T1MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

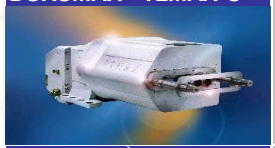
Power Ratings

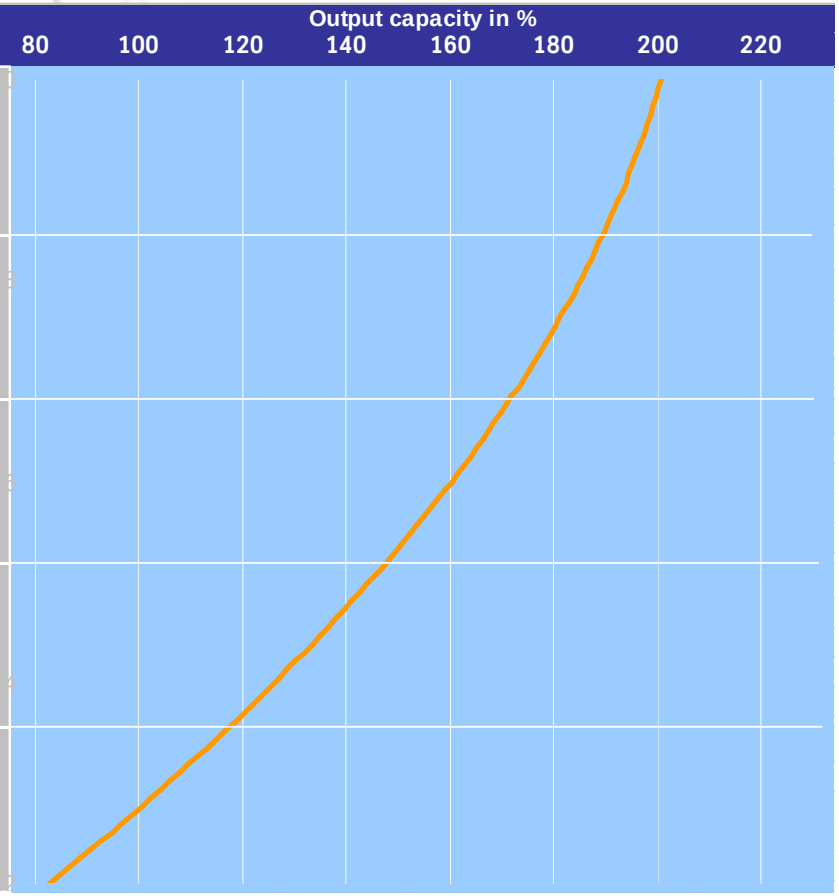
gearbox size	T1MAX 92 C			T1MAX 110 C			T1MAX 125 C			T1MAX 135 C			T1MAX 170 C		
center distance	75,35 mm			90 mm			108 mm			110 mm			146 mm		
n_2 [rpm]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]	P_M [kW]	T_2 [Nm]	F_{axW} [kN]
5	10	17.970	254	17	30.252	363	28	50.000	363	32	58.000	363	75	135.000	363
10	20	17.970	254	34	30.252	363	56	50.000	363	65	58.000	363	150	135.000	363
15	30	17.970	254	51	30.252	363	84	50.000	363	97	58.000	363	226	135.000	363
20	40	17.970	254	67	30.252	363	111	50.000	363	129	58.000	363	301	135.000	363
25	50	17.970	254	84	30.252	363	139	50.000	363	162	58.000	363	376	135.000	363
30	60	17.970	254	100	29.947	363	165	49.496	363	192	57.415	363	447	133.639	363
35	70	17.970	244	111	28.593	355	184	47.258	355	214	54.819	355	497	127.597	355
40	80	17.970	235	122	27.465	341	202	45.393	341	235	52.656	341	546	122.561	341
45	89	17.850	226	133	26.513	329	220	43.821	329	255	50.832	329	593	118.316	329
50	96	17.296	219	143	25.617	319	236	42.339	319	274	49.113	319	637	114.315	319
55	103	16.804	213	153	24.964	310	253	41.260	310	293	47.862	310	683	111.402	310
60	109	16.370	208	163	24.317	302	269	40.192	302	312	46.622	302	725	108.517	302
65	116	15.981	203	172	23.738	295	284	39.234	295	330	45.511	295	767	105.931	295
70	122	15.632	198	181	23.220	288	299	38.377	288	347	44.517	288	808	103.618	288

DURUMAX® Twin Shaft Extruder Gearboxes
Relation Torque-Ratings, L / D-Ratio and Output

During the years the extruder manufactures increased the output capacities of their machines by increasing the LD-ratio of the screws. Therefore the demand for gearboxes with higher and higher torque ratings grows parallel.

In the diagram you can see the developement of our twin shaft extruder gearboxes related to the increased output capacities of the extruders from 1978 up to now.

Gerbox Type	Torque Factor D_F [Nm/cm³]	LD-Ratio
DURUMAX® T2MAX C 	50	32
DURUMAX® T1MAX 	42	28
DURUMAX® TPM 3 DOS 	38	26
DURUMAX® TPM 3 DOS 	28	24
DURUMAX® TPM 3 	20	22



DURUMAX® T2MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

DURUMAX® T2MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

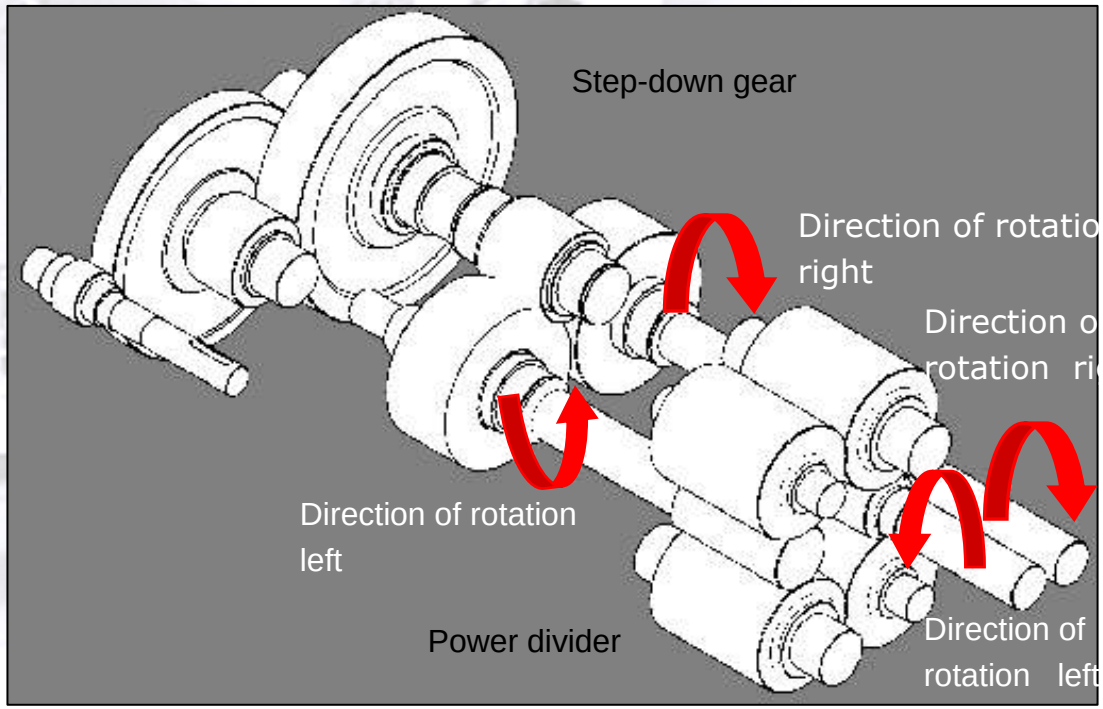
- The Strongest, Highest Torque Extrusion Gearbox in the Industry

We don't know of anyone that can compete with our new gearbox generation T2MAX® from Henschel.
Compare our new torque factors with the standards of the industry.

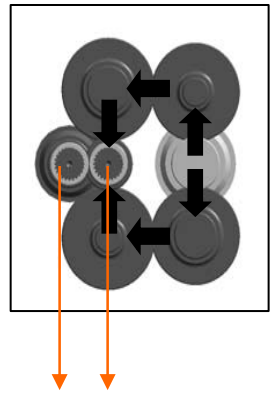
Engineering:
Extruder gearbox consists of the gearbox modules step-down gear, thrust bearing housing, power divider
with the new 7 shaft design, adapter housing or tie rod

DURUMAX® T2MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating Design Concept

- Step-down gear and power divider



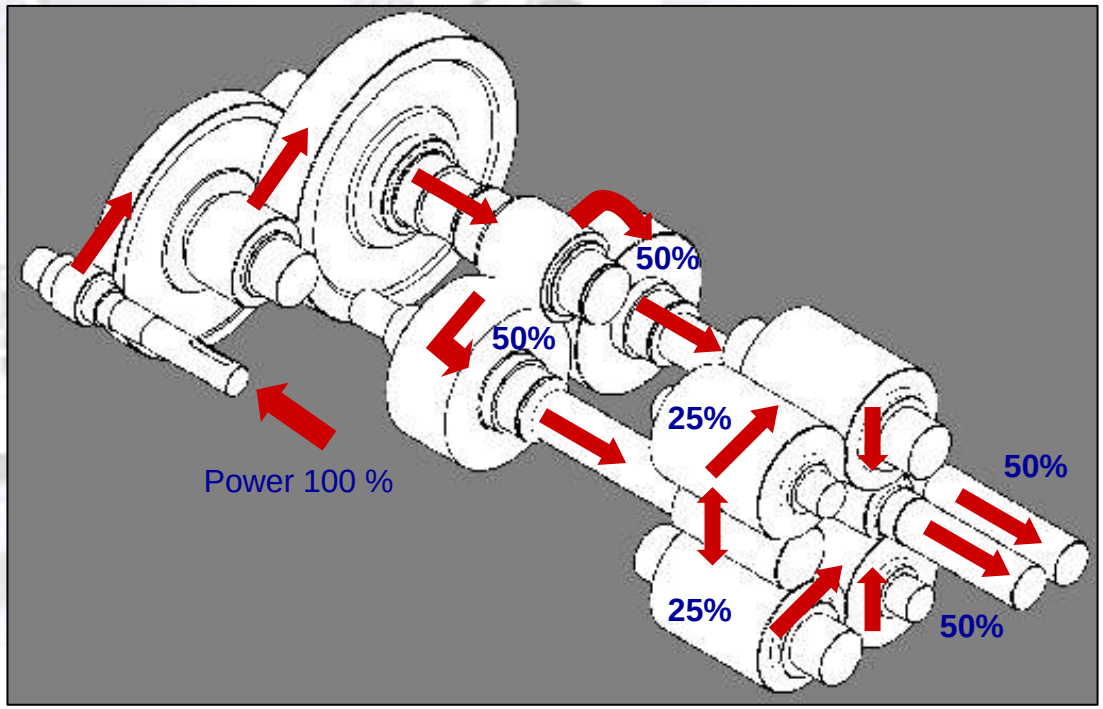
View of the front



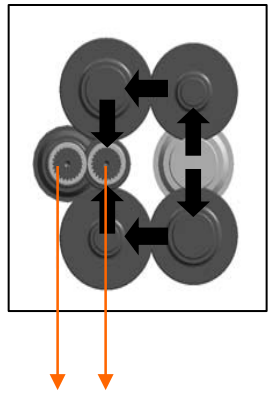
Output shafts

DURUMAX® T2MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating Design Concept

- Distribution of Torque



View of the front



Output shafts

DURUMAX® T2MAX C_{ounter} Twin Shaft Extruder Gearbox counter-rotating

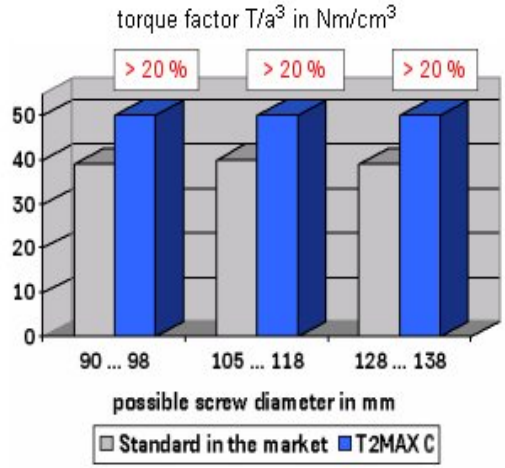
- The strongest, highest Torque Extrusion Gearbox in the Industry

gearbox size	T2MAX-94C	T2MAX-105C	T2MAX-135C
center distance	76 mm	84 mmn	110 mmn
n_1	1.750 min^{-1}	1.750 min^{-1}	1.750 min^{-1}
n_2	45 min^{-1}	35 min^{-1}	28 min^{-1}
P_M	110 kW	116 kW	208 kW
T_{2N}	21.948 Nm	29.636 Nm	66.550 Nm
T_{2NW}	10.974 Nm	14.818 Nm	33.257 Nm
F_{axW}	278 kN	346 kN	573 kN

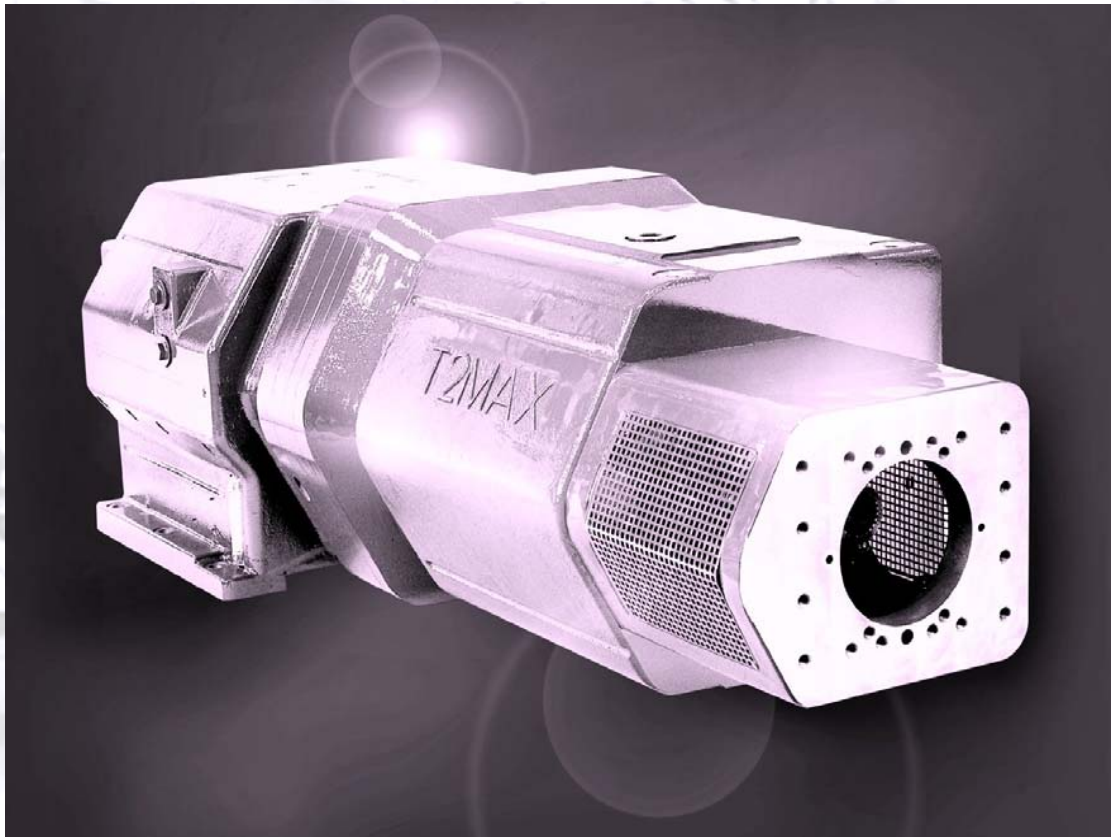
Legend:

n_1 = input speed P_M = motor power [kW] T_{2NW} = output torque per shaft [Nm]

n_2 = output speed T_{2N} = total output torque [Nm] F_{axW} = axial force per shaft [kN]



DURUMAX® T2MAX Similar Twin Shaft Extruder Gearbox co-rotating



DURUMAX® T2MAX Similar Twin Shaft Extruder Gearbox co-rotating

- The Strongest, Highest Torque Extrusion Gearbox in the Industry

T2MAX® - the low weight, easy access, heavy duty housing gearbox with the best service. This, plus incredible durability, performance, torque and speed, is what we call "simply the best"!

Engineering:
Extruder gearbox consists of the gearbox modules step-down gear, thrust bearing housing, power divider
with the new 7 shaft design, adapter housing or tie rod

DURUMAX® T2MAX S$_{imilar}$ Twin Shaft Extruder Gearbox co-rotating

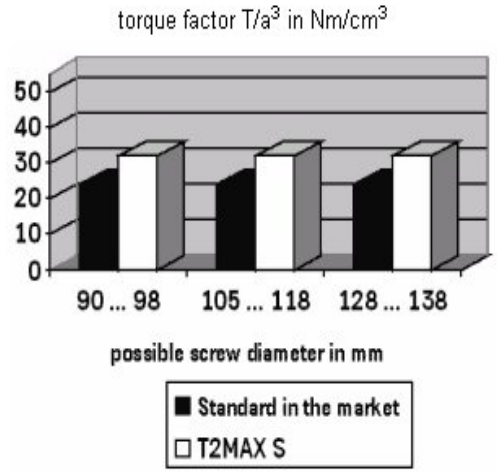
- The Strongest, Highest Torque Extrusion Gearbox in the Industry

gearbox size	T2MAX-90S	T2MAX-103S	T2MAX-133S
centre distance	76 mm	84 mmn	110 mmn
n_1	1.750 min^{-1}	1.750 min^{-1}	1.750 min^{-1}
n_2	1.200 min^{-1}	600 min^{-1}	600 min^{-1}
P_M	1.888 kW	1.275 kW	2.863 kW
T_{2N}	14.048 Nm	18.967 Nm	42.592 Nm
T_{2NW}	7.024 Nm	9.483 Nm	21.296 Nm
F_{axW}	159 kN	208 kN	347 kN

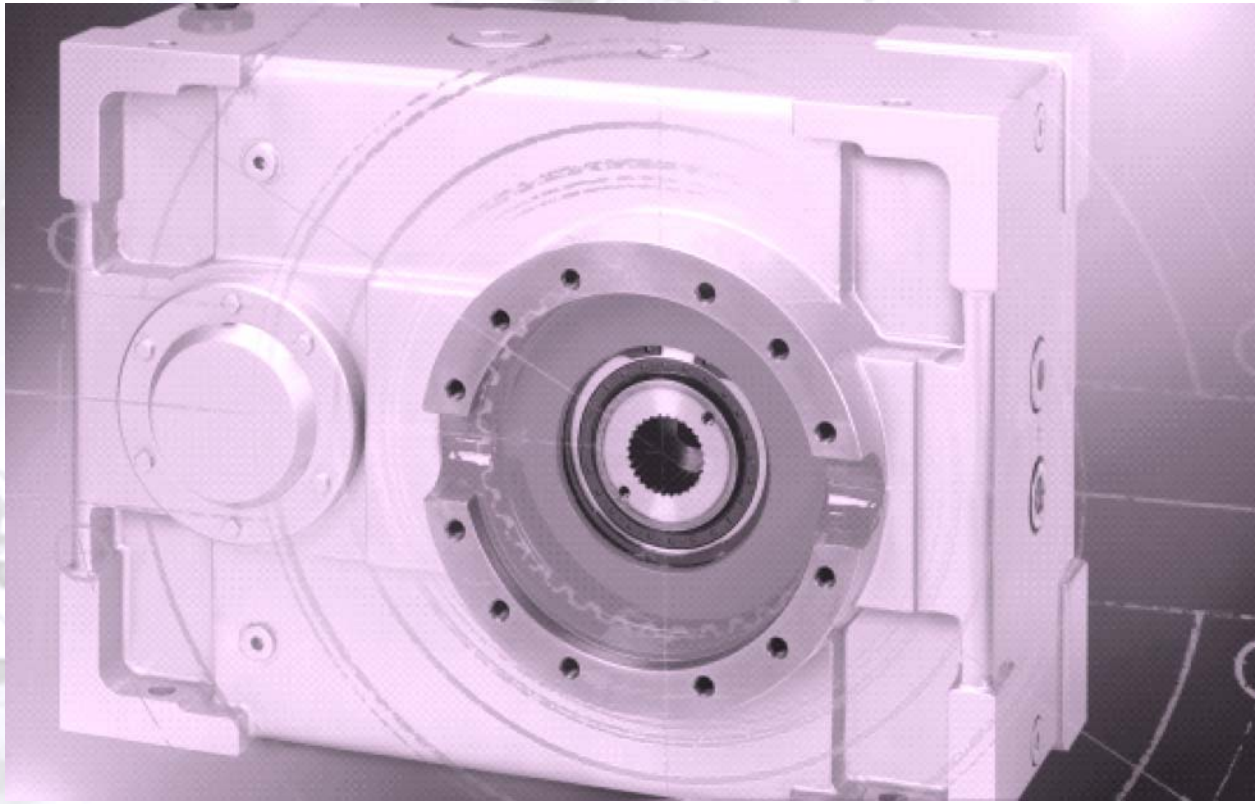
Legend:

n_1 = input speed P_M = motor power [kW] T_{2NW} = output torque per shaft [Nm]

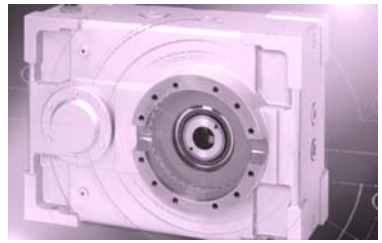
n_2 = output speed T_{2N} = total output torque [Nm] F_{axW} = axial force per shaft [kN]



DURUMAX® S2 Single Shaft Extruder Gearbox



DURUMAX® S2 Single Shaft Extruder Gearbox



- Developed especially for the requirements and interests of extrusion

Engineering:

- Modern gearbox design equipped with two-stage spur gears Direct or V-belt drive
- Ratios of i = 6 to 25
- Brand name bearings from manufactures such as INA, FAG or SKF
- Splash lubrication with integrated oil reservoir for emergency running properties.
- Injection lubrication for increased requirements
- Cooling of vertical and horizontal models by integrated cooling pipes for the most applications, external lubrication system on demand
- Cylinder and screw connections according to customer requirements

On request we supply following features:

- Screw removable from the backside through the gearbox
- Monitoring devices for backpressure, screw speed and oil temperature
- Bell housing for mounting the motor directly at the gearbox
- We can put your companies logo on the gearbox housing
- Gearbox supplied with final coating

DURUMAX® S2 Single Shaft Extruder Gearbox

Power Ratings

P_M = motor power [kW]
T_2 = output torque [Nm]
F_{axW} = allowable axial force per shaft [kN]
n_2 = output speed [min-1]

Gearbox Size			S2-20		S2-30		S2-40		S2-50		S2-60		S2-70	
i	n_1 [rpm]	n_2 [rpm]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]
6,3	1.000	159	347	6	391	7	1.200	21	1.267	22	1.633	28	2.907	50
	1.500	238	232	6	391	10	1.200	31	1.267	33	1.633	42	2.907	75
	2.000	317	173	6	323	11	932	32	1.267	44	1.227	42	2.400	83
	2.500	397	139	6	259	11	745	32	1.100	48	987	43	1.913	83
8	1.000	125	400	5	600	8	1.200	16	1.867	25	2.667	36	3.933	54
	1.500	188	333	7	567	12	1.200	25	1.867	38	2.267	46	3.933	80
	2.000	250	250	7	423	12	1.200	33	1.733	47	1.700	46	3.267	89
	2.500	313	200	7	340	12	992	34	1.387	47	1.360	46	2.600	89
9	1.000	111	400	5	600	7	1.200	15	1.453	18	2.667	32	3.000	36
	1.500	167	370	7	600	11	1.200	22	1.453	26	2.667	48	3.000	55
	2.000	222	279	7	497	12	1.200	29	1.453	35	2.033	49	3.000	73
	2.500	278	223	7	399	12	1.067	32	1.453	44	1.647	50	2.767	84
10	1.000	100	400	4	600	7	1.200	13	1.867	20	2.667	29	-	-
	1.500	150	397	6	600	10	1.200	20	1.867	31	2.667	44	-	-
	2.000	200	297	6	597	13	1.200	26	1.867	41	2.200	48	-	-
	2.500	250	239	7	477	13	1.200	33	1.813	49	1.767	48	-	-
11,2	1.000	89	400	4	600	6	1.200	12	1.867	18	2.667	26	5.333	52
	1.500	134	400	6	600	9	1.200	18	1.867	27	2.667	39	5.333	78
	2.000	179	333	6	600	12	1.200	23	1.867	36	2.500	49	4.267	83
	2.500	223	267	6	521	13	1.200	29	1.867	45	2.000	49	3.433	84
12,5	1.000	80	400	3	600	5	1.200	10	1.867	16	2.667	23	5.333	47
	1.500	120	400	5	600	8	1.200	16	1.867	24	2.667	35	5.333	70
	2.000	160	373	7	600	10	1.200	21	1.867	33	2.667	47	4.700	82
	2.500	200	297	6	560	12	1.200	26	1.867	41	2.133	47	3.767	82
14	1.000	71	400	3	600	5	1.200	9	1.867	15	2.667	21	-	-
	1.500	107	400	5	600	7	1.200	14	1.867	22	2.667	31	-	-
	2.000	143	400	6	600	9	1.200	19	1.867	29	2.667	42	-	-
	2.500	179	357	7	600	12	1.200	23	1.867	36	2.400	47	-	-
16	1.000	63	400	3	600	4	1.200	8	1.867	13	2.667	18	5.333	36
	1.500	94	400	4	600	6	1.200	12	1.867	19	2.667	27	5.333	55
	2.000	125	400	5	600	8	1.200	16	1.867	25	2.667	36	5.333	73
	2.500	156	400	7	600	10	1.200	20	1.867	32	2.667	45	4.933	84
18	1.000	56	400	2	600	4	1.200	7	1.867	11	2.667	16	5.333	32
	1.500	83	400	4	600	5	1.200	11	1.867	17	2.667	24	5.333	48
	2.000	111	400	5	600	7	1.200	15	1.867	23	2.667	32	5.333	65
	2.500	139	400	6	600	9	1.200	18	1.867	28	2.667	40	5.333	81
20	1.000	50	400	2	600	3	1.200	7	1.867	10	2.667	15	5.333	29
	1.500	75	400	3	600	5	1.200	10	1.867	15	2.667	22	5.333	44
	2.000	100	400	4	600	7	1.200	13	1.867	20	2.667	29	5.333	58
	2.500	125	400	5	600	8	1.200	16	1.867	25	2.667	36	5.333	73

DURUMAX® S2 Single Shaft Extruder Gearbox

Power Ratings

P_M = motor power [kW]
T_2 = output torque [Nm]
F_{axW} = allowable axial force per shaft [kN]
n_2 = output speed [min-1]

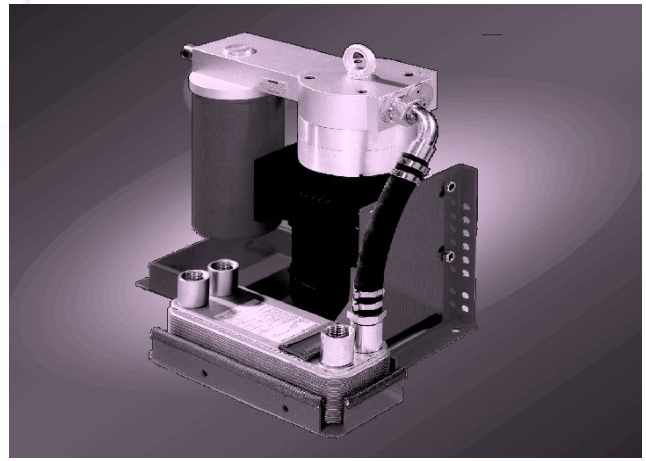
Gearbox Size			S2-90		S2-110		S2-120		S2-130		S2-150		S2-200	
i	n_1 [rpm]	n_2 [rpm]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]	T_2 [Nm]	P_M [kW]
6,3	1.000	159	5.867	102	10.767	186	-	-	-	-	-	-	-	-
	1.500	238	4.900	127	7.187	187	-	-	-	-	-	-	-	-
	2.000	317	3.667	127	-	-	-	-	-	-	-	-	-	-
	2.500	397	-	-	-	-	-	-	-	-	-	-	-	-
8	1.000	125	7.333	100	14.500	198	13.200	180	-	-	-	-	-	-
	1.500	188	6.533	134	9.667	198	8.800	180	-	-	-	-	-	-
	2.000	250	4.900	134	7.253	198	-	-	-	-	-	-	-	-
	2.500	313	-	-	-	-	-	-	-	-	-	-	-	-
9	1.000	111	-	-	14.667	178	15.913	193	26.667	323	33.633	408	-	-
	1.500	167	-	-	11.967	218	10.600	193	22.433	408	22.433	408	-	-
	2.000	222	-	-	8.987	218	-	-	-	-	-	-	-	-
	2.500	278	-	-	-	-	-	-	-	-	-	-	-	-
10	1.000	100	8.000	87	14.667	160	-	-	-	-	-	-	38.933	425
	1.500	150	7.333	120	12.633	207	-	-	-	-	-	-	25.967	425
	2.000	200	5.500	120	9.467	207	-	-	-	-	-	-	-	-
	2.500	250	4.400	120	-	-	-	-	-	-	-	-	-	-
11,2	1.000	89	10.000	97	-	-	20.000	195	26.667	260	40.000	390	-	-
	1.500	134	8.533	125	-	-	14.267	208	26.667	390	27.433	401	-	-
	2.000	179	6.433	125	-	-	10.700	208	-	-	-	-	-	-
	2.500	223	-	-	-	-	-	-	-	-	-	-	-	-
12,5	1.000	80	10.000	87	14.667	128	20.000	175	26.667	233	40.000	349	-	-
	1.500	120	9.733	127	14.667	192	15.433	202	26.667	349	31.567	413	-	-
	2.000	160	7.300	127	11.333	198	11.567	202	23.667	413	23.667	413	-	-
	2.500	200	5.853	128	9.067	198	-	-	-	-	-	-	-	-
14	1.000	71	10.000	78	14.667	114	20.000	156	26.667	208	-	-	51.200	399
	1.500	107	10.000	117	14.667	171	18.600	217	26.667	312	-	-	34.133	399
	2.000	143	7.567	118	12.833	200	13.967	218	26.667	416	-	-	-	-
	2.500	179	6.033	118	10.267	200	-	-	-	-	-	-	-	-
16	1.000	63	10.000	68	14.667	100	-	-	-	-	40.000	273	61.800	421
	1.500	94	10.000	102	14.667	150	-	-	-	-	38.667	395	41.200	421
	2.000	125	9.567	130	14.000	191	-	-	-	-	28.967	395	30.933	422
	2.500	156	7.667	131	11.200	191	-	-	-	-	-	-	-	-
18	1.000	56	10.000	61	14.667	89	20.000	121	26.667	162	40.000	242	-	-
	1.500	83	10.000	91	14.667	133	20.000	182	26.667	242	40.000	364	-	-
	2.000	111	10.000	121	14.667	178	15.700	190	26.667	323	31.567	383	-	-
	2.500	139	8.067	122	13.500	205	12.567	190	-	-	-	-	-	-
20	1.000	50	10.000	55	14.667	80	20.000	109	26.667	145	40.000	218	66.667	364
	1.500	75	10.000	82	14.667	120	20.000	164	26.667	218	40.000	327	49.667	406
	2.000	100	10.000	109	14.667	160	18.933	207	26.667	291	38.633	421	37.267	406
	2.500	125	9.733	133	14.667	200	15.167	207	-	-	-	-	-	-

TA Oil Lubrication and Cooling Units

- Our tailor made oil cooling and lubrication units ensure optimum lubrication of our DURUMAX® gearboxes and a efficient heat elimination in every range of performance.

Features:

- ☞ For every application the right dimensioned oil cooling and lubrication unit
- ☞ Wide range of standard units consisting of:
  - electrical driven oil-pump
  - heat-exchanger
  - pressure switch
  - oil-filter
- ☞ Each unit can be adjusted individually e.g. with
  - switchable double oil-filter with impurification display
  - thermometer, manometer
  - thermostat valve for cooling water flow



Technical Details:

Type	Cooling Capacity [kW]	Circulating Oil Quantity [l/min]
TA 2,5-6-320	2,5	6
...	...	...
TA 265-700-320	265	700

Applications

MUTAX® Worm Gear Sets an Worm Gearboxes

- MUTAX®-worm gear sets, which are in use for widely different applications under the roughest conditions as well as in highest precision, are a guarantee for quality and reliability - and this since **1918**.

MUTAX® Worm Gear Sets and Worm Gearboxes

As a member company of the Worm Gearbox Workshop of German Research Association Power Transmission Engineering (FVA), and supplier of worm gear sets for its research projects, Henschel has direct access to the newest developments in the worm gearbox field.

This product, which fulfils customer requirements and keeps running costs to a minimum, boasts solid contacts to the leading research universities, employs modern computing methods and newest computer-aided design

MUTAX® is a synonym for full interchangeability. That is, worm and wheel need not necessarily be manufactured as a pair. In fact, even after a period of years wheels can be replaced by new ones without requiring replacement of the worm.

MUTAX® involute gears offer decisive advantages:

- interchangeability
- unaffected by variations in centre distance
- specific contact pattern with simple tool forms
- precision-grindable flanks
- worm profile independent from grinding disc diameter
- on years accurate reproducibility of flank form and quality
- high degree of efficiency
- long service life
- high load capacity
- insensitive to shock loads and vibration damping
- low noise emission

MUTAX® worm gear sets

- MUTAX® SIMPLEX
  standard worm gear sets
- MUTAX® DUPLEX
  backslash adjustable worm gear sets

Your benefits

- Mutax® worm gear sets are available in all centre distances and ratios which are realisable with our wide range of tools
- Exact reproducibility of the flank form and the quality by master worm gear
- Variable interchangeability of each part of the set worm wheel and shaft can be replaced separately
- Best efficiency
- Unsusceptible to shock, vibration-reducing and robust
- High lifetimes and load capacities

Your benefits

- Insensibility of the gears against changes in centre distances (e.a. due to bending of the worm gear shaft)
- Concerted forming of the contact pattern with simple tool shapes
- Finest qualities by precise grinding of the flank geometry
- Procurement-/cost benefits due to the independence of the produced screw profile from the grinding disc

MUTAX® Simplex

Evolvent worm gear sets

Technichal Details		Scope
Input power	P1	0,5 to 850 kW*
Ratio	i	4 to 100 (single stage)
Center distance	a	65 to 1.000 mm
Output torque	T2	100 to 350.000 Nm**

*0.7 to 1140HP **75 to 258000 lbf-ft

Worm gear sets supplied by Henschel Antriebstechnik are to found in numerous mechanical engineering branches and machine installations for example presses, pumps, building machines

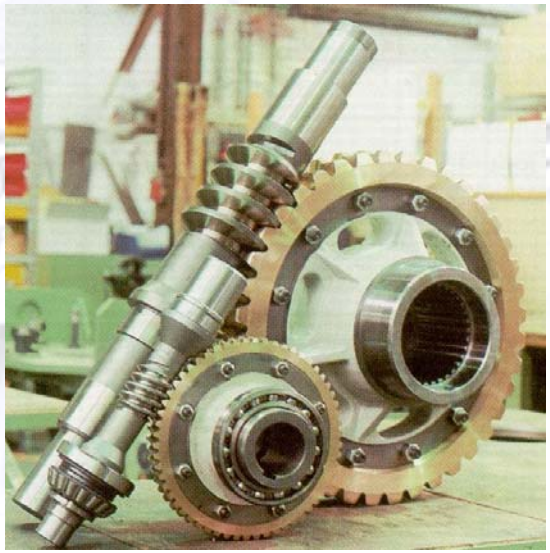
MUTAX® Simplex applications

- worm shaft with semifinished shaft ends and solid wheel

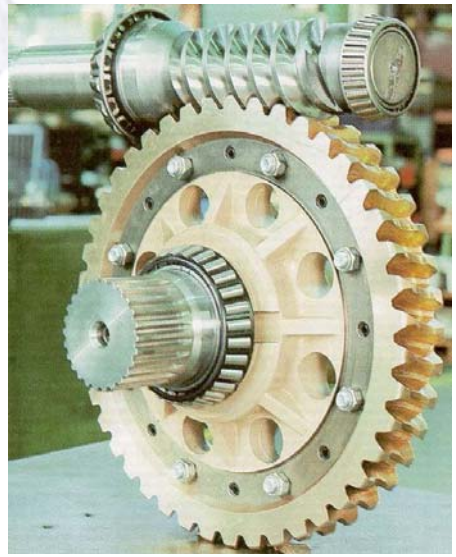
- worm shaft with finished customised shaft ends and worm wheel without fixation holes

MUTAX® Simplex applications

- worm shaft for reinforced bearing and worm wheel with hub for **hollow** shaft output drive

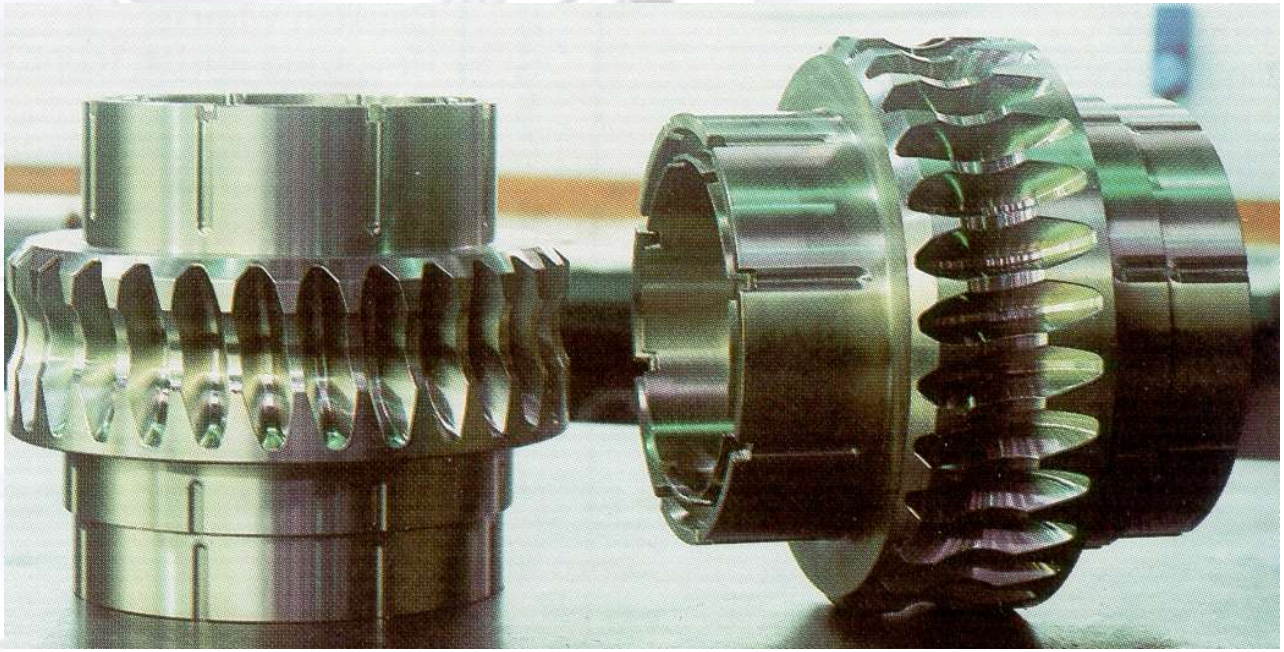


- worm shaft with fitted bearing and worm wheel hub for **solid** shaft output drive



MUTAX® Simplex applications

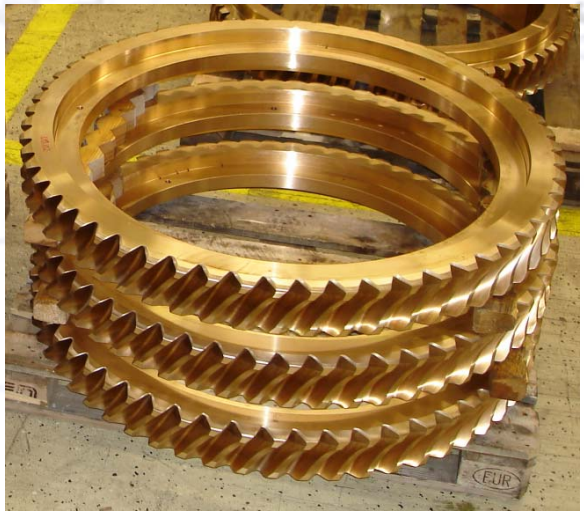
- Example of specially made products according to customer requirements

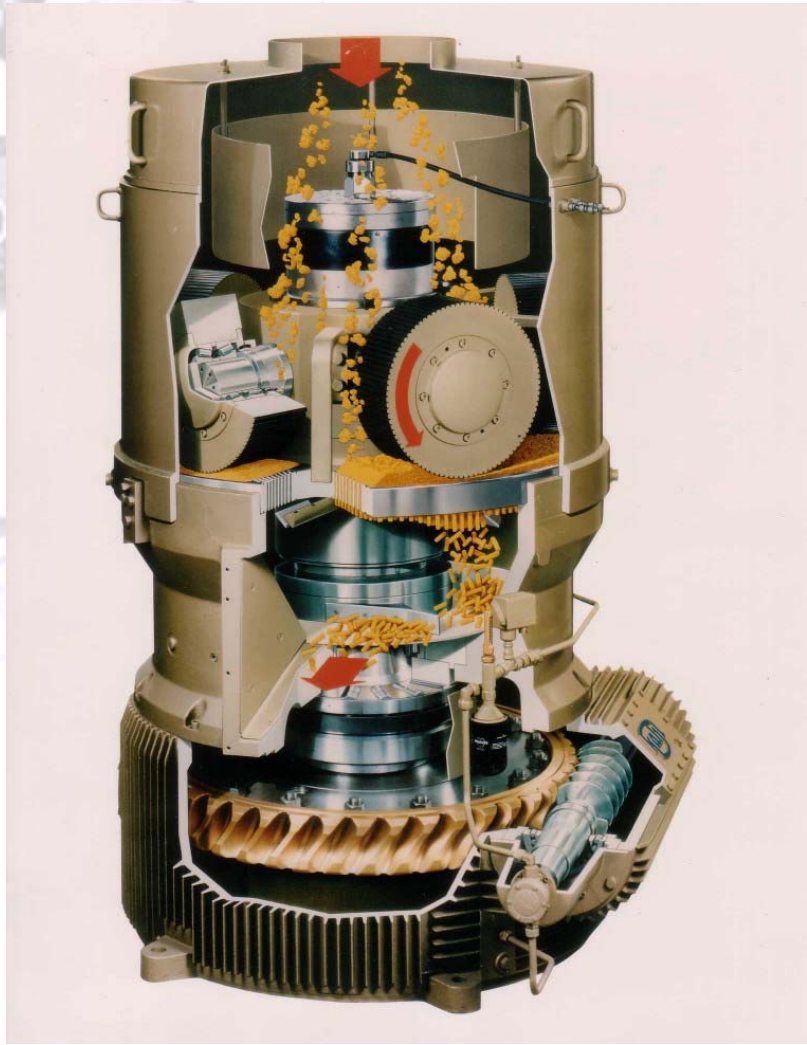


MUTAX® Simplex applications

Milling drive

centre distance
a=500mm

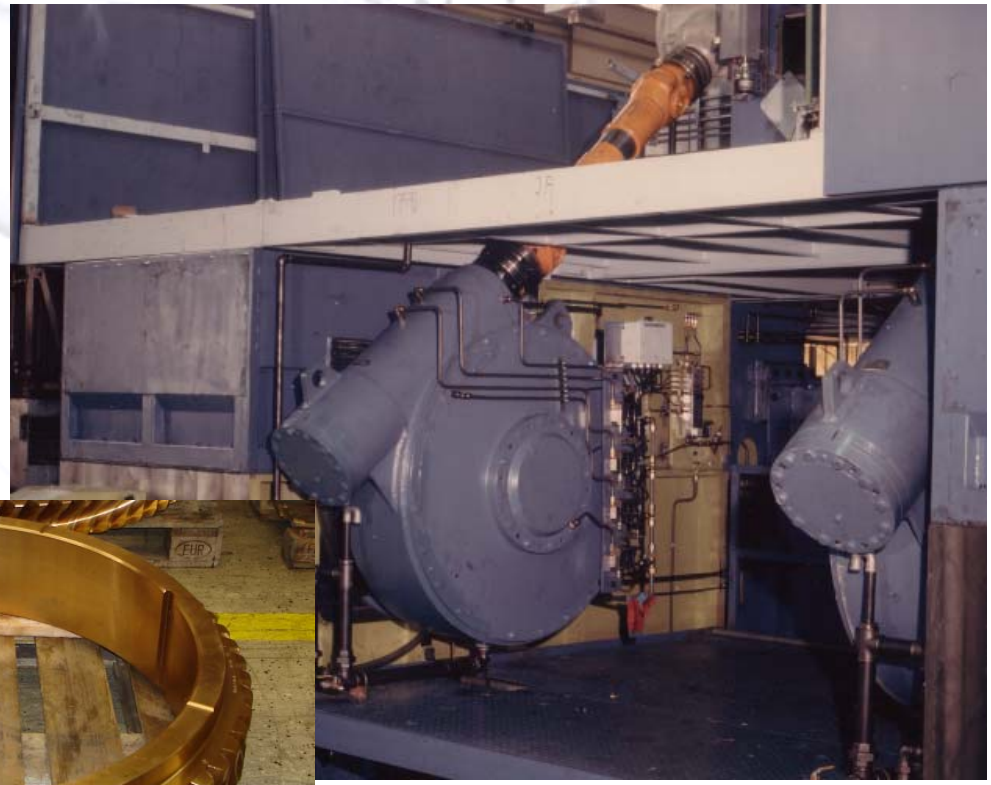




MUTAX® Simplex applications

Presse drive

centre distance
a=750mm



MUTAX® Simplex applications

Tube coating machine

centre distance
a = 107,03 mm

MUTAX® DUPLEX

- Evolvent worm gear sets, adjustable and corrective backlash

Technichal Details		Scope
Input power	P1	0,5 to 450 kW*
Ratio	i	4 to 100 (single stage
Center distance	a	65 to 1.000 mm
Output torque	T2	100 to 350.000 Nm**

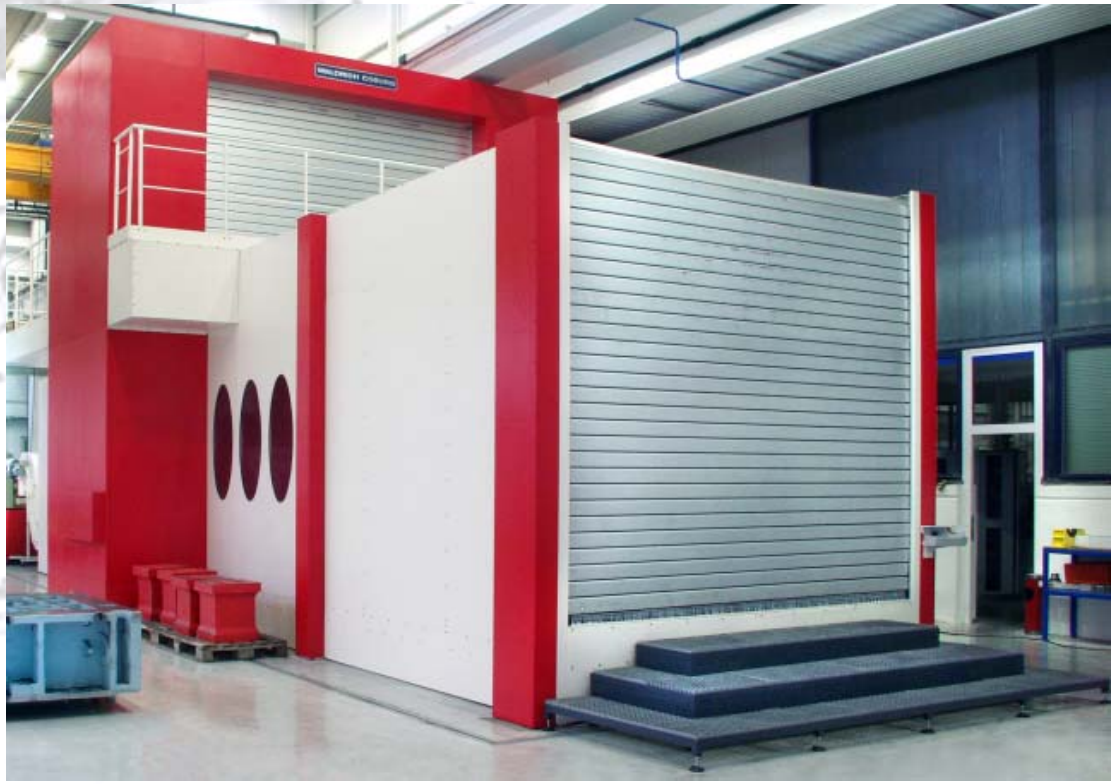
*0.7 to 1140HP **75 to 258000 lbf-ft

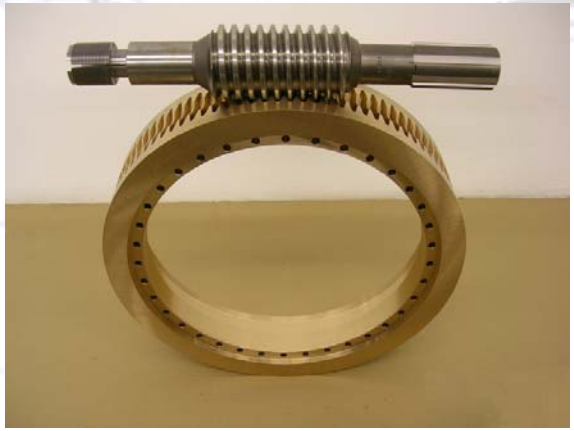
Worm gear sets supplied by Henschel Antriebstechnik are to found in numerous mechanical engineering branches and machine installations for example printing machines, measuring equipment, machine tools, turntables

MUTAX® Duplex applications

5-axle machining

centre distance
a = 251 mm





MUTAX® Duplex applications

Positioning of milling head

centre distance
a = 170 mm

MUTAX® Duplex applications

Rotary table drive

centre distance
a = 549 mm

Industrial sectors and main customers

SIMPLEX

- **Steel-mills** — SMS Group
- **Cranes** — KoneCranes; DEMAG Cranes; MAN TAKRAF; ThyssenKrupp Fördertechnik and various sea ports
- **Presses** — Schuler; Müller Weingarten; Komage
- **Mills** — Amandus Kahl
- **Wire and tubes** — KM-Europa; Friedrich Kocks; Schumag; Koch
- **Profiling** — Dreistern
- **Lifts & escalators** — ThyssenKrupp Elevator

Industrial sectors and principle customers

DUPLEX

- **Machine tools**
- **Milling heads**
- **Rotary tables**

Boehringer

Cross Hüller

AXA

Trumpf

TOS Varnsdorf

Atemag

Rückle

Peiseler

MUTAX® worm gearboxes

- MUTAX® SIMPLEX
  standard worm gearboxes
- MUTAX® DUPLEX
  backslash adjustable worm gearboxes

MUTAX® worm gearboxes

- MUTAX®-worm gearboxes in special design are developed together with the customer. They are tailor-made for every concrete case. The technical data for the gearbox's dimensions is determined together with the gearbox's design and the possible need for additional equipment.

- Scope of supply: Foot or shaft mounted design

  - with horizontal or vertical output shaft
  - with or without output or motor flange
  - single reduction or with an addition helical or worm reduction train

Your benefits

- Mutax®-worm gear boxes are optimally sized according to your predetermined load data and following required safety regulations
- Every intermediate ratio is also available between **i >= 5** and **<=100** (single-stage)
- Best **involute** worm toothing
- Everything from one source
- Prototype for series development and permanent further development

MUTAX® worm gearboxes for special applications

Aerial (antenna) drives

central drive unit for balling presses

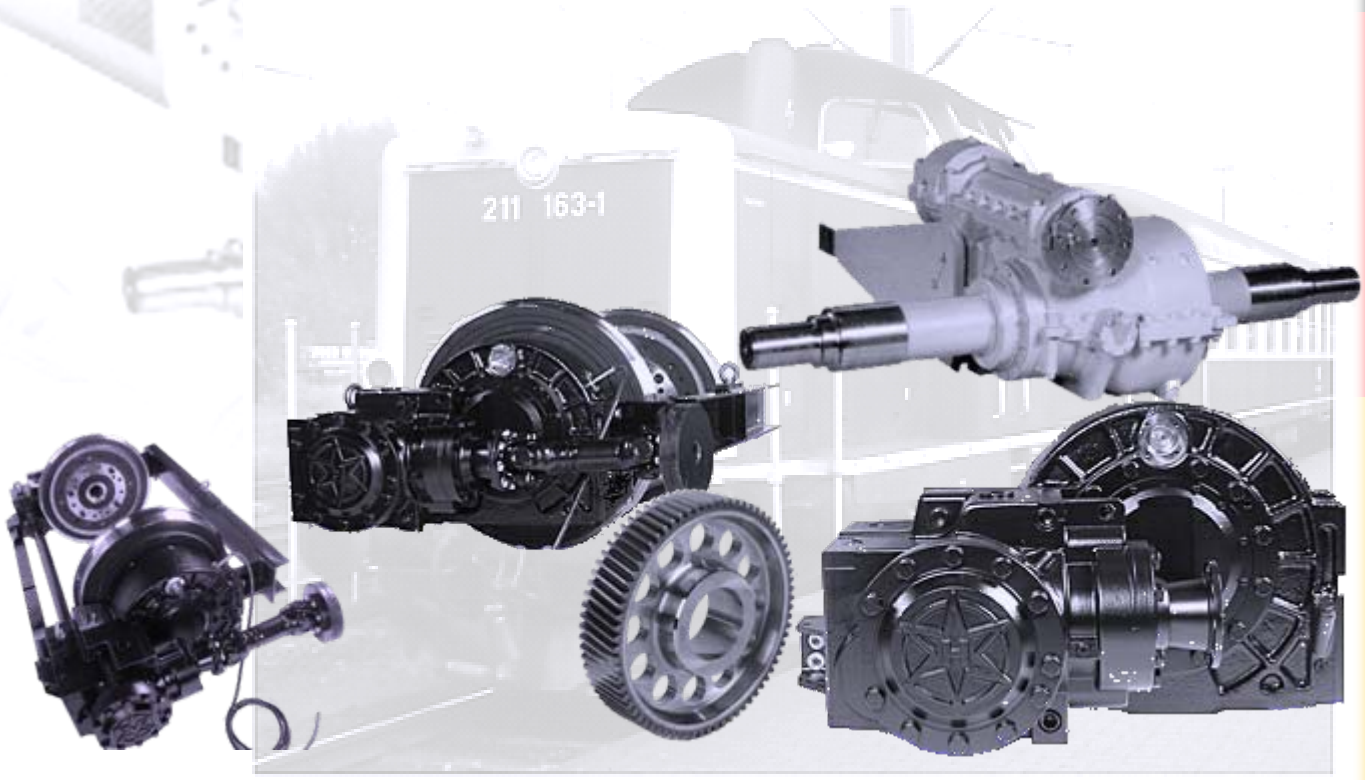
drive unit for escalators

non-magnetic sonar, free from backlash

special gearbox for offshore working platforms

DURUTRAIL® Locomotive Gearboxes and Gear Sets

- Competence in Railway Technology from a long Tradition



DURUTRAIL® Locomotive Gearboxes and Gear Sets

History of Railway Technology

1810	Founding of the company "Gießerei und Maschinenfabrik Kassel" by G. Chr. Carl Henschel (1759 - 1835)
1837	Commissioning of the plant at Holländischer Platz with the name "Henschel & Sohn, Cassel"
1848	First Henschel-Locomotive named "Drache" (Dragon) Carl Anton Henschel (1780 - 1861) starts with built up of locomotives Expansions of operation by Oscar Henschel (1837 - 1894)
1899	5.000. locomotive had been produced
1910	Centenary of the company Henschel, 10.000. locomotive had been produced
1923	20.000. locomotive had been produced
1931	Taking over the locomotive-manufacturing of Hannoversche Maschinenfabrik AG, Hannomag, Hannover (seit 1846); Henschel rises up to the biggest manufacturer of locomotives
1960	150-birthday; 30.000. Henschel-Locomotive had been produced for Ghana

DURUTRAIL® Locomotive Gearboxes and Gear Sets

History of Railway Technology

1976	Renamed in: "Thyssen Industrie AG Henschel" (shortform: Thyssen Henschel); 32.000. Locomotive had been produced for Egypt
1990	Founding a new company with Asea Brown Boverié under contribution of the locomotive part of Henschel and Wagon Union Renamed in: "ABB HENSCHEL AG" (3.600 employees and 500 million Euro sales volume)
1991	Delivery of the 33.000 Henschel-Locomotive ICE-traction unit to the German Natianal Railways (Deutsche Bundesbahn) The standard gearbox program had been sold to Flender. The manufacture of gearboxes, which is specialised into worm gearboxes, extruder gearboxes, locomotive axle gearboxes and custom gearboxes, remains to Henschel in Kassel.
2002	Renamed in "Henschel Industrietechnik GmbH" with products Power Transmisssion, Mixing Technology and Handling Systems.
2003	KERO Holding AG takes over Henschel Industrietechnik GmbH from ThyssenKrupp Technologies AG
2004	Spin-off HENSCHEL Antriebstechnik GmbH
2006	MBO of HENSCHEL Antriebstechnik by Matthias Henke and Dr. Jörg Kremer

DURUTRAIL® Locomotive Gearboxes and Gear Sets

- Our customers appreciate the partnership and competence of Henschel Antriebstechnik:

  1. Competent advice on and completion of customer specified power transmission solutions
  2. Testing and offering of general system solutions
  3. Service

DURUTRAIL® Locomotive Gearboxes and Gear Sets

Your Advantages

- Specialist and qualified partner of railway technology
- Best price-performance ratio
- Spare parts for axle gearboxes
  - according to drawings
  - or acc. to samples
- Procurement of spare parts
  (spur gears, driving wheel sets, spare parts for divider gearbox and axle gearbox)

DURUTRAIL® Locomotive Gearboxes and Gear Sets

Your Advantages

- We guarantee you a maximum in service life and running capacity for a minimum in maintenance and repair costs
- Compact construction and low noise emission
- Thick-walled housing made of spheroidal graphite iron, cast steel iron or grey cast iron
- Vibration reducing housing design
- Maximum safety of operation
- Adaptability to customer requirements

DURUTRAIL® Railway Technology in Perfection

Gearbox Hotline

Service Hotline 24 h

0049 561 801 6118

Department DURTRAIL®

- quick and customer orientated transaction
- short reaction time

- mounting and production capacity
- high expenditure for research and development
- close collaboration with leading companies in the field of bearing, sealing and lubrication technics
- technology and cost leadership

Gearbox Center

- world-wide technician dispatches
- short reaction time (24h Germany, 48h Europe / USA and 72h world)
- full-service and gearbox exchange programme

Gearbox Service

DURUTRAIL® Tradition in the Locomotive Industry



- Locomotive gearboxes supplied by Henschel since 1960

1. Type AK/AKV size 13, 17, 18, 20 for locomotive type DHG 300...1200	more than 1.300 units
2. Type AK/AKV size 18, 20, 22 for locomotive type DH(G) 500...5400	more than 1.100 units
3. Torque converter Typ SWG and SWB size 240...500 for speeds from 240 up to 500 HP	more than 60 units
4. Axle gearbox for speeds from 500 up to 2550 HP	more than 1.200 units

DURUTRAIL® Tradition in the Locomotive Industry

- Our customers are located in the following countries:

Europe

Germany, Denmark, Yugoslavia, Sweden, Spain, Russia, Greece, Italy, Norway, Austria, Switzerland

Asia

India, China, Thailand, Indonesia, Sri Lanka, Iraq

Africa

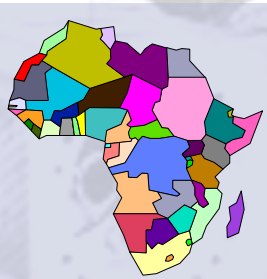
Congo, Kenya, Egypt, Sudan, Uganda, Liberia, Mali,

Ivory Coast, Ghana, Nigeria, Senegal, Tanzania,Togo, Zaire

Australia

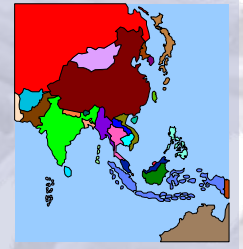
DURUTRAIL® Tradition in the Locomotive Industry

Africa
811



Ivory Coast/ Burkina Faso	37
Egypt	479
Ghana	53
Kenya	56
Tanzania	42
Uganda	59
Congo	8
Liberia	17
Nigeria	15
Zambia	19
Senegal	4
Sudan	76
South Africa	10
Togo	2
Zaire	8

Asia
443



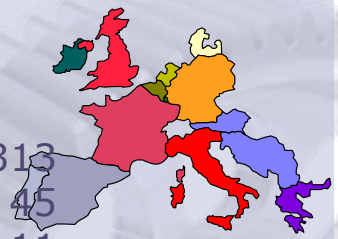
Bangladesh	21
India	53
Indonesia	91
Iraq	82
Iran	2
Sri Lanka	61
Thailand	69
PR China	34

DURUTRAIL® Tradition in the Locomotive Industry

Central-/South America
17

Argentina	2
Brazil	11
Costa Rica	4

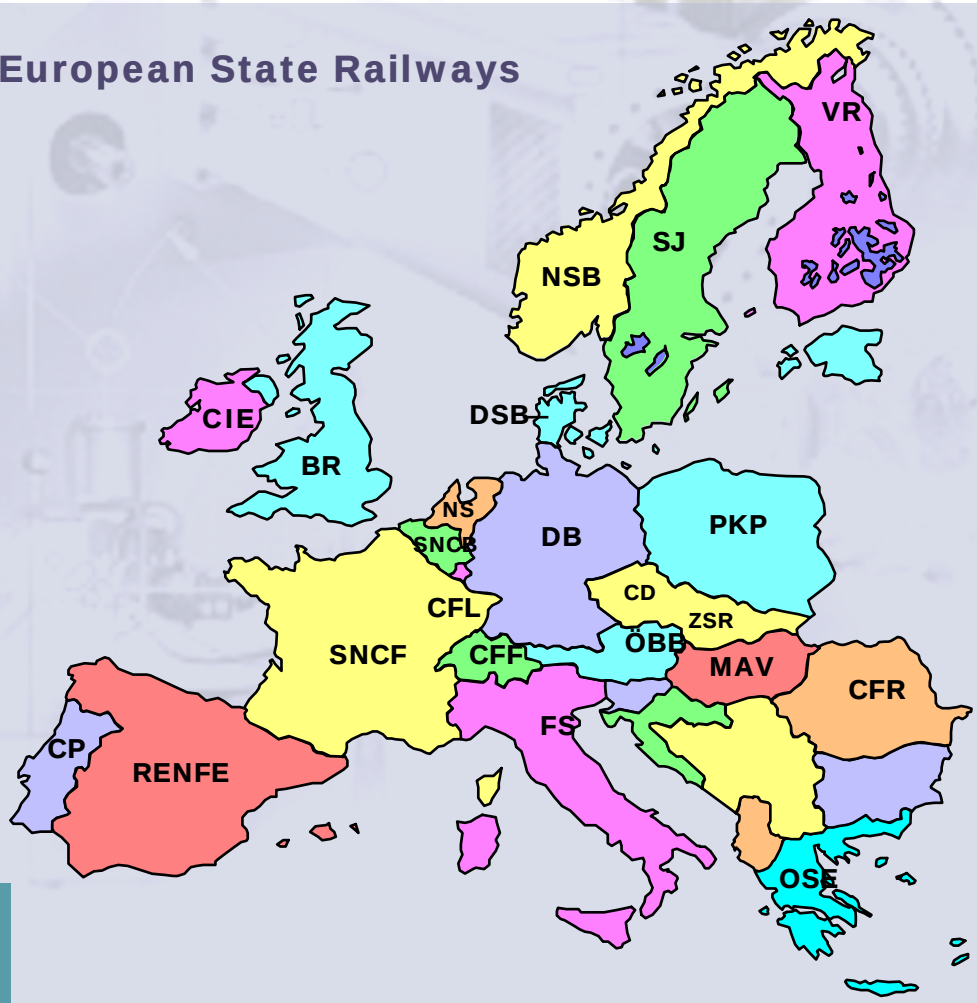
Europe
2655



Germany	2313
Denmark	45
Bulgaria	11
CSSR	2
Italy	33
Luxembourg	6
Netherlands	10
Austria	38
Portugal	6
Rumania	5
Sweden	59
Greece	26
Switzerland	42
Spain	28
Turkey	2

DURUTRAIL® Tradition in the Locomotive Industry

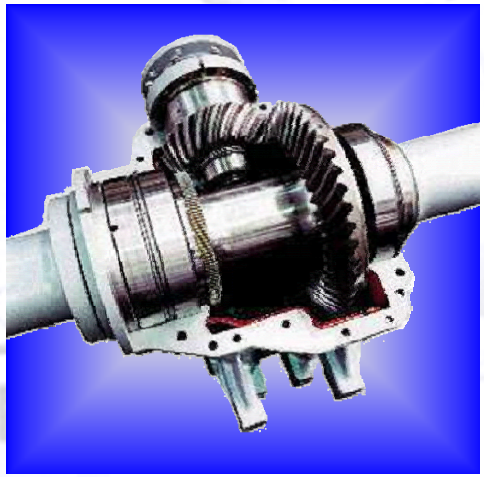
European State Railways



BDZ	: Bulgarian State Railways
BR	: British Rail
CD	: Czech Railways
CFF	: Swiss Federal Railways
CFL	: Luxembourg Railways
CFR	: Romanian State Railways
CIE	: Irish Rail
OSE	: Hellenic Railways Organisation
CP	: Portuguese Railways
DB	: German Railways
DSB	: Danish State Railways
FS	: Italian Railways
MAV	: Hungarian State Railways
NS	: Netherlands Railways
NSB	: Norwegian State Railways
ÖBB	: Austrian Federal Railways
PKP	: Polish State Railways
RENFE	: Spanish National Railways (AVE)
SJ	: Swedish State Railways
SNCB	: Belgian State Railways
SNCF	: French National Railways
VR	: Finish State Railways
ZSR	: Slovak Railways

DURUTRAIL® Locomotive Gearboxes and Gear Sets

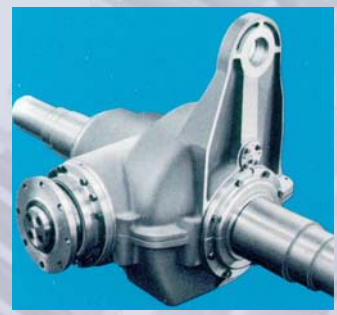
- Locomotive gearboxes and spare parts for axle gearboxes



DURUTRAIL® Locomotive Gearboxes and Gear Sets

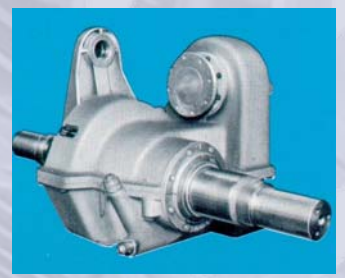
Single stage bevel gearbox AK

data		bandwidth
axle load in tons		10 to 20 t
axle shaft Ø	D	160 to 200 mm
ratio	i	2,4 to 3,8



Two stage helical-bevel gearbox AKV

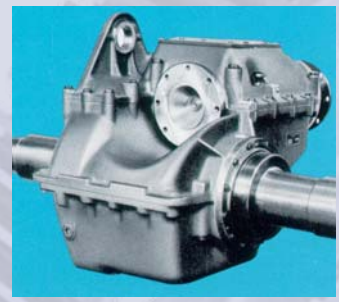
data		bandwidth
axle load in tons		10 to 15 t
axle shaft Ø	D	160 to 170 mm
ratio	i	2,6 to 5,5



DURUTRAIL® Locomotive Gearboxes and Gear Sets

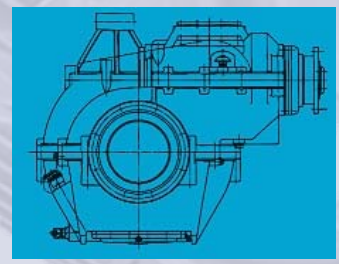
Two stage helical-bevel gearbox ATV

data		bandwidth
axle load in tons		16 to 24 t
axle shaft Ø	D	180 to 220 mm
ratio	i	2,9 to 4,72



Two stage helical-bevel gearbox RKS

data		bandwidth
axle load in tons		18 to 24 t
axle shaft Ø	D	180 to 220 mm
ratio	i	5,1 to 7,86



DURUTRAIL® Locomotive Gearboxes and Gear Sets

Two stage resp. three stage helical-bevel gearbox RKS-SO as well as RSKS-SO

data RKS-SO		bandwidth
axle load in tons		20 t
axle shaft Ø	D	200 mm
ratio	i	3,18

data RSKS-SO		bandwidth
axle load in tons		20 t
axle shaft Ø	D	200 mm
ratio	i	3,72 – 6,2

DURUTRAIL® Locomotive Gearboxes and Gear Sets

Applications

Diesel-Hydraulic Locomotives e.g. class 201, V 100.4 (DB)

Maximum speed:	90/100 km/h
Low gear	65 km/h
Tractive effort:	177 kN
Tractive effort on continuous rating	141 kN
Heating:	Steam boiler
Year of construction:	1958-1963

Scope of supply: RKS and RSKS gearboxes

DURUTRAIL® Locomotive Gearboxes and Gear Sets

Applications

Electric Locomotives e.g. class BR 145

Maximum speed:	140 km/h
Continuous rating:	4.200 kW
Tractive effort:	300 kN
Year of construction:	1997(-2000)
Producer:	Adtranz

Scope of supply: spur gears

DURUTRAIL® Locomotive Gearboxes and Gear Sets

Applications

Electri multiple units e.g. class 401

Maximum speed:	280 km/h
Continuous rating	4.800 kW
Acceleration (0-250 km/h)	280 s
Stopping distance (250-0 km/h)	4.820 m
Fast stopping distance (250-0 km/h)	2.300 m
Year of construction:	1989-1996

Scope of supply: spur gears

DURUTRAIL® Locomotive Gearboxes and Gear Sets

Applications

Diesel-hydraulic locomotives e.g. class BB 302 / 303

Scope of supply:
driving wheel sets
inclusive axle gearboxes
AK and AKV, spare parts
for divider gearbox
and axle gearbox

DURUTRAIL® Locomotive Gearboxes and Gear Sets

- Applications

Diesel locomotive type DHG300 from HENSCHEL

Scope of supply:

axle gearbox DURUTRAIL AK20

DURUTRAIL® Locomotive Gearboxes and Gear Sets

- Applications

Regional train Protos build by Fahrzeugtechnik Dessau AG

Scope of supply:

axle gearbox DURUTRAIL EMU 18,5-4,8

DURUTRAIL® Locomotive Gearboxes and Gear Sets

Applications

100% low floor tram TMK 2200 for Zagreb, build by KONCAR

Scope of supply:

DURUTRAM low floor drive
NF 70-7,5

DURUTRAIL® Locomotive Gearboxes and Gear Sets

- Applications

Railcar V from Traktionssysteme Austria for subway line U1-U4, Vienna

Scope of supply:

gear sets

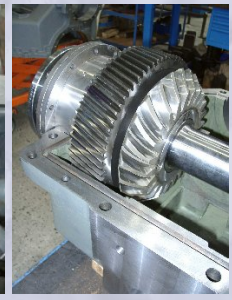
DURUTRAIL® Locomotive Gearboxes and Gear Sets

- Applications

Damage Report and Overhauling





DURUTRAIL® Locomotive Gearboxes and Gear Sets

References

Deutsche Bahn DB

ALSTOM

KONČAR

SIEMENS

EKOSTAHL GRUPPE COCKERILL SAMBRE

EISENBAHN UND HÄFEN GMBH

Reuschling Wir sorgen für Bewegung

WIENER LINIEN

BOMBARDIER TRANSPORTATION BOMBARDIER

GKU

RHEINBRAUN

Gmeinder Getriebe- und Maschinenfabrik GmbH

traktionssysteme austria

VGF

MAN TAKRAF

Fahrzeugtechnik Dessau

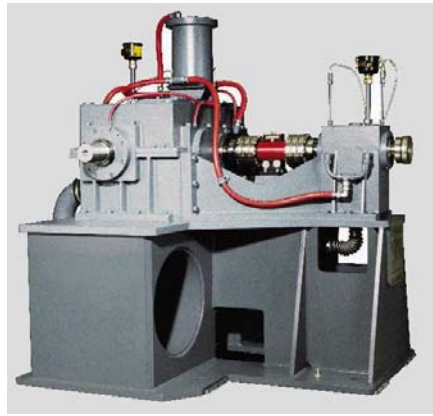
DURUHIT® Custom Made Special Gearboxes and High Speed Gearboxes for Motor Test Benches

DURUHIT® special gearboxes, which are in use for widely different applications under the roughest conditions, are a guarantee for quality and reliability. They are applied to all areas of mechanical and power engineering and are used as power transmitters, speed reducers and/or rotation changers.

DURUHIT® gearboxes in special design are developed together with the customer. They are **tailor-made** for every concrete case. The technical details for the gearbox's dimensions is determined together with the gear-box's design and the possible need for additional equipment. Complete driving systems originate from DURUHIT® gearboxes through the fitting of gearbox stages, prime movers, brakes, oil lubrication systems, electric control systems, etc. This means that the customer needs to make less telephone calls and is relieved from coordination and adaptation work that costs time and money. Optimum drive solutions can be developed for new systems and existing drive concepts can be optimised.

Special gearboxes for special application - With Henschel experience to the drive solution

High-speed gearboxes for Formular 1 motor testing benches



In racing and motorsport in particular our high-speed test stand gearboxes ensure that the teams are in pole position. Test stand trials at maximum speed, probing the power limits are imperative for the further development of racing car engines.

Very fine, high quality gearing and special bearings adapted to the high speed and load provide smooth, malfunction-free operation.

Today we achieve powers of P= 1,000 kW and speeds of up to n_{1max}=22,000 min^{-1}.

Special gearboxes for special application - With Henschel experience to the drive solution

High-speed gearboxes for motor testing benches

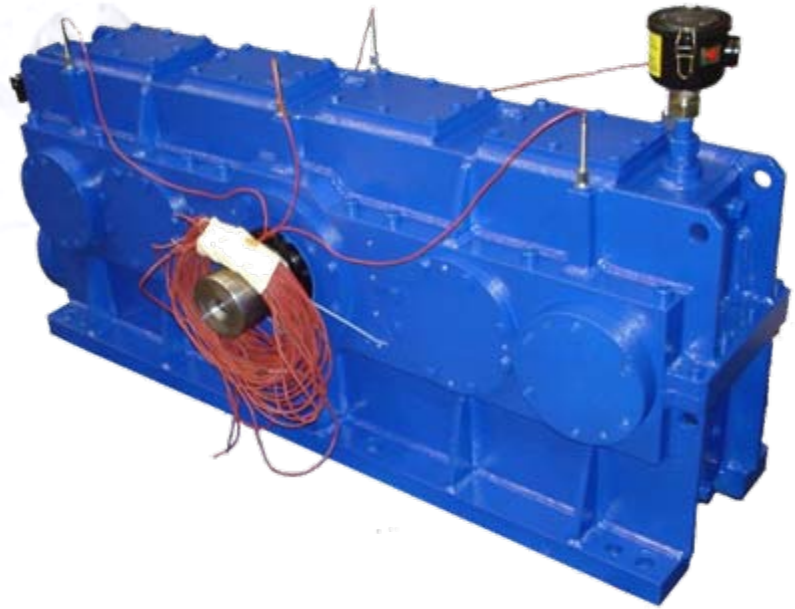
For a vehicle-motor testing bench HENSCHEL supplies a gearbox set consisting of two spur gearboxes and one 4-step indexing gearbox.

Each of the spur gearboxes offer a power rating of 576 kW at maximum 4.500 rpm. The indexing gearbox is designed for a torque rating of 22.647 Nm.

Special gearboxes for special application - With Henschel experience to the drive solution

Summation gearboxes for motor testing benches

Single stage spur summation gearbox for a motor testing bench with a central input shaft and two output shafts. Both output shaft supply a torque rating of of 1.400 Nm at 2.250 rpm.



Special gearboxes for special application - With Henschel experience to the drive solution

Winch drive for oil drilling platform - Operation under extreme conditions

For oil drilling rigs Henschel designed a special gearbox with oil lubrication system unit with special requirements. The heavy duty winch drive for this application covers two different operation conditions:

1) Keep back the mass of the drill pipes during the drilling process (feeding drive)
   - 2-stage Planetary input gearbox and 2-stage, disengageable spur gear set
   - Input power : 39 kW
   - output speed: 2,5 rpm
2) Quick pulling to put off the pipes out of the bore hole
   - Two double stage spur gear sets with two switchable ratios
   - 2 x Input and 1 output shaft
   - Input power: 2 x 850 kW
   - Output speed: 52 rpm
   - Max. torque: 214.000 Nm

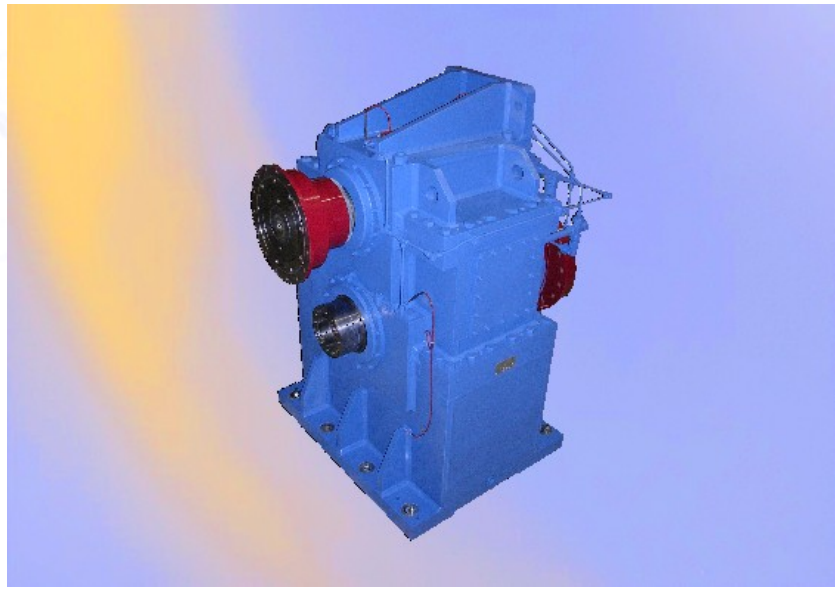
These two main operation condition together with the explosion proof oil lubrication system, the output shaft bearing for the force of the rope drum, the welded steel housing for extreme low operation temperatures of -40° Celsius are meet with one gear unit. These special designed gear unit with a weight of 9 tons grant a long lifetime and reliable function under extreme conditions.

Special gearboxes for special application - With Henschel experience to the drive solution

Spur gearbox for waterpower turbines

Our high-efficiency gear units for water turbines gear up the turbine speed into the required generator speed. Special thrust bearings in the gear unit absorb the forces from the turbine in both axial directions.

- input power P_1 = 1.100 kW
- input speed n_1 = 187,5 rpm
- output speed n_2 = 720,0 rpm
- ration i = 3,85



Special gearboxes for special application - With Henschel experience to the drive solution

Gearboxes for special-purpose vehicles

Custom made gearboxes for different types of special vehicles are our daily business.
We create gear units in close co-operation with the customer´s R+D department.

- Design topics: Small space, low noise, long lifetime, suitable coupling system, safe sealing system a.s.o

Example:

Generator drive with cooling fan and high elastic couplings system.
Max. output speed of 11.000 rpm

Special gearboxes for special application - With Henschel experience to the drive solution

Generator drives for railway cars

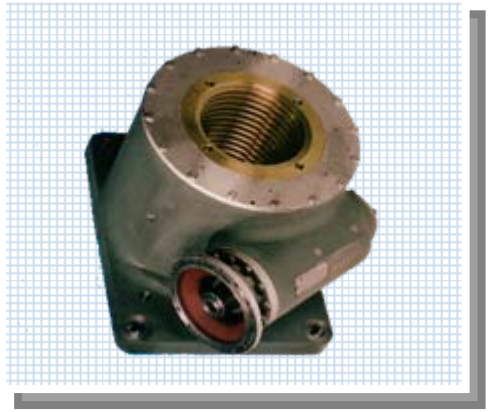
For generating electrical power in railway passanger cars we have developed a generator gearbox which is driven by the car´s axle. Scope of supply: Axle gearbox with elastic coupling, cardan shaft, safty clutch, torque arm and axle clemping elements

- Power	P	=	45 kW at 900 rpm (axle speed)
- Input torqe	T_{1max}	=	1779 Nm
- Ratio	i	=	1/3,737 (19/71)
- Output speed	n_2	=	3632 rpm (generator speed)
- Train speed	V_{max}	=	160 km per h
- Weight gearbox	m	=	442 kg

Special gearboxes for special application - With Henschel experience to the drive solution

Worm gearset for Offshore rigs

36 gearboxes keep the oil platform in position after elevating. Backlash, cold tough housing material, reliability and low maintenance are gearbox requirements.



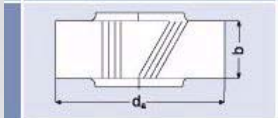
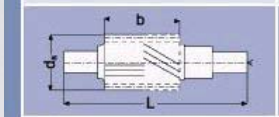
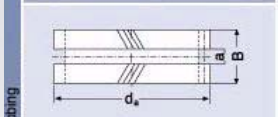
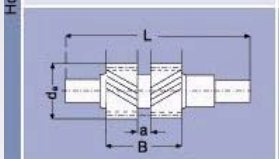
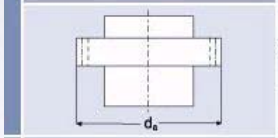
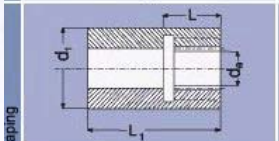
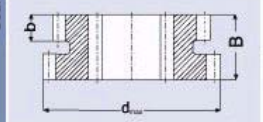
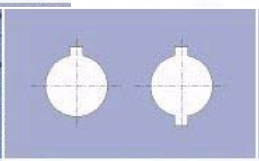
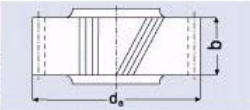
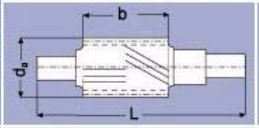
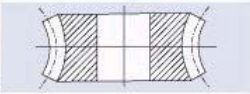
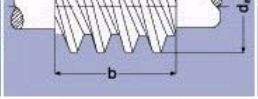
Job Order Production and Heat Treatment

Job Order Production and Heat Treatment

- HENSCHEL Antriebstechnik, your qualified partner in services around gear technology

From gear manufacturing, measurement, heat treatment and balancing, as per your design datas or counseled by our design- and manufacturing engineers, your parts or systems will be manufactured as according to state of the art technology.

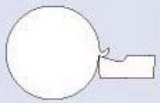
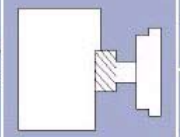
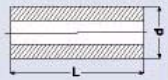
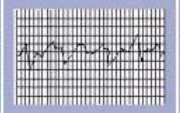
Job Order Production and Heat Treatment

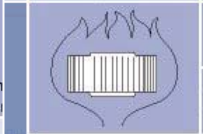
	Machining	Module	Tip circle-ø d_a	Dimensions	Comments
Hobbing		1 to 18	40 to 2000 mm	b = 800 mm max. 8 to	Spur gearing Helical gearing
		1 to 18	40 to 2000 mm	b = 800 mm max. 8 to	Spur gearing Helical gearing Centering with thread according to DIN 332
		1 to 18	40 to 2000 mm	b = 800 mm L = approx. 1200 mm, beyond this on request max. 8 to	Double helical gearing, dim. of the free clearance "a" with pitch angle - β 25°: a ≈ 8 times module, pitch angle above β 25°: a ≈ 10 times module
		1 to 18	40 to 2000 mm	B = 800 mm max. 8 to	Double helical g of the free clear "a" with pitch an β 25°: a ≈ 8 time pitch angle abo β 25°: a ≈ 10 tim Centering with t according to DI
		Spacing 3/8 " to 2 "	to 2000 mm		Chain sprockets multiple chain s
Gear shaping		0.8 to 8	to 300 mm	$L_{max.}$ =200 mm L_1 and d_1 on request	Internal gearing spur teeth Hollow shafts
		1 to 8	to 300 mm	$b_{max.}$ = 200 mm	External gearing spur teeth
		0.8 to 8	to 600 mm	$b_{max.}$ = 200 mm $d_{max.}$ = 750 mm	Internal gearing Special profiles Larger dimensio request
Groove drawing/shaping				Groove width 3 to 30 mm, groove length max. 600	Special profiles on request
Tooth flank grinding		1.5 to 24	35 to 1000 mm	$b_{max.}$ =750 mm b = dependent on angle β Weight max. 6 to	Spur and helical gearing
		1.5 to 24	35 to 1000 mm	$b_{max.}$ =750 mm L = to approx. 845 mm, beyond this on request b = dependent on angle β	Spur and helical gearing. Centering with thread
Worm gears/shafts		1.5 to 20		Center distance a = 40 to 1000 mm	Hobbing with worm gear mill All designs
		1.5 to 20	20 to 240 mm, can be ground to ø 320 mm	$b_{max.}$ = 665 mm	Worm milling All designs
		1.5 to 20	$d_{a\ max.}$ on request, can be ground to ø 320 mm	Max. workpiece Ø = 320 mm	Worm gridning All designs

- A modern machinery and a deep vertical manufacturing depth provide you allways with precision parts as per your demand.

  Speed, flexibility and accuracy is our advantage

Job Order Production and Heat Treatment

	Machining	Equipment	Working ranges	Comments
Turning		Center lathe	ø to 370 mm and 1800 mm length, in the chuck up to 650 mm	Larger dimensions on request
		Vertical and horizontal lathe	ø to 1350 mm Workpiece height 900 mm	Larger dimensions on request
		CNC lathe	ø to 1350 mm and 2000 mm length, in the chuck up to 500 and 1000 mm	Wheels, shafts,flanges for series production machining
Boring		Boring, horizontal boring and milling	Clamping area 1000 x 1200 mm max. travel: vertical 1200 mm horizontal 1000 mm transverse 1200 m	Boring with shank diameter to 120 mm
		CNC boring and milling	Clamping area 1000 x 500 mm max. travel: vertical 1000 mm horizontal 530 mm transverse 500 m	
Grinding		Boring and circular grinding machine	Boring ø $d_{max.}$=1000 mm Workpiece length $L_{max.}$=1600 mm	
		Surface grinding on circular table	ø 1600 mm L = 40	
		Thread grinding	ø 200 mm L = 100	
Measuring		Testing machine Multiple coordinate measuring machine	Module 0.75 to 20 1000 mm diamete 400 mm tooth wid for helix gearing depending on angle Angle length max. 1500 mm measuring range 2000 x 1200 x 1000 mm Max. weight 1000 kg	measurment with diagram; all known measuring techniques can performed
Balancing		Balancing	Rotor weight max. = 700 kg Rotor diameter max. =1260 mm	Dynamic

	Machining	Equipment	Working ranges	Comments
Heat treatment		Vertical kiln	ø 800 x 1600 mm	Annealing, carburizing, hardening, tempering (to 950°C)
		Chamber furnace	850 x 1170 x 600 mm	Annealing, carburizing, hardening, tempering (to 950°C)
		Blasting plant	ø 1000 x 1500 mm	De-scaling
		Press	ø 200 x 2600 mm	Straightening (up to 100 t press force)
		Washing plant	ø 800 x 1200 mm	Washing

- Our quality is high. Henschel performs all surface treatments in a dedicated computer controlled hardening shop.

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Catalogues

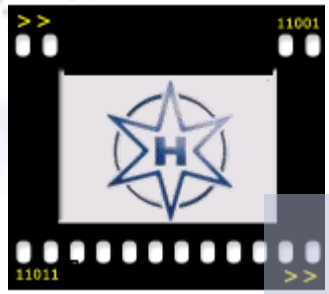
DURUMAX® Extruder Gearboxes

MUTAX®

DURUTRAIL®

DURUHIT®

Job Order Production & Heat Treatment



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