ZOLLERN

Solid metals. Fine solutions.

Drive Technology

Slewing gears

The ZOLLERN Group
ZOLLERN is one of the pioneers in the metal industry. At several locations in Europe, North America and Asia, 2,000 employees develop, produce and service a wide range of high-quality metal products. ZOLLERN supplies sophisticated solutions for a wide range of applications with its business areas of drive technology, investment casting, sand casting and forging as well as steel profiles.

Content	Side

Slewing Units

ZOLLERN Slewing Units
have proved highly successful under extreme operating conditions. Their principal features and most significant advantages are

- compact dimensions
- long operation life
- modular design of gear unit
- ease of maintenance
- high performance
- functional design

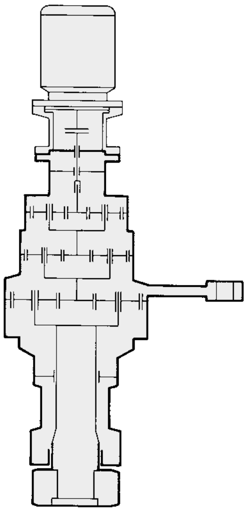
With these characteristics the machine designer will get a ready to install unit and will achieve economic solutions even in confined space conditions.

Potential applications

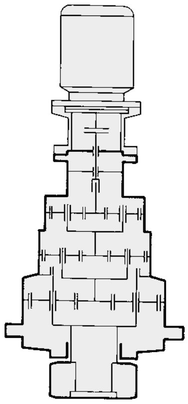
- mobile cranes
- material and working elevators
- shipboard and deck cranes
- dockyard and harbour cranes
- container gantries
- yaw & pitch drives for wind turbines
- construction cranes and conveyors
- loading and cargo handling cranes
- rescue and wrecker salvage trucks
- offshore cranes
- access platforms

ZOLLERN gears use components common to our complete range (Winches, Slewing Units, Industrial Gears, Free Fall Winches) giving the advantage of volume production: cost savings from standard parts, reduced lead times, tested and proven designs across the whole range and readily available spares for units in service.

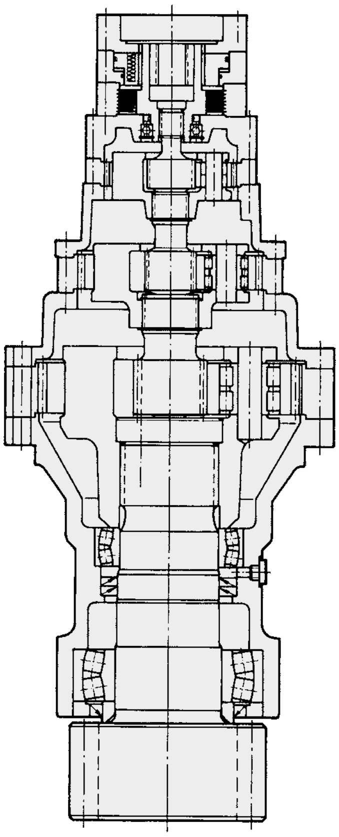
Features and design



Coaxial design
Three planetary stages
Ratios i = 46 to 177
Drive by electric motor
Long output shaft
Fastening by reaction torque arm
Input shaft and output shaft have the same direction of rotation



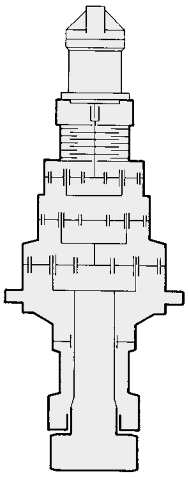
Coaxial design
Three planetary stages
Ratios i = 46 to 177
Drive by electric motor
Short output shaft
Input shaft and output shaft have the same direction of rotation.



Slewing Unit
Output torques from 1.400 to 1.550.000 Nm Ratios i = 17 to 1.209 (other ratios available on request). When determining the torque, the acceleration and the deceleration as well as wind effect and other induced loads must be taken into consideration (see page 9).

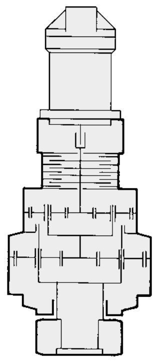
Rating
The output torques $T_{dyn\ max}$ mentioned in table page 10 refer to FEM I 3rd edition, collective load L2, duty cycle class T5, corresponding to 'transmission group M5'. Ambient temperature + 20°C. (FEM-Fédération Européenne de la Manutention).

Gear teeth design
Optimized for best possible tooth flank and root load capacity and minimum sliding speeds in accordance with DIN 3990. Externally toothed gears case hardened and ground, internal gears heat-treated and nitrided.



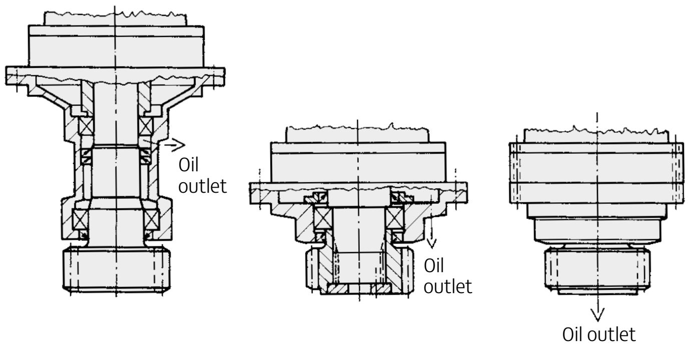
Coaxial design
Three planetary stages

Ratios i = 46 to 177
Drive by hydraulic motor
Long output shaft
Input shaft and output shaft have the same direction of rotation.

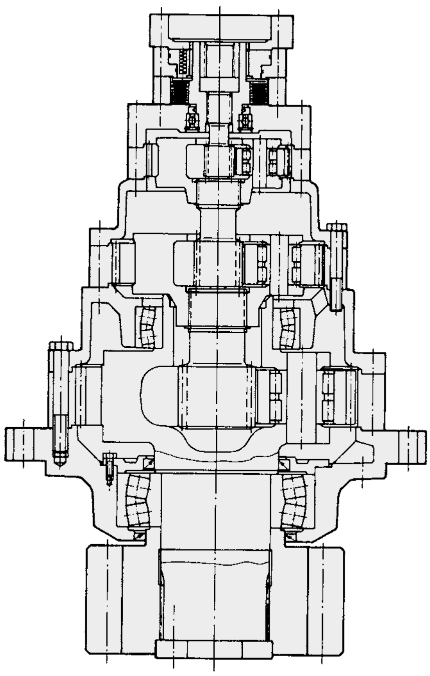


Coaxial design
Two planetary stages

Ratios i = 17 to 35
Drive by hydraulic motor
Short output shaft
Input shaft and output shaft have the same direction of rotation.



Lubrication
All gears and anti-friction bearings are splash lubricated. Output bearings are grease packed for lifetime operation –requiring no further service attention. Service intervals and recommended lubricants are given in the table on page 15. Oil level is checked by either dip stick or sight glass.



Efficiency
The efficiency per planetary stage is 98 % and for the output shaft bearing including sealing 99 %.
Example: Slewing gear with 2 planetary stages

$\eta_{total} = 0,98 \times 0,98 \times 0,99$
$= 0,95$

Bearings
All components carried in antifriction bearings. Needle roller bearings and cylindrical roller bearings in the planetary wheels. Generously dimensioned self aligning roller bearings in the output shaft housing, supporting the pinion.

Installation
Vertical or horizontal as specified

Features and design

Seals
The input is sealed by a radial shaft sealing ring with a dust lip

a) by two radial shaft sealing rings
b) by the grease packing in the output shaft housing
c) by another radial shaft sealing ring

so that safe protection against oil loss and against penetration of dirt and water is assured.

Input Options
ZOLLERN's modular system provides for hydraulic or electric motor input interfaces. Flange mounted or free shaft with key to DIN 5480.

Parking brake
Amply dimensioned spring-applied multi-disc parkingbrake, hydraulically released, to hold the slewing mass and to brake the slewing mass in case of emergency. Not to be used as a service brake.

Pressure	min. 15 bars
	max. 250 bars
Back pressure	max. 0,5 bar allowed

Please consult us if back pressure value exceeds this figure. Connecting line 8 x 1 tubing to DIN 2391 C, as short as possible.

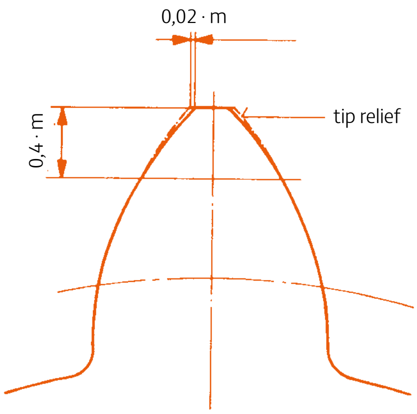
Service brake to hold and brake the slewing mass, hydraulically, pneumatically or mechanically operated (optional extra).

Eccentric adjustment
For accurate adjustment of backlash between the output pinion and the driven ring gear, the output shaft assembly can be provided with eccentric adjustment in relation to the flange and output pinion.

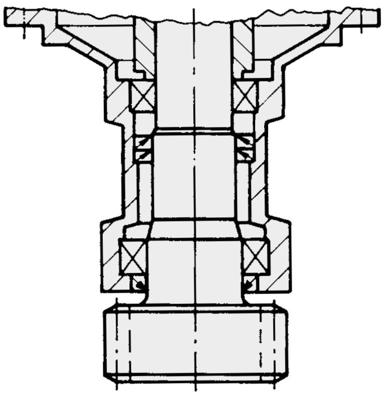
Eccentricity	Flange I	x = 2,5
	Flange II	x = 1,5
	Flange III	x = 1,5

Painting Primer
This is a specially developed multi-primer with a two-component zinc-dust epoxy resin base. Colour: Grey white. A two component epoxy resin is most suitable for the finish coat.

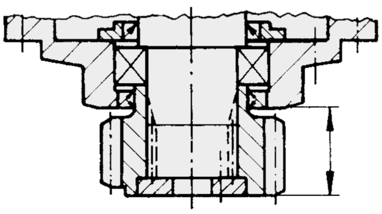
Output pinion
Addendum modification coefficient
x = + 0,5
Gear cutting quality 9e
Tip relief



Output Pinion Options



Forged one piece pinion shaft – standard



Splined Output Shaft
Pinion fitted with splines to DIN 5480.

Output Pinion Specification
Tough 42CrMo4V hardened gear steel tempered to 700–900 N/mm2 Teeth surface hardened HRC 57+7 (Case hardened Pinions with ground gearing available on request)

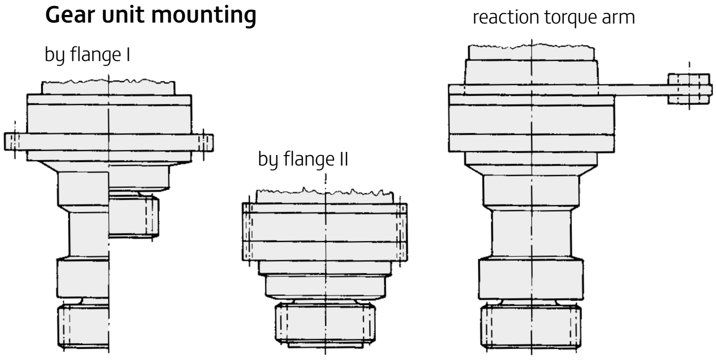
Selection of gear unit size
In order to determine the correct gear unit for a given application, the output torque T_{dyn} has to be multiplied with the factor k, page 10.

$T_{nom} = T_{dyn} \times k \leq T_{dyn_{max}}$

Working conditions
The slewing gears are designed for operation in European conditions or similar. Permissible oil temperatures -20°C to +70°C.

Working environment such as salt water, high salt level in air, dust, sludge, flying stones, overpressures, severe vibration or shock, excessive ambient temperatures or aggressive media have to be specified.

Gear unit mounting



Gear unit selection

Determination of the imposed maximum torques on the output pinion of the slewing gear unit can only be undertaken with the exact knowledge of the general view.

The following has to be considered acc. to section I, 3rd edition 1998

S_{MF} = maximum torque due to frictional forces
S_{MW8} = maximum torque due to wind effect 80 N/m²
S_{MS} = maximum torque due to inclined position
S_{MA} = maximum torque due to acceleration
S_{MW25} = maximum torque due to wind effect 250 N/m²
γm = amplifying coefficient of loading depending on mechanism group factor

Regular service without wind effect

$S_{M\,max\,I} = (\bar{S}_{MF} + \bar{S}_{MA})\,\gamma m$
S_{MF} = greatest value, $\bar{S}_{MF}$ = average value

Regular service with wind effect

$S_{M\,max\,II} = (\bar{S}_{MF} + \bar{S}_{MA} + \bar{S}_{MW8})\,\gamma m$
$S_{M\,max\,II} = (\bar{S}_{MF} + \bar{S}_{MW25})\,\gamma m$

Regular service with wind effect and inclined position

$S_{M\,max\,II} = (\bar{S}_{MW8} + \bar{S}_{MS})\,\gamma m$
$S_{M\,max}$ is the result of the most unfavourable combination of torques which may occur at the same time but not the sum of the maximum individual values.

Application Factor k for slewing gears

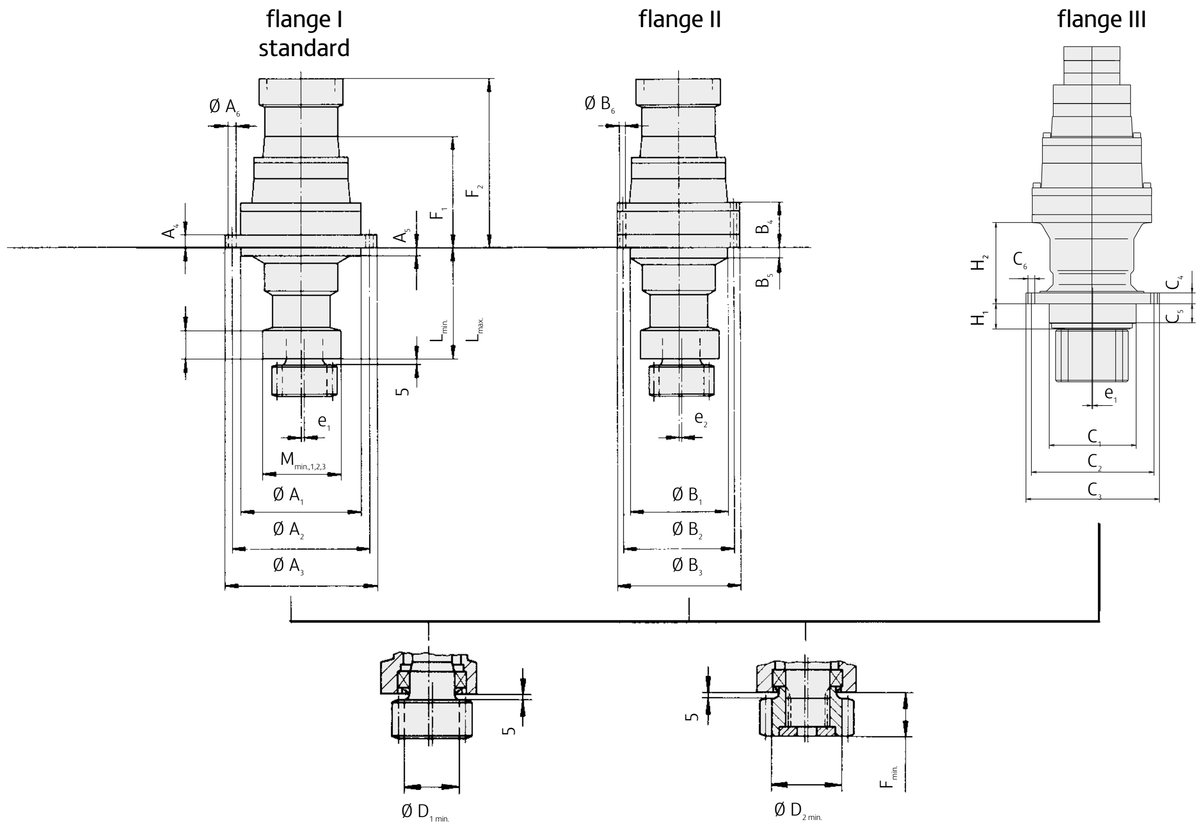
Running time classification	Symbol	T2	T3	T4	T5	T6	T7	T8
	Mean running time per day in hours, related to one year	over 0,25 to 0,5	over 0,5 to 1	over 1 to 2	over 2 to 4	over 4 to 8	over 8 to 16	over 16
	Life in hours 8 years, 200 days/year	400 to 800	800 to 1.600	1.600 to 3.200	3.200 to 6.300	6.300 to 12.500	12.500 to 25.000	25.000 to 50.000
Load conditions	Collective coefficient k_m	Drive unit class Application Factor k						
L1	to 0,125	M1 0,90	M2 0,93	M3 0,95	M4 1	M5 1,07	M6 1,18	M7 1,24
L2	0,125 to 0,250	M2 0,93	M3 0,95	M4 1	M5 1	M6 1,14	M7 1,24	M8 1,48
L3	0,250 to 0,500	M3 1	M4 1,05	M5 1,13	M6 1,18	M7 1,25	M8 1,48	M8 1,67
L4	0,500 to 1.000	M4 1,25	M5 1,3	M6 1,4	M7 1,48	M8 1,52	M8 1,65	M8 1,97

Classification guidance

According FEM section I 3rd edition, table T.2.1.3.5.

Type of appliance Designation	Particulars concerning nature of use (1)	Type of mechanism				
		Hoisting	Slewing	Luffing	Traverse	Travel
Erection cranes		M2 - M3	M2 - M3	M1 - M2	M1 - M2	M2 - M3
Stocking and reclaiming transporters	Hook duty	M5 - M6	M4	-	M4 - M5	M5 - M6
Stocking and reclaiming transporters	Grab or magnet	M7 - M8	M6	-	M6 - M7	M7 - M8
Workshop cranes		M6	M4	-	M4	M5
Overhead travelling cranes, pigbreaking cranes, scrapyard cranes	Grab oder magnet	M8	M6	-	M6 - M7	M7 - M8
Bridge cranes for unloading, bridge cranes for containers Other bridge cranes (with crab and/or slewing jib crane)	a) Hook or spreader duty b) Hook duty	M6 - M7 M4 - M5	M5 - M6 M4 - M5	M3 - M4 -	M6 - M7 M4 - M5	M4 - M5 M4 - M5
Bridge cranes for unloading, bridge cranes (with crab an/or slewing jib crane)	Grab or magnet	M8	M5 - M6	M3 - M4	M7 - M8	M4 - M5
Drydock cranes shipyard jib cranes, jib cranes for dismantling	Hook duty	M5 - M6	M4 - M5	M4 - M5	M4 - M5	M5 - M6
Dockside cranes (slewing, on gantry, etc.), floating cranes and pontoon derricks	Hook duty	M6 - M7	M5 - M6	M5 - M6	-	M3 - M4
Dockside cranes (slewing, on gantry, etc.), floating cranes and pontoon derricks	Grab or magnet	M7 - M8	M6 - M7	M6 - M7	-	M4 - M5
Floating cranes and pontoon derricks for very heavy loads (usually greater than 100 t)		M3 - M4	M3 - M4	M3 - M4	-	-
Deck cranes	Hook duty	M4	M3 - M4	M3 - M4	M2	M3
Deck cranes	Grab or magnet	M5 - M6	M3 - M4	M3 - M4	M4 - M5	M3 - M4
Tower cranes for building		M4	M5	M4	M3	M3
Derricks		M2 - M3	M1 - M2	M1 - M2	-	-
Railway cranes allowed to run in train		M3 - M4	M2 - M3	M2 - M3	-	-
Mobile cranes	Hook	M3 - M4	M2 - M3	M2 - M3	-	-

Technical Data



Nominal size ZHP	Output torque[1]		Input speed[2]	Flange mountings																							
				flange I								flange II								flange III							
	$T_{dyn\ max}$ (Nm)	$T_{stat\ max}$ (Nm)	$n_{max.}$ (rpm)	A_1 h_7	A_2 ±0,2	A_3	A_4	A_5	A_6	Number	Scrwe strength rating	B_1 h_7	B_2 ±0,2	B_3	B_4	B_5	B_6	Number	Scrwe strength rating	C_1 h_7	C_2 ±0,2	C_3	C_4	C_5	C_6	Number	Scrwe strength rating
3.13	1.400	2.100	3.000	180	210	240	20	15	11	12	8.8	-	-	-	-	-	-	-	-	140	200	220	18	10	13,5	12	8.8
3.15	3.850	5.770	3.000	210	240	270	20	15	13,5	24	8.8	178	200	220	74	15	11	18	10.9	180	200	220	20	15	11	24	10.9
3.19	7.150	10.700	3.000	250	290	320	25	15	13,5	24	8.8	210	235	260	85	18	13,5	24	10.9	210	235	260	25	15	13,5	24	10.9
3.20	11.000	16.500	3.000	285	325	355	25	20	13,5	24	10.9	230	258	282	87	24	13,5	24	10.9	230	258	282	25	60	13,5	24	10.9
3.22	19.000	28.500	3.000	320	365	395	30	20	17,5	24	10.9	265	296	326	112	20	17,5	24	10.9	255	345	375	30	65	17,5	24	10.9
3.24	25.000	37.500	2.800	355	400	430	30	20	17,5	24	10.9	295	330	368	111	20	22	24	8.8	280	330	368	30	85	22	24	10.9
3.25	33.000	49.500	2.800	390	440	475	35	20	22	24	8.8	325	362	400	121	20	22	24	10.9	280	395	430	35	63	22	24	10.9
3.26	45.000	67.500	2.800	430	475	515	40	20	22	24	10.9	365	400	437	136	20	22	24	10.9	365	400	440	35	25	22	24	10.9
3.27	61.000	91.500	2.800	465	525	575	45	20	26	24	8.8	395	435	480	151	20	26	24	10.9	395	435	480	45	51	26	24	10.9
3.29	91.000	136.500	2.300	550	600	660	50	30	26	24	10.9	460	510	565	170	20	33	24	8.8	435	485	540	45	52	33	24	8.8
3.31	150.000	225.000	2.300	630	680	740	50	30	26	24	10.9	530	580	635	204	30	33	24	10.9	-	-	-	-	-	-	-	-
3.32	230.000	345.000	2.300	680	750	820	55	30	33	24	8.8	580	635	685	235	30	33	24	10.9	-	-	-	-	-	-	-	
3.33	290.000	435.000	1.900	Available on request																							
3.34	370.000	555.000	1.900	Available on request																							
3.36	590.000	885.000	1.900	Available on request																							
3.38	1.100.000	1.650.000	1.900	Available on request																							
3.40	1.550.000	2.325.000	1.900	Available on request																							

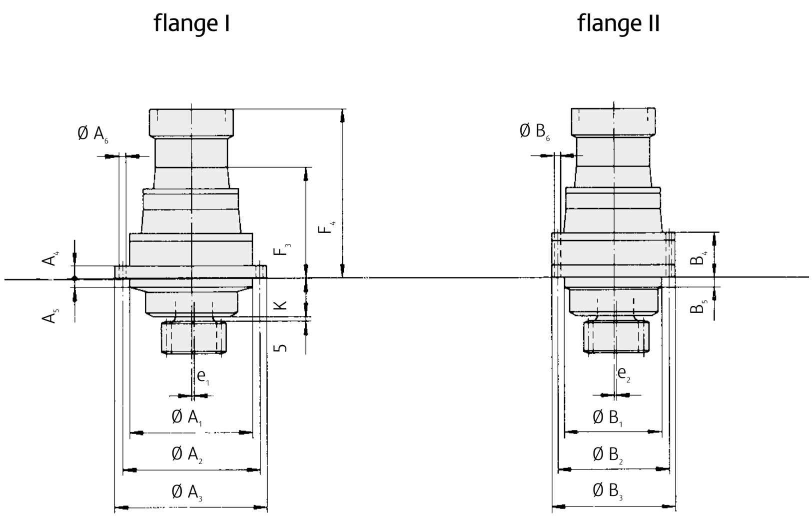
[1] According to FEM section I

Drive unit class M5
Load conditions L2 (P = const. / n_{ab} = 15 rpm)
Running time classification T5

[2] Changes possible depending on motor size

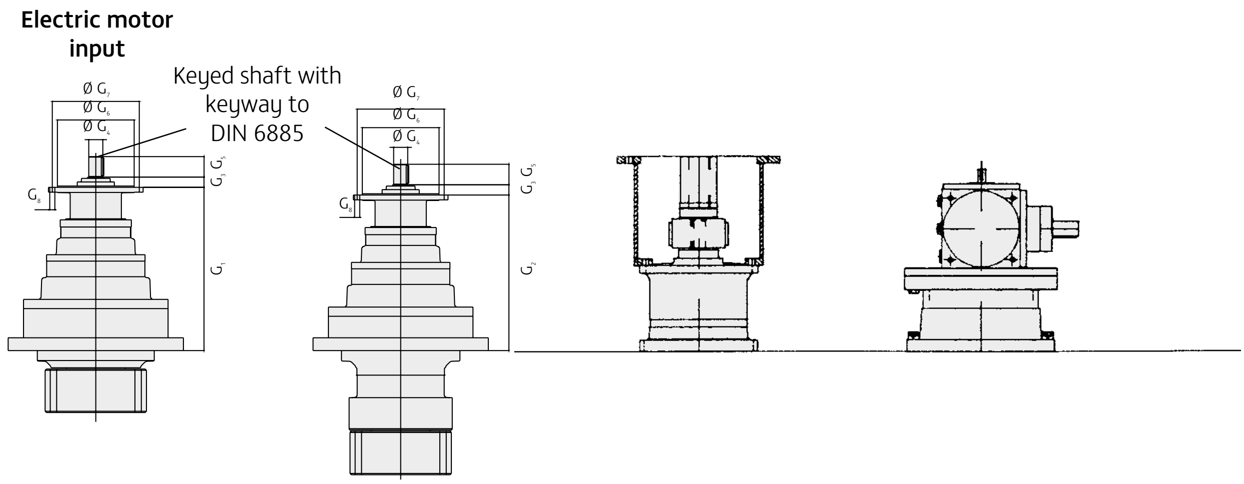
ZOLLERN have a policy of continuous product improvement, and details may be changed without notice.

Technical Data



Nominal size ZHP	Output drive												Hydraulic motor input											
													2-stage				3-stage				4-stage			
	K	H_1	H_2	$L_{min.}$	$L_{max.}$	$M_{min.}$ h_7	N	$F_{min.}$	$D_{1min.}$	$D_{2min.}$	e_1	e_2	F_1	F_2[2)] appr.	F_3	F_4[2)] appr.	F_1	F_2[2)] appr.	F_3	F_4[2)] appr.	F_1	F_2[2)] appr.	F_3	F_4[2)] appr.
3.13	50	42	44	140	400	125	51	45	60	80	1,2	-	127	256	-	-	-	-	-	-	-	-	-	-
3.15	55	55	118	170	800	150	55	55	85	100	1,5	1,5	149	299	184	334	226	355	261	390	-	-	-	-
3.19	70	70	125	190	800	180	62	80	110	115	2,5	1,5	180	348	215	383	271	421	306	456	-	-	-	-
3.20	75	75	163	230	1.300	210	78	80	115	135	2,5	1,5	191	374	231	414	301	451	341	491	370	499	410	539
3.22	90	78	165	250	1.300	240	85	85	135	160	2,5	1,5	226	415	276	465	346	514	396	564	437	587	487	637
3.24	100	100	200	300	1.300	270	108	100	150	180	2,5	1,5	226	415	281	470	350	518	405	573	442	592	497	647
3.25	100	78	261	330	1.300	270	116	100	160	190	2,5	1,5	257	471	327	541	393	576	463	646	504	654	574	724
3.26	100	100	255	340	1.300	270	125	110	170	205	2,5	1,5	286	500	371	585	425	608	510	693	537	705	622	790
3.27	110	110	285	350	1.700	340	131	115	180	225	2,5	1,5	319	598	409	688	480	669	570	759	600	768	690	858
3.29	140	190	244	420	1.700	380	172	145	220	240	2,5	1,5	350	629	-	-	525	739	615	829	660	843	750	933
3.31	160	-	-	450	1.700	420	170	165	240	280	2,5	1,5	379	-	-	-	575	789	685	899	714	903	824	1.013
3.32	170	-	-	480	1.800	450	170	-	-	-	2,5	1,5	432	-	-	-	648	927	783	1062	796	1010	931	1.145
3.33	Available on request																							
3.34	Available on request																							
3.36	Available on request																							
3.38	Available on request																							
3.40	Available on request																							

[2)] Changes possible depending on motor size

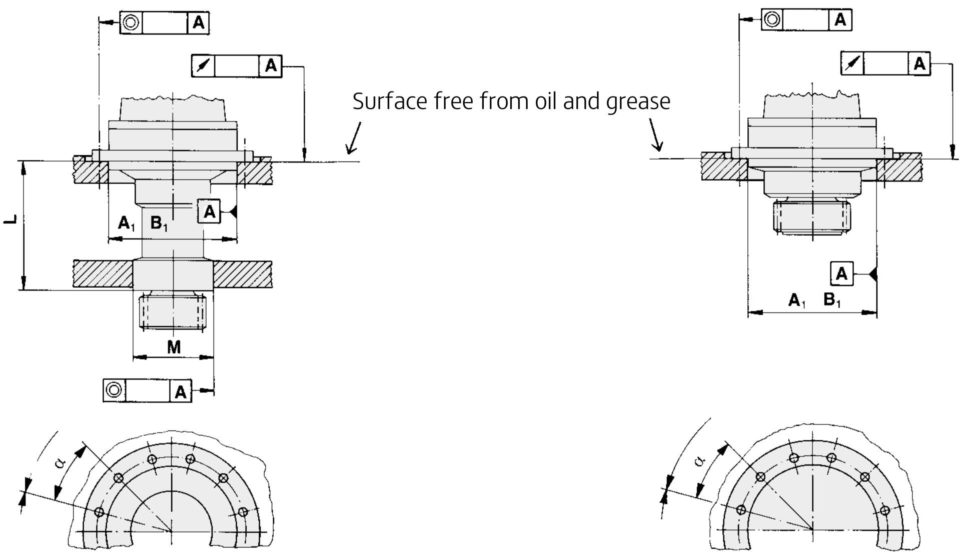


Nominal size ZHP	Electric motor input																							
	2-stage								3-stage								4-stage							
	G_1	G_2	G_3	G_4 k_6	G_5	G_6 h_6	G_7 ±0,2	G_8	G_1	G_2	G_3	G_4 k_6	G_5	G_6 h_6	G_7 ±0,2	G_8	G_1	G_2	G_3	G_4 k_6	G_5	G_6 h_6	G_7 ±0,2	G_8
3.13	280	-	38	28	30	200	228	8*M12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.15	284	319	38	38	45	250	280	8*M12	335	370	38	28	30	200	228	8*M12	-	-	-	-	-	-	-	-
3.19	314	349	38	42	50	250	280	8*M12	406	441	38	28	30	250	280	8*M12	457	492	38	28	30	200	228	8*M12
3.20	348	388	40	42	50	300	340	8*M16	434	474	38	38	45	250	280	8*M12	487	527	38	28	30	200	228	8*M12
3.22	381	431	40	48	56	300	340	8*M16	480	530	38	38	45	250	280	8*M12	572	622	38	28	30	250	280	8*M12
3.24	381	436	40	48	56	300	340	8*M16	480	535	38	38	45	250	280	8*M12	572	627	38	28	30	250	280	8*M12
3.25	440	510	40	55	65	360	415	8*M16	550	620	40	42	50	300	340	8*M16	637	707	38	38	45	250	280	8*M12
3.26	468	553	40	60	75	360	415	8*M16	579	664	40	48	56	300	340	8*M16	668	753	38	38	45	250	280	8*M12
3.27	523	613	40	60	75	450	500	8*M16	607	697	40	48	56	300	340	8*M16	706	796	38	38	45	250	280	8*M12
3.29	-	-	-	-	-	-	-	-	704	794	40	55	65	360	415	8*M16	814	904	40	42	50	300	340	8*M16
3.31	-	-	-	-	-	-	-	-	734	844	40	60	75	360	415	8*M16	845	955	40	48	56	300	340	8*M16
3.32	-	-	-	-	-	-	-	-	821	956	40	60	75	450	500	8*M16	942	1077	40	55	65	360	415	8*M16
3.33	Available on request																							
3.34	Available on request																							
3.36	Available on request																							
3.38	Available on request																							
3.40	Available on request																							

Installation instructions

The slewing gear needs to be correctly fitted in the machinery bed frame. Locations need to be concentric and square to the ring gear fitting.

The structure must be rigid and sufficiently stiff to resist bending during operation. The table below gives recommended tolerances.



Nominal size	Max. admissible deformations due to external forces								Concentric bores in the assembly, admissible manufacturing					The pinion shaft of the slewing gear must not be deformed inadmissibly by external forces and manufacturing tolerances. Max. admissible tolerances from the centre axis					Nominal size
									Length of output shaft L					Length of output shaft L					
	A1 B1	A2 B2 ±	A ◎	A ↗	A6	B6	α ±	M	200	400	600	800	≥ 1000	200	400	600	800	≥ 1000	
3.13	0,09	0,2	0,3	0,05	11	–	15'	0,09	0,05	0,05	–	–	–	0,20	0,20	–	–	–	3.13
3.15	0,10	0,2	0,3	0,05	14	11	15'	0,10	0,05	0,05	0,10	0,10	–	0,20	0,20	0,30	0,30	–	3.15
3.19	0,12	0,2	0,3	0,05	14	14	15'	0,12	0,05	0,10	0,10	0,10	–	0,20	0,30	0,30	0,40	–	3.19
3.20	0,14	0,2	0,3	0,05	14	14	15'	0,14	0,05	0,10	0,10	0,10	0,15	0,25	0,30	0,30	0,40	0,40	3.20
3.22	0,16	0,2	0,3	0,07	18	18	15'	0,16	0,05	0,10	0,10	0,15	0,20	0,30	0,35	0,35	0,50	0,50	3.22
3.24	0,18	0,3	0,5	0,07	18	22	10'	0,18	–	0,10	0,10	0,15	0,20	–	0,35	0,35	0,50	0,50	3.24
3.25	0,20	0,3	0,5	0,07	18	22	10'	0,20	–	0,10	0,10	0,15	0,20	–	0,35	0,35	0,50	0,50	3.25
3.26	0,20	0,3	0,5	0,10	22	22	10'	0,20	–	0,10	0,15	0,20	0,25	–	0,40	0,40	0,60	0,60	3.26
3.27	0,23	0,3	0,5	0,10	22	26	10'	0,23	–	0,10	0,15	0,20	0,25	–	0,40	0,50	0,60	0,80	3.27
3.29	0,25	0,3	0,5	0,10	26	33	10'	0,25	–	–	0,15	0,20	0,25	–	–	0,50	0,60	0,80	3.29
3.31	0,25	0,3	0,5	0,10	26	33	10'	0,25	–	–	0,15	0,20	0,25	–	–	0,50	0,60	0,80	3.31
3.32	0,25	0,3	0,5	0,10	26	33	10'	0,25	–	–	0,15	0,20	0,25	–	–	0,50	0,60	0,80	3.32

Form- and situation tolerances acc. to DIN 7184

| ◎ | 0,2 | A |

The center line of the toleranced part must be within a cylinder at a diameter of t = 0,2, which center line coincides with the center line of the reference plane.

| ↗ | 0,2 | A |

The tolerance of the plane surface must not exceed the tolerance of t = 0,2 during one revolution of the workpiece.

Gear reduction ratios

// 2-stages – coaxial

Ratio	17	22	26	30	35
3.13	•	•	•	•	•
3.15	•	•	•	•	•
3.19	•	•	•	•	•
3.20	•	•	•	•	•
3.22	•	•	•	•	•
3.24	•	•	•	•	•
3.25	•	•	•	•	•
3.26	•	•	•	•	•
3.27	•	•	•	•	•
3.29	•	•	•	•	•
3.31	•	•	•	•	•
3.32	•	•	•	•	•
3.33	•	•	•	•	•
3.34	•	•	•	•	•
3.36	•	•	•	•	•
3.38	•	•	•	•	•
3.40	•	•	•	•	•

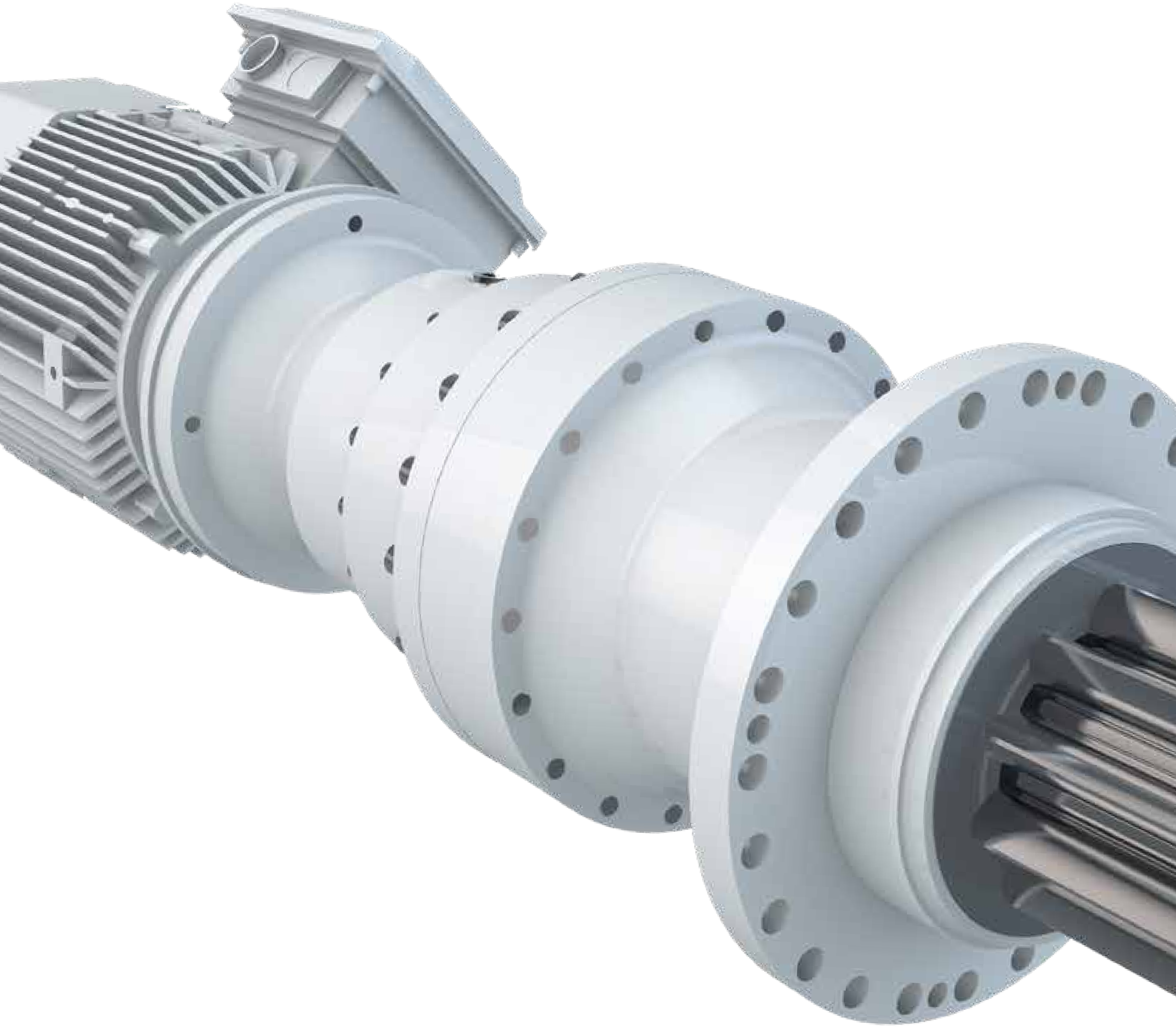
// 3-stages – coaxial

Ratio	46	61	72	84	94	108	130	148	154	177
3.13	•	•	•	•	•	•	•	•	•	•
3.15	•	•	•	•	•	•	•	•	•	•
3.19	•	•	•	•	•	•	•	•	•	•
3.20	•	•	•	•	•	•	•	•	•	•
3.22	•	•	•	•	•	•	•	•	•	•
3.24	•	•	•	•	•	•	•	•	•	•
3.25	•	•	•	•	•	•	•	•	•	•
3.26	•	•	•	•	•	•	•	•	•	•
3.27	•	•	•	•	•	•	•	•	•	•
3.29	•	•	•	•	•	•	•	•	•	•
3.31	•	•	•	•	•	•	•	•	•	•
3.32	•	•	•	•	•	•	•	•	•	•
3.33	•	•	•	•	•	•	•	•	•	•
3.34	•	•	•	•	•	•	•	•	•	•
3.36	•	•	•	•	•	•	•	•	•	•
3.38	•	•	•	•	•	•	•	•	•	•
3.40	•	•	•	•	•	•	•	•	•	•

// 4-stages – coaxial

Ratio	199	236	272	322	353	367	418	435	501	542	570	650	676	739	780	886	922	1.007	1.064	1.209
3.13	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.15	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.19	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.20	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.22	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.24	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.25	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.26	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.27	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.29	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.31	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.32	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.33	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.34	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.36	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.38	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3.40	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Other ratios available on request



Recommended lubricants for ZOLLERN Slewing gear units

Type/ Specification	Lubricants to DIN 51502			
	Mineral Olic acc. DIN 51 517 T3 CLP 220	**Synthetic Lubricants acc.** DIN 51 517 T3 CLP HC (PAO) 220	**Synthetic Lubricants acc.** DIN 51 517 T3 CLP PG 220	**Grease acc.** DIN 51 825 KP 2 K
Aral	Degol BG 220	-	Degol GS 220	Aralub HLP 2
Avia	Gear RSX 220	Synthogear PE 220	-	-
	-	Avilub Gear PAO 220	Gear VSG 220	Avialith 2 EP
BP	Energol GR-XP 220	-	-	Energrease LS-EP 2
Castrol	Alpha EP 220	Alphasyn EP 220	Alphasyn GS 220	Longtime PD2
	Alpha SP 220	Optigear Synthetic A 220	Alphasyn PG 220	Spheerol EPL 2
	Optigear BM 220	Optigear Synthetic PD 220	Tribol 800/220	Tribol 4020/220-2
	Tribol 1100/220	-	-	-
Fuchs	Renolin CLP 220	Renolin Unisyn CLP 220	Renolin PG 220	Renolit LZR 2 H
	Renolin CLP 220 Plus	-	-	Renolit EP 2
Mobil	Mobilgear 600 XP 220	Mobil SHC 630	Mobil Glygoyle 220	Mobilux EP 2
	-	Mobil SHC Gear 220	-	Mobilgrase XHP 222
Shell	Omala 220	Omala HD 220	Tivela S 220	Alvania EP (LF) 2
	Omala S2 G 220	Omala S4 GX 220	Omala S4 WE 220	Gadus S2 V220 2
Total	Carter EP 220	-	-	Multis EP 2
	Carter XEP 220	Carter SH 220	Carter SY 220	Lical EP 2

Attention: Mineral and PAO-based gearbox oils are not to be mixed with PG (polyglycol)-based synthetic oil. Greases with different soap bases are not to be mixed.

Lubrication frequency

Oil

- 1st oil change after 200 operating hours
- 2nd oil change after 1000 operating hours further oil change after every 1000 operating hours; at least once a year

Grease

- Once a week or on recommissioning

Lubrication type only according indication in the installation drawing resp. in the maintenance manual.

Slewing gears Application Questionnaire

Company/Address

Date

Proper department

Person concerned

Number of inquiry

Phone

Fax

e-mail

Demand

Application (e.g. mobile crane, ship-offshore-harbour cranes, tower cranes)

Used for

//Operating conditions – Design criteria

Power/Rating

Dynamic laod

Output torque T_{dyn} ______ (Nm)

Output speed n_{ab} ______ (rpm)

T_{dyn} is equivalent to $S_{M\ max\ II}$ acc. to FEM Section I

Installed power P (kW)

Static load

Output torque T_{stat} ______ (Nm)

Rating according to FEM Section I

Drive unit class: ❑ M

Load conditions: ❑ L

Running time class: ❑ T

Approval acc. to classification society

❑ ABS ❑ DNV ❑ GL

❑ LRS ❑ RMRS ❑ Others ______

Alternative rating

Load conditions	T_{dyn} (Nm)	n_{ab} (rpm)	Time slice (%)
1			
2			
3			
4			
			100 %

Calculated life time ______ (hour)

Safety against ______ (–)

❑ Yield strength ❑ Break

with ❑ T_{dyn} ❑ T_{stat} ______ (Nm)

//Technical data

Output pinion

Module m ______ (Nm)

Number of teeth z ______ (rpm)

Face width b ______ (rpm)

Addendum modification x ______ (kW)

Standard x=0,5 for output pinion

❑ Pinion shaft forged in one piece (standard)

❑ Splined pinion shaft

❑ Hardened and tempered, machined teeth, tooth flank induction hardened, gear quality 9e (standard), ZOLLERN special improved surface finish.

❑ Case hardened with grinded tooth flanks, gear quality 8e

Ring gear

z ______

b ______ (mm)

x ______

❑ Internal teeth

❑ External teeth

Ratio

i ______ ± ______ %

Flange connection

❑ Flange I ❑ Flange II ❑ Flange III

Length of output housing L ______ (mm)

Mounting position

Pinion ❑ up ❑ down ❑ horizontal

//Drive hydraulic motor

Manufacturer ______

Type ______

Available oil flow Q ______ (l/min)

Available differential pressure Øp ______ (bar)

//Drive electric motor

Manufacturer ______

Type ______

Power ______ (kW)

Speed ______ (rpm)

Control (Frequency inverter; ON/OFF; Softstarter)

Voltage, AC/DC ______

Starting torque T_A ______ (Nm)

Breakdown torque T_K ______ (Nm)

Power-on time ED ______ (%)

Starting per hour ______

//Brake

Apply as

❑ Parking brake ❑ Service brake

Execution

❑ Spring loaded multi disc brake

❑ with backstop ❑ Brake motor

❑ Disc brake ❑ Drum brake

Actuation

❑ hydraulically min. release pressure ______ (bar)

❑ electric max. release pressure ______ (bar)

expected back pressure ______ (bar)

//Scope of supply

❑ Motor

❑ Load holding valve

❑ Brake for drive unit

❑ Coupling

❑ Motor flange

❑ Reaction torque arm

❑ Incremental encoder

❑ Hydraulic power pack

❑ Frequency control

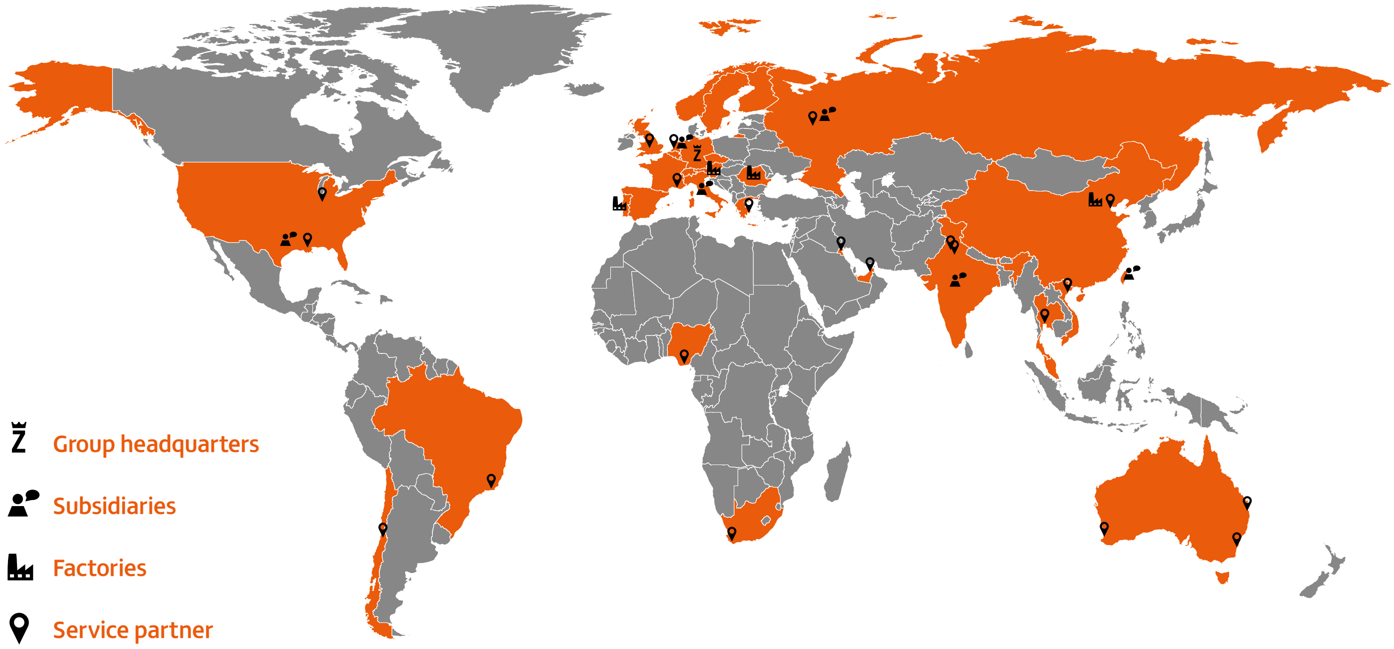
❑ Hydraulic control

❑ Approval

❑ Material Certificates

Remarks and special operating conditions

Please fill in all known data.



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