

ZOLLERN

Solid metals. Fine solutions.

Drive Technology

Free fall
winches



The ZOLLERN-Group

With first-class products and customized solutions in the sectors drive technology, investment casting, sand casting and forging as well as steel profiles we are one of the leading manufacturers – worldwide.

As one of the oldest family-run businesses in Germany we are proud to look back on an impressive 300-year history during which we have merged tradition with innovation. Our main focus is on excellent quality and service.

Welcome to the world of ZOLLERN, where experience and progress go hand in hand to offer our customers the best solutions and products for their requirements in various industrial sectors.

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Free fall winches



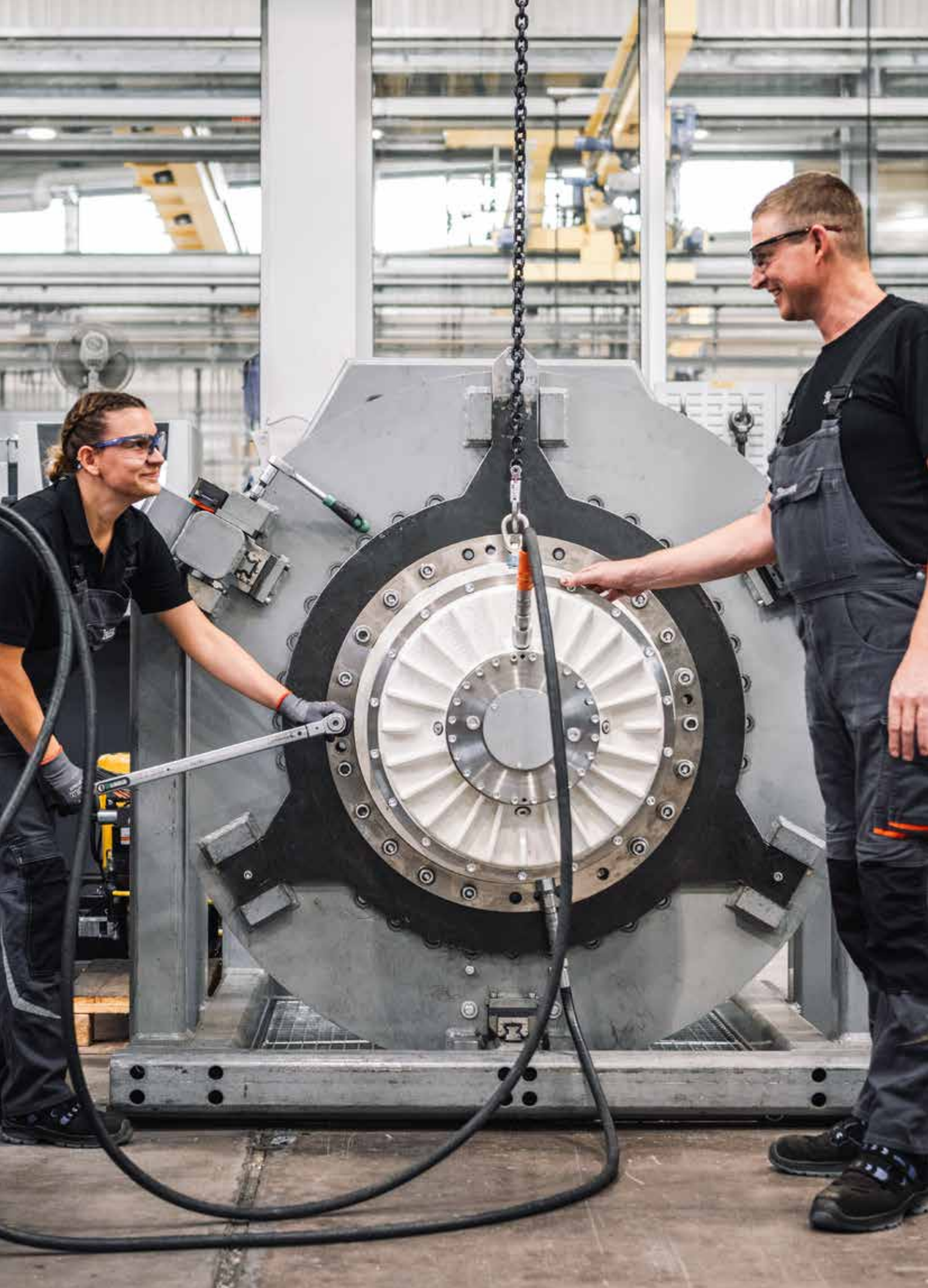
Free fall winches

have given evidence of high performance even under the most arduous and unfavorable conditions. Their outstanding features and advantages are

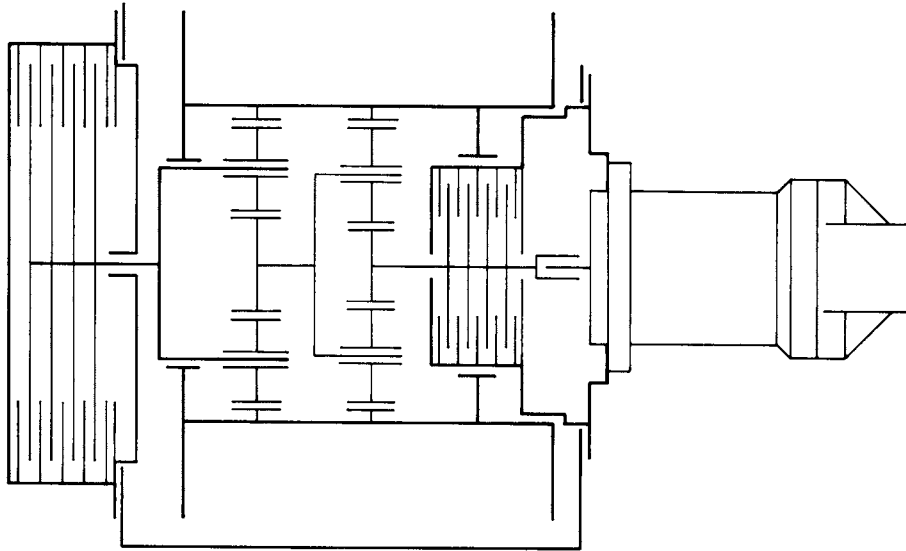
- compact design
- rigid winch construction
- modular design
- high efficiency
- long working life
- simple maintenance
- effective design

The designer can use complete units which provide economical solutions even when space is limited e.g. for

- drilling rigs
- pile-boring plant
- well-boring plant
- louvered slide gripping device
- stripping shovel
- pipe layer
- pile driving



Free fall winch design



Range of free fall winch models

Hoisting application, line pull 13 kN to 650 kN. Controlled free fall application, line pull 6,5 kN to 325 kN.

Calculation according to FEM

The output torques T , listed on page 6 based on FEM-standards I and IX as well as DIN 15020. Load conditions L3, running time classification T5, according drive unit group M6. Ambient temperature + 20°C. (FEM - Fédération Européenne de la Manutention).

Gear tooth forms

Selected for optimum tooth flanks and root strength and also for minimum sliding velocity, as per DIN 3990. External gear teeth are case hardened and ground, internal gears are annealed and nitride hardened.

Bearings

All gearbox elements are fitted with anti-friction bearings, needle roller or cylindrical roller bearings for the planetary gears.

Lubrication

All gear parts and anti-friction bearings are oil splash-lubricated. The drum bearings are grease lubricated. For lubricating intervals and selection of lubricants see table at page 9.

Seals

The input and output drives are protected against oil leakage and ingress of dirt or water by radial shaft sealing rings. The drum bearings are protected by felt rings or radial shaft sealing rings.

Rope drum

Material GGG-40 to GGG-60, rope groove pitch according ZOLLERN Sonderrillung. If the rope drum is without grooves, the rope can be wound in both directions.

Mounting position

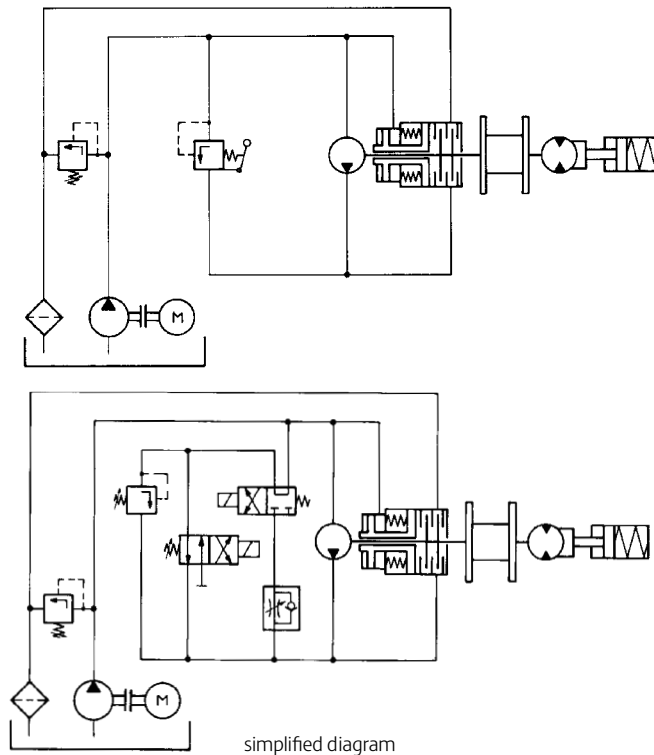
horizontal

Free fall brake

The free fall brake housing must be filled with hydraulic oil. In all applications, the circulation of hydraulic oil through the free fall brake housing is necessary. The circulating oil should be lead back to the reservoir without back pressure.



Hydraulic control valves for free fall brake



Free fall application

Normal line pull 50% of the hoisting capacity. If another line pull is necessary, please contact zollern.

Controlled free fall

If the spring loaded multiple disc brake is hydraulically released, a fast lowering application is possible. The line speed is controlled by the measuring pump and the free fall valve. An electrically or an manually operated free fall valve can be chosen.

Load stop

The load stop during controlled free fall up to standstill can be softly adjusted with both types of valves.

Full released free fall (emergency free fall)

During the emergency free fall the line speed grows uncontrolled, the load freely drops down. Load stopping is not allowed.

Constant line pull

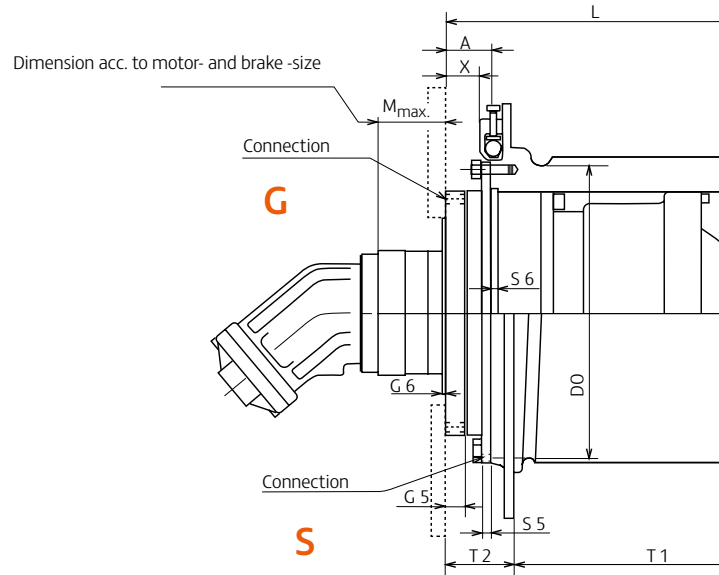
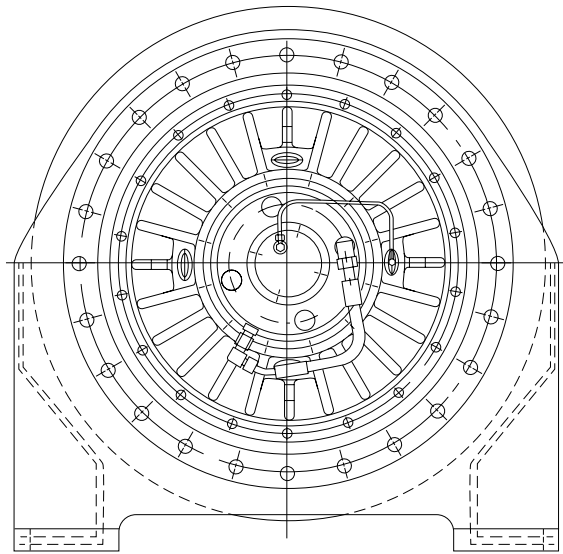
If the spring loaded free fall brake will be partly released, a constant line pull can be got. If the line pull is increased the rope pays off.

Cooling

In all applications the circulation of hydraulic oil through the free fall brake housing is necessary. This provides cooling for the brake and also ensures that the brake housing is completely filled with oil.

Back pressure

The spring loaded multiple disc free fall brake is able to compensate a back pressure of 5 bar. In case of a higher back pressure, please contact ZOLLERN.



Nominal data of rope drum

ZHP	output torque (Nm)		line pull	input speed	DO 1	G Connection gear – Frame/Bolts 10.9						S Connection rope drum						F	
	T_{nenn} $l \leq 70$ $l > 70$	$T_{max. stat.}$ $l \leq 70$ $l > 70$	F_{nenn} (kN)			$n_{max.}$ min. ⁻¹	DO 1	G 1 location	G 2 pcd	G 3 ext.	G 4 pitch	G 5	G 6	S 1 location	S 2 pcd	S 3 ext.	S 4 pitch	S 5	S 6
EG					ca.	Ø	± 0,2	Ø				Ø	± 0,2	Ø				Ø	± 0,2

ZHP	output torque (Nm)		line pull	input speed	DO 1	G Connection gear – Frame/Bolts 10.9						S Connection rope drum						F		
	T_{nenn} $l \leq 70$ $l > 70$	$T_{max. stat.}$ $l \leq 70$ $l > 70$	F_{nenn} (kN)			$n_{max.}$ min. ⁻¹	DO 1	G 1 location	G 2 pcd	G 3 ext.	G 4 pitch	G 5	G 6	S 1 location	S 2 pcd	S 3 ext.	S 4 pitch	S 5	S 6	F 1 location
6.15	2.300	2.800	13																	
6.19	6.300	7.700	32	290	190	225	255	16°	16*M 16	25	5	265	290	310	15°	24* Ø 14	12	9	390	430
	6.500	8.000	34																	
6.20	9.700	12.000	45	330	200	255	285	20°	16*M 16	25	5	295	320	340	15°	24* Ø 14	12	9	390	430
	10.200	12.300	47																	
6.22	16.800	20.300	65	380	230	280	315	15°	22*M 16	25	5	330	360	390	20°	18* Ø 18	16	9	500	550
	17.300	21.000	68																	
6.24	20.800	25.000	72	430	270	320	355	15°	22*M 16	25	5	370	400	430	15°	24* Ø 18	16	9	500	550
	21.300	26.000	77																	
6.25	22.000	35.000	92	460	300	350	385	15°	22*M 20	30	5	400	440	480	20°	18* Ø 22	20	9	500	550
	22.500	36.000	94																	
6.26	30.000	48.000	116	520	330	390	425	15°	22*M 20	30	5	440	480	520	15°	24* Ø 22	20	9	500	550
	31.000	50.000	120																	
6.27	38.000	61.000	133	560	355	420	460	15°	22*M 24	38	5	470	520	560	20°	18* Ø 26	24	9	500	550
	39.000	62.000	136																	
6.29	62.000	99.000	185	650	430	480	530	15°	22*M 24	38	5	550	590	630	15°	24* Ø 26	24	9	500	550
	63.000	100.000	189																	
6.31	90.000	144.000	237	740	515	565	615	15°	24*M 30	47	5	640	690	750	15°	24* Ø 33	30	9	690	740
	92.000	147.000	243																	
6.32	138.000	221.000	332	800	580	630	680	15°	24*M 30	47	5	700	755	815	15°	24* Ø 33	30	9	690	740
	140.000	224.000	337																	
6.33	170.000	272.000	361	900	670	720	770	12°	30*M 30	47	5	790	840	890	12°	30* Ø 33	30	9		
	172.000	275.000	366																	
6.34	232.000	371.000	450	1000	720	770	820	10°	36*M 30	47	5	850	900	950	10°	36* Ø 33	30	9		
	235.000	376.000	456																	
6.36	385.000	616.000	643	1150	840	900	960	10°	36*M 36	56	5	1.000	1055	1.120	10°	36* Ø 39	36	9		
388.000	621.000	648																		

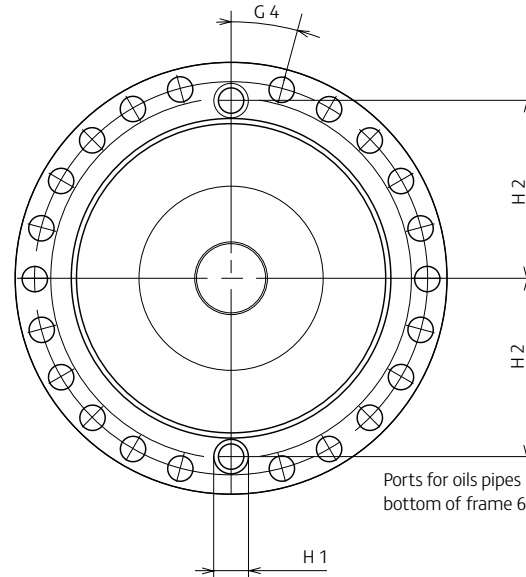
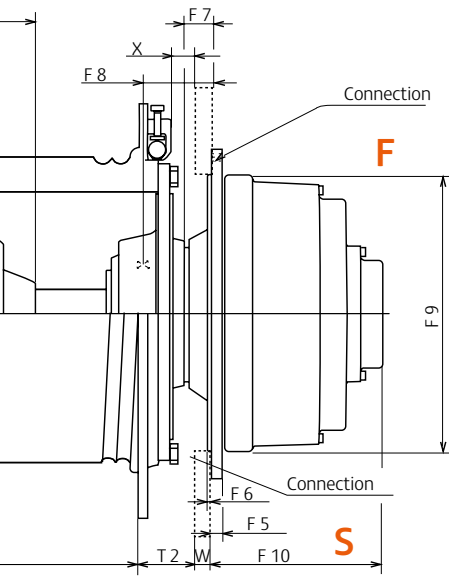
Depending on motor and brake arrangement 2000-5000

Layout acc FEM Section I

Group classification M 6
Class of utilisation T 5

State of loading L3
($n_{mean} = 25 \text{ min.}^{-1}$, $P = \text{const.}$)

Winch corresponding to European Norm Draft CENT TC 151
(Edition 14/12/90)

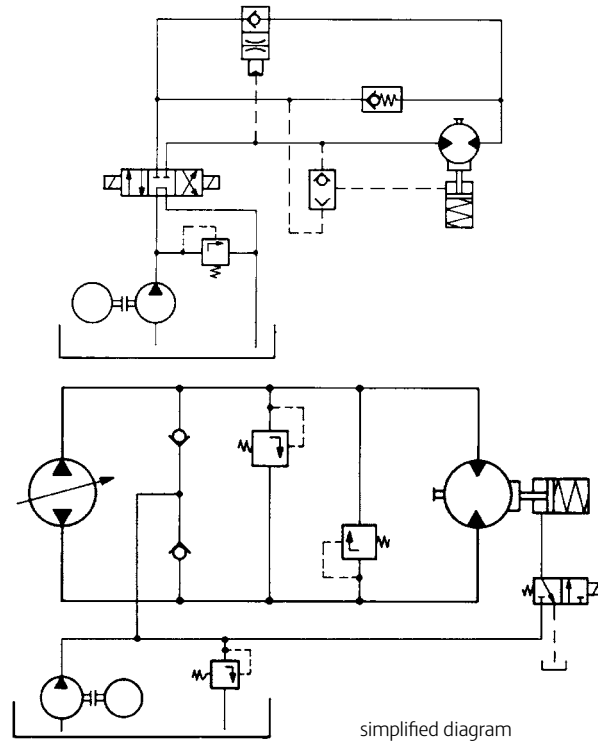


Connection free fall brake – Frame/Bolts 8.8										Dimensions E = T1 + 2 • T2 + W										
F 3 ext.	F 4 pitch	F 5	F 6	F 7	F 8	F 9	F 10	H 1	H 2	A	C	M _{max.}	T 1	T 2	W frame	L	x _{min.}	ZHP	EG	
∅								∅					2 stages	3 stages	ca. 2 stages	3 stages				
																			6.15	
454	12° ∅ 13	15	5	30	116	395	190	26	111	60	75	170	270	350	95	15	325	400	15	6.19
454	12° ∅ 13	15	5	30	116	395	190	26	117	60	75	140	325	415	95	15	355	445	15	6.20
590	24° ∅ 18	20	7	35	112	506	280	26	132	60	75	170	370	470	100	15	390	490	15	6.22
590	15° ∅ 18	20	7	35	112	506	280	26	152	60	80	170	395	505	100	20	415	525	20	6.24
590	24° ∅ 18	20	7	40	112	506	280	30	168	75	95	160	430	560	120	20	460	595	20	6.25
590	15° ∅ 18	20	7	50	112	506	280	30	184	75	95	210	500	610	120	20	520	625	20	6.26
590	15° ∅ 18	20	7	50	127	506	305	30	195,5	90	110	200	520	630	140	20	555	675	20	6.27
590	15° ∅ 18	20	7	50	127	506	305	30	233	90	115	200	565	725	145	25	595	760	25	6.29
800	15° ∅ 22	30	10	70	130	630	365	-	240	110	140	200	585	765	180	30	645	830	30	6.31
800	15° ∅ 22	30	10	70	135	630	400	-	268	110	140	150	630	810	180	30	710	890	30	6.32
								-	-	110	160	150			190	40			40	6.33
								-	335	120	160	140			200	40			40	6.34
								-	385	120	190	110			240	50			50	6.36

Due to continuous development and improvements in design we reserve the right to introduce changes without prior notice.



Hydraulic control valves for rope winches



Hoisting and lowering application

The free fall brake is held engaged by springs

Open hydraulic circuit

Hoisting

The hydraulic oil supply regulates the line speed.

Lowering

The load is held by a brake valve. The oil pressure to open the check valve must exceed the release pressure of the parking brake. If the hoisting or lowering operation is stopped, the spring loaded parking brake will prevent any moving.

Closed hydraulic circuit

Hoisting/ lowering

The hydraulic oil supply regulates the line speed. During lowering application the load is held by the oil pump. If the hoisting or lowering operation is stopped, the spring loaded parking brake will prevent any moving.

Kind of oil

Synthetic oils of viscosity class ISO VG 220. The oils must be in conformity with the load range 12 of the FZG-test DIN 51354.

Lubrication frequency

Oil

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

Grease

Once a week or on recommissioning

Recommended lubricants

// Lith. MZ-Grease NLGI 3 K 2 K DIN 51825				
ARAL Multi-purpose grease ARAL Grease HL 3	AVIA Multi-purpose grease	BP Multi-purpose grease L 3 BP Energr. LS 3	CHEVRON Dura-Lith Grease 3	Beacon 3 ESSO Multi-purpose grease
FUCHS Grease FWA 220 – FUCHS Multit-purpose grease	GULF Crown Grease No. 3	Mobilgrease MP Mobilub	SHELL Retinax A SHELL Alvania Grease R 3	Texaco Marfak All Purpose Glissando FL 30

Available ratios for free fall winches

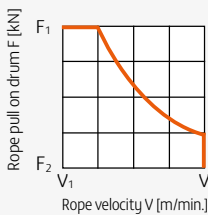
Type	Gear unit ratios ca. approx													
	17	20	24	28	35	43	54	64	72	83	90	102	113	136
6.15	Please refer to your ZOLLERN representative													
6.19		•	•	•	•	•	•	•	•	•	•	•	•	
6.20		•	•	•	•	•	•	•	•	•	•	•	•	
6.22		•	•	•	•	•	•	•	•	•	•	•	•	•
6.24		•	•	•	•	•	•	•	•	•	•	•	•	•
6.25	•	•	•	•	•	•	•	•	•	•	•	•	•	•
6.26	•	•	•	•	•	•	•	•	•	•	•	•	•	•
6.27	•	•	•	•	•	•	•	•	•	•	•	•	•	•
6.29	•	•	•	•	•	•	•	•	•	•	•	•	•	•
6.31	•	•	•			•	•	•		•	•	•	•	•
6.32	•	•	•			•	•	•		•	•	•	•	•
6.33	•	•	•			•	•	•		•	•	•	•	•
6.34	•	•	•			•	•	•		•	•	•	•	•
6.36	•	•	•				•	•		•		•	•	

Free fall winches application questionnaire

Company/Address		Date
Proper department	Person concerned	Number of inquiry
Phone	Fax	e-mail
Demand	Application (e.g. drilling rigs, pipe laying, pile driving)	Used for (e.g. main winch, auxiliary winch)

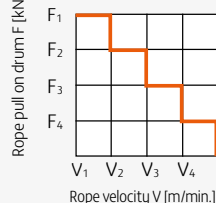
Operating conditions – Design criteria (All values based on 1st rope layer)

Rope pull on drum F_1 _____ (kN)
 Rope velocity V_1 _____ (m/min.)
 Rope pull on drum F_2 _____ (kN)
 Rope velocity V_2 _____ (m/min.)



Available power P _____ (kW)
 Control factor K _____

Rope pull on drum F_1 _____ (kN)
 Rope velocity V_1 _____ (m/min.)
 Rope pull on drum F_2 _____ (kN)
 Rope velocity V_2 _____ (m/min.)
 Rope pull on drum F_3 _____ (kN)
 Rope velocity V_3 _____ (m/min.)
 Rope pull on drum F_4 _____ (kN)
 Rope velocity V_4 _____ (m/min.)



Safety factor (e.g. 1.5) _____ (-)
 against yield strength
 for cableload at the winch F_1 _____ (kN)
 Calculated service life
 in operation hours h _____ (hrs.)
 with rope pull on drum of F_1 _____ (kN)
 and rope velocity V_1 _____ (m/min.)

Design in acc. with FEM Selection I and DIN 15020
 Gear drive group _____ Running time class. _____
 Loading conditions _____

Design in acc. with DIN Design Principles on Lifting Gear
 Operating hours _____ Hazard class. _____
 Standard conditions _____ Lifting class. _____

Acceptance in acc. with Classification Society
 GL, LROS, DNV, USSR-Register etc. _____

// Technical Data

Diameter of rope drum D_4 _____ (mm)	Direction of load	Number of rope layers z _____ (-)
Length of rope drum between drum flanges L_2 _____ (mm)	<input type="checkbox"/> right-hand <input type="checkbox"/> left-hand	Length of rope to be wound including
Diameter of rope d _____ (mm)	Type of rope groove	3 safety turns L_5 _____ (mm)
Rope groove lead p _____ (mm)	<input type="checkbox"/> DIN 15061 <input type="checkbox"/> special <input type="checkbox"/> grooveless	Diameter of drum flanges D_2 _____ (mm)
	Point of rope fixture	Gear ratio i _____ (-)
	<input type="checkbox"/> drive-side <input type="checkbox"/> opposite to drive	

// Drive hydraulic motor

Make _____
 Type _____
 available flow rate Q _____ (l/min)
 available pressure Δp _____ (bar)

// Free fall application

Free fall line pull _____ (kN)
 Trail of fall _____ (m)
 Max. speed of fall _____ (m/s)
 Cycles per hour _____

// Remarks & special operating conditions

// Parking brake

Type Spring loaded multi discbrake
 min. release pressure _____ (bar)
 max. release pressure _____ (bar)
Operation Hydraulically released
 expected back pressure _____ (bar)

// Free fall brake

Type
 Spring loaded multi discbrake
 expected back pressure _____ (bar)
Operation
 Hydraulic

ZOLLERN Group

Product areas

Metals and shaping

// Investment casting parts



- Turbine components
 - Vanes / Blades / Shrouds / Heat Shields
- Structural Castings
 - Gas Turbines / Aero / Engines Defense / Medical / Industrial Components
- Automotive
 - Turbine Wheels / Waste gates / Vanes / Pins / Planet carriers
- Implants
 - Knees (Femur, Tibia) / Hips
- Alloys
 - Super alloys / Cobalt Chrome alloys



// Sand casting parts



- Sand casting
- Croningguss / Maskenguss
- Ceramic casting
- Continuous casting
- Centrifugal casting



// Forgings



- Forgings made of pure copper and copper alloys
- Semi-finished products, open die forged, flat bars, round bar
- Drop forged parts
- Rings, seamlessly rolled
- Bushings, seamlessly forged
- Individual pieces, small series, large series



// Special profiles and finished parts



- Special profiles, coils, bars
- Customer-specific finished parts
- Profile types hot-rolled, cold-rolled, cold-drawn, induction-hardened



Drive technology and automation

// Gearboxes



- Travel drives
- Slewing gearboxes
- Winch gearboxes
- Industrial gear units
- Gearboxes for tunnel boring machines
- Sugar mill gearboxes
- Electric drive systems
- Condition Monitoring and Predictive Maintenance

// Winches



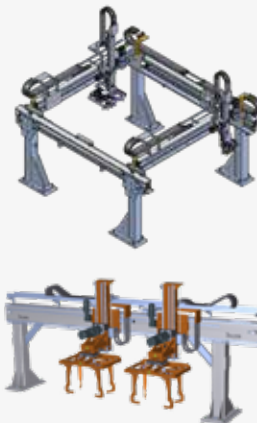
- Hoisting winches
- Free fall winches
- Pull winches
- Rescue boat winches
- Winch systems
- Winch gearboxes

// Electric motors



- Torque motors kits
- Synchronous motor kits
- Synchronous motor modules

// Automation, special systems



- Linear units, linear modules, gantry axes, portal units
- Telescoping axes
- Rotary modules, rotary tables
- Line gantries, area gantries
- Robot traverse axes, jig axes
- Storey lifter and lifting columns
- Fast conveyor
- Framing tenter handling / overhead systems
- Storage systems
- Complete systems with steel construction and control
- Special solutions
- Gripper

// Hydrostatic systems



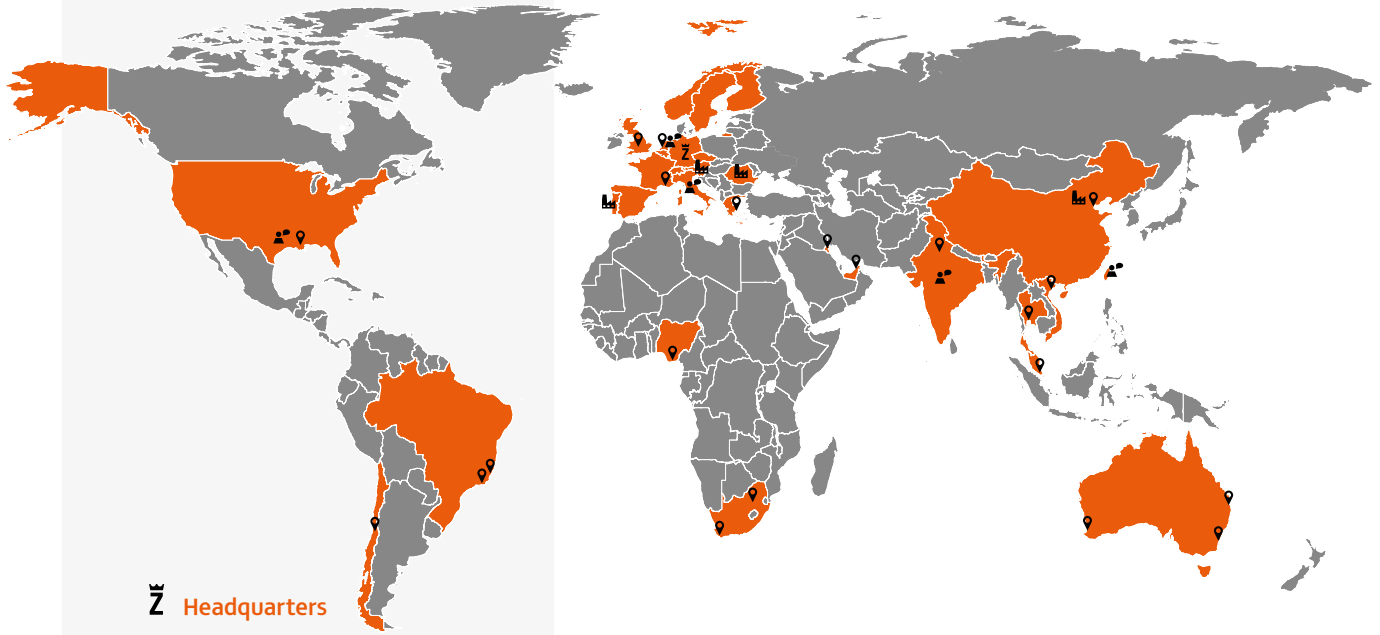
- Hydrostatic spindle units
- Hydrostatic rotary tables
- Aerostatic rotary tables
- Hydrostatic linear guides
- Hydrostatic center drive spindles
- Hydrostatic bearing components
- Hydrostatic special applications and test benches

// Rotary tables systems



- Roller bearing rotary tables
- Hydrostatic rotary tables
- Automatic pallet changing systems and linear axes
- Swiveling tables
- After sales service for products of ZOLLERN, Ruckle and Eimeldingen

ZOLLERN



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Taiwan, China

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Portugal
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Brazil
Chile
Greece
Great Britain
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Singapore
South Africa
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Dubai
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ZOLLERN-worldwide



ZOLLERN-Products



ZOLLERN GmbH & Co. KG

Heustrasse 1
88518 Herbertingen
Germany
T +49 7586 959-0
F +49 7586 959-575
zat@zollern.com
www.zollern.com

