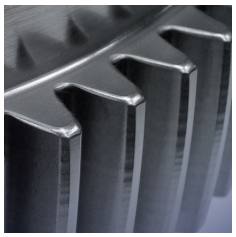
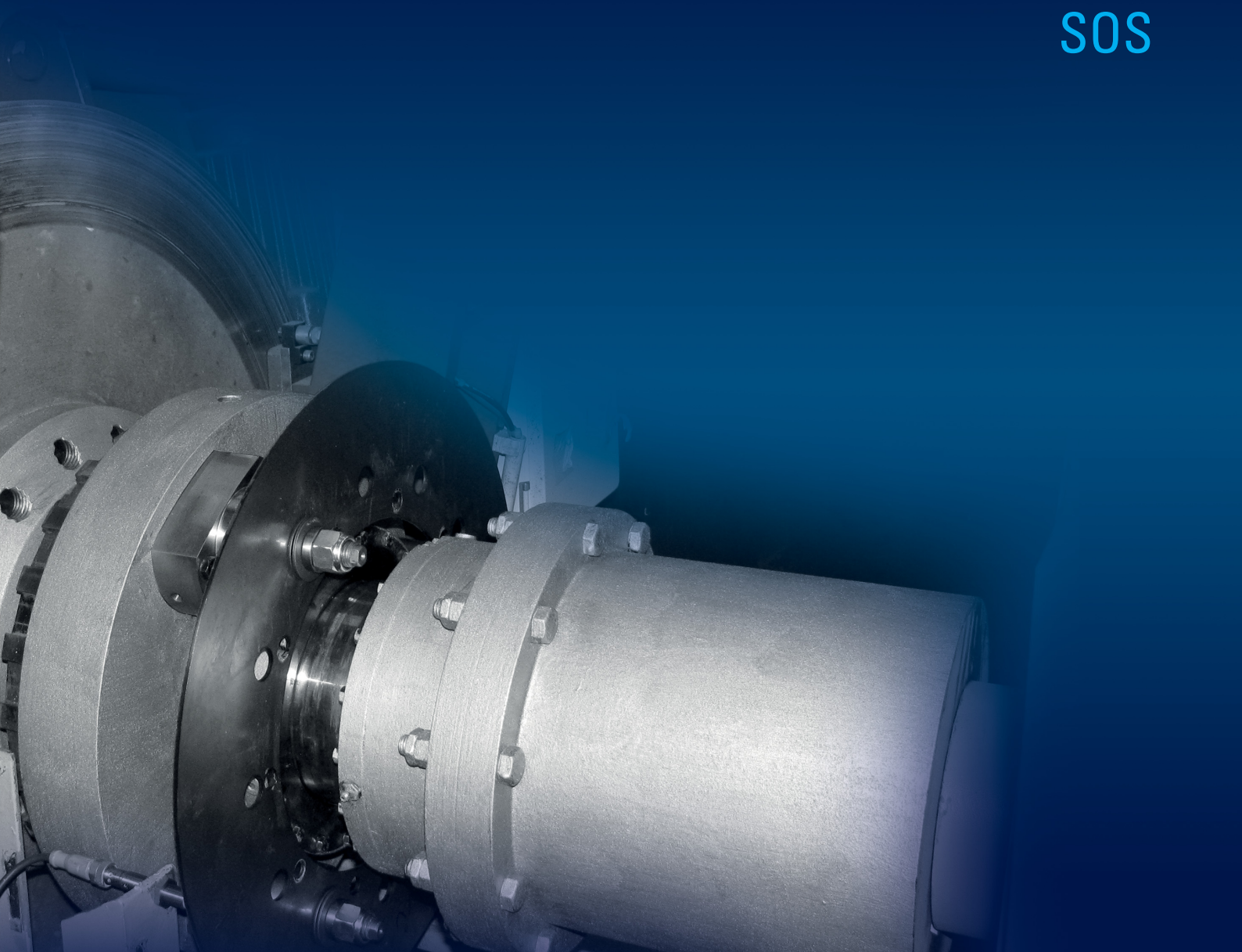
MALMEDIE


SNAG OVERLOAD SYSTEM

SOS



SOS
System Layout and Description

System Components

- Malmedie Safety Coupling MSC II
- PINTSCH BUBENZER *LiTec®* low inertia brake disc
- PINTSCH BUBENZER Thruster Service Brake SB28
- PINTSCH BUBENZER Emergency Brake SF with CMB force monitoring sensors (fast-setting execution)
- PINTSCH BUBENZER SOS PLC
- Malmedie Drum Coupling TTXs

Main Features

- MSC release time < 1 ms
- Snag protection completed in less than 100 ms
- Separate and independend SOS PLC, enclosure 800 x 2200 x 600 mm
- Retrofittable
- Manual reset of snag event after mandatory hoist inspection

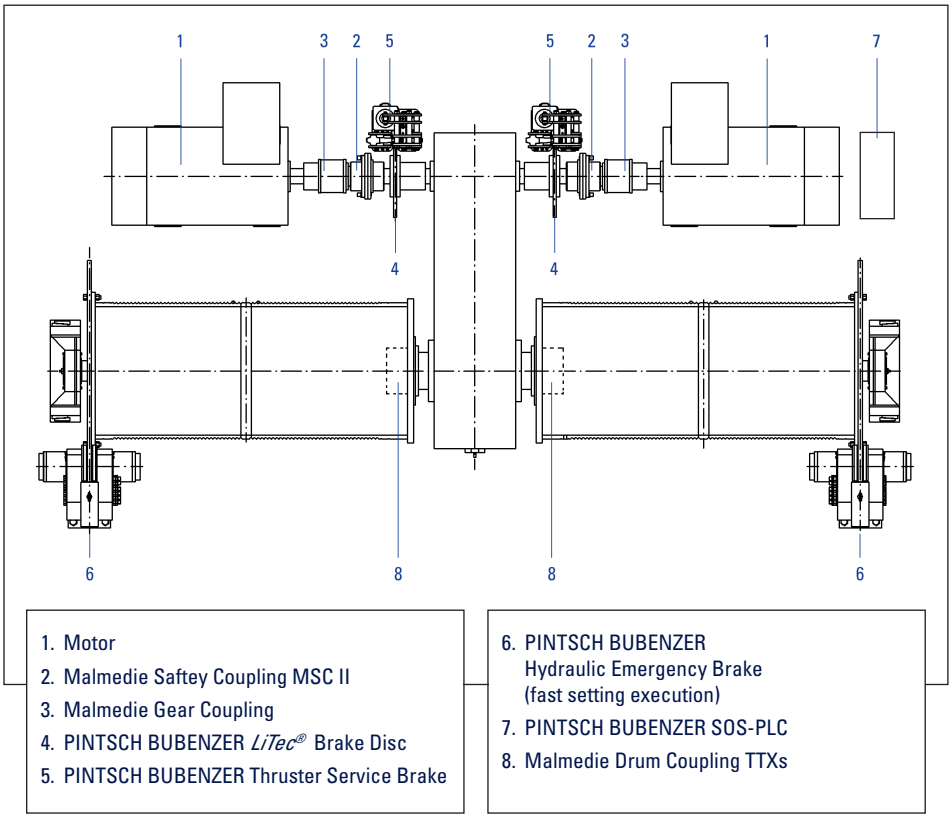
Options

- Automatic **rope-detensioning** function
- Monitoring display for crane driver cabins
- Automatic reset of SOS after snag event

Applications

- Ship-to-Shore Container Cranes
- Gantry Cranes

The SOS Snag Overload System is the first non-hydraulic snag protection for container cranes. It eliminates the danger of structural damage starting at the motor, which is beside the brake disc the major source of snag inertia load.



1. Motor
2. Malmedie Saftey Coupling MSC II
3. Malmedie Gear Coupling
4. PINTSCH BUBENZER *LiTec®* Brake Disc
5. PINTSCH BUBENZER Thruster Service Brake
6. PINTSCH BUBENZER Hydraulic Emergency Brake (fast setting execution)
7. PINTSCH BUBENZER SOS-PLC
8. Malmedie Drum Coupling TTXs

At any kind of overload the inertia and the driving force of the (AC!) motor is separated from the hoist by the MSC within one millisecond. To reduce the remaining inertia coming from the brake disc, *LiTec®* brake discs offering 60% less inertia than steel discs are in use. The special designed service and emergency brakes (fast setting execution) avoid at the same time a reverse of the rope drum. The reaction time of the system in combination with its own and separate PLC is ultra fast and completed, before conventional hydraulic systems are able to react.

Beside the advantage of having even less maximum rope forces compared to a conventional snag system, the system is much less in weight, low maintenance and cost effective.

Please Note !

MSC operations are subject to an inspection by Malmedie or Malmedie authorized service providers every three years. We supply a detailed operating manual with every order. Nevertheless, we would point out that the SOS is only as safe as the servicing and maintenance performed while it is in operation. The guarantee for the correct functioning of the brakes is therefore only valid if the user adheres to the German DIN standard 15434 part 2 (drum and disc brakes, servicing and maintenance in operation), or to comparable standards in his own country.

SOS
Single Rope Protection SRP

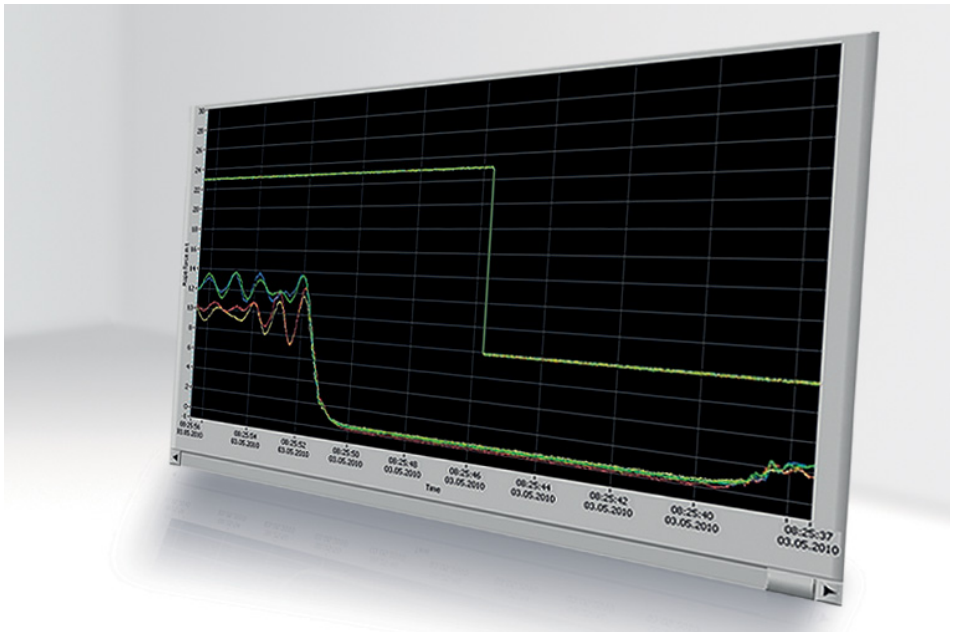
In addition to and independent from the mechanical protection device, the SOS Snag Overload System is also equipped with an electronic protective function.

To this end the load cells of the crane have two channels; one channel is used as before by the crane main PLC, while the second channel goes directly into the SOS controller via a specific developed high speed amplifier (approx. 20 ms). In the case of overload, even of only one rope, the SOS PLC applies the safety brakes and the safety coupling separates - depending on the speed - in order to protect the drive train. Hence, a snag case is already recognised at the earliest possible stage and the protective function sets in immediately.

Additionally the twistlock signals (open/close) are processed, so that the protection point is automatically set lower when the spreader is empty. Hence, the protective effect sets in earlier when the spreader is empty; in particular in critical operation with high speeds and an empty spreader, the possible overloads in the snag case are significantly lower.

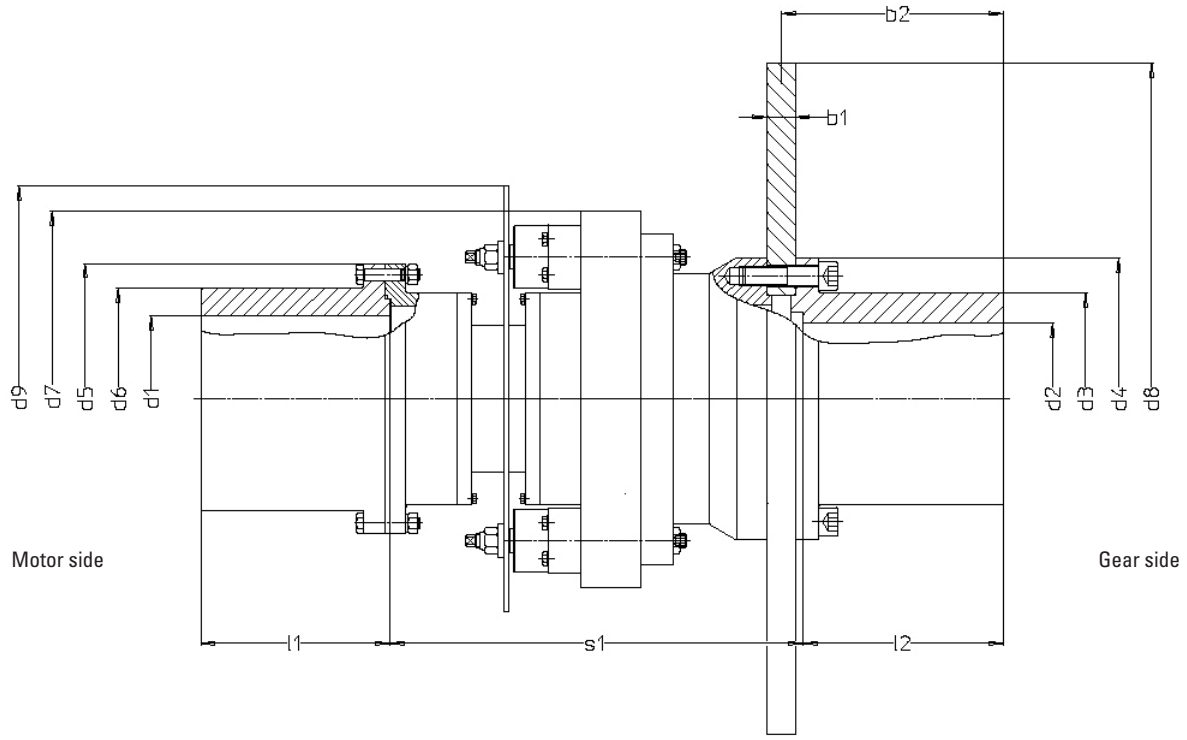
Advantages

- Redundancy of the system
- Several configurable switching points
- Early snag recognition



Picture, from right to left:
Rope loads with empty spreader (lower line), protection point at 8 tonnes. (Upper green line). As soon as the spreader has locked the container and all twistlocks are closed, the protection point of the SRP jumps to 23 tonnes. In the remainder of the curve, the rope loads when lifting are recognisable (lower lines)

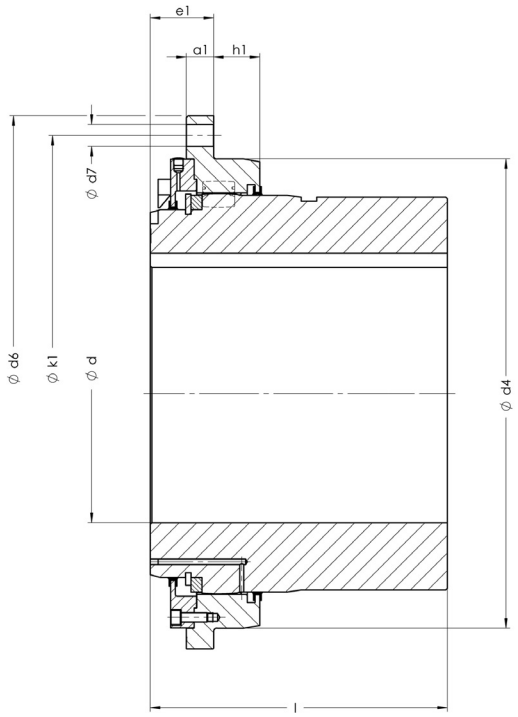
Dimensions and technical data	Rev. 07/12

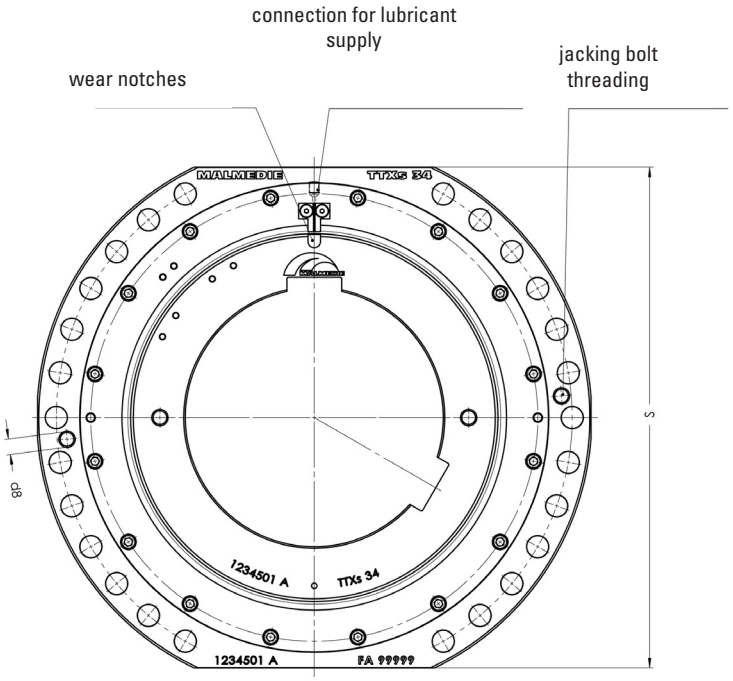


Tk N	[Nm]	24 000		
Tk max	[Nm]	48 000		
Adjustable Torque Limit	[Nm]	9 500 - 22 000		
d1	[mm]	max 175		
d2	[mm]	max 160		
d3	[mm]	224		
d4	[mm]	350		
d5	[mm]	286		
d6	[mm]	235		
d7	[mm]	398		
d9	[mm]	470		
s1	[mm]	438		
l1	[mm]	200		
l2	[mm]	212		
b2	[mm]	235		
LiTec® Brake Disc d8 x b1	[mm]	710 x 30	800 x 30	900 x 30
Weight incl. Brake Disc	[kg]	299	308	319
Moment of inertia	[kgm2]	5.95	7,24	9,28

All dimensions in mm

Dimensions and technical data	Rev. 01/09

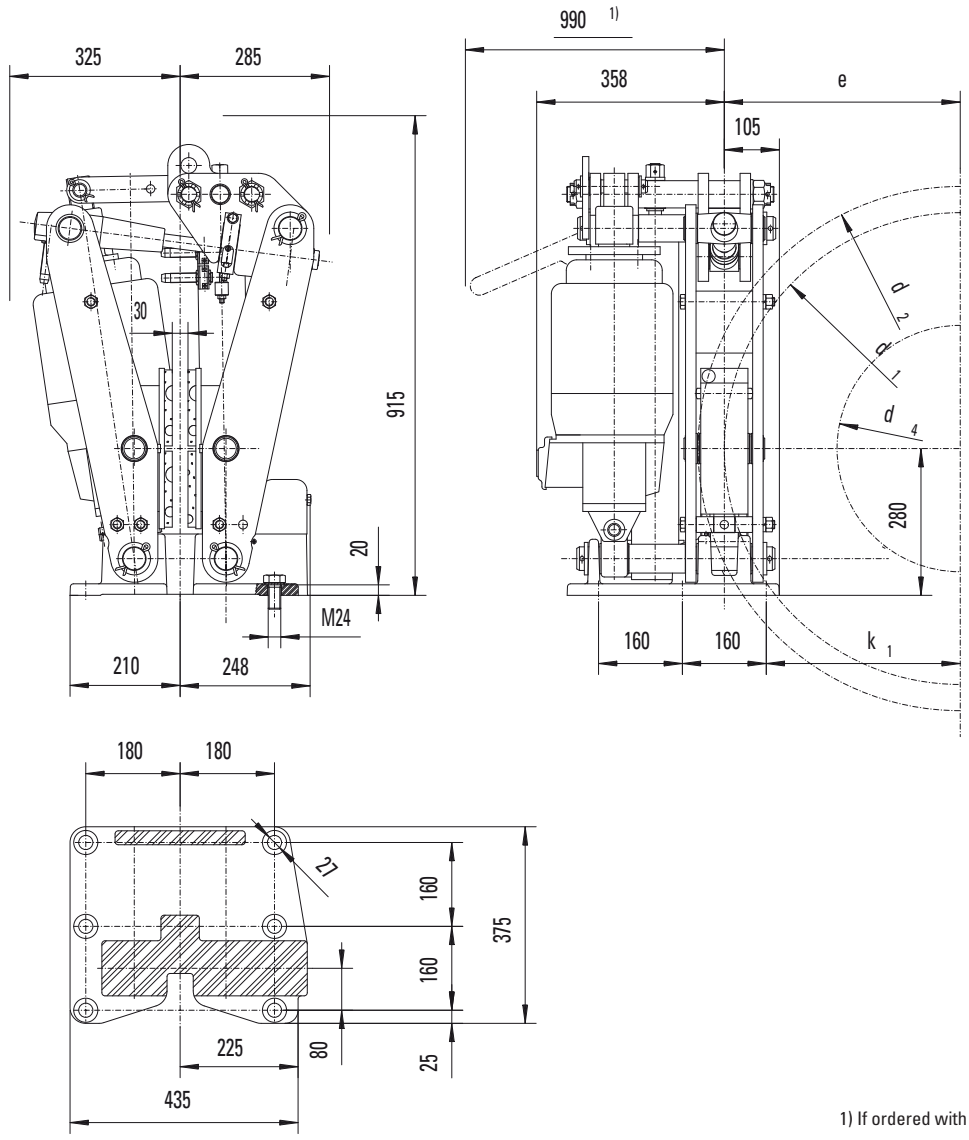




All dimensions in mm

Size	Torque	Radial load	Finish bores		Dimensions				Bolts	Qty.	Dimensions					Size
	Tk_{max} [Nm]	Fr_{max} [N]	$d^{H7}{}_{min}$ [mm]	$d^{H7}{}_{max}$ [mm]	a_1	d_{4h6}	d_6	d_7		Anz.	e_1	h_1	k_1	l	S_{h9}	
10	180 000	150 000	140	245	20	450	580	24	M20	14	60	30	530	260	530	10
15	240 000	180 000	160	290	25	530	650	24	M20	14	65	30	600	315	580	15
21	330 000	265 000	170	300	25	545	665	24	M20	26	65	35	615	330	590	21
26	410 000	315 000	170	310	25	560	680	24	M20	26	65	35	630	350	600	26
34	520 000	360 000	200	330	35	600	710	28	M 24	26	81	38	660	380	640	34
42	650 000	400 000	230	370	35	670	780	28	M 24	26	81	38	730	410	700	42
62	770 000	475 000	260	420	35	730	850	28	M 24	26	81	40	800	450	760	62
82	930 000	525 000	290	450	40	800	940	28	M 24	32	86	50	875	500	830	82

Dimensions and technical data	Rev. 10/08



1) If ordered with manual release lever

*) Average friction factor of standard material combination

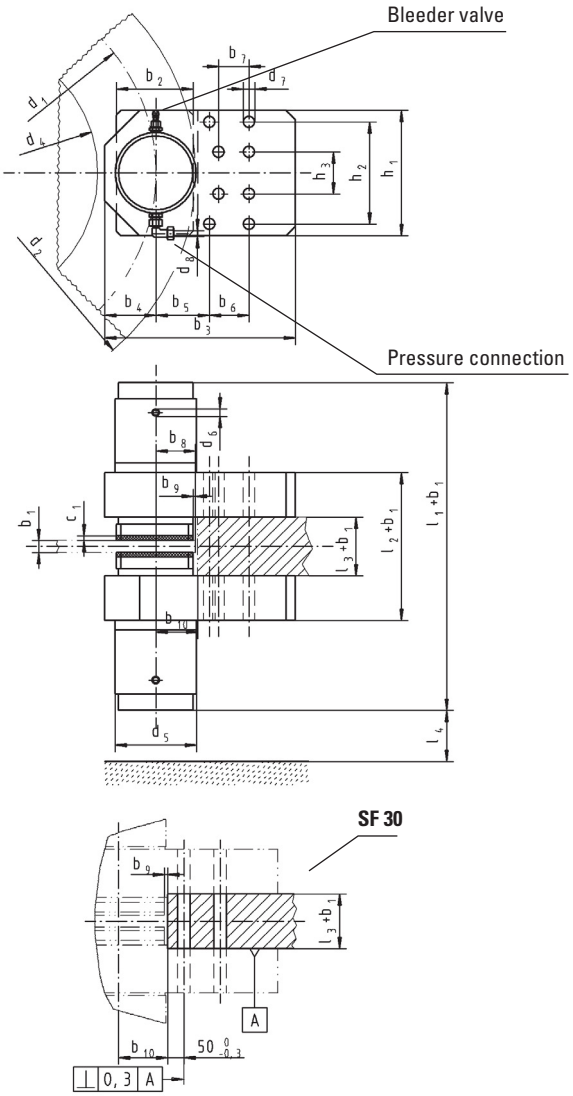
For crane brake lay-out use safety factors documented in the FEM 1.001, Section 1

Weight: 220 kg w/o thruster		Thruster type			Ed 301/10bb
		Contact force in N			62500
Dics Ø	Friction Ø				Brake torque M_{Br} in Nm Frition factor μ = 0,4*
d_2	d_1	d_4	e	k_1	
710	610	460	305	225	15250
800	700	550	350	270	17500
900	800	650	400	320	20000
1000	900	750	450	370	22500

PINTSCH BUBENZER

Dimensions and technical data

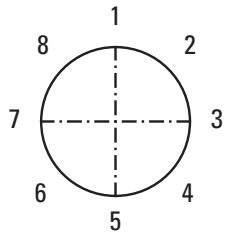
Rev. 12/06



Type SF		10	15	24	30	40
b_2		165	165	195	280	300
b_3		410	410	480	640	720
b_4		110	110	130	155	175
b_5		115	115	130	200	220
b_6		85	85	100	110	125
b_7		60	60	70	110	125
b_8		85	85	100	140	160
b_9		5	5	5	5	10
b_{10}		90	90	105	150	170
c_1		10	10	10	10	10
d_5		175	175	225	290	310
d_6		3/8"	3/8"	3/8"	3/8"	3/8"
d_7		25	25	31	38	50
d_8		12	12	12	12	12
h_1		270	270	300	400	480
h_2		220	220	230	300	375
h_3		90	90	70	100	125
l_1		685	750	810	940	981
l_2		292	292	342	402	502
l_3		100	100	110	130	110
l_{4min}		40	110	130	180	200
Bolt	ø	M24	M24	M30	M36	M48
Bolt material		10.9	10.9	10.9	10.9	10.9
Tighten. torque	Nm	1050	1050	2100	3500	6400
Data per caliper half: Contact force F_A	kN	100	150	240	300	400
Op. pressure	bar	140	180	180	210	210
Max. pressure	bar	200	200	200	240	240
Release stroke	mm	2	2	2	2	2
Oil volume	l	0,023	0,023	0,035	0,050	0,052
Pad surface	cm^2	427	427	570	1050	1360
Theor. friction	μ*	0,40	0,40	0,40	0,40	0,40
Weight	(kg)	200	210	368	760	1180

*) Average friction factor of standard material combination
All dimensions in mm.

Brake torque M_{Br} in Nm = F_A (kN) x μ x d_1 (mm)

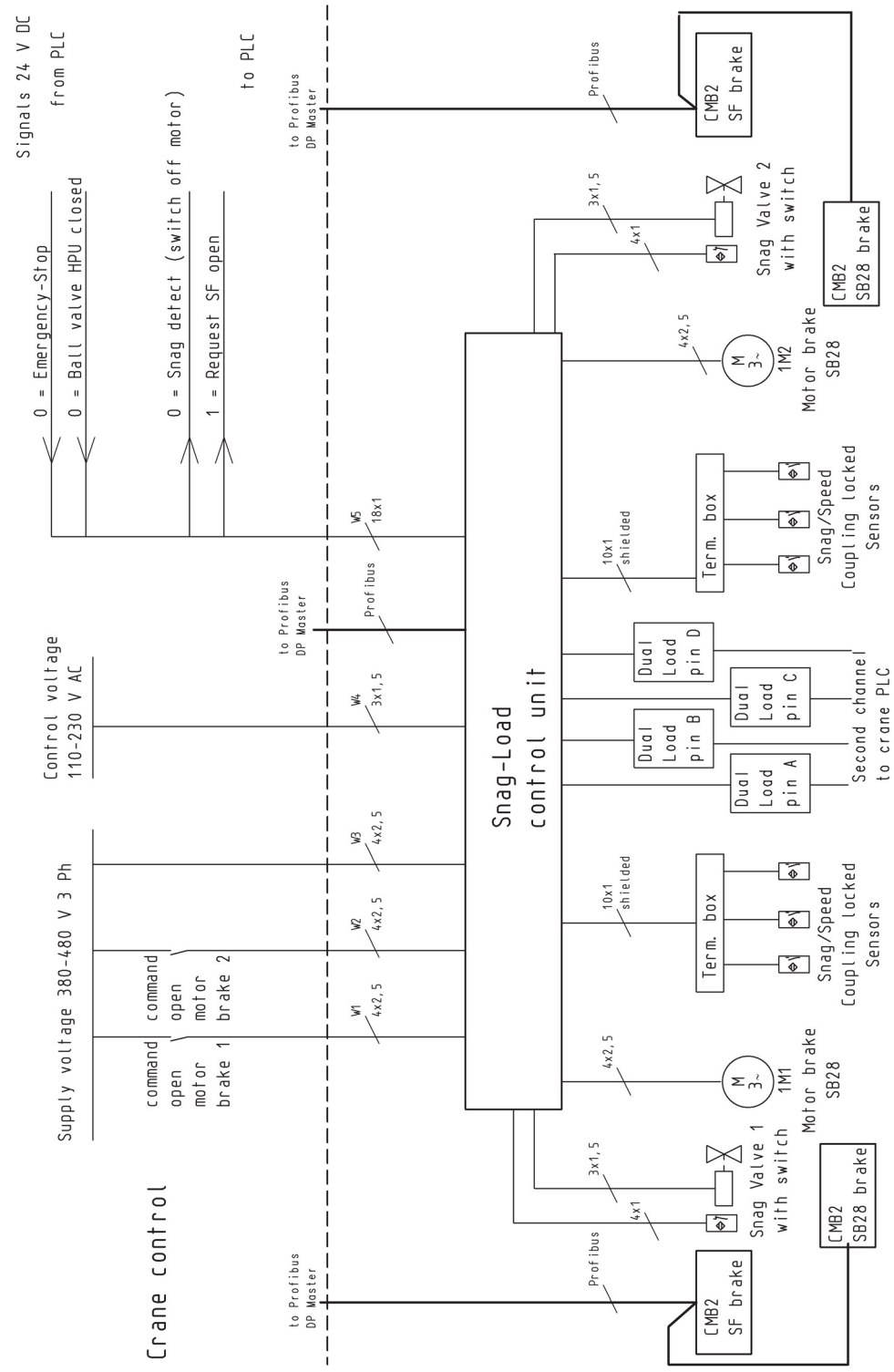


Please indicate mounting position in case of order.

Brake disc data					
	SF 10	SF 15	SF 24	SF 30	SF 40
d_1 =	d_2-170 mm	d_2-170 mm	d_2-200 mm	d_2-290 mm	d_2-320 mm
d_4 =	d_2-420 mm	d_2-420 mm	d_2-490 mm	d_2-620 mm	d_2-700 mm

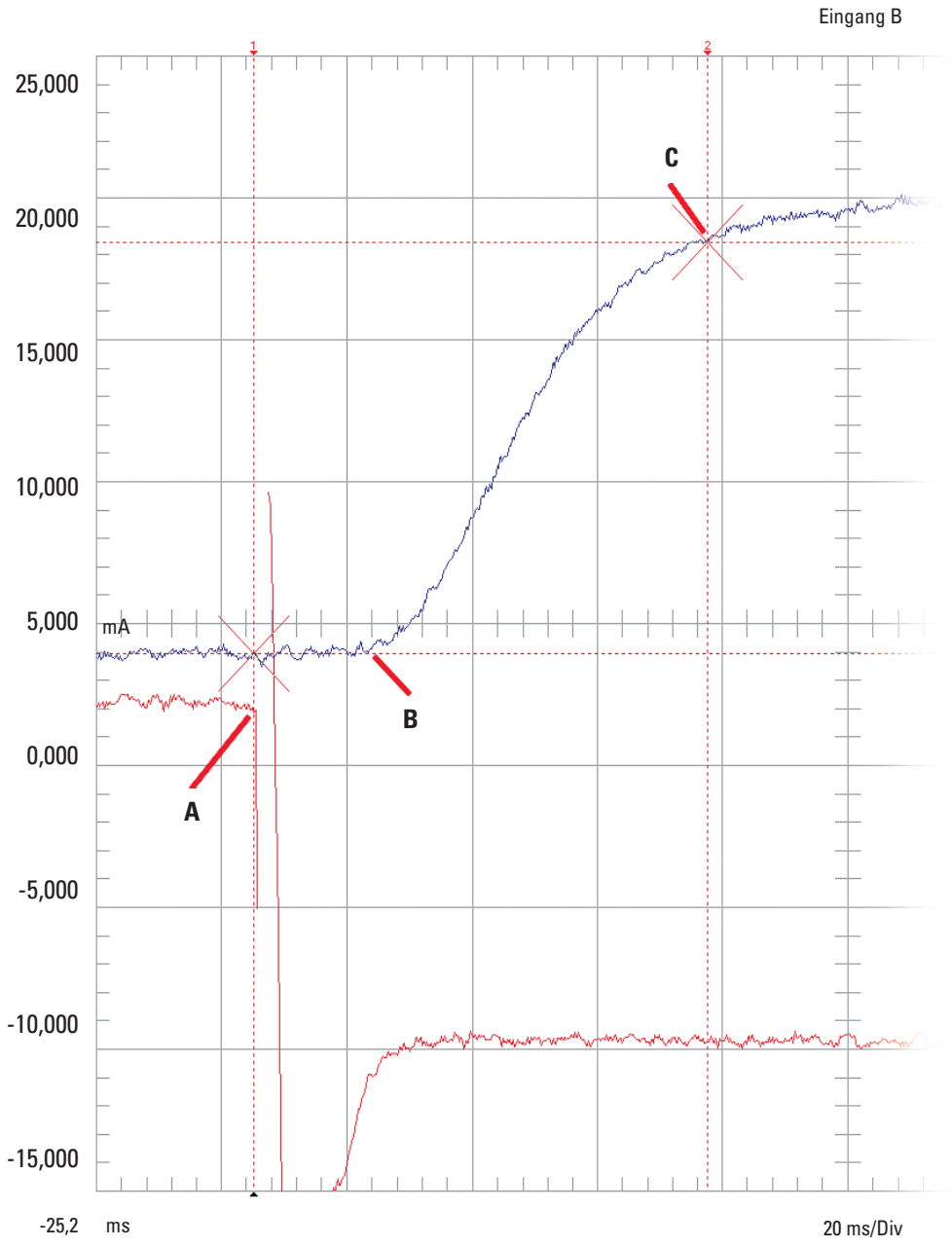
d_2 = Brake disc diameter in mm
d_1 = Friction diameter in mm
d_4 = Max. permissible drum or hub diameter in mm
b_1 = Disc thickness in mm (min. 30)

Input / Output data	Rev. 06/12



PINTSCH BUBENZER

Reaction time diagram of fast setting emergency brake SF	Rev. 11/06



x1:	0,0	ms
x2:	72,4	ms
dX:	72,4	ms
Y1:	3,903	mA
y2:	18,452	mA
dY:	14,548	mA

A	Snag Case
B	SF brake closed
C	90% contact force SF brake

Fast Setting Emergency Brake, recorded during German Lloyds approval

MSC separates motors After 20 ms first braking force is applied	**Line 1 (red)**
After 70 ms 90% of the braking force is applied	**Line 2 (blue)**

All dimensions in mm

German Lloyds Record of the torque at the gearbox input shafts:

Time scale

46.495 s
First MSC separating

46.510 s
Second MSC separating

46.515 s
First Reaction of upcoming braking forces from the safety brakes

46.560 s
Full stop of the rope drum

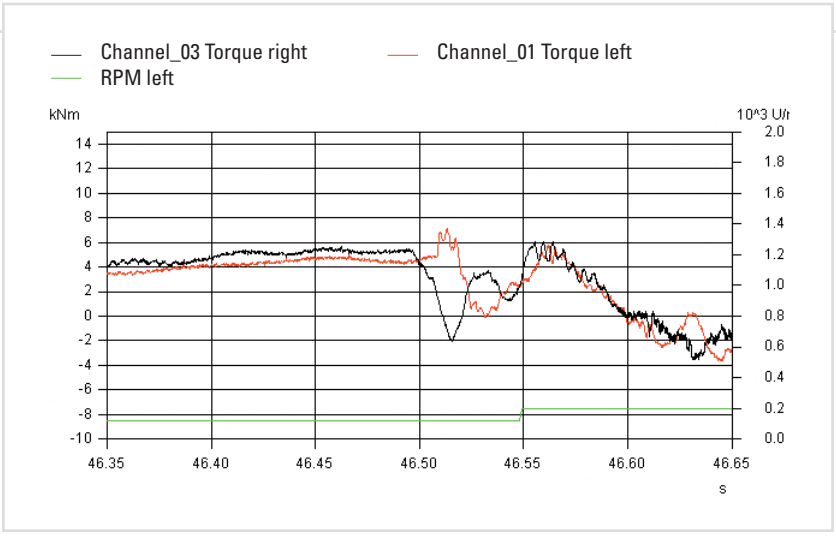
46.600 s
Gear box input torque equals zero

Germanischer Lloyd

Document Control Sheet

Client: GL – Bautechnik, Dpt. Ingenieurbau Mr. Thönnissen	**Client's ref.:** 4640-05-00637-81 Order dated 11.05.2006
Title: Torque Measurements at Hoisting Winch of Container Bridge No 8 Container Terminal Tollerort, Hamburg	
Abstract: At the hoisting winch of container bridge no. 8, located at container terminal Tollerort, Hamburg, torque measurements were performed. The aim of these measurements was to proof the function of an overload coupling build into the drive chain of the hoisting winch. The overload coupling (Malmedy safety coupling MSC) is intended to quickly disconnect the electric motor from the succeeding components in order to avoid any unacceptable load induced by dynamic effects. The measurements were carried out on May 12, 2006, at container terminal Tollerort, Hamburg.	
Department: Experimental Investigations / ESE	

Work carried out by	**Released by**
Dipl.-Ing. Uwe Weidner	Dipl.-Ing. Wolfgang Menzel (Head of Experimental Investigations Department)
Revision No.: 01	**Date of last revision:** 2006-05-23
Keyword(s)	**No. of pages:** in main body : 11; in attached tables :; in attached figures :; in other appendices : 18 — **Status:** ☐ Preliminary ☒ Final ☐ GL internal
	Report No.: ESE 2006.109 **GL Order No.:** 4640 05 00637 81/ 7910 06 66320 74 **GL Reg. No.:** -



CONNECTING POWER

AT ITS SAFEST

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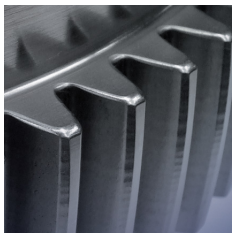


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