

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Brakes**

with type designation(s)
TS 200, TS 320, TS 500, TS 800, TS 1250, TS 2000

Issued to
PINTSCH BUBENZER GmbH
Kirchen (Sieg) Rheinland-Pfalz, Germany

is found to comply with
DNV GL standard DNVGL-ST-0378 – Standard for offshore and platform lifting appliances

Application :

Electromagnetic Quad-Disc Spring-Set Brake series "Twin Safe"

This Certificate is valid until **2022-12-14**.

Issued at **Høvik** on **2017-12-15**

DNV GL local station: **Essen**

Approval Engineer: **Chi Wan Bang**

for **DNV GL**

Aldo Matteucci
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

Brake series TWIN SAFE with the following characteristics:

Equipment designation: Twin Safe 200
Maximum braking torque: 2000 Nm
Number of springs: 18
Elastic force per spring: 552,6 N
Friction coefficient: 0,38
Number of friction surfaces: 4

Equipment designation: Twin Safe 320
Maximum braking torque: 3200 Nm
Number of springs: 15
Elastic force per spring: 976,2 N
Friction coefficient: 0,38
Number of friction surfaces: 4

Equipment designation: Twin Safe 500
Maximum braking torque: 5000 Nm
Number of springs: 19
Elastic force per spring: 1008,9 N
Friction coefficient: 0,38
Number of friction surfaces: 4

Equipment designation: Twin Safe 800
Maximum braking torque: 8000 Nm
Number of springs: 26
Elastic force per spring: 1008,9 N
Friction coefficient: 0,38
Number of friction surfaces: 4

Equipment designation: Twin Safe 1250
Maximum braking torque: 12600 Nm
Number of springs: 38
Elastic force per spring: 987,6 N
Friction coefficient: 0,38
Number of friction surfaces: 4

Equipment designation: Twin Safe 2000
Maximum braking torque: 20000 Nm
Number of springs: 59
Elastic force per spring: 950,0 N
Friction coefficient: 0,38
Number of friction surfaces: 4

Application/Limitation

- All materials in load carrying parts are to be delivered with minimum 3.1 certificates (EN 10204:2004) documenting mechanical properties and chemical composition in accordance with the approval documentation and shall comply with Sec.3. Note that the impact properties for all torque transmitting parts shall be in accordance with the standard based on design temperature for each installation.

- Above mentioned brake torque is the maximum torque the brake exerts. Allowable torque for the brake is the maximum torque divided by 1,8 or dynamic factor if this is above 1,8 (refer to the standard Sec.5 [5.2.3.5]).
- The friction coefficient has not been evaluated, the value has been provided by the manufacturer.

Type Approval documentation

The following documentation was stamped 2017-07-13 and given the status as shown below:

General drawings:

Drawing No.	Rev.	Date	Title	Status
8-A01416400951	C	29.06.2017	brake series TWIN SAFE tacho mounting	For information

TS200:

Drawing No.	Rev.	Date	Title	Status
8-000582600214	C	12.09.2014	Friction lining carrier SFB 100	Type approved
8-000585600214	E	10.07.2015	Brake flange SFB 100	Type approved
8-000661400214	J	10.02.2016	Intermediate flange A450 SFB 100	Type approved
8-001345900214	B	10.07.2015	armature plate 2MS/NS (22+32) SFB 100	Type approved
8-001415000958		09.09.2015	Twin Safe 200_ Document Overview	For information
8-001415010960		02.11.2015	Twin Safe 200_ Design of the magnetic circuit	For information
8-001423300214	0	17.07.2015	friction lining carrier TWIN SAFE 200	Type approved
8-0014234XX214	A	04.02.2016	pinion TWIN SAFE 200	Type approved
8-001424100214	0	04.08.2015	bolt Twin Safe 200	Type approved
8-001424300214	D	24.05.2016	middle flange TWIN SAFE 200	Type approved
8-001424600214	A	10.11.2015	coil body 2MS/NS+Hz TWIN SAFE 200	Type approved
8-A01415000960		02.11.2015	Twin Safe 200_ brake torque and number of springs	For information
8-A01415000961		02.11.2015	Twin Safe 200_ screwed joint intermediate flange - coil body	For information
8-A01415000961_A		02.11.2015	Twin Safe 200_ screwed joint intermediate flange - coil_A	For information
8-A01415000961_I		15.07.2015	Twin Safe 200_ screwed joint intermediate flange - coil_I	For information
8-A01415010961		02.11.2015	Twin Safe 200_ screwed joint of the brake flange	For information
8-A01415010961_VDI		02.11.2015	Twin Safe 200_ screwed joint of the brake flange	For information
8-A01415020961		02.11.2015	Twin Safe 200_ Stress analysis of the bolt	For information
8-A01415020961_DIN		02.11.2015	Twin Safe 200_ Stress analysis of the bolt	For information
8-A01415030961		02.11.2015	Twin Safe 200_ Stress analysis of the toothing	For information
8-A01415030961_DIN		02.11.2015	Twin Safe 200_ Stress analysis of the toothing	For information

TS320:

Drawing No.	Rev.	Date	Title	Status
8-0014210XX214	H	19.01.2017	pinion TS320, TS500, TS800	Type approved
8-0005885XX214	H	29.10.2014	intermediate flange A550-1	Type approved
8-001085210214	C	26.06.2015	intermediate flange S510 SFB160	Type approved
8-000589200214	D	21.08.2014	fricton lining-grp. SFB 160	Type approved
8-000589200214	C	19.08.2014	fricton lining-grp. SFB 160	Type approved
8-000589300214	E	23.06.2015	Brakeflange SFB 160	Type approved
8-001157600214	O	26.07.2000	armature plate	Type approved
8-001157600214	A	28.08.2014	armature plate	Type approved
8-001415300958		24.06.2015	Twin Safe 320_ Document Overview	For information
8-001415310960		26.04.2017	Twin Safe 320_ Design of the magnetic circuit	For information
8-001421100214	B	25.08.2015	bolt Twin Safe 320	Type approved
8-001421300214	C	28.08.2015	Middle flange Twin Safe 320	Type approved
8-001421300214	E	25.04.2016	Middle flange Twin Safe 320	Type approved
8-001421600214	O	23.06.2015	coil body 2Nuten + Hzg TwinSafe 320	Type approved
8-001421600214	B	17.05.2016	coil body 2Nuten + Hzg TwinSafe 320	Type approved
8-001423000214	O	26.06.2015	fricton lining-grp. TS 320	Type approved
8-001131900214	B	26.04.2017	fricton lining-grp. TS 320/SFB160-H	Type approved
8-A01415300960		26.04.2017	Twin Safe 320_ brake torque and number of springs	For information
8-A01415300961		24.06.2015	Twin Safe 320_ screwed joint intermediate flange - coil body	For information
8-A01415300961_A		26.04.2017	Twin Safe 320_ screwed joint intermediate flange - coil_A	For information
8-A01415300961_I		26.04.2017	Twin Safe 320_ screwed joint intermediate flange - coil_I	For information
8-A01415310961		24.06.2015	Twin Safe 320_ screwed joint of the brake flange	For information
8-A01415310961_VDI		26.04.2017	Twin Safe 320_ screwed joint of the brake flange	For information
8-A01415320961		24.06.2015	Twin Safe 320_ Stress analysis of the bolt	For information
8-A01415320961_DIN		26.04.2017	Twin Safe 320_ Stress analysis of the bolt	For information
8-A01415330961		24.06.2015	Twin Safe 320_ Stress analysis of the toothing	For information
8-A01415330961_DIN		26.04.2017	Twin Safe 320_ Stress analysis of the toothing	For information

TS500:

Drawing No.	Rev.	Date	Title	Status
8-001154900214	A	17.11.2014	armature plate, 2 flutes 22 + 32 SFB 250	Type approved
8-001420100214	C	22.07.2015	bolt Twin Safe 500	Type approved
8-000584500214	F	02.06.2015	Brake flange SFB 250	Type approved
8-001420600214	B	10.02.2015	coil body 2MS/NS+Hz Twin Safe 500	Type approved
8-000584200214	E	25.08.2014	fricton lining-grp. SFB 250	Type approved
8-000579200214	G	13.11.2014	intermediate flange A660 SFB 250	Type approved
8-001420300214	E	25.04.2016	Middle flange Twin Safe 500	Type approved
8-A01415400960		13.10.2016	Twin Safe 500_ brake torque and number of springs	For information

8-A01415400961_A	18.05.2016	Twin Safe 500_ screwed joint intermediate flange	For information
8-A01415400961_I	24.06.2015	Twin Safe 500_ screwed joint intermediate flange	For information
8-A01415400961	26.06.2015	Twin Safe 500_ screwed joint intermediate flange - coil body	For information
8-A01415410961	26.06.2015	Twin Safe 500_ screwed joint of the brake flange	For information
8-A01415410961_VDI	24.06.2015	Twin Safe 500_ screwed joint of the brake flange	For information
8-A01415420961	26.06.2015	Twin Safe 500_ Stress analysis of the bolt	For information
8-A01415420961_DIN	24.06.2015	Twin Safe 500_ Stress analysis of the bolt	For information
8-A01415430961	26.06.2015	Twin Safe 500_ Stress analysis of the tothing	For information
8-A01415430961_DIN	25.06.2015	Twin Safe 500_ Stress analysis of the tothing	For information
8-001415400958	24.06.2015	TwinSAFE 500_ Documentation overview	For information
8-001415410960	26.06.2015	TwinSAFE 500_ Design of the magnetic circuit	For information

TS800:

Drawing No.	Rev.	Date	Title	Status
8-001247500214	D	26.02.2015	Arm. plate f. 2 Nuten 22+32 SFB 400	Type approved
8-001417100214	C	23.02.2016	bolt Twin Safe 800	Type approved
8-000587400214	F	02.06.2015	Brake flange SFB 400	Type approved
8-001418100214	C	15.12.2015	coil body 2MS/NS+Hz Twin Safe 800	Type approved
8-000587300214	E	07.10.2014	friction lining-grp. SFB 400	Type approved
8-000670800214	J	10.11.2015	Intermediate flange A660 SFB 400	Type approved
8-001417300214	G	25.04.2016	Middle flange Twin Safe 800	Type approved
8-A01415600214		13.10.2016	Twin Safe 800_ brake torque and number of springs	For information
8-001415610960		26.06.2015	Twin Safe 800_ Design of the magnetic circuit	For information
8-001415600958		24.06.2015	Twin Safe 800_ Documentation overview	For information
8-A01415600961		26.06.2015	Twin Safe 800_ screwed joint intermediate flange - coil body	For information
8-A01415600961_A		13.10.2016	Twin Safe 800_ screwed joint intermediate flange - coil_A	For information
8-A01415600961_I		29.06.2015	Twin Safe 800_ screwed joint intermediate flange - coil_I	For information
8-A01415610961		26.06.2015	Twin Safe 800_ screwed joint of the brake flange	For information
8-A01415610961_VDI		24.06.2015	Twin Safe 800_ screwed joint of the brake flange	For information
8-A01415620961		26.06.2015	Twin Safe 800_ Stress analysis of the bolt	For information
8-A01415620961_DIN		24.06.2015	Twin Safe 800_ Stress analysis of the bolt	For information
8-A01415630961		26.06.2015	Twin Safe 800_ Stress analysis of the tothing	For information
8-		25.06.2015	Twin Safe 800_ Stress analysis of	For information

A01415630961_DIN

the toothing

TS1250:

Drawing No.	Rev.	Date	Title	Status
8-001346500214	A	19.01.2016	armature plate 2MS/NS (22+32) SFB 630/ TS 1250	Type approved
8-001435100214	0	18.01.2016	bolt Twin Safe 1250	Type approved
8-000591800214	D	18.01.2016	Brake flange SFB 630/ TS 1250	Type approved
8-001435600214	0	19.01.2016	coil body 2MS/NS +Hzg TwinSafe1250	Type approved
8-001370200214	A	19.01.2016	flange A780 SFB 630/ TS 1250	Type approved
8-000591100214	D	19.01.2016	friction lining carrier SFB 630/ TS 1250	Type approved
8-001308900214	B	19.01.2016	Friction lining group SFB 630-H/ TS 1250	Type approved
8-001435300214	0	10.05.2016	middle flange Twin Safe 1250	Type approved
8-0014350XX214	0	18.01.2016	pinion Twin Safe 1250	Type approved
8-A01415800960		24.04.2017	Twin Safe 1250_ brake torque and number of springs	For information
8-001415810960		24.04.2017	Twin Safe 1250_ Design of the magnetic circuit _Computations _ Strength checks _	For information
8-001415800959		24.04.2017	Twin Safe 1250_ Documentation overview _Competitions _ Strength tests _	For information
8-A01415800961		24.04.2017	Twin Safe 1250_ screwed joint intermediate flange - coil body	For information
8-A01415800961_A		18.04.2017	Twin Safe 1250_ screwed joint intermediate flange - coil_A	For information
8-A01415800961_I		24.04.2017	Twin Safe 1250_ screwed joint intermediate flange - coil_I	For information
8-A01415810961		24.04.2017	Twin Safe 1250_ screwed joint of the brake flange	For information
8-A01415810961_VDI		24.04.2017	Twin Safe 1250_ screwed joint of the brake flange	For information
8-A01415820961		24.04.2017	Twin Safe 1250_ Stress analysis of the bolt	For information
8-A01415820961_DIN		18.04.2017	Twin Safe 1250_ Stress analysis of the bolt	For information
8-S01415830961		24.04.2017	Twin Safe 1250_ Stress analysis of the toothing	For information
8-S01415830961_DIN		24.04.2017	Twin Safe 1250_ Stress analysis of the toothing	For information

TS2000:

Drawing No.	Rev.	Date	Title	Status
8-001436900214	0	26.04.2017	armature plate (22+32) TS 2000	Type approved
8-001437100214	0	24.04.2017	bolt Twin Safe 2000	Type approved
8-001436800214	0	24.04.2017	Brake Flange TS 2000	Type approved
8-001437600214	0	26.04.2017	coil body 2MS/NS +heater TS 2000	Type approved
8-001436700214	0	24.04.2017	flange A800 Ak-li TS 2000	Type approved
8-000618400214	C	22.07.2015	friction lining carrier SFB 1000/ TS 2000	Type approved
8-001292600214	C	25.04.2017	Friction lining-Grp. SFB 1000-	Type approved

		H/ TS 2000			
8-001437300214	0	24.04.2017	middle flange	Twin Safe 2000	Type approved
8-0014370XX214	0	24.04.2017	pinion	TS 2000	Type approved
8-A01416000960		24.04.2017	Twin Safe 2000_ brake torque and number of springs		For information
8-001416010960		24.04.2017	Twin Safe 2000_ Design of the magnetic circuit _Computations _ Strength tests _		For information
8-001416000959		24.04.2017	Twin Safe 2000_ Documentation _Competitions _ Strength proofs _		For information
8-A01416000961		24.04.2017	Twin Safe 2000_ screwed joint intermediate flange - coil body		For information
8-A01416000961_A		18.04.2017	Twin Safe 2000_ screwed joint intermediate flange - coil_A		For information
8-A01416000961_I		24.04.2017	Twin Safe 2000_ screwed joint intermediate flange - coil_I		For information
8-A01416010961		24.04.2017	Twin Safe 2000_ screwed joint of the brake flange		For information
8-A01416010961_VDI		24.04.2017	Twin Safe 2000_ screwed joint of the brake flange		For information
8-A01416020961		24.04.2017	Twin Safe 2000_ Stress analysis of the bolt		For information
8-A01416020961_DIN		24.04.2017	Twin Safe 2000_ Stress analysis of the bolt		For information
8-A01416030961		24.04.2017	Twin Safe 2000_ Stress analysis of the toothing		For information
8-A01416030961_DIN		24.04.2017	Twin Safe 2000_ Stress analysis of the toothing		For information

Tests carried out

Brake torque capacity tests carried out 22.03.2016 and 11.12.2017.

If a DNVGL product certificate is required, each brake shall be tested and witnessed by a DNVGL surveyor according to Sec.14 from the above-mentioned standard.

Marking of product

The brakes shall be marked according to Sec.14 from the standard.

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the approval are complied with. Reference is made to DNVGL-CP-0338.

END OF CERTIFICATE