Test Report No. EU-BD 1085

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Applicant/ Certificate holder:	Wittur Holding GmbH Rohrbachstrasse 26-30, 85259 Wiedenzhausen, Germany
Manufacturer of the test sample:	Wuxi Hengxin Machinery & Electric Manufactory Co., Ltd A6-5 Liyuan Development Zone, Binhu Distric, Wuxi City, Jiangsu Province, P. R. China
Date of application:	2018-09-12
Our order No.:	2482004910 (7482205057)
Test laboratory of the notified body:	TÜV SÜD Industrie Service GmbH Westendstr. 199 80686 Munich – Germany
Test number:	EU-BD 1085
Test object:	Braking device acting on the shaft of traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and braking element against unintended car movement Type :WB4600B
Order / Purpose of the examination:	Implementing an EU-type examination for a safety component according to Annex IV, Part A of Directive 2014/33/EU
Basis of examination:	- Directive 2014/33/EU, Annex I - EN 81-20:2014 Clause 5.6.6.11 and 5.6.7.13 - EN 81-50:2014 Clause 5.7 and 5.8
Extent of tests:	Comparing the safety component with the relevant requirements of the above Directive and the standards

Date: 2018-12-07

Our reference:
RI-LCC/SZY

Document:
PB_EU-BD_1085_181207_en

This document consists of 10 Pages.
Page 1 of 10

The test results refer exclusively to the units under test.

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1 Description of the test object

The safety component “ascending car overspeed protection means” comprising speed monitoring and speed reducing elements, shall detect overspeed of the ascending car, and shall cause the car to stop, or at least reduce its speed to that for which the counterweight buffer is designed.

The braking device with the type WB4600B, which refers to two single brake acting on the circumference of the brake drum (motor rotor), which connects to the shaft of traction sheave by a key, is used as a speed reducing element part of ascending car overspeed protection means, and also used as the braking element, part of the protection device against unintended car movement, which prevent or stop unintended car movement away from the landing with the landing door not in the locked position and the car door not in the closed position.

The braking device mainly consists of the electromagnet system (excitation coil, magnetic yoke and armature), brake spring and brake shoe with friction lining. When de-energized, the electromagnetic force disappeared, the armature under the action of the spring force, building up the braking torque, press on the surface of the brake disc which splined with the shaft of traction sheave, so braking. When powered on, the armature will move to overcome the brake spring force and open the brake disc. So the braking release under the action of the pull-in (electro-magnetic) force produced by the electromagnet system.

The braking devices are composed of two single braking devices, which must be arranged symmetrically. The rated voltage/rated current is DC 110V, 1.22A and the permissible design air gap between friction brake arm and the armature is 0.3 ~0.4 mm.

2 Documents which the report is based on

|U01| The approval drawings no. DSZ9000N-7503-00 from 2018-11-20, with certification stamp dated 2018-12-07

|U02| Detailed drawings total 21 pages (in the following table), with TÜV SÜD stamp dated on 2018-12-07;

Drawing no.	Description	Date / index
DSZ37DQ-6	Brake spring	2018-11-20 / NR
DSZ7000N-16	Hollow bolt	2018-11-20 / NR
DSZ7000N-21A	Hexagon head screw	2018-11-20 / NR
DSZ9000N-6	SS-5 Assembly	2018-11-20 / NR
DSZ7000N-58B-3	Hand shank	2018-11-20 / NR
DSZ7000N-58B-4	Press cake	2018-11-20 / NR
DSZ7000N-58B-5	Handle sleeve rod	2018-11-20 / NR
DSZ9000-1J	Magnetic ring	2018-11-20 / NR
DSZ9000N-2X	Armature	2018-11-20 / NR
DSZ9000N-3A	Brake shoe	2018-11-20 / NR
DSZ7000N-59	Handle Sleeve	2018-11-20 / NR
DSZ9000N-7A-1	Base	2018-11-20 / NR
DSZ9000N-7A-2	Turntable	2018-11-20 / NR
DSZ9000N-7A-3	Connecting sleeve	2018-11-20 / NR
DSZ7000N-20	Release block	2018-11-20 / NR
DSZ9000N-7A-5	release handle	2018-11-20 / NR
DSZ9000N-7A/7B	Remote loosening mechanism	2018-11-20 / NR
DSZ9000N-DC110V	Coil Assembly	2018-11-20 / NR
DSZ9000N-7A-4	Release Block	2018-11-20 / NR
DSZ7000N-56	Cylindrical head screw	2018-11-20 / NR
DSZ7000N-58B-6	Internal hexagonal flat end fastening screw	2018-11-20 / NR

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|U03| Owner's manual, total 2 pages
|U04| PP_Annex1_Pictures_EU-BD 1085_181207.pdf
|U05| Test record graphics and data Wittur_WB4600B_20181011.doc from SISE.
|U06| Application for EU-type examination dated 2018-09-12 from WITTUR
|U07| Calibration certificates of the test equipment

3 Test procedure

3.1 General

According to EN 81-50:2014, clause 5.1.1, the safety component shall be checked in particular that the mechanical, electrical and electronic components of the device are properly rated and that in the course of time the device does not lose its effectiveness, particularly through wear or aging. Currently, however, there is a statement (Committee CEN TC 10 WG1) that no additional or new testing methods to be dictated by these texts.

The test itself is to analysis how the changes of the standards and Directive have influenced on the safety principles of the design and safety functions.

3.2 Requirements of the test procedure

3.2.1 Requirements for braking device acting on the shaft of traction sheave, as part of the protection device against overspeed for the car movement in upwards direction

The test method and procedure described in Clause 5.7 of EN 81-50: 2014, for examining the brake device as one of two elements of the protective device for the car moving in upwards against over-speed, aims in its essential content at performing the tests with different (elevator) masses (config-urations) and issuing a certificate with the examination results.

Independent of the fact that the masses are unspecified or not described in more details, the test method is not mentioned the brake torque or braking force, and this method, appears also for other reasons, impracticable from the perspective of examination body.

The examination body, therefore, was defined different, but similar to Clause 5.7 of the EN81-50: 2014, the essential principle of the test method as follows:

- The applicant shall state the braking force or the braking torque, instead of the mass with which the test is carried out.
- Between the applicant and examination body shall determinate the test site, test arrangement and test mass (for testing, or determination of braking force / braking torque, e.g. in free-fall tests or on the torque test stand).
- In the certificate, the permissible braking force or the permissible braking torque is indicated instead of the permissible gross mass.
- The use of the certified braking force or the braking torque shall cause a deceleration of not more than 1 g_n of the upward-empty elevator car in the actual elevator system ("actual mass configuration").

As required in Clause 5.6.6.2 of EN81-20: 2014, the machine brake may only be used as a braking device of the protective device for the car moving in upwards against overspeed unless there is built-in redundancy and correct operation is self-monitored. This self-monitoring is subject to type examination.

However, in clause 5.7 of EN 81-50:2014, no further information will be referenced to verify this capability and no further requirements of this self-monitoring device are provided. Because of the undefined information on the self-monitoring, micro switch has been accepted as an example of monitoring device.

A series tests with 4 tests (2 clockwise, 2 counterclockwise) were carried out at maximum (tripping) speed (of the traction sheave) and at the permissible nominal braking torque. For each test, the braking torque and the rotary speed were recorded as a function of time and the average braking torque was determined (calculated) from the tests.

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3.2.2 Requirements for braking element acting on the shaft of traction sheave, as a part of the protection device against unintended car movement

In accordance with section 5.6.7.13 of EN 81-20:2014 and section 5.8 of EN81-50: 2014, now the braking element of the protection device against unintended car movement can be type test as a subsystem for the stopping, given that its interface conditions and the relevant parameters have been defined for the type-examination, if integrated in a complete system.

The test method and procedure is described in section 5.8.3.2.2 or 5.8.3.2.3 of EN81-50: 2014, 10 tests shall be separately carried out with a single brake torque representing an empty car in up direction and also a car carrying the rated load in down direction. For different torques, a series of tests shall be made for the maximum value and minimum value. Deviated from section 5.8.3.2.2 and section 5.8.3.2.1 of EN81-50: 2014, here only 10 tests, not 20 tests, were made on the stopping element.

Between each test the friction parts shall be allowed to return to their normal temperature.

During the tests one set of friction parts shall be capable of 5 tests minimum.

In Section 5.8.3.2.5 of EN 81-50: 2014, it is required to verify the correct operation of the self-monitoring, which detect loss of redundancy of the stopping element before a critical situation occurs. But no further information will be referenced to verify this capability and no further requirements of this self-monitoring device are provided. Because of the undefined information on the self-monitoring, micro switch has been accepted as an example of monitoring device.

The reduction of brake moment / force due to wear of brake pads or operational caused changes of traction are not part of this type examination.

The use of the certified braking force or the braking torque shall cause the car with any load in the car, up to 100 % of rated load, to stop, and keep it stopped, and shall not cause a deceleration of the car in excess of:

- 1 g_n for unintended movements in up direction with empty car;
- the values accepted for devices for protecting against free fall in the down direction

The installer of a lift must create an examination instruction to fulfill the overall concept (complete system, unintended car movement protection means), add it to lift documentation and provide any necessary tools or measuring devices, which allow a safe examination (e.g. with closed shaft doors).

The interface conditions and the relevant parameters of the stopping element as a subsystem were defined, determined and reported in this type-examination.

The nominal brake moment/force and maximum tripping rotary speed were stated by the applicant and verified by examination body. The response time is the time difference between the brake power drop and build-up of X% of the nominal braking moment / force. e.g., t_{50} means the time built up in milliseconds to 50% of the nominal braking moment / force. The achievement of 50% of the nominal braking moment may be the value taken from the examination recording during the tests or calculated from the time of 10% and 90% [$t_{50}= (t_{10}+ t_{90})/2$].

This response time as well as the braking distance is influenced by some factors, such as:

- Size – air gap
- Magnet design (Saturation, Material)
- Temperature
- Wiring (series/parallel)
- Energization (DC, AC)
- Overexcitation
- Attenuators (aging process of the attenuators)
- Traction (groove geometry, wear)

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A series of tests with 10 tests (5 clockwise, 5 counterclockwise) were made based on the stated nominal brake torque at the maximum rotary (tripping) speed (of the traction sheave) and at maximum air gap 0.4 mm (permissible air gap 0.3~0.4 mm). For each test, the braking torque and the rotary speed were recorded as a function of time and the average braking torque was determined (calculated) from the test.

Under the condition of the testing arrangement, the proof of the consistency of the brake torque / force by determining of a braking torque was provided, in order to provide reproducibility evidence in accordance with the standard (Section 5.8.3.2.1 of EN 81-50: 2014, each result within ± 20 % of the average value) that in a test series of 10 separate tests, none of these values deviates from the calculated average by more than ± 20 %. And the calculated average brake torque in a test series shall differ by not more than 20 % from those expected by the applicant (based on Section 5.8.4 of EN 81-50: 2014).

On the EU-type examination certificate, not the average value but the nominal braking torque / nominal braking force will be stated in opposition to Section 5.8.3.2.1 of EN 81-50: 2014. In addition, the maximum response time and the designated relevant design features are indicated.

According to the clause 5.6.6.1 of EN 81-20:2014, the maximum tripping speed (rotary speed) is shown on the certificate, but not the nominal (rated) speed (rotary speed).

Several braking tests were already made before the examination series, so that a partial run-in of the brake linings could be assumed.

The micro switches for direct monitoring of the brake elements movements in each braking circuit were checked for their correct functions.

For review and comparison with the design documents, the brake device was disassembled and separated into its components after testing.

3.3 Tests in detail

3.3.1 Document checks

- Check of the submitted document
- Comparison of the sample with the drawing documents
- Review of the instruction (owner's manual)

3.3.2 Mechanical tests

4 Information on tests

4.1 Test site

Shenzhen Institute of Special Equipment Inspection and Test

No. 6, Chuangye Rd., Qinghu Industrial Area, Longhua, Shenzhen, 518109, China

4.2 Date of test

2018-10-11

4.3 Participants

Participant on behalf of the certificate holder/manufacturer:

- Mr. Li Dong and Mr. Yang Zhen

Participant on behalf of the testing laboratory, Shenzhen Institute of Special Equipment Inspection and Test (SISE):

- Mr. Zhang Xin

Participant on behalf of the notified body, TÜV SÜD Industrie Service GmbH:

- Ms. Shen Zhiying, Mr. Li Jie

(TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch)

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4.4 Measurement equipment

Serial no.	Test equipment	Manufacture, type, serial no.	Calibration certificate no.	Accuracy	Calibration certificate was issued by	Date next calibration
P01	Tach -Torque Transducer	Beijing Sanjing Creation Science & Technology Group Co., Ltd, JN338-10000A, AE/XS/1010	/	Accuracy: 0.2%FS (Fullscale:10000 Nm; 2000 rpm)	Shenzhen Institute of Special Equipment Inspection and Test (SISE)(registration certificate No. CNAS L0916)	2018-08-19
P02	Data acquisition and analysis system	Donghua Testing Technology Co., Ltd. , DH5910, AM/XS/1603	183600690	Frequency measurement: MPE= ±0.01%; U_{rel}=0.01%, k=2 Frequency response of voltage measurement: MPE= ±2%; Voltage: amplitude indication: MPE= ±4%; U_{rel}=0.05%, k=2	Shenzhen Academy of Metrology & Quality Inspection (registration No. CNAS L0579)	2018-02-28
P03	Digital caliper	Guilin Guanglu Measuring Instrument Co., Ltd., 0-200mm, AL/XS/0311	181310325	Scale division = 0.01 mm 0 – 70 mm, MPE = ±0.02 mm; 70 – 200 mm, MPE = ±0.03 mm		2018-07-18

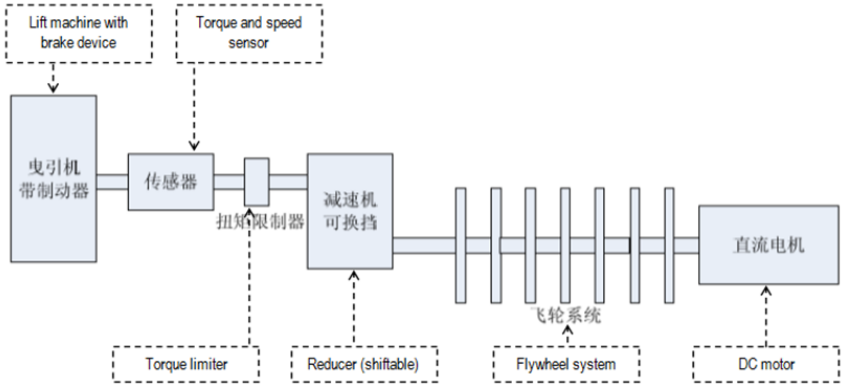
4.5 Test equipment

The conduct of the examination was performed on the torsion test stand.

As shown below (Figure 1 Schematic diagram of test system), the flywheel system of test bench is to be loaded for simulating the system inertia of elevator system.

Under the inverter control and the system software control, the DC Motor is powered on and realizes the loading (reach the setting unbalance loading value), then the brake device is energized and the brake is released. So the shaft, the traction sheave and the brake drum starts to rotate, and accelerates to achieve the specified speed (the setting maximum tripping speed) while driving the flywheel system operation for completing the loading of the system inertia. At that time while reaching the maximum tripping speed, the brake device is powered off and holds the brake drum. The shaft, the traction sheave and flywheel system will slow down and stop rotating with the action of the brake device. During the whole process, DC motor is energized.

Torque and speed sensors detect the brake torque and speed of the shaft in real time. By extracting voltage/current signal of brake coil contact and the micro-switch, and over the dynamic signal analyzer, the loss of power of the brake device, the micro-switch signal, and the building up brake torque can be detected, recorded and analyzed. The test record graphs were submitted from the test laboratory, SISE.



Picture 1 Test system

5 Findings

5.1 Document checks

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The submitted documents correspond in scope and content to the requirements of the test basis.

The owner's manual is checked for completeness of minimum information regarding that the instructions of the safety components for lifts shall include assembly, connection, adjustment, and maintenance which required in clause 6.1 in Annex I of directive 2014/33/EU.

To ensure that the series-produced safety components at the manufacturing stage conform to the type-examination safety component, ISO 9001:2015 certificate is provided for check (certificate no. 02018Q1464R1M, issued by Beijing ZhongDaHua Yuan Certification Center, valid until 2021-05-20.)

The construction of the test sample did correspond with the drawing documents submitted.

5.2 Mechanical tests

Symbols:

V_{t_s} is the max. tripping rotary speed of traction sheave (i.e. that of the shaft, brake disc/drum, or motor rotor) stated by the applicant [rpm];

V_{t_m} is the tripping rotary speed of traction sheave (i.e. that of the shaft, brake disc/drum, or motor rotor) measured for each test [rpm];

M_{B_n} is the permissible nominal brake torque stated by the applicant [Nm];

M_{B_mi} is the average brake torque measured during the braking for each test [Nm];

M_{B_mc} is the average brake torque calculated during the braking for a series of tests with 4 tests or 10 tests [Nm];

Dev_{B_mi} is the deviation of the measured average brake torque M_{B_mi} of each test from the calculated value M_{B_mc} of a test series [%];

Dev_{B_mc} is the deviation of the calculated average brake torque M_{B_mc} of a test series from the stated nominal brake torque M_{B_n} [%];

t_X is the response time of the stopping element (brake device), here is the time difference between the drop of the braking power until establishing X% of the nominal brake torque, t_{50} optionally calculated $t_{50}= (t_{10}+ t_{90})/2$ or value taken from the examination recording [ms].

5.2.1 Tests for the braking device acting on the shaft of traction sheave, as part of the protection device against overspeed for the car movement in upwards direction

5.2.1.1 Braking tests with both two single brake device
Test data under the condition of two single brake devices' action based on the nominal brake moment stated by the applicant

2 × 950 Nm = 1900 Nm with the assembly drawing no. DSZ9000N-7503-00					
Test no.	unit	1(CW)	2(CW)	3(CCW)	4(CCW)
V_{t_s}	rpm	309	309	309	309
V_{t_m}	rpm	332	325	335	331
M_{B_n}	Nm	1900	1900	1900	1900
M_{B_mi}	Nm	2198	2260	2096	2105
M_{B_mc}	Nm	2165			
Dev_{B_mi}	%	1.52	4.39	-3.19	-2.77
Dev_{B_mc}	%	13.95			

As shown in the above tests, the deviation (scatter) of the measured average braking torque during the tests were within the permissible range of ± 25% in relation to the value of the calculated average braking torque defined above. And the calculated average braking torque during the test series deviates by less than 20% from the stated nominal brake torque. This set torque (nominal brake torque) is taken within the scope of the EU-type examination certificate.

5.2.1.2 Braking tests with a single brake device

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4 tests (2 clockwise, 2 counterclockwise) are respectively carried out for verifying the corresponding brake torques under the condition of the action of a single brake device. The results show similar values of brake torque for each braking circuit.

Test data under the condition of a single brake device's action based on the nominal brake moment stated by the applicant.

1 × 950 Nm with the assembly drawing no. DSZ9000N-7503-00						
-	Test no.	unit	1(CW)	2(CW)	3(CCW)	4(CCW)
Single brake device (on the right side)	V_{t_s}	rpm	309	309	309	309
	V_{t_m}	rpm	311	323	327	328
	M_{B_n}	Nm	950	950	950	950
	M_{B_mi}	Nm	1056	1037	1106	1110
	M_{B_mc}	Nm	1077			
	Dev_{B_mi}	%	-1.95	-3.71	2.69	3.06
	Dev_{B_mc}	%	13.37			
-	Test no.	unit	1(CW)	2(CW)	3(CCW)	4(CCW)
Single brake device (on the left side)	V_{t_s}	rpm	309	309	309	309
	V_{t_m}	rpm	325	319	330	327
	M_{B_n}	Nm	950	950	950	950
	M_{B_mi}	Nm	1062	1039	1052	1035
	M_{B_mc}	Nm	1047			
	Dev_{B_mi}	%	1.43	-0.76	0.48	-1.15
	Dev_{B_mc}	%	10.21			

5.2.2 Tests for the braking element acting on the shaft of traction sheave, as a part of the protection device against unintended car movement

Test data under the condition of two single brake devices' action based on the nominal brake moment stated by the applicant.

2 × 950 Nm = 1900 Nm with the assembly drawing no. DSZ9000N-7503-00											
Test no.	unit	1(CW)	2(CW)	3(CW)	4(CW)	5(CW)	6(CCW)	7(CCW)	8(CCW)	9(CCW)	10(CCW)
V_{t_s}	rpm	309	309	309	309	309	309	309	309	309	309
V_{t_m}	rpm	332	332	325	334	332	339	335	331	328	334
t_{10}	ms	41	41	38	39	40	40	42	42	42	43
t_{50}	ms	82	83	84	81	82	82	83	83	92	85
t_{90}	ms	122	124	130	122	124	124	124	123	141	126
Max. t_x	ms	t_{10} = 43, t_{50} = 92, t_{90} = 141									
M_{B_n}	Nm	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
M_{B_mi}	Nm	2185	2198	2260	2276	2239	2052	2096	2105	2072	2107
M_{B_mc}	Nm	2159									
Dev_{B_mi}	%	1.2	1.81	4.68	5.42	3.71	-4.96	-2.92	-2.5	-4.03	-2.41
Dev_{B_mc}	%	13.63									

As shown in the above test data, the deviation (scatter) of the measured average braking torque during the tests were within the permissible range of ± 20% in relation to the value of the calculated average braking torque defined above. And the calculated average braking torque during the test series deviates by less than 20% from the stated nominal brake torque. This set torque (nominal brake torque) is taken within the scope of the EU-type examination certificate.

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5.2.3 Tests pursuant to EN 81-50:2014, number 5.7 and 5.8

The test results lie within the requirements of EN 81-50:2014, number 5.7 and 5.8

The measured values of the torque and speed have been measured with the test equipment |P1|.

5.3 Function test of the self-monitoring

The correct operation of the self-monitoring (micro-switch) was verified during the tests in the above point 5.2.1 and 5.2.2. The capability of the self-monitoring (micro-switch and control units) to detect loss of redundancy of the stopping element shall be verified on a complete unintended car movement protection system of a lift.

6 Test results

The EU-type examination shows that the brake device/element when used as intended complies with the requirements of the basis of examination.

6.1 Use as braking device – part of the protection device against overspeed for the car moving in upwards direction – permissible brake torque and maximum tripping speed

Permissible brake torque when the braking devices act on the shaft of traction sheave while the car is moving upward and the maximum tripping rotary speed of the traction sheave

Permissible brake torque when the braking devices act on the shaft of traction sheave while the car is moving upward [Nm]	Maximum tripping rotary speed of the traction sheave [rpm]
2 × 950 = 1900	309

The maximum tripping speed of the overspeed governor of the lift must be calculated on the basis of the maximum tripping rotary speed of the traction sheave as outlined below taking into account the diameter of the traction-sheave and car suspension.

$$v = \frac{D_{TS} \times \pi \times n}{60 \times i}$$

v = Tripping speed(m/s)
D_{TS} = Diameter of the traction sheave from rope's centre to rope's centre (m)
π = 3.14
n = Rotary speed(rpm)
i = Ratio of the car suspension

6.2 Use as braking element – part of the protection device against unintended car movement (acting in up and down direction)– permissible brake torque, response time, maximum tripping speed and features

6.2.1 Nominal brake torque and response time with relation to a brand-new brake element

Nominal Brake torque * [Nm]	Maximum tripping rotary speed [rpm]	Maximum response time ** [ms]		
		t_{10}	t_{50}	t_{90}
2 × 950 = 1900	309	43	92	141

Interim values can be interpolated.
Explanations:

*** Nominal brake torque:** Brake torque assured for installation operation by the safety component manufacturer.

**** Response time:** t_X time difference between the drop of the braking power until establishing X% of the nominal brake torque, t_{50} optionally calculated $t_{50} = (t_{10} + t_{90})/2$ or value taken from the examination recording

6.2.2 Assigned execution features

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Type of powering / deactivation		Continuous current / continuous current end
Brake control		Parallel
Nominal air gap		0.3 - 0.4 mm
Damping elements		Yes
Without over-excitation	Rated voltage	110 VDC
	Rated current	2 × 1.22 A
	Rated power	2 × 135 W

7 Conditions

7.1 Above mentioned safety component represents only a part of the protection device against overspeed for the car moving in upwards direction and unintended car movement (acting in up and down direction), only in combination with a detecting and triggering component in accordance with the standard (two separate components also possible), which must be subjected to an own type-examination, can the system be created for fulfilling the requirements for a protection device.

7.2 The manufacturer of the drive unit must provide calculation evidence that the connection traction sheave – shaft – brake disc (drum, rotor) and the shaft itself is sufficiently safe, if the brake disc (drum, rotor) is not a direct component of the traction sheave (e. g. casted on). The shaft itself has to be statically supported in two points. The calculation evidence must be enclosed with the technical documentation of the lift.

7.3 The installer of a lift must create an examination instruction to fulfil the overall concept, add it to lift documentation and provide any necessary tools or measuring devices, which allow a safe examination (e.g. with closed shaft doors).

7.4 The setting of the brake torque/force has to be secured against unauthorized adjustment (e. g. sealing lacquer).

8 Remarks

8.1 In the scope of this type-examination, it was found out, that the brake device also functions as a brake for normal operation, is designed as a redundant system and therefore meets the requirements to be used also as a part of the protection device against overspeed for the car moving in upwards direction and as braking element as a part of the protection device against unintended car movement.

8.2 Checking whether the requirements as per clause 5.9.2.2 of EN 81-20:2014 have been complied with is not part of this type examination

8.3 Other requirements of the standard, such as reduction of brake moment respectively braking force due to wear or operational caused changes of traction are not part of this type examination.

8.4 This report was issued according to the following standards:

- EN 81-20:2014, Clause 5.6.6.11 and 5.6.7.13
- EN 81-50:2014, Clause 5.7 and 5.8

A revision of this report will be necessary in case of changes or amendments of the above mentioned standards or of changes of state of the art.

Test laboratory “lifts and cranes” — the expert

Thoralf Mührel — Zhiying Shen