Report EC type-examination

Report belonging to (EC)*) type-examination certificate no.	:	NL.04.400.1002.004.40
Date of issue of original certificate	:	December 15th, 2004
No. and date of revision of certificate	:	Revision no. 2.0, June 15th, 2006
No. and date of revision of report	:	Revision no. 3.0, November 2nd, 2007
Concerns	:	safety component for lifts (ascending car overspeed protection means)
Revision 3.0 concerns	:	- number of springs in various models changed - layout of report changed
Requirements	:	Lifts Directive 95/16/EC Machinery Directive 98/37/EC Standards: EN 81-1
Project no.	:	P070208-01

1. General specifications

Name and address manufacturer	:	Schindler Drive Systems Pgno "Empresarium C/ Albardin, 58 E-50720 Cartuja Baja - Zaragoza
Description of safety component	:	Ascending car overspeed protection means for lifts with rated speeds up to and including 1.75 m/s, provided with Schindler DRSGB 142 machines and double disk brakes of Moteurs Leroy Somer
Type	:	Double disk brakes (FCRD 112)
Laboratory	:	Schindler factory in Ebikon (Lucerne) - Switzerland
Date / data of examination	:	November 30th and December 1st, 2004 April 26th and 27th, 2006
Examination performed by	:	H.B. Kaptein

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2. Description safety component

Description of ascending car overspeed protection means

The means consist of a double disk brake and an overspeed governor. Both brakes form an integrated part with the traction sheave (installed on the same main shaft) and are operated simultaneously.
It concerns two types of similar brakes (Moteurs Leroy Somer), to be applied with more types of similar machines (Schindler). For the proper combinations to be installed, see the specifications here after.
The overspeed governor that mainly will be applied shall be the type GBP manufactured by Schindler, that can be adjusted for rated speeds of the car up to and including 1.75 m/s). However every other type of overspeed governor can be applied that is suitable for the corresponding rated car speed (with a maximum of 1.75 m/s).
The ascending safety device is actuated by the electrical safety device (forced opening contact) of the overspeed governor. Neither the overspeed governor nor its contact is part of this investigation.
The disk brakes fulfil the requirements of the EN 81-1 standard, also in this case where it concerns two co-operating brakes in series being installed as a set.

Reference of rated loads, types of MLS-brakes and brake parts for machines DRSGB142

Rated load of the car (kg)	Reeving factor	Brake indication with MLS	Type of MLS brake (Nm)	Brake lining inside / outside diam. (mm)	Needed braking torque (Nm)	Delivered braking torque (Nm)	Length of spline bush	Number of pressure springs
320	2	FCRD 112	2 x 105	150 x 180	2 x 87	2 x 105	25	10
450	2	FCRD 112	2 x 150	150 x 180	2 x 133 2 x 148	2 x 150	25	14
630	1	FCRD 112	2 x 180	150 x 180	2 x 160	2 x 180	40	14
630	2	FCRD 112	2 x 105	150 x 180	2 x 86	2 x 105	25	10
800	2	FCRD 112	2 x 150	150 x 180	2 x 111	2 x 150	25	14
1000	2	FCRD 112	2 x 150	150 x 180	2 x 132	2 x 150	25	14
1250	2	FCRD 112	2 x 180	150 x 180	2 x 159	2 x 180	40	14

Notes:
- for all rated loads the brakes can be applied for the rated speeds up to and including: 1.75 m/s.
- for intermediate rated loads the next higher rated load with an equal brake configuration and an equal reefing factor must be applied
- the spline bushes can be installed on main shafts with diameters of ø 32 mm, as well on main shafts with diameters of ø 35 mm
- the brake lining area of both types have a surface of 7775 mm²
- the pressure springs are located on a diameter of ø 174 mm
- indication of pressure springs for all types of brakes: RST012RC004
- the lining material is glued on both disk parts of the splines of aluminium
- the lining material of the brakes is Bremskerl 6800
- adjustment of the 4 air gaps: 0.25 - 0.40 mm
- this type of brake is equipped with an internal aluminium ring for the braking surfaces
- the micro switch installed on the outside is provided with alternating contacts
- the required braking torques are depending of the actual car weights

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3. Examinations and tests

3.a. Method of testing, results, procedure

The Schindler lifts, at which the ascending car overspeed means will be applied, do have rated car speeds up to and including 1.75 m/s. They will be balanced for 40-50%; the maximum travel height is 60 m.
For the range of the minor rated loads of 320 kg up to and including 630 kg with a reefing factor of 1:1 or 1:2, an ascending car overspeed protection means for a lift of the rated car load of 630 kg was tested with the application of 2 x 105 Nm brakes; it can be assumed that the proper test results for the rated load of 630 kg will cover the requirements for the lower rated car loads also.
For the same range of rated loads, but with a reefing factor of 1:1 also brakes of 2 x 180 Nm can be applied.
An equal approach was performed for the ascending car overspeed protection means for cars with rated loads of 750 kg up to and including 1000 kg; in this case a lift with a rated car load of 1000 kg was tested with the application of 2 x 150 Nm brakes; again it can be assumed that the proper test results for the rated load of 1000 kg will cover the requirements for the lower rated car loads also.
The ascending car overspeed protection means for cars with rated loads of 1250 kg was tested separately, because of a bigger system mass to slow down and for that reason having bigger brakes (2 x 180 Nm). Besides these brakes with the capacity of 2 x 180 Nm were tested for the purpose of a maximum speed up to and including 1.25 m/s. Actually they were tested with a far more high tripping speed than the tripping speed belonging to the rated speed of 1.25 m/s.

For rated loads up to and including 630 kg, the heaviest car is 1260 kg. Weights were added to the car to reach this maximum car weight. To obtain the same balance of the system (50%) an equal amount of weight was added to the counterweight. Finally, the result was a maximum unbalance of the system with an empty car and with a system mass of approx. 2835 kg (approx. 2 x P + ½ Q).
For rated loads up to and including 1000 kg, the heaviest car is 1700 kg. Weights were added to the car to reach this maximum car weight. To obtain the same balance of the system (50%) an equal amount of weight was added to the counterweight. Finally, the result was a maximum unbalance of the system with an empty car and with a system mass of approx. 3900 kg (approx. 2 x P + ½ Q).
For rated loads up to and including 1250 kg, the heaviest car is 1500 kg. Weights were added to the car to reach this maximum car weight. To obtain the same balance of the system (50%) an equal amount of weight was added to the counterweight. Finally, the result was a maximum unbalance of the system with an empty car and with a system mass of approx. 3625 kg (approx. 2 x P + ½ Q).

All tests for rated loads up to and including 1000 kg were executed for a rated speed of 1.75 m/s. The tests for rated loads up to and including 1250 kg were executed for a rated speed of 1.25 m/s.

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If the rated speed will be reduced to respectively 0.40 m/s, 0.63 m/s, 0.80 m/s, 1.00 m/s, 1.25 m/s or 1.6 m/s, the maximum system mass can be increased because an equal amount of energy has to be dissipated ($\frac{1}{2}$ $mV^2 = C$).
The relation can be found in the ratio between the different maximum tripping speeds of the overspeed governor for the different rated speeds.
The maximum possible tripping speed in these cases is the upper limit of the adjustment of the overspeed governor, (see EN 81-1, chapters 9.10, 9.9.1 and 9.9.3).
This means that at a required rated speed of more than 1.00 m/s, the maximum tripping speed of the overspeed governor shall not exceed (1.25*V + 0.25/V) in m/s.
For a rated speed of 1.25 m/s the tripping speed equals 1.7625 m/s and for the rated speed of 1.75 m/s the tripping speed equals 2.33 m/s; for a rated speed of 1.0 m/s the maximum tripping speed shall not exceed 1.5 m/s. In this last case (rated speeds up to and including 1.0 m/s) the standard EN 81-1 permits that the safety contact of the overspeed governor switches at tripping speed.
The adjustments as described up here are valid for progressive safety gears and for instantaneous safety gears with buffered effect. In case of a rated speed of 0.63 m/s and so for an applied instantaneous safety gear (not the captive roller type), the maximum permitted tripping speed may not increase 0.8 m/s. If here the maximum value for GK is calculated via the maximum certified system mass, this calculated maximum car mass GK will result in a value far out of the range to apply, but also far out normal ranges of car weights for these specific rated loads. For this reason the calculated values for the maximum car mass to apply with a rated speed of 1.00 m/s do also apply for rated speeds of 0.80 m/s or lower rated speeds.
The calculated car weights derived from total system masses obtained at tests are valid for other rated speeds only in case the equal brakes are applied. Besides there are other limitations for the maximum car weight to apply, like maximum bending torque of the main shaft of the machine, maximum surface pressure, etc.
For calculated values of car masses obtained from the original values from maximum system masses at testing, see the table in the Annex 1 of this report.

3.b. Procedure

During the tests the subjoined procedure was followed:

1. The actual maximum car mass was determined and load was added to the car to reach this maximum car mass.
2. Load was added to the counterweight to balance the system for the determined maximum car mass and half of the rated car load (system balance 50%).
3. Half of the rated load was removed from the car to obtain the maximum unbalance for testing.
4. The test was performed by putting the measuring tool on the floor of the car and actuating this tool, while the car was located at the bottom landing floor.
5. After the doors were closed, the car was send to a higher level in the well by keeping the brakes opened manually via an additional external supply.

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6. During the different test runs the car did accelerate until it reached a speed of more than 2.33 m/s (2.20-2.96 m/s) for tripping with the rated speed of 1.75 m/s, after which the brakes were closed.
   At the test runs for the rated speed of 1.25 m/s, the brakes were closed after the car had reached a tripping speed of more than 1.7625 m/s (3.05-3.6 m/s).
7. After the car was stopped, the overspeed governor was reset and the relevant parts of the lift were checked for possible damage (overspeed governor and brakes of the machinery); also the measuring tool was removed from the car.
8. The data recorded by the measuring tool (PMT) were transferred to the laptop computer and saved; the results (produced overviews and graphics) were checked and interpreted, and printed at a later point of time.

This procedure was at first executed with brakes for 2 x 150 Nm installed on the DRSGB142 machine and repeated twice with 2 x 105 Nm and 2 x 180 Nm brakes installed. For each type of brake 5-6 test runs were carried out.

3.c. Test arrangement

The tests are executed with a model lift for the rated load of 630 kg, for the different tests equipped with the types of brakes as indicated in the table in chapter 1. The increasing speed of the car was followed by a laptop computer, connected to the encoder of the lift with which the tests were executed.
The PMT recorder was installed in the car at the bottom landing and actuated, after which the doors were closed. After the control was switched off, the brakes were opened manually by servicing hold to run buttons of the external supply to the brakes. The car started to increase speed from zero at travelling to a higher level in the well.

The speed of the upward travelling car increased until a level of more than 2.33 m/s with the tests of the 2 x 105 Nm and the 2 x 150 Nm brakes (far more than 1.7625 m/s with the tests of 2 x 180 Nm brakes), appearing directly after the overspeed governor was tripped (adjusted tripping speed 1.40 m/s). Above these speed levels the brakes were closed by cutting the external supply. From the moment the brakes did close, the car stopped after a distance of approx. 1.10 – 1.70 m.

3.d. Test equipment

Recorder:

Manufacturer PMT, Model indication EVA-625, indication TT 323.10.20.06, with valid calibration.

Laptop computer:

with software program for PMT: EVA-600.

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4. Conditions

The certificate is valid only if the following conditions are fulfilled:

- The ascending car overspeed safety device may be applied only at modernized or renovated lifts with Schindler machineries of the type DRSGB142 and brakes of the manufacturer Moteurs Leroy Somer with capacities of 2 x 105 Nm, 2 x 150 Nm or 2 x 180 Nm and with rated speeds up to and including 1.75 m/s, like indicated in the table on the Annex.
- The correct brakes shall be applied in the proper load configuration (see the table on the Annex).
- The proper pressure springs and bolts, also for their number, must be applied; this is also valid for the proper lining material (see the table at page 2). The application of a different number of springs in the brake unit or another lining material will require additional tests.
- The Schindler GBP overspeed governor can be replaced by any other overspeed governor, provided this overspeed governor is appropriate adjusted for the proper tripping speeds belonging to the rated speeds (up to and including 1.75 m/s), for actuating the contact in the proper direction of the moving car (upwards), and a suitable electric safety device (forced opening contact) is installed to interrupt the safety circuit resulting in closing the brakes.
- In case intermediate rated speeds are appropriate (e.g. 0.63 m/s, 0.85 m/s, or 1.50 m/s), the maximum mass or the car to apply must be calculated according the method stated in chapter 2 (subchapter at the pages 3 and 4), also taking care that the maximum values of the kinetic energy for the brakes to dissipate won't be exceeded (see the table on the Annex 1).
- For intermediate rated loads the next higher rated load with an equal brake configuration and an equal reefing factor must be applied.
- The instructions for testing the ascending car overspeed protection means and resetting the overspeed governor shall be available with the lift.
- The maintenance instructions shall be provided with the lift.
- For the rest the requirements of the EN 81-1 must be fulfilled.
- The EC type-examination certificate is only valid for products which are in conformity with the same specifications as the type certified product. Products deviating of these specifications need additional examination by Liftinstituut in order to determine whether a new EC type-examination certificate is necessary. Additional examination shall be requested by the certificate holder.

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5. Conclusions

Within the specified ranges of rated loads and belonging rated speeds, the ascending car overspeed protection means, existing of a random overspeed governor according EN 81-1 requirements and double disk brakes of Moteurs Leroy Somer installed on the proper Schindler machines (types DRSGB 142 or FMB 130 4A / -4B / -4C), is suitable to apply (see the tables on the Annex), and meet the requirements of the Lifts Directive 95/16/EC. For that reason an EC Type-examination certificate for this safety component is issued by Liftinstituut.
The reports and the prints with different graphics as the results of the tests are sent to Schindler separately.

6. CE marking and EC Declaration of conformity

Every ascending car overspeed protection means (double disk brake together with a proper overspeed governor), placed on the market by Schindler and installed as a safety component in S001 R.3 lifts or at modernisation of random other lifts that is in complete conformity with the examined type, must be provided with a CE marking according to Annex III of the Directive under consideration whether conformity with eventually other applicable Directives is proven.
Also every safety component must be accompanied by an EC Declaration of Conformity according to Annex II A of the Directive in which the name, the address and identification number of the Notified Body that carried out the EC type-examination (Liftinstituut) must be included as well as the number of the EC type-examination certificate.

Liftinstituut B.V.

p.o.

Ir. V.M.A. Barendregt
Senior Officer Certification
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Annex 1. Load ranges, limits of maximum system mass and limits of car mass at rated car speeds and 50% system balance

Rated load GQ (kg)	Range of car mass GK (kg)	Type of brake (Nm)	Reev. factor	Max. certified system mass (2 x GK + ½ x GQ) (kg)				Tested kinetic energy	Max. car mass GK to apply (kg)			
Rated speed in m/s up to and incl. →				1.00	1.25	1.6	1.75		1.00	1.25	1.6	1.75
Maximum tripping speed in m/s →				1.5	1.7625	2.16	2.33		1.5	1.7625	2.16	2.33
180	234 - 360	2 x 105	1	6840	4955	3299	2835	9730	3375	2432	1604	1372
320	288 - 640	2 x 105	1	6840	4955	3299	2835	9730	3340	2397	1569	1337
400	360 - 800	2 x 150	1	9410	6816	4538	3900	13694	4605	3308	2169	1850
450	405 - 900	2 x 150	1	9410	6816	4538	3900	13694	4592	3295	2156	1837
550	495 - 825	2 x 180	1	8747	6335	4218	3625	22585	4236	3030	1971	1675
550	495 - 1100	2 x 105	2	6840	4955	3299	2835	9730	3282	2340	1512	1280
630	567 - 756	2 x 180	1	8747	6335	4218	3625	22585	4216	3010	1951	1655
630	567 - 1260	2 x 105	2	6840	4955	3299	2835	9730	3262	2320	1492	1260
750	675 - 1350	2 x 150	2	9410	6816	4538	3900	13694	4517	3220	2081	1762
800	720 - 1360	2 x 150	2	9410	6816	4538	3900	13694	4505	3208	2069	1750
900	770 - 1530	2 x 150	2	9410	6816	4538	3900	13694	4480	3183	2044	1725
1000	850 - 1700	2 x 150	2	9410	6816	4538	3900	13694	4455	3158	2019	1700
1250	1000-1500	2 x 180	2	8747	6335	4218	3625	22585	4061	2855	1796	1500

Additional notes when reading the table:

- The **GRAY** marked values are the original values of the maximum car mass and the certified system mass at the different tests.
- The values of the tripping speed, used to calculate the tested kinetic energy are:
  2.62 m/s for rated loads of 630 kg with 1.75 m/s (2x105 Nm brakes),
  2.65 m/s for rated loads of 1000 kg with 1.75 m/s (2x150 Nm brakes),
  3.53 m/s for rated loads of 1250 kg with 1.25 m/s (2x180 Nm brakes).
- Only most usual rated loads (GQ), car masses (GK) and rated speed values are entered in the table, for other system masses the following procedure must be processed always:
  The total kinetic energy of the system must be less than 9730 Joule for a 2 x 105 Nm brake, less than 13694 Joule for a 2 x 150 Nm brake and less than 22585 Joule for a 2 x 180 Nm brake.
- The values of the maximum certified system mass for rated speeds up to and including 1.00 m/s, up to and including 1.25 m/s, and up to and including 1.6 m/s are calculated by using the tripping speeds of the overspeed governor ($½mv^2 = C$).
- To calculate the derived values of the maximum certified system mass (and from there the value of the car mass), the following tripping speeds of the overspeed governor are applied:
  for V= 1.75 m/s: 2.33 m/s,
  for V= 1.60 m/s: 2.16 m/s,
  for V= 1.25 m/s: 1.7625 m/s,
  for V= 1.0 m/s: 1.5 m/s.
- The less the driving forces (½Q) are and the less the system masses (2xGK + ½xGQ) are, the bigger the calculated car speed can become.
- The maximum certified system masses (2xGK + ½xGQ) are determined at testing and are fixed values for a system balance of 50% (see the **GRAY** marked values in the table). In case of a system balance of 40%, the car mass can be calculated with (2xGK + 0.4xGQ) starting from the fixed values at testing. Compared to the calculated car masses given in the table, this will result in something heavier cars to apply.
- The table gives theoretical values for the car masses belonging to the energy that has to be dissipated at emergency braking (ascending car overspeed protection means actuated). Friction forces aren't taken in account; the smaller the car, the smaller the friction forces will be and the bigger the car masses can be. This tendency can be recognised in the course of the calculated car masses at the speeds of 1.6 m/s, 1.25 m/s and 1.0 m/s, without being included for exact values for the friction.

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Annex 2. Overview of previous revisions of type examination certificates and reports.

PREVIOUS EC TYPE-EXAMINATION CERTIFICATES

Rev.	Date	Summary of revision
0	Dec. 15th, 2004	first issue of EC type-examination certificate
2.0	June 15th, 2006	new issued EC type-examination certificate because of extension of speed range, of rated load range and of brake range

PREVIOUS REPORTS, BELONGING TO THE EC TYPE-EXAMINATION CERTIFICATES

Rev.	Date	Summary of revision
0	Dec. 15th, 2004	original report (with 2 types of brakes of one type of machine and for 10 different rated loads)
1.0	Sept. 19th, 2005	limits adjustment of air gaps accommodated (page 2)
2.0	June 15th, 2006	- rated speeds for application of all brakes extended (1.75 m/s) - range of rated loads for application extended (1125 kg) - new brake model (2 x 180 Nm) implemented - possibilities for other system balance stated (40-50%)

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