

EC TYPE-EXAMINATION CERTIFICATE

Acting under the Warenwetbesluit liften issued by Liftinstituut B.V.
identification number Notified Body 0400,
commissioned by Besluit no. A&G/W&P/03 56126 of October 15th, 2003

Certificate no. : NL.04-400-1002-051-01 Revision no.: 5.0

Description of the product : Double Disk Braking Systems (9 pieces)

Trademark, type : RST010RC011 (2 x 65 Nm) }
RST010RC011 (2 x 80 Nm) } FCRD90
RST010RC011 (2 x 88 Nm) }

RST012RC004 (2 x 80 Nm) }
RST012RC004 (2 x 105 Nm) } FCRD112
RST012RC004 (2 x 150 Nm) }
RST012RC004 (2 x 180 Nm) }
RST012RC004 (2 x 200 Nm) }

RST012RC006 (2 x 280 Nm) — FCRD132

Name and address of the manufacturer : MOTEURS LEROY SOMER
Boulevard Marcellin Leroy
16005 Angouleme Cedex - France

Name and address of the certificate holder : MOTEURS LEROY SOMER
Boulevard Marcellin Leroy
16005 Angouleme Cedex - France

Certificate issued on the basis of the following requirements : Lifts Directive 95/16/EG, NEN-EN 81-1

Test laboratory : Schindler Factory, Ebikon (Lucerne) - Switzerland
MLS (Rabion factory), Angoulême - France

Date and number of the laboratory report : November 23rd, 2004 and December 4th, 2004
May 4th, 2006

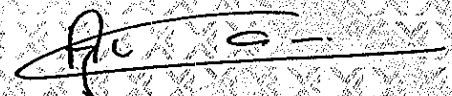
Date of EC type-examination : December 2002 thru April 2004
November 30th and December 1st, 2004
April 26th and 27th, 2006
October 21st, 2008 (France)

Annexes with this certificate : Report belonging to the type-examination certificate no.:
NL.04-400-1002-051-01, Revision 3.2

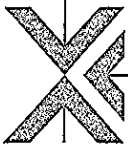
Additional remark : See the conditions in the report as indicated above

Conclusion : The safety component meets the requirements of the Lifts
Directive 95/16/EC taking into account any additional remarks
mentioned above

Issued in Amsterdam
Date of issue : October 27th, 2008



Liftinstituut B.V.
Manager certification



Report of EC type-examination

Report belonging to EC type-examination certificate no. : NL.04-400-1002-051-01

Date of issue of certificate : November 23rd, 2004

No. and date of revision of certificate : Revision no. 5.0, October 27th, 2008

No. and date of revision of report : Revision no. 5.0, October 27th, 2008

Concerns : Double disk brake to be applied as part of a safety component for lifts

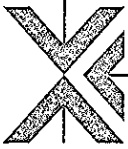
Revision 5.0 concerns : - Two new brake models added:
2x200 Nm and 2x280 Nm.
- Tabel split up in 2 sections and data added.
- Some existing data accommodated.

Requirements : Lifts Directive 95/16/EC
Standard: EN 81-1

Project no. : P080055-06

1. General specifications

Manufacturer	: Moteurs Leroy Somer
Address	: Boulevard Marcellin Leroy 16005 Angouleme Cedex
Country	: France
Description of lift component	: Double disk brakes
Type	: RST010RC011 (2 x 65 Nm) RST010RC011 (2 x 80 Nm) } FCRD90 RST010RC011 (2 x 88 Nm) RST012RC004 (2 x 80 Nm) RST012RC004 (2 x 105 Nm) } FCRD112 RST012RC004 (2 x 150 Nm) RST012RC004 (2 x 180 Nm) RST012RC004 (2 x 200 Nm) RST012RC006 (2 x 280 Nm) — FCRD132
Laboratory	: Schindler Factory Ebikon (Lucerne) – Switzerland Angoulême – France (partly)
Date / data of examination	: July 15 th , 2003 April 26 th , 2004 and July 9 th , 2004 Nov. 30 th and Dec. 1 st , 2004 April 26 th and 27 th , 2006 October 21 th , 2008 (France)
Examination performed by	: H.B. Kaptein



2. Description of lift component

Description of the brakes

The specified disk brakes are intended to be used as holding brakes for the application in lift installations equipped with controlled drive systems.

The brakes each consist of two independent electro-mechanical disk brakes, that have to be mounted to the flange of a lift machine by three stud bolts (M8, M10 or M12).

One disk is clamped in between the lift machine flange and the anchor of the first brake. The other disk is clamped between the brake housing of the first brake and the anchor of the second brake.

The brake disks are manufactured of heat treated aluminium. The asbestos-free brake lining is bonded to the disks at both sides. In the centre of both disks is a hole provided with splines (models FCRD90), respectively provided with a bush with splines (models FCRD112 and FCRD132), for the connection of the disks with the main shaft of the machine.

The main differences between the types are the dimensions of the electro-magnets, the dimensions of the brake lining, the dimensions of the stud bolts and the installing diameters of the pressure springs and the stud bolts, resulting in different outside dimensions of the housings. Other internal differences are the number of the applied pressure springs, the diameters of the applied splines and their number of teeth, and the installing diameter of the pin spacers (surrounding the stud bolts); the bigger dimensions can have separate spline bushes, that have a key and keyway connection to the main shaft ($\varnothing 32$ mm or $\varnothing 35$ mm) of the machine. All these differences of the types deliver different values for the minimum and the maximum braking torque to practice, at which can be noted that the dimensions of the pin spacers and the air gaps are equal. Both anchors are pushed towards the brake disks by means of guided compression springs. The different amount of springs, mainly defining the brake torque, cannot be adjusted in the field.

The brakes are fully adjusted delivered from the factory. Though the air gap of the brakes can be adjusted as well in the factory as also on site, no further adjustments are required on site. The wear of the brake lining has such a low degree that re-adjustment of the air gap during life time is not needed. This means that maintenance on the brake is also not needed.

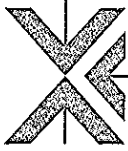
The momentary state of the disks (activated or not activated) is monitored by contacts, acting in an electrical circuit giving feedback to the frequency converter of the lift. The contacts (micro-switches) are insulated and installed on the outside at the bottom of the brake housings.

More details can be found on the next page.

Technical details and limits of use

Type indication	FCRD 90	FCRD 90	FCRD 90	FCRD 112	FCRD 112
Nominal braking torque (Nm)	2 x 65	2 x 80	2 x 88	2 x 80	2 x 105
Maximum dynamic braking torque for 2 brakes (Nm)	202	248	248	248	325
Minimum braking torque delivered per brake (Nm)	70.6	90.8	100.8	91.6	104.6
Brake lining diameters outside / inside (mm)	ø152 x ø132	ø152 x ø132	ø152 x ø132	ø180 x ø150	ø180 x ø150
Brake lining area (mm ²)	4461	4461	4461	7775	7775
Brake lining equiv. Radius (mm)	71	71	71	82.5	82.5
Indication of pressure springs	RST010 RC011 (654181c)	RST010 RC011 (654181c)	RST010 RC011 (654181c)	RST012 RC004 (674036c)	RST012 RC004 (674036c)
Number of pressure springs	7	9	10	7	8
Installing diameter of the pressure springs (mm)	ø 136	ø 136	ø 136	ø 174	ø 174
Minimum spring force (N)	1462.1	1879.8	2088.7	1632.0	1865.1
Maximum spring force (N)	1525.6	1961.5	2179.5	1697.8	1940.3
Spline (hub) diameter (mm)	ø 30	ø 30	ø 30	ø 50	ø 50
Spline (hub*) length (mm)	25	25	25	40 (97*)	40 (97*)
Spline hub keyway length (mm)	-	-	-	70	70
Spline (hub) number of teeth	22	22	22	28	28
Spline (hub) tooth module (mm)	1.25	1.25	1.25	1.667	1.667
Spline (hub) max. torque (Nm)	101	124	124	124	162.5
Spline maximum contact pressure / fatigue (Mpa)	20.4 / 9.49	25.1 / 11.6	25.1 / 11.6	5.5 / 2.5	7.2 / 3.34
Spline safety factor for maximum torque / fatigue	14.2 / 11.1	11.6 / 9	11.6 / 9	52.8 / 41.1	40.3 / 31.4
Pin spacers max. torque (Nm)	202	248	248	248	325
Pin spacers implementation radius (mm)	88	88	88	103	103
Pin spacers tangential load (N)	574	705	705	602	789
Pin Share resistance area (mm ²)	136	136	136	136	136
Pin spacers shear stress (MPa)	12.5	15.3	15.3	13.1	17.1
Pin spacer safety factor against shear stress	24.0	19.6	19.6	22.9	17.5
Pin spacers pressure (MPa)	4.2	5.2	5.2	4.4	5.8
Pin spacer safety factor against pressure resistance	71.1	57.9	57.9	67.8	51.7
Stud bolts	M 8	M 8	M 8	M 10	M 10
Torque on nut of stud bolts (Nm)	24	24	24	48	48
Install. diam. of stud bolts (mm)	ø 176	ø 176	ø 176	ø 206	ø 206
Ax. force on nut of stud bolts (N)	17050	17050	17050	23048	23048
Pin spacer pressure reaction (MPa)	125.4	125.4	125.4	169.5	169.5
Stud bolts safety factor at pressure reaction on lining (N)	4.8	4.8	4.8	3.5	3.5
Shaft diameter of machine for brake installation (mm)	Ø 32 mm (n6 F7) or Ø 35 mm (n6 F7)				
Overall dimensions (mm)	ø 204 x 151.5	ø 204 x 151.5	ø 204 x 151.5	ø 235 x 163.5	ø 235 x 163.5

Note: * only for spline hub



Technical details and limits of use

Type indication	FCRD 112	FCRD 112	FCRD 112	FCRD 132
Nominal braking torque (Nm)	2 x 150	2 x 180	2 x 200	2 x 280
Maximum dynamic braking torque for 2 brakes (Nm)	465	558	620	868
Minimum braking torque delivered per brake (Nm)	156.9	183	218.1	336.0
Brake lining diameters outside / inside (mm)	ø180 x ø150	ø180 x ø150	ø180 x ø150	Ø215 x ø185
Brake lining area (mm ²)	7775	7775	7775	36141
Brake lining equiv. Radius (mm)	82.5	82.5	82.5	100
Indication of pressure springs	RST012 RC004 (674036c)	RST012 RC004 (674036c)	RST012 RC006 (674079a)	RST012 RC006 (674079a)
Number of pressure springs	12	14	8	10
Installing diameter of the pressure springs (mm)	ø 174	ø 174	ø 175	ø 198
Minimum spring force (N)	2797.7	3262.9	3888.6	4941.7
Maximum spring force (N)	2910.5	3399.9	4168.6	5210.8
Spline (hub) diameter (mm)	ø 50	ø 50	ø 50	ø 50
Spline (hub*) length (mm)	40 (97*)	40 (97*)	40 (97*)	45
Spline hub keyway length (mm)	70	70	-	47
Spline (hub) number of teeth	28	28	28	28
Spline (hub) tooth module (mm)	1.667	1.667	1.667	1.667
Spline (hub) max. torque (Nm)	232.5	279	296	414
Spline maximum contact pressure / fatigue (Mpa)	10.3 / 4.8	12.4 / 5.7	13.7 / 6.38	17.1 / 7.9
Spline safety factor for maximum torque / fatigue	28.1 / 21.9	23.4 / 18.3	21.1 / 16.5	17.0 / 13.2
Pin spacers max. torque (Nm)	465	558	620	868
Pin spacers implementation radius (mm)	103	103	103	248
Pin spacers tangential load (N)	1129	1354	1505	875
Pin Share resistance area (mm ²)	136	136	136	206
Pin spacers shear stress (MPa)	24.5	29.4	32.7	8.4
Pin spacer safety factor against shear stress	12.2	10.2	9.2	35.7
Pin spacers pressure (MPa)	8.3	10.0	11.1	4.2
Pin spacer safety factor against pressure resistance	36.1	30.1	27.1	70.6
Stud bolts	M 10	M 10	M 10	M 12
Torque on nut of stud bolts (Nm)	48	48	48	83
Install. diam. of stud bolts (mm)	ø 206	ø 206	ø 206	ø 248
Ax. force on nut of stud bolts (N)	23048	23048	23048	23855
Pin spacer pressure reaction (MPa)	169.5	169.5	169.5	115.8
Stud bolts safety factor at pressure reaction on lining (N)	3.5	3.5	3.5	5.2
Shaft diameter of machine for brake installation (mm)	Ø 32 mm (n6 F7) or Ø 35 mm (n6 F7)			
Overall dimensions (mm)	ø 235 x 163.5	ø 235 x 163.5	ø 235 x 163.5	ø 285 x 183

Note: * only for spline hub

Additional specifications for all types

Assumptions for calculations : 150 % of the torque at dynamic brake operation
5000 cycles for total lifetime

Maximum number of revolutions : approx. 3000 min⁻¹

Values for calculations

- yield strength for pin spacers : 300 N/mm²
- compression strength for pin spacers : 600 M/mm²(Pg)
- Rp 0.2 resistance for spline : 290 N/mm²
(ultimate tensile strength)
- fatigue limit (for stress) : 105 N/mm²

- splines according standard : NFE 22-141
- spline material (equal to brake disk) : heat treated aluminium min. AS7G06 (Y33),
or steel (42 Cr Mo 4 TQ+T)
- spline bush : steel (equals minimum 42 Cr Mo 4 TQ+T)
Rm = 850 – 1150 N/ mm²
- parallel key : steel (equals minimum 42 Cr Mo 4 TQ+T)
Rm = 850 – 1150 N/ mm²

- global stiffness of springs according : DIN 2089
- fatigue life for the springs : 10⁷ cycles
- stud bolt material : minimum 8.8
- brake lining material : Bremskerl 6800
- armature plate : steel S235G or steel with equal strength after
phosphorescence

- static / dynamic friction coefficient : 0.34 (+/- 20%) / 0.36 (+/- 15%)
(with 6 - 88 rpm)

- nominal voltage : 102 VDC (+/- 15%)

- Air gap adjustment:
 - set-up limits from factory : 0.28 - 0.33 mm (measured with comparator)
 - accepted working limits at delivery : 0.25 - 0.40 mm (measured with feeler gauge)
 - note : a used brake with a maximum air gap of 0.60 mm is still
capable to deliver the minimum required braking torque

Note: spline hubs for 2 x 80 Nm, for 2x105 Nm, for 2x150 Nm, and for 2x180 Nm
brakes (FCRD 112 only).

Principal drawings of the brakes are shown in the annexes of this report.

3. Examinations and tests

The brakes were examined and tested in full accommodated lifts for their worst cases, as well for the brakes and also for being part of ascending car overspeed protection means. This means that the tests were performed for the purpose to be applied in Schindler traction lifts of the type S001 R.3, with machines of the types FMB 130 and SGB 142, and provided with a counterweight. The model lifts on which the tests were performed were balanced for the required 50%, while they satisfied the maximum system mass. In this way the tests fully covered the requirements for the brakes of the concerning lift machines, as also for being part of ascending car overspeed protection means.

The tests were performed in the Schindler R&D centre in Ebikon, Switzerland at the dates as indicated on page 1.

4. Results

Within the framework of the certification activities, the following items were checked and found in order:

- The models of the concerning brakes
- Relevant layout drawings and cross section drawings of the concerning brakes
- Brake lining material specifications
- The results of the strength calculations
- The test results
- The instructions for dismounting and replacement.
- The instructions for replacement of the sealing O-rings.

The load tests passed without remarks and did not lead to permanent deformations or loss of stability.

After the final examinations the installations and the technical file were found in accordance with the requirements.

5. Conditions

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.

Furthermore the following conditions are applicable:

- The double disk brake is certified to be applied as part of an Ascending car overspeed protection means for lifts, like indicated in EN 81-1, chapter 9.10, of which chapter in particular the requirements of the articles 9.10.1, 9.10.4.d), 9.10.5 and 9.10.10.a) must be fulfilled for the purpose of application.
- Prior to general application of these brakes with lifts, compliance of the lift design with the following requirements for lift brakes of EN 81-1, issue September 1998, shall be checked: 12.4.1.1, 12.4.2.1, 12.4.2.2, 12.4.2.3, 12.4.2.4.
- On the brakes a data plate shall be fixed, indicating:
 - the name of the manufacturer,
 - the type examination sign (CE) and its references.
- Installing instructions for the brake units shall be provided at deliveries.

6. Conclusions

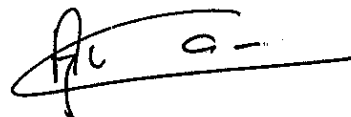
Within the specified braking capacities these brakes meet the requirements of the Lifts Directive 95/16/EC and the standard EN 81-1, issue 1998. However it is explicitly pointed out that compliance with the EMC Directive was not assessed.

Based upon the results of the type-examination, Liftinstituut B.V. issues a revised EC type-examination certificate. The number of this EC type-examination certificate, being NL.04-400-1002-051-01, Rev. 4.0, may be indicated on the type identification plate.

7. EC Declaration of conformity

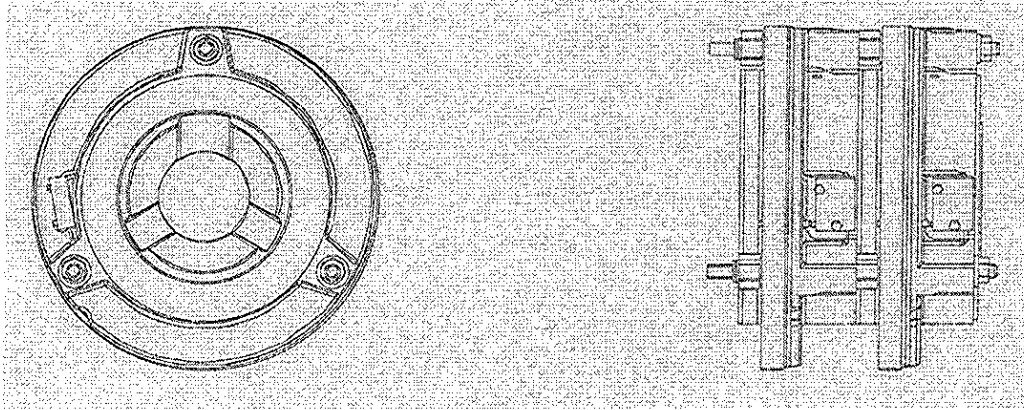
Every (compounded) brake, also in case being part of a lift machinery (lift component), placed on the market by Moteurs Leroy Somer, type designations as stated on page 1 of this report, that is in complete conformity with the examined type must be provided with a CE marking according to Annex 3 of the Directive 95/16/EC, under consideration that conformity with the EMC Directive and eventually other applicable Directives is proven. Also every safety component must be accompanied by an EC Declaration of Conformity according to Annex 2 of the Directive in which the name, the address and the 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.

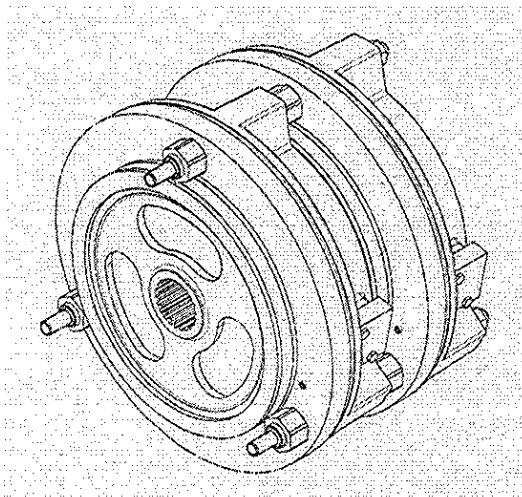


Ir. V.M.A. Barendregt
Senior Officer
Certification and Technology

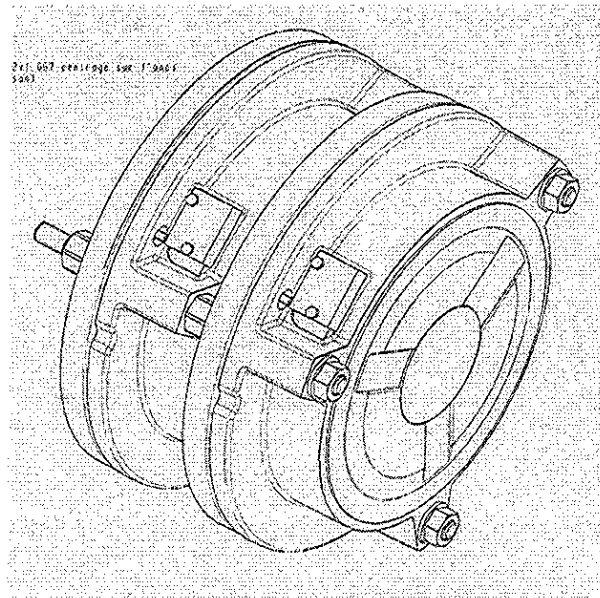
Annex 1. Outside views of brakes with disk state monitoring contacts



FRCD 90 (2 x 80 Nm)

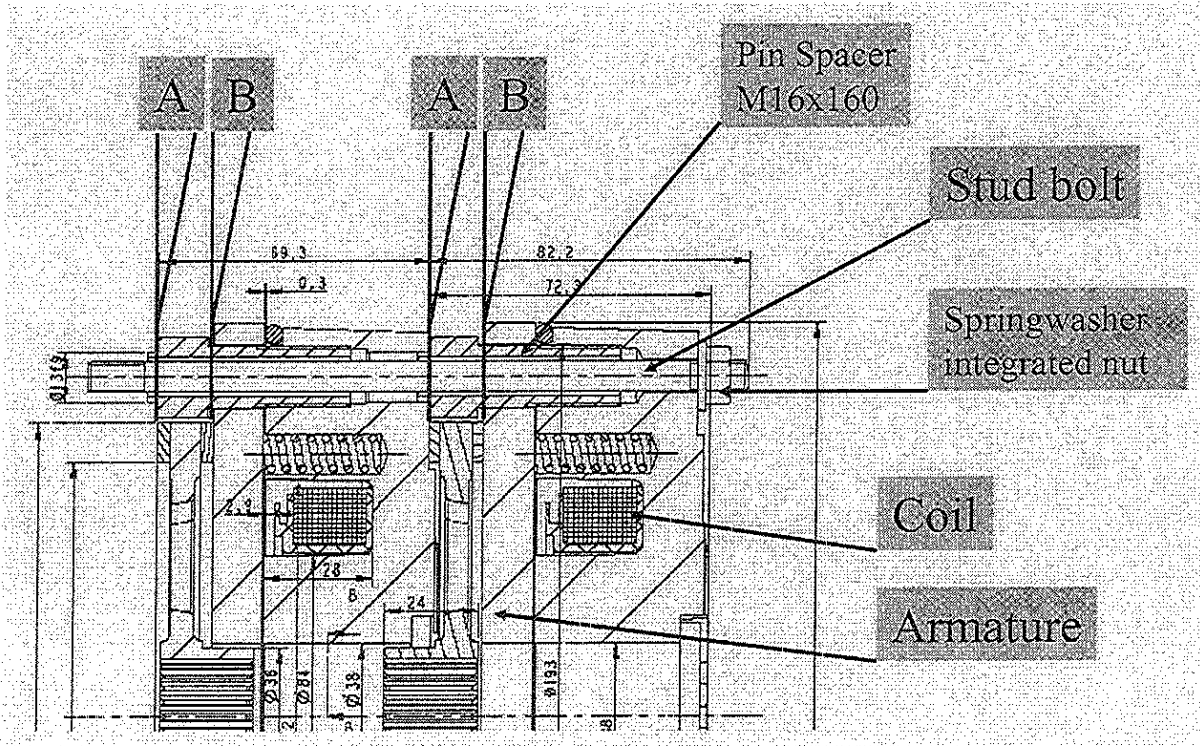


FRCD 90 (2 x 80 Nm)



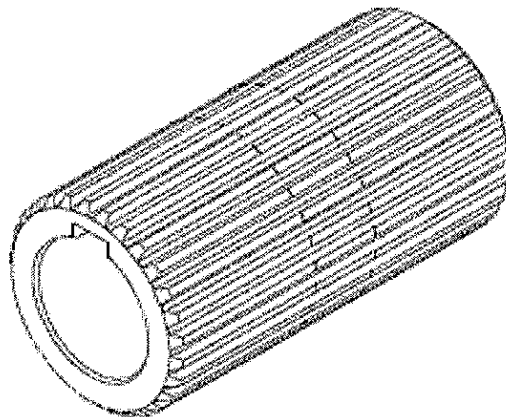
FRCD 112 (2 x 150 Nm)

Annex 2. Half cross section with indication of parts and air gap adjustment.



Air gaps can be measured and adjusted at A and B, when the armature is attracted by the coil.

Annex 3. Spline bush.



Spline bush with keyway for shaft $\varnothing 32$ mm.

Annex 4. Overview of previous revisions of (EC)-type examination certificates and reports.

PREVIOUS EC-TYPE EXAMINATION CERTIFICATES

Rev.	Date	Summary of revision
0	23-11-2004	First issue of type-examination certificate
1.0	21-12-2004	New type-examination certificate because of update for new brake
2.0	17-10-2005	New type-examination certificate because of update for details
3.0	12-07-2006	New type-examination certificate because of new brake added
3.1	2-04-2007	New type-examination certificate because of update various data all brakes with exception of 2 x 180 Nm brake
3.2	2-11-2007	New EC-type examination certificate because of changing type examination into EC-type examination, as well various data of the 2 x 180 Nm brake updated
4.0	15-04-2008	New EC-type examination certificate because of implementation two new brakes 2x88 Nm (FCRD90) and 2x80 Nm (FCRD112)

PREVIOUS REPORTS, BELONGING TO THE EC-TYPE EXAMINATION CERTIFICATES

Rev.	Date	Summary of revision
0	23-11-2004	original report for brakes of 2 x 65 Nm, 2 x 80 Nm and 2 x 150 Nm
1.0	21-12-2004	- brake of 2 x 105 Nm added in report - some values for brake 2 x 150 Nm adapted
2.0	17-10-2005	- limits for adjustment of airgap changed - spline bush data implemented (table at page 3)
3.0	12-07-2006	- new brake added (2 x 180 Nm) - some concerning parts of text adapted - history introduced (Annex 3)
3.1	2-04-2007	- various data updated for all types of brakes, with exception for 2 x 180 Nm (pages 3 and 4) - specification air gap adjustment extended
3.2	2-11-2007	- Type examination changed into EC-type examination - various data of the 2 x 180 Nm updated (page 3)
4.0	15-04-2008	- Two new brake types implemented: 2 x 88 Nm (FCRD90) and 2 x 80 Nm (FCRD112). - Most data of all existing brakes updated, because of new performed calculations