Vacuum Circuit Breaker
ECA, up to 24 kV

Operating Instructions
No. 531 251, Edition 11/00

T&D

AREVA

Table of Contents

2 Technical data

Type designation

The type designation of the vacuum circuit-breaker (refer to name plate) specifies the essential technical data. The following example shows the composition of the type designation:

Example	**ECA 12-25-12-21**
Series	ECA
Rated voltage	12 kV
Rated short-time current (rated short-circuit breaking current)	25 kA
ated normal current	1250 A
Pole center spacing (PMA)	210 mm

Operating times *

Rated voltage		[kV]	12	17.5	24
Opening time at release rated voltage					
for release	160 W	[ms]		30 – 50	
for release	25 W	[ms]		45 – 65 **	
Arcing time (max. value)		[ms]	12	14	14
Closing time at release rated voltage		[ms]		30 – 50	
Minimum command time "OFF"					
electr. tripping					
for release	160 W	[ms]		20	
for release	25 W	[ms]		50	
min. comm. time "ON"		[ms]		20	

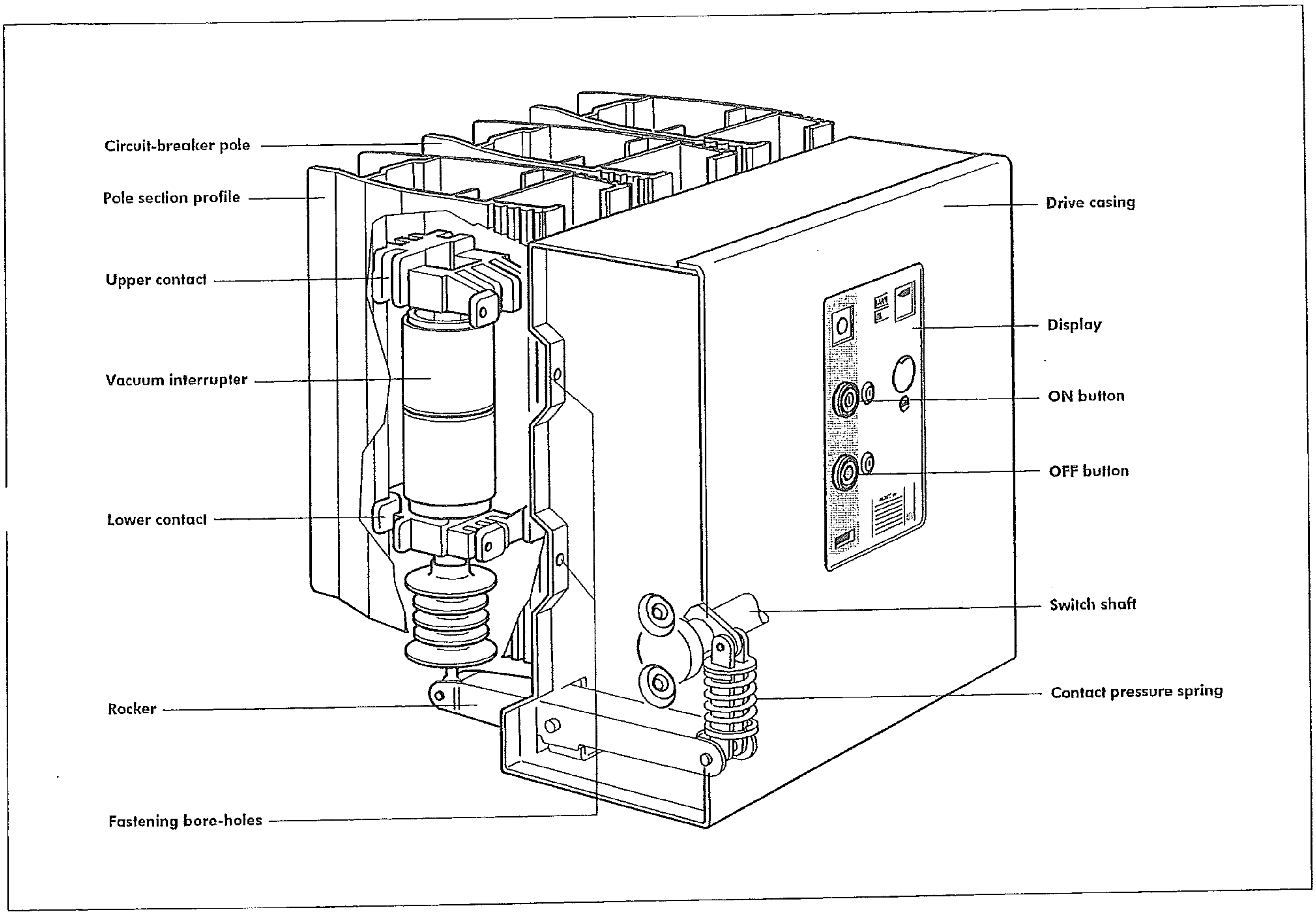
* Rated frequency according to data on rating plate (50 or 60 Hz)
** for release 25 W with extended opening time in case of 40/50 kA circuit-breaker (12 kV) = 80 – 110 ms

Weights

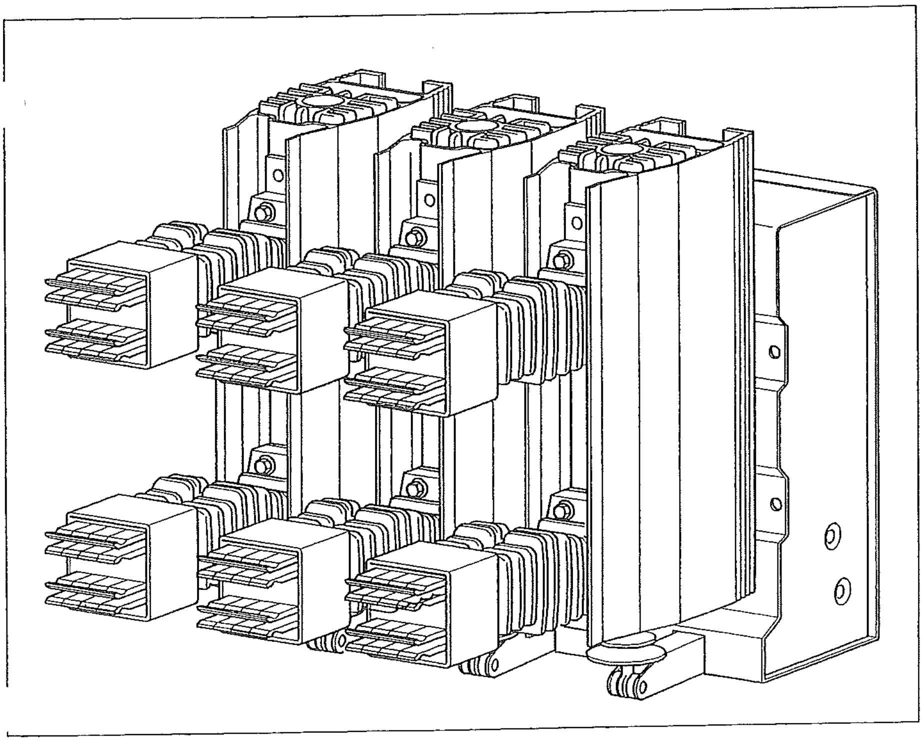
Rated voltage [kV]	Rated short-circuit breaking current [kA]	Rated normal current [A]	Weight [kg]
12	50	1250	175
12	50	2500	260
12	50	3150	325
12	40	3150	200
12	20	630 – 1250	90
12	25 – 31.5	630 – 1250	95
12	31.5 – 40	1250 – 2500	150
12	31.5 – 40	3150	200
17.5	20 – 31.5	630 – 1250	95
17.5	25 – 31.5	1600 – 2500	150
17.5	25 – 31.5	3150	200
24	16 – 25	630 – 1250	100
24	25	1600 – 2500	150

The weights are reference values of the ECA circuit-breaker without packing

3 Components fitted in circuit-breaker



1 *View - ECA circuit-breaker*



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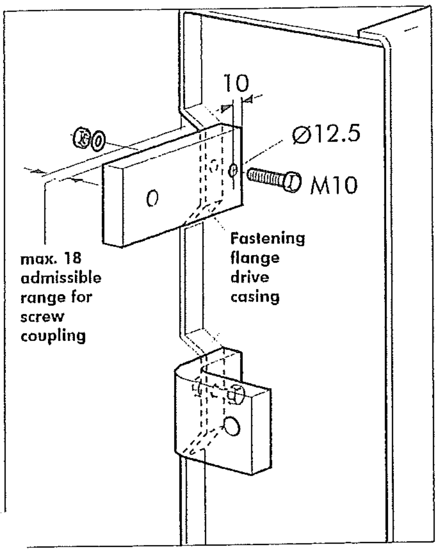
ECA circuit-breaker 3150 A with moving contacts

5 Installation



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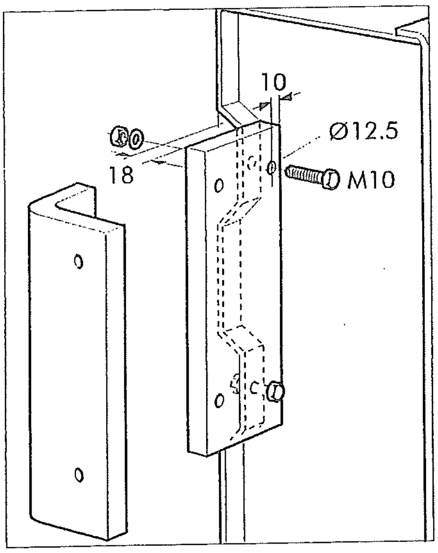

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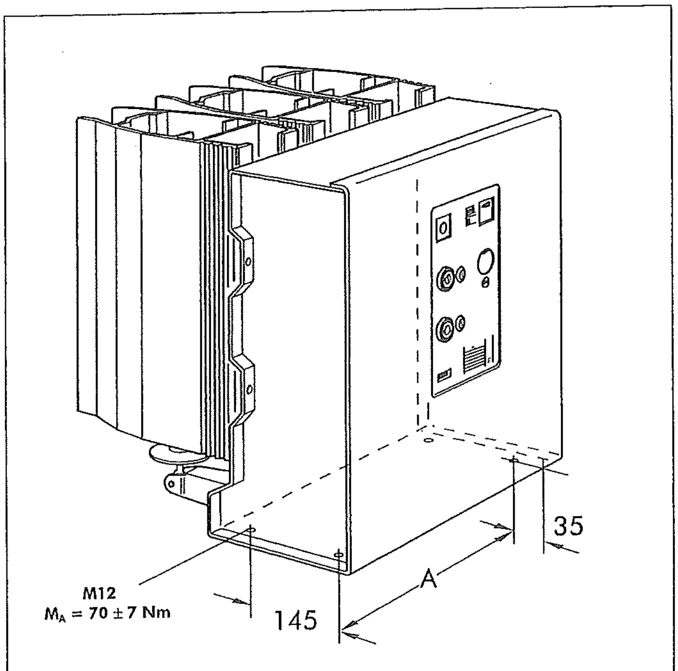
Example for fastening by means of a plate or angular support for circuit-breaker with pole center spacing of 210 mm and 275 mm



Pole center spacing	A
160	414
210	514
275	644

M_A = Tightening torque

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Example for fastening on the base plate

Prior to installation

- Check technical data on name plate.
- Check rated supply voltage of the control and operating devices installed.
- In case of individually supplied units, disassemble the transport support (hot-galvanized) and the transport device for crane transport (orange).

The circuit-breaker is supplied in position "OFF" and with the energy storing device "released".

The energy storing device must not be charged until assembly is finished. Risk of injuries!
The control panel may only be swung out if the energy storing device is "released".

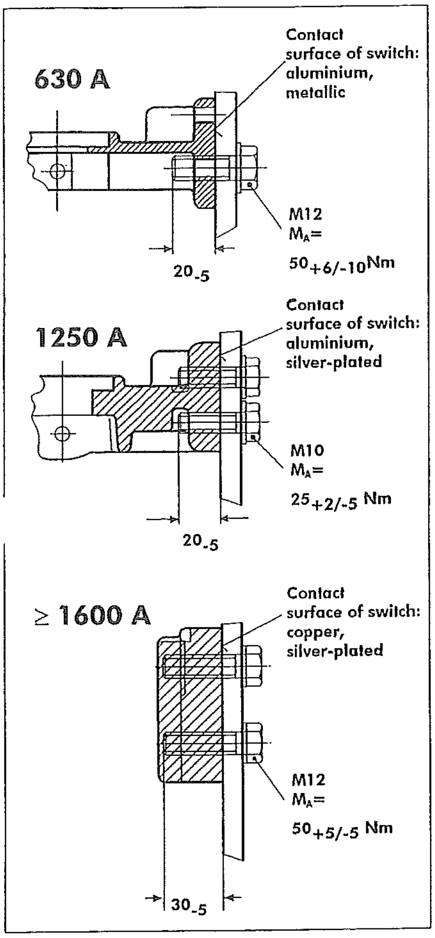
Locking of additional devices

If locking of other devices is to be actuated or controlled depending on the circuit-breaker position, it must be ensured that the masses and forces acting on the units do not interfere with the switching characteristics of the circuit-breaker.

Fastening

- Fastening bore-holes are installed in the sectional steel elements of the back panel and at the bottom of the drive casing (Figs. 6, 7 and 8).
- Any other than standard installation positions must be agreed upon with the manufacturer.
- The circuit-breaker must not be deformed by the fastening.
- Fasten screws according to the tightening torques specified in section 10.

A dimension drawing is made available on request.
Screws and attachments are not included in the scope of supplies.



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Conductor bar connection

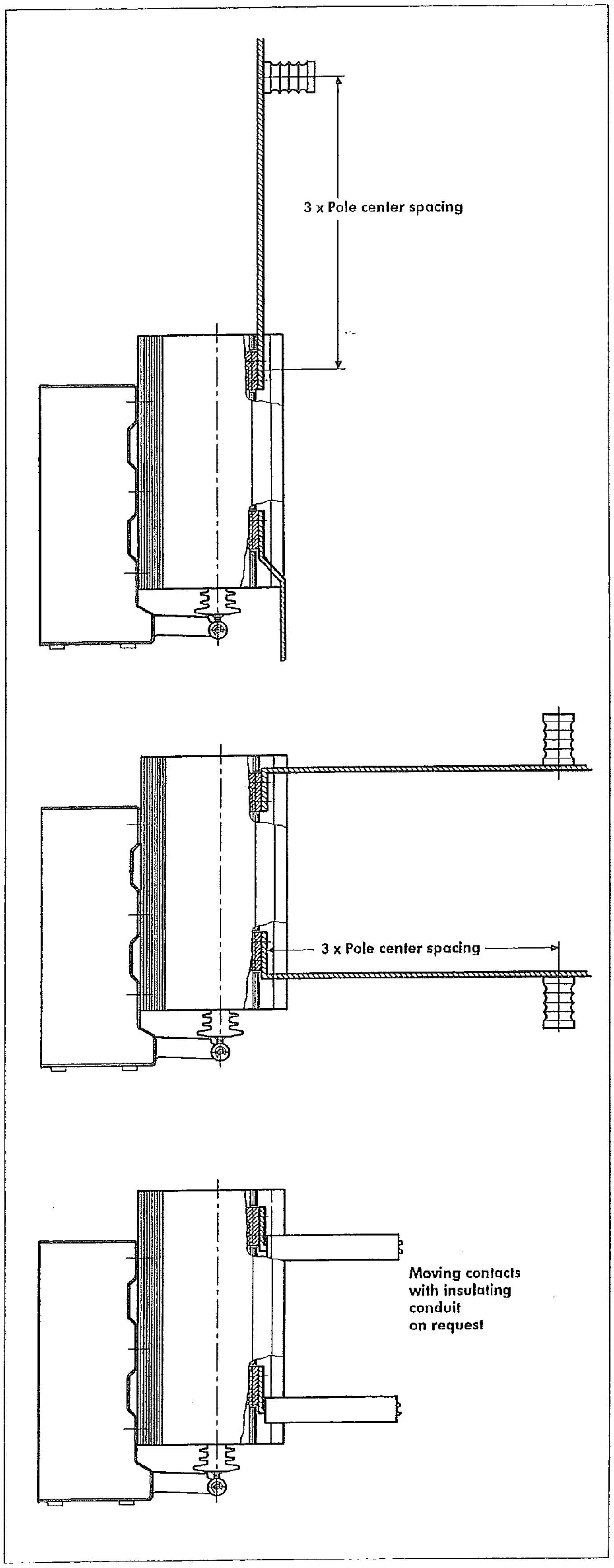
Material of busbars or cable lugs for circuit-breaker connection

Connection areas on circuit-breaker	Connection surface on busbar or cable lug
Connection for 630 A Material: Aluminium, metallic	Copper or aluminium
Connection for 1250 A Material: Aluminium, silver-plated Connection as from 1600 A or higher Material: Copper, silver-plated	Copper or copper and aluminium, silver-plated. In case of aluminium, please use a copper washer (thickness 0.1 mm) covering the full size of the connection area. To this effect, the rated (normal) current must be reduced in general by 13 %, or consultation with the manufacturer is required.
Earth connection Material: Steel	Selection according to DIN VDE 0101 or corresponding to national design specification

(Connection areas are areas where current transfer takes place)

Inadmissible matching of materials of connecting areas:

Copper (silver-plated), aluminium (silver-plated) must not be combined with aluminium.



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Example for connection

When connecting the busbars or cables, adhere to the following instructions:

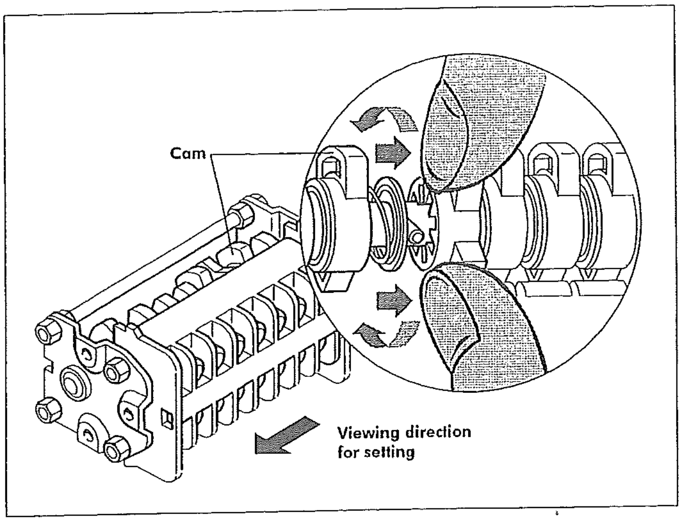
1.
Adjust busbars so that after screw-fastening, no mechanical forces are acting on the circuit-breaker.

2.
Take account of DIN 43 670 and DIN 43 671 regarding the continuous current load. Operators outside of the Federal Republic of Germany should apply the locally applicable regulations.

3.
Screw-fasten busbar according to DIN 43 673.
The circuit-breaker must not be deformed by screw-fastening the busbars.

Refer to Table 3 on page 21.

6 Auxiliary switch



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Setting of the cams of the auxiliary switch

Switching functions on delivery, refer to circuit diagram.

Other switching functions of the auxiliary switch can be set by adjustable cams.

Setting procedure:

1.
Move circuit-breaker into "OFF" position;
energy storing device "released".

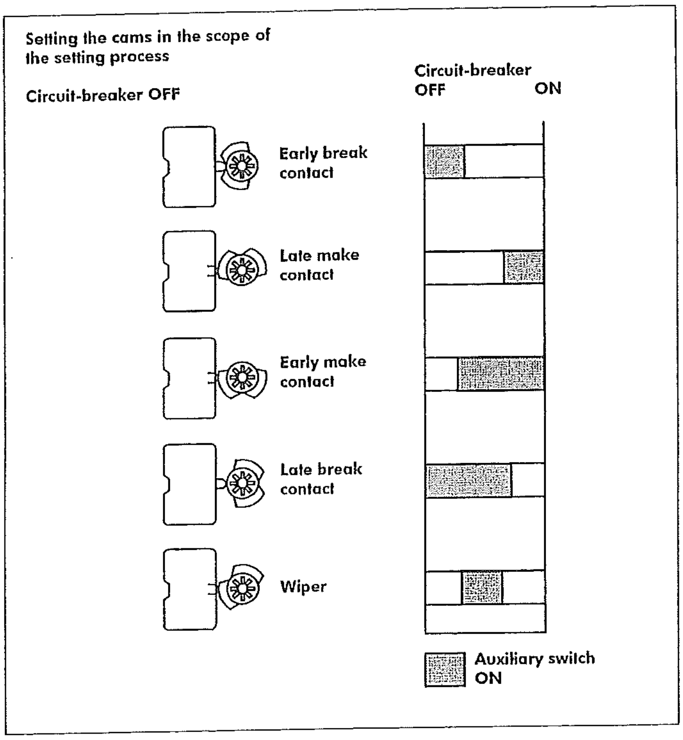
2.
Remove cover plate
(release six screws).

3.
Set desired switching function.

4.
Click cam into the catch again.

5.
Check whether the cam has locked in the changed position.

6.
After adjustment, mount cover plate.



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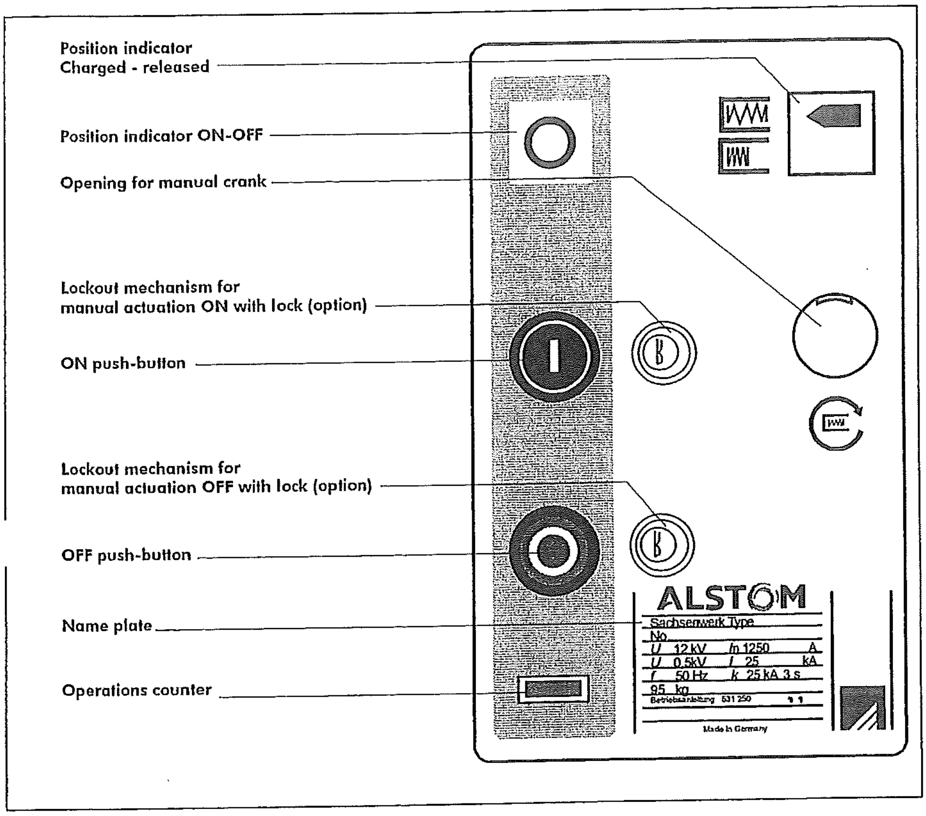
Possible switching functions of the auxiliary switch (switching program)

Auxiliary switches

		VDC					VAC	
Rated supply voltage		24	48	60	110	220	120	230
Switching capacity	[A]	8	4	3	2	1	10	10
Rated short-time withstand current		100 A for a duration of 30 ms						
Time factor T=L/R	[ms]	≤ 20					–	
Rated continuous current	[A]	10						

8 Operation



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Display of circuit-breaker

Initial position

- Circuit-breaker in "OFF" position.
- Energy storing device "released".

Position indications on circuit-breaker and possible operating sequences

Pos.	Position indicator ON/OFF switch position	Position indicator Energy storing mechanism (closing spring)	Opening spring	possible operating sequence
1	OFF	released	released	none
2	OFF	charged	released, is charged by C	C O
3	ON	released	charged	O
4	ON	charged	charged, is re-charged by C	O C O

C = ON,
O = OFF

9 Maintenance

The series ECA vacuum circuit-breakers do not require maintenance for a service life of over 20 years.

A visual inspection of the circuit-breaker is recommended at intervals of 4 years, depending on the stress the circuit-breaker is subject to during operation, and on the operating conditions. In case of dust deposits, the circuit-breaker must be cleaned by expert staff.

Caution when working on the drive mechanism - there is a risk of getting injured. Energy storing device must be released, and the circuit-breaker must be switched OFF.

In case of doubt or if deviations from the circuit-breaker's proper working order are detected, the manufacturer should be contacted.

Circuit-breaker with rated short-circuit breaking current of 50 kA

Every 5 000 switching cycles	■ Grease drive (page 24)
Every 10 000 switching cycles	■ Replace contact force spring packages *)
After the total current limit has been reached (refer to diagram)	■ Replace vacuum interrupter chambers

*) Please contact manufacturer.

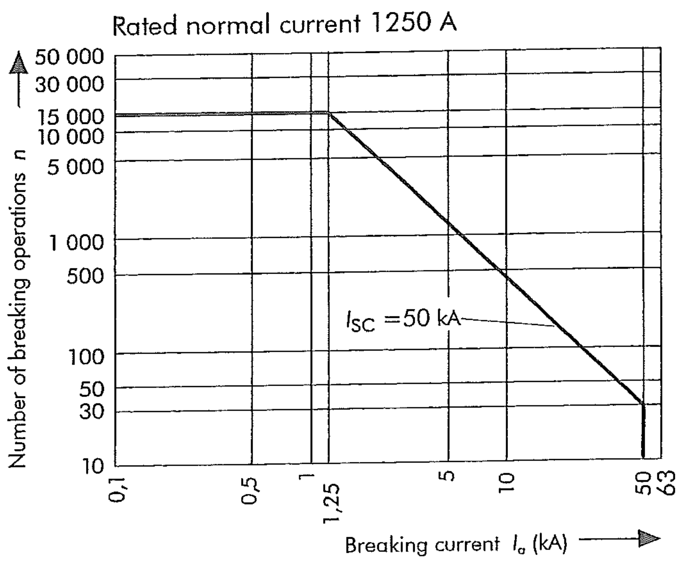
Circuit-breaker with rated short-circuit breaking current of up to 40 kA

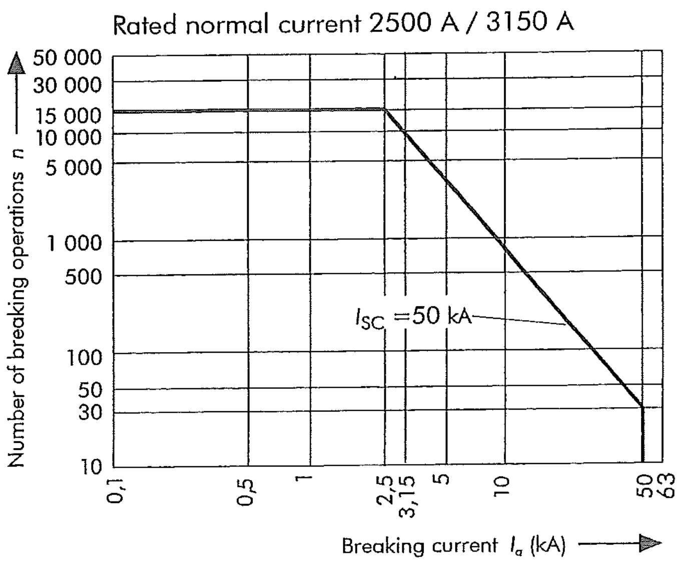
Every 10 000 switching cycles	■ Grease drive (page 24)
After the total current limit has been reached (refer to diagram)	■ Replace vacuum interrupter chambers

Operation after the limit of 30,000 switching cycles must be considered taking account of the economic conditions.

In this case, contact the manufacturer.

Circuit-breaker with rated short-circuit breaking current of 50 kA





Screw couplings

Thread size	Tightening torque [Nm] min.	max.
M6	7	9
M8	16	24
M10	36	44
M12	63	77
M16	153	187
M20	297	363

Table 1:
Hex. bolts and machine screws (except slotted screws) and nuts ithout ratchet toothing.

Thread size	Tightening torque [Nm] min.	max.
M6	12.5	15.5
M8	32	40
M10	65	79
M12	90	110
M16	243	297

Table 2:
Screws and nuts with ratchet toothing.

.hread size	Tightening torque [Nm] min.	max.
M6	4.5	6.5
M8	10	14
M10	20	27
M12	40	56
M16	80	108

Table 3:
Screw connection between switching device and conductor bar.

The following elements must be used for all metal screw couplings:

- Screws and bolts: Grade ≥ 8.8,
- Nuts: Grade 8.

Screws, bolts or nuts must be processed as follows:

- Apply a thin film of multi-purpose lubricant ML on threads and the head support of screws.
- Tighten screw couplings with a torque according to Table 1 to 3.

Auxiliary equipment

The auxiliary equipment can be purchased from ALSTOM Sachsenwerk GmbH.

	Ref.
Contact lubricant KL 0.5 kg can	008 157
Multi-purpose lubricant ML 0.5 kg can	008 154
Liquid lubricant FL 0.5 l can	008153
Cleaning agent 1 l can	008 152

The use of other auxiliary equipment is not admissible.

Accessories

	Ref.
Manual crank	617 810

Cleaning insulating components and vacuum interrupter chambers

Cleaning of parts of plastic and ceramics:

- Pole section profiles
- Post insulators
- Ceramics of vacuum interrupter chambers

- Clean by means of a dry, lint-free cloth. Depending on dirt collected, replace cloth as often as necessary.

Type approval of vacuum interrupter chambers acc. to. RöV

The vacuum interrupter chambers have been approved by the X-Ray Ordinance (RöV) of the Federal Republic of Germany up to a maximum voltage amounting to the rated short-time power-frequency voltage (rated power frequency withstand voltage) defined by DIN VDE/IEC . Thus, they satisfy the conditions for operation exempt of approval up to the voltage in question according to the X-Ray Ordinance (RöV).

Disposal after the end of service life

A manual on disposal after the end of the service life is available for disposal of the ECA vacuum circuit-breaker. Disposal at the end of the service life is performed, on request, by the Service Center at the manufacturer's.

Address and delivery address:

ALSTOM Sachsenwerk GmbH
Service-Center V71
Rathenaustrasse 2
D-93055 Regensburg
Phone: -49-941 / 4620-771
Fax: -49-941 / 4620-776

Drive

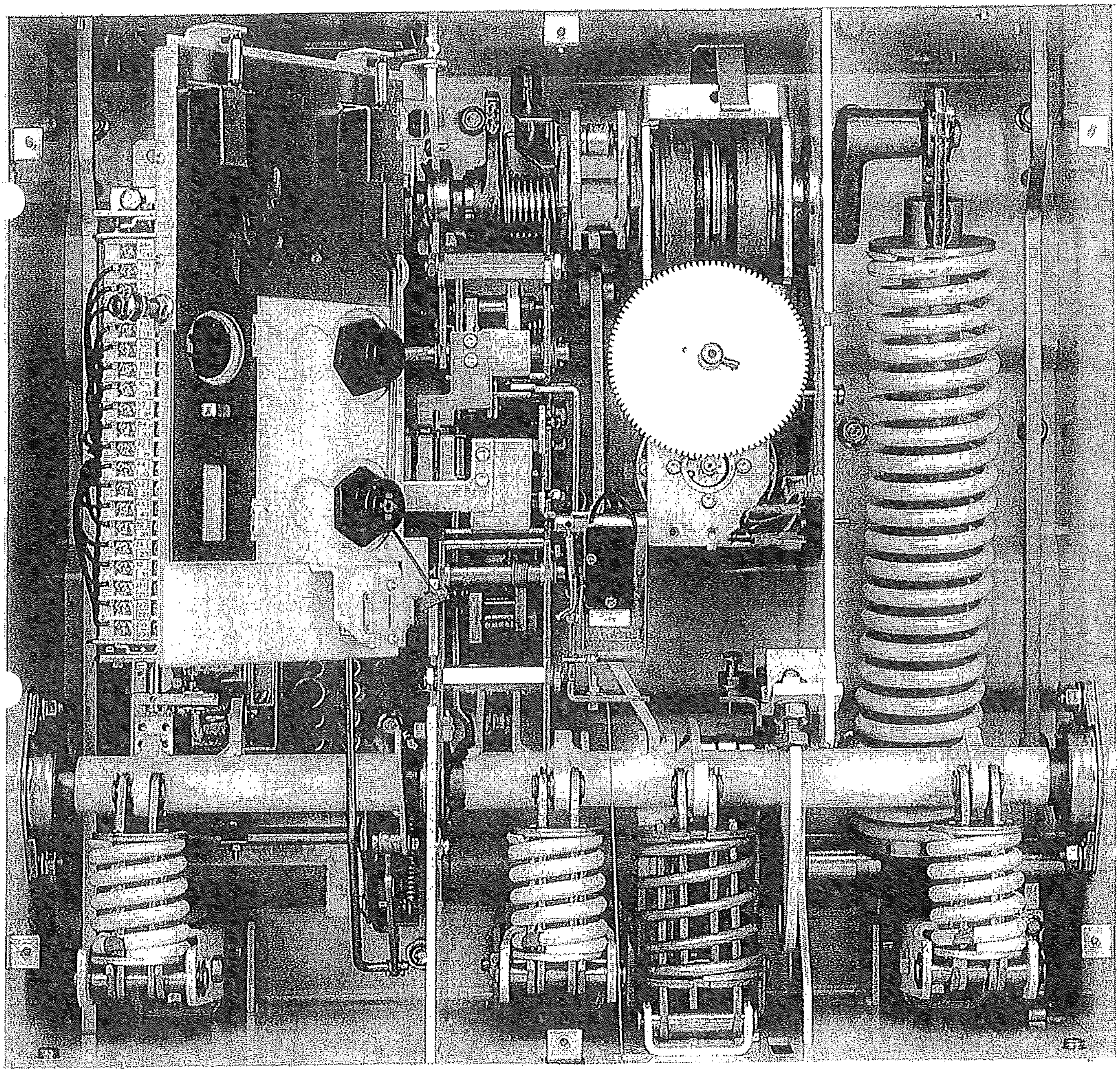
☞ *Work may only be performed on the drive mechanism if the energy storing device is released and the circuit-breakers are switched OFF.*

The following elements are not lubricated:

- Spring charging mechanism
- Motor
- Ball bearings and sliding bearings
- Shunt closing release

Shunt opening release

- Initiator ON - OFF
- Initiator "energy storing device"
- Auxiliary switch
- Plungers of tripping and closing coils



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Lubrication points in drive (explanation, refer to Fig. 24)

Routine Test Report

Date: 18.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-40-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
Equipment:	voltage - kV	12
	withst. impulse volt. - kV	75
	frequency - Hz	50
	rated current c.b. - A	3150
Production no. TC425622-1	short-time withstand c. - kA	31.5
Type designation ECA12-40-31-21	short circuit duration - sec.	3
Year of production 2005	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 18.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-31-06-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
Equipment:	voltage - kV	12
	withst. impulse volt. - kV	75
Production no. TC436292-1	frequency - Hz	50
Type designation ECA12-31-06-21	rated current c.b. - A	630
Year of production 2005	short-time withstand c. - kA	31.5
	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
Purchase order:	Classification M2	M2
US Steel Kosice		
Purchase order no. 9781		
Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 18.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-31-06-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436309-1	rated current c.b. - A	630
Type designation ECA12-31-06-21	short-time withstand c. - kA	31.5
Year of production 2005	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		.
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 18.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-31-06-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436326-1	rated current c.b. - A	630
Type designation ECA12-31-06-21	short-time withstand c. - kA	31.5
Year of production 2005	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 18.07.05

AREVA

Customer:	**RATED VALUE:**	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-40-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436343-1	rated current c.b. - A	3150
Type designation ECA12-40-31-21	short-time withstand c. - kA	31.5
Year of production 2005	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
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Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 18.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-40-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436385-1 Type designation ECA12-40-31-21 Year of production 2005	rated current c.b. - A	3150
	short-time withstand c. - kA	31.5
	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 18.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-40-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436402-1	rated current c.b. - A	3150
Type designation ECA12-40-31-21	short-time withstand c. - kA	31.5
Year of production 2005	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice		
Purchase order no. 9781		
Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
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Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 26.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
	rated current c.b. - A	4000
Production no. TC436515-1	short-time withstand c. - kA	50
Type designation 12-50-31-21	short circuit duration - sec.	3
Year of production 2005	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 26.07.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-12-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436581-1	rated current c.b. - A	1250
Type designation ECA12-50-12-21	short-time withstand c. - kA	50
Year of production 2005	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		.
US Steel Kosice		
Purchase order no. 9781		
Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436626-1	rated current c.b. - A	4000
Type designation ECA12-50-31-21	short-time withstand c. - kA	50
Year of production 2005	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-12-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12

Equipment:		withst. impulse volt. - kV	75
		frequency - Hz	50
		rated current c.b. - A	1250
Production no.	TC436643-1	short-time withstand c. - kA	50
Type designation	ECA12-50-12-21	short circuit duration - sec.	3
Year of production	2005	c.b. switching sequence	0-0,3s-CO-3min-CO
		Classification E2	E1
		Classification C2	C1
		Classification M2	M2
Purchase order:			
US Steel Kosice			
Purchase order no.	9781		
Customer ref.	3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-12-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
	rated current c.b. - A	1250
Production no. TC436660-1 Type designation ECA12-50-12-21 Year of production 2005	short-time withstand c. - kA	50
	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-12-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
	rated current c.b. - A	1250
Production no. TC436677-1 Type designation ECA12-50-12-21 Year of production 2005	short-time withstand c. - kA	50
	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		.
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-12-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
	rated current c.b. - A	1250
Production no. TC436694-1	short-time withstand c. - kA	50
Type designation ECA12-50-12-21	short circuit duration - sec.	3
Year of production 2005	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
Equipment:	voltage - kV	12
Production no. TC436711-1	withst. impulse volt. - kV	75
Type designation ECA12-50-31-21	frequency - Hz	50
Year of production 2005	rated current c.b. - A	3150
	short-time withstand c. - kA	50
Purchase order:	short circuit duration - sec.	3
US Steel Kosice	c.b. switching sequence	0-0,3s-CO-3min-CO
Purchase order no. 9781	Classification E2	E1
Customer ref. 3234-4500066080	Classification C2	C1
	Classification M2	M2

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 23.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
	rated current c.b. - A	4000
Production no. TC436745-2	short-time withstand c. - kA	50
Type designation ECA12-50-31-21	short circuit duration - sec.	3
Year of production 2005	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
	rated current c.b. - A	4000
Production no. TC436762-1 Type designation ECA12-50-31-21 Year of production 2005	short-time withstand c. - kA	50
	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation Number of this standard Number of this standard voltage - kV	12-50-31-21 IEC 62271-100 / 2001 IEC 60056 / 1987 12
Equipment:	withst. impulse volt. - kV frequency - Hz	75 50
Production no. TC436779-1 Type designation 12-50-31-21 Year of production 2005	rated current c.b. - A short-time withstand c. - kA short circuit duration - sec. c.b. switching sequence Classification E2 Classification C2 Classification M2	4000 50 3 0-0,3s-CO-3min-CO E1 C1 M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436804-1	rated current c.b. - A	4000
Type designation ECA12-50-31-21	short-time withstand c. - kA	50
Year of production 2005	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice		
Purchase order no. 9781		
Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
Equipment:	voltage - kV	12
	withst. impulse volt. - kV	75
Production no. TC436821-1	frequency - Hz	50
Type designation ECA12-50-31-21	rated current c.b. - A	4000
Year of production 2005	short-time withstand c. - kA	50
	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice		
Purchase order no. 9781		
Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-31-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	frequency - Hz	50
Production no. TC436838-1 Type designation ECA12-50-31-21 Year of production 2005	rated current c.b. - A	4000
	short-time withstand c. - kA	50
	short circuit duration - sec.	3
	c.b. switching sequence	0-0,3s-CO-3min-CO
	Classification E2	E1
	Classification C2	C1
	Classification M2	M2
Purchase order:		
US Steel Kosice Purchase order no. 9781 Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	ECA12-50-12-21
	Number of this standard	IEC 62271-100 / 2001
	Number of this standard	IEC 60056 / 1987
	voltage - kV	12

Equipment:

Production no.	TC752789-1
Type designation	ECA12-50-12-21
Year of production	2005

Purchase order:

US Steel Kosice

Purchase order no.	9781
Customer ref.	3234-4500066080

RATED VALUE (continued):

withst. impulse volt. - kV	75
frequency - Hz	50
rated current c.b. - A	1250
short-time withstand c. - kA	50
short circuit duration - sec.	3
c.b. switching sequence	0-0,3s-CO-3min-CO
Classification E2	E1
Classification C2	C1
Classification M2	M2

Tests passed acc. to IEC:

Power frequency high voltage test the main circuit (IEC 62271-100/7.1)
Dielectric test on auxiliary and control circuits (IEC 62271-100/7.2)
Measurement of the resistance of main circuit. (IEC 62271-100/7.3)
Design and visual checks (IEC 62271-100/7.5)
Mechanical operation test. (IEC 62271-100/7.101)
Test of the auxiliary electrical devices. (IEC 62271-100/7.101)
Verification of correct wiring. (IEC 62271-100/7.101)
Test of closing and opening time (IEC 62271-100/7.101)
Test of closing and opening speed (IEC 62271-100/7.101)
Test of contact simultanity (IEC 62271-100/7.101)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	AHA 12-50-09
	Number of this standard	IEC 62271-200 / 2003
	Number of this standard	IEC 60298 / 1994
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	withst.power frequency volt.kV	28
	frequency - Hz	50
Customer no. =1Res.ECA	operating current outgoing - A	1250
Production no. TC752782-1	short-time withstand c. - kA	50
Type designation AHA 12-50-09	short circuit duration - sec.	3
Year of production 2005	Internal arc classification	IEC 60298
	operating current busbar - A	4000
	operating/installation instr.	531681/531686
Purchase order:	-	Res.ECA
	Purchase order no.	009781
US Steel Kosice		.
Purchase order no. 9781		.
Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test on main circuit (IEC 60298/7.1)
Dielectric test on auxiliary and control circuits (IEC 60298/7.2)
Mechanical operation test. (IEC 60298/7.102))
Test of the auxiliary electrical devices. (IEC 60298/7.105)
Verification of correct wiring. (EN 60298/7.106)
Test of the capacitive voltage indication system (IEC 60243-5)

Routine Test Report

Date: 05.09.05

AREVA

Customer:	RATED VALUE:	
AIR LIQUIDE AGS GmbH Site manager Mr. Josef Gvora Job Site of AIR Separation Unit No. 9 SK-04454 Kosice	type designation	AHA12-50-09
	Number of this standard	IEC 62271-200 / 2003
	Number of this standard	IEC 60298 / 1994
	voltage - kV	12
Equipment:	withst. impulse volt. - kV	75
	withst.power frequency volt.kV	28
	frequency - Hz	50
Customer no. =2Res.ECA	operating current outgoing - A	4000
Production no. TC752801-1	short-time withstand c. - kA	50
Type designation AHA12-50-09	short circuit duration - sec.	3
Year of production 2005	Internal arc classification	IEC 60298
	operating current busbar - A	4000
	operating/installation instr.	531681/531686
Purchase order:	-	Res.ECA
	Purchase order no.	009781
US Steel Kosice		.
Purchase order no. 9781		.
Customer ref. 3234-4500066080		

Tests passed acc. to IEC:

Power frequency high voltage test on main circuit (IEC 60298/7.1)
Dielectric test on auxiliary and control circuits (IEC 60298/7.2)
Mechanical operation test. (IEC 60298/7.102))
Test of the auxiliary electrical devices. (IEC 60298/7.105)
Verification of correct wiring. (EN 60298/7.106)
Test of the capacitive voltage indication system (IEC 60243-5)