

## CERTIFICATE OF SHORT-CIRCUIT RATING

Laboratory Ref. No: 7194-011

Certificate No. 16624

**APPARATUS:** Three Phase and Neutral Extendable Horizontal and Vertical Busbars, with One Incoming and One Outgoing Air Circuit-breaker Circuit and Four Moulded case circuit-breaker Outgoing circuits Enclosed in a 415V/690V/8kV ( $U_n/U_{sc}/U_{oc}$ ) 50Hz Switchgear and Controlgear Assembly.

**DESIGNATION:** ArTu 2500A Switchboard Form 4b.

**MANUFACTURER:** ABB SACE S.p.A., Via Italia 58, 23846 Garbagnate M.ro (LC), Italy

**TESTED BY:** Falcon Testing Laboratory Limited, Loughborough, Leics., LE11 1HR.  
Tested for: ABB SACE S.p.A., and M/s. Arabian Controls and Switchgear of Al -Malki Group, P.O. Box 40688, Salwa Industrial Area, Doha, Qatar.

**DATE OF TESTS:** 3<sup>rd</sup> January to 3<sup>rd</sup> April 2003.

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this certificate has been subjected to the series of proving tests in accordance with

BS EN 60439-1:1999, EN 60439-1:1999 and IEC 60439-1:1999, Clauses 8.2.1, 8.2.5 and 8.2.6, Sub-clauses 8.2.2.2 to 8.2.2.5, 8.2.2.6, 8.2.3.2.3a), b), d) and 8.2.4.2.

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the ratings assigned by the manufacturer as stated below.

For ratings assigned by the manufacturer and proved by test see page Numbers 1, 2 and 3.

The record of Proving Tests applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

This Certificate comprises 39 pages, 3 diagrams, 28 oscillograms, 24 photographs, 13 drawings and no other sheets as detailed on page 4.

Only integral reproduction of this Certificate, or reproductions of this page accompanied by any page(s) on which are stated the assigned rated characteristics of the apparatus tested, are permitted without written permission from ASTA BEAB Certification Services, Hilton House, Corporation Street, Rugby. CV21 2DN England.



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*P Gibbons*

ASTA Observer  
P Gibbons

*C. Nick-Lane*

DIRECTOR

*4th May 2007*

Date

**Ratings Assigned by the Manufacturer and Proved by Test.****1. Rated currents – to Clause 8.2.1.****1.1 Test on complete assembly**

Incoming circuit including:

Air circuit-breaker ABB SACE E3N 25, 2500A, 3 pole	: 2250A.
Main horizontal busbars	: 2250A.
Vertical / horizontal profiled busbars	: 1128A.

**Outgoing circuits**

Rated diversity factor	: 0.701.
Air circuit breaker ABB SACE E2N16, 1600A, 3 pole	: 1122A.
Moulded case circuit breaker ABB SACE S6S, 800A, 3 pole	: 561A.
Moulded case circuit breaker ABB SACE S5H, 400A, 3 pole	: 280A.
Moulded case circuit breaker ABB SACE T3S250, 250A, 3 pole	: 175A.
Moulded case circuit breaker ABB SACE T2S160, 160A, 3 pole	: 112A.

**1.2 Test on horizontal and vertical / horizontal profiled busbars only**

Main horizontal busbars	: 2500A.
Vertical / horizontal profiled busbars	: 1600A.

**2. Rated power frequency withstand voltage – to Sub-clause 8.2.2.2 to 8.2.2.5.**

Main circuits only, no control or auxiliary circuits fitted.

External operating handles of insulating material.	: 3750V.
Between phases and to earth.	: 2500V.

**3. Rated impulse withstand voltage – to Sub-clause 8.2.2.6.**

Main circuits only.	: 8.0kV.
No control or auxiliary circuits fitted.	

**4. Rated short-time ( $I_{cs}$ ) and peak withstand current ( $I_{pk}$ ). – to Sub-clause 8.2.3.2.3b) and d).**

Three phase	: 50kA rms for 3 seconds, 105kA peak.
Adjacent phase and neutral	: 30kA rms for 3 seconds, 63kA peak.
Nearest phase and protective conductor	: 30kA rms for 1 second, 63kA peak.

**Incoming circuit connections (air circuit-breaker not fitted)**

Three phase	: 3 off 100mm x 10mm tin plated hdhc copper bar per phase.
Neutral	: 2 off 100mm x 10mm tin plated hdhc copper bar.

**Main horizontal busbars**

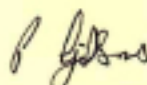
Three phase	: 2 off 125mm x 10mm tinplated hdhc copper bar per phase.
Neutral	: 1 off 125mm x 10mm tinplated hdhc copper bar.

**Vertical / horizontal profiled busbars**

Three phase	: 1 off 60mm x 20mm (drawing number 854070) tin plated hdhc copper profiled bar per phase.
Neutral	: 1 off 60mm x 20mm (drawing number 854071) tin plated hdhc copper profiled bar.

**Protective circuit**

Horizontal protective conductor	: 1 x 60mm x 10mm tin plated hdhc copper bar.
Vertical protective conductor	: 1 x 60mm x 10mm tin plated hdhc copper bar.



Ratings Assigned by the Manufacturer and Proved by Test continued

**5. Rated short-time ( $I_{cs}$ ) and peak withstand current ( $I_{pk}$ ).** – to Sub-clause 8.2.3.2.3b) and d).

Three phase : 65kA rms for 1 second, 143kA peak.  
Adjacent phase and neutral : 39kA rms for 1 second, 81.9kA peak.

Main horizontal busbars

Three phase : 2 off 125mm x 10mm tinplated hdhc copper bar per phase.  
Neutral : 1 off 125mm x 10mm tinplated hdhc copper bar.

Incoming circuit connections (air circuit-breaker not fitted)

Three phase : 3 off 100mm x 10mm tin plated hdhc copper bar per phase.  
Neutral : 2 off 100mm x 10mm tin plated hdhc copper bar.

**6. Rated conditional short-circuit current ( $I_{cc}$ ).** – to Sub-clause 8.2.3.2.3a).

Three phase : 50kA rms at 415V, 0.25pf, 105kA peak.

Outgoing circuits

Air circuit-breaker : ABB SACE E2N16, 1600A, 3 pole.  
Connections three phase : 2 x 60mm x 10mm tin plated hdhc copper bar per phase.

Moulded case circuit-breaker : ABB SACE S6S, 800A, 3 pole, linear operation.  
Connections three phase : 1 x 40mm x 10mm tin plated hdhc copper bar per phase.

Moulded case circuit-breaker : ABB SACE S5H, 400A, 3 pole, rotary operation.  
Connections three phase : 1 x 30mm x 6mm tin plated hdhc copper bar per phase.

Moulded case circuit-breaker : ABB SACE T3S250, 250A, 3 pole, rotary operation.  
Connections three phase : 1 x 20mm x 5mm tin plated hdhc copper bar per phase.

Moulded case circuit-breaker : ABB SACE T2S160, 160A, 3 pole, rotary operation.  
Connections three phase : 1 x 20mm x 5mm tin plated hdhc copper bar per phase.

**7. Rated conditional short-circuit current ( $I_{cc}$ ).** – to Sub-clause 8.2.3.2.3a).

Adjacent phase and neutral : 30kA rms at 240V, 0.25pf, 63kA peak.

Outgoing circuit

Air circuit-breaker : ABB SACE E2N16, 1600A, 3 pole.  
Connections three phase : 2 x 60mm x 10mm tin plated hdhc copper bar per phase.  
neutral : 1 x 60mm x 10mm tin plated hdhc copper bar per phase

**8. Rated conditional short-circuit current ( $I_{cc}$ ) of protective conductor** – to Sub-clause 8.2.4.2.

Nearest phase and protective conductor : 30kA rms at 240V, 0.25pf, 63kA peak.

Horizontal protective conductor : 1 x 60mm x 10mm tin plated hdhc copper bar.

Outgoing circuits

Air circuit-breaker : ABB SACE E2N16, 1600A, 3 pole.  
Connections three phase : 2 x 60mm x 10mm tin plated hdhc copper bar per phase.

Moulded case circuit-breaker : ABB SACE S6S, 800A, 3 pole, direct operation.  
Connections three phase : 1 x 40mm x 10mm tin plated hdhc copper bar per phase.

Ratings Assigned by the Manufacturer and Proved by Test continued**9. Mechanical operations – to Clause 8.2.6.**

Incoming circuit-breaker ABB SACE E3N 25, 2500A, 3 pole	: 50 close open operating cycles. : 50 withdrawal and insertion operations.
Outgoing circuit-breaker ABB SACE E2N16, 1600A, 3 pole	: 50 close open operating cycles. : 50 withdrawal and insertion operations.
Outgoing moulded case circuit-breaker ABB SACE S6S, 800A, 3 pole.	: 50 close open linear handle operations.
Outgoing moulded case circuit-breaker ABB SACE S5H, 400A, 3 pole.	: 50 close open rotary handle operations.
Outgoing moulded case circuit-breaker ABB SACE T3S250, 250A, 3 pole.	: 50 close open rotary handle operations.
Outgoing moulded case circuit-breaker ABB SACE T2S160, 160A, 3 pole.	: 50 close open rotary handle operations.

