

Australian Standard™

**Insulators—Porcelain stay type—
Voltages greater than 1000 V a.c.**

This Australian Standard was prepared by Committee EL-010, Overhead Lines. It was approved on behalf of the Council of Standards Australia on 23 May 2005. This Standard was published on 14 June 2005.

The following are represented on Committee EL-010:

Australasian Railway Association
Australian Chamber of Commerce and Industry
Australian Electrical and Electronic Manufacturers Association
Australian Porcelain Insulators Association
Electricity Engineers Association (New Zealand)
Energy Networks Association

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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 3609—2005

Insulators—Porcelain stay type—Voltages greater than 1000Va.c.

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NOTES

Australian Standard™

**Insulators—Porcelain stay type—
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PREFACE

This Standard was reviewed by the Australian members of the Joint Standards Australia/Standards New Zealand committee EL-010, Overhead Lines. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to republish this Australian Standard without technical alterations. There are minor editorial changes and cross-references to referred Standards have been updated.

The Standard applies to porcelain stay insulators, used in conjunction with stay wires and it deals with general requirements, characteristics and methods of test.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard

Insulators—Porcelain stay type—Voltages greater than 1000 V a.c.

1 SCOPE AND GENERAL**1.1 Scope**

This Standard specifies requirements for porcelain stay insulators as defined in Clause 1.3.1 and which are incorporated with the stay wires used for poles supporting overhead lines.

NOTE: Appendix B lists information that should be specified by the purchaser of the insulators.

1.2 Referenced documents

The following documents are referred to in this Standard.

AS

1222 Steel conductors and stays—Bare overhead

1222.1 Part 1: Galvanized (SC/GZ)

1931 High-voltage test techniques

1931.1 Part 1: General definitions and test requirements

1.3 Definitions

For the purpose of this Standard the definitions below apply.

1.3.1 Stay insulator

Insulator consisting of one part, with two transverse holes for the insertion of stay wires and hereafter referred to as ‘insulator’.

1.3.2 Power-frequency wet flashover voltage

Arithmetic mean value of the measured voltages which cause flashover of the insulator under the conditions prescribed in Clause 2.2.

1.3.3 Flashover

Disruptive discharge external to the insulator, connecting those parts which normally have the operating voltage between them.

NOTE: In this Standard the term ‘flashover’ includes a flashover across the insulator surface as well as disruptive discharge by sparkover through air adjacent to the insulator.

1.3.4 Mechanical failing load

Maximum mechanical load at which failure occurs in an insulator when tested under the prescribed conditions.

1.3.5 Lot

Group of insulators offered for acceptance from the same manufacturer, of the same design, and manufactured under similar conditions of production.

1.4 Classification of tests

Tests shall be classified as follows:

(a) Type tests

Type tests are intended to verify the main characteristics of an insulator which depend mainly on its design. They are carried out once for a new design or manufacturing process of insulator and then subsequently repeated only when the design or manufacturing process is changed; when the change affects only certain characteristics, only the test(s) relevant to these characteristics need to be repeated. Type tests are usually carried out on a small number of insulators.

Valid type test certificates are those issued by an independent testing organization, confirming that these tests have been satisfactorily performed. The tests serving for the establishment of type test certificates may be carried out in a laboratory other than that of the issuing organization if a qualified witness of the latter is present.

For mechanical tests, the certificate shall be valid for 10 years from the date of issue. There is no time limit for the validity of certificates for electrical type tests.

Within the above limits, the type test certificates remain valid while there is no significant disparity between the results of the type tests and subsequent corresponding sample tests.

Type tests shall be carried out only on insulators from a lot that has complied with the requirements of the relevant routine tests.

(b) Sample tests

Sample tests are carried out to verify the characteristics of an insulator which can vary within the manufacturing process and the quality of the component materials of the insulator. Sample tests are used as acceptance tests on a sample of insulators taken at random from a lot that has met the requirements of the relevant routine tests.

(c) Routine tests

Routine tests are intended to eliminate defective units and are carried out during the manufacturing process. Routine tests are carried out on every insulator.

1.5 Marking

Each insulator shall be legibly and indelibly marked with the name or trade mark of the manufacturer and the year of manufacture.

Markings shall be printed and shall be applied before glazing.

2 GENERAL REQUIREMENTS FOR TESTS

2.1 Verification of dimensions and visual inspection

Checks shall be carried out to verify that the test samples are in accordance with the relevant drawings, particularly in regard to the smooth transition between radii and the

2.2.2 *Method of support*

The assembled test sample shall be strung with its axis at 45° from the vertical with the upper loop attached to a suitable insulator and the lower loop connected to earthed metal.

2.2.3 *Water spray*

The direction of the water spray shall be from above, in the vertical plane and normal to the axis of the assembled test sample.

The water spray shall be reasonably uniform and shall cover the insulator and 150 mm of the stranded loops from the edge of the insulator.

The precipitation rate, resistivity and temperature of the water shall be in accordance with the requirements of AS 1931.1.

2.2.4 *Test voltage*

While the test sample is being sprayed, a voltage of approximately sine waveform and power frequency shall be applied between the stranded loops. The insulator shall then be flashed over not less than 10 times.

The r.m.s. flashover voltage to be recorded shall be the mean of not less than 10 consecutive observations, measured and corrected in accordance with the requirements of AS 1931.1.

2.3 Mechanical strength test

2.3.1 *Method of assembly*

The test sample shall be assembled by threading a steel wire or steel rope through each of the transverse holes and the loops shall be secured with clamps. Both loops shall be equal and the overall length of the assembly shall be not less than 10 times the length of the insulator.

2.3.2 *Test force*

A test force shall be applied along the axis of the (looped) assembly and shall be increased at a steady rate until the specified minimum failing load is reached or fracture occurs.

The type of steel strand or steel rope and the test force shall be recorded.

2.4 Porosity test

Fragments from the insulator shall be immersed in a 1 percent solution of fuchsin (1 g fuchsin in 100 g methylated spirit) under a pressure of not less than 15 MPa for a time such that the product of the test duration in hours and test pressure in megapascals is not

3.2 Sample tests

3.2.1 General

The number of samples shall be as given in Table 3.1 (N being the number of insulators in the lot offered for inspection).

TABLE 3.1
SELECTION OF SAMPLES

Lot size (N)	Sample size
≤ 300	See Appendix B
$> 300 \leq 1\ 200$	10
$> 1\ 200 \leq 3\ 000$	14
$> 3\ 000 \leq 10\ 000$	20
$> 10\ 000$	See Appendix B

Insulators that have been subjected to the sample tests shall not be used in service (see Appendix B).

3.2.2 Verification of dimensions

The test samples shall be checked in accordance with Clause 2.1. The dimensions and tolerances of insulators shall be in accordance with Clause 4.1.

3.2.3 Mechanical strength test

The samples shall be assembled and tested in accordance with Clause 2.3.

The insulator shall not fracture at less than the minimum failing load specified in Clause 4.3.

3.2.4 Porosity test

Fragments of insulators from the lot shall be prepared and tested in accordance with Clause 2.4.

Examination of the freshly broken surfaces with normal or corrected vision shall not reveal any dye penetration. Penetration into small cracks formed during the initial breaking shall be ignored.

3.2.5 Retest procedure

The following retest procedure applies:

- (a) If only one insulator fails to comply with the sample test, a new sample equal to twice the quantity originally submitted to that test, shall be subjected to retesting.
- (b) If two or more insulators fail to comply with any of the sample tests, or if any failure occurs during the retesting, the complete lot is considered as not complying with the Standard and shall be rejected.
- (c) Option for re-submission of a rejected lot (see Appendix B).

3.3 Routine test

The routine test comprises a visual examination and it shall be carried out on every insulator as follows:

- (a) Colour

The colour of the insulator shall match the colour specified, within commercially acceptable tolerance.

- (b) Finish

The areas specified as glazed shall be covered by a smooth hard glaze, free from cracks and other defects prejudicial to satisfactory performance in service.

On those areas specified as glazed, the total area not covered by glaze shall not exceed 100 mm², and the area of any single glaze defect shall not exceed 50 mm².

4 STANDARD CHARACTERISTICS

4.1 Dimensions

dimensions and tolerances of insulators shall be in accordance with the relevant drawings shown in this Standard.

Insulator types and corresponding figure numbers are shown in Table 4.1.

4.2 Power-frequency wet flashover voltages

The power-frequency wet flashover voltages shall not be lower than those specified in Table 4.1 for each type of insulator.

4.3 Mechanical strength

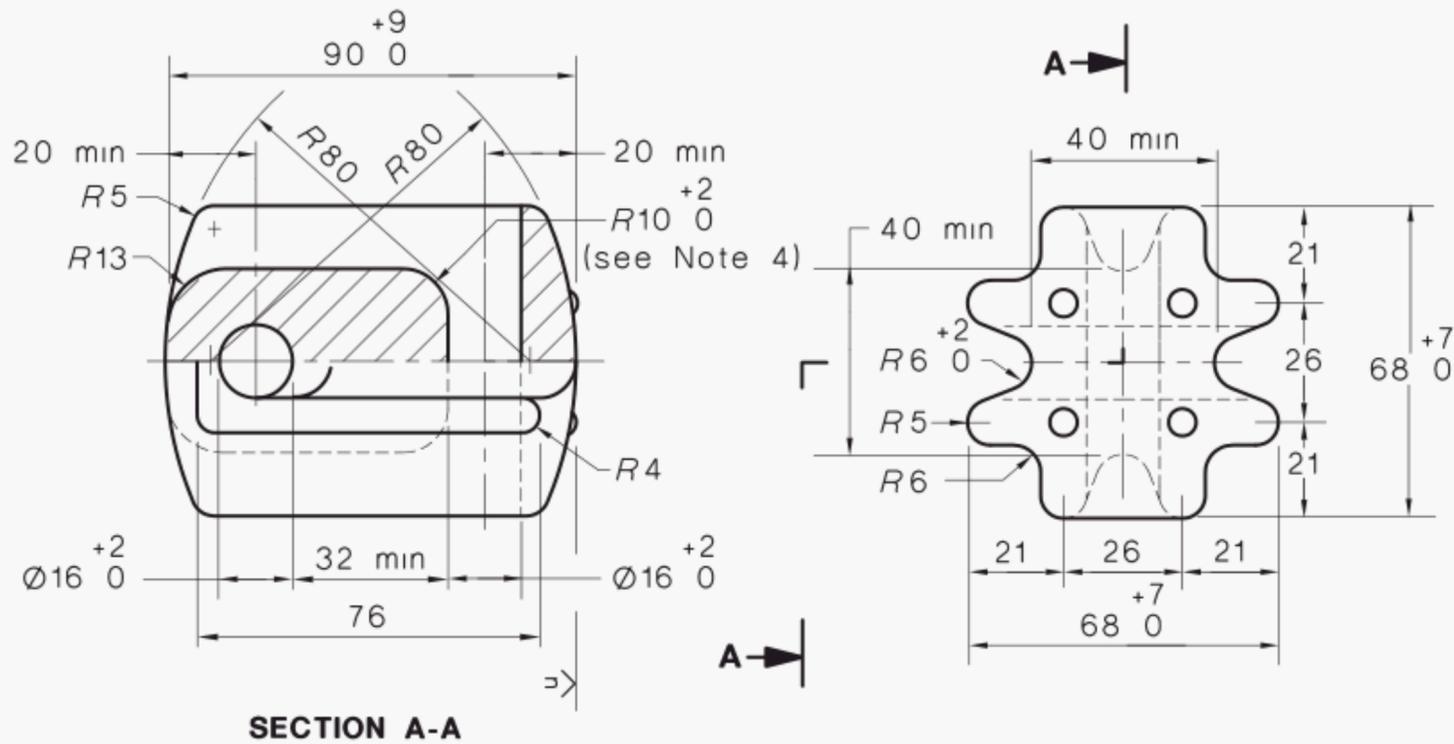
The strength of the insulator varies with the flexibility of the steel strand or steel rope with which it is used. The mechanical strength of the insulator and nominated stay wire combination shall be not less than that specified in Table 4.1.

Other mechanical strength ratings of insulator and stay wire combinations are shown in Appendix A.

TABLE 4.1
INSULATOR AND STAY WIRE CHARACTERISTICS

Insulator reference		Power-frequency wet flashover load voltage kV min.	Steel strand for mechanical strength test (see Note)	Minimum failing load kN
Figure No	Type			
4.1	GY1	10	7/2.75	27
4.2	GY2	15	19/2.00	71
4.3	GY3	20	19/2.75	222
4.4	GY4	30	19/2.75	222

NOTE: Steel strand in accordance with AS 1222.1.

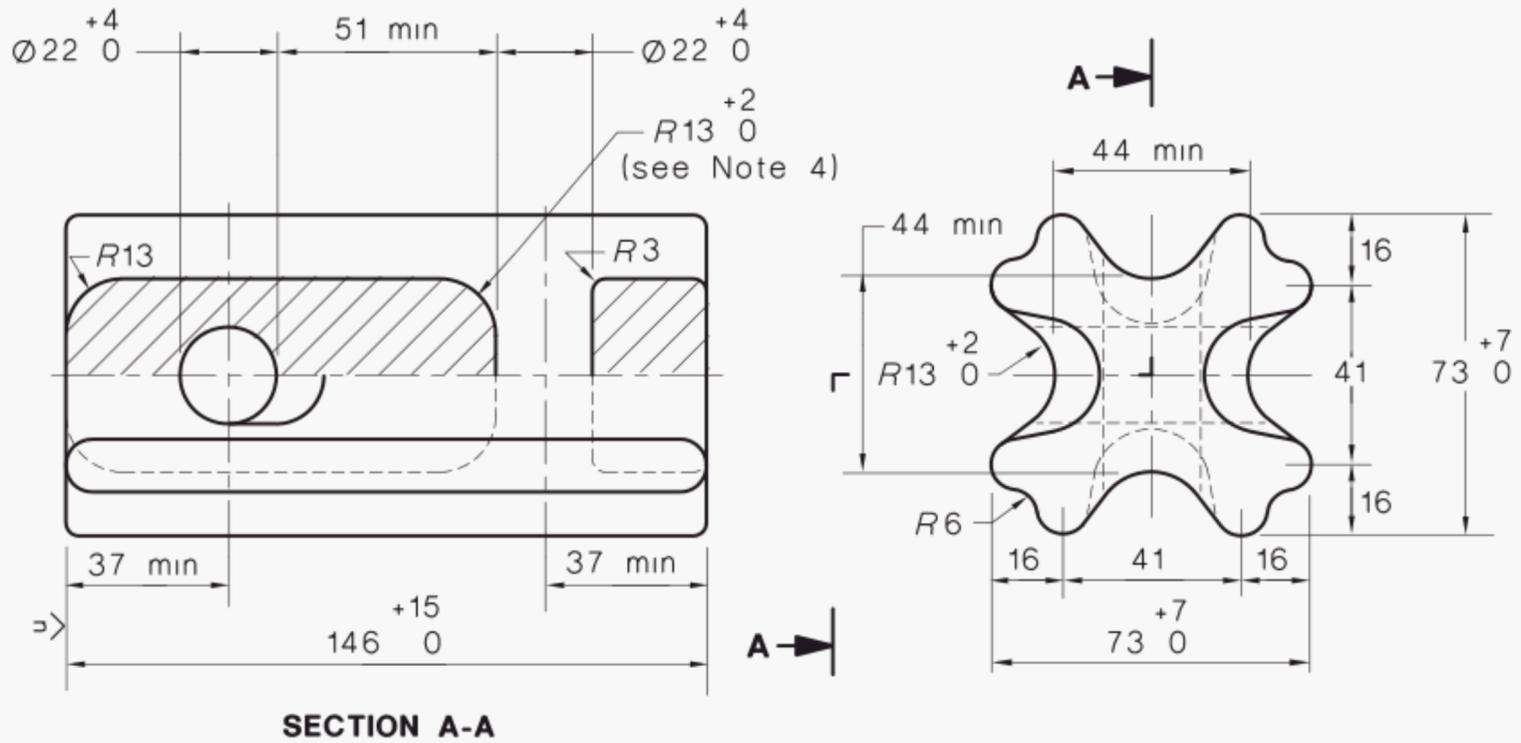


NOTES:

1. Material: Porcelain.
2. Finish: Glazed all over except surfaces marked thus: "u".
3. Tolerances: Unless otherwise stated, all dimensions are subject to a tolerance of $\pm 5\%$.
4. Transitions: All transitions between surfaces must be smooth to provide even bearing for wire rope or strand.

DIMENSIONS IN MILLIMETRES

FIGURE 4.1 TYPE GY1

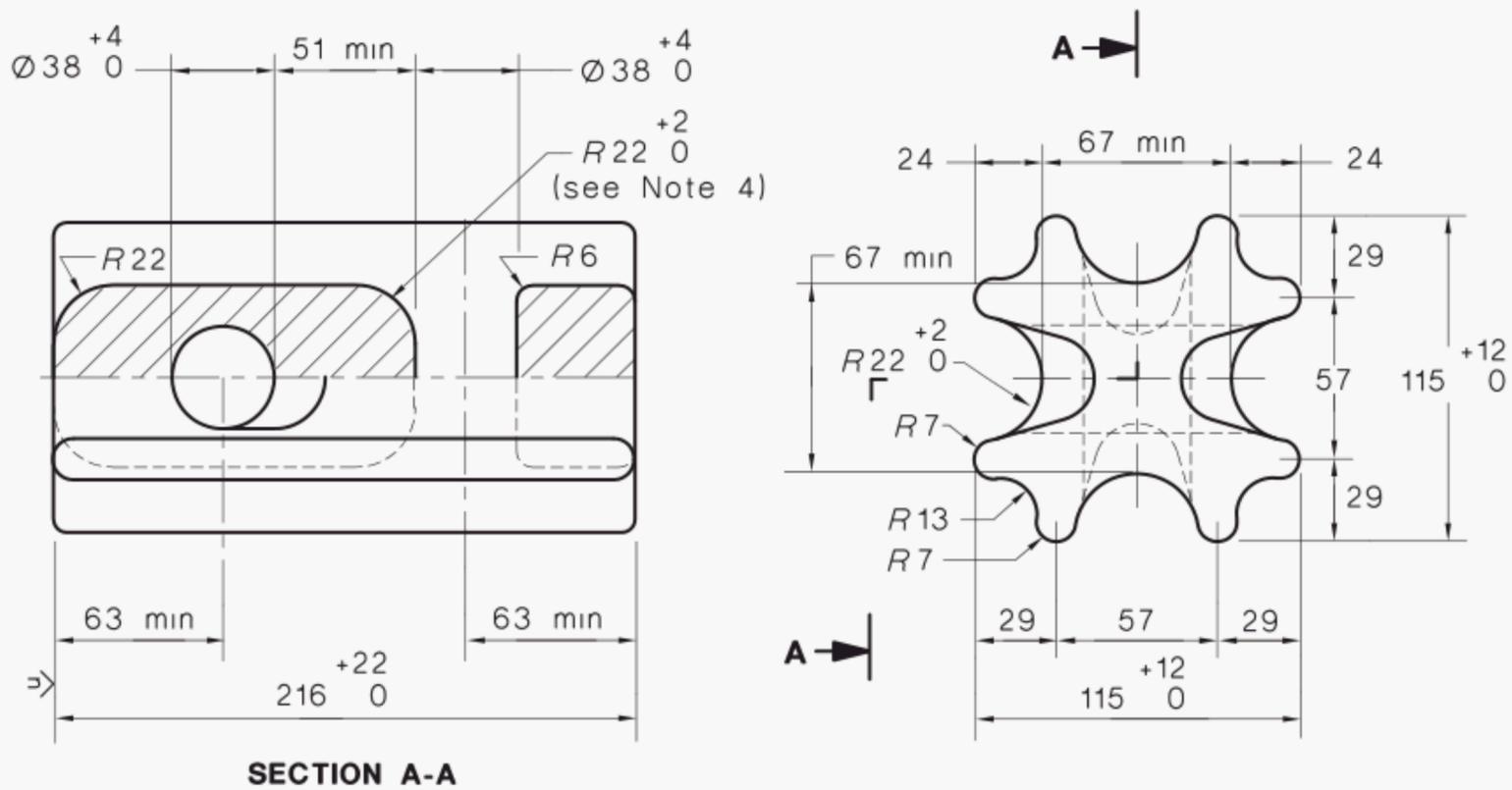


NOTES:

1. Material: Porcelain.
2. Finish: Glazed all over except surfaces marked thus: "u".
3. Tolerances: Unless otherwise stated, all dimensions are subject to a tolerance of ±5%.
4. Transitions: All transitions between surfaces must be smooth to provide even bearing for wire rope or strand.

DIMENSIONS IN MILLIMETRES

FIGURE 4.2 TYPE GY2

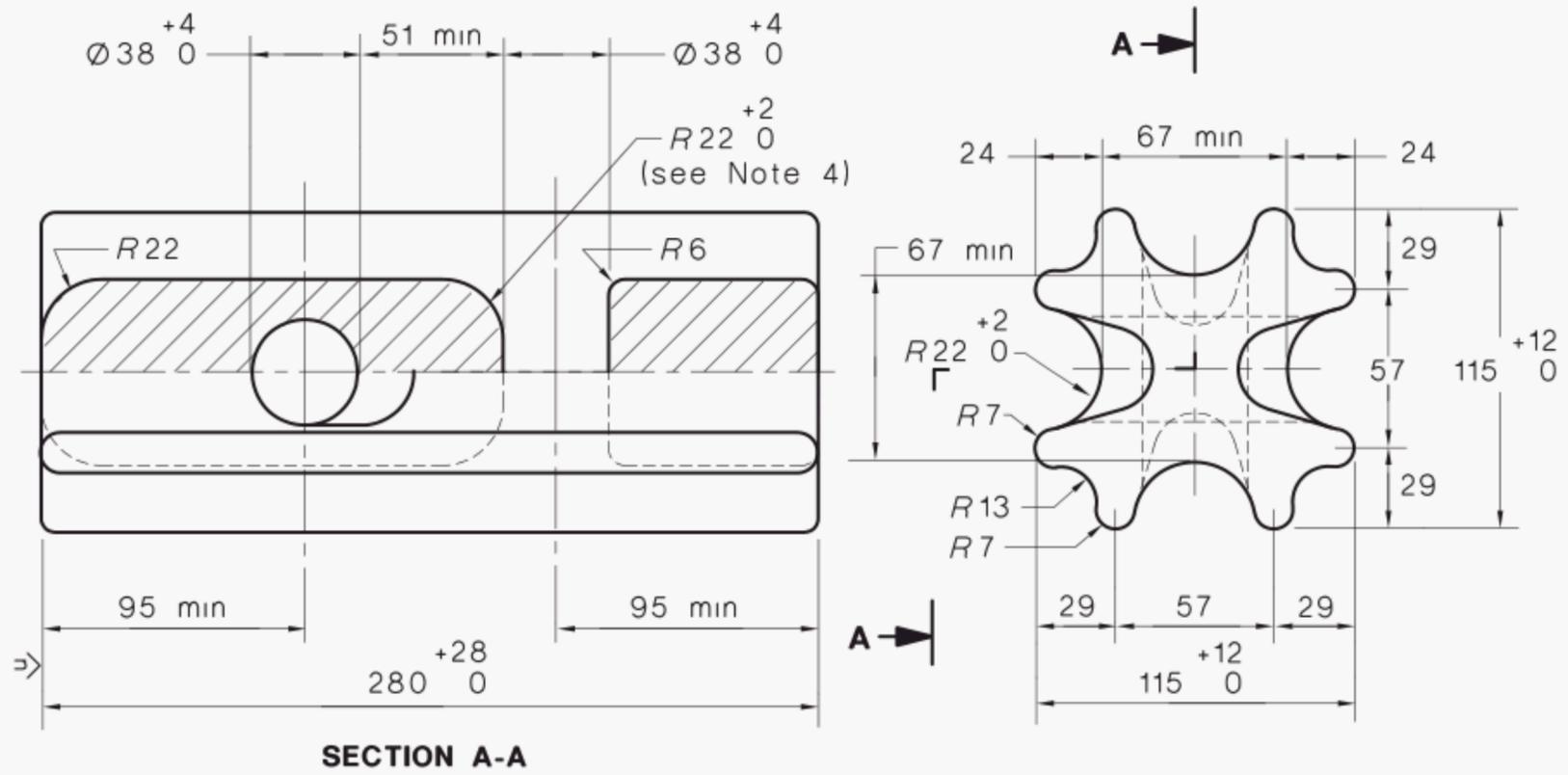


NOTES:

1. Material: Porcelain.
2. Finish: Glazed all over except surfaces marked thus: "u".
3. Tolerances: Unless otherwise stated, all dimensions are subject to a tolerance of ±5%.
4. Transitions: All transitions between surfaces must be smooth to provide even bearing for wire rope or strand.

DIMENSIONS IN MILLIMETRES

FIGURE 4.3 TYPE GY3



NOTES:

1. Material: Porcelain.
2. Finish: Glazed all over except surfaces marked thus: "u".
3. Tolerances: Unless otherwise stated, all dimensions are subject to a tolerance of $\pm 5\%$.
4. Transitions: All transitions between surfaces must be smooth to provide even bearing for wire rope or strand.

DIMENSIONS IN MILLIMETRES

FIGURE 4.4 TYPE GY4

APPENDIX A
MECHANICAL STRENGTH RATINGS OF INSULATOR AND STAY WIRE
COMBINATIONS

(Normative)

Insulator type	Strand or wire rope size	Failing load of steel strand or rope kN	Corresponding failing load of insulator kN
GY2	19/2.75*	140	53.4
GY3	6 H 7/60.3†	180	161
	6 H 7/69.9†	262	133
	6 H 7/79.4†	321	89

* Number of strands/diameter of each wire, (in accordance with AS 1222.1).

† Steel rope strand configuration/circumference of wire rope in millimetres, (see Clause 4.3).

APPENDIX B

ITEMS TO BE SPECIFIED BY THE PURCHASER OR SUBJECT TO AGREEMENT BETWEEN THE PURCHASER AND MANUFACTURER

(Informative)

B1 GENERAL

Some items listed below are additional to the purchasing details normally provided by the purchaser at the time of order and should either be specified by the purchaser or be subject to agreement between the purchaser and manufacturer.

B2 ITEMS TO BE SPECIFIED BY THE PURCHASER

- (a) Type of insulator (see Clause 1.1).
- (b) Requirements concerning test certificates (see Clause 1.4(a)).
- (c) Colour of insulator (see Clause 3.3).
- (d) For sample tests, whether samples will be selected at random from the lot by the purchaser's representative (see Clause 3.2.1).
- (e) Tolerance on dimensions, if other than that specified in Clause 4.1.

B3 ITEMS SUBJECT TO AGREEMENT BETWEEN PURCHASER AND MANUFACTURER

- (a) Whether the porosity test may be carried out on representative pieces of ceramic, fired adjacent to the insulators (see Clause 2.4).
- (b) The number of insulators to be subjected to the power-frequency wet flashover test, and the mechanical strength test, if not three (see Clause 3.1).
- (c) For sample tests, the sample size for lot sizes ≤ 300 , or, for lot sizes $> 10\ 000$, the minimum number of lots, of between 3 000 and 10 000 insulators, to be made up (see Clause 3.2.1).
- (d) Retest procedure, whether a rejected lot can be resubmitted for acceptance (see Clause 3.2.5).

NOTES

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Standards Australia is responsible for ensuring that the Australian viewpoint is considered in the formulation of international Standards and that the latest international experience is incorporated in national Standards. This role is vital in assisting local industry to compete in international markets. Standards Australia represents Australia at both ISO (The International Organization for Standardization) and the International Electrotechnical Commission (IEC).

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