



Ergon Energy Corporation Limited

**Technical Specification for 12kV,
24kV and 36kV Drop-Out
Disconnecter**

ETS06-03-01

Technical Specification for 12kV, 24kV and 36kV Drop-Out Disconnecter



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1. Purpose and Scope

This specification sets out the technical requirements for single pole, single insulator, single venting expulsion drop-out (EDO) disconnector fuse units Class AK1 together with fuse links for use on overhead distribution systems in a totally exposed environment. Drop-out disconnector fuse units are primarily used for the protection of distribution transformers and the protection of spur sections of overhead lines from the main backbone line.

2. References

2.1 Applicable Standards

The Drop-out Disconnectors and Fuse Links shall be designed, manufactured and tested in accordance with the relevant parts of the following Standards and all amendments issued from time to time except where varied by this specification.

Should inconsistencies be identified between standard and/or this specification, the Supplier shall immediately refer such inconsistencies to the Purchaser for resolution.

STANDARD	TITLE
AS 1033	High voltage fuses (for rated voltages exceeding 1000 V)
AS 1154	Insulator and conductor fittings for overhead power lines
AS 1214	Hot-dip galvanised coatings on threaded fasteners (I.S.O. metric coarse thread series)
AS62271.102	High voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches
AS 1824	Insulation co-ordination
AS 1856	Electroplated coatings - silver
AS 2650	Common specifications for high voltage switchgear and controlgear standards
AS 2837	Wrought alloy steels - Stainless steel bars and semi-finished products
AS 2947	Insulators - Porcelain and glass for overhead power lines - Voltages greater than 1000 V a.c.
AS 4169	Electroplated coatings - Tin and tin alloys
AS 4360	Risk Management
AS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.
AS/NZS ISO 9001	Quality management systems -Requirements

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3. Drawings

3.1 Drawings by the Purchaser

The following drawings under **Attachment 4** forms part of this specification.

DRAWING NUMBER	TITLE
06-03-01	Typical Drop out Disconnecter Fuse Unit (Expulsion Type)

4. Service Conditions

The Drop-out Disconnectors and Fuse Links will be exposed to the following environmental conditions:-

Ambient Temperatures	45° summer day time -5° winter night time
Solar Radiation Level	1100 watts per square metre with high ultraviolet content
Precipitation	Tropical summer storms with gust wind speeds above 160km/h, and an annual rainfall in excess of 1500 mm
Humidity	Extended periods of relative humidity in excess of 90% R.H.
Atmospheric Classifications	Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities in the range 2.0 - 3.0 g/m ² .

5. Design and Construction

Design and construction performance parameters are detailed in this section.

5.1 Disconnecter Fuse Unit

5.1.1 Ratings

The disconnecter fuse units shall be Class AK1 complying with AS 1033.1 and shall have the following ratings:-

Rated Voltage	(kV)	12	24	36
Rated Frequency	(Hz)	50	50	50
Rated Current	(A)	100	100	100
Minimum Rated Breaking Current (symmetrical)	(kA)	8	6	4
Insulation Level minimum (B.I.L.)(Outdoor Service)	(kVPeak)	95	150	170
Load switching Capacity (Minimum)		Magnetising Current applicable to 500kVA transformer		

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5.1.2 Operation

It shall not be possible to close the fuse carrier without the top cap fitted. The disconnecter fuse units shall be designed and constructed such that on closing the fuse carrier-fuse link no additional stress shall be applied to the fuse link which could cause it to fail.

To allow for interchangeability of fuse carriers between fuse units from different manufacturers, the distance between contacts shall be strictly in accordance with QESI drawing number 06-03-01.

Lifting rings of 25 mm nominal internal diameter shall be provided on the bottom end and on the top of the fuse tube to enable the removal and replacement of the fuse tube using a standard operating rod fitted with a hook-link stick. When an expulsion drop-out disconnecter fuse is mounted on a pole the fuse carrier shall not hit the pole during opening operation.

The top contact support of the disconnecter fuse shall be provided with hooks suitable for attachment of a portable load breaking tool.

5.1.3 Mounting

The angle of inclination of the disconnecter fuse carrier shall be sufficient to allow ease of operation with due regard to the safety of the operator. The disconnecter shall be capable of being mounted on either poles or crossarms.

The purchaser shall specify the type of mounting required.

a) Timber Crossarm Mounting

A hole shall be provided in the mounting bracket to allow the disconnecter to be fixed to the top of the crossarm by means of a M20 bolt vertically through the crossarm with its centre line located 50mm from the face of the crossarm.

A suitable locking arrangement shall be provided to prevent rotation of the disconnecter about the mounting bolt when in service.

b) Pole Mounting

A hole shall be provided in the mounting bracket to allow the disconnecter to be fixed to a pole by a M20 bolt.

A further hole shall be provided for an M16 coachscrew connection to the pole to prevent rotation of the disconnecter about the mounting bolt when in service.

5.1.4 Contacts

All electrical contact surfaces are to be silver plated in accordance with AS 1856 to ensure that the thickness of plating provides durability of the contact surfaces over a service life of 35 years.

All contacts shall be greased, self-aligning and shall have wiping action to remove oxide or other contamination on the contact surfaces and constructed to eliminate arcing damage to the main contacts. As the hinge and fuse carrier may be subject to operation from an off-centre position they shall be of robust construction to align correctly under this condition.

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5.1.5 Fuse Carrier

Details of the materials used in the composition of the fuse carrier and the means adopted to make it durable and weatherproof shall be provided.

5.1.6 Insulators

The insulator shall be a single piece, fully vitrified non-puncturable porcelain in accordance with AS 2947. The preferred colour is munsell grey.

The minimum electrical characteristics of each insulator shall be:

PARTICULARS	UNITS	12kV	24kV	36kV
Lightning Impulse Withstand Voltage	kV _{pk}	95	150	170
Wet Power Frequency Withstand Voltage	kV	28	50	70
Creepage Distance	mm	230	430	580

The insulator shall be of adequate mechanical strength to withstand the loads applied during the opening and closing cycles. Details of the design features including the mechanical rating of the insulators and testing undertaken to meet these requirements shall be provided.

5.1.7 Terminal Connections

A terminal connection shall be provided on both the supply and load sides of the disconnecter fuse unit and shall provide for a lug connection using a single M10 bolt, and also bolted clamp connection capable of accommodating a conductor range from 5.3 mm to 14.3 mm diameter.

The connection shall be designed so that the conductor can be removed using live-line techniques which do not require a bolt to be held during the untightening process i.e. the bolt is held captive in the terminal fitting to prevent rotation of the bolt at any stage when untightening and shall not become loose once the nut is removed.

The connections shall be designed for use with aluminium, copper, or steel conductors and to minimise the effects of electrolytic corrosion of dissimilar metals.

A bolted clamp shall meet the performance requirements of Section 5 of AS 1154 Part 1.

Tunnel and U-Bolt type clamps are not acceptable.

5.1.8 Corrosion Protection

The hinge and latch mechanisms of the unit shall be constructed of corrosion resistant metals and shall include no ferrous parts other than stainless steel.

All current carrying parts shall be of a high electrical conductivity, corrosion resistant metal

All nuts, bolts and washers other than those associated with the mounting bracket shall be stainless steel in accordance with AS 2837. The bolts and washers shall be grade 316 and to avoid binding, the nuts shall be grade 304 and a suitable lubricant shall be applied to the threads of all stainless steel bolts before tightening. The lubricant shall not contain graphite.

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All support brackets and other ferrous parts other than stainless steel shall be galvanised in accordance with AS 4680 and AS 1214.

5.1.9 Vibration

When the fuse link is intact and correctly inserted the carrier shall latch securely when closed and shall not be dislodged from the fuse contacts by vibration or wind pressure. The carrier shall not dislodge from the bottom hinge in the opening operation, or in the open position during wind or vibration conditions.

5.1.10 Bird/Fauna/Vermin Proofing

The insulator/mounting bracket combination shall be designed in such a manner so as to minimise the risk of flashover due to birds, and other wildlife, without the use of plastic or rubber coverings.

The fuse carrier design shall minimise the possibility of insect nests being formed in the fuse carrier.

5.1.11 Fuse Link Installation

A flipper spring mechanism shall be incorporated into the design of the fuse carrier to assist the fuse link ejection. The fuse link tail shall be held captive such that it does not make contact with the inner walls of the fuse carrier i.e. the flipper spring mechanism shall centrally locate the range of fuse link sizes from the smallest to the largest diameters, within the fuse carrier. Detailed drawings indicating the position of the flipper spring together with the smallest and largest fuse links when installed within the fuse carrier shall be provided.

Fuse link attachment to the fuse carrier trunnion must prevent binding of the fuse link on the thread. Further, the tail section of the fuse carrier trunnion shall be metal only i.e. this section shall NOT be covered by PVC or other material.

The thumb screw or the attachment used to retain the fuse link shall be held captive in the unscrewed position.

5.1.12 Marking

Both the fuse base and the fuse-carrier shall be clearly and durably marked with the year of the manufacture and in accordance with AS 1033.1.

The fuse-carrier shall be marked with a reflective tape to distinguish between the open and closed position at night time.

5.1.13 Earthing Attachment

The bottom hinge section of the dropout disconnecter unit shall be provided with an earth attachment device satisfying the following requirements:

- a) Be capable of supporting the weight of the portable earthing cables (nominally 35kg) and not allow accidental detachment of the portable earths.
- b) Have a 1 second withstand current rating of 6kA (minimum).
- c) Provide a clearance of 500mm ((nominal) from the live parts to the earth attachment point.
- d) Be orientated in-line with the dropout disconnecter so that the device does not interfere with the operation of the unit or reduce the phase to phase clearances.

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5.2 Fuse Link

5.2.1 Construction

Fuse links must be suitable for use with fuse carriers when fitted with arc shortening rods. This requires that the button head be screwed onto a threaded portion of the fuse link so that the fuse link can be used on equipment with or without arc shortening rods. The largest fuse link specified shall be capable of freely entering into the fuse carrier.

5.2.2 Material

The fuse link and strain elements shall be of suitable material to achieve the required electrical rating and performance of the link.

The flexible tail shall incorporate appropriate measures to minimise deterioration from corona near the base of the carrier. Where an anti-corrosive grease is used, the type of grease is to be advised.

5.2.3 Electrical Characteristics

The electrical characteristics of fuse links supplied against this specification shall conform to the relevant Time-Current characteristics detailed in Appendix A of AS 1033.1 for either speed class K (fast) or speed class T (slow).

Time/Current characteristic curves shall be provided with the offer for each of the fuse links which fully detail pre-arcing current versus pre-arcing time and tolerances. Average pre-arcing time and arcing time shall also be stated thereon.

Each fuse link shall be capable of withstanding a continuous static tensile load of 8.0 kg and a dynamic tensile load (equivalent to the instantaneous load applied to the fuse link during the closing operation of the fuse carrier) of 12.0 kg without mechanical deformation or change in electrical characteristics.

5.2.4 Marking

The manufacturer's identity, fuse link class and current rating shall be permanently marked on each fuse-link.

6. Performance and Testing

6.1 Type Tests

Test reports on the following type tests shall be provided with the offer.

- a) Type tests of the drop out disconnecter fuse units as set out in Section 5 of AS 1033.1. With respect to the breaking tests, the fuse links covered by each homogenous series shall be defined and test reports detailing the results of each of Test Duties 1, 2, 3, 4 and 5 for each series shall be provided.
- b) Insulator Electrical Type Test as set out in Clause 5.4 of AS 1154.
- c) Fuse Link Static and Dynamic Load Test (refer Clause 5.2.3 of this Specification).

6.2 Routine and Batch Testing of EDO Unit

Routine and Batch Test Certificates shall be supplied with each batch delivery in accordance with requirements below:

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a) Routine Testing

Each EDO unit shall be visually inspected to ensure the correct operation of the unit.

b) Batch Testing

The EDO shall be operated 3 times with a fuse element in place to ensure the functional elements are correct. A visual inspection shall be carried out before and after the operation tests to ensure there have been no detrimental effects on the unit due to the operations.

The batch testing shall be carried out on 2% of the batch quantity.

6.3 Batch Test on Insulators (See AS 2947.1)

Batch Test Certificates for the insulators shall be provided with each delivery.

6.4 Fuse Carrier Drop Out Performance

Suppliers shall comment on the release performance of the fuse carrier on operation of the fuse link under all fault conditions including low level faults. Details of any special features adopted to ensure the correct operation of the fuse carriers shall be submitted.

7. Risk Assessment

7.1 Compliance

The Tenderer warrants (without limiting any other warranties or conditions implied by law) that all Goods have been produced, sold and delivered to the Principal in compliance with all applicable laws (including all workplace health and safety and electrical safety legislation, codes of conduct and the Principal's Workplace Health & Safety and Electrical Safety Conditions).

7.2 Formal Risk Assessment

Offered items shall be subjected to a formal risk assessment prior to acceptance. Any documented risk assessment must meet the requirements of AS/NZS 4360:1995 Risk Management as a minimum standard. It is preferred that the risk assessment methodology uses an energy model to identify hazards.

7.3 Hazards

The risk assessment/s must identify hazards to the purchaser's personnel, public and property associated with:

- The installation of the equipment
- The operation and maintenance of the equipment during life expectancy
- Dismantling/disposal of equipment at end of life

8. Quality Assurance

8.1 Purchasers Policy

It is the Purchaser's policy to procure goods, equipment and services from sources that demonstrate the ability to supply quality products.

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9. Samples

9.1 Production Samples

Samples of items may be required during the tender assessment period. Samples would normally only be required from tenderers who have previously not supplied the items to the Purchaser.

9.2 Sample Delivery

When samples are required, production samples shall be delivered freight free, suitably packaged and labelled including reference to the Contract Number.

The Purchaser may at its discretion either purchase the samples at the tendered price or return the samples to the respective tenderer after the contract has been awarded. Samples shall be supplied within 7 days of official request.

10. Packaging and Marking

10.1 General

Individual cartons shall contain one disconnecter fuse unit and accessories. The cartons must be sufficiently sturdy to allow storage by stacking on a pallet.

Each fuse link shall be separately packaged and in a manner such that the flexible tail is not folded or kinked so as to cause corona problems during service.

10.2 Marking

Disconnecter Fuse Unit

The following information shall be legibly and indelibly marked on BOTH sides of the carton:

- a) Manufacturer's name and catalogue number
- b) Rated Voltage and Current
- c) Purchase Order Number
- d) Description of contents and gross mass
- e) Handling or lifting instructions where applicable

Fuse Link

The following information shall be legibly and indelibly marked on the carton and visible on the individual package:

- a) Manufacturer's name and catalogue number
- b) Rated Voltage and Current
- c) Speed Class
- d) Batch Number (Carton Only)
- e) Precautions in handling (Link Only)

10.3 Quarantine

Should any timber packaging be supplied from overseas manufactures, then it is mandatory that all conditions and inspections required by the Australian Quarantine Act be met and that all these costs be included in the offered price.

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11. Service Performance

Suppliers shall state:-

- (a) The period of service achieved by the items offered within Australian service conditions;
- (b) Australian electricity supply authorities who have a service history of the items offered;
- (c) Contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.

12. Reliability

12.1 Service Life

The expected minimum average service life of lighting poles is 35 years. The design and construction shall be as specified in the relevant sections of this specification.

12.2 Evidence in Support of Reliability

Suppliers are invited to submit any proposals which may increase the anticipated service life of poles.

13. Training

Training material in the form of drawings, instructions and/or audio visuals shall be provided for the items accepted under the offer.

This material shall include but is not limited to the following topics:

- Handling
- Storage
- Application (particularly in areas of heavy coastal pollution)
- Installation
- Maintenance
- Environmental performance
- Electrical performance
- Mechanical performance
- Disposal

14. Environmental Considerations

At the time of the Supplier submitting its offer, the Supplier must provide to the Purchaser all information requested regarding the practices, procedures and chemicals used by the Supplier which may affect the environment.

Suppliers are required to comment on the environmental soundness of the design and the materials used in the manufacture of the items offered. In particular, comments should address such issues as recyclability and disposability at the end of service life.

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15. Information to be Provided

15.1 Specific Technical Requirements

At the time of the Supplier submitting its offer, the Supplier shall advise the Purchaser of the Supplier's particulars and its sub-suppliers' particulars as required in **Attachment 2** of this specification.

15.2 Checklist of Supporting Documentation

Attachment 3 details a checklist of supporting technical documentation which is required to be submitted with the offer.

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16. Attachment 1 – Risk Assessment

The Tenderer shall complete the relevant items (as applicable):

REF.	PARTICULARS	YES/NO
1.	Have Risk Assessments been carried out on equipment tendered which meet the requirements of AS 1033.1, drawing number 06-03-01, AS 1856, AS 1154, AS 2837, AS 4680 and AS 1214	
2.	Have copies of such risk assessments been included with the tender	
3.	What is the weight of the components to be moved	
4.	How often do the components have to be moved	
5.	Are space restrictions associated with:	
5.1	Manual/materials handling tasks	
5.2	Installation/maintenance	
5.3	Operating procedures?	
6.	Is there provision for the use of mechanical lifting devices?	
7.	Is the load stable?	
8.	What is the level of coupling? (poor/fair/good) (e.g. are operating handles fitted with grips)	
9.	What are the push/pull/rotational forces required to operate the equipment:	
9.1	When new?	
9.2	During life expectancy?	
10.	Do "above ground" work surfaces have adequate fall protection (e.g. slip resistant surface, hand rails)?	
11.	Do the work positions require undesirable postures such as:	
11.1	Bending	
11.2	Stretching	
11.3	Twisting	
12.	What postures are required to be sustained over what period of time?	
13.	What movements are repetitive and for what duration?	
14.	What are the sound pressure levels (expressed in dB(A))?	
15.	What hazardous substances are used/produced (including after failure) such as:	
15.1	Dust	
15.2	Gas	
15.3	Fume	

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Attachment 1 – Risk Assessment... (Cont'd)

REF.	PARTICULARS	RESPONSE
15.4	Emissions	
15.5	Mist	
15.6	Liquid	
15.7	Solids	
16.	Are the hazardous substances controls compatible with normal operational requirements?	
17.	Is a Safety Data Sheet for all hazardous substances provided?	
18.	What are the expected hazardous changes/by-products associated with the deterioration of a substance?	
19.	Is there any possible contact with energised components?	
20.	What are the levels of radiation emitted?	
21.	When in service, are any normally accessible areas hot/cold enough to be a hazard?	
22.	Are there any biological hazards?	
23.	Are there any mechanical hazards (e.g. nip in points, exposed moving components)?	
24.	Are mechanical hazards appropriately controlled (e.g. guarding, lock-outs)?	
25.	Are load limits established and clearly identified?	
26.	Are gauges clearly visible and easily interpreted?	
27.	Are control movements consistent with established Australian conventions (e.g. switch "UP" position is "OFF")?	
28.	What is the degree of whole body or hand/arm vibration? (Hz)	
29.	Are projectiles generated?	
30.	Are special tools required/identified/supplied?	
29.	What are the hazards associated with equipment failure?	

SIGNATURE OF TENDERER: _____

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17. Attachment 2 – Supplier Details

Supplier's Name and Address	
Name and Address of Sub supplier	
Corrosion protection Treatment Offered	

SIGNATURE OF TENDERER: _____

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18. Attachment 3 – Technical Document Checklist

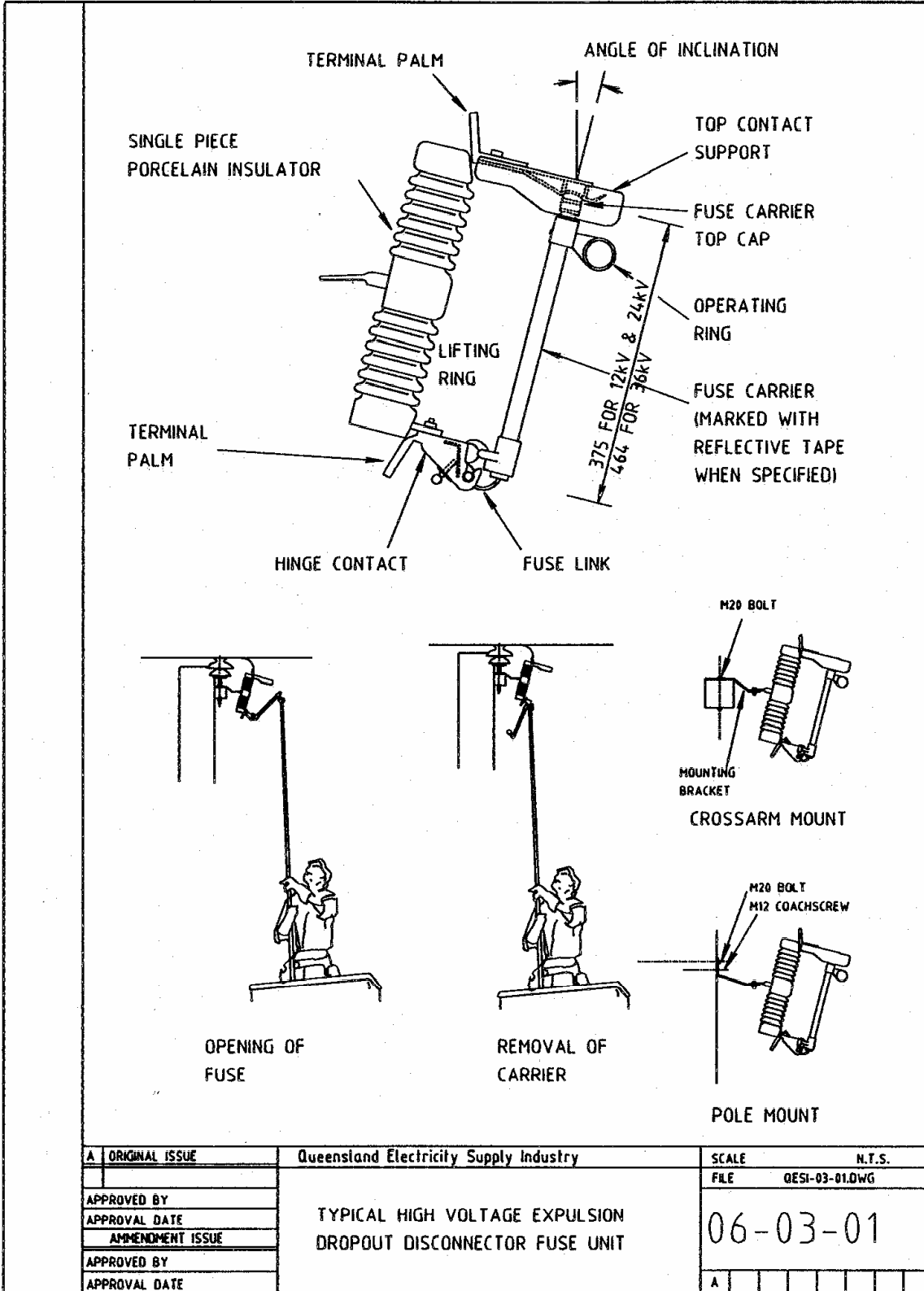
CLAUSE Ref.	PARTICULARS	YES/NO
The Supplier must provide to the Purchaser full and comprehensive details of the following items?		
5.1.2	Distance between contacts in accordance with QESI drawing number 06-03-01 .	
5.1.3	Disconnecter mounting requirements	
5.1.4	Contact surfaces	
5.1.7	Design of terminal connections	
5.1.8	Corrosion protection and galvanisation of parts	
6.1	Type test reports submitted	
6.2	Availability of routine test reports when requested	
7.2	Risk assessment done	
8.1	Quality system manual to be used in performing this Contract and evidence that the Supplier satisfies the Quality Certification requirements of ISO 9001	
9.0	Samples supplied	
11.0	Details of service performance submitted	
12.0	Reliability – any proposals which will satisfy the performance specification or increase the service life	
13.0	Availability of training materials	
14.0	Environmental considerations	

SIGNATURE OF TENDERER: _____

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19. Attachment 4 – Typical Drawing



A	ORIGINAL ISSUE	Queensland Electricity Supply Industry	SCALE	N.T.S.
	APPROVED BY	TYPICAL HIGH VOLTAGE EXPULSION DROPOUT DISCONNECTOR FUSE UNIT	FILE	QESI-03-01.DWG
	APPROVAL DATE		06-03-01	
	AMENDMENT ISSUE			
	APPROVED BY			
	APPROVAL DATE			A