



Ergon Energy Corporation Limited

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches

ETS06-09-01

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



Contents

1. Purpose and Scope	1
2. References	1
2.1 Applicable Standards	1
3. Drawings	1
3.1 Drawings by the Purchaser	1
4. Service Conditions	1
4.1 System Conditions	1
4.2 Environmental Conditions	2
5. Design and Construction	2
5.1 General	2
5.2 Arc Extinguishing and Insulating Medium	2
5.3 Enclosure	3
5.4 Mounting	3
5.5 Low Gas Pressure Indicator/Lock-out	3
5.6 Pressure Relief	3
5.7 Surge Arrester Brackets	4
5.8 Surge Arresters	4
5.9 Markings and Nameplate	4
5.10 Operating Mechanism	4
5.11 Vibration and Impact	5
5.12 High Voltage Bushings and HV Leads	5
5.13 Earthing	5
5.14 Corrosion Protection	6
6. Performance and Testing	6
6.1 Type Tests	6
6.2 Routine Tests	6
7. Risk Assessment	6
7.1 Compliance	6
7.2 Formal Risk Assessment	6

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



7.3 Hazards	6
8. Quality Assurance.....	7
8.1 Purchasers Policy	7
8.2 Documentary Evidence.....	7
8.3 Quality Certification Program	7
9. Samples	7
9.1 Production Samples.....	7
10. Packaging and Marking.....	7
10.1 General	7
10.2 Marking.....	7
10.3 Quarantine	8
11. Service Performance	8
12. Reliability	8
12.1 Service Life	8
12.2 Evidence in Support of Reliability.....	8
13. Training.....	8
14. Environmental Considerations	9
14.1 Environmental Soundness	9
14.2 Safety Data Sheet.....	9
15. Information to be Provided	9
15.1 Specific Technical Requirements.....	9
15.2 Checklist of Supporting Documentation	9
16. Warranty	9
17. Attachment 1 – Design and Performance Criteria for Equipment Required by the Purchaser	10
18. Attachment 2 – Risk Assessment.....	11
19. Attachment 2 – Risk Assessment... (Cont'd)	12
20. Attachment 3 – Supplier Details	13
21. Attachment 4 – Technical Document Checklist	14

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



1. Purpose and Scope

This specification sets out the requirements for the design, manufacture, testing and delivery of pole-mounted three phase gas insulated load break switches for use on totally exposed electricity distribution networks at nominal A.C. voltages of 11 and 22 kV.

2. References

2.1 Applicable Standards

Unless otherwise specified herein, all equipment shall be designed and manufactured in accordance with the relevant current Australian and International Standards including all amendments at the time of calling quotations, in particular:

STANDARD	TITLE
AS 1265	Bushings for Alternating Voltages above 1000 V
AS 1824	Insulation Coordination (Phase-to-earth and Phase-to-phase above 1kV)
AS 2006	Circuit Breakers for Rated Voltages above 1000 V
AS 2067	Switchgear assemblies and ancillary equipment for alternating voltages above 1 kV
AS 2395	Terminals for Switchgear Assemblies for Alternating Voltages above 1 kV
AS 2650	High Voltage A.C. Switchgear and Controlgear Common Requirements
AS/NZS 60265	High-voltage switches
IEC 60376	Specification and Acceptance of New Sulphur Hexafluoride (plus supplements)
AS/NZS ISO 9001	Quality management systems – Requirements

If quotations are offered for any equipment not complying with these standards, detailed descriptions shall be given of the differences between the apparatus offered and the standard requirements.

3. Drawings

3.1 Drawings by the Purchaser

There are no drawings attached to this specification.

4. Service Conditions

4.1 System Conditions

The equipment offered shall be suitable for use on non-effectively earthed and effectively earthed networks and under the system conditions as specified in **Attachment 1**.

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



4.2 Environmental Conditions

The gas switch shall be suitable for use under the environmental conditions as follows:

Altitude	Up to 1000 m
Ambient Temperatures	45° summer day time -10° winter night time
Maximum Daily Variation	35 °C
Solar Radiation Level	1100 watts per square metre (which related to a maximum black body temperature of 80°) with high ultraviolet content
Precipitation	Tropical summer storms with gust wind speeds above 160km/h, and an annual rainfall in excess of 2000 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 of 2.0 - 3.0 g/m ² .
Lightning Activity	Extremely high, Isokeraunic level of 40 thunder days per year
Vibrations due to external causes are negligible	
The switchgear will be mounted on concrete poles or timber poles	

5. Design and Construction

5.1 General

The equipment shall have rated characteristics as detailed in the **Attachment 1**. If there are any conflicts between **Attachment 1** and the rest of this document, **Attachment 1** has precedence.

The equipment will be used as a switch-disconnector for line access purposes.

5.2 Arc Extinguishing and Insulating Medium

5.2.1 The arc extinguishing and insulating medium shall be SF6 gas complying with the requirements of IEC Publication No. 60376 and the latest amendment thereto and shall be identified as such.

5.2.2 Tenders shall state the consequences of loss of SF6 gas on:

- The voltage withstand capability of an open circuit switch;
- The load current switching capability of the switch;
- The fault making capability of the switch.

5.2.3 The successful tenderer shall undertake to recover and recycle the SF6 gas remaining in the switchgear and dispose of toxic byproducts within the SF6 chamber along with the other parts of the equipment in an environmentally responsible manner at the end of their service life.

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



5.3 Enclosure

- 5.3.1 A hermetically sealed stainless steel enclosure shall be provided. The sealed pressure system shall be suitable for a service life of 30 years.
- 5.3.2 The switchgear enclosure shall be provided with a controlled vent to prevent fragmentation of the enclosure in case of over-pressure.

5.4 Mounting

- 5.4.1 The gas switch shall be suitable for **pole-top mounting** or **mid-pole mounting**.
- 5.4.2 Brackets required for the mid pole mounting of the gas switch shall be supplied with the pole top mounting brackets shall be supplied as optional items. The brackets and tank wall are to be of adequate strength to limit distortion when mounted. Full details of the mounting brackets shall be provided with the tender.
- 5.4.3 Adequately rated lifting eyes shall be provided. They shall be designed to allow the completely assembled switch (with surge arresters fitted) to be lifted without recourse to a sling spreader. The maximum angle of tilt when the assembly is lifted from the lifting eyes using a sling shall be 2.5 degrees from the plane of the mounting bracket. The diameter of the eyes shall be a minimum of 30mm.
- 5.4.4 A detailed drawing of the gas switch mounting arrangement with surge arresters fitted should be provided with the tender submission. The minimum phase-to-phase and phase-to-earth clearances (including clearances to the structure) shall be indicated on the drawing.

5.5 Low Gas Pressure Indicator/Lock-out

- 5.5.1 The gas switch shall be fitted with a pressure indicating and lock-out device which shall:
 - a) Indicate when an unsafe low gas pressure condition is reached

AND

- b) Automatically lock out the gas switch to prevent further operations if the SF6 pressure falls to a value where any further loss of pressure results in a reduction of insulation levels, below the system maximum voltage.

Full details of the low pressure indicator and the locking mechanism shall be provided with the tender.

5.6 Pressure Relief

- 5.6.1 Tank design shall incorporate a pressure relief/rupture mechanism, which is of a non fragmenting design, and designed to vent the pressure and any emissions away from the operator.

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



5.7 Surge Arrester Brackets

- 5.7.1 Surge arrester brackets suitable for mounting of surge arresters adjacent to each HV bushing on the load side and the source side of the switch shall be provided. The surge arrester brackets will be used as the connection point for the arrester earth. The brackets shall have an unpainted corrosion resistant metal connecting zone which has the capability to conduct surge arrester current. A 14mm diameter hole shall be drilled in the bracket for the arrester mounting.
- 5.7.2 The brackets shall be constructed so as to accommodate the mounting of polymeric housed surge arresters complying with Ergon technical specification **ETS09-01-01**. A minimum of 100mm clearance shall be provided between the sheds of the phase bushing and the arrester.
- 5.7.3 Clearances between the switchgear metalwork and surge arresters shall be as such that phase to phase and phase to ground clearances are achieved in accordance with AS 1824.

5.8 Surge Arresters

- 5.8.1 The gas switch shall be supplied fitted with surge arresters complying with Ergon Technical Specification ETS09-01-01. Surge arresters are required on both sides of the switch. Table 1 of **ETS09-01-01** details the arresters to be used for each system voltage. Surge arresters covered under ETS09-01-01 Item 2 are required on the 11kV units and Item 5 on the 22kV units.
- 5.8.2 The surge arresters shall be provided with a 16mm² stranded copper /XLPE insulated high voltage lead and a bird cap to suit the rated voltage of the equipment. (**Note:** This requirement overrides the surge arrester specification where only 0.6/1kV insulation is specified for the HV leads)
- 5.8.3 Full details of the surge arresters including the HV leads and the bird caps offered shall be included with the tender

5.9 Markings and Nameplate

- 5.9.1 In the case where the placement of the bushings on switch is such that the identification is not obvious, phase identification markings shall be provided on the switch in accordance with Table 6.1 of AS2067 (i.e. markings U1, V1, W1 on the normal source side and U2, V2, W2 on the normal load side). These markings will be of a quality to remain viewable for the products working lifetime.
- 5.9.2 A name plate shall be provided using a non ferrous material or stainless steel, with the information in accordance with Table 2 of AS 60265.1 engraved, indelibly stamped or etched.
- 5.9.3 The name plate shall be mounted clear of live parts in a position likely to be readable while the gas switch is in service without compromising safety of the operator.
- 5.9.4 In addition the rated current and voltage shall also be marked such that the information is readable from ground level under normal conditions.

5.10 Operating Mechanism

- 5.10.1 The gas switch shall be provided with an operating mechanism to enable it to be operated from ground level using a standard operating stick. The opening/closing operations shall be spring assisted so that the speed of operations is completely independent of the operator's effort. The **operating mechanism shall be lockable either on the "ON" position or the "OFF" position.**

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



- 5.10.2 Clear and unambiguous indication shall be provided to an operator standing on the ground as to the status of the gas switch. This shall be by an indicator mechanically linked to the switching mechanism, which shall be clearly visible to an observer eight metres below the switch. Symbols and colours for the indicators shall be a Red "1" or "ON" for ON and Green "0" or "OFF" for OFF. The colours shall remain vivid for the products working life.
- 5.10.3 A mid-pole actuator and a down-rod assembly to enable the operation of the switch approximately 3.0m below the mounting position using a standard operating stick is required as an optional extra. The mid-pole actuator shall be lockable either on the "ON" position or the "OFF" position. (The cost of the mid-pole actuator and down-rod assembly shall not be included in the tender price, but shown separately)
- 5.10.4 Full details of the operating mechanism and the mid-pole actuator shall be included in the tender submission.

5.11 Vibration and Impact

- 5.11.1 The switch shall be provided with a safety latch to prevent mal-operation due to gravity, vibration, electromagnetic forces or shocks caused by vehicle impact on the pole.

Details of the design features and the testing undertaken to meet these requirements shall be provided with the offer.

5.12 High Voltage Bushings and HV Leads

- 5.12.1 Bushings shall be manufactured and tested in accordance with AS1265. The HV bushings shall be of high quality glazed porcelain, or a composite of cyclo aliphatic epoxy resin or high quality glazed porcelain bushings and silicon bushing boots having a protected creepage length and impulse withstand value of not less than those specified in Attachment "A". If the latter arrangement is provided, 6x2.5m lengths of water-blocked HV CCT or other approved cable (to suit the full load rating of the switch and the rated voltage) shall be supplied with each switch. A dimensioned drawing of the bushings (and boots if applicable) shall be supplied with the tender. (The cost of the HV cables and accessories shall be included in the tender price)
- 5.12.2 If the gas switch offered is provided with air insulated bushings they shall comply with the minimum phase-to-phase and phase-to-earth clearance requirements of clause 9.1 of AS2067 and the bushings shall be provided with terminal palms / clamps suitable for attaching the source/load side jumpers (95-120 mm² insulated copper cable), and the surge arrester leads (16 mm² insulated copper cable). Suitable insulating bushing covers to fit over the live terminals/lugs shall also be supplied for each bushing insulator.

5.13 Earthing

- 5.13.1 Provision shall be made to ensure the electrical continuity of all exposed metal. The switch enclosure and the mid pole mounting operating handle shall be fitted with an external M12 earth stud, complete with a nut, lock nut and serrated washer.

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



5.14 Corrosion Protection

- 5.14.1 The stainless steel enclosure of the gas switch shall be painted or powder coated to ensure a maintenance free service life of 30 years under the specified environmental conditions.
- 5.14.2 All current carrying parts shall be made of high conductivity corrosion resistant metal. All external copper and associated alloy components shall be electrolytically bright tin plated in accordance with AS 4169.
- 5.14.3 The support brackets and other ferrous parts of the units other than stainless steel shall be galvanized in accordance with AS 4680.

6. Performance and Testing

6.1 Type Tests

Copies of certificates of all type tests shall be submitted with the tender. These tests shall be in accordance with AS 2650 and AS/NZS 60265.1.

6.2 Routine Tests

Routine tests shall be carried out in accordance with AS 2650 and AS/NZS 60265.1 on all equipment supplied.

Routine Test Certificates are not required to be despatched with the equipment but shall be made available to the Purchaser when requested, within 1 working day. A certificate of compliance shall be provided with each delivery.

Electronic records of all test certificates shall be supplied to the Purchaser on a compact disc at the end of the contract.

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

Tendered items shall be subjected to a formal risk assessment prior to acceptance. **It is preferred that the supplier performs the risk assessment themselves and provide the resultant documentation with their tender** Where risk assessment documentation is not provided with the tender, or does not meet the required standard, such tenders shall have their price loaded with the estimated costs associated with the Purchaser conducting the assessments. Any documented risk assessment which accompanies the tender 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 corporation personnel, the public and property associated with:

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



- The installation of the equipment
- The operation and maintenance of the equipment during life expectancy
- Dismantling/disposal of equipment at end of life
- The "Risk Assessment" schedule included with this specification is to be completed by the Supplier. Note the schedule contains a generic set of questions designed to cover all the purchaser's plant and materials and the supplier is only required to complete those items applicable to the product tendered.

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.

8.2 Documentary Evidence

Documentary evidence shall be provided concerning the level of quality system certification associated with the supplier and/or manufacturer. This documentation shall include the Capability Statement associated with the Quality System Certification.

8.3 Quality Certification Program

Tenderers shall provide details of their program to upgrade their Quality Certification to meet the requirements of ISO 9001.

9. Samples

9.1 Production Samples

Tenderers shall state if they are prepared to make a sample unit as tendered against this specification available to the purchaser for testing and evaluation. All costs for delivery and return of this sample unit shall be the responsibility of the tenderer.

10. Packaging and Marking

10.1 General

10.1.1 Each unit shall be individually packed. The equipment must be securely fastened to prevent movement during transport and handling.

10.1.2 A copy of installation instructions for the equipment shall be provided in a weather proof bag inside each package.

10.2 Marking

10.2.1 The following information shall be legibly and indelibly marked on the crate:

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

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



10.3 Quarantine

Should any timber packaging be supplied from overseas manufacturers, 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.

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

Suppliers are required to comment on the reliability of the equipment and the performance of the materials offered for a service life of 30 years under the specified system and environmental conditions.

12.2 Evidence in Support of Reliability

Such comments shall include evidence in support of the reliability and performance claimed including information on Failure Mode and Effect Analysis.

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
- Installation
- Maintenance
- Environmental Performance
- Electrical Performance
- Mechanical Performance
- Disposal

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



14. Environmental Considerations

14.1 Environmental Soundness

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 disposal at end of service life and also disposal of packaging material.

14.2 Safety Data Sheet

Tenderers are required to provide with their tender documentation a Safety Data Sheet for every chemical substance used for electrical and thermal insulation, impregnation, and paint finish or for any other purpose.

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 3** of this specification.

15.2 Checklist of Supporting Documentation

Attachment 4 details a checklist of supporting technical documentation which is required to be submitted with the offer.

16. Warranty

The equipment shall be guaranteed against all defects, fair wear and tear accepted, for a period of not less than 36 months from date of delivery.

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



17. Attachment 1 – Design and Performance Criteria for Equipment Required by the Purchaser

REF.	PARTICULARS	UNITS	ITEM 1	ITEM 2
1.	Number of phases		3	3
2.1	Nominal rated voltage	kV	11	22
2.2	Rated maximum voltage	kV	12	24
3.	Rated frequency	Hz	50	50
4.1	Rated normal current (Minimum)	A	630	630
4.2	Closed loop breaking current	A	630	630
4.3	Cable charging current	A	10	10
4.4	No load transformer breaking current	A	25	25
	Mainly active load (approx 0.7 p.f.) – Breaking Current	A	630	630
5.1	Prepared rated making current	kA rms	16	16
5.2	Rated short time withstand current for 1 sec.	kA	16	16
5.3	Rated peak withstand current	kA peak	40	40
6.	Rated impulse withstand voltage			
	a) to earth and between phases	kVp	95	125
	b) across isolating distance		110	145
7.	Rated 1 minute power frequency withstand (wet)	kV		
	a) to earth and between phases		28	50
	b) across isolating distance		32	60
8.	HV bushings creepage length (minimum)	mm	400	600
9.	Preferred minimum taut string metal to metal clearance in air			
9.1	Phase to phase	mm	190	330
9.2	Phase to ground	mm	160	280

SIGNATURE OF TENDERER: _____

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



18. Attachment 2 – 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 1824, AS 2067, AS 2650, AS/NZS 60265 and IEC 60376	
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	

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



19. Attachment 2 – 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: _____

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



20. Attachment 3 – Supplier Details

Supplier's Name and Address	
Name and Address of Sub supplier	
Source(s) of SF6 gas:	
Hot dip galvanization plant	
Corrosion protection Offered	

SIGNATURE OF TENDERER: _____

Technical Specification for Pole Mounted Three (3) Phase Gas Insulated Load Break Switches



21. Attachment 4 – Technical Document Checklist

CLAUSE Ref.	PARTICULARS	YES/NO
The Supplier must provide to the Purchaser full and comprehensive details of the following items?		
5.2.2	SF6 gas	
5.4.4	Mounting detail drawings submitted	
5.8.3	Details of Surge Arrestor submitted	
5.10.4	Details of Operating mechanism submitted	
5.11.1	Details design features to withstand vibration and impacts	
5.12.1	Dimensioned drawings of the bushings submitted	
6.1	Type test certificates submitted	
6.2	Availability of routine test certificates when requested	
7.0	Completed risk assessment- Attachment 2	
8.2 & 8.3	Quality system manual to be used in performing this Contract and Evidence that the Supplier satisfies the Quality Certification requirements of ISO 9001	
9.1	Samples submitted	
11.0	Service performance history	
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	

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____