WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

ENGINEERING SPECIFICATION
EE SPEC: 180

36kV Outdoor Dead Tank Circuit Breakers

Author: **Anthony M Smith**

Implementation Date: **January 2019**

Approved by

Policy Manager

Date: 24 January 2019

IMPLEMENTATION PLAN

Introduction

This document specifies the requirements for 36kV Outdoor Dead Tank Circuit Breakers.

Main Changes

This is a new EE SPEC and replaces the parts of EE SPEC: 10/2 relating to outdoor 36kV dead tank circuit breakers.

Impact of Changes

This document modifies the requirements for 36kV outdoor dead tank circuit breakers and is relevant to all staff, contractors and Independent Connection Providers (ICPs) involved with the design, specification and installation of 33kV substations.

Implementation Actions

Purchasing to utilise this revised specification for establishing a new purchasing contract.

Managers, including Managers of Independent Connection Providers (ICPs) shall ensure that all staff and contractors involved in the tendering/ purchase and the design, installation modification and maintenance of WPD 33kV substations are aware of, and follow, the requirements of this specification.

Implementation Timetable

EE SPEC: 180 is implemented on issue for WPD's 2019 Tender and Framework Contract negotiations.
Equipment ordered from the current Framework Contract shall continue to meet EESPEC 10/2.

Equipment offered by third parties for adoption by WPD shall meet the requirements of this specification where:

- Purchased or ordered after 30 June 2019; or
- Purchased or ordered before 1 March 2019 and commissioned on, or after, 1 September 2019.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
January 2019	This is a new document based on parts of EE SPEC: 10/2 and overrides the elements of 10/2 that this document references. • The document only relates to 36kV outdoor circuit breakers. • Requirements for other 12 or 36kV outdoor equipment are not included.	Anthony M Smith

CONTENTS

1.0	INTRODUCTION	5
2.0	MODIFICATIONS AND ADDITIONS TO ENA 41-36	5
2.1	References	5
2.2	System Earthing	7
2.3	Summary of Range (ENA TS 41-36 Schedule 2.1)	7
2.4	Ratings	7
2.5	Rated Supply Voltage of Closing and Opening Devices and of Auxiliary and Control Circuits	7
2.6	Auxiliary Switches (ENATS 41-36 cl 2.5.4)	7
2.7	Accessibility of Auxiliary and Control Equipment (BSEN 62271-1 cl 5.4.2.2)	7
2.8	Labelling and Marking	7
2.9	Phase Identification	7
2.10	Clearances for Overhead Conductor Connected Equipment	8
3.0	REQUIREMENTS	8
3.1	General	8
3.2	Guarantee	8
3.3	Auxiliary Supplies	8
3.4	Current Transformers	8
3.5	Class PX CT's	9
3.6	Metering Current Transformers	10
3.7	Earthing	10
3.8	Small wiring and Terminals	10
3.9	Fuses and Links	11
3.10	Ancillary Equipment	12
3.11	Multicore / Multipair Terminal Boxes and Glands	12
3.12	Interlocking	12
3.13	Anti-Condensation Heaters	12
3.14	Control Cabinet Lighting and Power	12
3.15	Terminal Palms	12
3.16	Drawings	12
	APPENDIX A - AUXILIARY SWITCHES	14
	APPENDIX B - SCHEDULE – SUMMARY OF TECHNICAL PARAMETERS	15
	APPENDIX C - SCHEDULE B TYPES OF DEAD TANK CIRCUIT BREAKERS	17
	APPENDIX D - SUPERSEDED DOCUMENTATION	21
	APPENDIX E - ASSOCIATED DOCUMENTATION	21
	APPENDIX F - KEYWORDS	22

1.0 INTRODUCTION

1.1 This Technical Specification sets out Western Power Distributions (WPD's) requirements for 36kV outdoor dead tank circuit breakers for use on its 33kV systems.

1.2 It is based on and must be read in conjunction with the current version of ENA TS 41-36 and other referenced standards and specifications listed either within ENATS 41-36 or this WPD specification. WPD options, changes or additions to the ENATS requirements are stated in this WPD document. Unless otherwise stated the requirements of the relevant part(s) of ENATS 41-36 shall apply.

1.3 Any selection of options or changes to this specification by WPD shall be made in writing.

1.4 Where this WPD Technical Specification is being used for Tender purposes then unless otherwise specified in writing at time of Tender, all equipment offered against this Technical Specification shall be compliant with this Technical Specification.

1.5 Preference will be given to non Sulphur hexafluoride (SF6) devices but this does not preclude SF6 units being offered.

2.0 MODIFICATIONS AND ADDITIONS TO ENA 41-36

2.1 References

2.1.1 References are in accordance with ENA TS 41-36 with the following additions in Table 1, below.

2.1.2 Users of all standards and technical specifications shall ensure they are applying the most recent editions together with any amendments.

2.1.3 Whilst the IEC base document(s) are listed for information, the prime document that shall take priority is the British Standard enacting the European Standard (EN) or European Harmonisation Document (HD).

BS No.	Title	IEC / ISO base
BSHD 60269	Cartridge fuses for voltages up to and including 1000V ac and 1500V dc	IEC 60269
BSEN 60898	Circuit breakers for overcurrent protection for household and similar installations	IEC 60898
BSEN 61000-6-2	Electromagnetic compatibility (EMC) Generic standards – Immunity for industrial environments	IEC 61000-6-2
BSEN 61000-6-4	Electromagnetic compatibility (EMC) Generic standards – Emission Standard for industrial environments	IEC 61000-6-4
BSEN 61000-6-5	Electromagnetic compatibility (EMC) Generic standards – Emission Standard for Power Station and Substation Environments	IEC 61000-6-5
BS IEC 61508	Functional safety of electrical / electronic / programmable electronic safety-related systems	IEC 61508

Table 1: Additional References

2.2 System Earthing

2.2.1 (BSEN 62271-1 – clause 9.1) The equipment shall be suitable for use on three phase systems in which the neutral is earthed either solidly or through a resistance or reactance of low value or through a reactor or arc suppression coil. It should be noted that parts of WPD's network employ arc suppression coil earthing and Tenderers are advised to consider carefully the implications of this, with particular emphasis on the phase voltages during earth fault conditions.

2.3 Summary of Range (ENA TS 41-36 Schedule 2.1)

2.3.1 Schedule 2.1 of ENATS 41-36 includes items for which the required option is already stated within the text of 41-36, for example, rated frequency. Schedule 2.1 of 41-36 is replaced in this WPD Technical Specification by Schedule B. For the avoidance of doubt, where the selected option is already stated in the text of 41-36 it is not repeated within the WPD Schedules.

2.4 Ratings

2.4.1 Rated short-time withstand current (ENATS 41-36 cl 1.4.5). In the interests of standardisation default switchgear ratings are shown in WPD Schedule B and these options shall normally be selected. However, it is the WPD User's responsibility to check with WPD Primary System Design Team that these default ratings are sufficient for the envisaged future specific site duty. Standard EN options include 16, 20, 25 and 31.5kA.

2.4.2 Rated short-circuit breaking current (ENATS 41-36 cl 2.4.101). The rated short-circuit breaking current shall be not less that the rated short-time withstand current as specified in 3.4.1 above.

2.4.3 The rated value of short-circuit breaking current shall be assigned at dc time constants of both 45ms and 120ms.

2.5 Rated Supply Voltage of Closing and Opening Devices and of Auxiliary and Control Circuits

2.5.1 (Ua) ENATS 41-36 cl 1.4.8:- In addition, equipment shall operate normally when the supply voltage is within the tolerances specified in ENA TS 50-18 and BSEN 62271-1.

2.6 Auxiliary Switches (ENATS 41-36 cl 2.5.4)

2.6.1 In addition to auxiliary switches required for normal circuit breaker function, further auxiliary switches, in accordance with Appendix A, shall be provided for WPD use and all these, including spares, shall be wired out to an accessible terminal blocks within the fixed portion.

2.7 Accessibility of Auxiliary and Control Equipment (BSEN 62271-1 cl 5.4.2.2)

2.7.1 In addition, to provide resilience against flooding it is preferred that all HV and LV live parts, mechanism and control equipment, including cable terminations are located as high as practicable above ground level.

2.8 Labelling and Marking

2.8.1 Labelling and marking shall comply with ENATS 41.36 and Table 1.8.

2.9 Phase Identification

2.9.1 Phases shall be identified in accordance with ENATS 41.36 1.5.10.101.2; that is U1 U2, V1 V2, W1 W2.

2.10 **Clearances for Overhead Conductor Connected Equipment**

2.10.1 Minimum clearance from ground level of a fixed access platform to exposed live conductors shall be basic electrical clearance (as defined in BSEN 61936) plus 300mm plus personal reach. Clearance to support insulation shall be 300mm plus personal reach.

2.10.2 For the purposes of this specification, personal reach is 2.25m.

3.0 REQUIREMENTS

3.1 **General**

3.1.1 Suppliers and Manufacturers shall satisfy the requirements of BSEN ISO 9000; BSEN ISO 9001; BSEN ISO 14000 and BSEN 14001 for all product's supplied.

3.1.2 All equipment and systems shall satisfy requirements of the EMC directive. EMC emissions and immunity requirements shall, as a minimum, satisfy the requirements of the generic emission and immunity standards for industrial environments BSEN 61000-6-2 and BSEN 61000-6-4 and also all relevant EMC product standards.

3.1.3 There is no requirement for the supplier to offer protection panels or circuit VT's in conjunction with the circuit breakers.

3.2 **Guarantee**

3.2.1 The supplier of the plant / equipment covered by this specification shall provide a guarantee for that equipment. The guarantee period that the supplier warrants will be a minimum of five (5) years from the date of completion of commissioning of the relevant plant / equipment. Note, this requirement applies to plant / equipment purchased by Independent Connection Providers (to be adopted by WPD) as well as equipment purchased directly by WPD.

3.3 Auxiliary Supplies

3.3.1 Circuit breaker spring winding motor and protection/alarm relay auxiliary supplies for new equipment are normally rated at 110Vdc.

3.3.2 Equipment shall operate correctly over the DC auxiliary voltage ranges specified in ENATS 48-5, ENATS 50-18 and ENATS 41-36 issue 2, as applicable.

3.3.3 Tele-control auxiliary supplies are either 48Vdc or 24Vdc depending on where the equipment is to be installed. In general a positive common rail is used with negative switching, however, for switchgear used in South Wales this polarity is reversed. Details will be confirmed at time of order.

3.4 **Current Transformers**

3.4.1 Current transformers (CT's) shall be in accordance with EA TS 41-36 and BSEN 61869-2 with the following additions. Characteristics and ratios are specified in the accompanying Schedules in Appendix B and Appendix C and as set out below.

3.4.2 CT specification, layout and connections shall be as per the detail within EE SPEC 87 and its associated drawings. Appendix B states requirements for each type and ratios. Characteristics are specified below, unless they are required to match those at an existing substation for an existing unit protection scheme.

3.4.3 All connections from secondary windings shall be brought out and taken, by means of separate insulated leads, to an accessible terminal board to permit testing of individual CT's. Any joints or connections in the secondary leads shall be carried out at an accessible terminal board.

3.4.4 Irrespective of the ratio, the rated continuous thermal current of the CT's (I_{cth}) of protection class CT's shall match the full continuous current rating of the circuit breaker. For measurement class CT's the rated continuous thermal current (I_{cth}) shall be 120% of the rated primary current (I_{pr}) of the CT unless a higher rating is specified.

3.4.5 CT's and secondary wiring within live compartments shall be fully and effectively shrouded by a substantial, earthed, metal screen. Care shall be taken to ensure that the cable sheath and its earth connections do not short out the current transformers.

3.4.6 Each current transformer forming part of a group of CT's to provide a given function shall have a knee point voltage within 20% of the other CT's within the same group. For example, a group of 3 CT's used as part of an overcurrent and earth fault protection scheme shall have knee point voltages within 20% of each other.

3.4.7 Where dual ratio CT's are specified the required class, accuracy and VA rating applies to both ratios, unless otherwise stated.

3.4.8 Type test certificates shall be provided by the purchaser with the equipment drawings.

3.4.9 Current transformer secondary windings shall have a bare wire diameter (copper) of not less than 0.8mm.

3.4.10 By agreement between the manufacturer and the WPD Policy Team, low energy output devices may be prescribed in lieu of CT's.

3.5 **Class PX CT's**

3.5.1 Class PX current transformers shall comply with BSEN 61869-2 and shall provide accurate transformation up to the maximum fault current rating of the associated main plant and ensure this performance under steady state conditions without undue saturation.

3.5.2 The minimum knee point requirements for CT's with a 1A secondary rating are specified below, where:

V_K = Knee point voltage

R_{CT} = DC secondary resistance of the CT

N = Ratio of the CT (i.e. primary current / rated secondary current)

3.5.2.1 CT's for Current Differential, Pilot Wire or Distance Protection:

- For 25kA circuit breakers: $V_K \geq 9.1 \times 10^4 (R_{CT} + 0.5)/N$
- For 31.5kA circuit breakers: $V_K \geq 9.5 \times 10^4 (R_{CT} + 0.5)/N$

3.5.2.2 CT's for Transformer Bias Differential and REF Protection

- For 25kA circuit breakers: $V_K \geq 5.0 \times 10^4 (R_{CT} + 1.5)/N$
- For 31.5kA circuit breakers: $V_K \geq 6.3 \times 10^4 (R_{CT} + 1.5)/N$

3.5.2.3 CT's for High Impedance Busbar Protection

- For 25kA circuit breakers: $V_K \geq 5.0 \times 10^4 (R_{CT} + 1)/N$
- For 31.5kA circuit breakers: $V_K \geq 6.3 \times 10^4 (R_{CT} + 1)/N$

For CT's with an alternative secondary rating, the minimum knee point requirement shall be calculated in accordance with the protection relay manufacturer's recommendations.

3.5.3 Where multi-ratio CT's are specified the knee point requirements shall be satisfied on each CT ratio.

3.5.4 In addition to the knee point requirements, the magnetising current for each CT shall be less than 50mA at the CT's knee point voltage. This requirement must be satisfied for each CT ratio.

3.6 Metering Current Transformers

3.6.1 Metering current transformers shall have independent cores and secondary windings from those provided for protection purposes. Provision shall be made to prevent un-authorised access to metering CT's and CT circuits.

3.6.2 Where metering CT's are specified, the CT ratios shall be selected by WPD from the options listed in Table 2.

3.6.3 **Metering CT's shall be tested to confirm compliance with BSEN 61869-2 on each ratio. In addition to these requirements, CT errors shall be supplied for each ratio at 5%, 20%, 100% and 120% test load points at the burden specified in the following table. These additional CT errors shall either be separately tested or calculated from other error test results.**

CT Ratio Options	VA Rating	Class	Additional Error Data
200/100/1 300/150/1 400/200/1 600/300/1 800/400/1 1200/600/1 1600/800/1 2000/1000/1	15VA	0.2S	Additional error data to be provided for 5%, 20%, 100% and 120% load points with a burden of 2.5VA with a 0.9 lagging power factor

Table 2: Metering CT Requirements

3.6.4 Electronic copies of the of test certificates in PDF format, including any error tests used as the basis of the calculations described above, shall be provided in advance of the circuit breakers delivery for each metering current transformer. These shall be sent to the WPD project engineer by electronic mail.

3.7 Earthing

3.7.1 Earthing requirements shall be in accordance with ENA TS 41-24 and ENA TS 50-18.

3.8 Small wiring and Terminals

3.8.1 Small wiring and terminals shall comply with ENA TS 41-36 with the following additions:

- The application of small wiring, ancillary electrical equipment and protection shall in general follow the principles in Engineering Recommendation S15.
- Secondary wiring shall comprise of:

- AC wiring: 2.5mm^2 (minimum) copper stranded cable with PVC insulation to BS6231 Type BR, or equivalent tri-rated cable complying with BS6231.
- DC wiring: 2.5mm^2 (minimum) copper stranded cable with PVC insulation to BS6231 Type BR, or equivalent tri-rated cable complying with BS6231.
- The insulation of AC and DC wiring shall be coloured white in all circuits, except earthing which shall be coloured green/yellow. A.C. and D.C. wiring shall be terminated with crimped connections in accordance with ENA TS 50-18.
- Terminal blocks used for protection, alarm and control circuits shall be screw clamp with spring type, in accordance with EATS 50-18 Type B.
- Terminal blocks for 24VDC and 48VDC tele-control wiring, and for transducer output wiring shall be screw clamp type, to EATS 50-18 Type C with a hinged link for isolation purposes.
- Sufficient space shall be allowed so that connections can be tightened or un-tightened and wires removed and re-inserted. Spare cores shall be terminated at the terminal blocks furthest from the cable gland.
- All circuit breakers are to be equipped with pairs of plug test sockets of a type to be agreed at the time of tender, fitted to the trip and close circuits and connected as shown on WPD drawings. These terminals shall be mounted in accessible position within the circuit breaker control panel compartment and shall be labelled “remote trip socket” and “remote close socket”.

3.9 **Fuses and Links**

3.9.1 Secondary fuselinks, links and fuse carriers shall be in accordance with EATS 50-18 and BS HD 60269-2 reference A.

3.9.2 Fuses and fuse holders up to 20A rating shall be in accordance with BS HD 60269-2 reference A1.

3.9.3 The fuse holders and bases shall be coloured as follows:

- 2A, 4A, 6A, 10A fuselink ratings: black (colour 642 of BS 381C)
- 16A fuselink rating: green (colour 216 of BS 381C)
- Solid links: white

3.9.4 GE Power Controls or Mersen Red Spot fuse holders shall be provided unless otherwise agreed at the time of tender.

3.9.5 All fuses and links shall be mounted vertically, grouped logically and consistently on the front of the panel and shall be clearly labelled. The label shall show the function of the fuses/links and include the fuse/link number as specified on the schematic drawings. Where a double row of fuses and links is required, the labelling of the bottom row may need to be mounted on a stand-off bracket to ensure they are clearly visible.

3.9.6 Fuse terminals shall be suitably shrouded to minimise electric shock hazards. The incoming (supply) side of each circuit shall be connected on the bottom terminal of the fuse/link.

3.10 **Ancillary Equipment**

3.10.1 Requirements for ancillary equipment including relays, contactors, control / selector switches, transducers, push buttons and lamps are specified in EE SPEC: 136.

3.11 **Multicore / Multipair Terminal Boxes and Glands**

3.11.1 Where a multicore / multipair terminal box is fitted it shall be placed so that work can be carried out on this box with the equipment after the equipment is installed and cables jointed. With the multicores / multipairs made off, they shall not interfere with the making or breaking down of the main cable box.

3.11.2 Adequate terminal blocks and cable gland space shall be provided to terminate all the cores of all multicore / multipair cables. Standard types are listed inn EE SPEC: 78/1, EE SPEC 79/2 and EE SPEC 80/1. Insulated cable glands, where required shall be insulated to 4kV ac. for 1 minute.

3.12 **Interlocking**

3.12.1 Permissive interlocking shall be provided on incoming transformer circuits as detailed in ENATS 41-36 clause 2.5.11.101.a

3.12.2 Castell Type Q or Fortress Type H are required. Numbering/legend will be provided at the time of order.

3.13 **Anti-Condensation Heaters**

3.13.1 A heater shall be provided at an appropriate location in each panel. The heaters shall be 230Vac. One control thermostat per switchboard shall be provided. A double pole switch shall control the supply to the heater/s, which shall be located at a readily accessible position on the switchboard and clearly labelled/identified.

3.14 **Control Cabinet Lighting and Power**

3.14.1 A 230V ac lighting unit within the control cabinet should be fitted to ensure the main indication parts are visible when lit. The unit should operate when the door opens/closes.

3.14.2 A 230V ac UK mains socket with an RCD is required.

3.15 **Terminal Palms**

3.15.1 Terminal palms size 1 to 3.1.2 and Figure 1 of ENATS 41.16 are required.

3.15.2 Where these cannot be provided the Tenderer shall specify what is offered.

3.16 **Drawings**

3.16.1 The manufacturer shall provide the following drawings for approval within one month of the commencement date of the contract or by mutually agreed date at the placement of the order:

- General Arrangement of each circuit breaker / cubicle
- Schematic Diagram for each circuit breaker / cubicle
- Wiring diagram for each circuit breaker / cubicle

3.16.2 Once approval has been obtained, an additional copy of the drawings shall be provided.

3.16.3 Following on-site installation and commissioning of the unit(s), the manufacturer/installer shall ensure that all modifications made to the unit during their works are, as a minimum, annotated on a marked up copy of the drawings to be left on site and that these drawings are then fully drawn up and sent to the project engineer prior to the unit being energised or as agreed with site project engineer.

3.16.4 A copy of the commissioning report shall be provided following site commissioning.

3.16.5 All drawings shall be provided electronically in .dwg CAD format for archive usage with a .pdf copy available for immediate use on site.

AUXILIARY SWITCHES

Auxiliary switches shall comply with ENA TS 50-18.

Sufficient auxiliary switches shall be provided for the associated protection and control functions. Specific requirements are defined in WPD's standard schematic drawings.

In addition, each circuit breaker shall be provided with the following spare auxiliary switches, each wired back to accessible terminals blocks:

- 6 off normally open circuit breaker auxiliary switches
- 6 off normally closed circuit breaker auxiliary switches
- 2 off normally open springs charged auxiliary switches
- 2 off normally closed springs charged auxiliary switches

APPENDIX B

SCHEDULE – SUMMARY OF TECHNICAL PARAMETERS

Information	WPD Requirement	Sub-clause of ENATS 41.36/ IEC 62271-1 clause
Particulars of System		
Voltage(kV)	33	
Frequency (Hz)	50	
Number of phases	3	
Neutral earthing	Impedance / ASC / Solid	
Circuit Breaker Characteristics		
Number of poles	3	
Class	Outdoor -25°C +40°C Pollution level: Class III IEC 60815	1.2 /
Rated Voltage (kV)	36	1.4.1 /
Rated power frequency withstand voltage (kV)	70	
Rated Insulation Level(kV)	170	1.4.2 /
Rated frequency (Hz)	50	1.4.3 /
Rated Normal current (A)	1250A and 2000A	1.4.4 /
Rated short-time withstand current (kA)	25	1.4.5 /
Rated duration of short circuit (sec)	3	1.4.7 /
Rated supply voltage of opening and closing devices, and auxiliary and control circuits 1. Closing & tripping 2. Indication 3. Control	 110V dc 110V dc 24V / 48V dc	1.4.8 /
Rated short-circuit breaking current	Equal to rated short-time withstand current. 45ms time constant	2.4.101 /
Rated short-circuit making current	2.5 times rated short-circuit breaking current	2.4.103 /
Rated operating sequence	O-0.3s-CO-15s-CO	2.4.104 /
Rated out of phase making and breaking currents	a) Rated out-of-phase breaking current – 25% of rated short circuit breaking current b)Rated out –of-phase making current – crest value of a)	2.4.106 /
Rated capacitive switching currents	Class C2	2.4.107 /
Rated cable-charging breaking current (A)	50	2.4.107 /
Rated line charging breaking current (A)	10	2.4.107 /
Classification of mechanical operations	Class M2 – 10000 ops	2.4.110 /
Classification in regard of electrical endurance – tested for auto-reclose duty	Class E2	2.4.111 /

Supplier To Declare		
Mechanism type (give details)		2.5.5 to 2.5.7 /
Closing mechanism power consumption (mA) and duration of consumption (s)		
Operating time – Close operation (ms)		
Operating Time – Open operation (ms)		
Noise (during operation and/or activity) (dB)		
Arc interruption medium		
Insulation medium		
Type of gas		
Mass of Gas (kg)		
Volume of Compartment (m^3)		
Mass of gas (kg) that would be lost if gas leaked until compartment pressure equals the standard atmospheric conditions (+20°C and 101,3 kPa), without air entering the chamber.		
Method(s) of monitoring pressure and achieving temperature compensation		
Gas monitoring indicator		1.5.9 /
Rated filling pressure pre (or density pre) for insulation and/or switching [kPA and BAR(G)]		/ 3.6.5.2
Alarm pressure pae (or density pae) for insulation and/or switching [kPA and BAR(G)]		/ 3.6.5.3
Minimum functional pressure pme (or density pme) for insulation and/or switching [kPA and BAR(G)]		/ 3.6.5.5
Alarm pressure for operation pam (or density pam) [kPA AND Bar(g)]		/ 3.6.5.4
Minimum functional pressure for operation pmm (or density pmm) [kPA AND Bar(g)]		/ 3.6.5.6
Mass of complete unit (kg)		
Maximum dynamic floor/support loading(s) (kN)		
Dimensions (m)		
AIS bushing details		
Colour of paint		

APPENDIX C

SCHEDULE B TYPES OF DEAD TANK CIRCUIT BREAKERS

WPD 36kV Outdoor Dead Tank Circuit Breaker Type Reference	**Details and uses against EE SPEC 87**	**Standard drawings**	800/1 30VA 5P20	800/1 Class PX (4.5.2.1)	800/1 15VA CL. 0.5S	800/1 15VA 5P20	1200/1 Class PX (4.5.2.3)	1200/1 30VA; 5P20	2000/1 30VA; 5P20	L2 only: 2000/1 15VA Class 0.5S	L1/L3 only: 2000/1 15VA Class 0.5S	2000/1 30VA; 5P10	2000/1 Class PX (4.5.2.2)	Metering CT's (4.6.3)
36OD01-1250A	36C1A T/F feeder circuit with A/R & without intertripping	SPC36C1/OD ac SPC36C1/OD dc SPC36C1-GA	1 Set of 3				1 Set of 3							
	36C2A T/F feeder circuit with intertripping	SPC36C2/OD ac SPC36C2/OD SPC36C2-GA	1 Set of 3				1 Set of 3							
	36C3A T/F feeder circuit with local tripping	SPC36C3/OD ac SPC36C3/OD dc SPC36C3-GA	1 Set of 3				1 Set of 3							
	36C7A T/F feeder circuit without A/R & without intertripping	SPC36C7/OD ac SPC36C7/OD dc SPC36C7-GA	1 Set of 3				1 Set of 3							
	TX2 / TX4 Transformer Protection	SPC36TX2/OD ac SPC36TX2/OD dc SPC36TX2-GA SPC36TX4/OD ac SPC36TX4/OD dc SPC36TX4-GA	1 Set of 3				1 Set of 3							

Continued…

WPD 36kV Outdoor Dead Tank Circuit Breaker Type Reference	Details and uses against EE SPEC 87	Standard drawings	800/1 30VA 5P20	800/1 Class PX (4.5.2.1)	800/1 15VA CL. 0.5S	800/1 15VA 5P20	1200/1 Class PX (4.5.2.3)	1200/1 30VA; 5P20	2000/1 30VA; 5P20	L2 only: 2000/1 15VA Class 0.5S	L1/L3 only: 2000/1 15VA Class 0.5S	2000/1 30VA; 5P10	2000/1 Class PX (4.5.2.2)	Metering CT's (4.6.3)
36OD02a-1250A	36C4A Circuit with distance protection	SPC36C4/OD ac SPC36C4/OD dc SPC36C4-GA	1 Set of 3	1 Set of 3			1 Set of 3							
	36C5A Circuit with pilot wire protection	SPC36C5A/OD ac SPC36C5A/OD dc SPC36C5A-GA	1 Set of 3	1 Set of 3			1 Set of 3							
	36C6A Circuit with current differential protection	SPC36C6A/OD SPC36C6A/OD SPC36C6A-GA	1 Set of 3	1 Set of 3			1 Set of 3							
36OD02b-2000A	36C4B Circuit with distance protection	SPC36C4/OD ac SPC36C4/OD dc SPC36C4-GA	1 Set of 3	1 Set of 3			1 Set of 3							
	36C5B Circuit with pilot wire protection	SPC36C5B/OD ac SPC36C5B/OD dc SPC36C5B-GA	1 Set of 3	1 Set of 3			1 Set of 3							
	36C6B Circuit with current differential protection	SPC36C6B/OD ac SPC36C6B/OD dc SPC36C6B-GA	1 Set of 3	1 Set of 3			1 Set of 3							

Continued…

WPD 36kV Outdoor Dead Tank Circuit Breaker Type Reference	**Details and uses against EE SPEC 87**	**Standard drawings**	800/1 30VA 5P20	800/1 Class PX (4.5.2.1)	800/1 15VA CL. 0.5S	800/1 15VA 5P20	1200/1 Class PX (4.5.2.3)	1200/1 30VA; 5P20	2000/1 30VA; 5P20	L2 only: 2000/1 15VA Class 0.5S	L1/L3 only: 2000/1 15VA Class 0.5S	2000/1 30VA; 5P10	2000/1 Class PX (4.5.2.2)	Metering CT's (4.6.3)
36OD03-2000A	36C1B T/F feeder circuit with A/R & without intertripping	SPC36C1/OD ac SPC36C1/OD dc SPC36C1-GA	2 sets of 3				1 Set of 3							
	36C2B T/F feeder circuit with intertripping	SPC36C2/OD ac SPC36C2/OD dc SPC36C2-GA	2 sets of 3				1 Set of 3							
	36C3B T/F feeder circuit with local tripping	SPC36C3/OD ac SPC36C3/OD dc SPC36C3-GA	2 sets of 3				1 Set of 3							
	36C7B T/F feeder circuit without A/R & without intertripping	SPC36C7/OD ac SPC36C7/OD dc SPC36C7-GA	2 Set of 3				1 Set of 3							
	TX4 (2000A) Transformer Protection	SPC36TX4/OD ac SPC36TX4/OD dc SPC36TX4-GA	2 sets of 3				1 Set of 3							

Continued…

WPD 36kV Outdoor Dead Tank Circuit Breaker Type Reference	**Details and uses against EE SPEC 87**	**Standard drawings**	800/1 30VA 5P20	800/1 Class PX (4.5.2.1)	800/1 15VA CL. 0.5S	800/1 15VA 5P20	1200/1 Class PX (4.5.2.3)	1200/1 30VA; 5P20	2000/1 30VA; 5P20	L2 only: 2000/1 15VA Class 0.5S	L1/L3 only: 2000/1 15VA Class 0.5S	2000/1 30VA; 5P10	2000/1 Class PX (4.5.2.2)	Metering CT's (4.6.3)
36OD04M-1250A	36C11A Incoming circuit with metering	SPC36C11/OD SPC36C11/OD SPC36C11-GA	1 Set of 3		1 Set of 3									1 Set of 3
36OD05M-1250A	36C12A Outgoing circuit with metering	SPC36C12/OD ac SPC36C12/OD dc SPC36C12-GA	1 Set of 3		1 Set of 3		1 Set of 3							1 Set of 3
36OD06M-2000A	36C12B Outgoing circuit with metering	SPC3612B/OD ac SPC3612B/OD dc SPC36C12B-GA	1 Set of 3			1 Set of 3	1 Set of 3							1 Set of 3
36OD07-1250A	36B3A Bus-section with 2 distance protection relays	SPC36B3/OD ac SPC36B3/OD dc SPC36B3-GA	2 sets of 3	2 sets of 3										
36OD08-1250A	36B4A Bus-section without distance protection	SPC36B4/OD ac SPC36B4/OD dc SPC36B4-GA					2 sets of 3	2 sets of 3						
36OD09-2000A	36B4B Bus-section without distance protection	SPC36B4/OD ac SPC36B4/OD dc SPC36B4-GA					2 sets of 3		2 sets of 3					
36OD10-2000A	36ITB Incoming T/F circuit	SPC36IT/OD ac SPC36IT/OD dc SPC36IT-GA					1 Set of 3			1 Set of 3	1 Set of 3	1 Set of 3	1 Set of 3	

APPENDIX D

SUPERSEDED DOCUMENTATION

This is a new specification and no documents are superseded by its issue.

APPENDIX E

ASSOCIATED DOCUMENTATION

Current versions of:-

ST:SD1C	"Selection and Application of WPD Assessed Switchgear for Use on the Distribution Network"
EE SPEC 10	"12kV and 36kV Outdoor Overhead Conductor Connected Switchgear and Voltage Transformers"
EE SPEC 78	"Specification for Multipair Cables"
EE SPEC 79	"Specification for SCADA Multipair Light Current Control Cables"
EE SPEC 80	"Specification for Multicore Cables"
EE SPEC 87	"Protection, Alarm and Control Panels Associated with 36kV and 72kV Outdoor Switchgear, 33kV and 66kV Transformers and Control Panels Associated with Arc Suppression Coils"
EE SPEC 89	"Relating to Fixed Earthing Systems for Major Substations"
EE SPEC 98	"Relating to Approved Protection, Voltage Control and Alarm Relays and Test Access Blocks"
EE SPEC: 136	"Ancillary Electrical Equipment for Use in Conjunction with Switchgear and Protection/Control Panels"
ENA TS 41-24	"Guidelines for design, installation, testing and maintenance of main earthing systems in substations"
ENA TS 41-36	"Switchgear for service up to 36kV (Cable and overhead line connected)"
ENA TS 41-38	"Power installations exceeding 1kV ac – Design of high-voltage open-terminal stations"
ENA TS 50-18	"Application of ancillary electrical equipment"
BSEN 60898	"Specification for circuit breakers for overcurrent protection for household and similar installations"
BSEN 61869-2	"Instrument transformers: Part 2: Additional requirements for current transformers"
BSEN 61000-6-2	"Electromagnetic Compatibility (EMC). Generic Standards. Immunity for industrial environments"
BSEN 61000-6-4	"Electromagnetic Compatibility (EMC). Generic Standards. Emission Standard for industrial environments"
BSEN 61000-6-5	"Electromagnetic Compatibility (EMC). Generic Standards. Immunity for industrial equipment used in power station and substation environments"
BSEN 61936	"Power installations exceeding 1 kV a.c. - Part 1: Common rules"
BSEN 62271-1	"High-voltage switchgear and controlgear - Part 1: Common specifications"
BSEN 62271-100	"High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers"
BSEN 62271-101	"High-voltage switchgear and control gear - Part 101: Synthetic testing"
BSEN 62271-200	"High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1kV and up to and including 52 kV"
BSHD 60269-2	"Low-voltage fuses Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)"
BS IEC 61508	"Functional safety of electrical/electronic/ programmable electronic safety-related systems. Requirements for electrical/electronic/ programmable electronic safety-related systems"

APPENDIX F

KEY WORDS

Circuit Breaker; Dead Tank; Open Terminal; Switchgear