

**1. SCOPE**

This document defines the policy and standard arrangements to be adopted for the provision of connections to customers at low voltage in single-occupied premises in compliance with ESQCR 2002.

This document supersedes several existing documents. These are listed in Appendix B.

**2. ISSUE RECORD**

**This is a controlled maintained document.**

**All copies printed via the Intranet or photocopied will be deemed uncontrolled.**

Issue Date	Issue No	Author	Amendment Details
Sept 2006	1	R H Bracey	Initial issue: 17 page document

**3. ISSUE AUTHORITY**

Author	Owner	Issue Authority
R H Bracey Engineering Consultant	Alastair Graham Policy and Standards Manager	Carl Woodman Engineering Services Manager .....

**4. REVIEW**

This document shall be subject to periodic review as and when required.

**5. CONTENTS**

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## 6. REFERENCES

### Statutory Instruments

SI 2002 No. 2665      The Electricity Safety, Quality and Continuity Regulations 2002  
(ESQCR 2002)

### British Standards

BS 88                      Cartridge fuses for voltages up to and including 1000V ac  
and 1500 V dc.  
BS 1361                    Specification for cartridge fuses for ac circuits in domestic  
and similar premises.  
BS 7671                    Requirements for electrical installations. IEE wiring regulations.

### EnergyNetworks documents

EART-01-002              Low Voltage Earthing Policy  
ESDD-01-003              Padmount Transformer Substations  
EPS-01-005                Policy for Supplies to Mobile Phone Base Station Sites

## 7. DEFINITIONS

Company:                      Refers to SP Distribution Limited, SP Transmission Limited  
and SP Manweb plc.

EnergyNetworks:              SP PowerSystems Ltd, operator of network assets on behalf of  
the Company.

SP Distribution Limited      The Distribution Licence Holder for the distribution service  
area formerly known as ScottishPower.

SP Transmission Limited      The Transmission Licence Holder for the transmission service  
area formerly known as ScottishPower.

SP Manweb plc                The Distribution Licence Holder for the distribution service are  
formerly known as Manweb.

## **8. GENERAL**

The arrangements for provision of new low voltage electricity connections to customers in single-occupied premises shall comply with this policy. The permitted connection arrangements are described in sections 10 and 11 of this document and are illustrated schematically in Appendix A.

A low voltage connection shall normally be provided where the customer's maximum demand does not exceed 500 kVA. Above this limit and where the customer's maximum demand is less than 1000 kVA, connections may be provided at either low or high voltage. The latter is preferred if the customer's future demand is likely to exceed 1000kVA or where the nature of the customer's load requires a high voltage point of common coupling to the network. Low voltage connections shall not be provided where the customer's maximum demand exceeds 1000 kVA.

Where a modification to an existing connection arrangement is required (eg to afford an increase in connection capacity), the provisions of this policy shall be adhered to as far as is reasonably practicable.

### **8.1 Points of connection**

The Point of Connection is defined as the set of terminals belonging to the Company to which Customer-owned cables are connected. This point may be at the cutout, substation fuseboard (or fused takeoff chamber) or isolating switch as appropriate to the connection arrangement. The Point of Connection is equivalent to the Supply Terminals as defined in ESQCR 2002.

There shall normally be only one point of connection within any single Customer's premises. This is in order to avoid significant safety and technical issues associated with segregation of installations, risk of interconnection and multiple points of isolation. Requests for additional low voltage standby supplies shall normally be refused on the above grounds coupled with the fact that the standby supply would have no greater reliability.

Domestic premises shall normally only be provided with a single phase connection and the cable termination / metering equipment shall be installed either at a suitable location within the customer's premises or within an Approved external meter cabinet.

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## **8.2 Customer responsibilities**

The term “Customer” used within this document includes the Customer’s electrical contactor where relevant.

The Customer shall provide adequate space for Company apparatus and the metering equipment.

No Company apparatus shall be installed on a Customer's premises unless the installation location is weatherproof and secure.

No new connection shall be installed unless the Customer has declared that their installation will comply with BS 7671 before energisation.

Where an Approved external meter cabinet is newly installed, this shall become the responsibility of the Customer.

## **8.3 Associated requirements**

Earthing arrangements shall comply with EART-01-002.

This document makes reference to the use of 3c Waveform (WF) cables (ie CNE) which are suitable for PME systems; the use of 4c WF cables is not precluded for those situations where an SNE arrangement is required.

Connections to Mobile Phone Base Station Sites shall be in accordance with EPS-01-005.

The application of Padmount Substations shall be in accordance with ESDD-01-003.

Design and construction of new substations shall be in accordance with the appropriate Company standard.

The connection of pole mounted substations to underground high voltage networks is subject to special consideration to ensure that adequate electrical protection is provided to guard against earth faults.

All materials and equipment used for low voltage connections purposes shall be approved by the Company.

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## 8.4 Metering

Metering is the responsibility of a Meter Operator appointed by the Customer's Supplier.

Generally, whole-current (WC) metering is suitable for connection capacities not exceeding 100A (23 kVA single phase, 69 kVA three phase). Domestic single phase single rate credit meters are normally rated at 80A which limits the connection capacity to 18kVA.

For connection capacities in excess of these values, current transformer (CT) metering will be required. CT chambers, CTs and associated connection blocks will be owned by the Company.

## 8.5 Isolating Switches

All connections with WC metering shall be equipped with a 100A switch-disconnector ("isolating switch") owned by the Company. The switch shall be a double pole, phase and neutral switched for single phase connections or a four pole, three phase and neutral switched for three phase connections. The latter is also to be used for single phase two-rate tariff connections (in which case, the phase and neutral of both the 24 hour and restricted circuits shall be switched). Isolating switches shall be located after the meter.

Connections with CT metering shall not be fitted with a Company-owned isolating switch – the Customer is responsible for providing suitable incoming switchgear adjacent to the CT chamber.

## 8.6 LV fuses

Fuses for use in cutouts shall be as follows:

For 25A (street lighting) cutouts	HRC type to BS 88.
For 100A cutouts	HRC type IIb to BS 1361.
For 200A-1000A cutouts	HRC type to BS 88 part 5.

Fuses for use in substation fuseboards and fused takeoff chambers shall be HRC type to BS88 part 5.

## 8.7 Meter Tails

The Customer shall provide suitable cables (meter tails) to connect their incoming switchgear to the Company isolator or cutout. Meter tails shall not exceed 3 metres in length and shall normally be single core, stranded copper conductor, pvc insulated and sheathed, sized in accordance with Table 8.1 below. Requirements for Customer cables associated with substation metered connections are detailed in section 11.3.

Cutout rating (A)	Fuse rating (A)	Meter tail size
100	100	25 mm <sup>2</sup>
200	160	70 mm <sup>2</sup> (note 1)
200	200	95 mm <sup>2</sup> (note 1)
400	315	240 mm <sup>2</sup> (note 1)
500	400	400 mm <sup>2</sup> (note 1)

**Table 8.1 – meter tail sizes**

### Notes

- 1- minimum sizes are shown – for 200A cutouts, conductors shall be circular or be terminated by the Customer in a circular pin connector – for 400/500A cutouts, conductors shall be terminated by the Customer in a cable lug with an M12 fixing hole.

## 8.8 Polarity indication and sealing

Polarity indication shall be provided adjacent to the Point of Connection (on the Company isolating switch where provided) using the letters L and N for single phase connections and L1, L2, L3 and N for three phase connections respectively.

All Company apparatus shall be left in a sealed condition. The outgoing terminal cover of isolating switches shall be sealed with a temporary seal that must be broken by the Customer in order to connect his meter tails.

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## **9. DECLARED CONNECTION CAPACITY**

The declared connection capacity shall be in accordance with the appropriate connection arrangement and shall normally be stated on the Connection Offer.

The declared nominal supply voltage shall be 230 V single phase / 400 V three phase and the maximum connection capacities (kVA) stated in this document are based on these voltages.

The maximum capacity may be limited by the rating of the apparatus used to provide the connection (lv cutout, lv cable, metering equipment or transformer) or for other reasons.

Where single phase connections to domestic premises are provided with the cable termination and metering equipment installed within an Approved external meter cabinet, the connection capacity shall be limited to 18kVA due to thermal considerations.

The lv fuse provided at the point of connection is designed to provide short circuit protection in compliance with Regulation 24(1)(c) of ESQCR 2002. The maximum connection capacity shall not exceed the fuse rating and the fuse rating shall not exceed the rating of other connection apparatus.

The sizing of cables for low voltage connections assumes continuous ratings - cyclic ratings are not used since the associated plant items do not have a cyclic rating.

## 10. NETWORK CONNECTIONS

Connections may be given from network distributors (overhead or underground) but due account must be taken of any limitations caused by the network design, distributor capacity, existing distributor loadings, voltage drop and earth loop impedance. These limitations may constrain the connection capacity and/or require reinforcement of the network before the connection can be provided.

New network connections shall wherever reasonably practicable be provided via an underground service cable.

### 10.1 Unmetered connections

Network connections may be unmetered in cases where the maximum demand is relatively low (normally not exceeding 500W in line with Balancing & Settlements Code Procedure 520) and the demand is predictable (eg street lighting connections) and shall normally be single phase.

Single phase unmetered connections shall be provided via 4mm<sup>2</sup> single phase service cable terminated into either a 25A cutout (for street lighting columns or similar) fitted with an appropriately rated fuse not exceeding 16A or (for other installations) a 100A cutout fitted with an appropriately rated fuse not exceeding 30A. See Appendix A arrangement A1.

### 10.2 Metered connections

Single and three phase metered network connections shall be in accordance with Table 10.1 below.

Maximum connection capacity (kVA)	Service cable	Cutout rating (A)	Maximum fuse rating (A)	Appendix A arrangement
23 single phase	25 or 35mm <sup>2</sup> single phase	100	100	A2
69	35mm <sup>2</sup> three phase	100	100	A2
138	95 mm <sup>2</sup> 3c WF	200	200	A3
217	185 mm <sup>2</sup> 3c WF	400	315	A3
276	300 mm <sup>2</sup> 3c WF	500	400	A3

**Table 10.1 - metered network connections**

## 11. SUBSTATION CONNECTIONS

Connections shall be given directly from a substation in the circumstances described in this section.

New substation connections shall be provided via an underground service cable.

The substation transformer rating will depend on the required connection capacity, the extent of connection of the substation to any surrounding lv network and the associated demand of any network connected customers.

The rating of the substation fuse(s) protecting the service cable(s) shall equal that of the cutout fuse(s).

### 11.1 Single phase

Where no network distributors exist, a single phase connection may be given directly from a pole mounted substation or (where permissible) padmount substation in accordance with Table 11.1 below. However, the installation of a three phase connection should be encouraged for connection capacities exceeding 23kVA wherever reasonably practicable.

Maximum connection capacity (kVA)	Transformer rating (kVA)	Service cable	Cutout rating (A)	Maximum fuse rating (A)	Appendix A arrangement
23	25	25 or 35mm <sup>2</sup> single phase	100	100	A4
46 (note 1)	50	95 mm <sup>2</sup> 3c WF	200	200	A5
92 (note 2)	100	95 mm <sup>2</sup> 3c WF	200	200	A5

**Table 11.1 - single phase pole/padmount substation connections**

Notes

- 1- Only one phase core and one pole of a three pole cutout utilised.
- 2- This is a split phase (or bi-phase) arrangement - two phase cores and two poles of a three pole cutout utilised.

## 11.2 Three phase

Where no network distributors exist, or where distributor capacity and/or loading precludes a network connection, a three phase connection may be given directly from a dedicated fuseway or ways in either a pole mounted substation or (where permissible) padmount substation in accordance with Table 11.2 below or a ground-mounted substation in accordance with Table 11.3 below.

Maximum connection capacity (kVA)	Transformer rating (kVA)	Service cable	Cutout rating (A)	Fuse rating (A)	Appendix A arrangement
50	50	35mm <sup>2</sup> three phase	100	80	A4
100	100	95 mm <sup>2</sup> 3c WF	200	160	A5
138	200	95 mm <sup>2</sup> 3c WF	200	200	A5
200	200	185 mm <sup>2</sup> 3c WF	400	315	A5

**Table 11.2 - three phase pole/padmount substation connections**

Maximum connection capacity (kVA)	Service cable	Cutout rating (A)	Fuse rating (A)	Appendix A arrangement
138	95 mm <sup>2</sup> 3c WF	200	200	A5
217	185 mm <sup>2</sup> 3c WF	400	315	A5
276	300 mm <sup>2</sup> 3c WF	500	400	A5
353	2x185 mm <sup>2</sup> 3c WF	1000 (note 1)	2x315	A6
463	2x300 mm <sup>2</sup> 3c WF	1000 (note 1)	2x400	A6

**Table 11.3 - three phase ground mounted substation connections**

### Notes

- 1- The twin service cable arrangements employ a 1000A metering connection unit and are only to be used in cases where it is not reasonably practicable to establish a substation metered connection in accordance with section 11.3. The twin service cables shall, as far as reasonably practicable, be of equal length and they shall be taken from adjacent lv fuseways at the same substation. The maximum length of twin service cables shall be 200 metres and no branch connections shall be taken from them (ie they are "clean feeders"). Fuseways at both ends of each cable shall be labelled as follows: at substation "Customer xxx parallel feeder 1", at connection unit "Parallel feeder 1 from nnn substation". The GIS and GND records shall be marked "cables run in parallel - keep clean". The customer shall provide four single core cables of suitable rating and suitably terminated for connection into the unit.

### 11.3 Three phase (metered at substation)

The preferred arrangement for higher capacity low voltage connections is via CT metered ways on the fuseboard or transformer-mounted fuse cabinet (TMFC) within a substation. Such substations shall be constructed adjacent to the customer's switchroom and on the customer's land. The substation transformer rating will depend on the required connection capacity, the extent of connection of the substation to any surrounding lv network and the associated demand of any network connected customers. Within the SP Manweb plc area, the use of transformers greater than 500kVA is subject to the proviso that no permanent lv interconnection is permissible.

Single core cables of suitable rating shall be provided, owned and maintained by the customer to interconnect the Company substation and the Customer's switchroom. These cables shall pass via the shortest possible route that is under the control of the customer and the route length shall not normally exceed 10 metres. Where the Customer provides armoured single core interconnecting cables, these shall be bonded and earthed at the Customer's switchroom. The armour shall be removed and suitably insulated prior to the cables being terminated onto the fuseboard or TMFC. The Customer's separate earth conductor shall be terminated onto the lv earth bar on the fuseboard or TMFC. The multi-core cables between the metered ways and the metering panel shall not exceed 20 m in length.

Such connections shall be in accordance with Table 11.4 below.

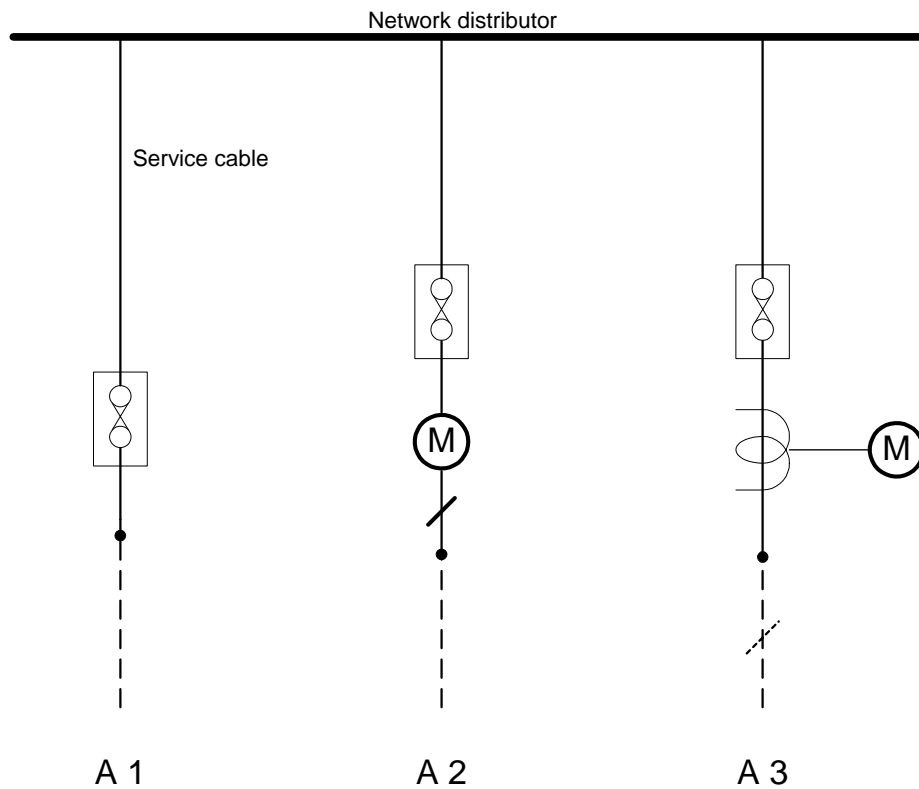
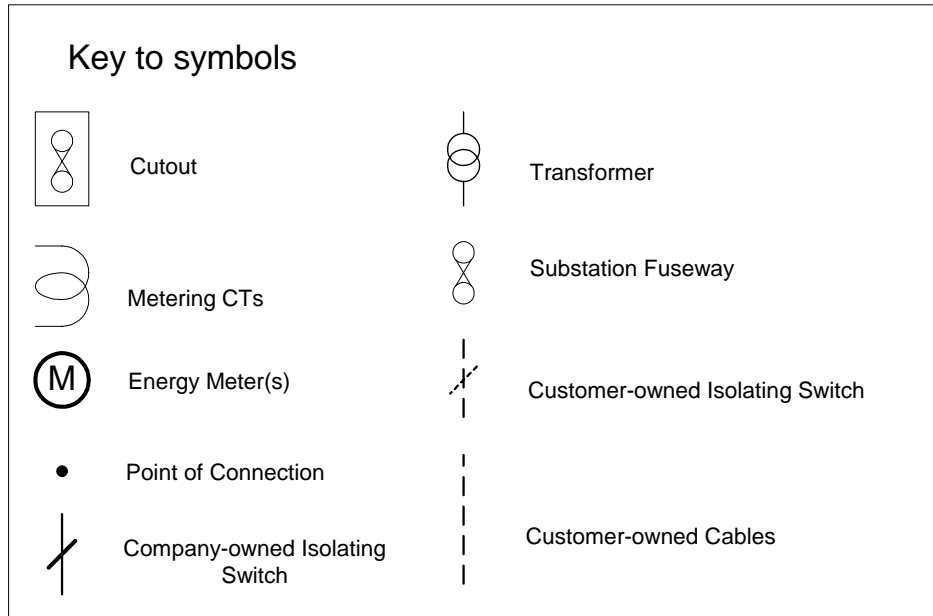
Maximum connection capacity (kVA)	Metered fuseway fuse rating (A)	Appendix A arrangement
217	315	A7
276	400	A7
435	2x315	A8
552	2x400	A8
828	3x400	A9
966 (note 1)	3x500 (note 3)	A9
1000 (note 2)	2x2x400	A10

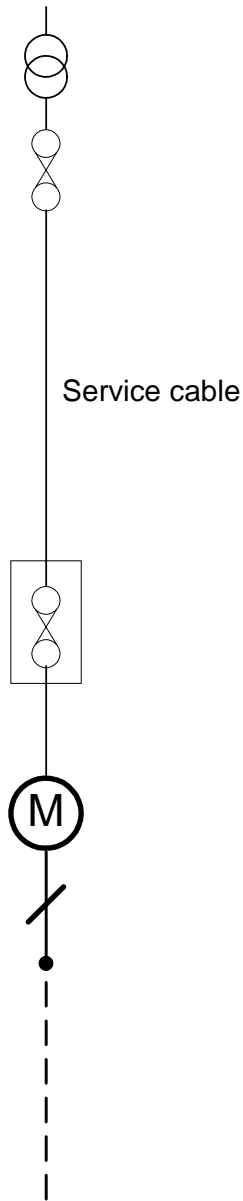
**Table 11.4 - three phase connections metered at substation**

#### Notes

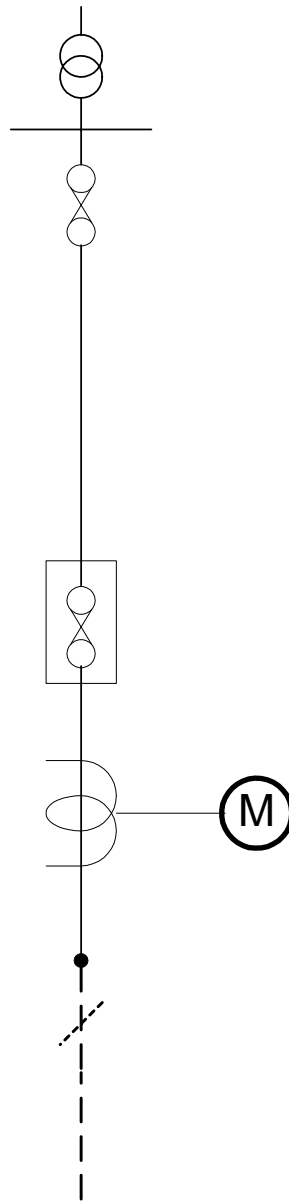
- 1- 1000kVA transformer - the normal 1600A TMFC rating is limited to 1400A in this application.
- 2- SP Manweb plc area only - 2x500kVA transformers with double lv fuseboard.
- 3- There is a risk of maldiscrimination between transformer hv protection and 3x500A lv fuses but this is accepted since no other customers should be affected.

## APPENDIX A – SCHEMATIC CONNECTION ARRANGEMENTS

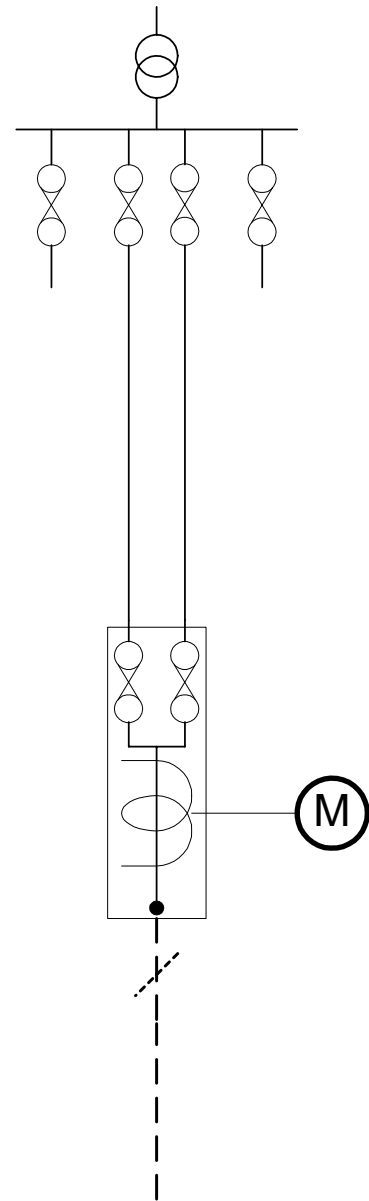




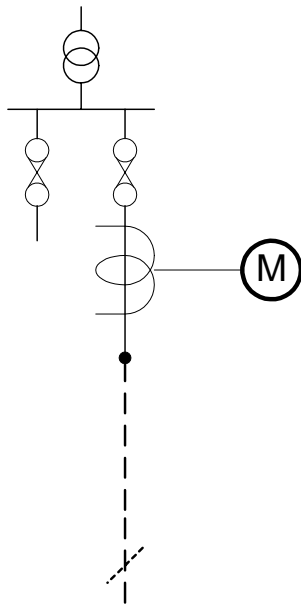
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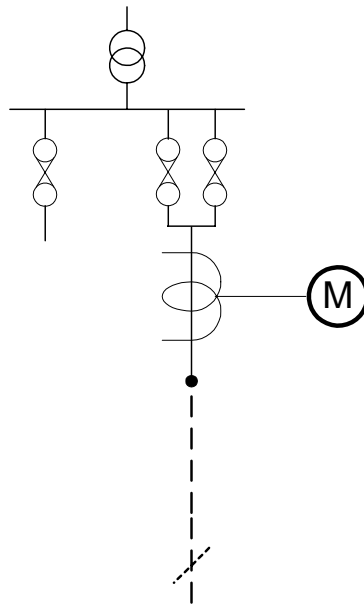
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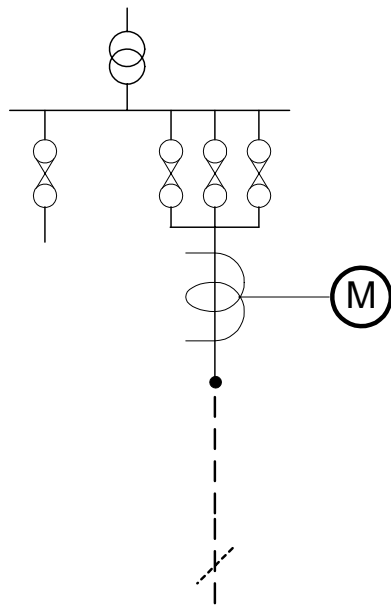
A 6



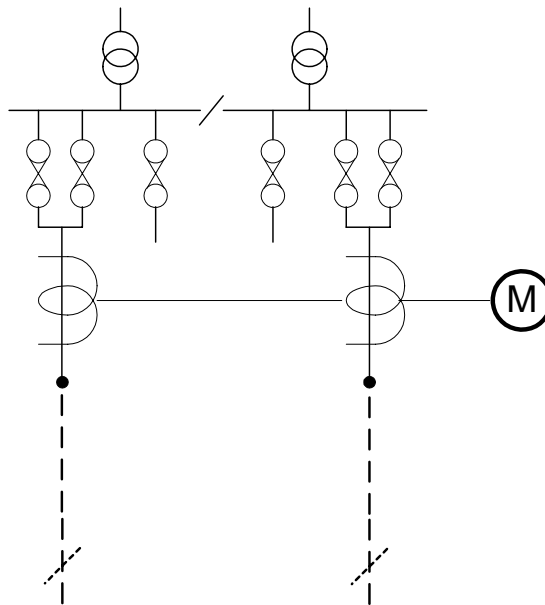
A 7



A 8



A 9



A 10

## APPENDIX B – SUPERSEDED DOCUMENTS

The following documents are superseded in whole or part by this document:

### ScottishPower documents

DCM 1.2.2	Low voltage installations: connection of customers electrical installations	In entirety - withdrawn
DDM sec.6	Standard schemes for supply to industrial and commercial customers	Sections 6.8 and 6.11.1
SDM part A	Service design manual – domestic premises	Sections 5 and 9

### Manweb documents

72/0220/02	Standard Supply Arrangements	Sections 5-9 only
EM 133	Supplies to consumers at low and medium voltage	In entirety - withdrawn
EM 166	Supplies to consumers at low and medium voltage Up to 30kVA installation arrangements	In entirety - withdrawn