

Substation Design Instruction

Schneider (Merlin Gerin) RM6 24kV switchgear

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SUBSTATION DESIGN INSTRUCTION

PRIMARY SYSTEMS

Document No	:	SDI 207
Amendment No	:	6
Approved By	:	MPS
Approval Date	:	17/02/2016
Review Date	:	17/02/2019

SDI 207 SCHNEIDER (MERLIN GERIN) RM6 24KV SWITCHGEAR

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1.0 PURPOSE

To provide a technical guideline to assist with the application and installation of Schneider RM6 switchgear.

2.0 SCOPE

The instruction provides information to assist in the design and installation of substations that require Schneider RM6 switchgear. The instruction deals only with standard units approved by Endeavour Energy for use in the network.

The instruction does not include mounting and earthing details. For this information, refer to Earthing Design Instruction EDI 100 – Distribution earthing design, construction and test and the manufacturer's installation instructions in document numbers 07897073EN, dated January 2006 and 07897071EN, dated March 2007. The switchgear complies with the requirements of Equipment Technical Specification ETS 0068 – Distribution indoor and padmount substation 11/22kV switchgear specification.

Endeavour Energy purchases only 24 kV rated Schneider Electric RM6 (previously known as Merlin Gerin RM6) switchgear for use on both 11kV and 22kV systems. Endeavour Energy has approved the following assemblies rated at 24kV for use in the network.

Switchgear type (Schneider reference no.)	Description	Approval no.
24 kV RM6 NE - IQ	Non extensible one load break switch unit for ring main feeders and one fuse unit for transformer feeder	330019 and A20006A
24 kV RM6 NE - IQI	Non extensible two load break switch units for ring main feeders and one fuse unit for transformer feeder	330004 and 020021A
*24 kV RM6 NE - IDI	Non extensible two load break switch units for ring main feeders and one circuit breaker unit for transformer feeder	330020 and A20005A
24 kV RM6 NE - III	Non extensible three load break switch units for ring main feeders (switching station)	330021 and 530139
24 kV RM6 NE - IIII	Non extensible four load break switch units for ring main feeders (indoor stations only)	530140
24kV RM6 NE - IIQI	Non extensible three load break switch units for ring main feeders and one fuse unit for transformer feeder	U20023A
*24kV RM6 NE - IIDI	Non extensible three load break switch units for ring main feeders and one circuit breaker unit for transformer feeder	U20022A

* with VIP 300 protection relay, supplied with the circuit breaker unit.

Equivalent configurations are available in the extendable version of RM6 switchgear (RM62) and can be used in padmount substations.

3.0 REFERENCES

Company Policy (Network) 9.2.2 – Network Protection
Company Policy (Network) 9.2.5 – Network Asset Design

Company Policy (Network) 9.7.1 – Network Asset Construction
Company Policy (Network) 9.8.3 – Network Operations
Company Policy (Network) 9.9.1 – Network Asset Maintenance
System Control Branch Procedure NCB 4415 - Merlin Gerin Type RM6 - 24kV Ring Main Switchgear
Earthing Design Instruction EDI 100 – Distribution earthing design, construction and test
Equipment Technical Specification ETS 0068 – Distribution indoor and padmount substation 11/22kV switchgear
Equipment Technical Specification ETS 0069 – Distribution indoor and padmount substation low voltage switchgear
Equipment Technical Specification ETS 0072 – Padmount Substation Plinth and Culvert
Equipment Technical Specification ETS 0077 – Padmount Substation Cubicles
Mains Construction Instruction MCI 0006 – Underground distribution: Construction standards manual
Mains Design Instruction MDI 0028 – Underground distribution network design
Substation Design Instruction SDI 101 – Distribution substation general details and minimum requirements
Drawing no. 063607 – 22kV PM Substation Toe Clamp Layout
Network Management Plan (December 2013 Review)
NSW Work Health and Safety Act 2011
NSW Work Health and Safety Regulation 2011
AS 60265.1 High voltage switch – switches for rated voltages above 1kV & less than 52 kV
AS 1033.2 - High voltage fuses for rated voltages exceeding 1000V – current limiting type.
AS 62271.1 - High-voltage switchgear and controlgear - Common specifications
AS 2629 - Separable insulated connectors for power distribution systems above 1kV
EN 50181 - Plug-in Type Bushings Above 1 kV up to 52 kV and From 250 A to 2,50 kA for Equipment Other Than Liquid Filled Transformers
IEC 60282-1 High voltage fuses – current limiting fuses
Schneider installation instruction no. 07897071EN
Schneider operation instruction no. 07897073EN
ENA National Electricity Network Safety Code (Doc.01-2008)

4.0 DEFINITIONS AND ABBREVIATIONS

TRF

Transformer

HRC

High rupturing capacity

XLPE

Cross-linked polyethylene

5.0 ACTIONS

5.1 General

Schneider RM6 switchgear is secondary distribution switchgear. The switchgear is type tested, factory assembled and metal enclosed for installation in padmount substations. The switchgear can be used in indoor substations in special situations, but only with the approval of Endeavour Energy.

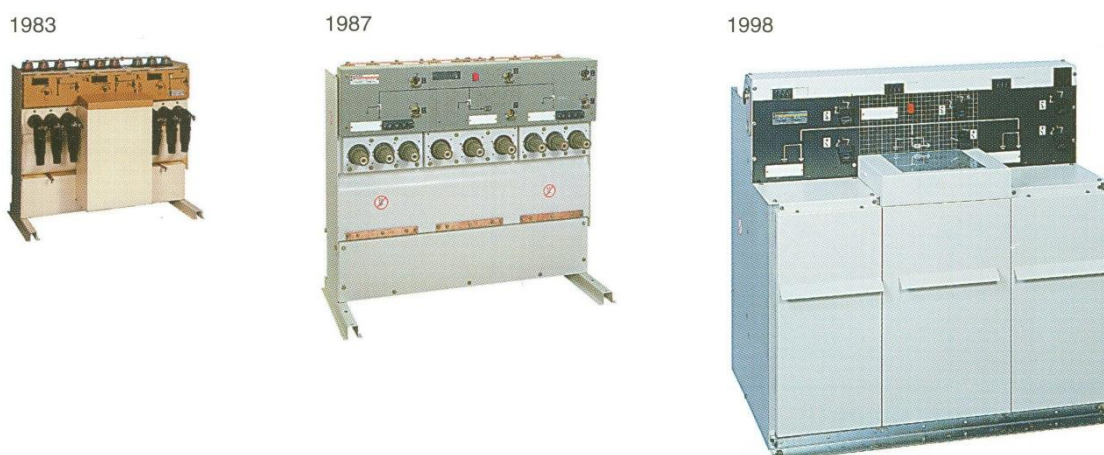
The main technical features are:

- three-pole metal enclosed and SF6 filled;

- SF6 gas at 0.2bar pressure is used for insulation and electric arc extinction;
- stainless steel, gas tight metal enclosure, which is sealed for life, houses the live parts, switch disconnectors, earthing switch, fuse switch or circuit breaker;
- earthing switch has a short circuit making capacity;
- HRC fuses and cable-sealing ends accessible when the circuit is earthed (mechanically interlocked);
- the switchgear cannot be extended;
- blow out of a fuse opens the switch in series; and
- in case of a single fuse blow out, all the three phases of the switch are opened through a striker pin provided on the fuses.

Further description, operation and maintenance instructions on RM6 switchgear can be found in operating instruction no's 07897071EN and 07897073EN from Schneider. These instructions form an integral part of this document.

Figure 1: Design changes since 1983



5.2 Specifications

RM6 switchgear is basically rated at 24kV. The specifications when chosen to operate at 12kV and 24kV are:

Rated system voltage of use	12kV	24KV
50Hz 1 minute withstand	50 kV rms	50 kV rms
1.2/50 μ s impulse withstands	125 kVp	125 kVp
Rated current of busbars	630 A	630 A
Rated current of cable feeders	630 A	630 A
Rated current of transformer feeders (CB or SFU)	200 A	200 A
Rated short time withstand current for 1 sec	21kA	16 kA
Peak making current (making capacity) of switch and earthing switch	52.5 kA	40 kA

5.3 Dimensions and weight

	NE IQI	NE IDI	NE III	NE IIII	NE IIQI	NE IIDI
Width (mm)	1186	1186	1186	1619	1619	1619
Depth (mm)	710	710	710	710	710	710
Height (mm)	1142	1142	1142	1142	1142	1142
Weight (kg)	210	210	150	270	270	270

The switchgear is rated for 24kV applications: for use on an 11kV system, an extension fuse link is required.

Figure 2: Typical dimensions drawings

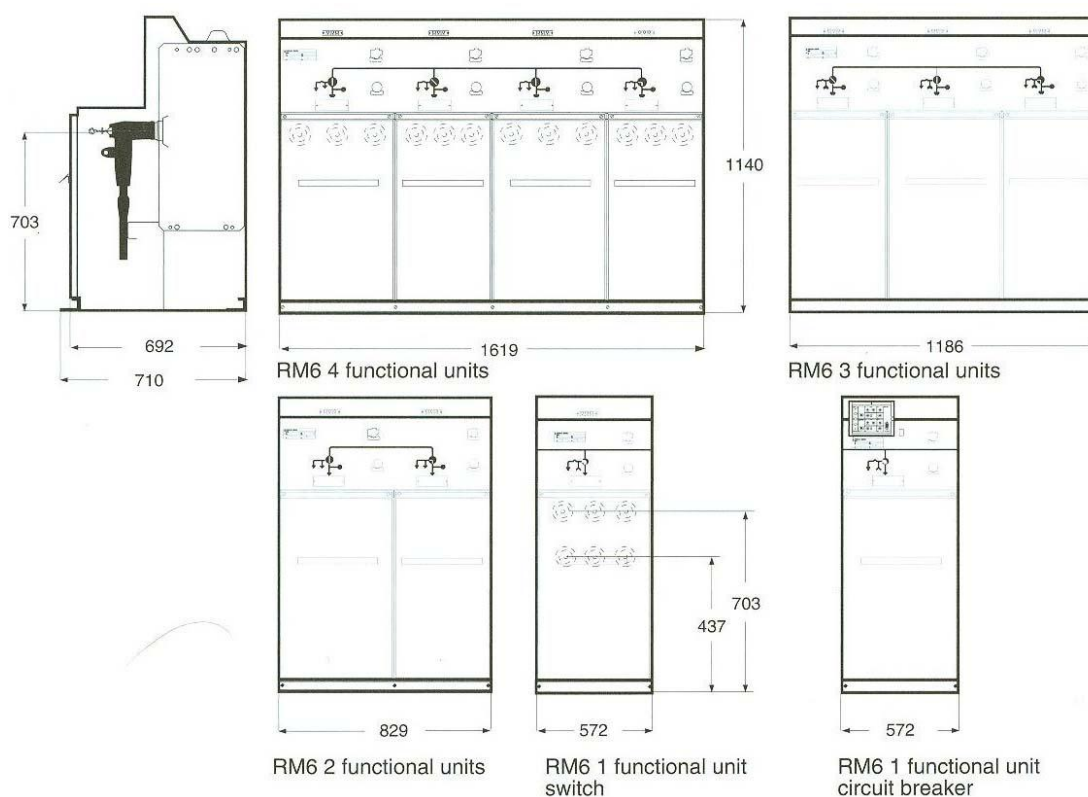
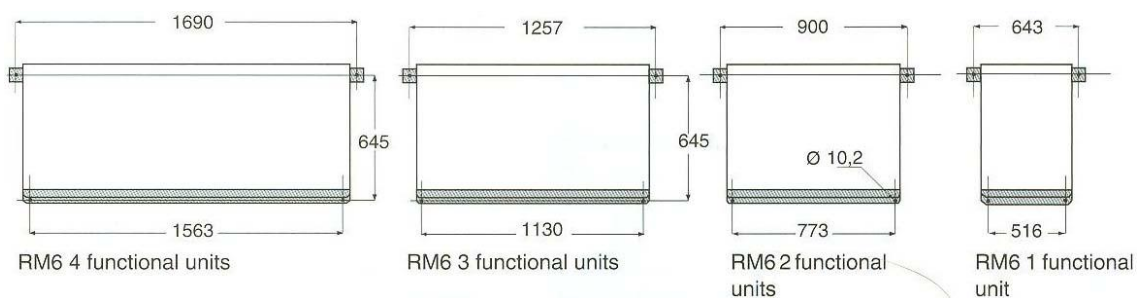


Figure 3: Typical penetration and bolt down dimensions



There is also an additional 80mm riser frame supplied under the switchgear to separate the steel switchgear frame from the concrete plinth to help reduce any reactions when the concrete gets wet. The frame also allows a little more room for the cable connection to the lower fuse unit. The riser frame shall be covered at the front and on the sides.

5.4 Installation

Schneider RM6 switchgear is designed for installation in padmount substations, but could be used in an indoor substation as mentioned previously. The switchgear is suitable for installation on the standard plinth as shown in Drawing no. 063607, Equipment Technical Specification ETS 0069 – Distribution indoor and padmount substation low voltage switchgear and Mains Construction Instruction MCI 0006 – Underground distribution: Construction standards manual.

The switchgear does not require the installation of space heaters for operations. For further details, refer to the installation manual and instructions for use, document no's 07897071EN and 07897073EN respectively, provided by Schneider.

5.5 Cabling

To establish that the correct method of earthing is installed on the first leg of a feeder cable exiting a zone substation it is necessary to obtain the earthing details from the earthing design. The correct selection of screened elbow is important and in some cases the screened elbow will need to be isolated from the incoming cable screens. The Elastimold 430TB screened elbow shown in the following tables is suitable for this purpose.

5.5.1 Switch unit

The network switch units in new RM6 switchgear are provided with 630A type C bushings, manufactured to Standard EN 50181 (similar in content to AS 2629). These bushings use M16 bolt for the connection of cable lugs.

There are some RM6 switchgear units, supplied previously by Schneider, that are provided with 400A bushings, type B, manufactured in accordance with Standard EN 50181 (similar in content to AS 2629) and which are used on network switches. These bushings use 12mm plug-in elbow connectors.

Dead break elbow terminations are recommended for termination of XLPE cables (150mm² or 300mm²). These bushings are capable of accepting a range of screened elbows terminations including:

Manufacturer	Type reference for use on 630A, type C bushing	Type Reference for use on 400A, type B bushing
Elastimold	K400TB or 430TB	K400LR
Pirelli Cable	FMCTs 400	FMCE400
F&G/NKT	CB 24-630	
Kabledon	SOC 630	SOC 630

24kV screened elbow connectors are to be used in all cases, including 11kV areas.

Refer to documents no's 07897071EN and 07897073EN, provided by Schneider, for complete details of acceptable terminations. A *Unistrut* is provided inside the cable compartment for clamping and supporting of feeder cables.

5.5.2 Circuit breaker unit

Each circuit breaker is fitted with 630 Amp bushings, type C, manufactured in accordance with Standard EN 50181 (similar in content to AS 2629). The bushing uses a 630A M16 bolt for connection of the cable lug.

Dead break elbows are recommended for use with minimum 70 mm² XLPE cable for tee-off connection to the transformer. These bushings are capable of accepting the following screened elbows:

Manufacturer	Type reference for use on 630A, type C bushing
Elastimold	K400TB or 430TB
Pirelli Cable	FMCTs 400
F&G/NKT	CB 24-630
Kabledon	SOC 630

24kV screened elbow connectors are to be used in all cases, including 11kV areas. Refer to document no's 07897071EN and 07897073EN, provided by Schneider, for complete details of acceptable terminations. A *Unistrut* is provided inside the cable compartment for clamping and supporting of cables.

5.5.3 Fuse-switch unit

Each fuse-switch unit is fitted with 200 Amp bushings, type A, manufactured in accordance with Standard EN 50181 (similar in content to AS 2629). This bushing uses a 200A plug in the bushing.

Dead break, 200 Amp elbow terminations are recommended for use with 25mm² to 95mm² XLPE cable for tee-off connection to the transformer. These bushings are capable of accepting the following plug-in elbows:

Manufacturer	Type reference for use on 200A, type A bushing
Elastimold	K158LR
F&G/NKT	EASW 20-250

Pre-made leads are available for connection to either 11kV or 22kV transformers. 22kV screened elbow connectors are to be used in all cases, including 11kV areas.

Refer to operating instruction no's 07897071EN and 07897073EN, provided by Schneider, for complete details of acceptable terminations. A *Unistrut* is provided inside the cable compartment for clamping and supporting of cables.

5.6 Operation

It is important that only authorised personnel carry out any switching operations.

For detailed instructions on operation of the switchgear, refer to documents no's 07897071EN and 07897073EN, provided by Schneider.

5.6.1 Operation at 11kV

When it is required for the switchgear to be operated at 11kV, the following alterations will be required.

5.6.1.1 Fuse extension

Merlin Gerin RM6 switchgear (when operating at 22kV) is designed to suit 442mm long DIN fuses. As 11kV DIN fuses are 292mm long, an extension must be fitted to elevate the bottom contact in the fuse compartment. Information and the parts for the modification are available as a kit from Schneider Pty Ltd.

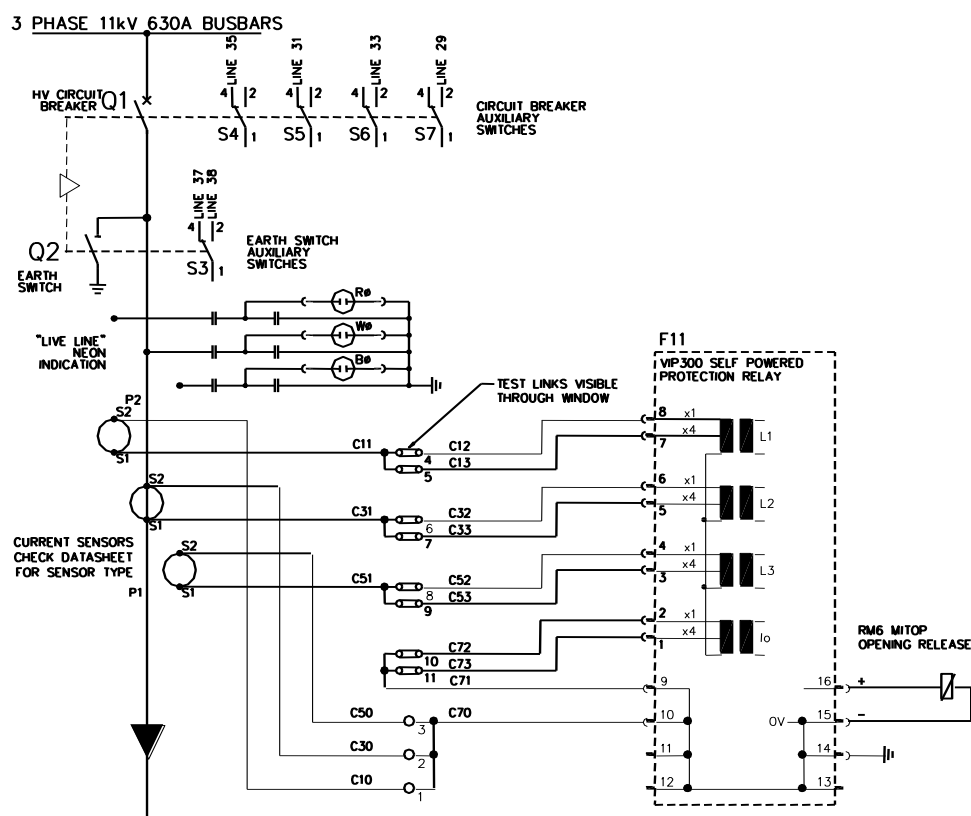
5.6.1.2 Circuit breakers

The circuit breakers are suitable for use on 22kV and 11kV systems without modifications.

5.6.2 Circuit breakers

The circuit breaker uses self-powered over current and earth fault protection VIP 300 relays. Test links are provided at the front of the switchgear to allow relay testing. The test link circuit diagram is shown below. The relay setting must be checked with the Protection Group before being put in to service.

Figure 4: Test link circuit diagram



5.6.3 Interlocks

The operation of the earth switch is interlocked with the main circuit switch or the circuit breaker so that the closing of the earth switch is impossible while the main circuit switch or the circuit breaker is closed.

Access to the cable compartment is interlocked with the earthing switch.

For further details, refer to Schneider document no's 07897071EN and 07897073EN.

5.6.4 Mimic diagrams

The switchgear status indicators are placed directly on the moving contact assembly-operating shaft. They give a clear indication of the position of the switchgear.

5.7 Accessories

5.7.1 Short circuit indicators

Horstmann ALPHA E and Alpha M short circuit indicators were used up until the end of 2011, after this the Horstmann Sigma F&E are being installed. The short circuit indicator CTs fit around each phase and should be located around the HV bushing. If there is any excess wiring to the CTs then this should be gathered and tied back out of the way of other cabling.

Figure 5: Alpha E units used up until the end of 2011



Figure 6: Sigma F+E units used after 2011



5.7.2 Phase concordance unit

The phase concordance unit can be used with the voltage indicator lamps fitted as standard on all ring main units supplied to Endeavour Energy. The unit can be purchased directly from Schneider Pty Ltd.

5.8 Single line diagrams

Figure 7: Diagram no. 1

RM6 NE IQI

Two switch units for ring main feeders

One switch fuse unit for transformer feeder

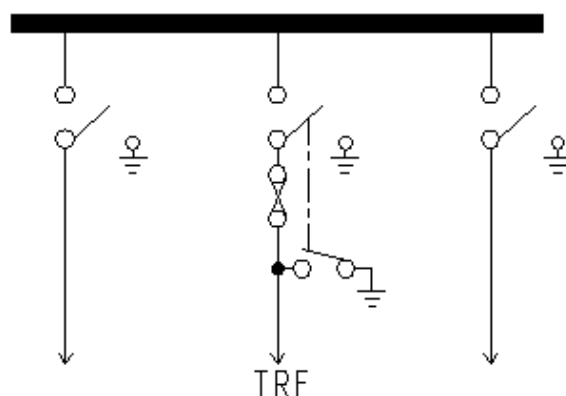


Figure 8: Diagram no. 2

RM6 NE IDI

Two switch units for ring main feeders

One Circuit-breaker unit for transformer feeder

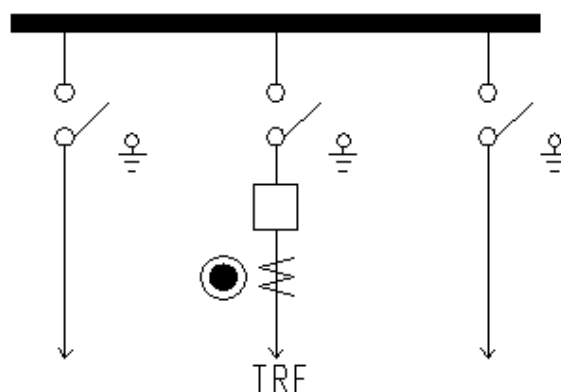
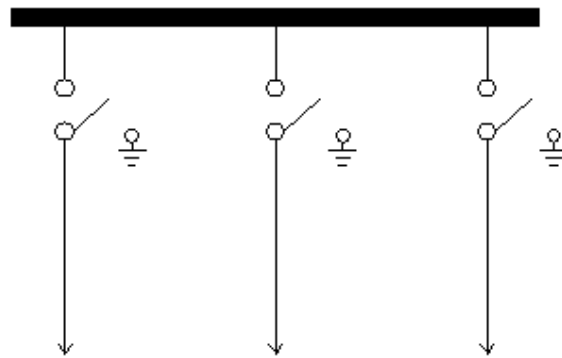


Figure 9: Diagram no. 3

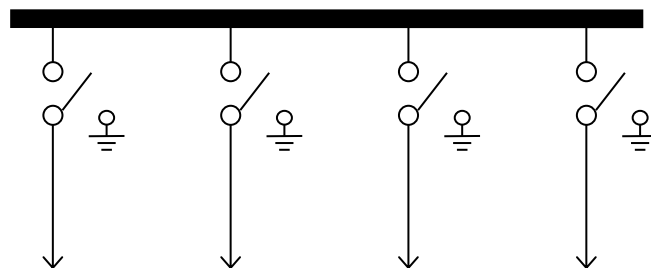
RM6 NE III

Three switch units for ring main feeders

**Figure 10: Diagram no. 4**

RM6 NE IIII

Four switch units for indoor subs only

**Figure 11: Diagram no. 5**

RM6 NE IIQI

Three switch units for ring main feeders

One switch fuse unit for transformer feeder

Indoor subs only

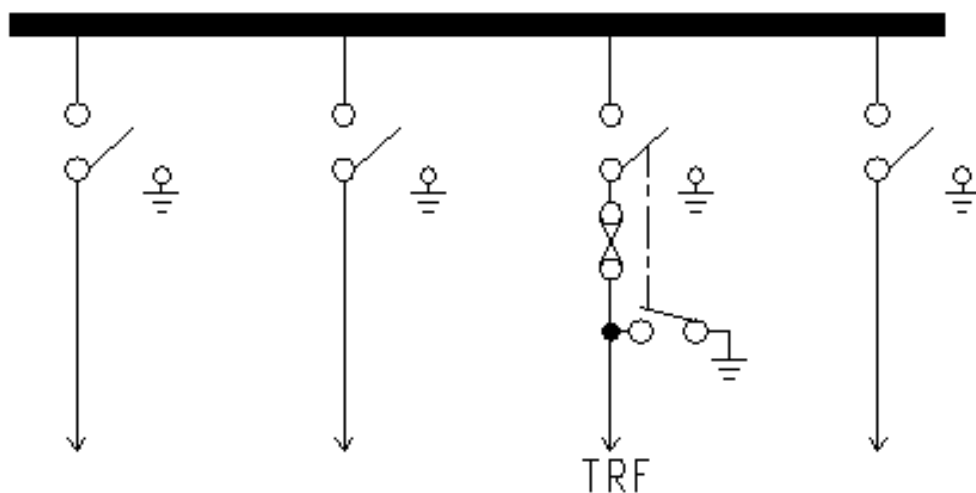


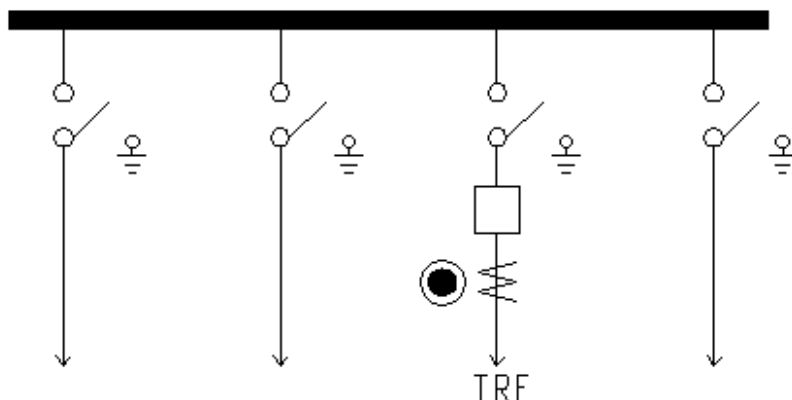
Figure 12: Diagram no. 6

RM6 NE IID1

Three switch units for ring main feeders

One Circuit-breaker unit for transformer feeder

Indoor subs only



6.0 AUTHORITIES AND RESPONSIBILITIES

Chief Engineer has the authority and responsibility for:

- approving this instruction; and
- approving variations to the requirements of this instruction.

Manager Primary Systems has the authority and responsibility for endorsing and recommending changes and revisions to this instruction.

Network Substations Manager has the authority and responsibility for revising and updating this instruction in accordance with company policy and procedures.

Regional managers have the authority and responsibility for determining that all designs carried out by Regional employees conform to the requirements of this instruction.

Manager Network Connections has the authority and responsibility for determining that all designs carried out by Level 3 ASPs conform to the requirements of this instruction.

Accredited Service Providers have the authority and responsibility to determine that the latest issue of any instruction or drawing relevant to or listed in this manual is available and used during the design of any project.

7.0 DOCUMENT CONTROL

Documentation Content Coordinator	: Network Substations Manager
Documentation Distribution Coordinator	: Branch Process Coordinator