

Ring Main Unit SCADA Switchgear Interface

Document No. ETS 0115

Amendment No. 0

3/06/24



**Endeavour
Energy**

**POWER
together**

Revision History

Nil.

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Document Control

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1. Documentation Scope

Three (3) Equipment Technical Specifications have been prepared for suppliers to deliver Endeavour Energy's functional and technical requirements for the SCADA connected Ring Main Units (RMU):

ETS 0114 - RMU SCADA RTU hardware interface outlines the requirements for the SCADA Remote terminal unit (RTU), the cubicle that houses the RTU, and cubicle plug interface.

ETS 0115 - RMU SCADA switchgear interface outlines the requirements for the switchgear interface and the cable between the switchgear and RTU.

ETS 0116 - Field device SCADA requirements outlines the RTU communications and general requirements necessary to integrate with the Endeavour Energy SCADA system.

The split of responsibilities between these documents is visualised below:

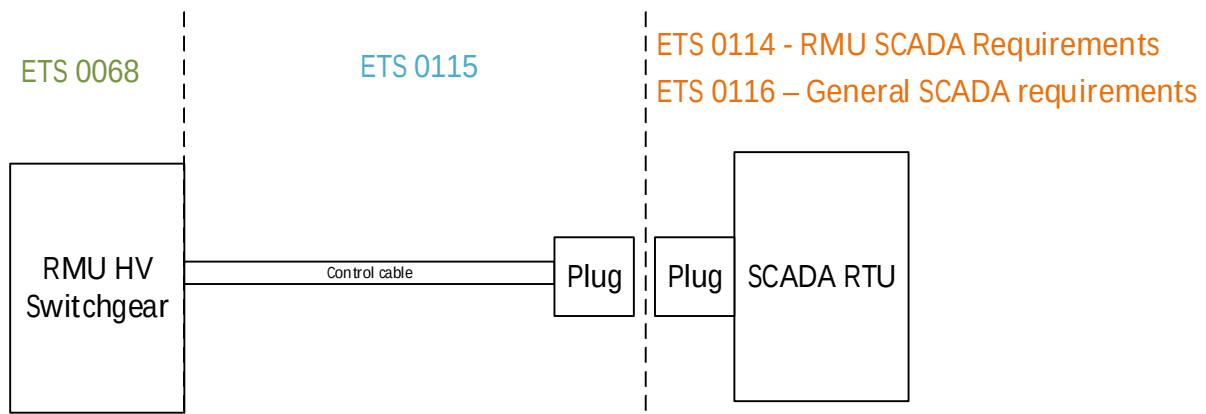


Figure 1: Split of responsibilities between RMU ETS documents.

Non-SCADA requirements for HV Switchgear can be found in ETS 0068 - Distribution indoor and pad-mount substation 12-24kV switchgear.

2. References

External Regulations		
Electricity Supply Act 1995 (NSW)		
Work Health and Safety Act 2011		
Work Health and Safety Regulation 2017 (NSW)		

External Standards		
Standard No.	Year	Title
AS/NZS 3000	2023	Electrical Installations
AS 60529	2004	Degrees of protection provided by enclosures (IP Code)
AS 62271.201	2019	High voltage switchgear and control gear Part 201: AC

		insulation-enclosed switchgear and control gear for rated voltages above 1kV and up to and including 52kV.
ENA Doc 01	2019	ENA National Electricity Network Safety Code

Company Policies and Procedures

Company Policy (Network) 9.2.1 – Network Planning

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

Company Standards

ETS 0114 – Automated RMU Controllers

ETS 0116 – Field Device Remote Terminal Units

3. Definitions and Abbreviations

Term	Definition
CT	Current Transformer
I/O	Input/Output
M	Mandatory Requirement
P	Preferred Requirement
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition

4. Actions

4.1.1 Switchgear Local and Remote Control

The switchgear must include a two-position switch on the front of the panel. The local / remote switch shall electrically inhibit the ability to perform remote operations from connected SCADA control cubicles based on its respective state.

Remote Mode

Controls originating from the SCADA control cubicle are passed through to the motorised switches. Local operation of each switch shall still be available for manual switching purposes.

Local Mode

In this mode, all operations are blocked from the SCADA control cubicle. The selector switches shall physically disconnect the control lines (or supply) to each of the motorised switches when in local.

4.1.2 Required Control Functionality

Table 1 contains the minimum controls required for **each** motorised switch that will be made available to the SCADA control cubicle.

Table 1 - Required Controls

Point	Comment	Requirement
Open switch	Per switch	M
Close switch	Per switch	M

The RMU design shall be designed for an auxiliary supply voltage of 24Vdc from the RTU control cubicle.

4.1.3 Required Switchgear Signal

Endeavour Energy requires switch status indication from motorised switches only. Therefore, the number of 24-pin connections required from the RMU to the RTU box will be equal to the number of motorised switches.

Below are the minimum indication requirements for each motorised switch that will be made available to the SCADA control cubicle:

Table 2 - Required Indicators

Category	Point	Requirement
General ¹	Low gas / Low pressure	M ²
	Low gas lockout	M ²
	Remote/Local indication	M
Main switch position	Switch open status	M
	Switch close status	M
Earth switch position	Earth switch open status	M
	Earth switch close status	M
Measurement	Current A phase	M
	Current B phase	M
	Current C phase	M

¹General points are not required per switch i.e. Only a single indication is required for each of the points.

²The preferred requirement for SF Gas / Insulation pressure is two stage discrete contacts, one for low gas, and the other for low gas lockout.

Alternatively, where only a single low gas indication is available, the gas pressure gauge shall have at least 2 sets of contacts as follows:

- Contact 1 for an indication alarm to the RTU, and
- Contact 2 to isolate the control circuit supply.

4.2 CT Test and Isolation Block

The switchgear shall include a CT shorting and test block to allow for safe disconnection of the motorised switch loom cables when the switchgear is live. The following are required:

1. CT secondary circuit terminated to a test block (A, B, C, N) which will allow for shorting of CTs if the RTU needs to be removed. The following Phoenix contact terminal block is provided as an example (see Table 3 for specific part numbers). The supplier may use an alternate product that is fit for purpose and provides the same functionality.
2. CT secondary circuit wired in star configuration on the RTU side of the test block.
3. CTs installed within the switchgear for each motorised switch.
4. CT test block installed in the gas gauge compartment (or similar) to allow Endeavour Energy staff to short links. A CT test block must be installed for each motorised switch which will have CT's connected.

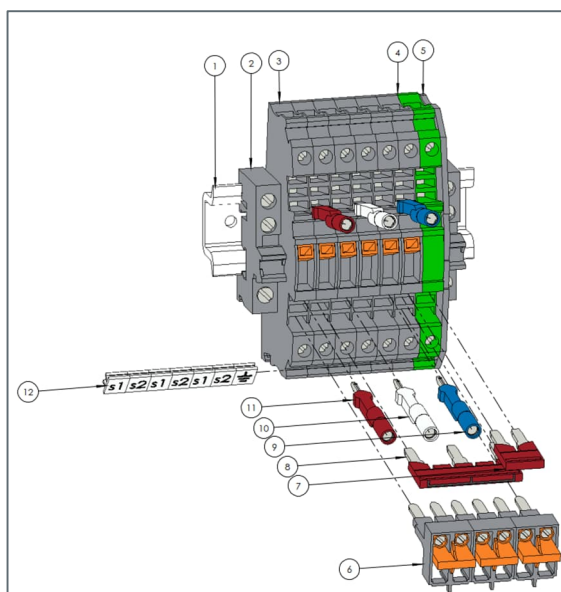


Figure 2: Example CT Shorting block to be provided for each motorised switch.

Table 3 - Phoenix CT Block Part Numbers

Item No	Description	Phoenix Part No	Quantity
1	DIN Rail	-	1
2	DIN Rail End Stop	1201142	2
3	Terminal, Test Disconnect	3047400	6
4	Terminal, Earth	3047442	1
5	Terminal End Cover	3047426	1
6	Switching Jumper	3000587	3

7	Plug-in bridge 1,2	3030284	1
8	Plug-in bridge, 1-3-5	3032389	1
9	Test Adapter, Blue	3032729	2
10	Test Adapter, White	3032797	2
11	Test Adapter, Red	3032732	2
12	Marker Strip (s1,s2,s1,s2,s1,s2, "earth symbol")	1052002	1

4.3 Open Circuit CT Protection

For each set of CT's within the RMU, the manufacturer shall provide a mechanism to reduce the hazards associated from the open circuit of the secondary wiring of current transformers. This is provided to reduce risks in the case that the plug is inadvertently disconnected from the RTU cubicle while the primary system is under load.

4.4 RMU to RTU Interface

The RMU-RTU interface shall be via a loom cable which is terminated to a 24-pin Phoenix Contact Heavycon Plug per switch on the side of the RTU enclosure.

Switch 1 requires the following item categories from Table 4 to be terminated between the male Heavycon plug insert and RTU I/O:

- "General Status + Motor Supply"
- Switch 1 "Indications"
- Switch 1 "Controls"
- Switch 1 "CT"

All subsequent switches require the following items to be terminated between the male Heavycon plug insert and RTU I/O:

- Switch 'n' "Indications"
- Switch 'n' "Controls"
- Switch 'n' "CT"

Refer to Table 4 for a detailed pinout configuration for each switch HeavyCon plug. Refer to Table 5 for specific Phoenix Contact HeavyCon part numbers.

The loom length from the compartment to the plug shall be 2m.

Table 4 - RMU-Loom Pinout Convention

Category	EVO HeavyCon Pinout	Pin size	Motorised Switch 1 (Plug 1)	All Additional Motorised Switches
Control	1	0.75mm ²	Remote control common +24 Vdc	Remote Control Common +24 Vdc
	2	0.75mm ²	Remote open	Remote open
	3	0.75mm ²	Remote close	Remote close
Indication	4	0.75mm ²	Switch open	Switch open
	5	0.75mm ²	Switch closed	Switch closed

	6	0.75mm ²	Indication common	Indication common
	7	0.75mm ²	Earth Switch (open indication)	Earth Switch (open indication)
	8	0.75mm ²	Earth Switch (close indication)	Earth Switch (close indication)
	9	0.75mm ²	Cable box cover removed	Cable box cover removed
spare	10		<i>spare</i>	<i>spare</i>
General Status + Motor Supply	11	1.5mm ²	Motor supply +24 Vdc	<i>Not used</i>
	12	0.75mm ²	Low gas	<i>Not used</i>
	13	0.75mm ²	Local/Remote	<i>Not used</i>
	14	1.5mm ²	Motor supply 0V	<i>Not used</i>
	15	0.75mm ²	Low gas lockout	<i>Not used</i>
Spare	16		<i>spare</i>	<i>spare</i>
	17		<i>spare</i>	<i>spare</i>
	18		<i>spare</i>	<i>spare</i>
	19		<i>spare</i>	<i>spare</i>
	20		<i>spare</i>	<i>spare</i>
CT	21	1.5mm ²	L1	L1
	22	1.5mm ²	L2	L2
	23	1.5mm ²	L3	L3
	24	1.5mm ²	Star point	Star point

Table 5 - Phoenix Contact HeavyCon Part Numbers

Description	Manufacturers Part Number
Male insert 24 way	1584033
Cord to cord body1	1407620
Cable gland + Strain relief	1414661
Coding pin (HC-CST)	1676857
Coding socket (HC-CBU)	1676860
Male pin 0.75mm ²	1674914
Male pin 1.5mm ²	1674875

4.5 Plug Coding

Each plug will be coded to ensure that each motorised switch cable cannot be plug into the incorrect socket. Phoenix Contact coding conventions are below in Figure 3.

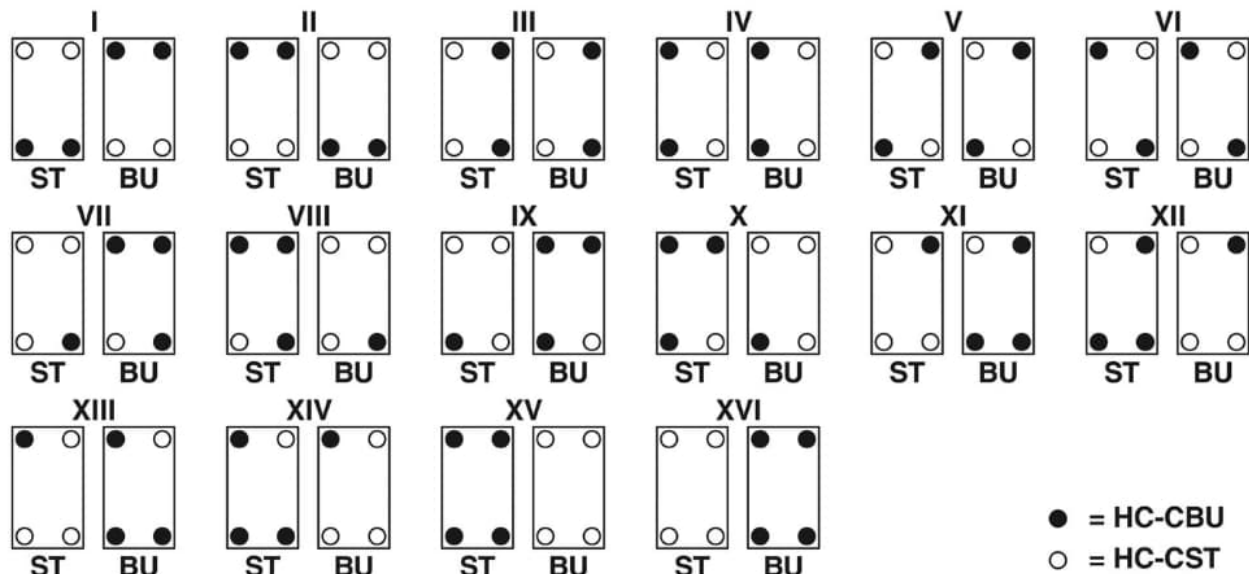


Figure 3: Phoenix Contact Heavycon Plug coding.

The coding for each plug shall for the RMU to receive switch cables 1 to 4 is given in Table 6.

Table 6 - Switch Plug Coding

Plug Number	Coding (Phoenix Contact Convention)	Diagram
Switch 1 ¹ (including general inputs)	I – ST	
Switch 2 ¹	II – ST	
Switch 3 ¹	III – ST	
Switch 4 ¹	IV – ST	

¹Switch numbering only includes motorised SCADA operable switches. Plugs are not allocated to non-motorised switches. Switch numbering is from left to right when viewed from the front.

4.6 Required Information

All relevant RTU and RMU design applications for approval must submit the following documentation:

- Schematic drawing of the control cubicle mounting location. The drawings must show typical markings, basic dimensions, hole locations and mounting brackets.
- Schematic electrical drawing comprising of all internal electrical, control wiring.
- Schematic drawing or table specifying the HeavyCon pinout to RTU I/O interface relevant to the manufacturer's implementation.
- Test report confirming all required inputs and outputs are functional via the HeavyCon plug.

5. Responsibilities

Head of System Operations has the authority and responsibility for:

- Approving this standard.

Secondary Systems Manager has the authority and responsibility for:

- Keeping the contents of this specification up to date.
- Making recommendations concerning compliance in respect to this specification.
- Evaluate and approve submissions from suppliers.

