

# Approved Protection Relays and Intelligent Electronic Devices for use in SSEN



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<b>TG-NET-PAC-004</b>	<b>Protection Relays and Intelligent Electronic Devices for use in SSEN</b>		<b>Applies to</b>	
			Distribution ✓	Transmission
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## 1 Introduction

This document lists the protection relays and Intelligent Electronic Devices (IEDs) which are approved by Scottish and Southern Electricity Networks (SSEN) for use on the power distribution system

- 1.1 All protection relays to be used on the SSEN network are subject to the ENA assessment process and/or extensively tested internally. This document contains a list of relays which are currently approved for use on the SSEN distribution network. For relays and equipment where the exact manufacturer configuration number is not specified an electrical engineer with the suitable knowledge and experience/or protection engineer must specify a relay appropriate for the application required. Where the protection design is carried out by a third party, SSEN may be contacted where clarification is required on a relay/application in order to prevent equipment being incorrectly specified. If a relay is not listed in this document it will be subject to Technical Authorisation in accordance with PR-NET-ENG-001 (see section 6).
- 1.2 This document exists to control the range of protection relays installed on the SSEN network so that relays for protection solutions are standardised whether installed and designed by SSEN, an Independent Distribution Network Operator (IDNO), an Independent Connections Provider (ICP) or where adoption of the third party equipment has occurred.
- 1.3 This list will be reviewed as cited in this document's review date to ensure the protection relays are economical to procure and continued to be 'fit for purpose' for use by SSEN, IDNOs and ICPs designing and installing equipment to be adopted by SSEN.
- 1.4 The cortecs / product codes listed are important and deviations from the listed cortecs / product codes are not permitted.
- 1.5 New IEDs with approved firmware versions should be factory tested for its functionality and the necessary type test certificates along with it's serial number need to be presented to the SSEN protection engineer. Occasionally 'Flashing a relay' with new firmware on site without factory tests may be necessary. The instructions to Flash a relay at site should be a recommendation from manufacturer and necessary supplier approved documentation should be in place to perform the action. The relays flashed should be recommissioned for all its functionalities and signal checks. Testing selected protection functions alone after 'Flashing' is not acceptable.

## 2 References

- 2.1 The documents detailed in Table 2.1 - Scottish and Southern Electricity Networks Documents Table 2.2 - External Documents

**Table 2.1 - Scottish and Southern Electricity Networks Documents**

Reference	Title
FO-NET-ENG-015	Technical Assessment and Approval of New or Changed Products
PR-NET-ENG-001	Technical Approval of Products for use by SSEN on the Distribution Network
PR-NET-ENG-002	Engineering Governance within Scottish & Southern Electricity Networks (Distribution)
BN-NET-PAC-001	IEC 61850 Based Solutions Usage in Distribution Business

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Table 2.2 - External Documents

Reference	Title
ENA ALP2-1	Protection Assessment Panel – Assessed Relays

### 3 Protection functions

The following abbreviations are used to describe the protection functions of the relays and the ANSI (American National Standards Institute) codes are here equated to the older SSEN codes. Table 3.1 - ANSI codes and the SSEN codes

Table 3.1 – ANSI Codes with SSEN description

ANSI	ANSI description	SSEN	SSEN description
21	Distance Relay	MHO / DIST	Distance protection
23	Temperature Control Device	WTT	Winding temperature trip
50	Instantaneous Overcurrent Relay	OCHS	Overcurrent high set (instantaneous)
50N	Neutral Instantaneous Overcurrent	E	Balanced earth fault (instantaneous)
50NTD	Neutral Instantaneous Overcurrent (Time Delay)	E DT	Earth fault delayed time
50TD	Instantaneous Overcurrent Relay (Time Delay)	OC DT	Overcurrent delayed time
50SG	Sensitive Ground Instantaneous Overcurrent	SEF	Sensitive earth fault
51	AC Time Overcurrent Relay	OCI	Overcurrent (IDMT characteristic)
51G	Ground Time Overcurrent	ESBI	Standby earth fault
51N	Neutral Time Overcurrent	EI	Balanced earth fault (IDMT)
51V	Voltage Restrained Time Overcurrent	OCVCI	Overcurrent voltage controlled
59NU-1	Neutral Voltage Unbalance stage 1	NPD1	Neutral voltage displacement stage 1
59NU-2	Neutral Voltage Unbalance stage 2	NPD2	Neutral voltage displacement stage 2
64	Restricted Ground Fault	RES	Restricted Earth Fault
64TH	Restricted Ground Fault (Transformer HV)	RES	Restricted Earth Fault
64TL	Restricted Ground Fault (Transformer LV)	RES	Restricted Earth Fault
67N	Neutral Directional Overcurrent	EDI	Directional earth fault (IDMT)
67P	Phase Directional Overcurrent	OCDI	Overcurrent directional (IDMT)
79	AC Reclosing Relay / Auto Reclose	DAR	Delayed auto-reclose
80	Liquid or Gas Flow Relay	BUCH	Buchholz relay
81U	Under Frequency	LFT	Low frequency
87	Differential Protective Relay	DIFF	Differential protection
87B	Bus Differential	CC	Circulating current busbar protection
87L	Segregated Line Current Differential	I DIFF/PP	Line differential/pilot protection
87T	Transformer Differential	DB	Duo bias
87HS	Transformer Differential High-set	DBHS	Duo bias high-set

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The protection functions ('Protection in use (ANSI)' column) ascribed to each relay are typical and include all the functions that may be required of that particular relay at the indicated voltage level. Special care should be taken to ensure that the protection functions in use are suitable for the network to be protected and this is the responsibility of the protection engineer designing the scheme. The functionalities listed are for reference purposes only and not for designing schemes.

## 4 Approval process

- 4.1 New relays to be used or trialled on the SSEN power distribution network will be subject to a Technical Authorisation in accordance with PR-NET-ENG-001 for 'New or Changed Products'. This process must be completed prior to the relay being procured, trialled or energised on the network.
- 4.2 Applications for Technical Approval of an IED has to be proactively made well ahead of trialling it in a Capital or Rechargeable live Project. It should not be presented as the only available solution pressurising the approving authority i.e being reactive to find protection solutions.
- 4.3 Trialling a new solution that is not ENA assessed by connecting in a SSEN location / test site (which has least customers) operating as parallel without 'trip-outputs-connected' is permitted, provided a Technical approval for the same is in place.
- 4.4 All IEDs or protection related solutions introduced in SSEN systems as part of the CB framework agreements, loose relay procurement as a replacement for historic relays or being part of a 'Design & Build' package needs to be technically authorised before reaching the design approval stage and before procurement.
- 4.5 Strategic Investments – Regions and Technical services (North and south) should not deal with suppliers directly receiving quotes for protection relays or Relay panels or any other OT related products without Procurement, OT standards and Equipment specification team's awareness. Involvement with the three key stakeholders in an early stage will ensure speedy approval process for any protection related solutions.
- 4.6 Technical Authorisation may only be granted by the Technical Authority, as appointed in PR-NET-ENG-002. The Technical Authority for Protection Relays and IEDs is the Standards Manager, Operational Technology. Submissions may be made to [operational.technology@sse.com](mailto:operational.technology@sse.com).
- 4.7 Relays will be removed from this document and updated: As the hardware is made obsolete / Where there are known reliability issues / Where SSEN incur high costs for repairs from suppliers / Where a brand of relay/equipment presents a risk to the network from plant requiring to be switched out to facilitate repair and replacement.
- 4.8 Relays will only be added to the list once adequate type testing has taken place internally, even if it has already been subject to Electricity Networks Association (ENA) assessment. In some cases relays can be included where suitable internal testing has taken place, results documented, and the relay is subject to similar IEC or ANSI standards as applied by the ENA but not ENA assessed. All reasonable efforts will be made to have the relay approved in cases where it is not.

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## 5 6.6 and 11kV Secondary Substation Protection Relays, tripping relays and interpose /control relays

Table 5.1 – Approved protection relays for RMUs, trip relays and Aux relays

Ground Mounted Units (RMUs)	
Manufacturer	Model
<b>Relays in use</b>	
GE	MiCOM P124
Merlin Gerin	VIP 300
Siemens	Argus NVD

Tripping relays and test plugs			
Manufacturer	Model	Contacts	
		N/O	N/C
GE	MVAJ051RA0800	5	-
GE	MVAJ101RA0800A		
GE	MVAJ103RA0802A	8	2
GE	MVAJ105RA0802A	8	2
GE	MFAC34VA0001A	-	-
GE	MVAX12R1DB0756A		
GE	MMLG02	-	-
Siemens	RMLG-02 - 7XG2220		

Interpose and control relays			
Manufacturer	Model	Contacts	
		N/O	N/C
GE	Prima relays	-	-
GE	MVAA		
GE	GCM05XX0751A	4	-
ABB	NSD570		
SEL	SEL2411 - Automation Controller (I/T unit) 241101DA0BDBD0X1030	10	11
SEL	SEL 2829M (Fibre/Serial Converter)		
SEL	SEL-2440 Automation controller		
Siemens	Rectifier 7PG2120-0AA00-1CCA		
Siemens	Alarm relay B22 7PG2132-1CC40-1AA0	2	2
Siemens	Pilot supervision B74/B75 7PG2144-1CC40-1CE0	2	2

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## 6 6.6 and 11kV Primary Substation Protection Relays

Table 6.1 – Approved relays for 6.6 kV and 11kV systems

6.6kV to 11kV Indoor substations protection relay list									
Protection asset / Protection location	MPR/ BUPR	Protection in use (ANSI)	Relay Model	Siemens			GE		
				Argus - 7SR2204-2AA12-0EA0	Solkor N - 7SG1813-7DC10-0EB0	Solkor RF 7PG2111-1DA30-0DB0	P14NZ11A120610A	P14DB11A4C0500A	MFAC34VA0001A
			I/p	13	9	3NO	-	-	-
			O/p	14	7	0NC	-	-	-
Transformer incomer	LVPR	51, 51N, 67P, 79, 64TL		X					
Feeder standard auto	MPR~	51, 51N, 50TD, 50NTD, 50SG, 79		X					
Feeder unit	MPR	87L, 51, 51N			X				
	BUPR~	51, 51N, 50SG		X					
Feeder incomer standard	MPR~	51, 51N, 50SG		X					
Feeder incomer unit	MPR	87L, 51, 51N			X				
	BUPR~	51, 51N, 50SG, 67P, 67N		X					
Bus section standard	MPR~	51, 51N		X					
Bus section cabled (left hand)	MPR#	87							X
	BUPR~	51, 51N		X					
Bus section cabled (right hand)	BUPR~	51, 51N		X					
Bus section trunking (left hand)	MPR~	51, 51N		X					
Bus section trunking (right hand)	MPR~	51, 51N		X					
Feeder standard metered	MPR~	51, 51N, 50SG		X					
Feeder unit metered panel	MPR	87L, 51, 51N			X				
	BUPR~	51, 51N, 50SG		X					

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Feeder incomer standard metered	MPR~	51, 51N, 50SG, 67P, 67N		X					
Feeder incomer unit metered	MPR	87L, 51, 51N			X				
	BUPR~	51, 51N, 50SG, 67P, 67N		X					
Feeder unit with Solkor RF send & pilot supervision	MPR	87L				X			
	BUPR~	51, 51N, 50SG		X					
Feeder unit with Solkor RF receive & pilot supervision	MPR	87L				X			
	BUPR~	51, 51N, 50SG		X					

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## 7 22 and 33kV Grid and Primary Indoor Substation Protection Relays

Table 7.1 – Approved relays for 22kV and 33kV Indoor systems

22 - 33kV Indoor substations protection relays list													
Protection asset / Protection location	MPR/ BUPR	Protection in use (ANSI)	Relay Model	Siemens		GE			Toshiba				
				Argus - 7SR2206-2AA87-0EAO	Solkor RF 7PG21111-1DA30-0DB0	P143 (OCDI with Load blinder) - P143811C4M0460J	B90D - B90-U00-HKH (restricted)	MFAC34V1AA0001A	GRE110-420A-10-10	GRL150-110A-10-10	HW: GRL200-11-F11-12-1J-31-110 SW: GRL200-1033-1J2-FE	HW: GRZ200-11-F11-00-1J-31-110 SW: GRZ200-1030-1J2-FE	
			I/p	33					-	2	-	7	7
			O/p	14					-	4	-	10	10
33kV Bus Bar Protection													
Bus section	BUPR	51, 51N		X									
Bus coupler	BUPR	51, 51N		X									
Transmission grid transformer incomer	MPR												
	BUPR												
Distribution grid transformer incomer	MPR												
	BUPR	51, 51N, 51V, 67P, 81U, 79				X							
Primary transformer feeder (local circuit breaker)	MPR	50, 51, 51N, 51G							X				
	BUPR~	50, 51, 50N, 59NU-1, 59NU-2, 80, 23		X									

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Cable I/C master	MPR#	87						X				
	BUPR	51, 51N		X								
Cable I/C slave	BUPR	51, 51N		X								
	MPR	50, 51, 50N							X			
Transformer feeder with fault thrower at remote end	BUPR	50, 51, 51N, 50SG, 79		X								
	MPR	50, 51, 50N							X			
Transformer feeder with GCM05 copper pilot intertrip	BUPR	50, 51, 51N, 50SG, 79		X								
	MPR	87L, 50, 51, 51N									X	
Transformer feeder with fibre optic intertrip	BUPR	50, 51, 51N, 50SG, 79		X								
	MPR	50, 51, 50N							X			
Generation feeder with metering	BUPR	50, 51, 50NTD, 51N, 50SG, 59NU		X								
	MPR	21, 51, 51N, 67N										X
Distance protection feeder	BUPR	51, 51N, 50SG, 79		X								
	MPR	87L, 51, 51N									X	
Unit protected feeder with fibre pilot	BUPR	51, 51N, 50SG, 79		X								
	MPR	87L, 51, 51N							X			
Unit protected feeder with copper pilot	BUPR	51, 51N, 50SG, 79		X								
	MPR	87L			X							
Unit protected feeder with copper pilot - sending end	BUPR	51, 51N, 50SG, 79		X								

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Unit protected feeder with copper pilot - receiveing end	MPR	87L			X							
	BUPR	51, 51N, 50SG, 79		X								
Unit generation feeder with metering & fibre	MPR	87L, 50, 51, 51N								X		
	BUPR	50, 51, 50NTD, 51N, 50SG, 59NU		X								
~	High Voltage Protection Relay (HVPR)											
#	Cable Zone Protection Relay (CCR)											

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Table 7.2 – Approved relays for 22kV and 33kV Outdoor systems

22 - 33kV Outdoor protection relays list																
Protection asset / Protection location	MPR/ BUPR	Protn in use	Siemens				Alstom / GE					ZIV-IR0247-3ZLV-F1 ZZE1FOSMN	Supertapp N+	A-Eberle - 112.2473_03 v3.24		
			Argus C - 7SR1102-1GA12-2AA0	Argus - 7SR2206-2AA87-0EAO	Solkor N - 7SG1813-7DC10-0EB0	Solkor RF	P542811C4M0300J	P142 - P142811C4M0410J	P143 (32 input version) - P143811F4M0410J	P143 (OCDI with Load blinder) - 143811C4M0460J	P143 (with InterMiCOM) - P14381EC4M0410J				P143 (without InterMiCOM) - P143811C4M0410J	P445 - P445811C4M0370J
			1 / p	3	33	9										
			0 / p	5	14	7										
33kV BB Protection																
Transmission grid transformer incomer	MPR			Transmission owned												
	BUPR			Transmission owned												
Distribution grid transformer incomer	MPR			Transmission owned												
	BUPR	51, 51N, 51V, 67P, 81U, 79														
Bus section using P142 Relay	BUPR	51, 51N							X							
Bus coupler using P142 Relay	BUPR	51, 51N							X							

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33kV Transformer feeder with copper pilot intertrip using P143 & Argus	MPR	50, 51, 50N	X																
	BUPR	50, 51, 51N									X								
Primary transformer (local circuit breaker) P143 & Argus	MPR~	50, 51, 51N, 50N, 59NU-1, 59NU-2, 51G, 79, 80																	
	BUPR	50, 51, 51N	X																
AVC	VRR																	X	X


~ High Voltage Protection Relay (HVPR)  
 (A) Circuit A  
 and  
 (B) and B

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## 8 66 and 132kV Grid Substation Protection Relays

Table 8.1 – Approved relays for 66kV and 132kV systems

66 - 132kV Outdoor and Indoor substations protection relays list														
Protection asset / Protection location	MPR/ BUPR	Protn in use (ANSI code)	Relay Model	GE									Supertapp N+	A-Eberle - 112.2473_03 v3.24
				DUO-Bias-M - 7SR2423-2AA12-0CA0	MFAC34V1AA0001A	P142 - P142811C4M0410J	P143 (32 input version) - P143811F4M0410J	P143 (with InterMiCOM) - P14381EC4M0410J	P143 (without InterMiCOM) - P143811C4M0410J	P445 - P445811C4M0370J	P642 - P642821D4M0040J	P643 - P643821D4M0040K		
			I/p			16	32	24	24	16	12	24		
			O/p			7	14	14	14	16	12	16		
132kV Busbar Protection	MPR													
HV Connections Protection	MPR			X										
132kV OH Feeder Protection using P445	MPR	21, 51, 67N, 79								X				
	BUPR	51, 51N								X				
132kV Cable Feeder Protection using Solkor N & P143 without intertrip	MPR	87L, 50, 51, 51N												
	BUPR	50, 51, 51N								X				

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132kV Transformer feeder (Cable) Protection using Solkor N & P143 with intertrip	MPR	87L, 50, 51, 51N											
	BUPR	50, 51, 51N					X						
132kV Network Bus Section Protection using 2 P445s	MPR (A)	21, 51, 67N, 79							X				
	MPR (B)	21, 51, 67N							X				
132kV Bus Section using P142 Relay	BUPR	51, 51N				X							
132kV Bus Coupler using P142 Relay	BUPR	51, 51N				X							
Transformer Protection using Duo-Bias-M, P143	MPR (TRPR)	87HS, 87T, 64TH, 64TL, 81U, 80		X									
	BUPR*	51, 51N, 51G (Stage-2)							X				
Transformer Protection using P643, P143	MPR	87HS, 87T, 64TH, 64TL, 80									X		
	BUPR	51, 51N, 51G							X				
Transformer AVC	VRR											X	X
	*	High Voltage Protection Relay (HVPR)											
	(A)	Circuit A											
	(B)	Circuit B											



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## 9 Historic relays present in SSEN substations (For information only)

Table 9.1 Historic relays

66/132kV		22/33kV		6.6/11kV	
Relay	Prot. Function	Relay	Prot. Function	Relay	Prot. Function
MCGG42		MCGG22	51G	P121	51G
MCGG52		MCGG42		P122	
MCGG62		MCGG52		P141	
MCGG82		MCGG62		P142	
MCAG14		MCGG82		P521	87
MCAG19		MCAG14		Solkor N	87
MCAG34		MCAG39		SolkorRf	87
MCAG39		KCGG120		MFAC34	87B
KCGG120		KCGG122	51G	FV2	
KCGG130		KCGG140		CDG12	
KCGG140		KCGG142		CDG31	
KCGG141		KCEG130	67P	CDD21	
KCGG142		KCEG140	67P, 51NTD	MFAC14	64
MVTR52		KCEG142	51, 51V, 27	MCAG14	64
MVTR59		TJEV	67P	MCGG52	51N
MVAJ25	TRR	BD	67P	METI31	67P
MVTT	TRR	METI31	67P	MCGG62	67P
MVTT14	OC2S12	CAG14	64	MCGG22	51G
CAG14	64	CAG17		KCGG140	
CAG17		CAG37		KCGG142	
CAG19		CDG11		KCEG142	51G
CAG33		CDG12		7SR220	
CAG37		CDG31			
CDAG51		CDG51			
CDG11		CDAG31			
CDG12		CDAG51			
CDG31	51	CDG SPEC			
CDG61	51	CDD21	67P/67N		
CDD21		CGD31	51		
VAT11	51	P122			
2DCC		P123			
2DCC03		P127	67P		
AKC2		P141			

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P121		P142	
P122		P143	
P142		P445	
P143		P521	DD
P143IM		PBO	51
P443		PBOA	51N
P445		PG2	51G
P742		PG3	51G
PBO		BSE	51G
PBO2		ARGUS 7SR	
ARGUS 7SR		TJM10	51, 51N
TJV		2TJM10	51, 51N
B69		MVUA11	OC2SI2, 79
B3	64	MVTT14	OC2SI2
2B3	64	MVTU18	59NU
FAC	64	KBCH120	87, 50N, 64
FAC14	64	MFAC	87B
DB M200	87T	MFAC34	87B
DT2	87T	DAD	87B
DUOBIAS M	87T	TRANSLAYS	87L
FV2	87T_CC	MCB102/TRANSLAY	87L
C21	87T	7SD60	87L
4C21	87T	SolkorRf	87L
PBD2	87T	Solkor N	87L
7SR242	87T	HO2	87L
MBCH12	87T	HOA2	87L
P521	87	MHOA4	87L
MBCZ	87B	RSG2	87L
P741	87B	P542	87L
CAG34	87B	QUADRAMHO	21
FSL	87B	SD14E	21
DBA2	87B	AEG SD14E	21
Solkor N	87, 51, 51N	SSM3V	21
SolkorRf	87L	LFZP122	21
MFAC34	87	Ohmega311	21
S01-137DC	87L	THR 3PE1	21
HO2	87L	SHPM101	21
DS4	87L	MHR4	21
MICRO Ph	87L	SSRR3V	21

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MBCI	87L	OPTIMHO	21, 67N	
OPTIMHO	21	P443	21, 79	
LFZP122	21	MICOMP443	21, 79	
LFZP112	21	VAT	79	
QUADRAMHO	21	VAR21	79	
SHPM101	21	VAR22	79	
KAVR100	79	VAR42	79	
KAVR159	79	VAR51	79	
VAR102/3	79	VAR101	79	
T4DA1	79	VAT11	79	
MVTP31	59	VAU	79	
Basler	81U	MVTR51	79	
AKA2	74	KAVR100	79	
AKH3	74	KAVR159	79	
VAT21	74	KVTR100	79	
DBA	74	ARGUS 8	81U	
DBM4	74	FTG	81U	
MVUA	74	BE181	81U	
VTX	74	Basler	81U	
MVUA11		P923	81U	
MVAA11		ROCOF	81R	
		B3	64	
		DUOBIAS M	64	
		FAC	64	
		FAC14	64	
		FV2	64	
		VMG	27	
		VAG	27	
		VAG70	27	
		MVAG31	27	
		MVAG34	27	
		MCAG34	27	
		GF3	INT	
		TEB DDB1	VTS	
		MVTP31	74	
		VTX31	74	
		NSD570	I/T	
		TDS	I/T	

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Local control Unit / Recloser controllers & protection relays	
Historic Relays	
GE	CDG31
Hawker Siddeley	Polarr (GVR)

## 10 Revision History

No	Overview of Amendment and Text affected	Previous Document	Revision	Authorisation
01	New document created	N/A	1.00	Andrew Robertson

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