

Technical Schedules

Technical Schedules – MV Cables

Employer's requirements (A)

Supplier Technical Offerings and Guarantees (B)

Item	Description	Units	Schedule A	Schedule B
	Cable Characteristics			
1.01	Rated voltage (Ur)	kV	22	
1.02	Number of cores (1- Core or 3- Cores)	No.	3	
1.03	Conductor Type	Cu/Al	Cu	
1.04	Insulation	PILC/ XLPE	XLPE	
1.05	Screening of cables	Y/N	Yes	
1.06	Semiconducting core screen	Y/N	Yes	
1.07	Core identification	Y/N	Yes	
1.08	Metal sheath	Y/N	Yes	
1.09	Bedding under armouring	Y/N	Yes	
1.10	Armouring / copper wire screened	Y/N	Yes	
1.11	Conductor Size	mm ²	50	
1.12	Rated frequency (fr)	Hz	50	
1.13	Bear SABS Mark	Y/N	Y	
1.14	Applicable Product Standard		SANS 1339	
1.15	Applicable Eskom Standard for XLPE Cable		240- 56063792	
1.16	Type of outer sheath		MDPE	
1.17	Ultraviolet (UV) radiation stabilized outer sheath		required	
1.18	Reduced halogen emission properties if PVC used for armour bedding and outer sheath		required	
1.19	Longitudinal water blocking for conductor and cable		required	
1.20	Method used to achieve water blocking		specify	
1.21	Instructions for conductor water blocking removal for jointing & termination		required	
1.22	Hole for wooden drums for a spindle in mm if not 80mm (minimum).	mm	Specify	
1.23	Drum length	m	N/A	
1.24	Cable outer sheath marking to SANS 97 or 1339		required	
1.25	Type tests report and applicable certificates to be provided		required	
1.26	Marking of cable identification system		required	

	Description	Units	Schedule A	Schedule B
1.27	Cable identification system location		As per Spec	
1.28	Dimensions of cable offered		provide	
1.29	Maximum sustained current rating in Ground	A	provide	
1.30	Maximum sustained current rating in Air	A	provide	
1.31	Maximum sustained current rating in Ducts	A	provide	
1.32	Short circuit rating	kA	provide	
1.33	Cable mass	Kg/m	provide	
1.34	Gross mass per standard drum length	kg	provide	
1.35	Resistance at max conductor temperature	Ω	provide	
1.36	Reactance per phase?	Ω/m	provide	
1.37	Capacitance per phase?	nF/m	provide	
1.38	Zero sequence impedance per phase?	Ω/m	provide	
1.39	Zero sequence capacitance per phase?	nF/m	provide	
1.40	Cable thermal time constant?	s	provide	
1.41	Cable Terminations to comply with Eskom Specification 240-56030619	Y/N	yes	

Technical Schedules – MV Reactor

Employer's requirements (A)

Supplier Technical Offerings and Guarantees (B)

Item	Description	Units	Schedule A	Schedule B
1. Environmental				
1.1	Altitude above sea level	m	1800	
1.2	Ambient temperature			
	Maximum	C	45	
	Minimum	C	-10	
	Daily average	C	35	
	Yearly average	C	30	
	Maximum average daily temperature variation	C	20	
1.3	Relative humidity			
	Minimum	%	50	
	Maximum	%	96	
	Average	%	68-83	
1.4	Solar radiation			
	Maximum	W/m ²	2.6 x 103	
1.5	Wind loading	Pascal s/ ms- 1	1200/40	
1.6	Pollution		Inland	
1.7	Type		Industrial	
1.8	Classification (IEC 60815)	mm/kV	31	
1.9	Climatic conditions		Rain/dry/ h ail/high UV radiation	
1.10	Seismic level	g	0.3	
2. System Details				
2.1	Maximum system voltage (Um)	kV	22	
2.2	Temporary overvoltage			
	For 10 min	kV	1.05 Um	
	For 1 min	kV	1.25 Um	
	For 5 s	kV	1.5 Um	
	For 1 s	kV	1.75 Um	
2.3	Nominal system frequency	Hz	50	
2.4	Number of phases		3	
2.5	Three-phase system fault levels (design value)	kA	provide	
2.6	Single-phase system fault levels (design value)	kA	provide	
3. Type				
3.1	Phases	1Ø/3Ø	3Ø	
3.2	Model		provide	
3.3	Winding Connections		delta	
3.4	Application		Shunt Reac tor – capacitive curre nt compensation	

4. Reactor Rating				
4.1	Rated power	kVAr	Refer enquiry document	
4.2	Rated voltage	kV	24	

Technical Schedules – MV Reactor

Employer's requirements (A)

Supplier Technical Offerings and Guarantees (B)

Item	Description	Units	Schedule A	Schedule B
	Cable Characteristics			
1.01	Rated voltage (Ur)	V	400	
1.02	Number of cores	No.	2/3/4	
1.03	Conductor Type	Cu/Al	Cu/Al	
1.04	Insulation	PVC/ XLPE	PVC	
1.05	Core identification	Y/N	Yes	
1.06	PVC Bedding under armouring	Y/N	Yes	
1.07	Galvanised steel wire armoured	Y/N	Yes	
1.08	Conductor Size	mm ²	2.5-185	
1.09	Rated frequency (fr)	Hz	50	
1.10	Bear SABS Mark	Y/N	Y	
1.11	Applicable Product Standard		SANS 1507	
1.12	Applicable Eskom Standard for LV Cable		240- 56063805	
1.13	Outer sheath material		PVC	
1.14	Ultraviolet (UV) radiation stabilized outer sheath		required	
1.15	Reduced halogen emission properties of PVC used for armour bedding and outer sheath		required	
1.16	Hole for wooden drums for a spindle in mm if not 80mm (minimum).	mm	Specify	
1.17	Drum length	m	500	
1.18	Cable outer sheath marking to 1507		required	
1.19	Type tests report and applicable certificates to be provided		required	
1.20	Marking of cable identification system		required	
1.21	Cable identification system location		As per Spec	
1.22	Dimensions of cable offered		provide	
1.23	Maximum sustained current rating in Ground	A	provide	
1.24	Maximum sustained current rating in Air	A	provide	
1.25	Maximum sustained current rating in Ducts	A	provide	

Technical Schedules – Free Standing RMU

Employer’s requirements (A)

Supplier Technical Offerings and Guarantees (B)

Item	Document	Sub-clause	Description	Units	Schedule A	Schedule B
			RMU 22kV 630A/200A 2R1B			
1.1			Nominal voltage	kVrms	22	
1.2	SANS 1874 4.2.1		Rated power-frequency voltage	kVrms	24	
1.3	SANS 1874 4.2.2		System frequency	Hz	50	
1.4			Number of phases		3	
1.5			System voltage range	pu	0.9 to 1.1	
1.6	240- 56030406		Rated lightning impulse withstand voltage	kVpeak	150	
1.7	SANS 1874		Rated short-duration power frequency withstand voltage	kVrms	50	
1.8	SANS 1874		Rated normal current of busbars	A	630	
1.9	SANS 1874	4.4.1.3	Rated normal current of switch dis-connector	A	630	
1.10	SANS 1874	4.6.1.3	Rated current of circuit breaker	A	630 or 200	
1.11	SANS 1874	4.2.4.1	Rated short-time withstand r.m.s. current (3 seconds)	kArms	20	
1.12	SANS 1874	4.2.4.3	Rated short-time withstand r.m.s. current (3 seconds) of earthing switches	kArms	20	
1.13	SANS 1874	4.2.4.1	Rated peak withstand current	kApeak	50	
1.14	SANS 1874	4.2.6	Rated short circuit breaking current of the circuit breaker	kArms	20	
1.15	SANS 1874	4.2.7	Rated short circuit making current	kApeak	50	
Design						
2.2	SANS 1874 4.18		Irrespective of the inland or coastal rating the RMU enclosure shall be suitable for coastal applications		All RMUs shall be suitable for Coastal applications	
2.3	SANS 1874	4.3.2	Extensible unit required?		No	
2.4	SANS 1874	4.3.3.3	Degree of protection offered (RMU):			
	SANS 62271-200		a) moving parts		IP 2X	
	SANS 62271-200		b) live parts		IP 2X	

	SANS 876		c) cable boxes		IP 3X	
2.5	SANS 1874	4.3.5	Type of cable test facilities offered?		Yes	
	SANS 1874	4.3.5.4	Cable test facilities interlocked?		Yes	
2.6	SANS 1874	4.3.9.1	Interlock with remote equipment required? If yes, state	Y/N	No	
			a) type of interlock required		N/A	
			b) auxiliary supply details		20 or 16	
			c) interfacing details of remote equipment		N/A	
2.8	SANS 1874	4.3.9.2	Interlocking facilities offered		N/A	
2.9	SANS 1874	4.3.10.2	Insulating medium		provide	
2.10	SANS 1874	4.3.10.2	Minimum maintenance free period	yrs.	30	
2.11	SANS 1874	4.3.10.3	Interrupting technology (switch dis-connectors)		provide	
2.12	SANS 1874	4.3.10.3	Interrupting technology (circuit breaker)		provide	
2.13	SANS 1874	4.3.14.1 a)	IAC required for RMUs -AFLR in accordance with SANS 62271-200?		Yes	
2.14	SANS 1874	4.3.14.1	IAC required for the RMUs (AB - FLR in accordance with SANS 62271-200 & SANS 62271-202)?		Yes	
<u>Switch-disconnectors</u>						
3.1	SANS 1874	4.4.1.1	Class of switch dis-connector (min)		E2-M1	
3.2	SANS 1874 & 240-56062752	4.3.5.1 & 3.1.1 a)	Cable test facility to be independent of cable termination enclosure?		Yes	
3.3	SANS 1874	4.3.5.4	Cable test facilities interlocked?		Yes	
3.4	SANS 1874	4.4.2.2 / 4.9.2	Provision for remote tripping and closing required (i.e. remote control via RTU)?	Y / N	N	
3.5	SANS 1874	4.4.2.2 / 4.9.2	Details of remote opening and closing offered		N/A	
3.6	SANS 1874	4.4.2.2 / 4.9.2	Provision for remote indications and alarms required (i.e. via RTU)?	Y / N	N	
3.7	SANS 1874	4.6.2.18	Provision for hand-held remote control unit (open, close and earth) required?		Yes	
3.8	240-56030406	3.4b) and 3.25a)	Type of plug-in connector to be supplied			
3.9	240-56030406		Pins for trip control function		C and D	
3.10	240-56030406		Pins for close control function		A and B	

3.11	240-56030406	3.25	Details of provisions offered for hand-held remote control unit	24V/110V	Yes	
3.12	SANS 1874	4.9.1.4	Accuracy class and burden (VA) of CT offered (if applicable)		N/A	
3.13	SANS 1874	4.9.1.6 / 4.9.2	Provision for communication with an RTU (i.e. remote analogue indication)?		No	
3.14	SANS 1874	4.9.1.7	Type of ammeter/multi-meter offered		provide	
Cable termination enclosure of the switch dis-connector functional units						
4.1	240-56030406	3.13	Spacing between bushing centres (min)	mm	105 mm or 90 mm	
4.2	240-56030406	3.13	Spacing between outer bushing centres and enclosure side wall	mm	55 mm or 50 mm	
4.3	SANS 1874	4.8	Distance from bushing centre line to cable support clamp (min). The cable support clamp shall be mounted above any bottom enclosure mounted plates for 3 core cable termination applications. For 1 core cable termination applications where bottom plates are required to be mounted above the cable clamps for Internal Arc venting compliance, the plate shall be positioned to meet the SANS 876 requirement for a 22 kV voltage rating single core cable termination to be fitted.	mm	800	
4.4	SANS 1874	4.8	Bushings horizontally positioned?	Y/N	YES	
4.5	SANS 1874	4.8.4	Type of bushing		EN 50181 C-type interface	
4.6	SANS 1874	4.11.4	Cross sectional area of earthing bar (min)	mm ²	120	
4.7	SANS 1874	4.8.6	Type of cable support clamp		SANS 876 / D-DT-8019 / 240-56062752	
4.8	240-56030406	3.13 g)	Size (range) of cable support clamp (3 Core Cable	mm	50-100	
4.9	240-56030406	3.13 g)	Size (range) of cable support clamps (3 * 1	mm	25-55	
Circuit-breakers for tee-offs						
5.1	SANS 1874	4.6.1.1	Class of circuit-breaker (min)		E2-M1	
5.2	SANS 1874	4.6.1.3	Rated normal current of the circuit-breaker (200A/630A).	A	200A / 630A	
5.3	SANS 1874	4.3.5.1	Cable test facility to be independent of cable termination enclosure?	Y/N	Not mandatory (if available to be supplied)	
5.4	SANS 1874	4.6.3.3 / 4.9.2	Provision for remote tripping and closing, and the opening for the inline dis-connector required (i.e. remote control via	Y/N	No	
5.5	SANS 1874	4.6.3.4	Details of remote tripping and closing, and the opening for the inline dis-connector where applicable offered.		provide	
5.6	SANS 1874	4.9.2	Provision for remote indications and alarms required (i.e. via RTU)?	Y/N	No	

5.7	240-56030406	3.4	Provision for hand-held remote control unit (trip and close) required?	Y/N	Yes	
5.8	240-56030406	3.4 b)	Type of plug-in connector to be supplied		ITT Cannon type CA 3102 A 14S-2 or equivalent	
5.9			Pins for trip control function		C and D	
5.10			Pins for close control function		A and B	
5.11	240-56030406	3.4	Details of provisions offered for hand-held remote control unit	24V/110V	provide	
5.12	240-56030406	3.10 b)	Second Trip Coil required and Voltage	Y	No	
Protection relay Requirements						
5.12	240-56030406	3.6.1	Self-Powered Protection Relay (SPR) required.	Y/ N	Y	
5.12.1	240-56030406	3.6	Protection functional requirements satisfied, i.e. functions, setting ranges, characteristic curves etc. (provide technical manual).		provide	
5.12.2	240-56030406	3.6.1.1 c)	Details of provisions made to ensure minimum earth fault pick-up current of 40 A.		provide	
5.12.3	240-56030406	3.6	CT ratio required if different to that specified (SPR).	A		
5.14	240-56030406	3.6.1.3	Protection CT: type, class and ratio	T_ C_ R	provide	
5.15	240-56030406	3.6 3.6.1.2 a)	Detail the supply requirements to power up SPR for single and Three Phase conditions	A	provide	
5.16	240-56030406	3.6.2	SPR to include additional functionality for communication of Analogues to IRTU	Y/N	N	
5.17			Protection IED required for IRTU application.	Y/N	N	
5.18	240-56030406	3.6, 3.6.3.1-3.6.3.12	Protection functional requirements satisfied, i.e. functions, setting ranges, characteristic curves etc. (provide technical manual).		provide	
5.19	240-56030406	3.7	Current sensors- type, class and ratio	T_ C_ R_	provide	
5.20	240-56030406	3.8	Voltage sensors- type, class	T_ C_	provide	
Cable termination enclosure of the circuit breaker functional units						
6.1	240-56030406	3.13d)/,e)/ & f)	Spacing between bushing centres (min)	mm	90	

6.2	240-56030406	3.13d)/,e)/ & f)	Spacing between outer bushing centres and enclosure side wall (min)	mm	55	
6.3	SANS 1874 4.8	SANS 1874 4.8	Distance from bushing centre line to cable support clamp (min). The cable support clamp shall be mounted above any bottom enclosure mounted plates for 3 core cable termination applications. For 1 core cable termination applications where bottom plates are required to be mounted above the cable clamps for Internal Arc venting compliance, the plate shall be positioned to meet the SANS 876 requirement for a 22 kV voltage rating single core cable termination to be fitted.	mm	800	
6.4	SANS 1874	4.8	Bushings horizontally positioned?	Y/N	YES	
6.5	SANS 1874	4.8.4	Type of bushing		EN 50181 C-type interface	
6.6	SANS 1874	4.11.4	Cross sectional area of earthing bar (min)	mm ²	120	
6.7	SANS 1874	4.8.6	Type of cable support clamp		SANS 876 /D-DT-8019 / 240-56062752	
6.8	240-56030406	3.13g)	Size (range) of cable support clamp (3 Core Cable	mm	50-100	
<u>Busbars</u>						
7.1	SANS 1874	4.7.2	Current rating of Busbars	A	630	
7.2	SANS 1874	4.7.2	Busbars to be extensible left or right?	L / R /NA	N/A	
<u>IRTU</u>						
8.1	SANS 1874	4.9.2	RTU to be provided?	Y/N	No	
<u>Gas requirements</u>						
9.1	SANS 1874	4.10.2	Expected life before replenishment of gas (minimum)	Years	30	
9.2	SANS 1874	4.10.3 & 3.13	Type of gas indication device		Density meter	
9.3	SANS 1874	4.10.5	Mass of gas:			
9.3	SANS 1874	4.10.5 4.10.6	a) Busbar chamber	kg	provide	
			b) Other	kg	provide	
<u>Earthing</u>						
10.1	SANS 1874	4.11.1	Earth fault level and duration	kA-s	2 kA – 3 s	

Item	Document	Sub-clause	Description	Units	Schedule A	Schedule B
<u>Live Circuit Indication</u>						
11.1	SANS 1874 240- 56030406	4.12.4 3.14	Type of live circuit indication required		VDS	
<u>Earth Fault Indication</u>						
12.1	SANS 1874	4.13.1	Type of earth fault indicator		Self- Powered via internal CT	
			Earth fault indicator details:			
12.2	SANS 1874	4.13.6	a) Cable box location for CT		LHS 'R'	
12.3	SANS 1874	4.13.7	b) Position of 'remote' indicator		Visible from outside, front of RMU	
12.4	SANS 1874	4.13.7	c) Method of protecting indicator against vandalism		Welded steel tube	
			Make of earth fault indicator			
12.6	SANS 1874	4.13	Type (model) of earth fault indicator		provide	
<u>Testing</u>						
15.4	SANS 1874	5.2.3	RMU Internal arc type test details		yes	
15.5	SANS 1874	5.2	RMU type test reports		Yes	
15.6	240- 56030406	3.21 and 3.22	RMU type test reports and videos		Yes	
15.7	240- 56030406	3.6.4 e)	CT type test reports		Yes	
15.8	240- 56030406	3.6.5 f)	VT type test reports		Yes	
15.9	240- 64685228	4.	SPR Type test report		Yes	
15.10	240- 64685228	4.	Protection IED Type test report		Yes	
15.11	CISPR- 11/A, IEC 60255- 25, EN 55011		Type Test for RFI Compliance		Yes	

Documentation						
17.1	SANS 1874	7.2	General assembly drawing(s)		provide	
17.2	SANS 1874	7.2	Drawing(s) showing mimic indication system, tee-off operating procedure, other labels & signs		provide	
17.3	SANS 1874	7.2	Wiring diagram(s)		provide	
17.4	SANS 1874	7.2	Rating plate drawing		provide	
17.6	SANS 1874	7.2	Tabulated summary of completed type tests required?	Y/N	Yes	
17.7	SANS 1874	7.2	Full set of type test reports required?	Y/N	Yes	
17.8	SANS 1874	7.2	Proof of type test laboratory accreditation?	Y/N	Yes	
17.9	SANS 1874	7.2	Copy of RMU factory routine test certificate?		Yes	
17.10	SANS 1874	7.2	Copy of CT and VT factory routine test certificate?	Y/N	Yes	
17.11	SANS 1874	7.2	Copies of the latest technical catalogue(s) including SPR and	Y/N	Yes	
17.12	SANS 1874	7.2	Number of installation, operation and maintenance manuals		1	

