

ANNEXURE B (KEBU_SPEC_005)

TECHNICAL SCHEDULES A AND B FOR
TYPE B MINIATURE SUBSTATIONS

Schedule A: KEETMANSHOOP ELECTRICITY BUSINESS UNIT specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub-clause	Description	Unit	Schedule B	Schedule C
1		Standard operating conditions		xxxxxxxxxx	xxxxxxxxxx
		a) Altitude		not exceeding 1500 m	
		b) Ambient air temperature		-5 °C to 45 °C	
		c) Ultraviolet radiation		high	
		d) Relative humidity		10 % to 95 %	
		e) Corrosive conditions		corrosive	
		f) Newly Manufactured (Yes / No)		Yes (Must be newly manufactured)	
2		Ratings		xxxxxxxxxx	xxxxxxxxxx
		Transformer power rating (315, 630, 800 kVA)	kVA	315 & 630	
		Nominal system voltage (11 / 22kV as specified)	kV	11	
		System frequency	Hz	50	
		Number of phases		3	
		Rated no-load secondary voltage		420	
		Rated power-frequency voltage		SANS 780	
		Rated lightning impulse withstand voltage	kV	95	
		Rated short-duration power-frequency withstand voltage (50 Hz: 1 min)		28	
		Induced voltage withstand voltage		SANS 780	
3		Construction design		xxxxxxxxxx	xxxxxxxxxx
		Layout		Type B	
		Construction and IP rating		Refer to detail SPEC	
		Removable base sections adjacent to MV compartment (sections to be lap bolted with nuts on the inside of the channel and housing)		Yes	
		Concealed door and roof (if applicable) hinges		Yes	
		Compartment fastening/locking (Pad lockable)		as per detail spec	
		Compartment lock protection facility		Yes	
		Total mass of mini-sub	kg	xxxxxxxxxx	

Item	Sub-clause	Description	Unit	Schedule B	Schedule C
		Overall dimensions			
		a) MV compartment length	mm	xxxxxxxxxx	
		b) LV compartment length	mm	xxxxxxxxxx	
		c) Overall length	mm	xxxxxxxxxx	
		d) Overall width	mm	xxxxxxxxxx	
		e) Overall height	mm	xxxxxxxxxx	
		f) Base width	mm	xxxxxxxxxx	
		Provision for lifting of complete mini-sub onto a concrete plinth without the need for dismantling		Yes	
		Provision of lifting lugs on roof for ease of removal		Yes	
		MV switchgear, LV panel and transformer confined to separate compartments		Yes	
		Mini-sub housing sections/doors bonded		Yes	
4		Transformer		xxxxxxxxxx	xxxxxxxxxx
		Electrical requirements		SANS 780	xxxxxxxxxx
		Vector group		Dyn11	
		MV & LV Earthing (Combined / Saperate)		Saperate	
		MV system earthing (Effective / Non-effective)		Non-effective	
		LV transformer neutral earthing (Solid / resistively earthed)		Solid with Removable link	
		MV system fault level	kA	13.2kA	
		Temperature rise limits		as per SANS 780 Table 6	
		Secondary voltage regulation (Off-load)	%	± 5% with incremental steps of 2.5%	
		No-load losses	W	SANS 780	
		Load losses	W	SANS 780	
		Cost per kW of no-load losses	N\$/kW	SANS 780	
		Cost per kW of load losses	N\$/kW	SANS 780	
		X/R		SANS 780	
		Audio-sound level	dB(A)	SANS 780	
		Sealed transformer unit		Yes	
		Transformer MV bushings (internal screen to be earthed)		Type C with M16 x 2 thread	
		MV bushing-centre clearances (minimum)	mm	xxxxxxxxxx	

Item	Sub-clause	Description	Unit	Schedule B	Schedule C
		Clearances between outer bushing-centres and mini-sub metal enclosure (minimum)	mm	xxxxxxxxxx	
		Transformer overload protection facility		No	
5		Winding material (Copper / Aluminium)		xxxxxxxxxx	
		a) MV		Copper	
		b) LV		Copper	
6		Manufacturer		xxxxxxxxxx	
7		MV Compartment		xxxxxxxxxx	xxxxxxxxxx
		Equipment in MV compartment		Ring Main Unit to SANS 1874	xxxxxxxxxx
		RMU manufacturer		Ormazabal / ABB Safeplus or Similar pre-approved SF6 insulation	
		Are current-limiting fuses required for the tee-off connections?		Breaker with self powered relay	
		Incoming MV cable requirements			
		a) 3 x single-core / 2 x three-core		2 x 3-core	
		b) Cable material		Copper	
		c) Maximum size of core cross-section	mm ²	185	
		d) Type of cable (PILC / XLPE)		PILC / XLPE	
		e) Cable support (clamping) required		Yes	
		f) Minimum distance from cable clamp to centre-line of RMU bushings		650	
		g) Type of connection		Screened	
		Mini-sub earth bar (accessible from front of RMU)		Yes	
		Interconnection arrangement between RMU and transformer MV bushings		Single core Cables	
		Unscreened interconnecting equipment between RMU and transformer to be barricaded		Yes	
		Type of earth fault indicator			
8		LV Compartment		xxxxxxxxxx	xxxxxxxxxx
		Busbar rating	A	1,2 times the kVA capacity	
		Busbar insulation		Air insulated	
		Busbars		one per phase, LV neutral and earth bar	
		Current density of busbars	A/mm ²	refer to detail Spec	

Item	Sub-clause	Description	Unit	Schedule B	Schedule C
		Rated withstand current - 1 s (25 kA for up to 800 kVA)	kA	as per rating	
		Minimum clearance to earth and between phases	mm	20	
		LV earth bar bonded to the LV neutral busbar		Yes	
		LV earth busbar (4.9.3.2 of SANS 1029)		Copper busbar	
		LV earth busbar to be earthed (via an electrical bridge to the mini-sub earth bar)		Yes	
		Stainless steel M12 set screws provided		Yes	
		Provision of LV main switch disconnecter		Yes	
		- Type of switch disconnecter		IEC 60947-3	
		Number of outgoing LV feeder bays to be provided for		6	
		LV panel design		large frame MCCBs	
		LV maximum demand ammeters		on all three phases	
		- Ammeter type		Thermal integrating over 15 min period	
		LV indicating voltmeter with selector switch		Yes	
		Ammeter and voltmeter size and display	mm	Refer to detail SPEC	
		Ammeter and voltmeter position		Refer to detail SPEC	
		Provision of removable barrier to separate LV end compartment and front LV compartment		Yes	
		Elster A1700, MD Demand complete with CT's rated such to measure the transformer maximum amps		Yes	
9		Standardised streetlighting panel (if applicable)	Yes/No	Yes	
		a) photoelectric control unit	Yes/No	Yes	
		b) contactor capacity	A	Refer to details SPECS	
		c) number of lighting circuits		Refer to details SPECS	
		d) size of circuit single-pole fuses	A	Refer to details SPECS	
		e) type/manufacturer		xxxxxxxxxx	
		Programmable meter required?	Yes/No	Yes	
10		Materials and corrosion protection			xxxxxxxxxx
		Mini-sub enclosure and transformer tank		xxxxxxxxxx	
		Radiator		xxxxxxxxxx	
		Tinned copper busbars		xxxxxxxxxx	
		Mini-sub base		xxxxxxxxxx	
		Gland plate / Unistrut required		xxxxxxxxxx	

Item	Sub-clause	Description	Unit	Schedule B	Schedule C
11		Gland plate support structure			
		Final Outside colour		White	
11		Notices, signs and labels		xxxxxxxxxx	xxxxxxxxxx
		Transformer rating plate		Yes	
		Transformer to bear an SABS Approved mark on the rating plate		Yes	
		Treatment and full first aid instructions on inside of MV and LV compartment doors		Yes	
		Electrical warning signs on all doors and barriers		Yes	
		Transformer phase labels below bushings		Yes	
		Colour-coded LV busbars		Yes	
		Stencilled labelling on MV and LV compartment doors (both in- and outside)		Yes	
		kVA, Primary V, Secondary V, Corrosion class		Yes	
		ID markings linking roof to body per batch		Yes	
		Provision for the safe-keeping of documents		Yes	
12		Documentation		xxxxxxxxxx	xxxxxxxxxx
		Type test certificates	Sets	Yes	
		Routine test certificates	Sets	Yes	
		Drawings	Sets	Yes	
		Circuit diagrams (LV auxiliary wiring and equipment)	Sets	Yes	