

		MEDIUM VOLTAGE INDUCTION MOTORS TECHNICAL SCHEDULE A&B TEMPLATE (Rev. 0)				
Project Name:						
Project No:		MWP				
PLANT DESCRIPTION (e.g. Boiler, Turbine, Coal Overland, etc.)		Electric compressor				
APPLICATION (e.g. Centrifugal Fan, Screw Pump, Mill, Conveyor, etc.)		Compressor				
ITEM	DESCRIPTION		UNITS	ESKOM or SUPPLIER	ESKOM Comments	SUPPLIER Comments
1.0	Driven Load Requirements					
1.01	Driven machine manufacturer (OEM)		Name			
1.02	Manufacturer reference code/serial number		Code			
1.03	Number of units installed or to be installed		Number			
1.04	Power and Torque vs Speed Characteristic		Description			
1.05	Power required at duty point (referred to motor shaft)		kW			
1.06	Speed at duty point (referred to motor shaft)		RPM			
1.07	Speed range	1.071) Minimum speed	RPM			
	(Variable Speed application)	1.072) Maximum speed	RPM			
1.08	Efficiency of the driven equipment at duty point		%			
1.09	Load moment of inertia at motor shaft		kg.m ²			
1.10	Required starting torque		Nm			
1.11	Rated load torque		Nm			
1.12	Maximum permissible start-up time		s			
1.13	Maximum permissible deceleration time		s			
1.14	Maximum permissible torque margin (Peak Torque)		Nm			
1.15	Maximum axial movement of half coupling towards motor		mm			
1.16	Maximum axial half coupling towards away from motor		mm			
1.17	Maximum Axial Thrust Towards Motor		N			
1.18	Maximum Axial Thrust Away From the Motor		N			
1.19	Shaft Rotation (viewed on motor drive end shaft) Clockwise or Anticlockwise		Name			
1.20	Bearing type (Antifriction or sleeve bearing)		Ball/Roller/Sleeve			
1.21	Lubrication type (Grease or oil)		Name			
1.22	Area classification	Hazardous or Non-Hazardous	Hazard/Non-Hazard			
1.23	Application environmental conditions	1.2301) Indoor or Outdoor	Indoor/Outdoor	Indoor		
		1.2302) Clean or Dusty	Clean/Dusty	Dusty		
1.24	Starting method (Direct-on-line starting, Soft starting or Soft starting with speed variation)		DOL/Softstarter/VSD	DOL		
1.25	Method of stopping (Coast to stop, Mechanical braking or Electrical braking)		Name			
1.26	Drive coupling method (e.g. direct, gearbox)		Name			
1.27	Coupling type (e.g. belt, chain)		Name			
Required Drawings & Curves						
1.28	Load Torque-Speed curve(s) reference number		Number			
1.29	Load performance curve reference number		Number			
1.30	Coupling drawing reference number		Number			
1.31	Motor and Load Layout drawing reference number		Number			

2.0	Power Supply	UNITS	ESKOM	SUPPLIER	ESKOM Comments	SUPPLIER Comments
2.1	Normal Supply		Schedule A	Schedule B	Eskom Spec - 240-57617975	
2.101	Supply Voltage, 3-phase, $\pm 5\%$ (e.g. 3.3kV, 6.6kV, 11kV and 15kV)	kV	3.3kv $\pm 5\%$			
2.102	Supply frequency, 50Hz $\pm 2\%$	Hz	50 $\pm 2\%$			
2.103	Voltage unbalance: Negative sequence voltage up to 2 % of positive sequence voltage (Vp).	%	2%			
2.104	Voltage harmonic distortion	%	$\leq 5\%$			
2.2	Abnormal power supply (prevailing simultaneously for up to 6 hours)					
2.201	Supply Voltage, 3-phase, $\pm 10\%$ (e.g. 3.3kV, 6.6kV, 11kV and 15kV)	V	3.3kv $\pm 10\%$			
2.202	Supply frequency, 50 Hz $\pm 2\%$ for 80 minutes	Hz	50 $\pm 2\%$			
2.203	Voltage unbalance: Negative sequence voltage up to 3 % of nominal positive sequence voltage.	%	3%			
2.204	V/F ratio < 1.1 pu	pu	≤ 1.1			
2.3	Transient - voltage within 10% of nominal within 3 seconds after the transient:					
2.301	Complete loss of supply for 0.2 seconds	s	0.2			
2.302	Voltage depression up to 85% of nominal for up to 60 second	%	85% for 1minutes			
2.303	Voltage depression up to 75% of nominal for up to 1 second	%	75% , 1seconds			
3.0	Operating Conditions	UNITS	ESKOM	SUPPLIER	ESKOM Comments	SUPPLIER Comments
3.01	Altitude above sea level (e.g. 1000, 1600)	m	1626			
3.02	Normal daily maximum temperature	°C	26			
3.03	Normal daily minimum temperature	°C	4			
3.04	Extreme maximum temperature	°C	40			
3.05	Extreme minimum temperature	°C	0			
3.06	Ambient Air Quality	Describe				
3.07	Average humidity	%				
3.08	Extent of Base Vibrations	Low/Med/High	Med			
4.0	Motor General Information					
4.01	Applicable SANS standard	Code	SANS 60034			
4.02	Applicable Eskom Standard	Number	240-50237155			
4.03	Motor manufacturer (of existing motor where applicable - not the requirement)	Name	SIEMENS		Quote using Siemens dimensions	
4.04	Motor manufacturer reference code/serial number (of existing motor where applicable)	Code	Provide			
4.05	Fabrication factory	Name	Provide			
4.06	Motor life expectancy	Yrs	>20			
5.0	Motor Electrical Details					
5.10	Motor Rating					
5.101	Rated output power	kW	350			
5.102	Supply voltage (e.g. 3.3kV, 6.6kV, 11kV and 15kV)	V	3,300			
5.103	Frequency (e.g. 50 or 60)	Hz	50			
5.104	Full load current	A	72			
5.105	Rated Speed	RPM	2960			
5.106	Winding connection	Star/Delta	Star			
5.107	Duty-class as per IEC 60034-1 (e.g. S1, S2, S3, etc.)	Code	S1			
5.108	Utilization factor (Load power at duty point/motor rated power), $\geq 75\%$, $\leq 90\%$	%				
5.20	Motor Performance Guarantees					
5.201	Full load torque	Nm	1129			
5.202	Locked rotor torque	Nm	790			
5.203	Pull up torque	Nm	790			
5.204	Breakdown torque	Nm	2484			
5.205	Locked rotor current	A	432			
5.206	Efficiency at 100% Loading	%	95.0%			
5.207	Efficiency at 75% Loading	%	94.5%			
5.208	Efficiency at 50% Loading	%	93.0%			
5.209	Power factor at 100% Loading	%	85%			
5.210	Power factor at 75% Loading	%	83%			
5.211	Power factor at 50% Loading	%	80%			
5.30	Motor parameters					
5.301	X/R Ratio	%	Provide			
5.302	Stator Resistance @ Standstill (slip = 1)	Ω	Provide			
5.303	Stator Reactance @ Standstill (slip = 1)	Ω	Provide			
5.304	Rotor Resistance @ Standstill (slip = 1)	Ω	Provide			
5.305	Rotor Reactance @ Standstill (slip = 1)	Ω	Provide			

5.306	Stator Resistance @ Full Load	Ω	Provide			
5.307	Stator Reactance @ Full Load	Ω	Provide			
5.308	Rotor Resistance @ Full Load	Ω	Provide			
5.309	Rotor Reactance @ Full Load	Ω	Provide			
5.310	Full Load Slip	%	Provide			
5.311	Specified Temperature	$^{\circ}\text{C}$	Provide			
5.312	Magnetic Reactance (X_m)	Ω	Provide			
5.313	Magnetic Resistance (R_m)	Ω	Provide			
6.0	Motor Thermal Details					
6.10	Temperature rise					
6.101	Stator winding insulation class (Minimum class F)	Name	F			
6.102	Stator winding temperature rise at 1.0 Service Factor (Maximum class B)	K	80			
6.20	Performance and Thermal Capacity					
6.201	Run-up time at 100% of rated voltage	s	Provide			
6.202	Run-up time at 85% of rated voltage	s	Provide			
6.203	Run-up time at 75% of rated voltage	s	Provide			
6.204	Maximum Hot Locked Rotor Time at 100% of rated voltage	s	Provide			
6.205	Maximum Hot Locked Rotor Time at 85% of rated voltage	s	Provide			
6.206	Maximum Hot Locked Rotor Time at 75% of rated voltage	s	Provide			
6.207	Maximum Hot Acceleration Time at 100% of rated voltage	s	Provide			
6.208	Maximum Hot Acceleration Time at 85% of rated voltage	s	Provide			
6.209	Maximum Hot Acceleration Time at 75% of rated voltage	s	Provide			
6.210	Are safe stall and acceleration times rotor or stator limited?	Rotor / Stator	Provide			
6.211	Motor Current at Breakdown Torque	A	Provide			
6.212	Maximum Overload Time at Breakdown Torque Current from FLC operation	s	Provide			
6.213	Thermal time constant	Minutes	Provide			
6.214	Cooling time constant	Minutes	Provide			
6.215	Number of starts from Hot, within an hour	Number	2			
6.216	Number of starts from cold, within an hour	Number	3			

7.0	Mechanical Details					
7.1	Motor winding systems					
7.101	Method of stator winding Impregnation	Name	VPI			
7.102	Stator winding type (form-wound / roebel bar, etc)	Name	Form-wound			
7.103	Type of Wedges	Epoxy Glass / Magnetic	Magnetic			
7.104	Squirrel cage rotor type	Fabricated Cu/Al or Cast Al	Fabricated Cu			
7.105	Rotor Cage Type	Single / Double	Single			
7.2	Enclosure and Cooling					
7.201	Enclosure - Degree of protection (IP Code)	IP Code	55			
7.202	Cooling Method (IC code)	IC Code	IC611			
7.203	Primary Air Cooler (Heat Exchanger):					
7.2031	Type	CACA / CACW	CACA			
7.2032	Cooler Tube Material	Describe	Provide			
7.2033	CW Flow Rate	Litres per minute	NA			
7.2034	CW Pressure	kPa	NA			
7.2035	CACW Cooler Leak Detectors	Yes / No	NA			
7.2036	Location, if yes	Describe	NA			
7.2037	Type of Alarm Contact	N/C or N/O	NA			
7.3	Bearings					
7.301	Bearing type (e.g. Ball or Roller or Sleeve)	Name	Sleeve			
7.302	Bearing size	Name	80			
7.303	Lubricant Grade	Describe	TH32			
7.304	Lubrication interval	hrs	>= 4000			
7.305	Bearing life	hrs	>=100 000			
7.306	Bearing Oil Cooler	Yes / No	No			
7.307	Special Tube Material	Describe	NA			
7.308	Cooling Water Pressure	kPa	NA			
7.309	Cooling Water Flow Rate	Litres per minute	NA			
7.310	Vibration Sensor	Yes / No	NA			
7.311	Vibration Sensor Type	Describe	No			
7.312	Easy Access Oil Top Up Plugs	Yes / No	No			
7.313	Easy Access Oil Drain Plugs	Yes / No	No			
7.314	Grease Relief Valve / Plug	Yes / No	Yes			
7.315	Insulated Bearings	Yes / No	Yes			
7.316	Location of Bearing Insulation	Describe	OEM to determine			
7.4	Motor Size and Rotation					
7.401	Frame size	Code	355			
7.402	Frame H(A/B/C)/D/E Dimensions as per IEC 60072-2	Number	355(610/1250/315)80/170		may request GEC motor after award	
7.403	Rotor Moment of inertia	kgm²	Provide			
7.404	Motor total mass	kg	Provide			
7.405	Heat Exchanger Weight	kg	Provide			
7.406	Unidirectional Fans Acceptable?	Yes / No	No			
7.407	Shaft Rotational Direction (DE View)	Describe	Bi-Directional			
7.5	Power Terminal Box/es:					
7.501	Main TB Location (DE View)	RHS / LHS / Top	RHS			
7.502	Main TB Phase Segregation	Yes / No	No			
7.503	Number of Terminals	Number	3 +3			
7.504	Duplicate Terminals for Alternate Power Supply Connection	Yes / No	Yes			
7.505	Parallel Terminals for Current Sharing	Yes / No	No			
7.506	Blow Out Panel/s	Yes / No	Yes			
7.6	Auxiliary Terminal Box/es:					
7.601	Duplicate Auxiliary Terminal Boxes	Yes / No	Yes			
7.602	Free Hand Specification	Describe				
7.7	Vibration and Noise					
7.701	Bearing vibration limits	mm/s	240-50237155			
7.702	Noise level	dB	240-50237155			

8.0	Monitoring, Protection and Accessories				
8.1	Temperature Measuring Devices				
8.101	Stator Winding Embedded Temperature Detectors (ETDs)	Yes / No	Yes		
8.102	Winding ETD Type	Thermocouple / RTD	3-Wire PT100 RTD		
8.103	Number per Phase	Number	2		
8.104	Primary Cooling Air Temperature Detectors	Yes / No	No		
8.105	ETD Type	Thermocouple / RTD	NA		
8.106	Number to be Installed	Number	NA		
8.107	Bearing ETDs	Yes / No	Yes		
8.108	ETD Type	Thermocouple / RTD	Type-K Thermocouple		
8.109	Number per Bearing	Number	1		
8.11	Other ETDs	Part to be Monitored	No		
8.111	ETD Type	Thermocouple / RTD	NA		
8.112	Number to be Installed	Number	NA		
8.113	Dial Type Temperature Indicators	Yes / No	Yes		
8.114	Part/s to be Monitored	Describe	Bearing		
8.115	Indicator Type	Temp. Range	0-120		
8.116	Preferred Vendor Type	Describe	Provide		
8.2	Differential Protection CTs:	Yes / No			
8.201	Motor Supplied with Neutral Side CTs Installed	Yes / No	No		
8.202	CT Ratio	I_p/I_s	NA		
8.203	Knee Point Voltage	Volts	NA		
8.204	Max. I_0 @ V_{kp}	Amps	NA		
8.205	Class		NA		
8.206	Line Side CTs Already or to be Installed	Yes / No	NA		
8.207	Burden	VA	NA		
8.208	Maximum Secondary Resistance	Ω	NA		
8.3	Surge suppresser				
8.301	Surge suppresser required	Yes / No	Yes		
8.302	Make	Name	Dry type		
8.303	Number to be Installed per machine	Number	1x per phase		
8.304	Technical information reference number	Number	provide		
8.4	Partial Discharge Monitoring				
8.401	Partial Discharge Capacitors (required for P $\geq$ 800 kW Draught Group and all motor $\geq$ 6.6kV)	Yes / No	No		
8.402	Partial Discharge Capacitors Specification, if any	Type	NA		
8.403	Number PD Capacitors (3x1phase)	Number	NA		
8.5	Other Accessories:				
8.501	Lightning Arresters	Yes / No	no		
8.502	Speed Switch	Yes / No	no		
8.503	Earthing Brush	Yes / No	no		
8.504	Reversing Shaft Interlock/Switch	Yes / No	no		
8.6	Space Heaters				
8.601	Installed	Yes / No	Yes		
8.602	Voltage Rating	Volts AC	220		
8.603	Power Rating	W	provide		
8.604	"ON" Pilot Lamp	Yes / No	No		
9.0	Interface to Plant				
9.01	Motor mounting (Horizontal / Vertical) (Foot/Flange)	IM Code	1001		
9.02	Rotation (viewed on motor drive shaft) with U- V- W	Name	Bi-directional		
9.03	Maximum cable size that can fit on the terminal box	mm ²	50		
9.04	Direction of cable entry (Line terminal box view)	Top/Bot/Left/Right	Bot		
9.05	Cable type	Code			
9.06	Cable size	mm ²	TBD		
9.07	Flood Lubricated Bearing Total Oil Flow	Litres per minute	NA		
9.08	Oil Pressure	kPa	NA		
9.09	Inlet Oil Temperature Range	°C	NA		
9.10	Water Cooled Bearing Total H ₂ O Flow	Litres per minute	NA		
9.11	Water Pressure	kPa	NA		
9.12	Inlet Water Temperature	°C	NA		

10.0	Motor Painting					
10.01	Paint Finish	Standard/Special	Standard			
10.02	Number of Anti-rust Primer Coats	Number	2			
10.03	Internal Metal Surface Finish	Describe	Provide			
10.04	External Metal Surface Finish	Describe	Provide			
10.05	External Final Color Coding	BS 381 Code	G29 (Grey)			
11.0	Station Limitations					
11.01	Maximum Motor Mass	Ton	3			
11.02	Maximum Overall Motor Height	mm	1400			
11.03	Maximum Overall Motor Length	mm	2550			
11.04	Maximum Overall Motor Breadth	mm	1300			
11.05	Other	Describe	Motor to fit on existing base			
12.0	Documentation					
12.1	Drawings					
12.101	Motor Outline Drawing reference number	Number	Supplier to provide			
12.102	Power winding schematic diagrams and Auxiliaries schematic diagrams (PT100s, thermistor and heaters) reference number	Number	Supplier to provide after contract award			
12.2	Motor Curves					
12.201	Torque-speed curves plotted over the driven machine torque-speed curve at 100%, 85% and 75% Voltage reference number	Number	Supplier to provide			
12.202	Current-speed curves at 100%, 85% and 75% Voltage	Number	Supplier to provide			
12.203	Efficiency and Power factor vs. load curves at rated voltage reference number	Number	Supplier to provide			
12.204	Thermal limit curves reference number	Number	Supplier to provide			