

Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-FS-0001	Contract No. 66-6695
	TYPICAL I/O LIST FOR SCADA			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.
				Rev 01 Page 1 of 1

<p>tkIS India / Vendor</p> <p>Category Codes (Submission Purpose)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 For Approval <input type="checkbox"/> 2 For Review / Comments <input type="checkbox"/> 3 For Information <input type="checkbox"/> 4 For Engineering <input type="checkbox"/> 5 For Enquiry <input type="checkbox"/> 6 For Order Placement <input type="checkbox"/> 7 Final & Approved <input type="checkbox"/> 8 Released for Construction <hr/> <p>Acceptance Codes (Approval Codes)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 Approved <input type="checkbox"/> 2 Approved for Manufacturing / Fabrication with Comments as marked <input type="checkbox"/> 3 Not Approved / Resubmit <input type="checkbox"/> 4 Retained for Information / Records <input type="checkbox"/> 5 Reviewed <input type="checkbox"/> 6 Reviewed as Noted / Resubmit <p>Remarks for AC2 : This marked-up drawings is hereby approved for fabrication / manufacturing and shall be re-submitted after revision. This drawing should be revised only to the extent of tkIS India / Owner / Client comments. Any other changes made by you will not be considered unless clearly highlighted in covering letter asking for approval.</p> <p>This approval / review does not absolve the supplier from the full responsibility for design and fabrication.</p> <p>Date : ___/___/___ Name : _____</p>	<p>tkIS India / Owner / Client</p> <p>Category Codes (Submission Purpose)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 For Approval <input type="checkbox"/> 2 For Review / Comments <input type="checkbox"/> 3 For Information <input checked="" type="checkbox"/> 4 For Engineering <input type="checkbox"/> 5 For Enquiry <input type="checkbox"/> 6 For Order Placement <input type="checkbox"/> 7 Final & Approved <input type="checkbox"/> 8 Released for Construction <hr/> <p>Acceptance Codes (Approval Codes)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 Approved <input type="checkbox"/> 2 Approved for Manufacturing / Fabrication with Comments as marked <input type="checkbox"/> 3 Not Approved / Resubmit <input type="checkbox"/> 4 Retained for Information / Records <input type="checkbox"/> 5 Reviewed <input type="checkbox"/> 6 Reviewed as Noted / Resubmit <p>Date : ___/___/___ Name : _____</p>
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01		Finalized After NALCO'S Review And Issued For Engineering	20.02.18	PDW	20.02.18	MSD	20.02.18	MSD	-
00		Issued for Engineering	31.10.17	PDW	31.10.17	MSD	31.10.17	MSD	-
Rev.	Status	Description	Date	Prepared	Date	Checked	Date	Approved	AC
Barcode				Category Code: - 04					
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Typical I/O list for SCADA

Code NAL

Contract No: 66-6695

Doc ID 6695-ELT-G00-FS-0001

Rev. 01

Rev. No.	Sr No.	Equipment Description	I/O Service	AI	DI	DO	Type of Information	Hard/ Soft	Remarks		
01	1	11kV Incomer Breaker	Circuit Breaker on		1		Status	Hard			
			Circuit Breaker off		1		Status	Hard			
			Circuit Breaker trip (86) Operated			1		Status	Hard		
			Relay Unhealthy (Watchdog)			1		Alarm	Hard		
			Breaker Test Position			1		Status	Soft		
			Breaker Service Position			1		Status	Soft		
			Relay 51 Operated			1		Alarm	Soft		
			Relay 51N Operated			1		Alarm	Soft		
01				Relay 95 Unhealthy			1		Alarm	Hard	
			Relay 87L Operated				1		Alarm	Soft	
			Line Current R, Y & B Phase		3			Value	Soft		
			Frequency		1			Value	Soft		
			Power Factor		1			Value	Soft		
			kW		1			Value	Soft		
			kVAR		1			Value	Soft		
			kVA		1			Value	Soft		
			kVAh		1			Value	Soft		
			kWH		1			Value	Soft		
01				Close command from SCADA				1	Command	Hard	
01				Trip command from SCADA				1	Command	Hard	
01			2	11kV, 6.6kV & 0.690kV Line PT	PT MCB healthiness		1		Alarm	Hard	
	Relay 27 Operated					1		Alarm	Soft		
	Voltage R-Y, Y-B & B-R Phase				3			Value	Soft		
	3	11kV, 6.6kV & 0.690kV BUS PT	Relay 27 Operated, 20%		1		Alarm	Soft			
			Relay 27 Operated, 80%			1		Alarm	Soft		
			Relay 27 Operated, 80% with time delay (2)			1		Alarm	Soft		
			Relay 59 Operated			1		Alarm	Soft		
			Relay 59 Operated with time delay (2)			1		Alarm	Soft		
01				PT MCB healthiness			1		Alarm	Hard	
			Voltage R-Y, Y-B & B-R Phase		3			Value	Soft		
01	4	11kV BUS Coupler	Circuit Breaker on		1		Status	Hard			
			Circuit Breaker off			1		Status	Hard		
			Circuit Breaker trip (86) Operated			1		Status	Hard		
			Relay Unhealthy (Watchdog)			1		Alarm	Hard		
			Auto-manual switch-Auto selected			1		Status	Soft		
			Auto-manual switch-Manual selected			1		Status	Soft		
			Trip Selector Switch-I/C-1 Selected			1		Status	Soft		
			Trip Selector Switch-I/C-2 Selected			1		Status	Soft		
			Trip Selector Switch-B/C Selected			1		Status	Soft		
			Breaker Test Position			1		Status	Soft		
			Breaker Service Position			1		Status	Soft		
			Relay 25 operated			1		Alarm	Soft		
			Relay 51 Operated			1		Alarm	Soft		
			Relay 51N Operated			1		Alarm	Soft		
01				Relay 95 Unhealthy			1		Alarm	Hard	
			Relay 80 Operated				2		Alarm	Soft	
			Line Current R, Y & B Phase		3			Value	Soft		
01				Close command from SCADA				1	Command	Hard	
01				Trip command from SCADA				1	Command	Hard	
01			5	11/ 0.433 kV 11/ 6.9 kV 11/ 0.720 kV Transformer Feeder	Circuit Breaker on		1		Status	Hard	
					Circuit Breaker off			1		Status	Hard
	Circuit Breaker trip (86) Operated					1		Status	Hard		
	Relay Unhealthy (Watchdog)					1		Alarm	Hard		
	Breaker Test Position					1		Status	Soft		
	Breaker Service Position					1		Status	Soft		
	Relay 51 Operated					1		Alarm	Soft		
	Relay 51N Operated					1		Alarm	Soft		
	Relay 50 Operated					1		Alarm	Soft		
	Relay 50N Operated					1		Alarm	Soft		
01		Relay 95 Unhealthy					1		Alarm	Hard	
	Relay 96 Operated					1		Alarm	Soft		
	OTI Alarm					1		Alarm	Hard		
	OTI Trip					1		Alarm	Hard		
	WTI Alarm					1		Alarm	Hard		
	WTI Trip					1		Alarm	Hard		
	Buchholz Alarm					1		Alarm	Hard		
	Buchholz Trip					1		Alarm	Hard		
	Pressure Relieve Device Operated					1		Alarm	Hard		
	Oil Level Gauge Alarm					1		Alarm	Hard		
	Emergency pushbutton operated					1		Status	soft		
	Line Current R, Y & B Phase				3			Value	Soft		
	Power Factor				1			Value	Soft		
	kW				1			Value	Soft		
01		Load shedding command from SCADA						1	Command	Hard	
01		Close command from SCADA						1	Command	Hard	
01		Trip command from SCADA						1	Command	Hard	

Typical I/O list for SCADA

Code NAL

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Doc ID 6695-ELT-G00-FS-0001

Rev. 01

Rev. No.	Sr No.	Equipment Description	I/O Service	AI	DI	DO	Type of Information	Hard/ Soft	Remarks	
01	6	11/ 0.380 kV Normal Lighting Transformer Feeder	Circuit Breaker on		1		Status	Hard		
			Circuit Breaker off		1		Status	Hard		
			Circuit Breaker trip (86) Operated		1		Status	Hard		
			Relay Unhealthy (Watchdog)		1		Alarm	Hard		
			Breaker Test Position		1		Status	Soft		
			Breaker Service Position		1		Status	Soft		
			Relay 51 Operated		1		Alarm	Soft		
			Relay 51N Operated		1		Alarm	Soft		
			Relay 50 Operated		1		Alarm	Soft		
			Relay 50N Operated		1		Alarm	Soft		
			Relay 95 Unhealthy		1		Alarm	Hard		
			Relay 96 Operated		1		Alarm	Soft		
			WTI Alarm		1		Alarm	Hard		
			WTI Trip		1		Alarm	Hard		
			Line Current R, Y & B Phase	3			Value	Soft		
			Power Factor	1			Value	Soft		
			kW	1			Value	Soft		
			Close command from SCADA					1	Command	Hard
			Trip command from SCADA					1	Command	Hard
			01	7	11kV Motor Feeder	Relay Unhealthy (Watchdog)		1		Alarm
Breaker Test Position		1					Status	soft		
Breaker Service Position		1					Status	soft		
Ready to start		1					Status	soft		
Relay 49 Operated		1					Alarm	Soft		
Relay 50 Operated		1					Alarm	Soft		
Relay 50N Operated		1					Alarm	Soft		
Relay 46 Operated		1					Alarm	Soft		
Relay 50L/R Operated		1					Alarm	Soft		
Relay 50G Operated		1					Alarm	Soft		
Relay 95 Unhealthy		1					Alarm	Hard		
Relay 87M Operated		1					Alarm	Soft		
Line Current R, Y & B Phase	3						Value	Soft		
kW	1						Value	Soft		
Power Factor	1						Value	Soft		
Run Hour	1						Value	Soft		
Load shedding command from SCADA								1	Command	Hard
Trip command from SCADA					1	Command	Hard			
01	8	11kV VFD Feeder	Circuit Breaker on		1		Status	Hard		
			Circuit Breaker off		1		Status	Hard		
			Circuit Breaker trip (86) Operated		1		Status	Hard		
			Relay Unhealthy (Watchdog)		1		Status	Hard		
			Breaker Test Position		1		Status	soft		
			Breaker Service Position		1		Status	soft		
			Relay 51 Operated		1		Alarm	Soft		
			Relay 51N Operated		1		Alarm	Soft		
			Relay 95 Unhealthy		1		Alarm	Hard		
			Line Current R, Y & B Phase	3			Value	Soft		
			Power Factor	1			Value	Soft		
			kW	1			Value	Soft		
			kWH	1			Value	Soft		
			Load shedding command from SCADA					1	Command	Hard
			Close command from SCADA					1	Command	Hard
Trip command from SCADA					1	Command	Hard			
01	9	11kV, 6.6kV, 690V and 415V VFD	Speed Indication	1			Value	Soft		
			Fault Code		1		Alarm	Soft		
			Motor Running feedback (either in VFD or Bypass Mode)		1		Status	Soft		
			Motor Trip (either in VFD or Bypass Mode)		1		Alarm	Soft		
			Ready to start Feedback		1		Status	Soft		
			Local / Remote Selected		1		Status	Soft		
			VFD Temperature	1			Value	Soft		
			DC Voltage	2			Value	Soft		
			Line Current R, Y & B Phase	3			Value	Soft		
			kW	1			Value	Soft		
01	10	6.6kV & 0.690kV Incomer Feeder	Circuit Breaker on		1		Status	Hard		
			Circuit Breaker off		1		Status	Hard		
			Circuit Breaker trip (86) Operated		1		Status	Hard		
			Relay Unhealthy (Watchdog)		1		Status	Soft		
			Breaker Test Position		1		Status	soft		
			Breaker Service Position		1		Status	soft		
			Relay 51 Operated		1		Alarm	Soft		
			Relay 51N Operated		1		Alarm	Soft		
			Relay 51G Operated		1		Alarm	Soft		
			Relay 64R Operated		1		Alarm	Soft		
			Relay 95 Unhealthy		1		Alarm	Soft		
			Line Current R, Y & B Phase	3			Value	Soft		
			Frequency	1			Value	Soft		
			Power Factor	1			Value	Soft		
			kW	1			Value	Soft		
			kVAR	1			Value	Soft		
			kVA	1			Value	Soft		
			kVAh	1			Value	Soft		
kWH	1			Value	Soft					

Typical I/O list for SCADA

Code	NAL
Contract No:	66-6695
Doc ID	6695-ELT-G00-FS-0001
Rev.	01

Rev. No.	Sr No.	Equipment Description	I/O Service	AI	DI	DO	Type of Information	Hard/ Soft	Remarks
01	11	6.6 kV, 0.690 kV & 0.415 kV BUS Coupler	Circuit Breaker on		1		Status	Hard	
			Circuit Breaker off		1		Status	Hard	
			Circuit Breaker trip (86) Operated		1		Status	Hard	
			Relay Unhealthy (Watchdog)		1		Alarm	Soft	
			Auto-manual switch-Auto selected		1		Status	Soft	
			Auto-manual switch-Manual selected		1		Status	Soft	
			Trip Selector Switch-I/C-1 Selected		1		Status	Soft	
			Trip Selector Switch-I/C-2 Selected		1		Status	Soft	
			Trip Selector Switch-B/C Selected		1		Status	Soft	
			Breaker Test Position		1		Status	Soft	
			Breaker Service Position		1		Status	Soft	
			Relay 25 operated		1		Alarm	Soft	
			Relay 51 Operated		1		Alarm	Soft	
			Relay 51N Operated		1		Alarm	Soft	
			Relay 95 Unhealthy		1		Alarm	Soft	
			Relay 80 Operated		2		Alarm	Soft	
					Line Current R, Y & B Phase		3		Value
01	12	6.6kV Motor Feeder	Relay Unhealthy (Watchdog)		1		Alarm	Soft	
			VCU Test Position		1		Status	Soft	
01			VCU Service Position		1		Status	Soft	
			Ready to start		1		Status	Soft	
			Relay 49 Operated		1		Alarm	Soft	
			Relay 50 Operated		1		Alarm	Soft	
			Relay 50N Operated		1		Alarm	Soft	
			Relay 46 Operated		1		Alarm	Soft	
			Relay 50L/R Operated		1		Alarm	Soft	
			Relay 50G Operated		1		Alarm	Soft	
			Relay 95 Unhealthy		1		Alarm	Soft	
			Line Current R, Y & B Phase		3		Value	Soft	
			kW		1		Value	Soft	
			Power Factor		1		Value	Soft	
01		Run Hour		1		Value	Soft		
01	13	6.6 kV Capacitor Feeder	Circuit Breaker on		1		Status	Hard	
			Circuit Breaker off		1		Status	Hard	
			Circuit Breaker trip (86) Operated		1		Status	Hard	
			Relay Unhealthy (Watchdog)		1		Alarm	Soft	
			Breaker Test Position		1		Status	Soft	
			Breaker Service Position		1		Status	Soft	
			Relay 51 Operated		1		Alarm	Soft	
			Relay 51N Operated		1		Alarm	Soft	
			Relay 50 Operated		1		Alarm	Soft	
			Relay 50N Operated		1		Alarm	Soft	
			Relay 95 Unhealthy		1		Alarm	Soft	
			Relay 59 Operated		1		Alarm	Soft	
			Relay 60 Operated		1		Alarm	Soft	
			Line Current R, Y & B Phase		3		Value	Soft	
	kVAR		1		Value	Soft			
01	14	6.6 kV APFC	Isolator on		1		Status	Hard	
			Isolator off		1		Status	Hard	
			Relay Unhealthy (Watchdog)		1		Alarm	Soft	
			Step 1: On		1		Alarm	Soft	
			Step 2: On		1		Alarm	Soft	
			Step 3: On		1		Alarm	Soft	
			Step 4: On		1		Alarm	Soft	
			Line Current R, Y & B Phase		3		Value	Soft	
	kVAR		1		Value	Soft			
01	15	6.6 kV VFD Feeder & Power Feeder	Circuit Breaker on		1		Status	Hard	
			Circuit Breaker off		1		Status	Hard	
			Circuit Breaker trip (86) Operated		1		Status	Hard	
			Relay Unhealthy (Watchdog)		1		Status	Soft	
			Breaker Test Position		1		Status	Soft	
			Breaker Service Position		1		Status	Soft	
01			Relay 50 Operated		1		Alarm	Soft	
			Relay 50N Operated		1		Alarm	Soft	
01			Relay 51 Operated		1		Alarm	Soft	
			Relay 51N Operated		1		Alarm	Soft	
			Relay 95 Unhealthy		1		Alarm	Soft	
			Line Current R, Y & B Phase		3		Value	Soft	
			Power Factor		1		Value	Soft	
			kW		1		Value	Soft	
	kWH		1		Value	Soft			

Typical I/O list for SCADA

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Rev. 01

Rev. No.	Sr No.	Equipment Description	I/O Service	AI	DI	DO	Type of Information	Hard/ Soft	Remarks
01	16	0.415 kV Switchgear Incomer	Circuit Breaker on		1		Status	Hard	
			Circuit Breaker off		1		Status	Hard	
			Circuit Breaker trip (86) Operated		1		Status	Hard	
			Relay Unhealthy (Watchdog)		1		Status	Soft	
			Breaker Test Position		1		Status	Soft	
			Breaker Service Position		1		Status	Soft	
			Relay 51 Operated		1		Alarm	Soft	
			Relay 51N Operated		1		Alarm	Soft	
			Relay 51G Operated		1		Alarm	Soft	
			Relay 64R Operated		1		Alarm	Soft	
			Relay 95 Unhealthy		1		Alarm	Soft	
			Line Current R, Y & B Phase	3			Value	Soft	
			Frequency	1			Value	Soft	
			Power Factor	1			Value	Soft	
			kW	1			Value	Soft	
kWH	1			Value	Soft				
	17	0.415 kV Line PT	PT MCB healthiness		1		Alarm	Soft	
			Relay 27 Operated		1		Alarm	Soft	
			Voltage R-Y, Y-B & B-R Phase	3			Value	Soft	
			Voltage R-N, Y-N & B-N	3			Value	Soft	
	18	0.415 kV BUS PT	Relay 27 Operated, 20%		1		Alarm	Soft	
			Relay 27 Operated, 80%		1		Alarm	Soft	
			Relay 27 Operated, 80% with time delay (2)		1		Alarm	Soft	
			Relay 59 Operated		1		Alarm	Soft	
			Relay 59 Operated with time delay (2)		1		Alarm	Soft	
			PT MCB healthiness		1		Alarm	Soft	
			Voltage R-Y, Y-B & B-R Phase	3			Value	Soft	
Voltage R-N, Y-N & B-N	3			Value	Soft				
01	19	0.415 kV Power Feeder	Circuit Breaker on		1		Status	Hard	
			Circuit Breaker off		1		Status	Hard	
			Circuit Breaker trip (86) Operated		1		Status	Hard	
			Relay Unhealthy (Watchdog)		1		Status	Soft	
			Breaker Test Position		1		Status	Soft	
			Breaker Service Position		1		Status	Soft	
			Relay 50 Operated		1		Alarm	Soft	
			Relay 50N Operated		1		Alarm	Soft	
			Relay 51 Operated		1		Alarm	Soft	
			Relay 51N Operated		1		Alarm	Soft	
			Relay 95 Unhealthy		1		Alarm	Soft	
			Line Current R, Y & B Phase	3			Value	Soft	
			Frequency	1			Value	Soft	
			Power Factor	1			Value	Soft	
			kW	1			Value	Soft	
kWH	1			Value	Soft				
	20	LT Motor Feeder ≥30 kW < 75 kW	Line Current R, Y & B Phase	3			Value	Soft	
			kW	1			Value	Soft	
			kWH	1			Value	Soft	
01	21	LT Motor Feeder ≥75 kW	Ready to start		1		Status	Soft	
			Relay Unhealthy (Watchdog)		1		Status	Soft	
			Relay 49 Operated		1		Alarm	Soft	
			Relay 46 Operated		1		Alarm	Soft	
			Relay 50 operated		1		Alarm	Soft	
			Relay 50N operated		1		Alarm	Soft	
			Relay 50G operated		1		Alarm	Soft	
			Relay 50L/R operated		1		Alarm	Soft	
			Line Current R, Y & B Phase	3			Value	Soft	
			kW	1			Value	Soft	
kWH	1			Value	Soft				
01			Run Hour	1			Value	Soft	
01	22	DG SET (AMF PANEL)	DG SET On /Off		1		Status	Hard	
			DG SET trip		1		Status	Hard	
			Line Current R, Y & B Phase	3			Value	Soft	
01	23	0.415 kV DG SET Incomer Feeder	Circuit Breaker on		1		Status	Hard	
			Circuit Breaker off		1		Status	Hard	
			Circuit Breaker trip (86) Operated		1		Status	Hard	
			Relay Unhealthy (Watchdog)		1		Status	Soft	
			Breaker Test Position		1		Status	Soft	
			Breaker Service Position		1		Status	Soft	
			Relay 51 Operated		1		Alarm	Soft	
			Relay 51N Operated		1		Alarm	Soft	
			Relay 51G Operated		1		Alarm	Soft	
			Relay 49 Operated		1		Alarm	Soft	
			Relay 64R Operated		1		Alarm	Soft	
			Relay 87 Operated		1		Alarm	Soft	
			Relay 95 Unhealthy		1		Alarm	Soft	
			Relay 59 Operated		1		Alarm	Soft	
			Relay 46 Operated		1		Alarm	Soft	
			Line Current R, Y & B Phase	3			Value	Soft	
			Frequency	1			Value	Soft	
			Power Factor	1			Value	Soft	
kW	1			Value	Soft				
kWH	1			Value	Soft				

 नालको NALCO नेपाल एलुमिनियम कार्पोरेशन लिमिटेड National Aluminium Company Ltd.		Typical I/O list for SCADA			Code	NAL			
					Contract No:	66-6695			
					Doc ID	6695-ELT-G00-FS-0001			
					Rev.	01			
Rev. No.	Sr No.	Equipment Description	I/O Service	AI	DI	DO	Type of Information	Hard/ Soft	Remarks
	24	AC UPS	UPS-1 Failure		1		Alarm	Hard	
			UPS-2 Failure		1		Alarm	Hard	
01			Load on maintenance bypass		1		Status	Hard	
01			Load on battery		1		Status	Hard	
			Low battery		1		Alarm	Hard	
01			Load Isolated		1		Alarm	Hard	
	25	Battery charger	DC- Charger-1 Fault (Common fault signal)		1		Alarm	Hard	
			DC- Charger-2 Fault (Common fault signal)		1		Alarm	Hard	
01			Load on battery		1		Status	Hard	
			Low battery		1		Alarm	Hard	
01			Battery disconnected		1		Status	Hard	
	26	FA	FA system fault signal		1		Alarm	Hard	
			Fire alarm actuated		1		Alarm	Hard	
	27	HVAC	HVAC system failure		1		Alarm	Hard	
Notes:									
1 The above I/O list is preliminary & indicative. It shall be developed further based on engineering of SCADA & load shedding philosophy during detail engineering.									
2 Detail list shall be prepared by LSTK Contractor during detail engineering based on actual project requirements.									
3 LSTK Contractor to note that, addition of I/O's and any change in the philosophy of Hard/ Soft during detail engineering shall be complied without any time and cost implication to Owner.									