tkIS India / Vendor

Category Codes (Submission Purpose)

- ☐ 1 For Approval
- ☐ 2 For Review / Comments
- ☐ 3 For Information
- ☐ 4 For Engineering
- ☐ 5 For Enquiry
- ☐ 6 For Order Placement
- ☐ 7 Final & Approved
- ☐ 8 Released for Construction

Acceptance Codes (Approval Codes)

- ☐ 1 Approved
- ☐ 2 Approved for Manufacturing / Fabrication with Comments as marked
- ☐ 3 Not Approved / Resubmit
- ☐ 4 Retained for Information / Records
- ☐ 5 Reviewed
- ☐ 6 Reviewed as Noted / Resubmit

Remarks for AC2 : This marked-up drawings is hereby approved for fabrication / manufacturing and shall be re-sbumitted 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.

This approval / review does not absolve the supplier from the full responsibility for design and fabrication.

Date : ___/___/_____ Name : _____

tkIS India / Owner / Client

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Date : ___/___/_____ Name : _____

Rev.	Status	Description	Date	Prepared	Date	Checked	Date	Approved	AC
02		Revised as per NALCO's comment on make of MF meter and Issued for engineering	11.04.18	PDW	11.04.18	MSD	11.04.18	MSD	
01		Finalized After NALCO'S Review And Issued For Engineering	18.01.18	PDW	18.01.18	MSD	18.01.18	MSD	
00		Issued For Engineering	12.10.17	BTK	12.10.17	MSD	12.10.17	MSD	-

Barcode

Category Code: -04

INDEX SHEET

The document Cover Sheet indicates revisions made in this document along with the purpose of issue of the revised document. The details of revisions made in the enclosures of this document are listed in the table of *Contents* below and the enclosures listed therein are an integral part of this document.

CONTENTS

1.0 INTRODUCTION

This specification covers the design, manufacturing, inspection and testing of **Low Voltage Switchgear panels**. Equipment to be supplied shall comply with latest revision of applicable Indian Standards (IS) and specific codes and standards mentioned in clause 'Codes and standards' of Part-II of this specification.

Scope of supply and services covered under this specification shall be as per various parts of this specification. Standard and descriptive requirement is covered in Part-I while specific requirement is covered in Part-II. Requirements for testing at vendor's works are covered in Part-III.

2.0 GENERAL REQUIREMENTS

2.1 Construction

a. The low voltage switchgear panels shall be metal clad, totally enclosed CRCA sheet steel cubicles, compartmentalized and as specified in Part-II.

b. Each vertical section of panel shall be divided into horizontal and vertical bus bar chamber, cable compartments for accommodating incoming and outgoing cables and equipment compartment in modular design for accommodating all components of each outgoing feeder.

c. The incomer, bus coupler and other distribution feeders shall be with Air Circuit Breakers/ MCCBs/ SFU/ FSU as specified in Part-II.

d. The Motor starter modules shall be combination of SFU/ FSU + Magnetic contactor or vacuum contactor + Electronic Overload Relay and other components.

e. Each feeder compartment shall be provided with front access hinged door of adequate strength and padlocking facility with main power switch/ MCCB handle.

f. Compartment door shall be interlocked mechanically with the switch/ MCCB such that the door cannot be opened unless the switch/ MCCB is in OFF position, also means shall be provided for defeating the interlock at any time.

g. If louvers are provided, they shall be backed up by fine wire mesh.

h. Each vertical section of panel and feeder compartment shall be constructed, such that failure of one equipment does not affect the adjacent units. Between bus compartment and breaker compartment & breaker compartment and cable compartment, non perforated flame retardant partitions shall be provided.

i. The design and construction of each panel shall be such as to allow extension at either end.

j. Relays, meters and control switches shall be located at height which shall be convenient for monitoring and operating.

k. Bolted doors shall also be provided to cover front and back of busbar alley. Busbar alley shall be covered with screwed perforated sheet to avoid direct access to the vertical busbars on opening of the busbar alley door. Doors of busbar alley shall be fitted to board frame with special screws/ bolts such that same can be opened with special key only. Vertical cable alley with hinged door covering the entire height shall be provided.

l. Power and Control terminals in cable alley for each module shall be covered with bolted type, sloped hylam sheet or FRP sheet which shall be fixed after termination of power cable. Adequate number of slotted cable support arms shall be provided for cleating the cables.

m. Power and control cable terminations for outgoing feeders (in case of multiple feeders in one vertical section) shall be brought out in the cable alley. It shall be possible to access these cable terminations without opening the individual feeder compartment doors.

n. Power terminals in the cable alley shall be suitable for 3 phase, 4 wire cable terminations.

o. The size of cable alley shall be sufficient to accommodate the terminals and the cables- Power, control LCS, Signal (DCS interface). Sufficient space shall be provided to accommodate the bends in the cores of the cables.

p. The breaker of a given rating shall be prevented from engaging with stationary element of higher rating breaker.

q. Location of Incomer and Bus Coupler will be decided by LSTK Contractor during approval of drawing. Also location of breaker control switches, indicating lamps, relays, selector switches and meters shall be decided during approval of drawing and these shall be located on respective panels.

r. Each bus section shall be provided with one Marshalling Panel or MTB per shipping section as specified in part IIA. Number of contacts to be wired up to the Marshalling Panel/ MTB and terminal arrangement in Marshalling Panel/ MTB shall be as indicated in control schematic diagram(To be developed by LSTK Contractor). The interpanel wiring between the shipping sections shall be clearly identified with ferrules.

Terminals in the Marshalling Panel/ MTB shall be arranged in three groups labeled 'XM-SS', 'XM-CS' and 'XM-AS', physically separated from each other. Group 'XM-SS' shall comprise terminals for all Status signals i.e. outgoing potential free contacts from the board (e.g. Run, Trip). Group 'XM-CS' shall comprise terminals for all Control signals i.e. incoming commands/ interlocks from control room (e.g. Interlock, Auto start). Group 'XM-AS' shall comprise terminals for Analog signals i.e. 4-20 mA signals to/ from control room. Separate removable gland plate shall be provided for each Marshalling Panel/ MTB.

s. All openings, covers and doors shall be provided with neoprene gaskets.

t. Lifting lugs shall be provided on the top of all shipping sections.

u. Continuous current rating of various switchgear components/ busbars is in-panel rating at full load condition for design ambient temperature and site conditions. Vendor shall suitably derate the nominal rating to suit above condition.

v. All hardware shall be zinc-passivated or cadmium plated.

2.2 Bus Bars and Bus Taps

a. Busbars shall be of uniform cross section throughout the length rated for continuous and short time currents and Bus bar material shall be as indicated in Part-II. Bus bars shall be supported on insulators made of non-hygroscopic, non-inflammable, track resistant material.

Wherever joints between dissimilar materials are envisaged, silver paste or bi-metallic strips shall be provided on the surface.

All busbars and busbar joints shall be easily accessible for periodic inspection without requirement of dismantling any components like CTs etc.

b. Separate vertical droppers shall be provided for each vertical panel.

c. Connecting plates with required hardware shall be supplied for joining busbars at the shipping sections.

d. Vertical bus bars shall be sized for fault current as well as continuous rated current.

e. Only zinc passivated or cadmium plated high tensile strength steel bolts, nuts and washers shall be used for all bus bar joints and supports.

f. Separate BUS shall be provided per Bus section for Control Supply. Each bus section shall be provided with 2 nos. (1 working + 1 standby) control transformers with Auto-manual changeover. Each control transformer shall be sized for the respective bus section load. Separate BUS shall be provided per Bus section for Space Heater Power supply.

2.3 Draw-out Starter and Feeder modules:

a. Draw out Motor starter units/ distribution feeders shall be provided with self- aligning silver or tin-plated plug-in stabs for connection to the vertical bus.

b. The draw-out motor starter units/ distribution feeders shall be supported on guide rails and latched into place by a racking mechanism. The draw-out units shall have three distinct positions, SERVICE – TEST – ISOLATED.

In SERVICE position, the power and control supply/ circuits shall remain connected.

In TEST position, the power contacts of the module shall be disconnected from the busbars. However, control supply/ circuit connections shall remain connected for checking the functional requirements.

In ISOLATED position, both the Power and Control connections to the module shall be disconnected, however the module shall physically remain inside the Switchgear. It shall be possible to padlock the switch/ MCCB handle in OFF position.

It shall not be possible to rack in/ rack out the starter module or feeder module with the main Switch/ MCCB in ON position.

When the draw-out units are racked into the module compartments, they shall be positively earthed through a “pin” or with scraping earth connection. The earth connection shall make before the main power/ control contacts make and break after the power/ control contacts are disconnected. The earth connection shall remain connected in TEST position.

It shall be possible to close the door of the draw-out modules in all three positions i.e., SERVICE, TEST and ISOLATED positions.

c. The handle mechanism for operating the switch fuse/ MCCB of the draw-out modules shall be arranged to operate in a vertical plane - up for ON and down for OFF. If the handle mechanism is controlling an MCCB, the positions for ON, OFF and TRIP shall be labeled.

d. All draw-out modules shall be provided with safety shutters, operated automatically by the movement of draw-out carriage to cover stationary isolated contacts when the carriage is

withdrawn. Adequate arrangement shall be provided for vermin proofing when starter module is drawn out for maintenance.

e. All draw-out modules of identical ratings and type shall be physically and electrically interchangeable.

2.4 Earth Bus

Separate earth bus rated to carry maximum fault current for the specified time shall be provided along the full length of each board. Each feeder trolley, base plate, breaker unit etc. shall be earthed directly to this earth bus. Provision shall be made to terminate ground system cable at each end of the switchgear assembly.

Hinged doors shall be earthed through flexible earthing braids. All non-current carrying metal parts shall be effectively bonded to the earth bus.

2.5 Switchgear Components

Make of Switchgear Components shall be as specified in Part II. Technical particulars of switchgear component shall be as per various parts of this specifications and enclosed relevant documents.

2.5.1 Air Circuit Breakers

Circuit breakers shall be of proven design.

Each breaker shall be provided with emergency manual trip device, mechanical `ON-OFF' indicators, operation counter, spring `CHARGED-DISCHARGED' indicators, manual spring charging facility with manual `Close' push button. Manual `Close' push button shall be accessible after opening the front door.

Each breaker shall have three (3) positions - SERVICE, TEST and DISCONNECTED with mechanical indication. The design of breaker shall be such that it will be possible to close the front access door even when the breaker is pulled out to DISCONNECTED position.

After failure of power supply to the spring charging motor, at least one CLOSE-OPEN operation of the circuit breaker shall be possible.

For safe operation, maintenance and testing of circuit breaker, interlocks shall be provided for the following :

i. To prevent a closed circuit breaker from being isolated or inserted into the service position.

ii. To prevent operation of circuit breaker in any intermediate position.

iii. To ensure earthing of circuit breaker carriage before the main circuit breaker contacts are plugged into the stationary contacts. Positive earthing of the circuit breaker truck shall be maintained in the connected position.

iv. To prevent compartment door from being opened if the breaker is in closed position. Interlock defeat to be provided.

Circuit breaker cubicles shall be provided with safety shutters, operated automatically by the movement of draw-out carriage, to cover stationary isolated contacts when the carriage is withdrawn.

2.5.2 Moulded Case Circuit Breaker (MCCB)

MCCBs shall be provided with spring assisted quick make/ break, manually operated with trip free mechanism.

MCCBs shall have magnetic trip, thermal trip or thermal magnetic trip as per requirement specified in Part-II.

MCCBs shall be of Current limiting type and type tested for type-2 coordination as per IS:13947.

MCCBs shall be provided with shunt trip, auxiliary contacts and contact for trip indication/ alarm as per requirement specified in Part-II.

2.5.3 Electronic Thermal Overload Relay

Electronic Thermal overload relay shall be with variable setting range for motor full load current , Single phasing protection, possibility to select trip class, Auto/Manual reset function , Stop/test function with trip indication, three element, positive acting, ambient temperature compensated type.

Setting range of overload relay shall preferably be 60% to 120% of the full load current of motor. Range of overload relay shall be coordinated with fuse/ MCCB, contactor and motor rating for type-2 coordination.

The Overload Relay shall be hand reset type, reset Push Button shall be provided on the front door of the Panel. It shall be possible to reset the relay from the front of the Panel without opening the compartment door.

2.5.4 Current Transformer & Potential Transformer

Accuracy class, VA burden, ratio shall be as required. VA burden of current and potential transformer shall suit the connected load with minimum 20% margin in case same is not specified.

Earthing of CT secondary shall be done through separate earth link on terminal block.

Polarity of CTs shall be indelibly marked on each transformer & at the associated ferrules on terminal block.

2.5.5 Relays & Meters

Make and type of Protection relays and meters shall be as per Part-II , GES and enclosed SLD & schematic drawings. All relays shall be flush/ semi-flush mounted on the front of respective cubicle.

Ammeter for motor feeders shall be provided with suppressed end scale to indicate starting current (6 to 8 times full load current).

Numerical/ Microprocessor based relays & digital meters shall have facility for communication with SCADA as specified in Part-II.

2.5.6 Control Wiring

Control wiring shall be carried out with flexible heat resistant switchboard wires of minimum size 1.5 sq. mm for control circuits and 2.5 sq. mm for CT circuits. Wires connected to earth shall be of green colour only. HRPVC wires shall be used for potential tappings from busbar for PT, Voltmeter etc.

Each wire shall be identified at both ends with wire designation in accordance with the wiring diagram developed from approved control schematics. Inter-locking type plastic ferrules of yellow colour with black lettering shall be used for identification.

All wire termination except for Elmex type terminal blocks shall be made with ring/ fork tongue compression type connectors. Wires shall not be tapped in between terminal points. Type of lug shall suit relevant application.

The wiring inside the panel shall be properly laid and fixed in wiring ducts with removable covers. The wiring ducts shall be properly insulated. Wires shall be accessible from the front without removing the component mounting plate. Routing of wires behind the component mounting plate is not acceptable.

Wires forming part of tripping circuit of circuit breaker shall be provided with additional red ferrule marked `T' or some other acceptable identification mark shall be provided as per manufacturer's standard.

Wiring between different shipping sections shall be carried out through separate set of terminal block. Sufficient length of jumper wires shall be provided with ferrule nos. at both ends. One end of such wires shall be connected to the terminal block. Full details of such wiring shall be furnished by the vendor.

All spare contacts of relays, switches and other components shall be wired up to terminal blocks.

All openings in sheet steel partitions for carrying out inter-panel wiring shall be provided with rubber/ PVC grommets.

Wiring between fixed portion of cubicle and door mounted equipment shall be routed through flexible PVC conduits.

Two wires shall not be terminated in one terminal. Additional terminations if required shall be done on adjacent terminals by suitable shorting.

2.5.7 Control Terminal Block

The terminal block shall be grouped and segregated according to circuit functions and different voltage levels, and shall have 20% spare terminals. Individual terminals in each blocks in each group shall be serially numbered in accordance with the drawings. Such numbering shall be legible, permanent and indelible. Terminal block for CTs shall be provided with drop out facility for testing purposes for shorting and shall be segregated from other terminals.

Sufficient clear space shall be provided between gland plate and terminal blocks.

2.6 Name Plate

Main name plate shall be provided on top of the board, on front and back. Panel number shall also be indicated on a separate label both in front and rear.

Name plates of approved design shall be provided at the front of each cubicle. Rating plates for each instrument, relay and auxiliary switch, mounted on the face shall also be provided. All internally mounted components shall be identified with painting marks as per approved scheme drawings.

Material for name plates shall be as specified in Part-II, or approved equivalent. Inscription details on name plate shall be as per Owner/LSTK Contractor requirements and details of name plate will be issued after approval of vendor's GA drawing.

2.7 Painting

Vendor to furnish complete details of painting procedure and painting facilities available. Final paint shade shall be as indicated in Part-II.

3.0 FACTORY ACCEPTANCE TEST

LSTK Contractor/Owner/Consultant shall have the option to carry out the stage inspection.

Tests as specified in Part-III shall be carried out during final inspection. Fifteen days advance notice shall be given for carrying out final inspection.

Vendor shall ensure that all meters associated with testing of the equipment shall be calibrated by competent authority and this calibration certificate shall be valid at the time of carrying the testing of equipment.

4.0 GUARANTEED PERFORMANCE

The performance figures quoted in the Technical Particulars sheets shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, the LSTK Contractor/Owner reserves the right to reject the equipment. However, LSTK Contractor/Owner reserves the right to use the rejected equipment until the new equipment meeting the guarantee requirement is supplied by the vendor. However the vendor will be given an opportunity to rectify his equipment at his own cost. Also Owner / LSTK Contractor reserves the right to use rejected equipment till it is rectified. The period of guarantee of the equipment shall be as per agreed 'Commercial Terms and Conditions' enclosed along with tender.

5.0 SPECIAL REQUIREMENT

LSTK Contractor to note that Software is considered as a special tool. All upgrades from time to time shall be provided to OWNER with the detailed procedure and demonstration at site as part of LSTK Contractor's scope of work. LSTK Contractor shall supply all necessary software and tools to facilitate configuration of supplied electrical equipments.

Latest version of software applicable to supplied device shall be provided. Parametering and monitoring devices eg. Laptop (1no. common for all LV switchgear), complete with necessary software and safety / access control devices (Dongle, etc.), appropriate cables shall be supplied by the LSTK Contractor.

LSTK Contractor shall also supply the following tools & tackles. Quantity indicated is per LV Switchboard

- Breaker racking handles – 2nos.
- Manual spring charging handles – 2nos.
- Panel door keys – 2nos.
- Fuse pullers – 2nos.
- Air Circuit Breaker handling Trolleys – 2nos.

नालको NALCO नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.	LOW VOLTAGE SWITCHGEAR PANELS	Code	NAL		
		Contract no.	66-6695		
thyssenkrupp	PART - II A	Doc.	6695-ELT-G00-EC-0009		
	DESIGN DATA SHEET (GENERAL)	Rev.	02	Page	1 OF 7

GENERAL	001		Make	:	As per Vendor list - Electrical	
	002		Nominal system voltage	:	415 V	
	003		Voltage Variation	:	+/- 10 %	
	004		Highest system voltage	:	460 V	
	005		System frequency	:	50 Hz	
	006		Frequency Variation	:	+3 % / - 5 %	
	007		Power System	:	3 Phase, 4 Wire	
	008		Neutral Grounding	:	Solidly grounded	
	009		Individual Panel details	:	As per Part-IIC (To be developed by LSTK Contractor)	
	010		Control Cable type, Size and max. loop (to and fro) length	:	MCC to DCS :	*
					MCC to LCS :	*
CODES	011		IEC 61439/ IS 8623 (All parts) - Specification for low voltage switchgear & control gear assemblies			
	012		IS : 11353 - Marking of Insulated Conductors			
	013		IS : 5578 - Marking of Terminals & insulated Conductors			
	014		IS : 13703 - Low Voltage Fuses			
	015		IS : 1248 - Indicating Meters			
	016		IS : 3156 - Potential Transformers			
	017		IS : 2705 - Current Transformers			
	018		IS 191 - Copper Busbars			
	019		IS 5082 - Material data for Aluminium Busbars			
	020		IS 13235,IEC 60865-1 - Calculation of the effects of short circuit currents			
	021		Indian Electricity Act and CEA Regulations			
	022		IS/IEC : 60947 - Low voltage switchgear and control gear			
	023					
RATING	024		Rated Operational Voltage (U_e)	:	415 V	
	025		Rated insulation Voltage (U_i)	:	V	*
	026		Rated Impulse withstand voltage (U_{imp})			
			a) Main Circuit	:	kV	*
			b) Auxiliary Circuit	:	kV	*
	027		One minute Power frequency withstand voltage	:	2.5 kV	
	028					
CONSTRUCTION	029		Degree of Ingress Protection	:	IP 42 for MCC panels, IP 4X for ACB panels	
	030		Module Construction	:	Draw-out	
	031		Front	:	Single Front	
	032		Cable Entry	:	Bottom	
	033	01	Busduct Entry	:	Bottom	
	034		Material of Construction	:	CRCA, Sheet Steel	
	035		Marshalling panel provided per bus section	:	YES	
	036					
	037		**Thickness of sheet steel**			
			a) Frame / Door / Covers	:	min. 2 mm	
			b) Gland plates	:	min. 3 mm	
	038		**Material for Gland plate**			
			a) Multicore cables	:	3 mm thick sheet steel	
			b) Single core cables	:	4 mm thick aluminium	

PAINTING	039		Type of painting process	: 7 tanks process for surface preparation	
	040		Primer	: 2 coats of epoxy based primer, powder coating	
	041		Final paint	: 2 coats of epoxy based finish paint, powder coating	
	042		Final paint shade	: RAL-7032	
	043		Minimum thickness of paint	: 60 Microns	
NAMEPLATE	044		**Name plate**		
			a) Material	: Anodised Aluminium	
			b) Thickness	: 2 mm (min.)	
BUS BAR	045		Bus bar material	: Aluminium	
	046		Grade	: Electrolytic grade	
	047		**Clearance for busbars & connectors**	:	
			a) Phase to phase (min. 25 mm)	: mm	*
			b) Phase to ground (min. 19 mm)	: mm	*
	048		**Maximum allowable temperature at rated current**	:	
			a) Contacts/ Terminals		
			i) Bare copper	: 100 Deg C	
			ii) Bare Brass	: 105 Deg C	
			iii) Tin coated copper/ brass	: 105 Deg C	
			iv) Silver/ nickel coated copper/ brass	110 Deg C	
			v) Other metals (e.g. aluminium)	105 Deg C	
			b) Manual operating means		
			i) Metallic	: 55 Deg C	
			ii) Non-Metallic	: 65 Deg C	
			c) Parts intended to be touched but not hand held		
			i) Metallic	: 70 Deg C	
			ii) Non-Metallic	: 80 Deg C	
			d) Terminals for connections to external conductors	: 110 Deg C	
			e) Parts accessible but need not be touched during normal operation/ Exterior of Enclosures near cable entry		
			i) Metallic	: 80 Deg C	
			ii) Non-Metallic	: 90 Deg C	
	049		**Busbars/ terminals/ joints/ contacts during**		
			short circuit conditions	: 200 Deg C	
	050		(a) Bus bar to be sleeved	: Yes, Colour coded, Heat shrinkable sleeves	
			(b) Rated withstand temperature of sleeves	: °C	*
	051		Shrouding of Bus bar joints	: Yes	
	052		Material of Shrouds	: SMC/ DMC/ FRP/ Epoxy	*
	053		**Support Insulators**	:	
			a) Voltage class	: 1.1 kV	
			b) Material of insulator	: Epoxy / SMC / DMC	*
			c) Maximum distance between busbar supports	: mm	*
			d) Rated cantilever breaking load	: kN	*
	054		**Earth Bus**	:	
		01	a) Short circuit withstand capacity	: ____ kA for 1 s	*
			b) Material	: Copper	
			c) Size	: 50x6 mm minimum	
	055				
CONTROL AND AUX. SUPPLY	056		Protection Relays	: 110V DC +10%, -15%	
	057		ACB control and spring charging	: 110V DC +10%, -15%	
	058		Contactor controlled motor starters	: 240V AC +/- 10% through control transformer	
	059		Aux. supply for motor/ Panel space heaters	: 240V AC +/- 10%	
	060		Aux. supply for digital meters	: 110V DC / 240V AC +/- 10%	
	061				

AIR CIRCUIT BREAKER	062		Type	: Drawout Air Circuit Breaker		
	063		Make/ Model No.	:		*
	064		**Short circuit rating**	:		
		01	a) Rated Short time withstand current (Icw)	: _____ kA for 1 Sec		*
		01	b) Rated ultimate short circuit current (Icu)	: _____ kA (Same as Icw)		*
			c) Rated service short circuit current (Ics)	: 100 %Icu		
		01	d) Rated short circuit making current (Icm)	: 2.2 times breaking capacity		*
	065		**Interrupting time of breakers at rated current**	:		
			a) Opening time	: ms		*
			b) Closing time	: ms		*
	066		Operating duty	: O - 3 min.- CO - 3 min. - CO		
	067		**Permissible no. of operation without inspection of contact at**			
			a) Rated current	: Nos.		*
			b) 50% rated breaking current	: Nos.		*
			c) 100% rated breaking current	: Nos.		*
	068		**Operating mechanism type**	: Stored energy spring charged		
	069		**Spring charging motor**			
			a) Type	:		*
			b) Rating	: watts		*
	070		Spring charging time	: seconds		*
	071		**Allowable range of control voltage variation**			
			a) Closing	: + % to - %.		*
			b) Tripping	: + % to - %.		*
AIR CIRCUIT BREAKER	072		**Power required by**			
			a) Closing coil	: W		*
			b) Tripping coil	: W		*
	073		Auxiliary contacts	: 4NO +4NC (Minimum)		*
	074		**Make & continuous rating of auxiliary contacts at**			
			a) 240V AC	: A		*
			b) 220 V DC (Inductive breaking)	: A		*
			c) 110 V DC (Inductive breaking)	: A		*
	075		Integral releases to be provided for ACBs	: No		
	076		Type and model no. of Integral Release (if provided)	: Not Applicable		
	077		**In-panel breaker rating at design ambient temperature and site operating conditions :**			
			630 A/ 1250A/ 1600A (nominal rating)	: / / A		*
			2000 A/ 2500A/ 3150A (nominal rating)	: / / A		*
			4000A/ 6000A (nominal rating)	: / / A		*
			All breaker contacts shall be silver plated.			
MCCB	078		Make	:		*
	079		Rated ultimate short circuit current (Icu)	: 50 kA		**
	080		Rated service short circuit current (Ics)	: 100 % Icu for all applications including motor starters		
	081		Rated short circuit making current (Icm)	: kA		*
	082		**Type of Release/ Protections to be covered by release**			
			a) For Incomers/ Bus Couplers	: As per SLD encl. in Part-IV		
			b) For Motor Feeders	: As per SLD encl. in Part-IV		
			c) For non Motor Feeders	: As per SLD encl. in Part-IV		

NOT APPLICABLE

NOT APPLICABLE

MCCB	083		**Model no. of MCCB and Release**			
			a) For Incomers/ Bus Couplers	:		*
			b) For Motor Feeders	:		*
			c) For non Motor Feeders	:		*
	084		Shunt trip required	: Yes		
	085		Aux. contacts	: 1 NO + 1 NC		**
	086		Trip/ Alarm contacts	: Yes		
	087		Rotary operating mechanism with defeat interlock	: Yes		
	088		**In-panel MCCB rating at design ambient temperature and site operating conditions :**			
			63A/ 100A/ 125A (nominal rating)	: / /	A	*
			160 A/ 200A/ 250A (nominal rating)	: / /	A	*
			400A/ 630A (nominal rating)	: /	A	*
	089					
SWITCH	090		Make/ Model No.	:		*
	091		**Category of duty & type**			
			a) For motor feeders	: AC23		
			b) For power supply feeders	: AC23		
			c) For off-load isolation	: AC23		
			d) Capacitor feeders	: AC6b		
	092		Derating for installation inside Panel / feeder module			
	093		at design ambient temp. & site operating conditions	: %		*
	094					
POWER FUSES	095		Make/ Model No.	:		*
	096		Type	: High rupturing		
	097		Rupturing capacity	: 80 kA		
	098		Derating for installation inside Panel / feeder module			
	099		at design ambient temp. & site operating conditions	: %		*
	100					
CONTACTORS	101		**Power contactor Air break (below 75kW)/ Vacuum(75kW to 200kW & Agitator motors)**			
			a) Make/ Model No.	:		*
			b) Range of operating voltage	: 85 to 110 % of rated Volatge		
			c) Minimum drop out voltage	: 75 % rated voltage		
			d) Category of duty			
			i) For motor/ power feeders	: AC3		
			ii) For capacitor feeders	: AC6b		
	102		**Auxiliary contactor**			
			a) Make/ Model No.	:		*
			b) Range of operating voltage	: 85 to 110 % of rated Volatge		
			c) Minimum drop out voltage	: 75 % rated voltage		
			d) Auxiliary contacts	: 3NO + 3NC min.		
	103		Capacitance effect of long control cable length shall be considered while designing the control circuit. If required special measures like special auxiliary relays, R-C circuits shall be implemented. Actual loop length for each circuit will be informed during detail engineering.			
CT / PT	104		CT Construction	: Cast resin wound / bar primary		
	105		PT Construction	: Cast resin		
	106		Ratio, accuracy class and VA burden of CT/PT shall as per SLD			
	107					

RELAYS	108		**Overload relay**		
			a) Type	: Electronic	
			b) Make/ Model No.	:	*
			c) Changeover contact required	: Yes	
			d) Built-in single phasing protection available	: Yes	
	109		**Auxiliary relays**		
			a) Type	: Electromechanical	
			b) Make/ Model No.	:	*
	110		**Tripping Relays**		
			a) Type	: Electromechanical	
			b) Make/ Model No.	:	*
			c) Tripping Relays shall be high-speed lock-out type with hand reset contact		
	111		**Timers**		
			a) Type	: Electromechanical / static	*
			b) Make/ Model No.	:	*
	112		**Protection relays**	**Refer Part-IIB**	
			a) Type	: Numerical	
			b) Make/ Model No.	:	*
			Note : CBCT operated Earth leakage protection relay shall have minimum sensitivity of 100 mA (line side). Time delay shall be available with range of 1 to 3 seconds		
	113		Metering to be included in Numerical Relays	: Yes	
	114		Requirement of Numerical Relay Connectivity to SCADA	: Yes (Fully Compliant to IEC61850)	
	115		Min. no. of binary inputs and outputs (for numerical relays)	: Incomer/ Buscoupler - As required	
				Outgoing Feeder - As required	
	116		Loading of software and configuration of relay	: By vendor at factory	
			Note: All protection relays shall have minimum 2Nos. of spare terminals for future alarms & indication circuits.		
INDICATING METERS	117		Metering Parameters for Incomers/ Buscoupler/ Outgoing		
	118		feeders	: As per SLD	
	119		Accuracy Class of Meters	: As per SLD	
	120		**Type of Meters**	:	
			a) Incomers/ Buscoupler	: Digital	
			b) Outgoing feeders	: Digital	
			c) kWh/ kVArh/ kVAh meter (if applicable)	: Digital	
			d) Trivector Meter (if applicable)	: Digital	
	121		**Analog Meters**		
			Type, Scale	: Taut Band, 240 degree	
	122		**Size of Analogue meters**		
			a) Incomers/ Buscoupler	: min. 96 x 96 mm	
			b) Outgoing feeders	: min. 72 x 72 mm	
			c) Ammeters asssociated with Motor feeders shall be with Suppressed scale up to eight times		
	123		**Make**	:	
			a) kWh/ kVArh/ kVAh meter (if applicable)	:	*
			b) Trivector Meter (if applicable)	:	*
			c) Composite Meter (if applicable)	:	*
	124		Requirement for Connectivity to SCADA	: Yes (MODBUS RTU)	
REMOTE COMMUNICATION	125		Communication protocol	: IEC 61850 (For Relay's) / MODBUS RTU (For Meters)	
	126		Communication Port	: RJ45 (For Relays) / RS 485 (For Meters)	
	127		Real Time clock	: Yes	
	128		Time stamping resolution	: 1 ms	
	129		Parameters to be transmitted to SCADA	: As per (I/O List) (6695-ELT-G00-FS-0001)	
	130		Ports	: Dual redundant (For Relays) / Single (For Meters)	
			Note : Refer SCADA Block diagram (if any) for requirement of additional interface & hardware		

CONTROL TRANSFORMER	131		Type	:	Dry type, Air cooled, vacuum impregnated	
	132		Rating	:	Based on load, minimum 100 VA	
	133		Margin in VA capacity on connected load	:	50%	
	134		Secondary voltage	:	240 V AC	
	135		Off Load Tap changer	:	+/- 5% in steps of 2.5 %	
	136		Control Supply for Starter / Feeder Modules : Two number Control Transformer per Bus section, fed from			
			corresponding Bus Section busbars along with Auto-manual changeover switch shall be considered			
	137					
INDICATING LAMPS	138		Type	:	Clustered LED with min. 8 mm dia.	
	139		ON/ OFF/ Trip	:	Red/ Green/ Amber	
	140		Trip circuit supervision	:	White	
	141		Spring Charged	:	Blue	
	142		DC control supply fail (for each bus-section)	:	Blue	
	143					
CONTROL / SEL SWITCH	144		**Type**			
			a) For control power supply	:	Rotary, stayput	
			b) For breaker control	:	Pistol grip, T-N-C Switch, spring return to neutral	
	145					
PUSH BUTTONS	146		**Type**			
			a) Start	:	Spring return	
			b) Reset	:	Spring return	
			c) Stop	:	Stay put type, Mushroom head, turn to release	
SPACE HEATER	147		Type of control	:	Thermostat with MCB	
	148		Location	:	Cable chamber / Bus bar chamber	
	149		Rating	:	As per space heating requirement	*
MAKES OF	150		Electro mechanical relays	:	Alstom/ ABB	*
	151		Numerical/ Microprocessor based relays	:	ABB/ Alstom/ Siemens	*
	152		Auxiliary relays	:	Schneider/ ABB/ Easun Reyrolle	*
	153		Timer Relays	:	Alstom/ ABB/ Easun Reyrolle	*
	154		Power fuses	:	Siemens / L&T / ABB / Schneider / Mersen (Ferraz)	*
	155		Instrument transformers	:	AE/ Indcoil/ Precise/ Kappa/ ABB/ Pragati/ Siemens	*
	156		Bus bar support insulator	:	Dolf/ Fibrochem/ Glassfibro/ Baroda Insulators/ Vinayak	*
	157		kWh meter	:	Areva/ SIMCO	*
	158	02	Digital / Composite / Multi function meter	:	Conserv/ Secure/ Siemens/ HPL/ L&T/ Satec/Socomec	*
	159		Analog meters	:	Automatic Electric(AE)/ SIMCO/ IMP/ Rishabh/ MECO	*
	160		Air circuit breaker	:	L&T/ Siemens/ ABB/ Schneider	*
	161		Moulded case circuit breaker	:	ABB/ L&T/ Schneider/ Siemens	*
	162		Miniature circuit breaker	:	L&T/ Siemens/ ABB/ Schneider/ Havells/ MDS	*
	163		Switch	:	Kaycee/ Siemens/ L&T/ Areva/ Schneider/ ABB	*
	164		Contactor	:	Siemens/ L&T/ ABB/ Schneider	*
	165		Breaker control switch	:	Kaycee/ Areva/ Recom/ Vaishno/ Gem Telergon	*
	166		Control selector switch	:	Kaycee/ Siemens/ L&T/ Recom/ Vaishno/ Gem Telergon	*
	167		Terminal block	:	Elmex/ Connectwell/ Allen Bradley/ Fuji	*
	168		Internal wiring	:	BIS compliant	*
	169		Lugs	:	Dowells/ Jainson	*
	170		Push Buttons	:	Siemens/ L&T/Teknik/ Hensel/ Vaishno	*
	171		Indication lamps	:	Teknik/ L&T/ Siemens/Schneider/ Altos	*
	172		Thermister Relay	:	Minilec	*
	173		Annunciator	:	Chhabi/ Miniliec/ IIC/ Viashno/ AE	*
	174		Electronic Overload relays	:	Siemens / ABB / Schneider / GE / L&T	
	175		Transducers	:	Minilec/ ABB	

MISC.	176		a) Relay and metering compartment shall be provided with Panel Illumination Lamp
	177		b) 1 ph 240 V AC, 5 A socket shall be provided for Relay and metering compartment

			Description	For Review & Approval	Final, As-built Documents
DRAWINGS & DOCUMENTS	178		**GA & Foundation drawings indicating**	For No. of copies of drawing/documents to be issued by LSTK contractor for Approval/Review/Information during Detail Engineering and as a part of Final, As-built documentation - LSTK contractor to refer requirement indicated elsewhere in the tender	
			a) Static & Dynamic loading details, outline of panel &		
			space required in front & rear of panel		
			b) Cross section view of the panel		
			c) List of parts & complete bill of material		
	179		Detailed SLD of SWGR showing protection,		
			metering, etc.		
	180		Control schematic diagram of all feeder types showing		
			all interlocks, annunciations, etc.		
	181		Control logic diagram for all feeder types		
	182		Wiring diagram with terminal block disposition,		
			ferrule nos., etc.		
	183		Interpanel wiring diagram		
	184		Marshalling panel / MTB GA drawing		
	185		Relay setting document for individual feeder		
	186		Descriptive literature of major components		
	187		Installation, operation & maintenance manual for all eqpt.		
	188		Certificates for type tests on similar equipment		
			(as per Part-III)		
	189		Test certificates for bought out equipment		
	190		Routine Test Certificates		
	191		List of recommended spares apart from items		
			mentioned in elsewhere in tender		
	192		Manufacturing bar chart		
	193		Quality Assurance and Inspection Test procedure		
	194		Calculation of Switchgear Heat losses		
	195		Nameplate drawings		
	196		Notes:		
			a) For items marked " * " thus, data to be furnished / confirmed by LSTK Contractor during detail Engineering.		

GENERAL	001		Relay make	:		*
	002		Relay model no.	:		*
	003		Relay family	:		*
	004		Ordering code no.	:		*
	005		Typical application	:	As per GES & SLD	
	006		Region specific default setting	:	50Hz, IEC Standard, English language	*
	007		Protection functions	:	As per GES & SLD	
	008		Protection characteristics (Standard)	:	IEC	
	009		Number of user defined characteristics	:		*
	010		Reset characteristics	:		*
	011		Command to control Circuit breaker	:		*
	012					
ENCLOSURE & HARDWARE DESIGN	013		Housing	:	Flush mounting	
	014		Connection terminals	:	Screw type / plug-in type	*
	015		Dimensions	:		*
	016		Weight	:		*
	017		IP rating for housing	:		*
	018		**Human Machine Interface (HMI)**			
			a. Type of display	:	Graphic Display (For Incomers & buscouplers) / Alphanumeric Display(For other feeders)	
			b. Mimic required	:	Yes	
			c. HMI Language	:	English	
	019		**LED Indications**			
			a. No. of LEDs	:		*
			b. Programmable LEDs required	:	Yes	
			c. No. of programmable LEDs available	:		*
	020		Conformal coating required	:	Yes	
	021					
	022					
INPUT / OUTPUT	023		System frequency for measuring inputs	:	50 HZ	
	024		**Current inputs**			
			a. No. of CT inputs	:		*
			b. Rating of CT inputs	:	1/5 A (Refer GES)	
	025		**Voltage inputs**			
			a. No. of VT inputs	:		*
			b. Rating of VT inputs	:	63.5V AC	
			c. Auxiliary supply voltage	:	110V DC	
	026		**Binary inputs/outputs**			
			a. No. of binary inputs required	:	As Required	
			b. No. of binary inputs available	:		*
			c. Voltage threshold for binary inputs	:		*
			d. No. of binary outputs required	:	As Required	
			e. No. of binary outputs available	:		*
			f. Expandability of binary input/output	:		*
			g. Spare DI/DO per relay	:	2 DI / 2 DO (min.)	
	027		Analogue input to relay	:	4 - 20 mA	
	028		Analogue output from relay	:	4 - 20 mA	
	029		**RTD input to relay**			
			a. Type of RTD	:	PT-100	
			b. No. of RTD inputs	:	8 nos.	

USER PROGRAMMABLE LOGIC	031		Max. number of logical equations programmable	:		*
	032		Max. number of standard logic functions (AND/OR/NOT gates & timers) in each logic equation	:		*
	033		Allows user to implement own functions for switchgear automation[See Note-1]	:	Yes	
	034		Language for logic programming	:		*
	035					
	036					
	037					
	038					
	039		Note-1 : User shall be able to map the binary inputs, protection elements, LEDs and binary outputs together in a logical scheme			
DATA STORAGE, EVENT RECORDING	040		**Fault recording / event recording**			
			a. Number of faults recorded	:		*
			b. Number of event recorded	:		*
			c. User settable event for recording value exceeding specified value	:	Yes	
	041		**Oscillographic fault recording**			
			a. Number of oscillographic fault records available	:		*
			b. Number of cycles of pre-trigger data	:		*
			c. Number of cycles of post-trigger data	:		*
			d. Sampling rate	:	samples per cycle	*
			e. Buffer battery provided	:	Yes	
	042		**Time stamping**			
			a. Real time clock provided	:	Yes	
			b. Resolution for event log	:	msec	*
	043					
	044					
COMMUNICATION INTERFACES	045		Time synchronizing interface	:	IRIG-B	
	046		Service interface port (Front)	:	USB serial interface	
	047		Communication interface port (Rear)	:	RJ45 (2No. of copper ports)	
	048		Communication protocol	:	IEC61850	
	049		Communication port redundancy	:	Yes	
	050		Network redundancy protocol	:	Parallel Redundancy Protocol (PRP)	
	051		Number of communication ports	:	2Nos.	
	052		**Fiber Optic ports**		As required	
			a. Mode	:	Multi mode	
			b. Optical wavelength	:	850nm	
			c. Type of FO connectors	:	ST	
	053		Parameters to be transmitted to/from SCADA/~~PMS/EMS~~	:	As per SCADA I/O List	
	054					
PROGRAMMING SOFTWARE	055		Software version for logic programming	:		*
	056		Software version for relay parameterization	:		*
	057		Software version for IEC 61850 configuration	:		*
	058		Software version for fault record analysis	:		*
	059		Software for graphic visualization	:		*
	060		**Note:-**			
			a) For items marked " * " thus, data to be furnished / confirmed by LSTK Contractor during detail engineering			
			b) Data sheet shall be submitted by vendor for each Numerical Relay model type.			

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National Aluminium Company Ltd.

thyssenkrupp

LOW VOLTAGE SWITCHGEAR PANELS

PART - II C

DESIGN DATA SHEET (SPECIFIC PCC/ MCC WISE)

Code	NAL		
Contract no.	66-6695		
Doc.	6695-ELT-G00-EC-0009		
Rev.	01	Page	1 OF 2

GENERAL	001		Panel designation	:	*
	002		Incoming terminal suitable for termination of	:	As per SLD
			cable/ busduct		
	003		Protection and Metering	:	As per SLD & GES
	004		CT and PT Specification	:	As per SLD & GES
	005		Reference SLD no.	:	6695-ELT-G00-FA-0001 & 6695-ELT-G00-FA-0003 (LSTK Contractor to further develop detail SLDs for each switchgear)
	006		Heat Load	: watts	*
	007		Location	: Indoor	
BUS BAR	008		**Main Busbar**		
	009		Continuous current rating (In-panel rating at	:	*
			design ambient temperature and site conditions)		
	010		Size and no. of bus bars for		
			a) Per phase	:	*
			b) Neutral	:	*
	011		**Vertical Busbar**		
	012		Continuous current rating (In-panel rating at	:	*
			design ambient temperature and site conditions)		
	013		Size and no. of bus bars for		
			a) Per phase	:	*
			b) Neutral	:	*
	014	01	Rated short time current withstand capacity	: _____ kA for 1 s	*
	015	01	Rated peak current withstand capacity	: _____ kA (peak) 2.2*Rated short circuit current	*
DIMENSIONS/ CLEARANCES	016		Overall Dimensions (L x B x H mm)	:	*
	017		**Recommended clearances for maintenance**		
			a) Front	:	*
			b) Rear	:	*
			c) Sides	:	*
	018				

LOADING & DIMENSIONAL DETAILS			**Description**	**Static weight (kg)**	**Dynamic wt. (kg)**	**Dimensions (mm) (lxbxh)**
	019		Breaker panel complete with meters, switches & relays	*	*	*
	020		One vertical panel complete with maximum no. of	*	*	*
			outgoing feeders			
	021					
				Width of Panel in mm		
				Single front	**Double front**	
	022		Vertical section with breaker	*	- N.A. -	
	023		Vertical section with maximum number of feeders	*	- N.A. -	
	024		Cable alley vertical section (min. 300 mm)	*	- N.A. -	
	025		Busbar alley vertical section	*	- N.A. -	
	026					

Notes:

a) For items marked " * " thus, data to be furnished by LSTK Contractor during detail engineering

	027		Panel Designation : PCC / MCC (Indicate feeder summary Bus-wise)

OUTGOING FEEDER DETAILS

		Rating (kW / A)	ACB (A)	Switch (A)*	Fuse (A)*	MCCB (A)*	Contactor (A)*	Feeder type	Cable size	Quantity		
										FDR Qty	Spare Qty	Total Qty
028												
029												
030												
031												
032												
033												
034												
035												
036												
037												
038												
039												
040												
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064												

LSTK Contractor to prepare this list buswise for each panel

नालको NALCO नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.	LOW VOLTAGE SWITCHGEAR PANELS	Code	NAL		
		Contract no.	66-6695		
thyssenkrupp	PART - III	Doc.	6695-ELT-G00-EC-0009		
	INSPECTION TEST PLAN	Rev.	00	Page	1 OF 1

Sr. No.	Tests	Reference Documents	Sample size	Scope of Inspection		
				Vendor	Owner / Consultant / LSTK Contractor	Remarks
A	**Type Tests**					
i	Temperature rise test	IS 8623, IEC 61439		P_{PROTO}	R	See note 2
ii	Dielectric Properties	-do-		P_{PROTO}	R	
iii	Short Circuit withstand capacity	-do-		P_{PROTO}	R	See note 3
iv	Short circuit making & breaking capacities	-do-		P_{PROTO}	R	
v	Verification of IP protection	-do-		P_{PROTO}	R	
B	**Routine Tests**					
i	Visual check including layout, tag plates, paint shade, bus marking & sleeving, joint shrouding, identification of location of components etc.	GA drawings		P	W	
ii	Dimensional check including operational height, bus size, Clearances, creepage distances, bus duct flange dimensions etc.	GA drawings		P	W	
iii	Verification of busbar support arrangement with respect to type tested panel drawings	GA Drawings.		P	W	
iv	Bill of material / Make of component Check	-		P	W	
vi	Interchangeability of circuit breakers & outgoing feeder modules of similar rating and type.	-	100%	P	W	
vi	Mechanical operation of circuit breakers, outgoing feeder modules, auxiliary switches, manual devices, etc.	-		P	W	
vii	Operation checks for all control functions and safety interlocks. Check operation of feeders from Marshalling panel and Input/ output signals to Marshalling Panel.	Approved vendor drgs.		P	W	
viii	Operation of circuit breaker for minimum allowable control voltage.	-		P	R	
ix	Closing & opening time of circuit breaker at rated and min. control voltage	-		P	R	
x	Relay operation check through secondary injection	Approved vendor drgs.		P	W	
xi	Checking of meters through secondary injection	Approved vendor drgs.	Min. 10% and one of each type	P	W	
xii	CT Polarity tests	-		P	R	
xiii	Checking protection circuit & electrical continuity of protection circuit	IS 8623		P	W	
xiv	Functional tests	IS 8623, IS/IEC 60947	100%	P	W	
xv	High Voltage Test (Dielectric test)	-do-		P	W	
xvi	Insulation resistance of Main, auxiliary & control circuits before & after HV test	-do-		P	W	
C	**Test Certificates**					
i	Test Certificates for bought out items like breakers, MCCB, CT, PT, meters, relays, switches, contactors	GA drawings		P	R	

Notes:

1) W = Witness, R = Review, P = Perform on project equipment, P_{PROTO} = Perform on prototype.

2) Temperature rise test shall be performed at rated current with diversity factor = 1. One breaker panel (preferably bus coupler) shall be included in the test and the breaker shall carry the full test current.

3) Short circuit withstand capacity report shall be available for offered sizes of horizontal and vertical busbars.

TYPE-2 COORDINATION CHART FOR DOL MOTOR FEEDERS WITH SWITCH-FUSE-CONTACTOR-ELECTRONIC OVERLOAD RELAY

MOTOR RATING (kW)	MOTOR FULL LOAD CURRENT (A)	SDF In (A)	HRC FUSE In (A)	CONTACTOR In (A)	ELECTRONIC OVERLOAD RELAY RANGE (A)
0.37	1	32	4	12	60-120% of full load current
0.55	1.3	32	4	12	
0.75	1.9	32	6	12	
1.1	2.6	32	6	12	
1.5	3.7	32	10	12	
2.2	4.8	32	16	12	
3.7	7.8	32	20	12	
5.5	11.2	32	25	16	
7.5	15	32	32	18	
9.3	19	50	50	25	
11	20.8	50	50	25	
15	28	63	63	38	
18.5	34	63	63	40	
22	40	100	80	50	
30	53	100	100	65	
37	65	125	125	80	
45	78	125	125	95	
55	96	160	160	115	
75	131	200	200	170	
90	156	250	250	185	
110	189	250	250	225	
132	227	315	315	300	
160	271	400	400	325	
200	339	630	500	400	
250	398	630	500	500	

NOTES:

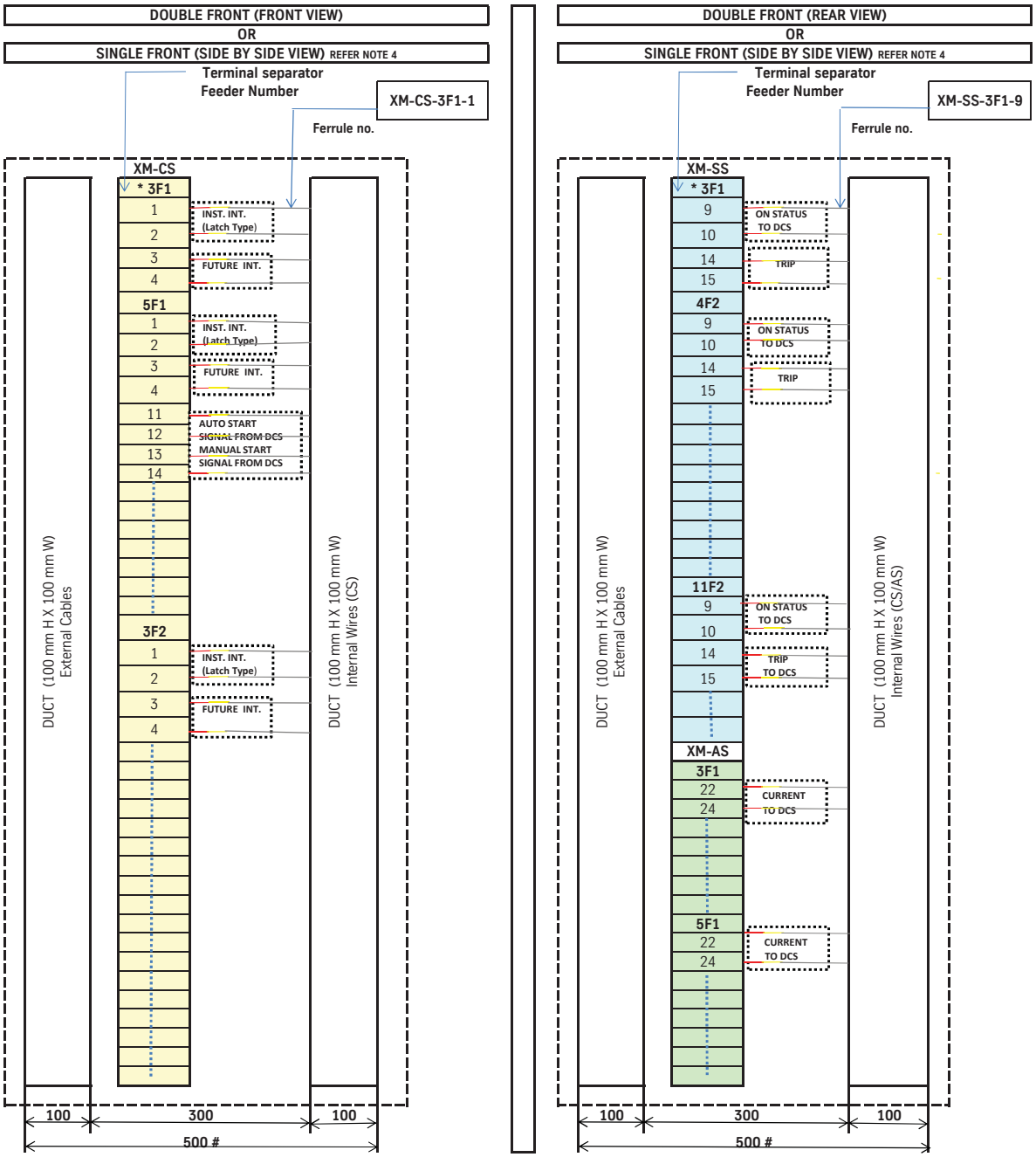
1. The switch and contactor ratings shown are the minimum required ratings. In case, components of higher rating are required as per manufacturer's recommendation to meet Type 2 Coordination requirements then the same shall be considered.
2. The range of the electronic overload relays shall be within the range specified above.
3. The fuse rating shall be followed as per the above chart. In case of L & T fuses, 63 A rating shall be considered for 11 kW and 80 A rating shall be considered for the 18.5 kW feeder.

4. Selection is for normal starting conditions with starting time less than or equal to 5 seconds.
5. Air Break Contactor - Below 75 kW (Contactor rating shall be one size higher than that recommended by the Type 2 Coordination of switchgear vendor).
6. Vacuum Contactor - 75 kW to 200 kW & Agitator motor.

Annexure-2

Signals to DCS are located in separate panels

TYPICAL LAYOUT OF MARSHALLING PANEL DIAGRAM



Notes:

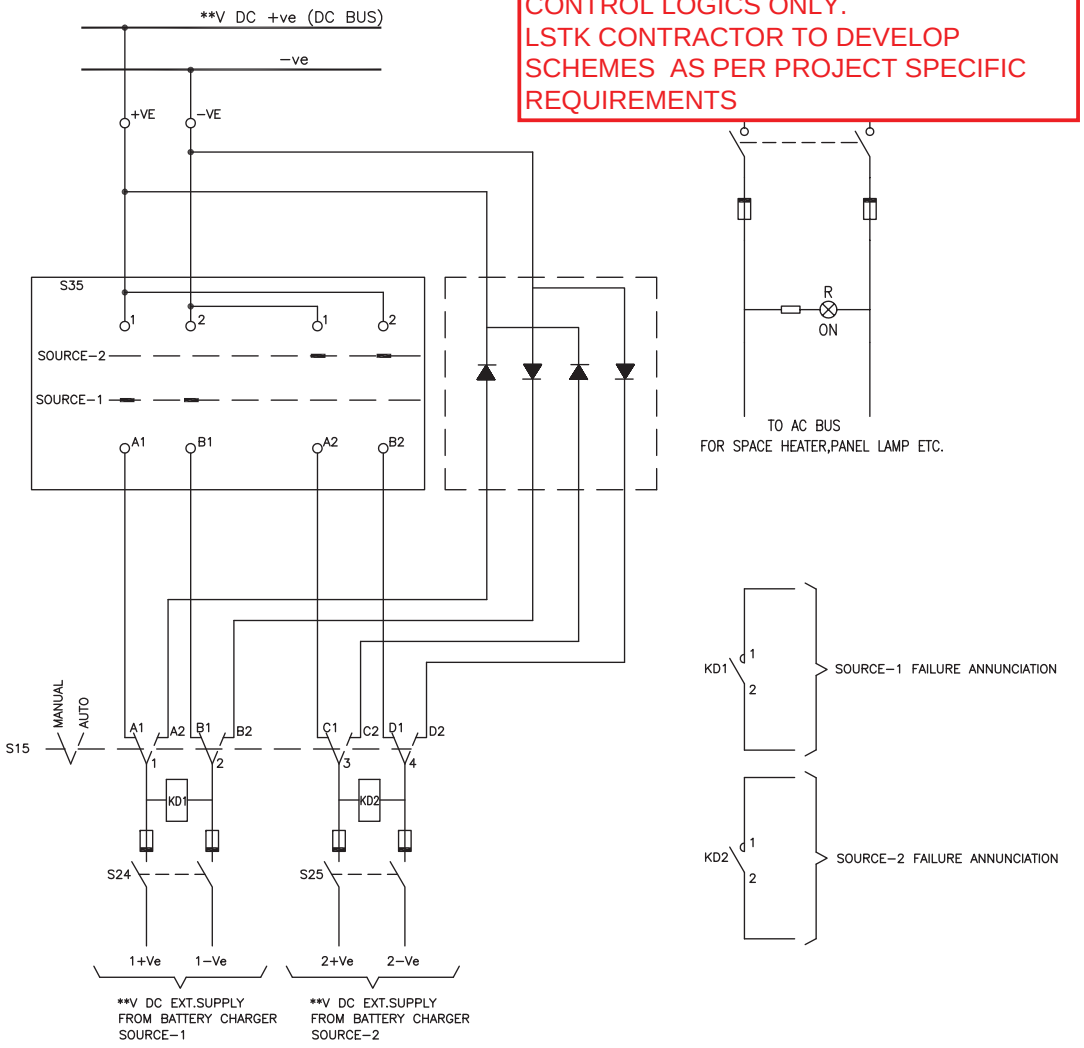
1. "#" Dimensions are tentative to be finalized by Switchgear Vendor.
2. Philosophy of termination of spare cores of cable and the percentage of spare terminals to be provided to be finalized after consultation with Instrumentation (INS).
3. "*"- The sequence of feeder shall be given by Instrumentation. Unique terminal number for each type of signal can be standardised for the project by Electrical and Instrumentation during detail
4. In case of single front panels there could be one panel for XM-CS, XM-SS and XM-AS are segregated and arranged vertically one below the other OR separate panels as indicated above.
5. Marshalling panel shall always be located at bottom of the panel.

Abbreviation:

XM-CS: Terminal strip for control signals (e.g.: Interlock, L/R/, A/M)
XM-SS: Terminal strip for status signals (e.g.: Run, Trip)
XM-AS: Terminal strip for Analog signals (e.g.: Current, Power)

ANNEXURE-3

THIS SCHEME SHALL BE REFERED FOR CONTROL LOGICS ONLY.
LSTK CONTRACTOR TO DEVELOP SCHEMES AS PER PROJECT SPECIFIC REQUIREMENTS



AC/DC CIRCUIT SHALL BE PART OF BUSCOUPLER OR BUSPT(BPT) FEEDER.

COMPONENT DESIGNATION

KA : REF RELAY (KA1,KA2,&KA3)
KB : STAND–BY EARTH–FAULT RELAY (KB1,KB2 & KB3)
K1 : ANTIPUMPING RELAY/CONTACTOR
K2 : OVERCURRENT & EARTHFAULT RELAY
: 3 O/C IDMT & 1 E/F (K2A,K2B,K2C,K2D,K2E,K2F,K2G & K2H)
: 3 O/C IDMT(VOLTAGE RESTRAINED) & 1 E/F (K2I)
K3 : BUS PT SECONDARY MCB
K4 : 80 % BUS UNDER VOLTAGE RELAY (K4A & K4B)
K5 : 20 % BUS UNDER VOLTAGE RELAY (K5A & K5B)
K6 : LINE PT SECONDARY MCB
K7 : 80% LINE UNDER VOLTAGE RELAY(K7A & K7B)
K9A & K9B : > 80% LINE VOLTAGE HEALTHY RELAY
K11 : LOCKOUT RELAY
K19 : DG REF OPERATED CONTACT MULTIPLICATION
K12 : TRIP CIRCUIT SUPERVISION RELAY
K21 : BREAKER CONTACT MULTIPLICATION RELAY (BISTABLE LATCHED TYPE / VAJC OR EQUIVALENT)
K8 : LINE UNDER VOLTAGE CONTACT MULTIPLICATION
K25 : LINE UNDER VOLTAGE(TIMER) CONTACT MULTIPLICATION
K10 : LINE VOLTAGE HEALTHY CONTACT MULTIPLICATION
K51,K52,K53,K54 : CONTACT MULTIPLICATION(BREAKER PARALLEL COMBINATION)
K22 : BUS PT MCB CONTACT MULTIPLICATION
K24 : LINE PT MCB CONTACT MULTIPLICATION
K31 : SYNCHRO CHECK RELAY
K32 : SYNCHRO CHECK RELAY CONTACT MULTIPLICATION
KD : CONTACTOR FOR DC SUPPLY (KD1 & KD2)
T1 : ON DELAY TIMER FOR 80 % U/V (0.5–5 SEC.)
K23 : BUS UNDER VOLTAGE(TIMER) CONTACT MULTIPLICATION
T2 & T3 : ON DELAY TIMER FOR PARALLEL TRIPPING (0.1–60 SEC.)
S1 : TNC BREAKER CONTROL SWITCH
S2 : A/M/I–AUTO/MANUAL/INDEPENDENT MODE SELECTOR SWITCH (FOR NORMAL SUPPLY CHANGEOVER)
S3 : TRIP SELECTOR SWITCH (TSS)
S4 : ON/OFF SWITCH FOR SYNCHROCHECK
S5 : A/M/I–AUTO/MANUAL/INDEPENDENT MODE SELECTOR SWITCH (FOR DG SUPPLY CHANGEOVER)
S24,S25. : DC SWITCH
S15 : DC AUTO/MANUAL SWITCH
S35 : SELECTOR SWITCH–SOURCE 1/2

NOTE :
1. PROTECTION RELAY,MASTER TRIP REALY,BREAKER CONTACT MULTIPLICATION RELAY,TRIP CIRCUIT SUPERVISION RELAY,COMPOSITE METER,AMMETER SELECTOR SWITCH, VOLTMETER SELECTOR SWITCH,AMMETER,VOLTMETER,TRIP SELECTOR SWITCH,AUTO–MANUAL INDEPENEDENT SELECTOR SWITCH,TNC SWITCH,INDICATING LAMPS SHALL BE MOUNTED ON DOOR FRONT.
2. FOR DETAIL SPECIFICATION OF RELAYS, METERS, C.T.'s & OTHER POWER DEVICES, REFER SINGLE LINE DIAGRAM.

1. USER TO ENTER LT PANEL IDENTIFICATION NUMBER.
2. SELECT TYPE OF INDICATING METERS i.e. CONVENTIONAL/ COMPOSITE DIGITAL AS PER GES.
3. BALANCE DETAILS (OTHER PROTECTIONS, INTERLOCKS AND INTERFACES IF ANY) SHALL BE UPDATED/MODIFIED BASED ON PROJECT REQUIREMENT.

THIS CLOUD SHALL BE DELETED AFTER FINALISING THE SCHEMATIC TYPE FOR THE PROJECT.

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
	Drawn/Prepared		Checked		Approved			
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	

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Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
			–	1 / 17

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Description
POWER AND CONTROL SCHEMATIC FOR 2 INCOMER, 1 DG INCOMER AND 2 BUS COUPLER WITH MANUAL & AUTO BUS TRANSFER FOR 415 V SWITCHGEAR

Store Location: Server/Share | Store Location: Folder | Store Name : E601

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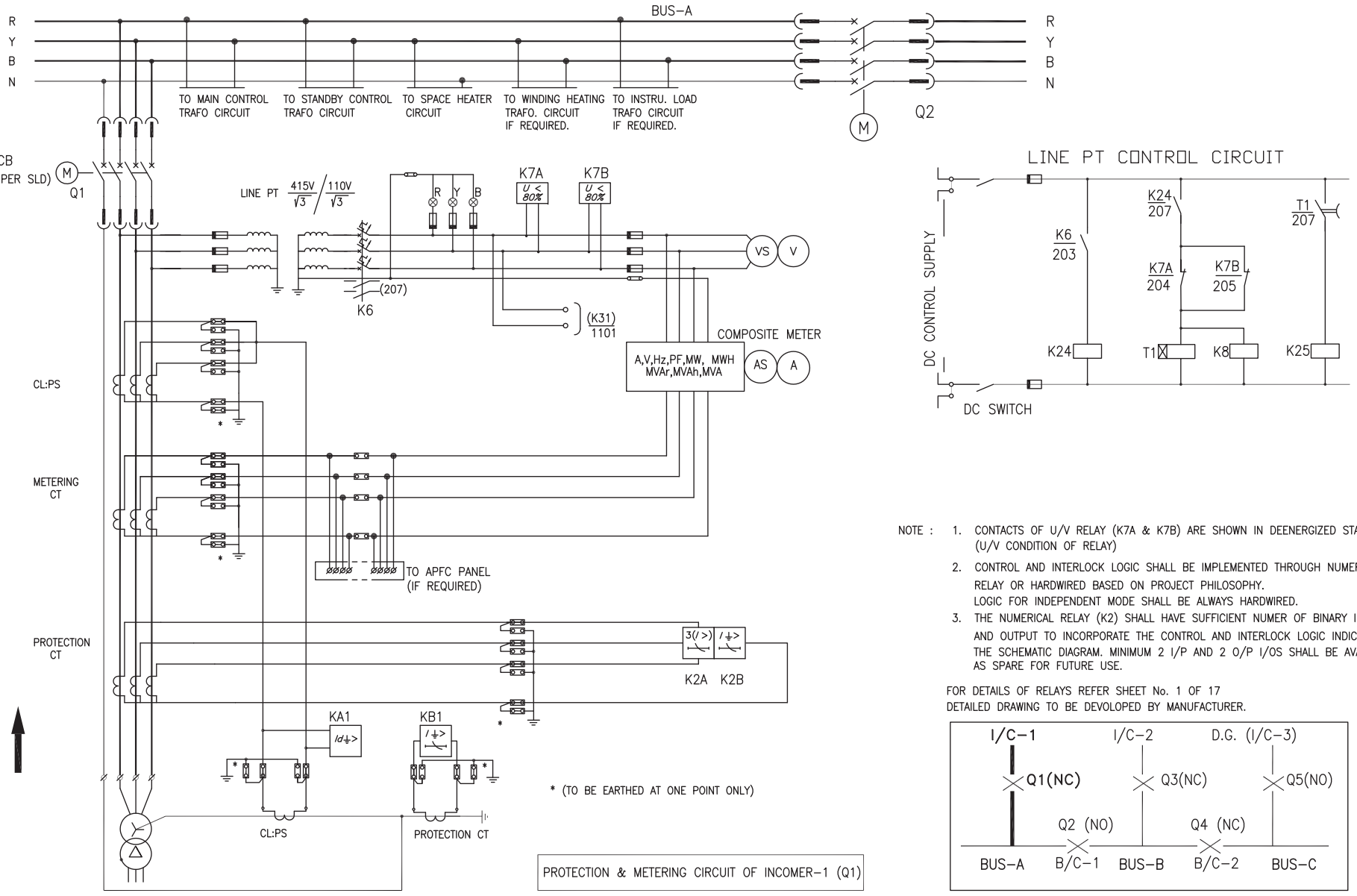
TKIS - India ISO A3



PROTECTION & METERING CIRCUIT OF INCOMER–1 (Q1)

NOTE :
1. CONTACTS OF U/V RELAY (K7A & K7B) ARE SHOWN IN DEENERGIZED STATE (U/V CONDITION OF RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY. LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.
3. THE NUMERICAL RELAY (K2) SHALL HAVE SUFFICIENT NUMER OF BINARY INPUTS AND OUTPUT TO INCORPORATE THE CONTROL AND INTERLOCK LOGIC INDICATED IN THE SCHEMATIC DIAGRAM. MINIMUM 2 I/P AND 2 O/P I/OS SHALL BE AVAILABLE AS SPARE FOR FUTURE USE.

FOR DETAILS OF RELAYS REFER SHEET No. 1 OF 17
DETAILED DRAWING TO BE DEVOLOPED BY MANUFACTURER.

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved			

Document–ID–BAR–Code

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
				2 / 17

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

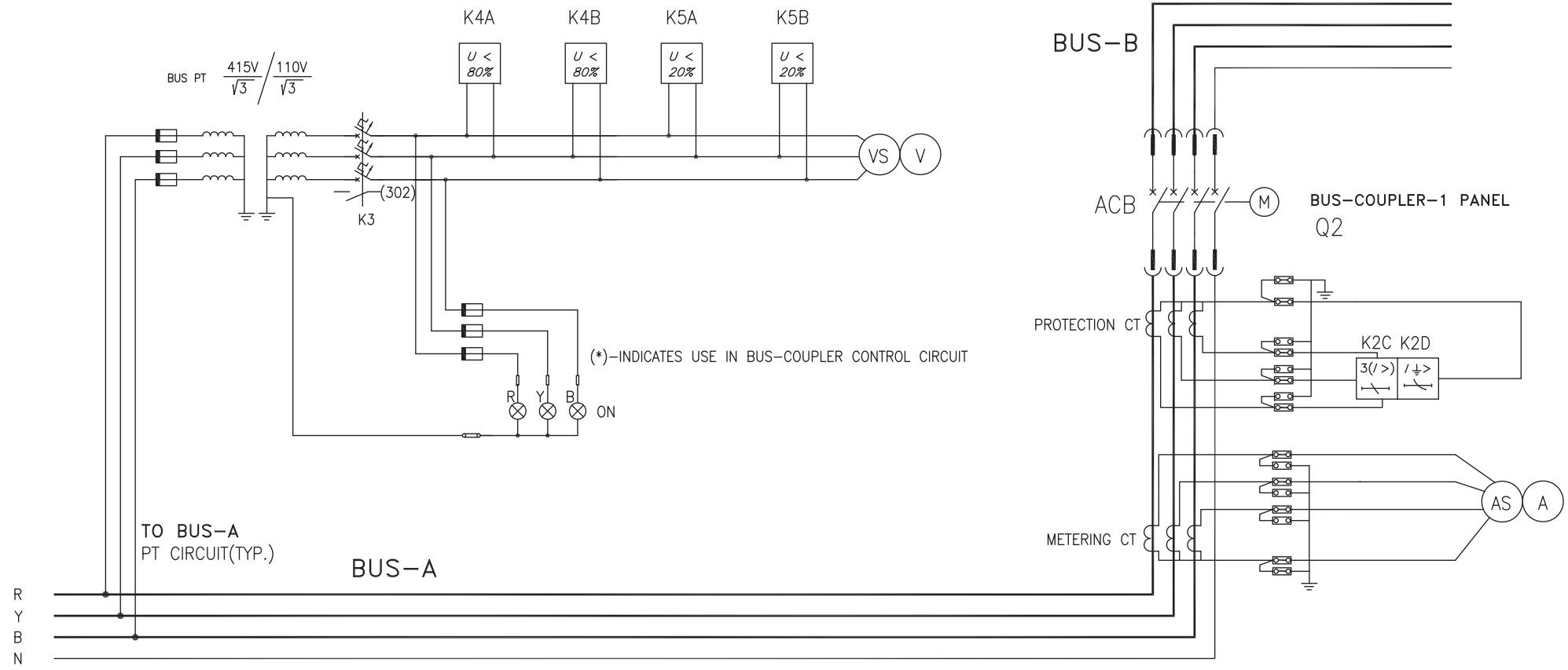
Store Location: Server/Share | Store Location: Folder | Store Name: E602

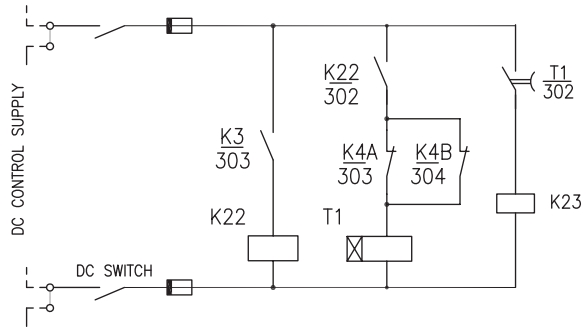
UAN | Code | Document ID | Part | Group | Rev. 0

ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR 2 INCOMER, 1 DG INCOMER AND 2 BUS COUPLER WITH MANUAL & AUTO BUS TRANSFER FOR 415 V SWITCHGEAR





CONTACTS OF T1 SHALL BE MULTIPLIED AND USED FOR
BREAKER CONTROL OUTGOING MOTOR/ CAPACITOR FEEDERS ON BUS–A

PROTECTION & METERING CIRCUIT OF BUSCOUPLER (Q2)

BUS A– PT CIRCUIT

NOTES :

1. CONTACTS OF UNDER VOLTAGE RELAYS (K4A,K4B,K5A,K5B,)
   ARE SHOWN IN THE DEENERGISED STATE (U/V CONDITION OF THE RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY.
   LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.
3. THE NUMERICAL RELAY (K2) SHALL HAVE SUFFICIENT NUMER OF BINARY INPUTS AND OUTPUT TO INCARPORATE THE CONTROL AND INTERLOCK LOGIC INDICATED IN THE SCHEMATIC DIAGRAM. MINIMUM 2 I/P AND 2 O/P I/OS SHALL BE AVAILABLE AS SPARE FOR FUTURE USE.

Rev.	Date	Name	Date	Name	Date	Name		Acc. Code
	Drawn/Prepared		Checked		Approved		Description	
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	

Document–ID–BAR–Code

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Pro. Unit	TON	Cat. Code	Acc. Code	Status

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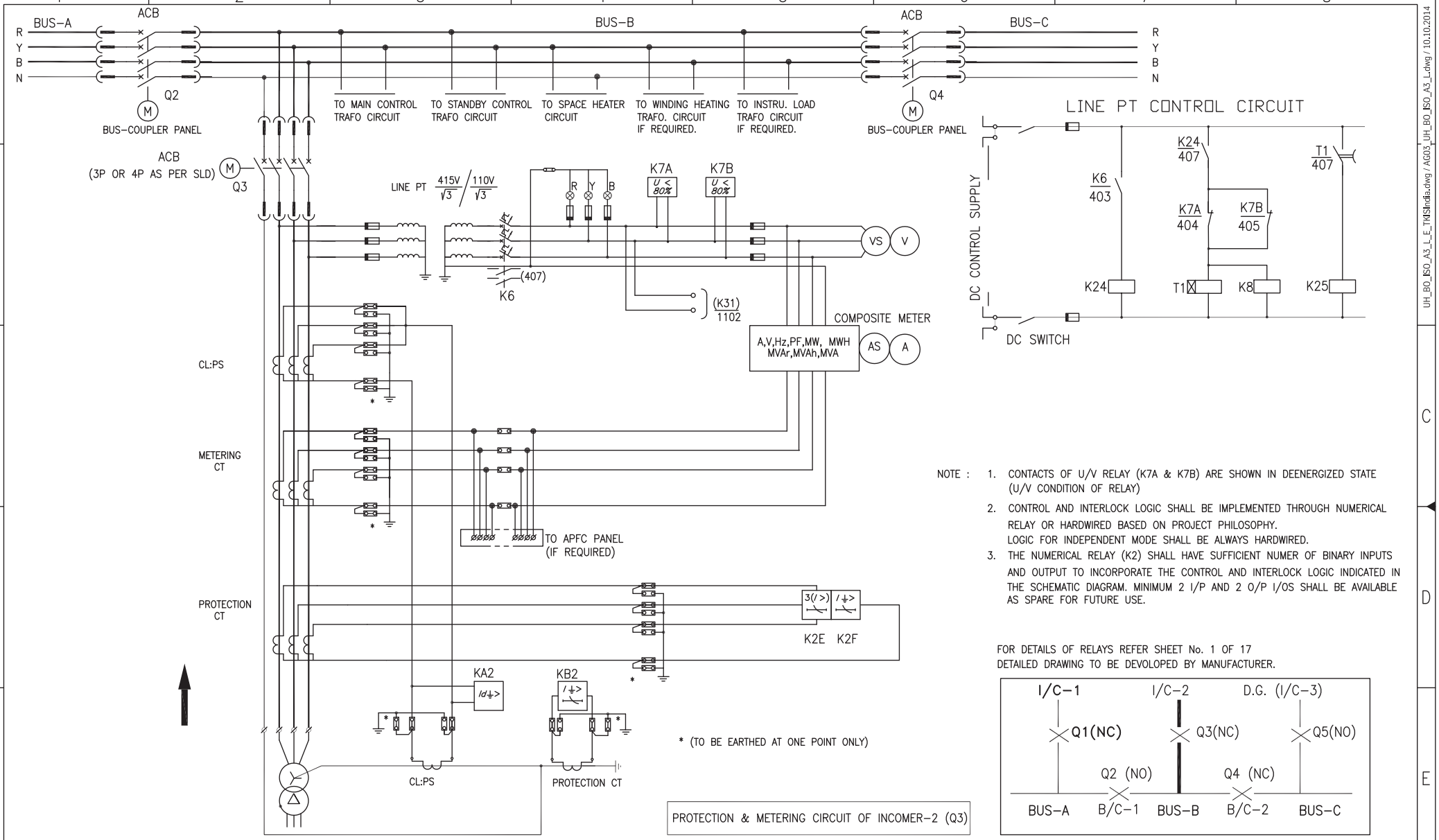
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Store Location: Server/Share | Store Location: Folder | Store Name: E603

ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR



PROTECTION & METERING CIRCUIT OF INCOMER-2 (Q3)

NOTE :

1. CONTACTS OF U/V RELAY (K7A & K7B) ARE SHOWN IN DEENERGIZED STATE (U/V CONDITION OF RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY. LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.
3. THE NUMERICAL RELAY (K2) SHALL HAVE SUFFICIENT NUMER OF BINARY INPUTS AND OUTPUT TO INCORPORATE THE CONTROL AND INTERLOCK LOGIC INDICATED IN THE SCHEMATIC DIAGRAM. MINIMUM 2 I/P AND 2 O/P I/OS SHALL BE AVAILABLE AS SPARE FOR FUTURE USE.

FOR DETAILS OF RELAYS REFER SHEET No. 1 OF 17
DETAILED DRAWING TO BE DEVOLOPED BY MANUFACTURER.

Document-ID-BAR-Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Drawn/Prepared	Name	Date	Checked	Name	Date	Approved	Name	Description	Acc. Code				

Pro. Unit	TON	Cat. Code	Acc. Code	Status
Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets 4 / 17

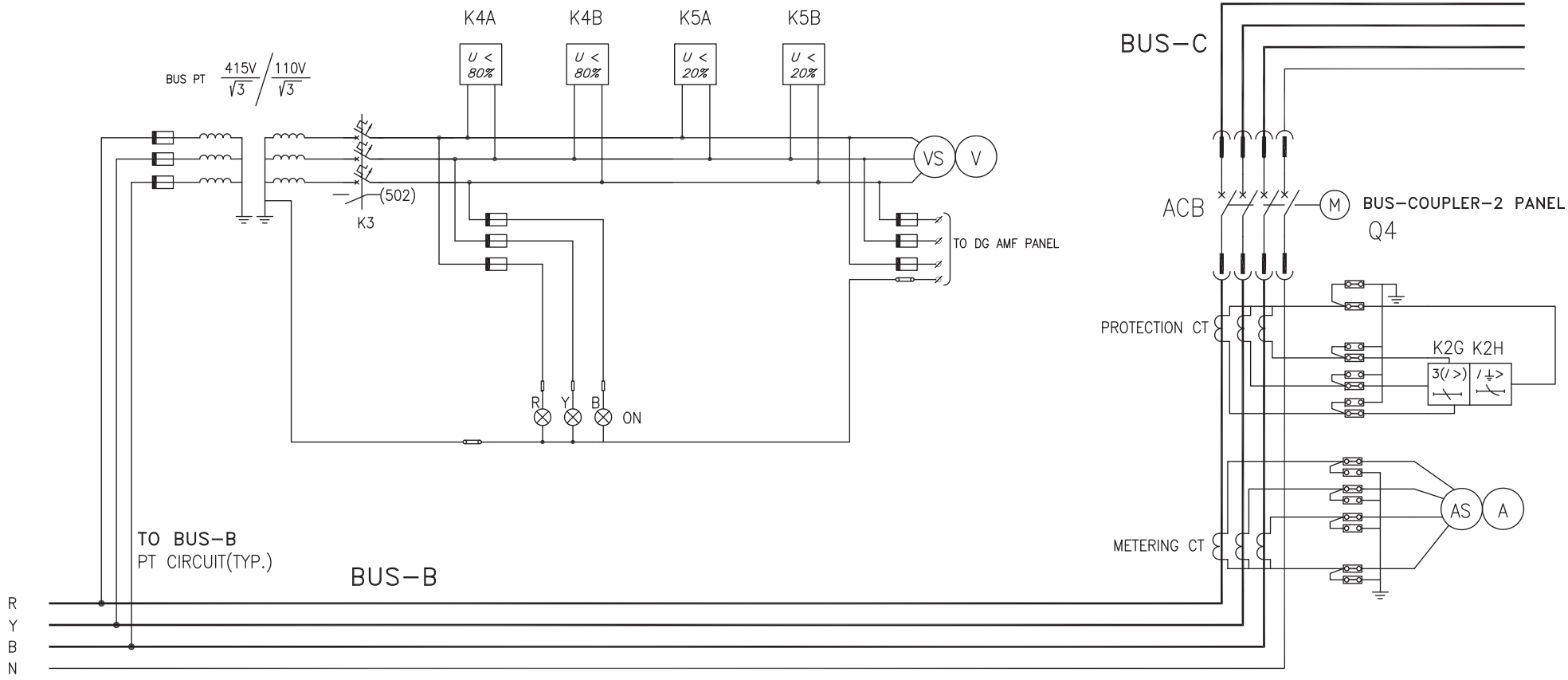
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

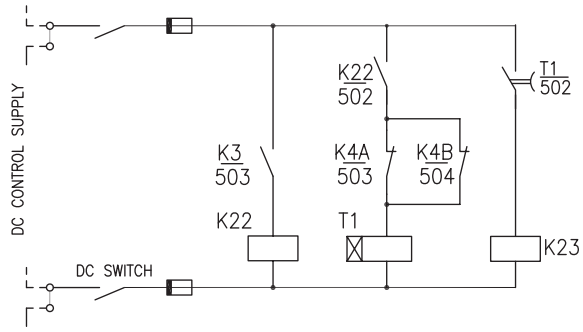
Store Location: Server/Share | Store Location: Folder | Store Name: E604

ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR 2 INCOMER, 1 DG INCOMER AND 2 BUS COUPLER WITH MANUAL & AUTO BUS TRANSFER FOR 415 V SWITCHGEAR





CONTACTS OF T1 SHALL BE MULTIPLIED AND USED FOR
BREAKER CONTROL OUTGOING MOTOR/ CAPACITOR FEEDERS ON BUS–B

PROTECTION & METERING CIRCUIT OF BUSCOUPLER–2 (Q4)

BUS B– PT CIRCUIT

NOTES :

1. CONTACTS OF UNDER VOLTAGE RELAYS (K4A,K4B,K5A,K5B,)
   ARE SHOWN IN THE DEENERGISED STATE (U/V CONDITION OF THE RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY.
   LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.
3. THE NUMERICAL RELAY (K2) SHALL HAVE SUFFICIENT NUMER OF BINARY INPUTS AND OUTPUT TO INCARPORATE THE CONTROL AND INTERLOCK LOGIC INDICATED IN THE SCHEMATIC DIAGRAM. MINIMUM 2 I/P AND 2 O/P I/OS SHALL BE AVAILABLE AS SPARE FOR FUTURE USE.

Rev.	Date	Name	Date	Name	Date	Name		Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved		Description	

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Pro. Unit	TON	Cat. Code	Acc. Code	Status

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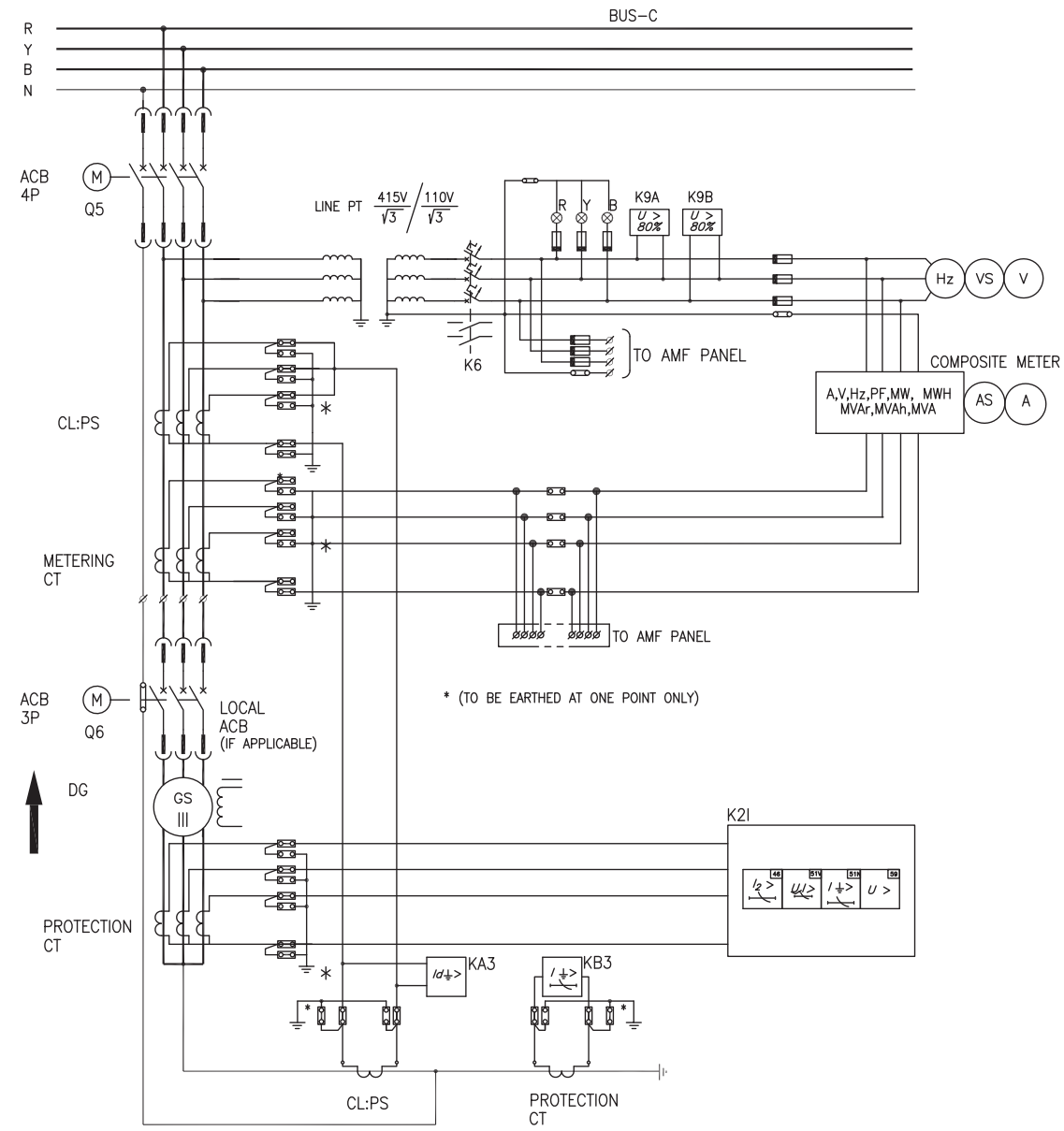
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

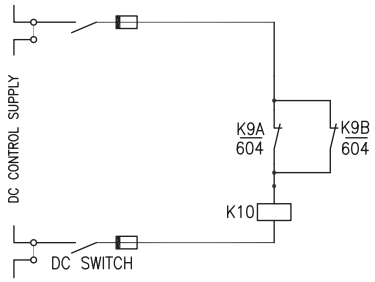
Store Location: Server/Share	Store Location: Folder	Store Name:
		E605

ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR



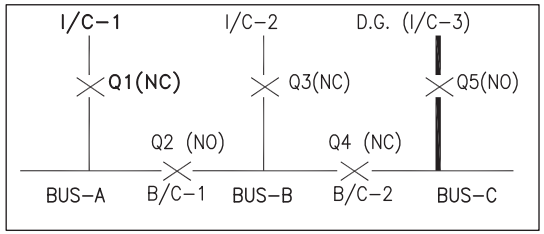


NOTE : 1. CONTACTS OF VOLTAGE HEALTHY RELAY (K9A & K9B) ARE SHOWN IN VOLTAGE HEALTHY STATE (VOLTAGE HEALTHY CONDITION OF RELAY)

2. LOCATION AND SCOPE OF RELAYS KA3, KB3 & K2I IS BASED ON SLD.

3. TARIFF METERING & CT'S AS PER SLD.

FOR DETAILS OF RELAYS REFER SHEET No. 1 OF 17
DETAILED DRAWING TO BE DEVOLOPED BY MANUFACTURER.



PROTECTION & METERING CIRCUIT OF DG. INCOMER (I/C–3 , Q5)

Document–ID–BAR–Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Drawn/Prepared Name		Date	Checked Name	Date	Approved Name	Description	Acc. Code					

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Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
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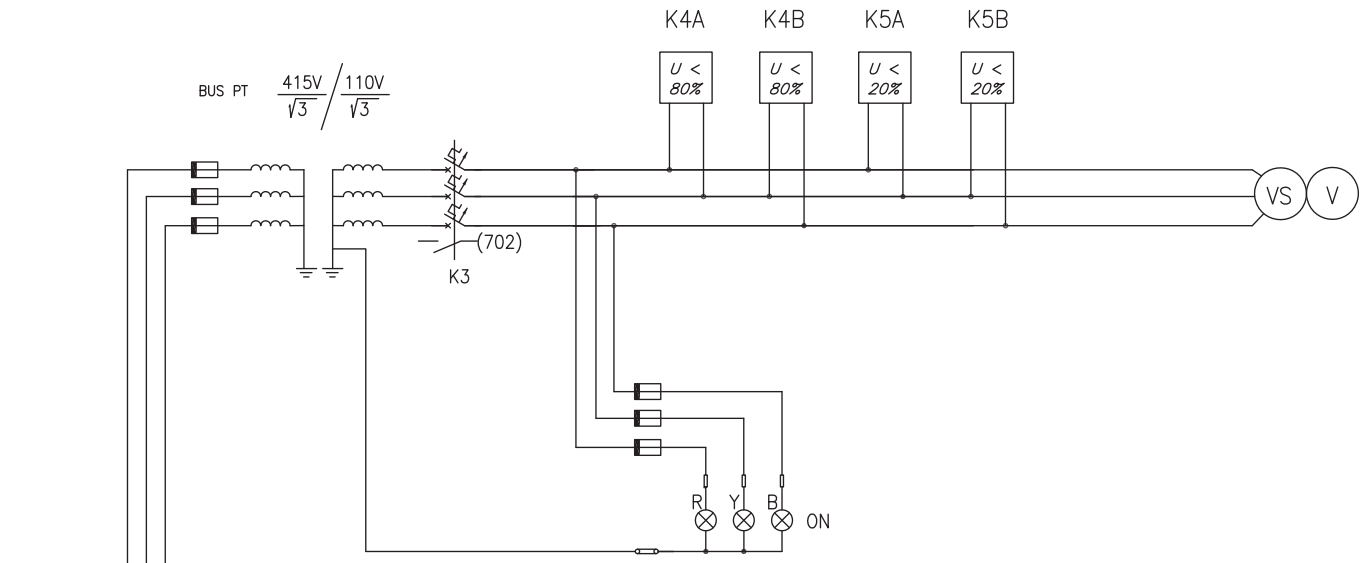
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Description
POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR

Store Location: Server/Share	Store Location: Folder	Store Name
		E606

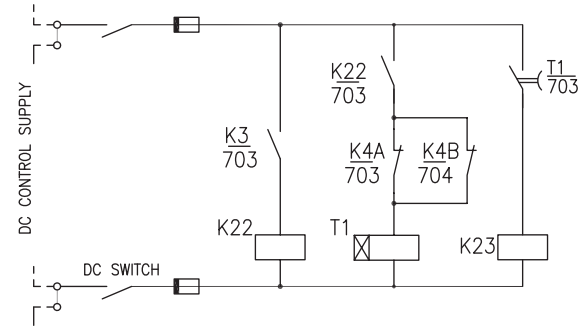
TKIS - India ISO A3



TO BUS–C
PT CIRCUIT(TYP.)

BUS–C

R
Y
B
N



CONTACTS OF T1 SHALL BE MULTIPLIED AND USED FOR
BREAKER CONTROL OUTGOING MOTOR/ CAPACITOR FEEDERS ON BUS–C

BUS C– PT CIRCUIT

NOTES :

1. CONTACTS OF UNDER VOLTAGE RELAYS (K4A,K4B,K5A,K5B,)
   ARE SHOWN IN THE DEENERGISED STATE (U/V CONDITION OF THE RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY.
   LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.

Rev.	Date	Name	Date	Name	Date	Name		Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved		Description	

Document–ID–BAR–Code

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
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Store Location: Server/Share	Store Location: Folder	Store Name: E607

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

UAN	Code: Document ID	Part	Group	Rev.
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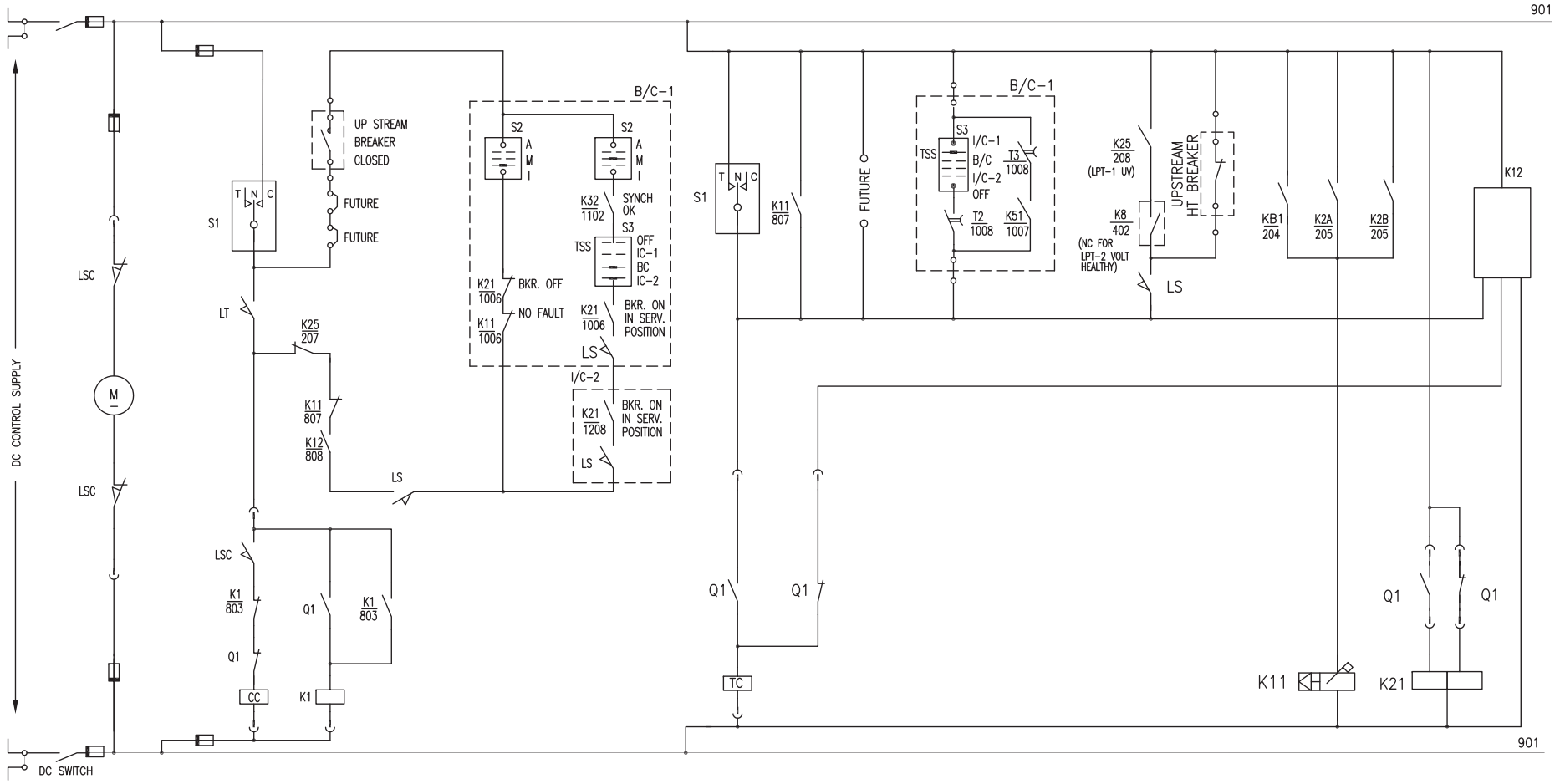
ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR



Q1, Q2, Q3, Q4, Q5, Q6 ARE BREAKER CONTACTS.
LSC CHANGES WHEN SPRING IS CHARGED, LT IN TEST & LS IN SERVICE.
CC: CLOSING COIL TC: TRIP COIL

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

CLOSING & TRIPPING CIRCUIT OF INCOMER–1 (Q1)

Document–ID–BAR–Code	Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
	0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
		Drawn/Prepared		Checked		Approved			

UAN	Code: Document ID	Part	Group	Rev.
				0

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
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	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

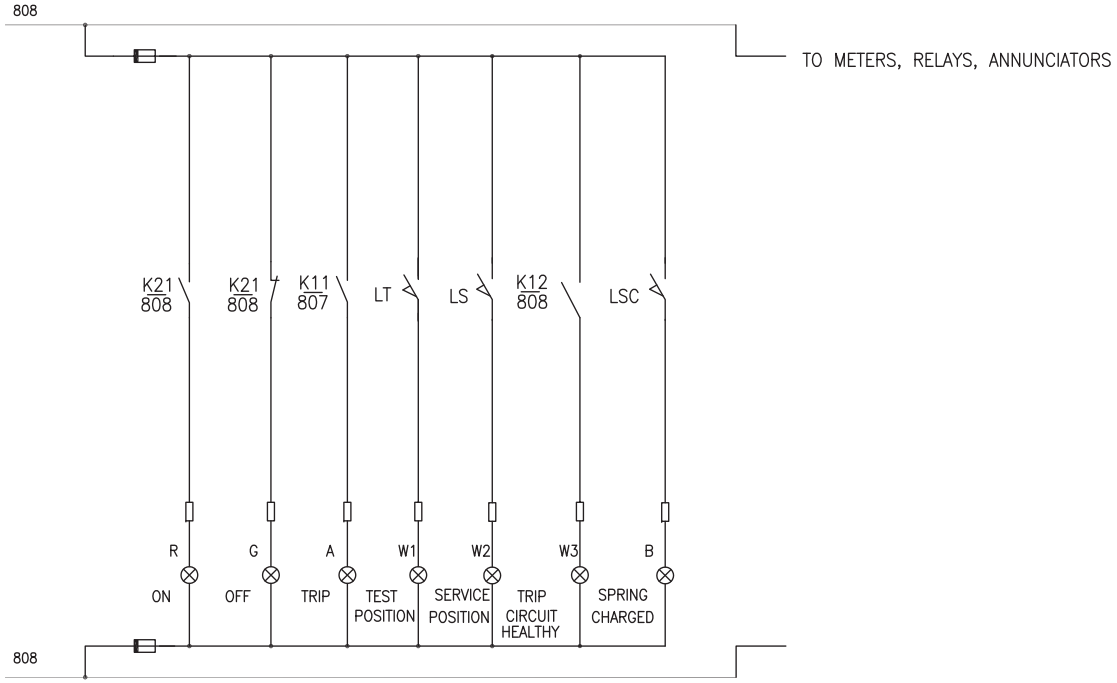
Store Location: Server/Share	Store Location: Folder	Store Name:
		E608

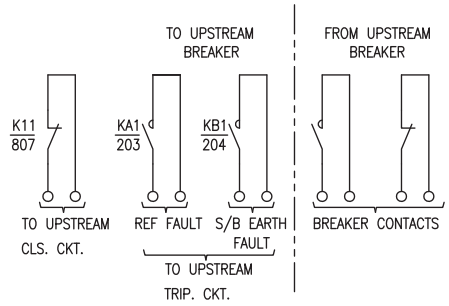
ThyssenKrupp Industrial Solutions (India)

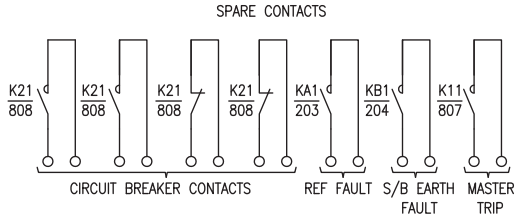
Description

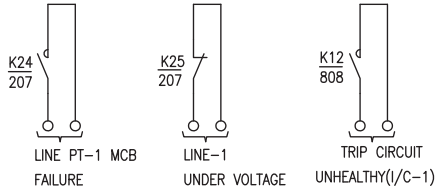
POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR

TKIS - India ISO A3









INCOMER–1 (Q1) INDICATION, AUX. CONTACTS

DETAILED CONTACT DEVELOPMENT & RELAYS FOR ADDITIONAL CONTACTS TO MEET FUNCTIONAL REQUIREMENT OF SCHEMATIC SHALL BE PROVIDED BY MANUFACTURER & SAME SHALL BE CONSIDERED IN THE OFFER.

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved			

Document–ID–BAR–Code

UAN | Code: Document ID | Part | Group | Rev. 0

Pro. Unit	TON	Cat. Code	Acc. Code	Status

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				9 / 17

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Store Location: Server/Share | Store Location: Folder | Store Name: E609

ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR

TKIS - India ISO A3

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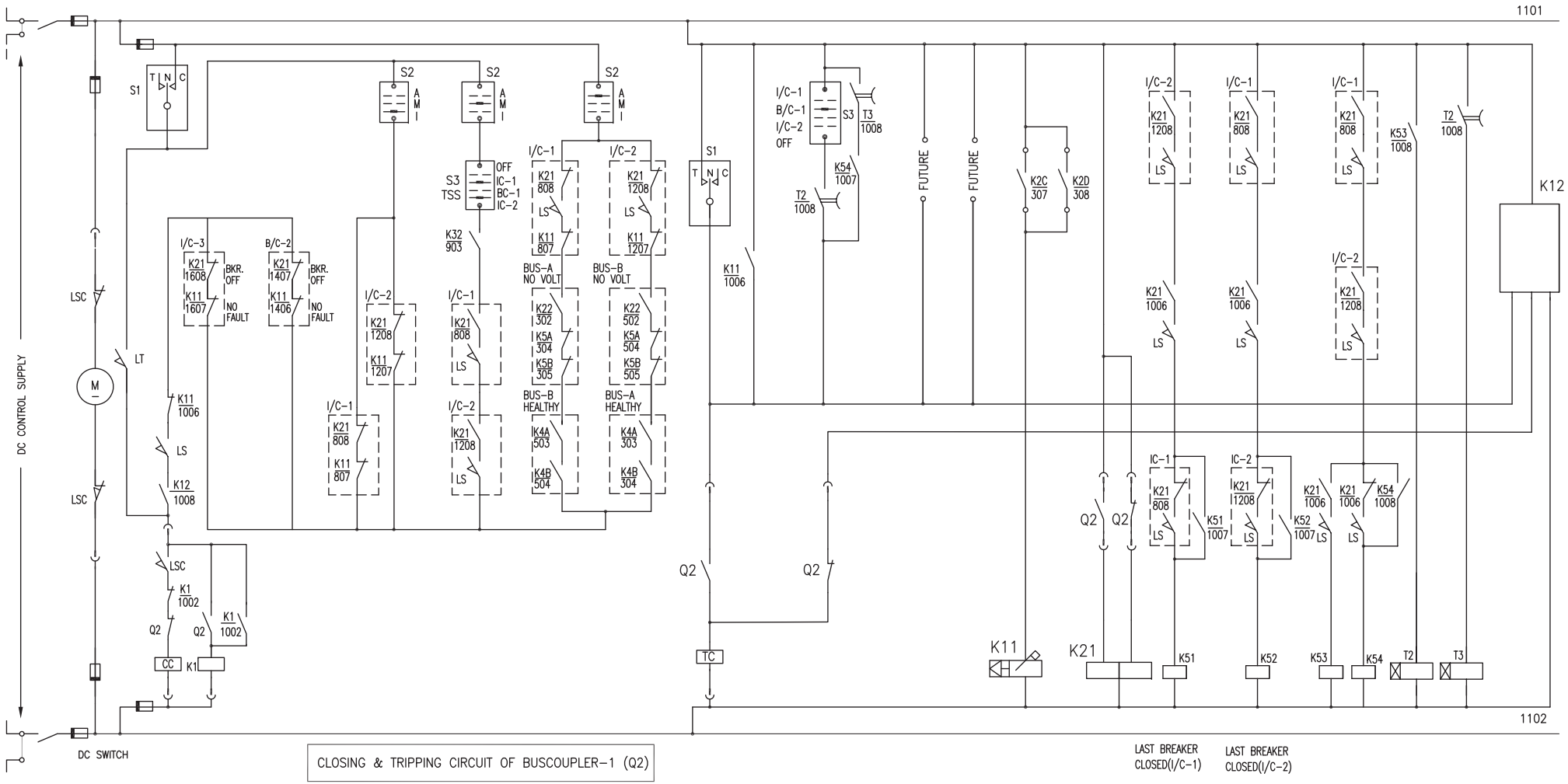

CLOSING & TRIPPING CIRCUIT OF BUSCOUPLER–1 (Q2)

LAST BREAKER CLOSED(I/C–1)

LAST BREAKER CLOSED(I/C–2)

Q1, Q2, Q3, Q4, Q5, Q6 ARE BREAKER CONTACTS.
LSC CHANGES WHEN SPRING IS CHARGED, LT IN TEST & LS IN SERVICE.
CC: CLOSING COIL TC: TRIP COIL

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

Document–ID–BAR–Code	Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
	0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
		Drawn/Prepared		Checked		Approved			

UAN	Code	Document ID	Part	Group	Rev.
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Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
				10 / 17

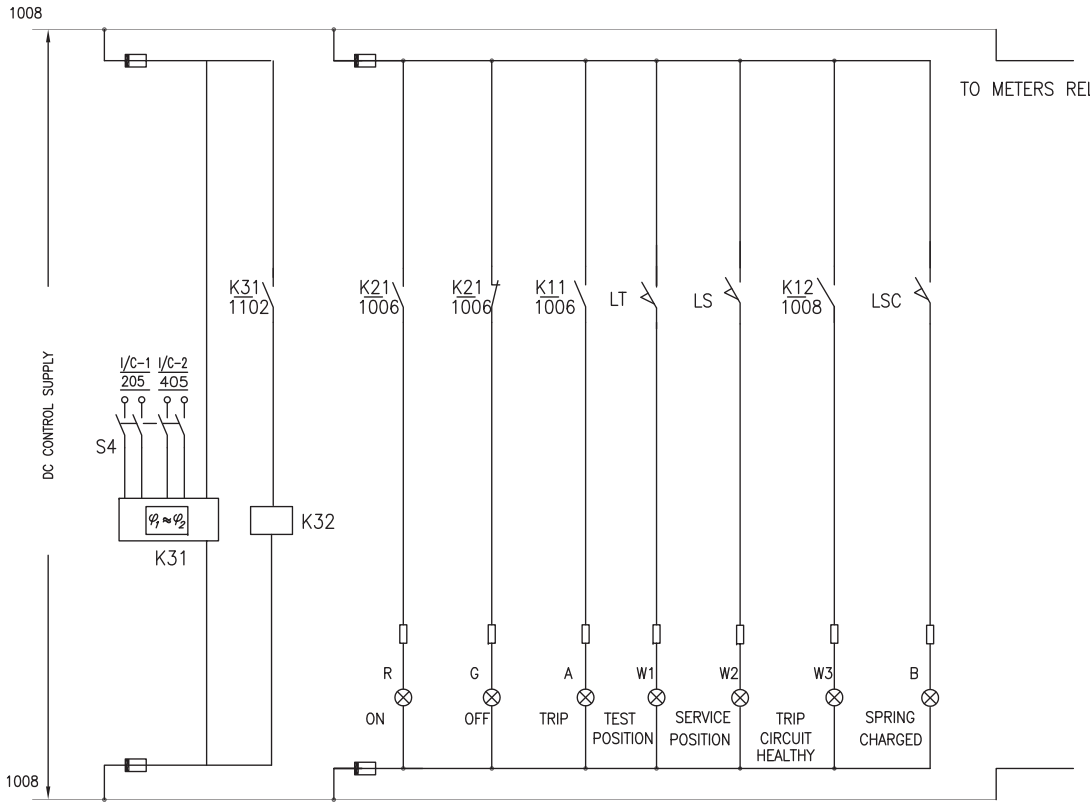
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Store Location: Server/Share	Store Location: Folder	Store Name:
		E610

ThyssenKrupp Industrial Solutions (India)

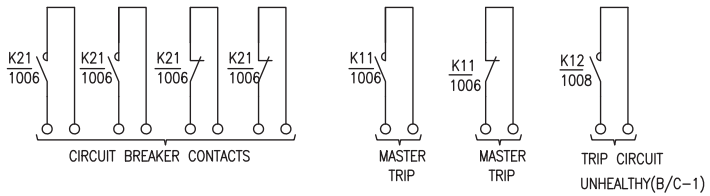
Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR

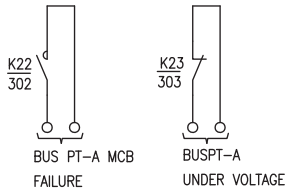


SPARE CONTACTS

BUSCOUPLER–1



BUS PT–A



DETAILED CONTACT DEVELOPMENT & RELAYS FOR ADDITIONAL CONTACTS TO MEET FUNCTIONAL REQUIREMENT OF SCHEMATIC SHALL BE PROVIDED BY MANUFACTURER & SAME SHALL BE CONSIDERED IN THE OFFER.

BUSCOUPLER–1 (Q2) INDICATION, AUX. CONTACTS

Document–ID–BAR–Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code: Document ID	Part	Group	Rev. 0
	Rev.	Date	Drawn/Prepared	Name	Date	Checked	Name	Date	Approved	Name	Description	Acc. Code				

ThyssenKrupp Industrial Solutions (India)

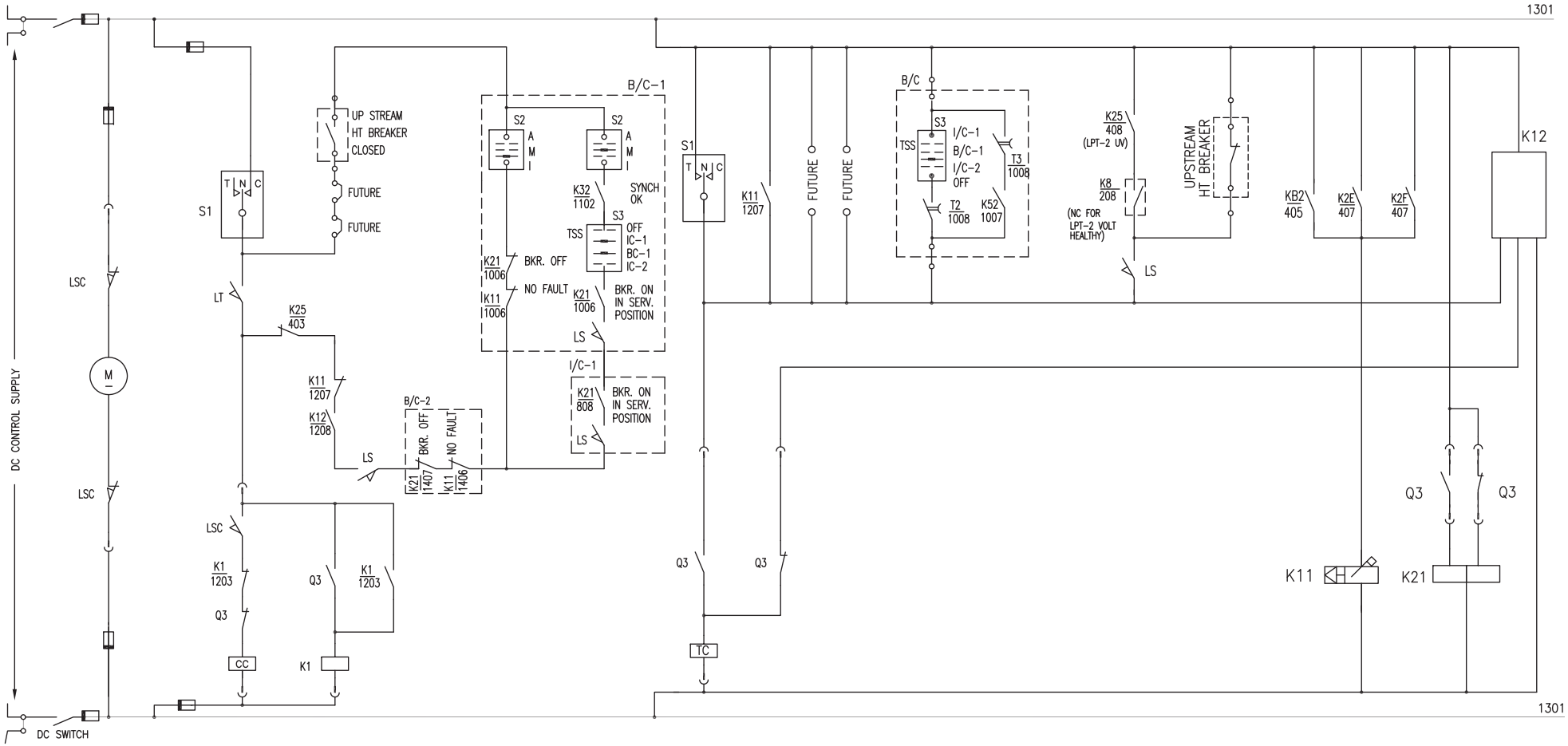
Pro. Unit	TON		Cat. Code	Acc. Code	Status
Con. Unit	Type of Document	Order No.	Scale		Tot. Sheets 11/17

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Description: POWER AND CONTROL SCHEMATIC FOR 2 INCOMER, 1 DG INCOMER AND 2 BUS COUPLER WITH MANUAL & AUTO BUS TRANSFER FOR 415 V SWITCHGEAR

Store Location: Server/Share	Store Location: Folder	Store Name
		E611

TKIS - India ISO A3



Q1, Q2, Q3, Q4, Q5, Q6 ARE BREAKER CONTACTS.
LSC CHANGES WHEN SPRING IS CHARGED, LT IN TEST & LS IN SERVICE.
CC: CLOSING COIL TC: TRIP COIL

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

CLOSING & TRIPPING CIRCUIT OF INCOMER–2 (Q3)

Document–ID–BAR–Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Drawn/Prepared Name		Date	Checked Name	Date	Approved Name	Description	Acc. Code					

ThyssenKrupp Industrial Solutions (India)

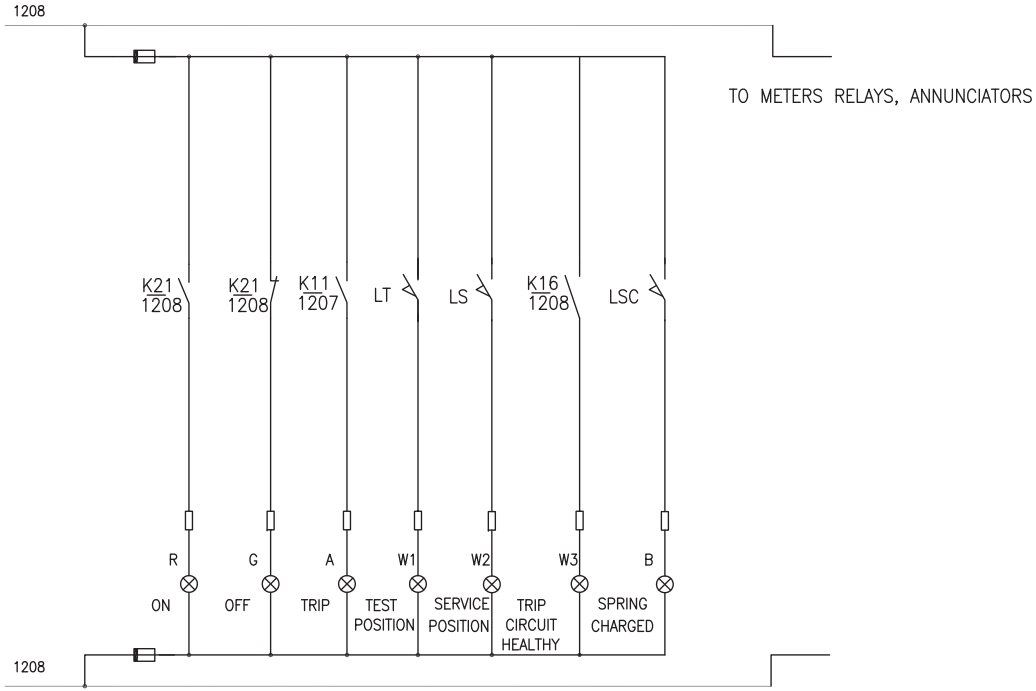
Pro. Unit	TON		Cat. Code	Acc. Code	Status
Con. Unit	Type of Document	Order No.	Scale		Tot. Sheets 12 / 17

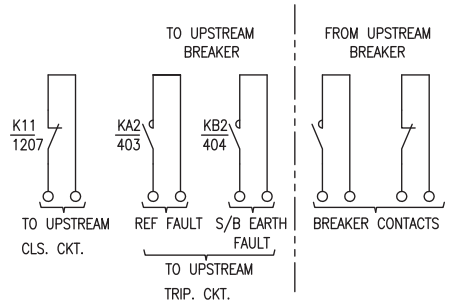
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

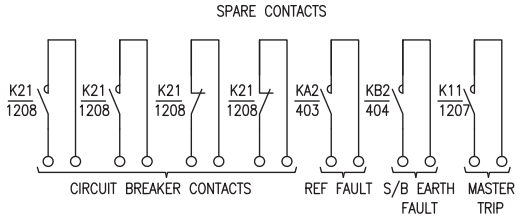
Description
POWER AND CONTROL SCHEMATIC FOR 2 INCOMER, 1 DG INCOMER AND 2 BUS COUPLER WITH MANUAL & AUTO BUS TRANSFER FOR 415 V SWITCHGEAR

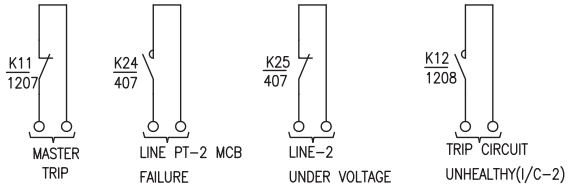
Store Location: Server/Share	Store Location: Folder	Store Name E612

TKIS - India ISO A3









INCOMER–2 (Q3) INDICATION, AUX. CONTACTS

DETAILED CONTACT DEVELOPMENT & RELAYS FOR ADDITIONAL CONTACTS TO MEET FUNCTIONAL REQUIREMENT OF SCHEMATIC SHALL BE PROVIDED BY MANUFACTURER & SAME SHALL BE CONSIDERED IN THE OFFER.

Rev.	Date	Name (Drawn/Prepared)	Date	Name (Checked)	Date	Name (Approved)	Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	

Document–ID–BAR–Code

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
				13/17

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

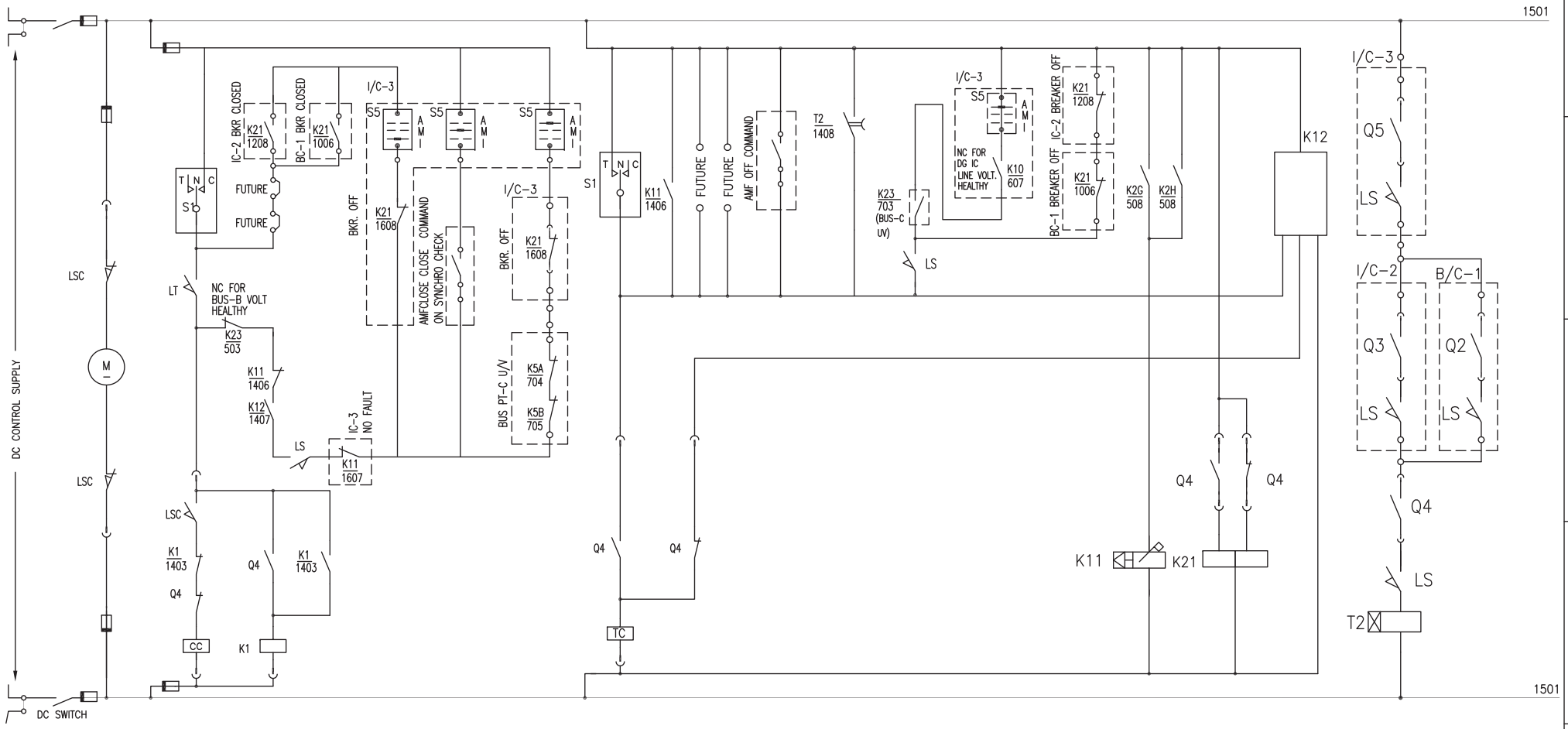
Store Location: Server/Share | Store Location: Folder | Store Name: E613

UAN | Code: Document ID | Part | Group | Rev. 0

ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR



Q1, Q2, Q3, Q4, Q5, Q6 ARE BREAKER CONTACTS.
LSC CHANGES WHEN SPRING IS CHARGED, LT IN TEST & LS IN SERVICE.
CC: CLOSING COIL TC: TRIP COIL

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

CLOSING & TRIPPING CIRCUIT OF BUSCOUPLER-2 (Q4)

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
	Drawn/Prepared		Checked		Approved			
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	

Document-ID-BAR-Code	UAN	Code: Document ID	Part	Group	Rev.
					0

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
				14/17

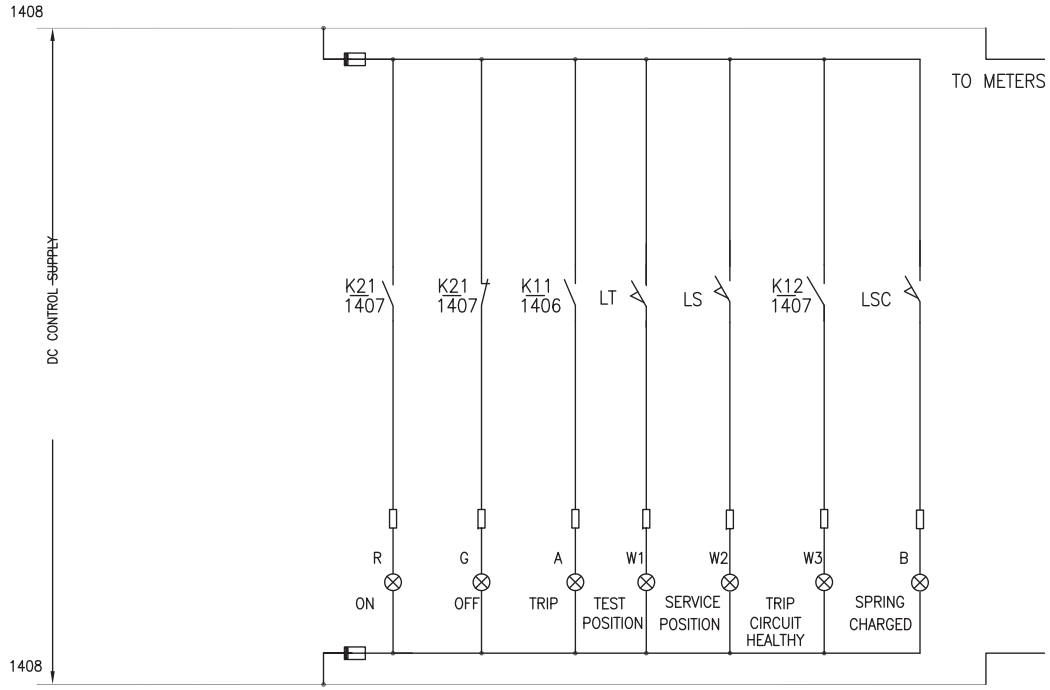
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Store Location: Server/Share	Store Location: Folder	Store Name
		E614

ThyssenKrupp Industrial Solutions (India)

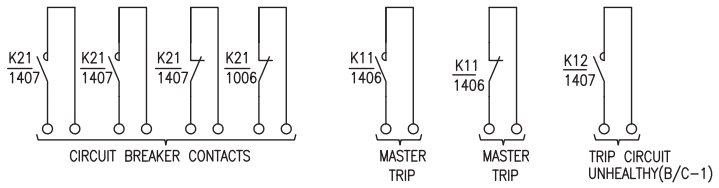
Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR

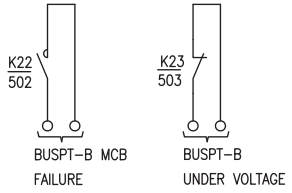


SPARE CONTACTS

BUSCOUPLER-2



BUS PT-B



DETAILED CONTACT DEVELOPMENT & RELAYS FOR ADDITIONAL CONTACTS TO MEET FUNCTIONAL REQUIREMENT OF SCHEMATIC SHALL BE PROVIDED BY MANUFACTURER & SAME SHALL BE CONSIDERED IN THE OFFER.

BUSCOUPLER-2 (Q4) INDICATION, AUX. CONTACTS

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved			

Document-ID-BAR-Code

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
				15 / 17

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

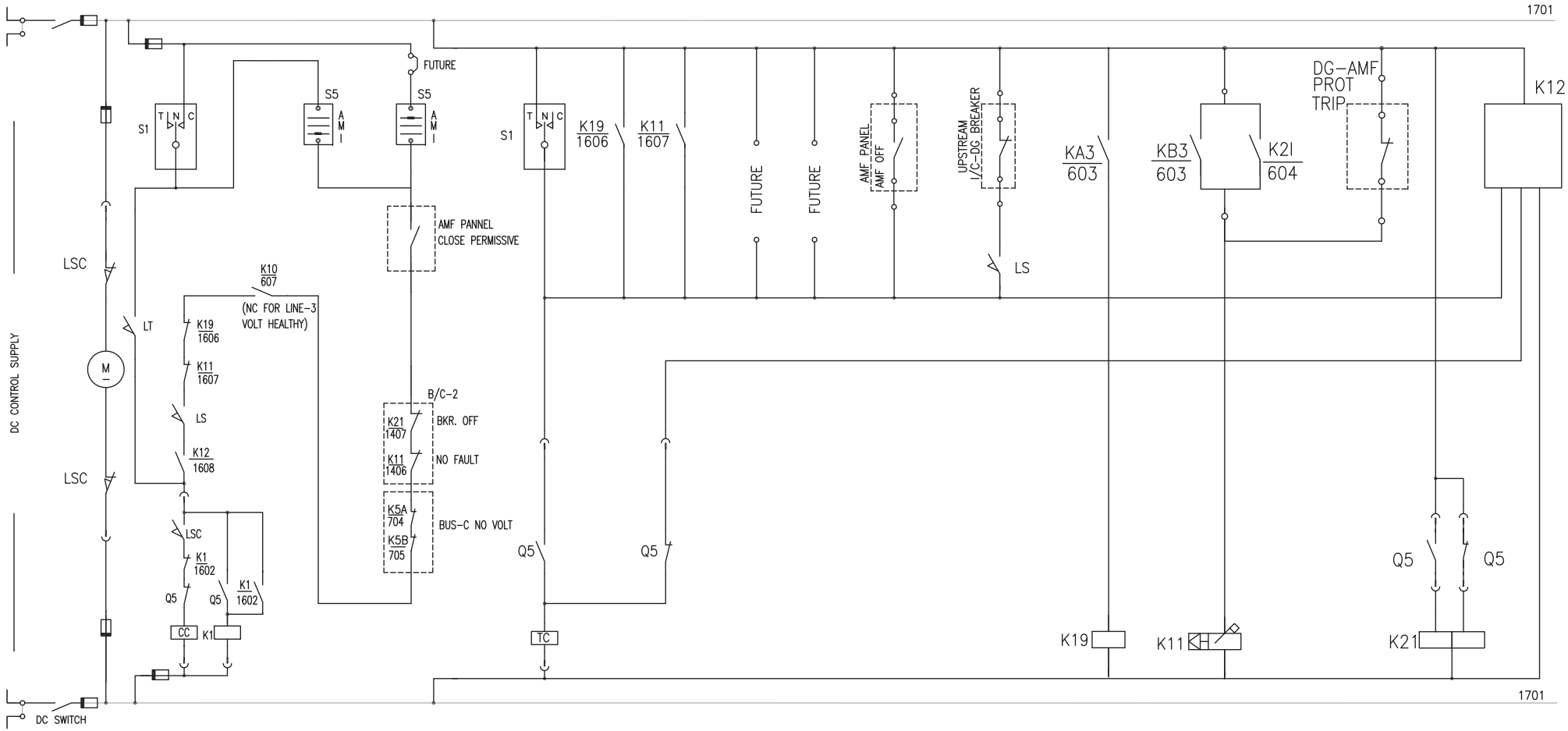
Store Location: Server/Share	Store Location: Folder	Store Name
		E615

UAN	Code: Document ID	Part	Group	Rev.
				0

ThyssenKrupp Industrial Solutions (India)

Description

POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR



Q1, Q2, Q3, Q4, Q5, Q6 ARE BREAKER CONTACTS.
LSC CHANGES WHEN SPRING IS CHARGED, LT IN TEST & LS IN SERVICE.
CC: CLOSING COIL TC: TRIP COIL

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

CLOSING & TRIPPING CIRCUIT OF DG INCOMER (I/C-3 , Q5)

Rev.	Date	Name	Date	Name	Date	Name		
	Drawn/Prepared		Checked		Approved		Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
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	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Store Location: Server/Share	Store Location: Folder	Store Name:
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UAN	Code: Document ID	Part	Group	Rev.
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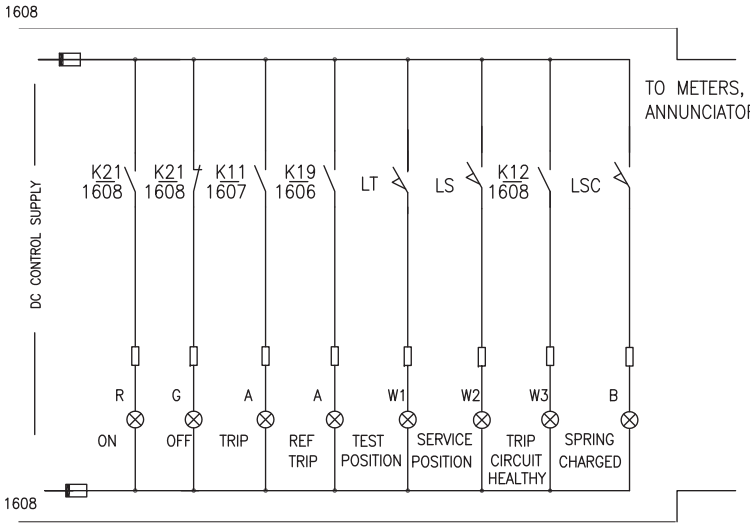
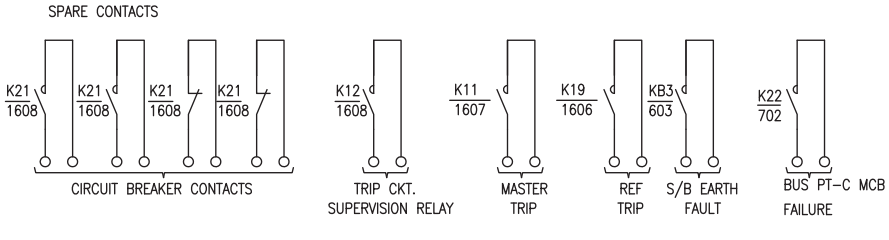
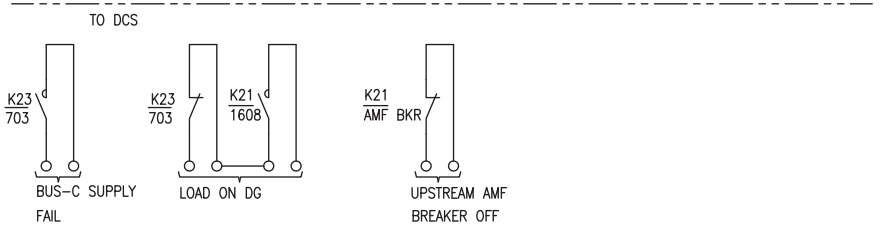
ThyssenKrupp Industrial Solutions (India)

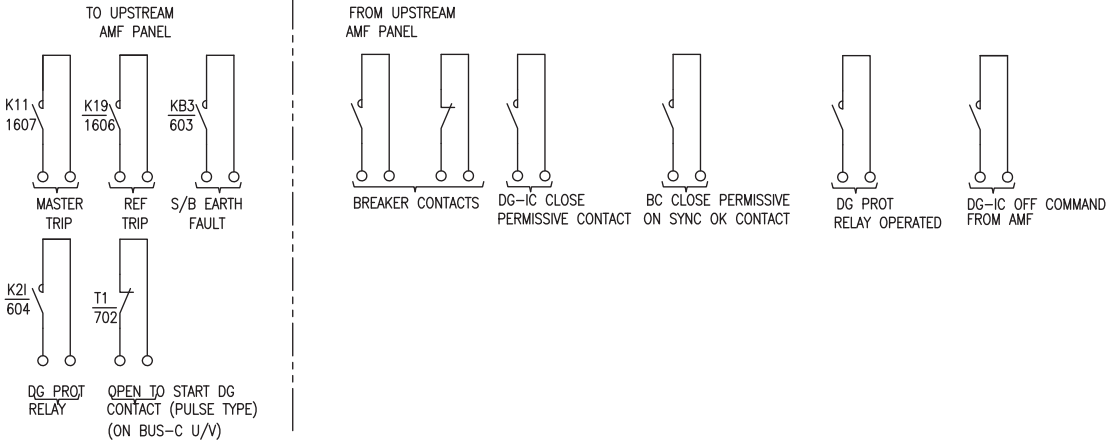
Description

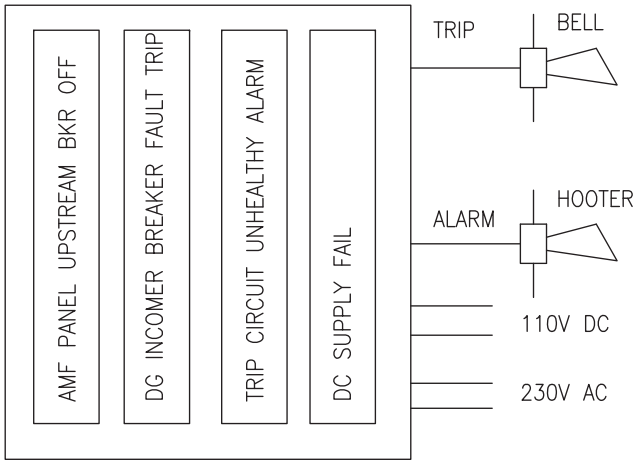
POWER AND CONTROL SCHEMATIC FOR
2 INCOMER, 1 DG INCOMER AND
2 BUS COUPLER WITH MANUAL & AUTO
BUS TRANSFER FOR 415 V SWITCHGEAR











1. ANNUNCIATOR SHALL BE PROVIDED ON DG–IC PANEL.
2. ANNUNCIATOR CONTACTS SHALL BE BREAK TO ANNUNCIATE TYPE
3. TEST, ACCEPT & RESET PUSH BUTTON SHALL BE PROVIDED ON ANNUNCIATOR PANEL.
4. WINDOWS FOR ALARM SHALL BE WHITE & FOR TRIP SHALL BE RED.
5. DC SUPPLY FAIL WINDOW SHALL BE WIRED TO 230V AC SUPPLY
6. TRIP CIRCUIT UNHEALTHY ALARM SHALL BE COMMON FOR ALL INCOMING & BUSCOUPLER ACB FEEDERS.

DG INCOMER (I/C–2 , Q5) INDICATION, AUX. CONTACTS

Document–ID–BAR–Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Drawn/Prepared	Name	Date	Checked	Name	Date	Approved	Name	Description	Acc. Code				
	Pro. Unit	TON			Cat. Code	Acc. Code	Status								
	Con. Unit	Type of Document		Order No.	Scale		Tot. Sheets 17 / 17								
Store Location: Server/Share	Store Location: Folder		Store Name: E617												

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

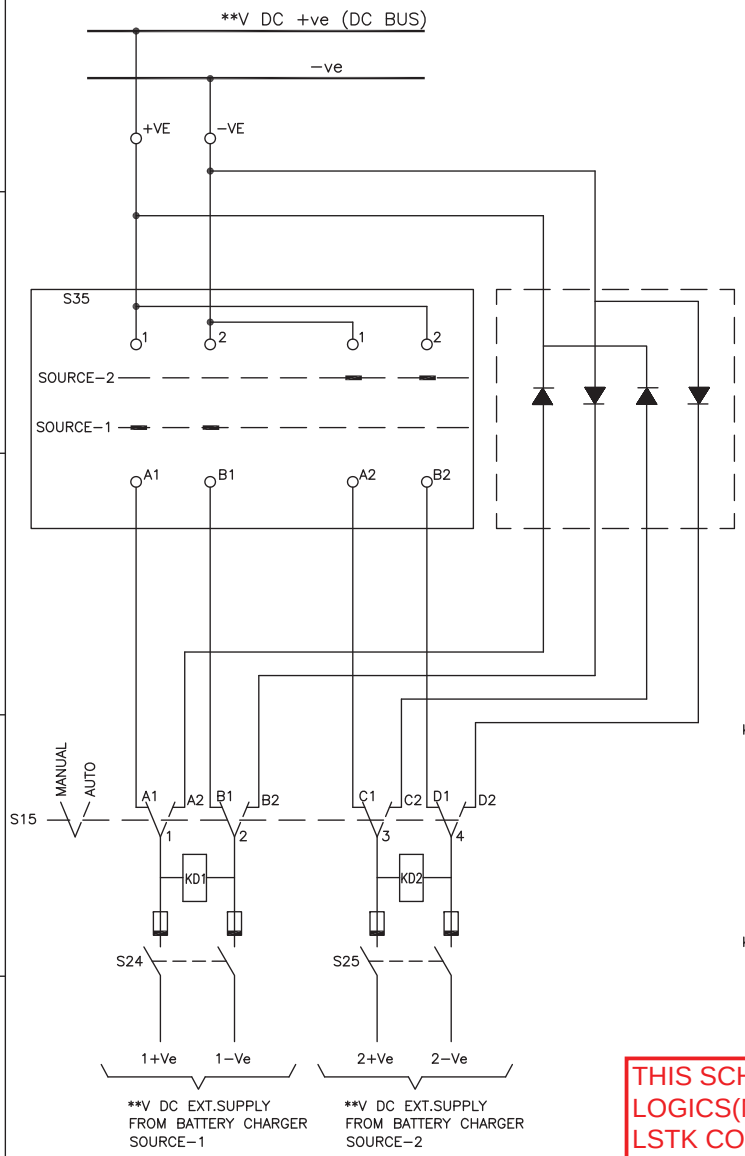
ThyssenKrupp Industrial Solutions (India)

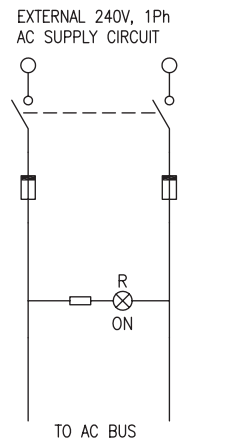
Description

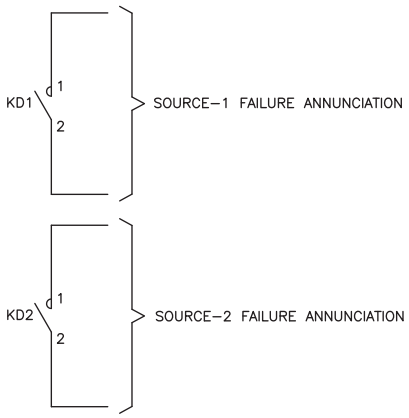
POWER AND CONTROL SCHEMATIC FOR 2 INCOMER, 1 DG INCOMER AND 2 BUS COUPLER WITH MANUAL & AUTO BUS TRANSFER FOR 415 V SWITCHGEAR

QAD No. PIN–ELP–ELT–3002–A05, Rev.00

ANNEXURE-4







AC/DC CIRCUIT SHALL BE PART OF BUSCOUPLER OR BUSPT(BPT) FEEDER.

THIS SCHEME SHALL BE REFERED FOR CONTROL LOGICS(MANUAL & INDEPENDENT) ONLY.
LSTK CONTRACTOR TO DEVELOP SCHEMES AS PER PROJECT SPECIFIC REQUIREMENTS

COMPONENT DESIGNATION

KA : REF RELAY (KA1 & KA2)
KB : STAND–BY EARTH–FAULT RELAY (KB1 & KB2)
K1 : ANTIPUMPING RELAY/CONTACTOR
K2 : OVERCURRENT & EARTHFAULT RELAY (K2A,K2B,K2C,K2D,K2E & K2F)
: 3 O/C IDMT & 1 E/F
K3 : BUS PT SECONDARY MCB (K3A & K3B)
K4 & K8 : 80 % UNDER VOLTAGE RELAY (K4A,K4B,K8A & K8B)
K5 & K9 : 20 % UNDER VOLTAGE RELAY (K5A,K5B,K9A & K9B)
K6 : LINE PT SECONDARY MCB (K6A & K6B)
K7 : 80% UNDER VOLTAGE RELAY (K7A,K7B,K7C & K7D)
K11,K13 & K15 : LOCKOUT RELAY
K12,K14 & K16 : TRIP CIRCUIT SUPERVISION RELAY
K21,K22 & K23 : BREAKER CONTACT MULTIPLICATION RELAY (BISTABLE LATCHED TYPE / VAJC EQUIVALENT)
K26,K10,K25, K23A,K24A,K51, K52,K53,K54. : CONTACT MULTIPLICATION
K41,42, : K43 & K44 : MCB CONTACT MULTIPLICATION (WITHOUT FLAG)
K31 : SYNCHRO CHECK RELAY
K32 : SYNCHRO CHECK RELAY CONTACT MULTIPLICATION
KD : CONTACTOR FOR DC SUPPLY (KD1 & KD2)
T1,T4, : T5 & T6 : ON DELAY TIMER FOR 80 % U/V (0.5–5 SEC.)
T2 & T3 : ON DELAY TIMER FOR PARALLEL TRIPPING (0.1–2 SEC.)
S1 : TNC BREAKER CONTROL SWITCH
S2 : A/M/I – AUTO/MANUAL/INDEPENDENT MODE SELECTOR SWITCH (FOR CHANGEOVER)
S3 : TRIP SELECTOR SWITCH (TSS)
S4 : ON/OFF SWITCH FOR SYNCHROCHECK
S24,S25. : DC SWITCH
S15 : DC AUTO/MANUAL SWITCH
S35 : SELECTOR SWITCH–SOURCE 1/2

NOTE :

1. PROTECTION RELAY,MASTER TRIP REALY,BREAKER CONTACT MULTIPLICATION RELAY,TRIP CIRCUIT SUPERVISION RELAY,COMPOSITE METER,AMMETER SELECTOR SWITCH, INDEPENEDENT SELECTOR SWITCH,TNC SWITCH,INDICATING LAMPS SHALL BE MOUNTED ON DOOR FRONT.
2. FOR DETAIL SPECIFICATION OF RELAYS, METERS, C.T.'s & OTHER POWER DEVICES, VOLTMETER SELECTOR SWITCH,AMMETER,VOLTMETER,TRIP SELECTOR SWITCH,AUTO–MANUAL REFER SINGLE LINE DIAGRAM.

1. USER TO ENTER LT PANEL IDENTIFICATION NUMBER.
2. SELECT TYPE OF INDICATING METERS i.e. CONVENTIONAL/ COMPOSITE DIGITAL AS PER GES.
3. BALANCE DETAILS (OTHER PROTECTIONS, INTERLOCKS AND INTERFACES IF ANY) SHALL BE UPDATED/MODIFIED BASED ON PROJECT REQUIREMENT. THIS CLOUD SHALL BE DELETED AFTER FINALISING THE SCHEMATIC TYPE FOR THE PROJECT.

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
	Drawn/Prepared		Checked		Approved			
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	

Document–ID–BAR–Code

Pro. Unit	TON	Cat. Code	Acc. Code	Status
Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
			–	1 / 11

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Store Location: Server/Share | Store Location: Folder | Store Name: PS101

UAN | Code: Document ID | Part | Group | Rev. 0

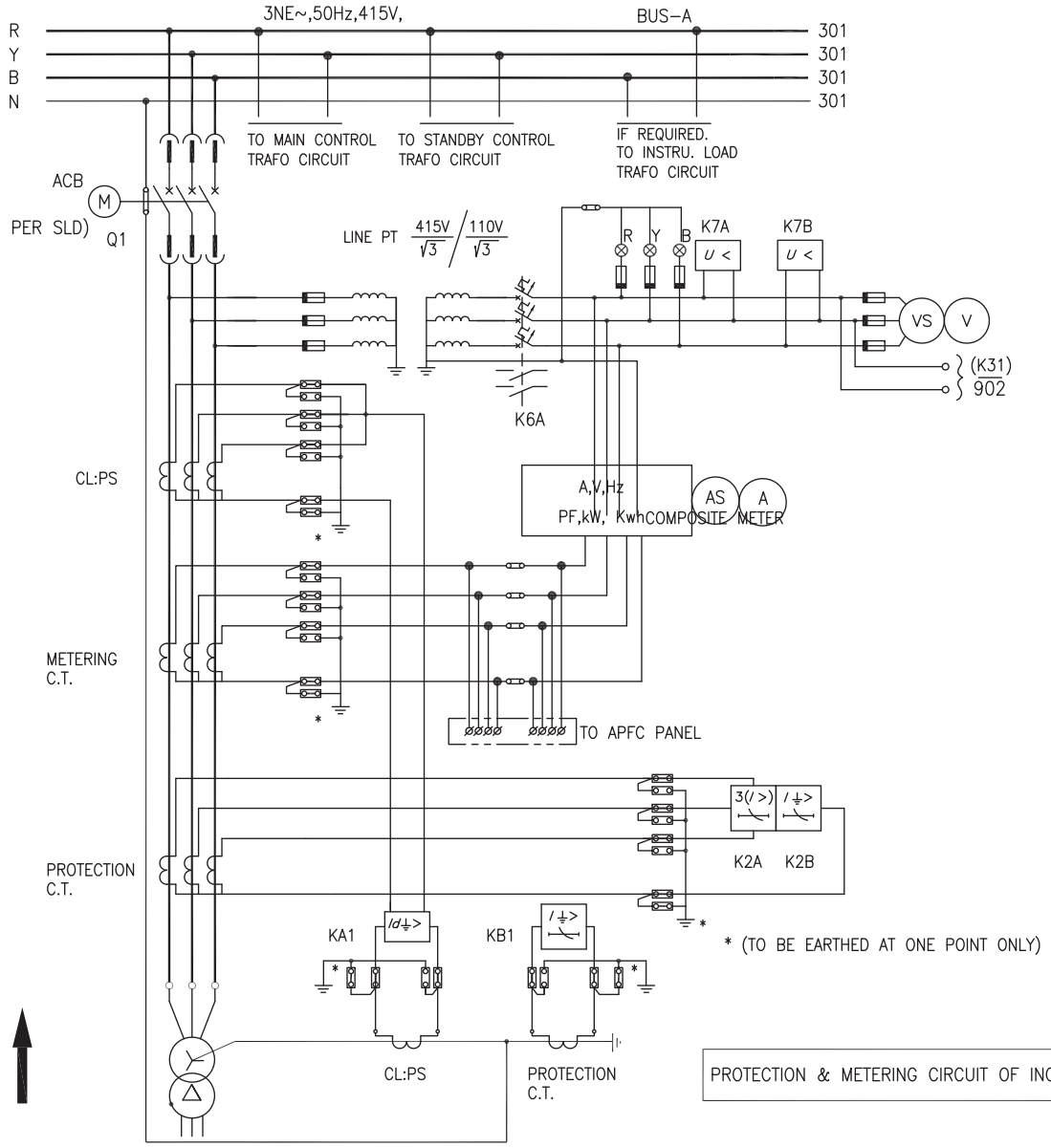
ThyssenKrupp Industrial Solutions (India)

Description

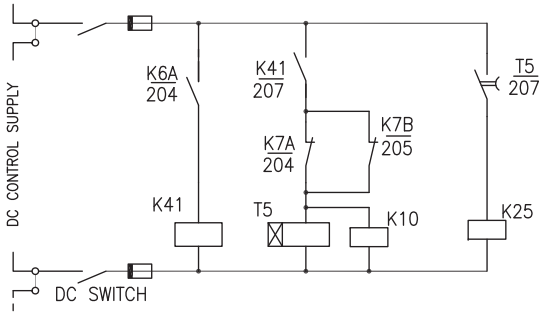
POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.

UH_BO_ISO_A3_L_E_TKISIndia.dwg / AG03_UH_BO_ISO_A3_L.dwg / 10.10.2014

TKIS - India ISO A3



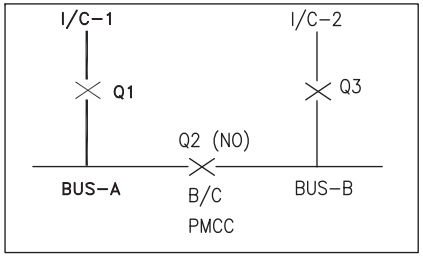
PROTECTION & METERING CIRCUIT OF INCOMER–1 (Q1)



NOTE :

1. CONTACTS OF U/V RELAY (K7) ARE SHOWN IN DEENERGIZED STATE (U/V CONDITION OF RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY. LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.
3. THE NUMERICAL RELAY (K2) SHALL HAVE SUFFICIENT NUMER OF BINARY INPUTS AND OUTPUT TO INCARPORATE THE CONTROL AND INTERLOCK LOGIC INDICATED IN THE SCHEMATIC DIAGRAM. MINIMUM 2 I/P AND 2 O/P I/OS SHALL BE AVAILABLE AS SPARE FOR FUTURE USE.
4. STABILISNG RESISTOR TO BE PROVIDED FOR REF PROTECTION.

FOR DETAILS OF RELAYS REFER SHEET NO. 1 OF 11
DETAILED DRAWING TO BE DEVOLOPED BY MANUFACTURER.



Document–ID–BAR–Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
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ThyssenKrupp Industrial Solutions (India)

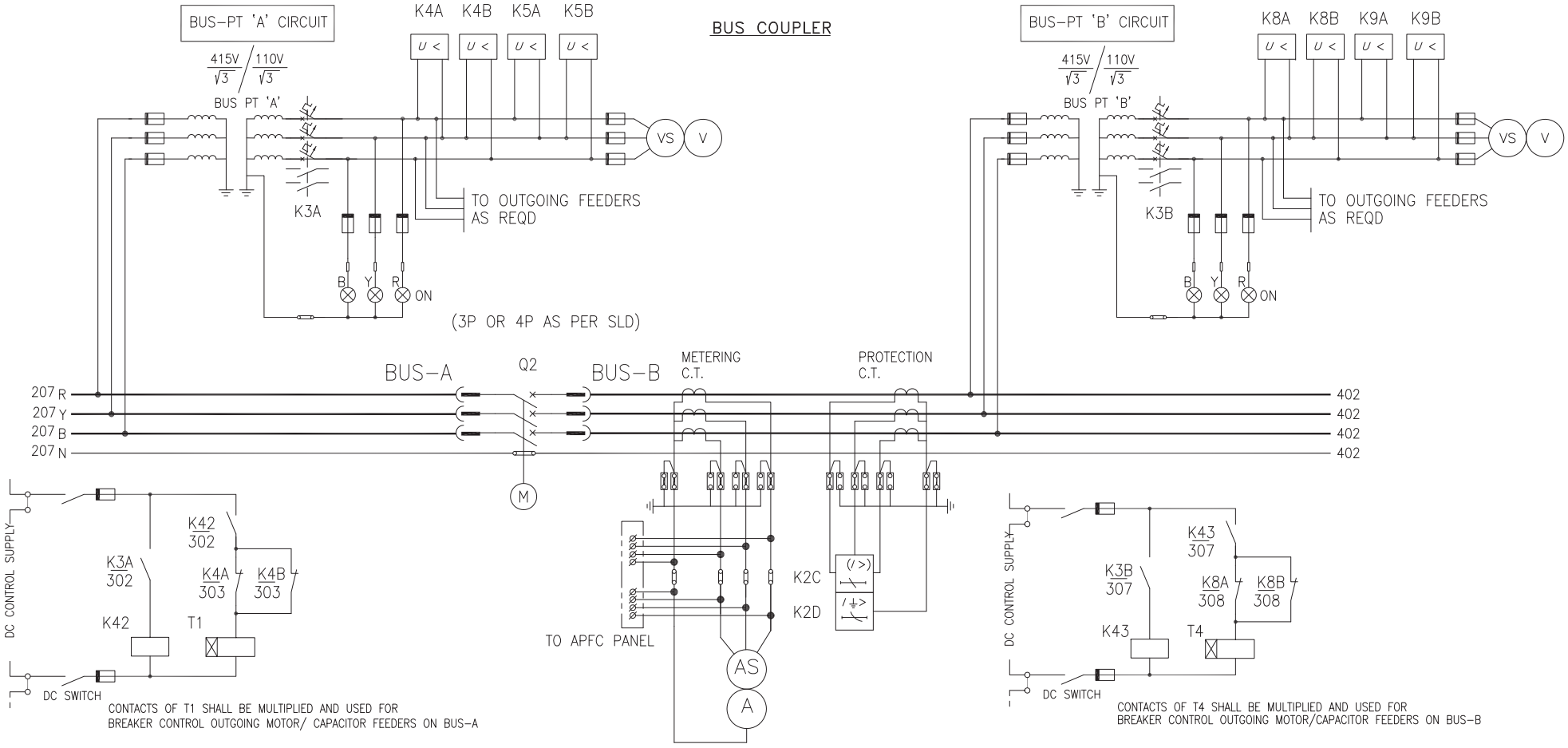
Pro. Unit	TON		Cat. Code	Acc. Code	Status	
Con. Unit	Type of Document	Order No.	Scale		Tot. Sheets	2 / 11

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.

Store Location: Server/Share	Store Location: Folder	Store Name: PS102



PROTECTION & METERING CIRCUIT OF BUSCOUPLER (Q2)

NOTES :

1. CONTACTS OF UNDER VOLTAGE RELAYS (K4A,K4B,K5A,K5B,K8A,K8B,K9A & K9B) SHOWN IN THE DEENERGISED STATE (U/V CONDITION OF THE RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY. LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.
3. THE NUMERICAL RELAY (K2) SHALL HAVE SUFFICIENT NUMER OF BINARY INPUTS AND OUTPUT TO INCARPORATE THE CONTROL AND INTERLOCK LOGIC INDICATED IN THE SCHEMATIC DIAGRAM. MINIMUM 2 I/P AND 2 O/P I/OS SHALL BE AVAILABLE AS SPARE FOR FUTURE USE.

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved			

Document-ID-BAR-Code

UAN | Code: Document ID | Part | Group | Rev. 0

ThyssenKrupp Industrial Solutions (India)

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
			–	3 / 11

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

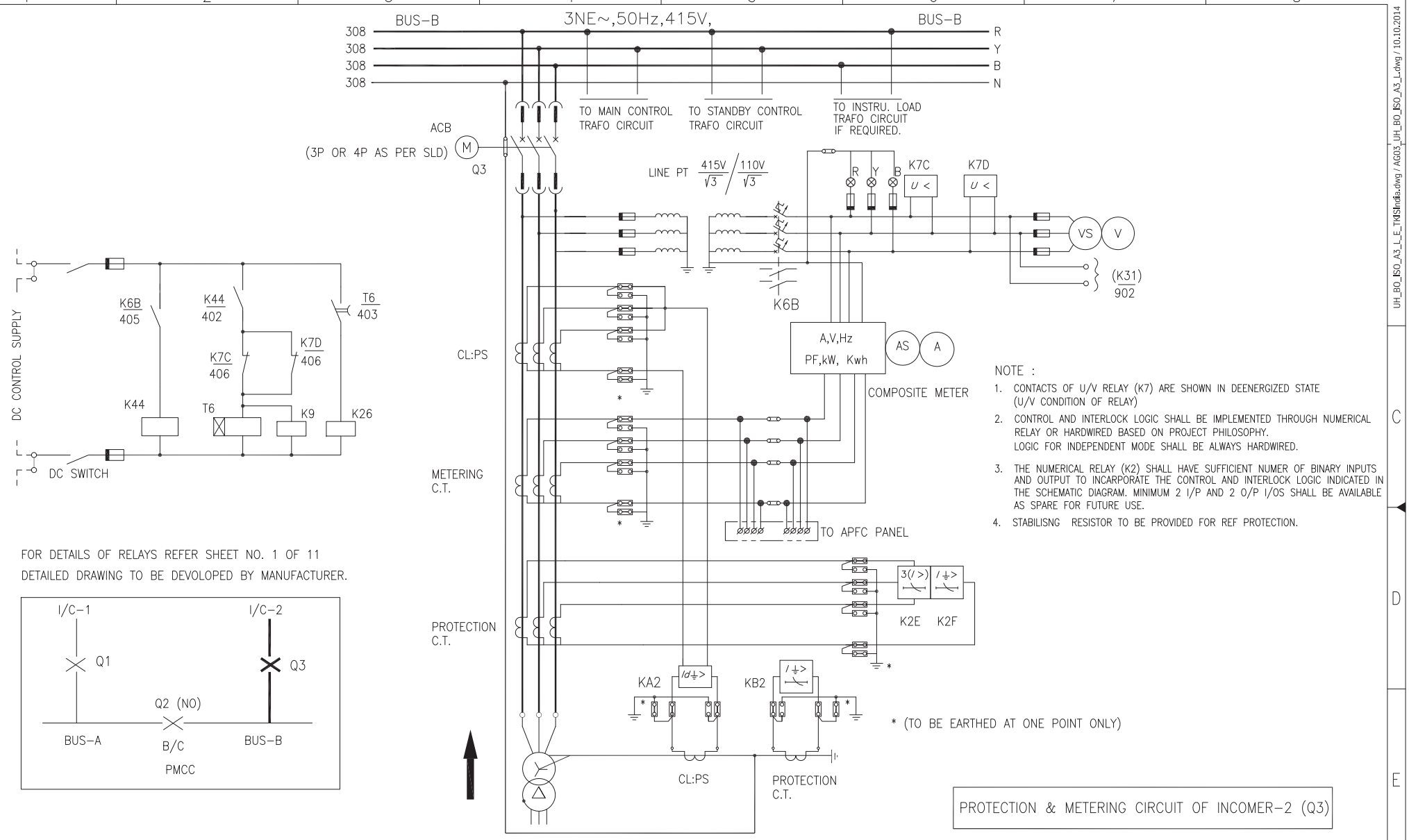
Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.

Store Location: Server/Share | Store Location: Folder | Store Name: PS103

UH_BO_ISO_A3_L_E_TKISIndia.dwg / AG03_UH_BO_ISO_A3_L.dwg / 10.10.2014

TKIS - India ISO A3



NOTE :

1. CONTACTS OF U/V RELAY (K7) ARE SHOWN IN DEENERGIZED STATE (U/V CONDITION OF RELAY)
2. CONTROL AND INTERLOCK LOGIC SHALL BE IMPLEMENTED THROUGH NUMERICAL RELAY OR HARDWIRED BASED ON PROJECT PHILOSOPHY. LOGIC FOR INDEPENDENT MODE SHALL BE ALWAYS HARDWIRED.
3. THE NUMERICAL RELAY (K2) SHALL HAVE SUFFICIENT NUMER OF BINARY INPUTS AND OUTPUT TO INCARPORATE THE CONTROL AND INTERLOCK LOGIC INDICATED IN THE SCHEMATIC DIAGRAM. MINIMUM 2 I/P AND 2 O/P I/OS SHALL BE AVAILABLE AS SPARE FOR FUTURE USE.
4. STABILISNG RESISTOR TO BE PROVIDED FOR REF PROTECTION.

PROTECTION & METERING CIRCUIT OF INCOMER-2 (Q3)

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved			

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Document-ID-BAR-Code

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
			–	4 / 11

Store Location: Server/Share | Store Location: Folder | Store Name: PS104

UAN | Code: Document ID | Part | Group | Rev. 0

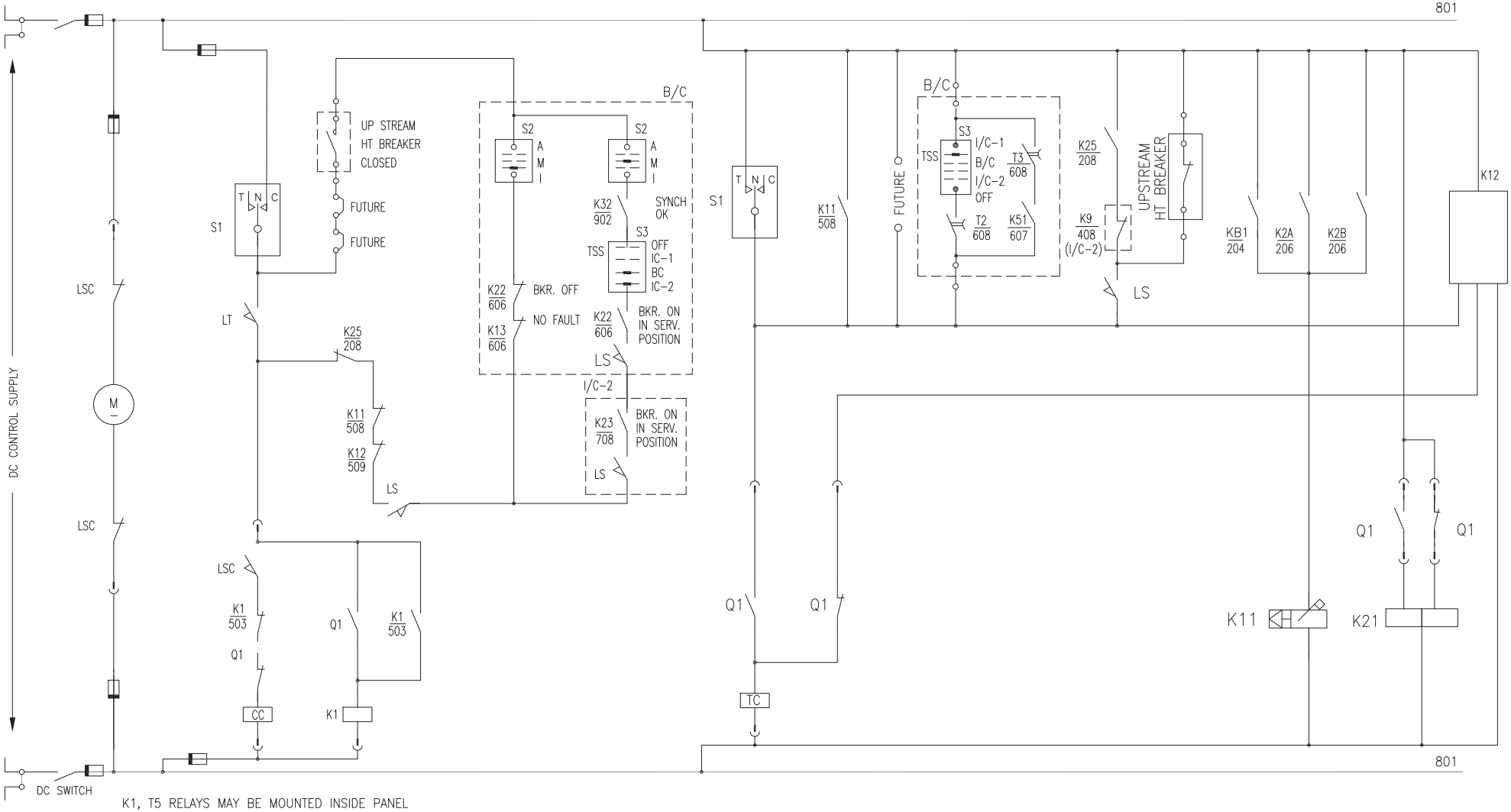
ThyssenKrupp Industrial Solutions (India)

Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.

TKIS - India ISO A3

UH_BO_ISO_A3_L_E_TKISIndia.dwg / AG03_UH_BO_ISO_A3_L.dwg / 10.10.2014



K1, T5 RELAYS MAY BE MOUNTED INSIDE PANEL
Q1, Q2, Q3 ARE BREAKER CONTACTS.
LSC CHANGES WHEN SPRING IS CHARGED, LT IN TEST & LS IN SERVICE.
CC: CLOSING COIL TC: TRIP COIL

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

CLOSING & TRIPPING CIRCUIT OF INCOMER-1 (Q1)

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
	Drawn/Prepared		Checked		Approved			
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	

Document-ID-BAR-Code

UAN	Code	Document ID	Part	Group	Rev.
					0

Pro. Unit	TON	Cat. Code	Acc. Code	Status

Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
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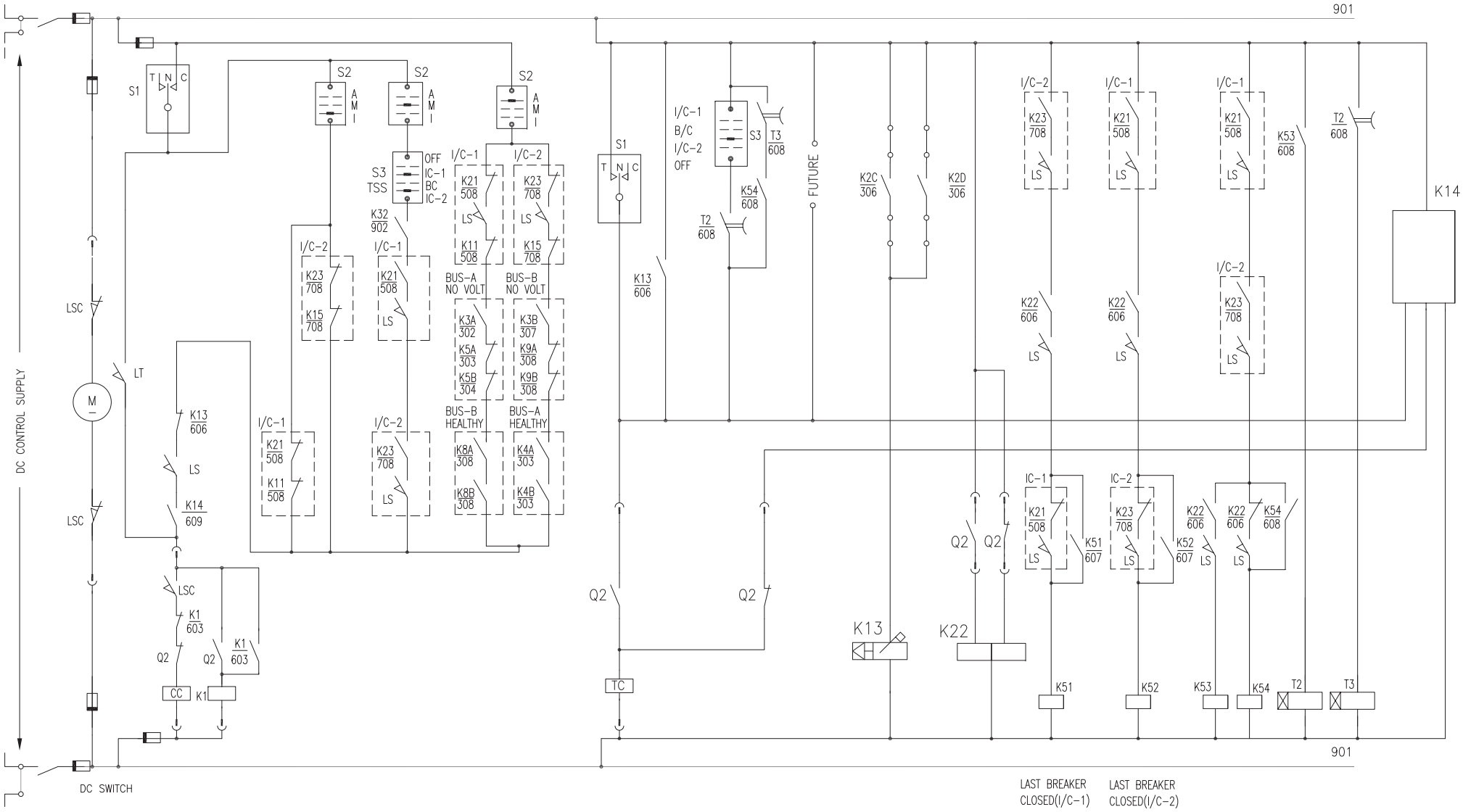
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Store Location: Server/Share | Store Location: Folder | Store Name: PS105

ThyssenKrupp Industrial Solutions (India)

Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.



INCOMERS & BUS-COUPLER TO BE CLOSED MANUALLY AFTER PUTTING SELECTOR SWITCH IN MANUAL

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

CLOSING & TRIPPING CIRCUIT OF BUSCOUPLER (Q2)

Rev.	Date	Name	Date	Name	Date	Name	Description	Acc. Code
0	22.12.2015	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
	Drawn/Prepared		Checked		Approved			

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Document-ID-BAR-Code

Pro. Unit | TON | Cat. Code | Acc. Code | Status

Con. Unit | Type of Document | Order No. | Scale – | Tot. Sheets 6 / 11

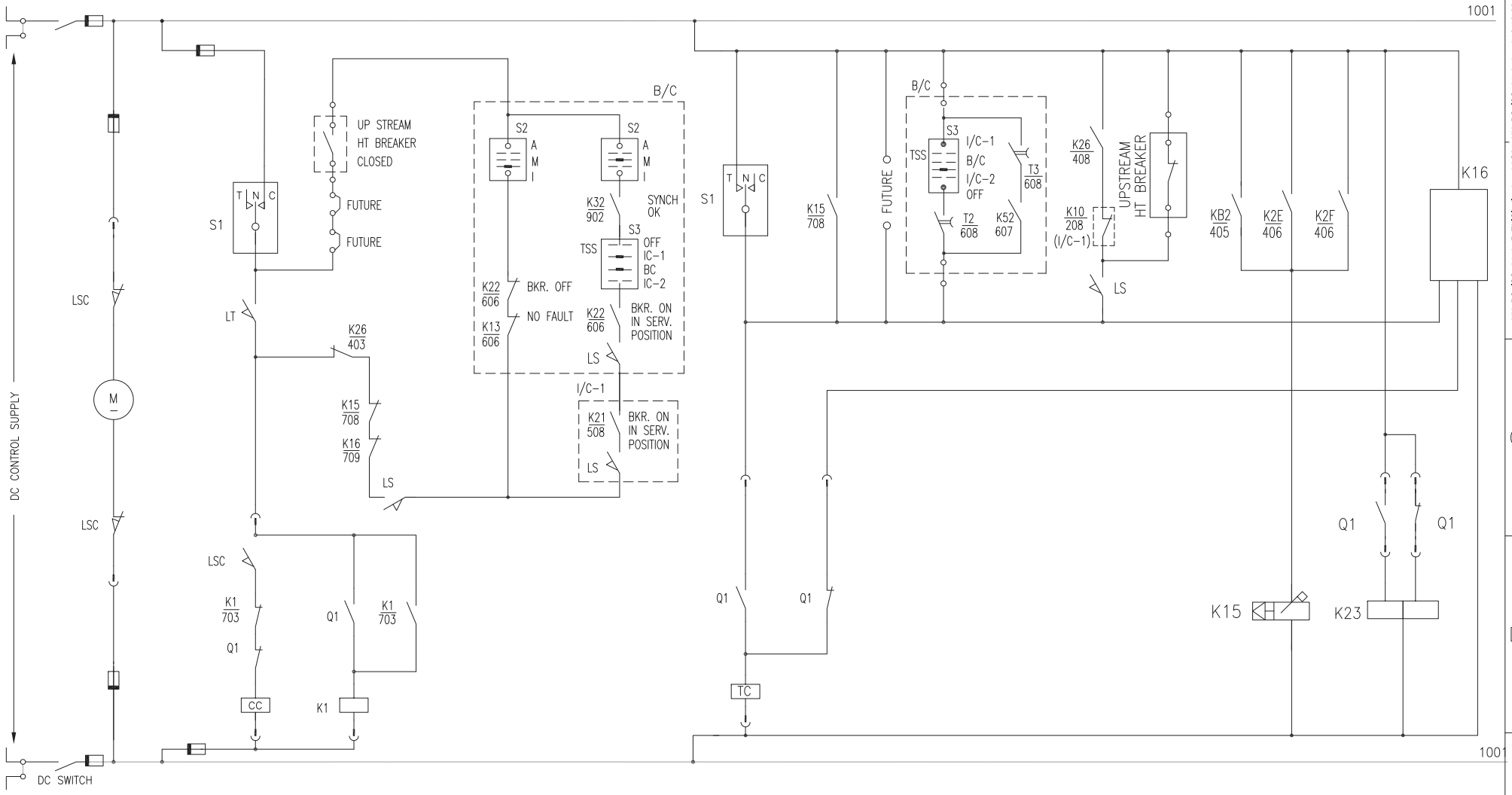
Store Location: Server/Share | Store Location: Folder | Store Name: PS106

UAN | Code | Document ID | Part | Group | Rev. 0

ThyssenKrupp Industrial Solutions (India)

Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.



K1, T6 RELAYS MAY BE MOUNTED INSIDE PANEL
Q1, Q2, Q3 ARE BREAKER CONTACTS.
LSC CHANGES WHEN SPRING IS CHARGED, LT IN TEST & LS IN SERVICE.

NOTE : TRIP CIRCUIT SUPERVISION RELAY SHALL BE WIRED AT THE END OF TRIPING CIRCUIT AS INDICATED.

CLOSING & TRIPPING CIRCUIT OF INCOMER-2 (Q3)

Document-ID-BAR-Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Name Drawn/Prepared		Date	Name Checked	Date	Name Approved	Description	Acc. Code					

ThyssenKrupp Industrial Solutions (India)

Pro. Unit	TON		Cat. Code	Acc. Code	Status
Con. Unit	Type of Document	Order No.	Scale		Tot. Sheets
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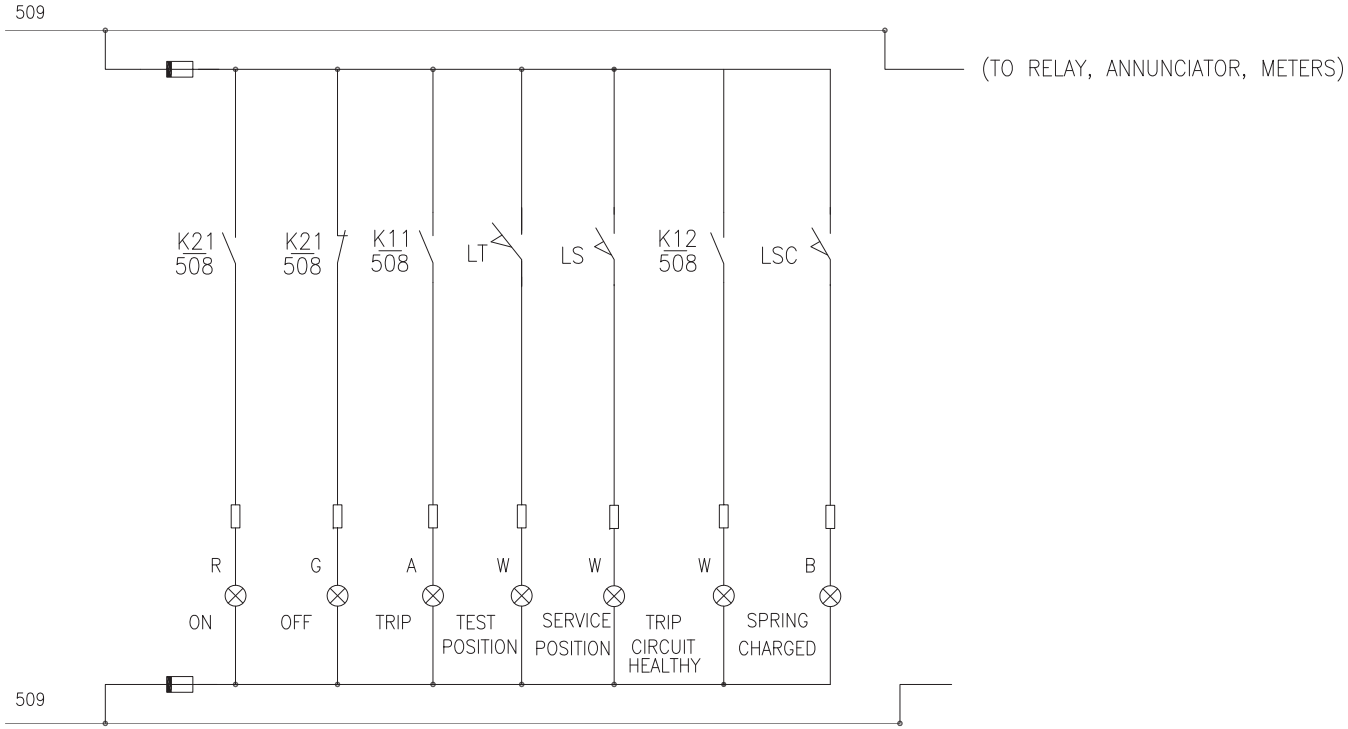
	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.

Store Location: Server/Share	Store Location: Folder	Store Name: PS107



INCOMER-1 (Q1) INDICATION

Document-ID-BAR-Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Name Drawn/Prepared		Date	Name Checked	Date	Name Approved	Description	Acc. Code					

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	Date	Name
Drawn	22.12.2015	RDK
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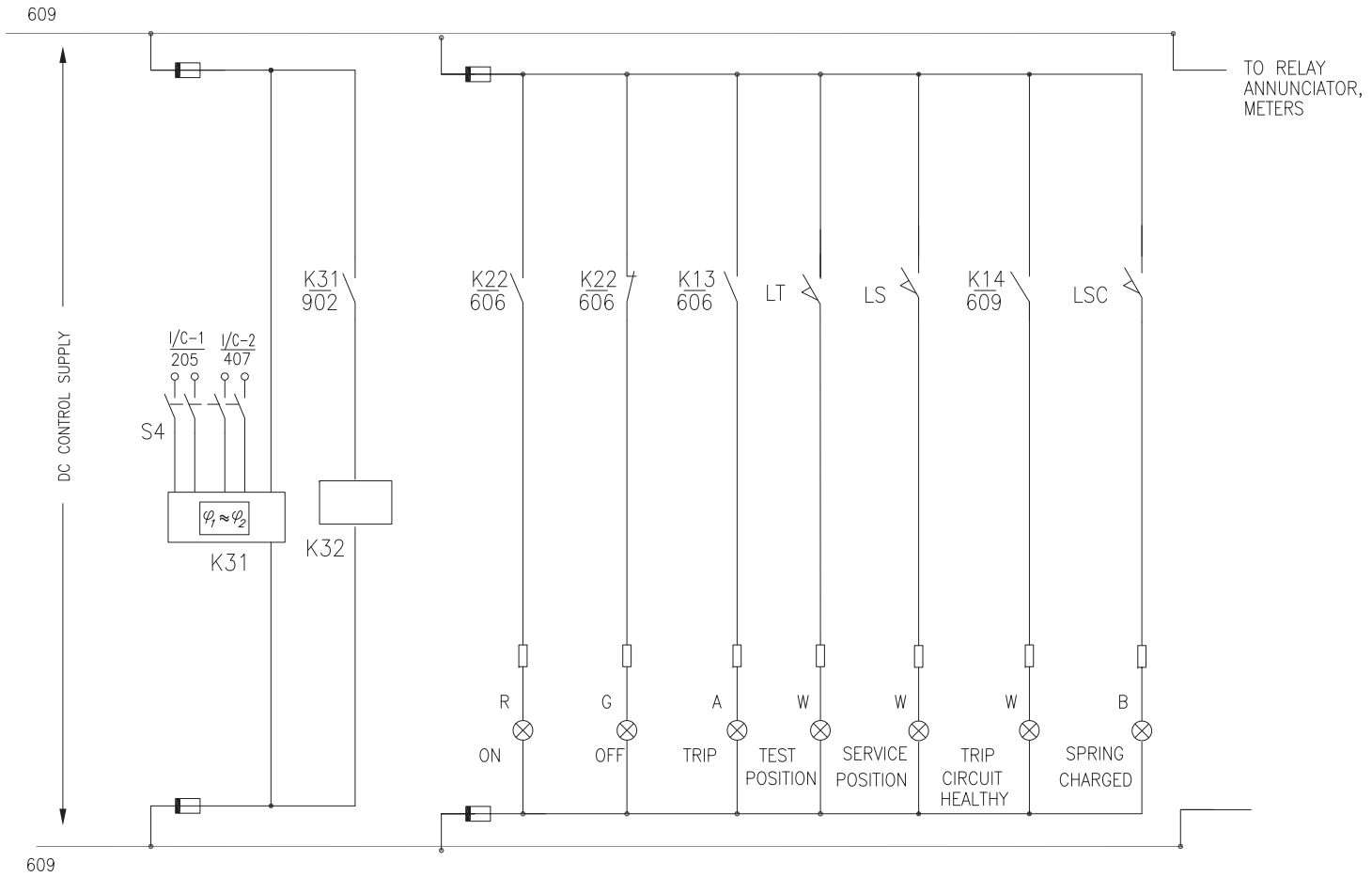
Approved	22.12.2015	RPM

Store Location: Server/Share	Store Location: Folder	Store Name: PS108

ThyssenKrupp Industrial Solutions (India)

Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.



BUSCOUPLER (Q2) INDICATION

Document-ID-BAR-Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Name Drawn/Prepared		Date	Name Checked	Date	Name Approved	Description	Acc. Code					

ThyssenKrupp Industrial Solutions (India)

Pro. Unit	TON		Cat. Code	Acc. Code	Status
Con. Unit	Type of Document	Order No.	Scale		Tot. Sheets
			–		9 / 11

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

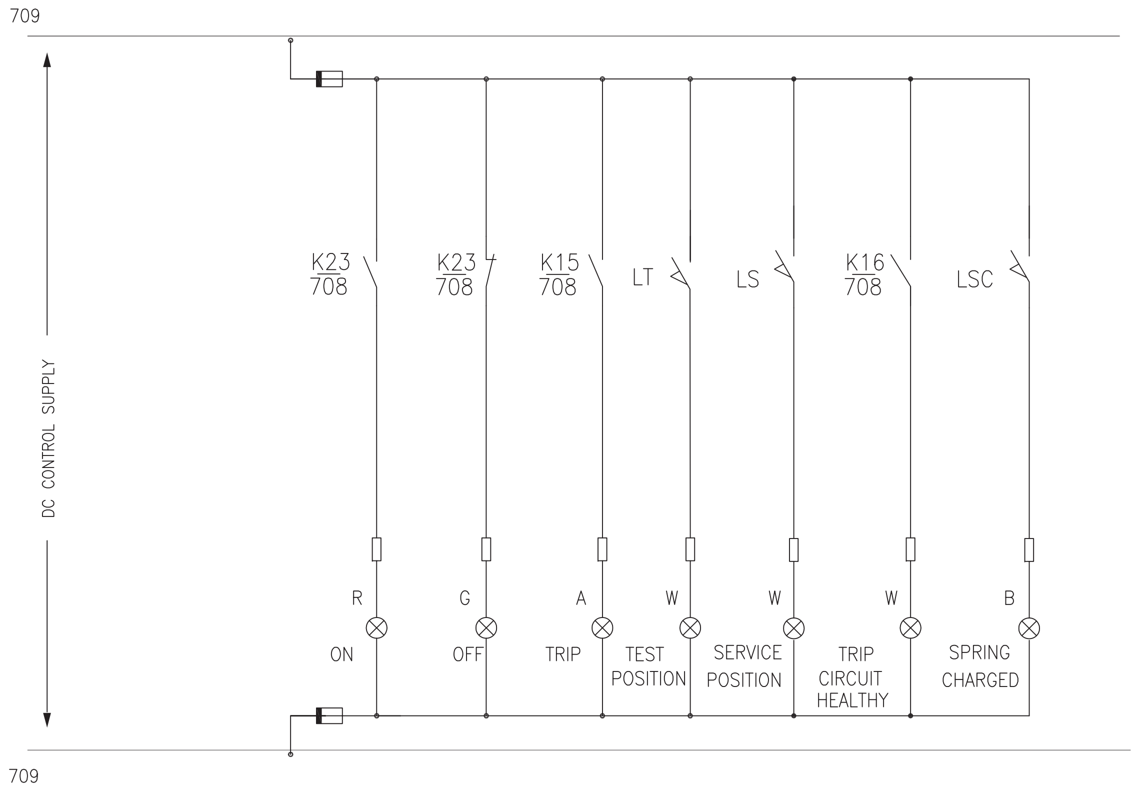
Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER &
BUS COUPLER WITH A/M/I SCHEME
FOR 415V SWITCHGEAR.

Store Location: Server/Share	Store Location: Folder	Store Name: PS109

UH_BO_ISO_A3_L_E_TKISIndia.dwg / AG03_UH_BO_ISO_A3_L.dwg / 10.10.2014

TKIS - India ISO A3



INCOMER-2 (Q3) INDICATION

0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD	
Rev.	Date	Name		Date	Name	Date	Name	Description	Acc. Code
	Drawn/Prepared			Checked		Approved			

Document-ID-BAR-Code

UAN	Document ID	Part	Group	Rev.
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Code

ThyssenKrupp Industrial Solutions (India)

Pro. Unit	TON	Cat. Code	Acc. Code	Status
Con. Unit	Type of Document	Order No.	Scale	Tot. Sheets
			–	10/11

	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Description

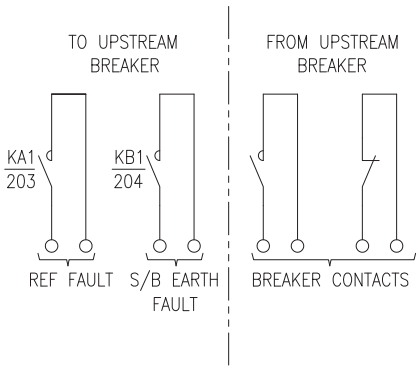
POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.

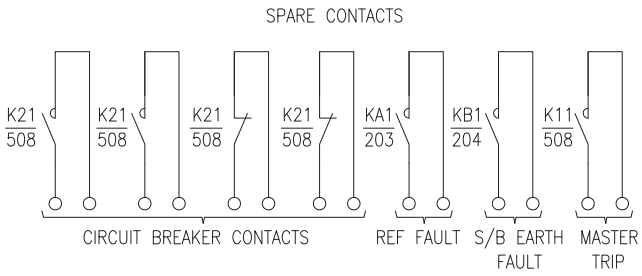
Store Location: Server/Share | Store Location: Folder | Store Name: PS110

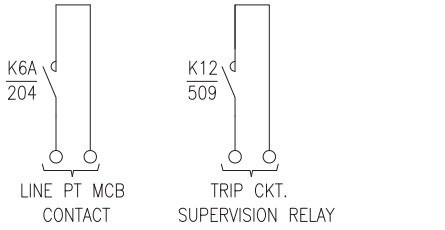
UH_BO_ISO_A3_L_E_TKISIndia.dwg / AG03_UH_BO_ISO_A3_L.dwg / 10.10.2014

TKIS - India ISO A3

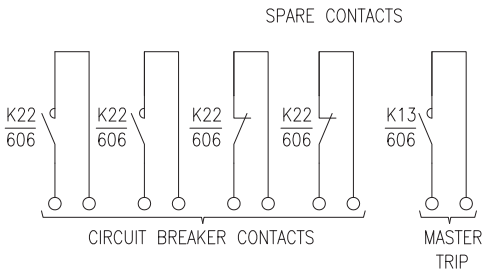
INCOMER – 1

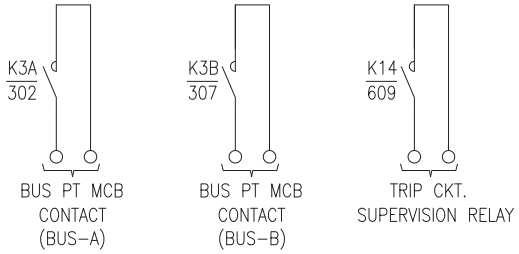




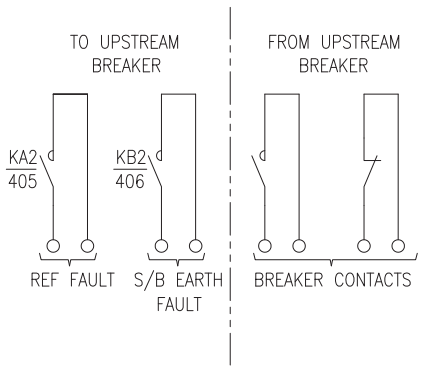


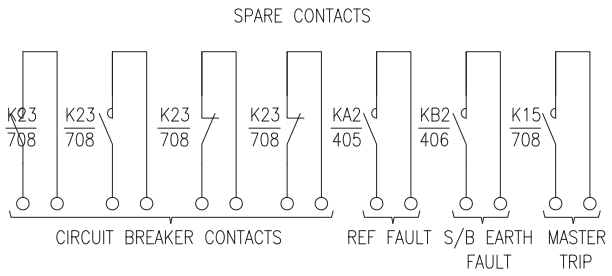
BUS COUPLER

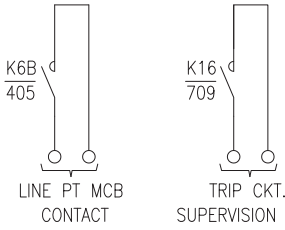




INCOMER – 2







* SPARE CONTACTS FOR PROTECTION RELAYS SHALL BE REALISED USING VAA TYPE RELAYS IF REQUIRED.

AUXILIARY AND SPARE CONTACTS DETAILS

Document-ID-BAR-Code	0	22.12.2015	RDK	RDK	22.12.2015	VMS	22.12.2015	RPM	ISSUED AS STANDARD		UAN	Code Document ID	Part	Group	Rev. 0
	Rev.	Date	Name Drawn/Prepared		Date	Name Checked	Date	Name Approved	Description	Acc. Code					

ThyssenKrupp Industrial Solutions (India)

Pro. Unit	TON		Cat. Code	Acc. Code	Status
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	Date	Name
Drawn	22.12.2015	RDK
Prepared	22.12.2015	RDK
Checked	22.12.2015	VMS
Approved	22.12.2015	RPM

Description

POWER & CONTROL SCHEMATIC FOR 2 INCOMER & BUS COUPLER WITH A/M/I SCHEME FOR 415V SWITCHGEAR.

Store Location: Server/Share	Store Location: Folder	Store Name: PS111

UH_BO_ISO_A3_L_E_TKISIndia.dwg / AG03_UH_BO_ISO_A3_L.dwg / 10.10.2014

TKIS - India ISO A3