





Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0021	Contract No. 66-6695
	TECHNICAL SPECIFICATIONS – LOCAL CONTROL STATIONS (FLAMEPROOF & INDUSTRIAL TYPE)			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.
				Rev 00 Page 1 of 2

tkIS India / Vendor <table> <tr><td><input type="checkbox"/></td><td>1</td><td>For Approval</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>For Review / Comments</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>For Information</td></tr> <tr><td><input type="checkbox"/></td><td>4</td><td>For Engineering</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>For Enquiry</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>For Order Placement</td></tr> <tr><td><input type="checkbox"/></td><td>7</td><td>Final & Approved</td></tr> <tr><td><input type="checkbox"/></td><td>8</td><td>Released for Construction</td></tr> </table> <hr/> <table> <tr><td><input type="checkbox"/></td><td>1</td><td>Approved</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>Approved for Manufacturing / Fabrication with Comments as marked</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>Not Approved / Resubmit</td></tr> <tr><td><input type="checkbox"/></td><td>4</td><td>Retained for Information / Records</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>Reviewed</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>Reviewed as Noted / Resubmit</td></tr> </table> <p>Remarks for AC2 : This marked-up drawings is hereby approved for fabrication / manufacturing and shall be re-submitted after revision. This drawing should be revised only to the extent of tkIS India / Owner / Client comments. Any other changes made by you will not be considered unless clearly highlighted in covering letter asking for approval.</p> <p>This approval / review does not absolve the supplier from the full responsibility for design and fabrication.</p> <p>Date : ____/____/____ Name : _____</p>	<input type="checkbox"/>	1	For Approval	<input type="checkbox"/>	2	For Review / Comments	<input type="checkbox"/>	3	For Information	<input type="checkbox"/>	4	For Engineering	<input type="checkbox"/>	5	For Enquiry	<input type="checkbox"/>	6	For Order Placement	<input type="checkbox"/>	7	Final & Approved	<input type="checkbox"/>	8	Released for Construction	<input type="checkbox"/>	1	Approved	<input type="checkbox"/>	2	Approved for Manufacturing / Fabrication with Comments as marked	<input type="checkbox"/>	3	Not Approved / Resubmit	<input type="checkbox"/>	4	Retained for Information / Records	<input type="checkbox"/>	5	Reviewed	<input type="checkbox"/>	6	Reviewed as Noted / Resubmit	tkIS India / Owner / Client <table> <tr><td><input type="checkbox"/></td><td>1</td><td>For Approval</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>For Review / Comments</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>For Information</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>4</td><td>For Engineering</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>For Enquiry</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>For Order Placement</td></tr> <tr><td><input type="checkbox"/></td><td>7</td><td>Final & Approved</td></tr> <tr><td><input type="checkbox"/></td><td>8</td><td>Released for Construction</td></tr> </table> <hr/> <table> <tr><td><input type="checkbox"/></td><td>1</td><td>Approved</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>Approved for Manufacturing / Fabrication with Comments as marked</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>Not Approved / Resubmit</td></tr> <tr><td><input type="checkbox"/></td><td>4</td><td>Retained for Information / Records</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>Reviewed</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>Reviewed as Noted / Resubmit</td></tr> </table> <p>Date : ____/____/____ Name : _____</p>	<input type="checkbox"/>	1	For Approval	<input type="checkbox"/>	2	For Review / Comments	<input type="checkbox"/>	3	For Information	<input checked="" type="checkbox"/>	4	For Engineering	<input type="checkbox"/>	5	For Enquiry	<input type="checkbox"/>	6	For Order Placement	<input type="checkbox"/>	7	Final & Approved	<input type="checkbox"/>	8	Released for Construction	<input type="checkbox"/>	1	Approved	<input type="checkbox"/>	2	Approved for Manufacturing / Fabrication with Comments as marked	<input type="checkbox"/>	3	Not Approved / Resubmit	<input type="checkbox"/>	4	Retained for Information / Records	<input type="checkbox"/>	5	Reviewed	<input type="checkbox"/>	6	Reviewed as Noted / Resubmit
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Rev.	Status	Description	Date	Prepared	Date	Checked	Date	Approved	AC
Based on: PIN-LES-ELT-1052, Rev.0, 12-2015			<div style="text-align: center; font-size: 2em;">Barcode</div>						Category Code: -04
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Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0021	Contract No. 66-6695
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				Rev 00 Page 2 of 2

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

Part	Docu Size	Description	No. of Pages	Rev. No.	Revised Clauses
	A4	Index Sheet and Status of Revision	2	00	-
Part-I	A4	General Specifications	2	00	-
Part-II	A4	Design Data Sheet	3	00	-
Annexure-1		Reference LCS Drawings	10	00	-

Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0021	Contract No. 66-6695
	LOCAL CONTROL STATIONS Part-I - General Specifications			 नालको NALCO नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.
				Rev 00 Page 1 of 2

1.0 INTRODUCTION

The design, manufacturing, inspection, testing and performance of Local Control Stations (LCS) shall comply with all currently applicable Indian & IEC Standards and specific Standards & Codes mentioned under clause 'Codes' of Part-II of this specification.

2.0 GENERAL REQUIREMENTS

2.1 Construction

Flameproof LCS enclosure shall have two separate sections for the push button/ switch elements and the terminals. The cover shall be fixed to the body by high tensile steel socket headed allen screws with a pair of plain and spring washers. The heads of these screws shall be effectively shrouded to permit its operation with special tools only.

All the components in the LCS, i.e. Push button elements, terminals, ammeter, selector switches shall be mounted on the body of LCS only. Only the operating knobs and handles of switches shall be mounted on the cover.

2.2 Cable Entries

Two threaded entries shall be provided on each LCS at the bottom for fixing cable glands, sizes of which are indicated in enclosed drawings. On flameproof LCS threaded flameproof metallic plug shall be provided for sealing one of the cable entries. Similarly on industrial LCS threaded plug shall be provided for the same purpose; material of threaded plug shall be same as enclosure material.



2.3 Earthing

The enclosure shall be provided with one external and one internal earthing terminal, each of 6 mm diameter, complete with nut and spring washers for termination of 6 sq. mm solid or stranded conductor.

In addition to this, suitable earthing link shall be provided between body and cover of LCS. The earthing terminals shall be clearly identified by the symbol " \perp " marked in legible and indelible manner on or adjacent to the terminal.

2.4 Nameplate

Nameplates shall be made from PVC sheet, rear engraved perspex with white letters of size minimum 3 mm on black background. All nameplates shall be identical in size for interchangeability and shall be fixed with screws on the cover. Caution nameplate marking as per relevant IS for flameproof enclosures shall also be provided. Inscription on the nameplates shall be as per the details indicated in the *Control Switch List* which will be issued after approval of LCS drawings by LSTK Contractor. A typical nameplate detail is shown below:

Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0021	Contract No. 66-6695
	LOCAL CONTROL STATIONS Part-I - General Specifications			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.
				Rev 00 Page 2 of 2

		KW RATING	TON NO.	
SWGR NAME	H2 MCC-1	150.00 kW	21AKM001	
FEEDER NAME	1F1	HYDROGEN COMPRESSOR		SERVICE DESCRIPTION

2.5 Painting

The enclosure (metallic) shall be powder coated. The paint film thickness shall be min. 60 microns. Paint shall be as described in Part-II.

3.0 FACTORY ACCEPTANCE TEST & DESPATCH

Inspection and testing shall be carried out based on latest revision of this specification and approved vendor drawings certified for construction. In case of any ambiguity between vendor drawing and order specification, the requirement indicated in technical specifications shall govern.

One sample of each type of LCS shall be made available to LSTK Contractor/Owner/Consultant for approval before commencement of manufacture of entire quantity, if desired. Routine tests shall be carried out on each LCS and LSTK Contractor/Owner/Consultant shall witness the routine tests on 20 % of the total quantity of each type of LCS. Type tests shall be carried out as specified in Part-II.



Fifteen days advance notice shall be given for carrying out final inspection and testing.


Vendor/LSTK Contractor shall ensure that all meters associated with testing of the equipment are calibrated by a competent testing authority and the calibration certificates are valid at the time of carrying out the testing of equipment.

After completion of inspection and testing, Vendor/LSTK Contractor shall furnish all as-built documents in required number of sets. The Release Order for dispatch of material will be issued only after receipt of final documents.

4.0 PERFORMANCE GUARANTEE

Vendor shall guarantee the equipment supplied by him for *Twelve months' satisfactory operation from the date of commissioning or Eighteen months from the date of dispatch*, whichever is earlier. In case of any failure in the bought out items same shall be replaced with new one within the period of guarantee. Moreover the Owner reserves the right to use rejected/failed equipment/component till it is replaced.

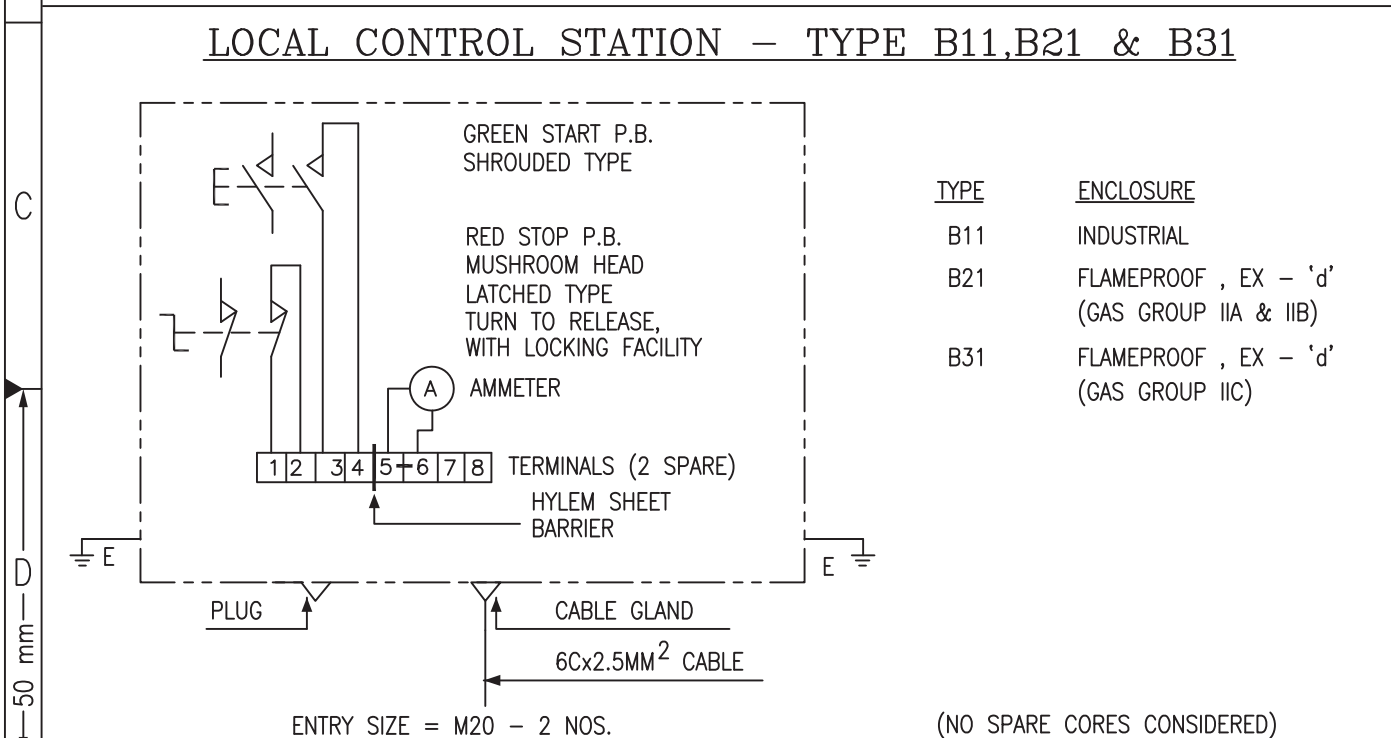
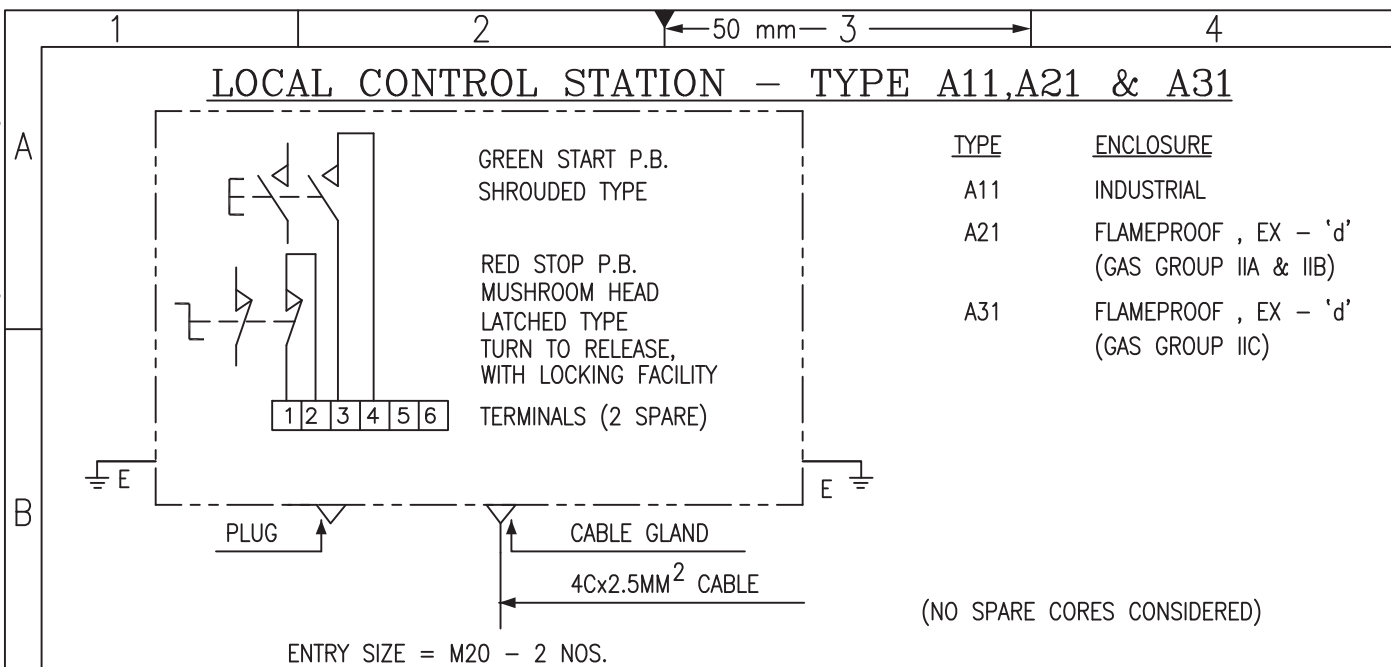
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				Contract no.	66-6695		
				Doc.	6695-ELT-G00-EC-0021		
				Rev.	00	Page	1 OF 3
GENERAL	001	Make	: As per Vendor list - Electrical				
	002	Location	: OUTDOOR				
	003	Material of Construction , Degree of Protection , Thickness of Enclosure :					
	004	a) Industrial	: Stainless Steel(SS 304), IP65				
		b) Flameproof	: Die Cast Aluminium (LM6), IP55				
	005	Canopy Material	: Same as Enclosure Material/ sheet steel painted				
	006	Final Paint Shade	:				
	007	Hardware Material	: Stainless Steel(SS 304)				
	008	Hazardous area classification	: *				
	009		:				
SITE CONDITIONS	010		:				
	011	Ambient Temperature (Max./Min.)	: _____ °C				
	012	Design Ambient Temperature	:				
	013		:				
	014	Altitude	: _____ m above MSL				
	015		:				
	016	Plant Environment	:				
	017		:				
	018		:				
CODES	019	IEC 60947 (Relevant parts): specification for low voltage switchgear and control gear					
	020	IS 4794 for push button stations					
	021	IEC 60079 for flameproof enclosures for electrical apparatus					
	022	Indian Electricity Act					
	023	CEA Regulations					
	024	Fire Insurance Authority Regulations					
	025						
	026	PUSH BUTTON					
COMPONENTS	027	Make	: Siemens/ L&T/Teknik/ Hensel / Vaishno				
	028	Type	: Start-Spring Return				
	029		Stop-Mushroom head Stayput Type				
	030	Locking facility for stop PBs to be provided	: Yes				
	031	TERMINAL BLOCK					
	032	Make	: Elmex/ Connectwell/ Allen Bradley / Fuji				
	033	Type & Size	: Clip-on, 2.5 sq. mm				
	034						
	035	Minimum distance between TBs & cable entry	: 50 mm				

 नालको NALCO नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.		LOCAL CONTROL STATIONS PART - II DESIGN DATA SHEET		Code		NAL	
				Contract no.		66-6695	
				Doc.		6695-ELT-G00-EC-0021	
				Rev.		00	Page
COMPONENTS		INTERNAL WIRING					
	036	Voltage grade	: 650 V				
	037	Conductor & Size	: Electrolytic grade stranded copper, min. 2.5 sq.mm				
	038						
	039	Termination	: With tinned copper lugs				
		AMMETER					
	040	Make	: AE/ SIMCO/ IMP/ Rishabh/ MECO				
	041	Type / Dimensions	: 72x72 mm				
	042						
	043	Accuracy class	: 1.0				
	044	CT secondary current range	: 1A				
	045	Scale graduation	:				
		a) Up to 1.2 FLC	: Linear				
		b) Beyond 1.2 FLC	: Suppressed scale up to eight times FLC				
	046	Special requirement	:				
		a) Red mark at FLC to be provided	: Yes				
		b) Ammeter indication range	: As per Primary rated current of CT				
		SELECTOR SWITCH					
	047	Make	: Kaycee/Siemens/L&T/Recom/Vaishno/Gem Telergon				
	048	No. of positions	: *				
	049	Type of handle	: *				
	050	Integral legend plate to be provided	: Yes				
		INDICATING LAMPS					
	051	Make	: Tecknik/ L&T/ Siemens /Schneider/Altos				
	052	Type & Wattage	: Clustered LED, _____ W *				
	053		:				
		BREAKER SWITCH					
	054	Make	: Kaycee/ Areva/ Recom/ Vaishno/ Gem Telergon				
	055	Type & No. of positions	: 3 Position, Momentary, Trip-Neutral-Close				
	056						
	057	Type of handle	: *				
	058	Integral legend plate to be provided	: Yes				
059							
060							
FACTORY ACCEPTANCE TEST	061	Routine test	:				
		a) Physical & dimensional checks					
		b) Insulation resistance test before & after HV test with 1000 V megger					
		c) Continuity & operation test					
		d) HV test at 2 kV for one minute					
	062	Type test	:				
		a) Hydrotesting : On one sample flameproof LCS casting of each type / Type test certificate.					
		b) IP-65 test : On one sample of each type of LCS / Type test certificate.					
063							

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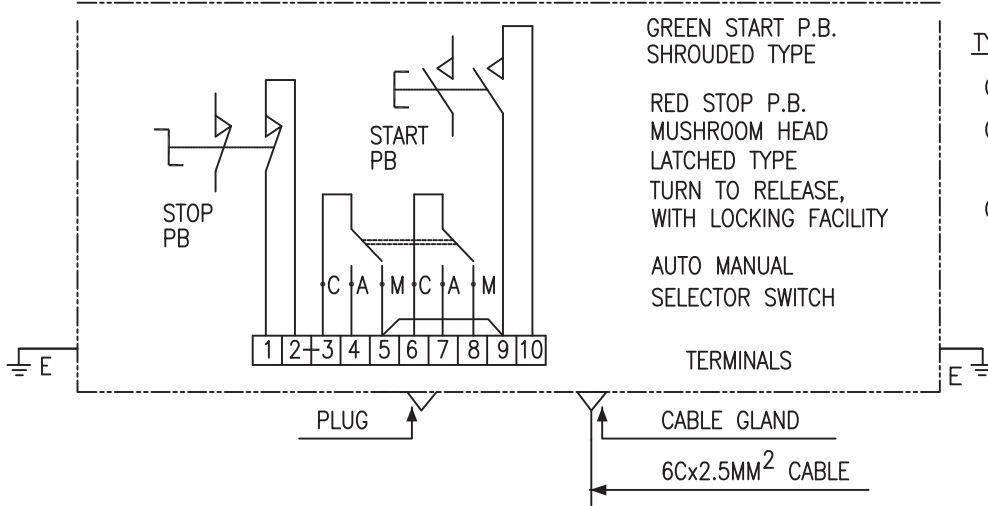
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								Con. Unit	Scale	Order No.	ThyssenKrupp Industrial Solutions (India) Copyright © 2015. All rights reserved. ThyssenKrupp Industrial Solutions (India) Private Limited	
								Description				
								LCS-CONTROL WIRING DIAGRAM TYPE AX1 & BX1				

LOCAL CONTROL STATION – TYPE C1,C2 & C3



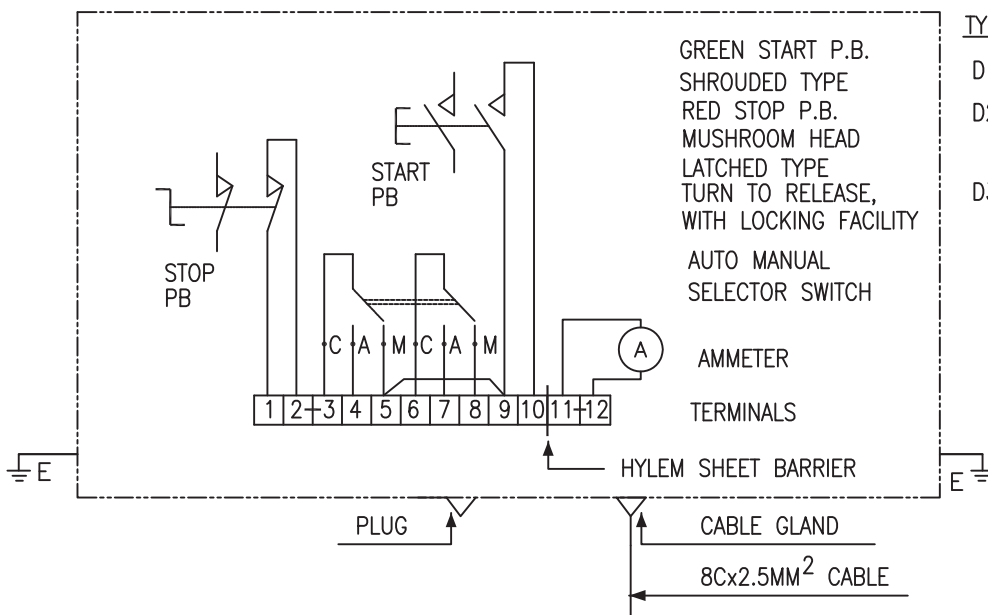
GREEN START P.B.
SHROUDED TYPE
RED STOP P.B.
MUSHROOM HEAD
LATCHED TYPE
TURN TO RELEASE,
WITH LOCKING FACILITY
AUTO MANUAL
SELECTOR SWITCH

TYPE	ENCLOSURE
C1	INDUSTRIAL
C2	FLAMEPROOF , EX - 'd' (GAS GROUP IIA & IIB)
C3	FLAMEPROOF , EX - 'd' (GAS GROUP IIC)

ENTRY SIZE = M25 - 2 NOS.

(NO SPARE CORES CONSIDERED)

LOCAL CONTROL STATION – TYPE D1,D2 & D3



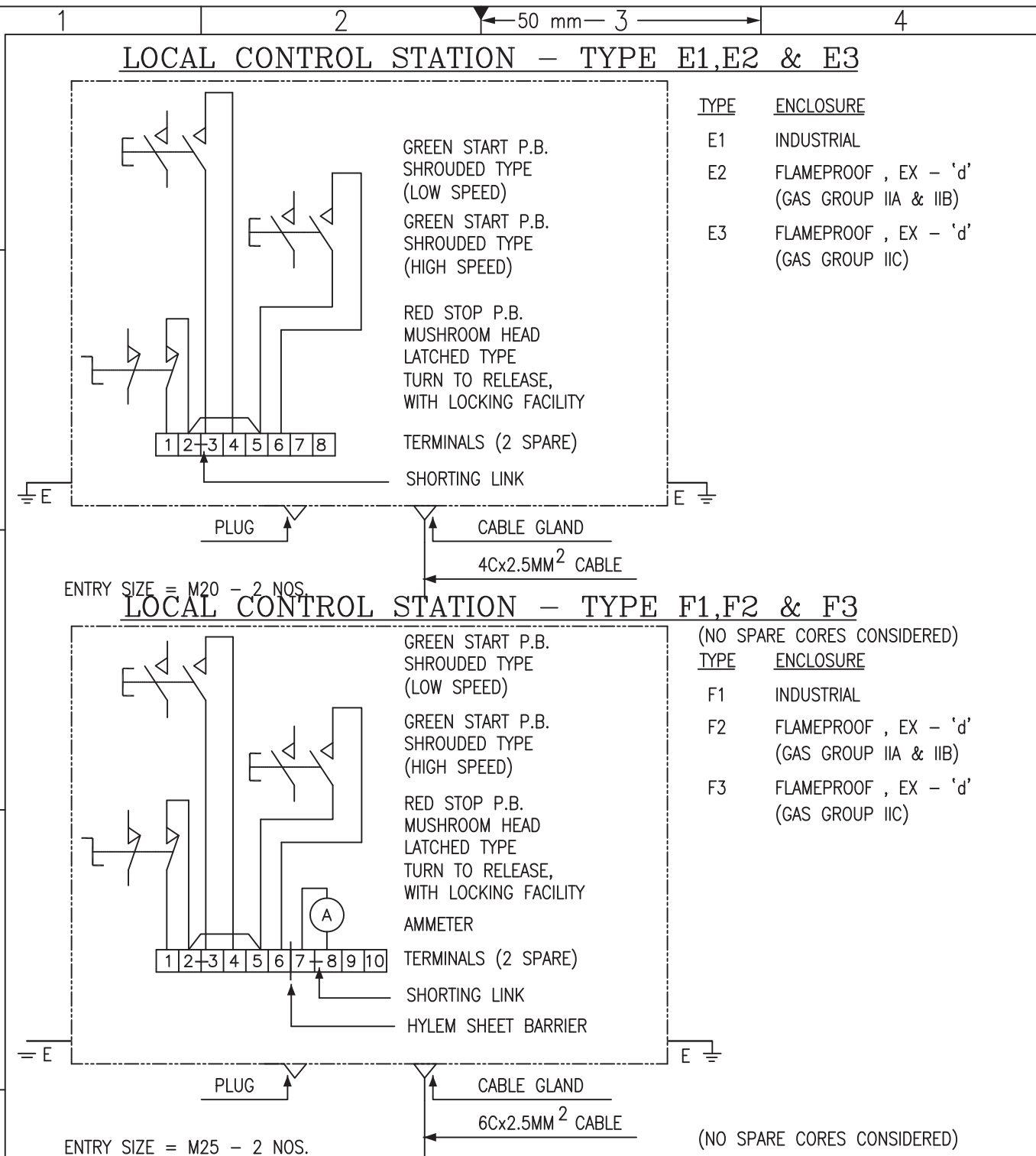
GREEN START P.B.
SHROUDED TYPE
RED STOP P.B.
MUSHROOM HEAD
LATCHED TYPE
TURN TO RELEASE,
WITH LOCKING FACILITY
AUTO MANUAL
SELECTOR SWITCH

TYPE	ENCLOSURE
D1	INDUSTRIAL
D2	FLAMEPROOF , EX - 'd' (GAS GROUP IIA & IIB)
D3	FLAMEPROOF , EX - 'd' (GAS GROUP IIC)

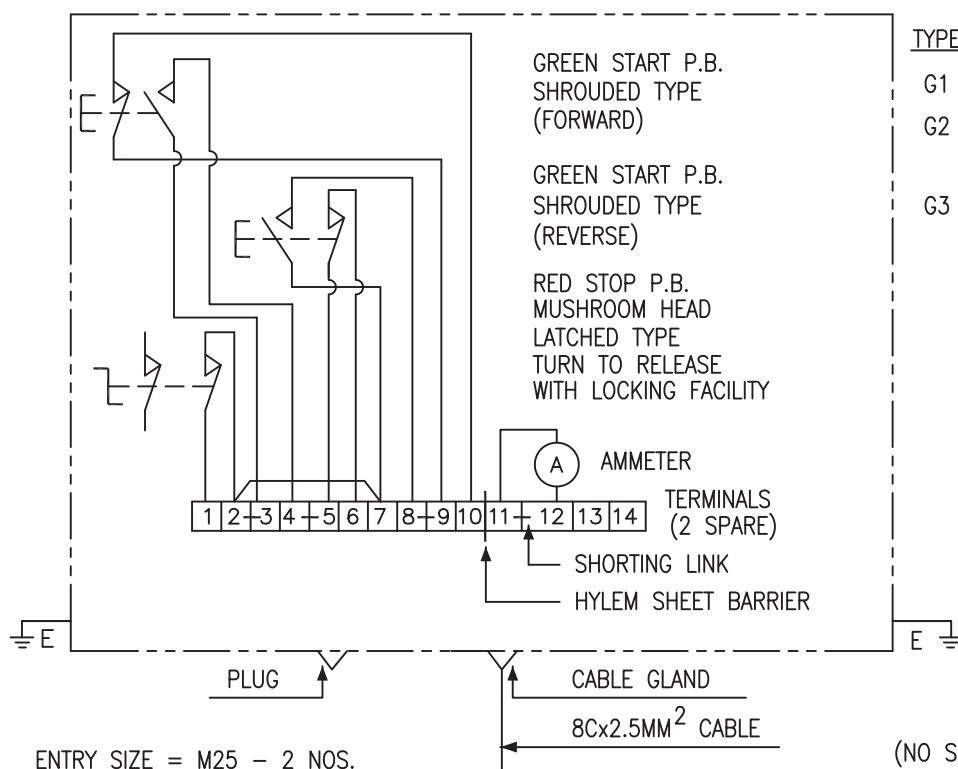
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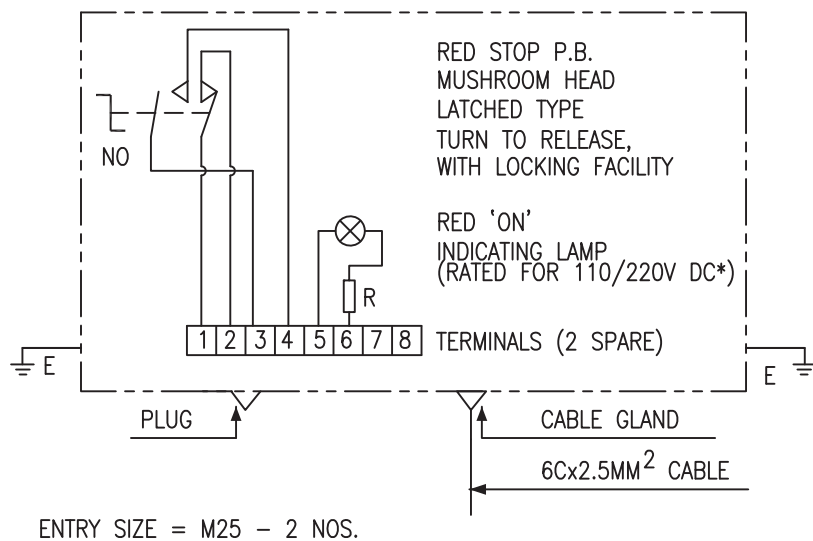
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Approved 22.12.15 RPM									
							LCS-CONTROL WIRING DIAGRAM TYPE C & D		



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Checked	22.12.15	VMS											
Approved	22.12.15	RPM								LCS-CONTROL WIRING DIAGRAM TYPE E & F			

1 2 3 4
50 mm**LOCAL CONTROL STATION – TYPE G1,G2 & G3**

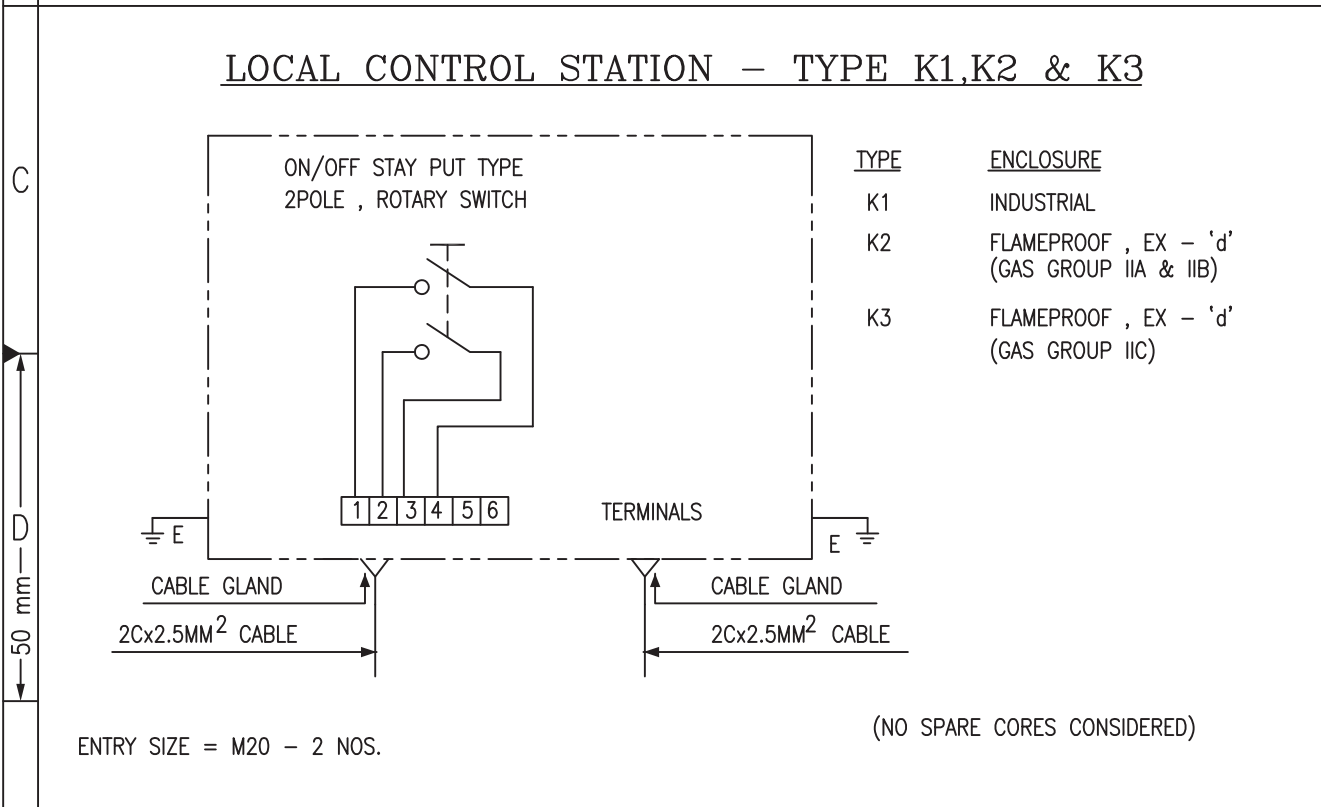
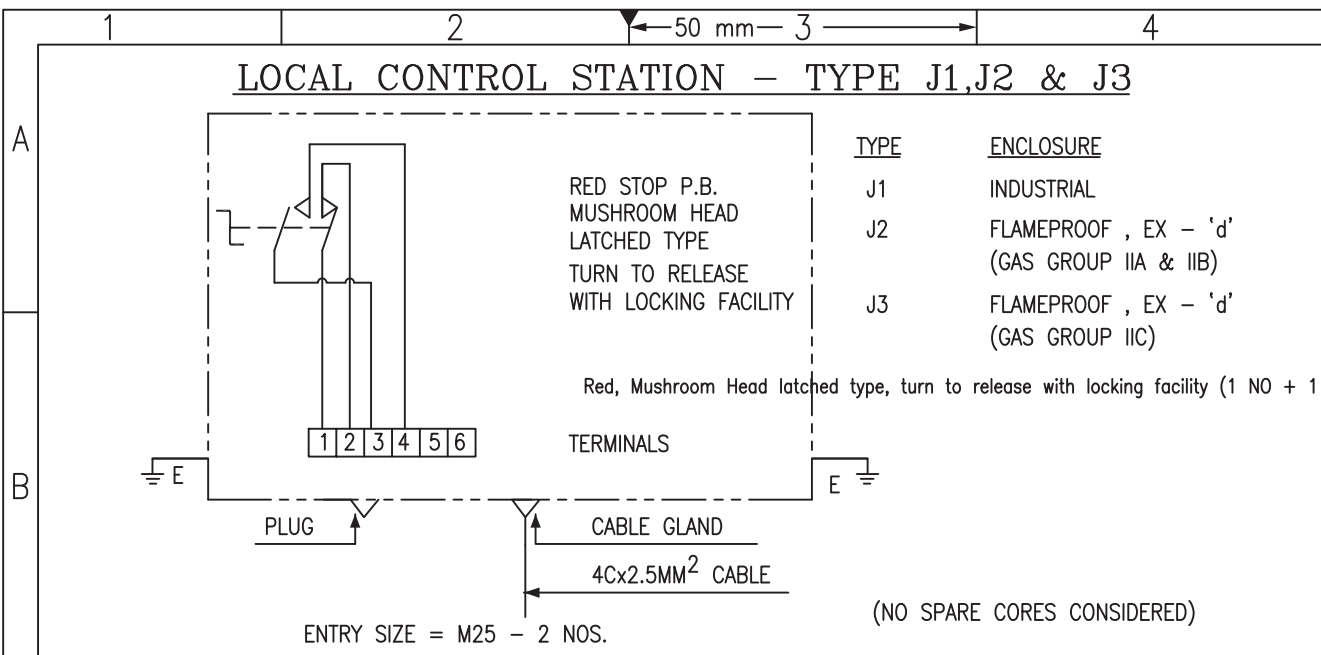
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G1	INDUSTRIAL
G2	FLAMEPROOF , EX – 'd' (GAS GROUP IIA & IIB)
G3	FLAMEPROOF , EX – 'd' (GAS GROUP IIC)

LOCAL CONTROL STATION – TYPE H1,H2 & H3

TYPE	ENCLOSURE
H1	INDUSTRIAL
H2	FLAMEPROOF , EX – 'd' (GAS GROUP IIA & IIB)
H3	FLAMEPROOF , EX – 'd' (GAS GROUP IIC)

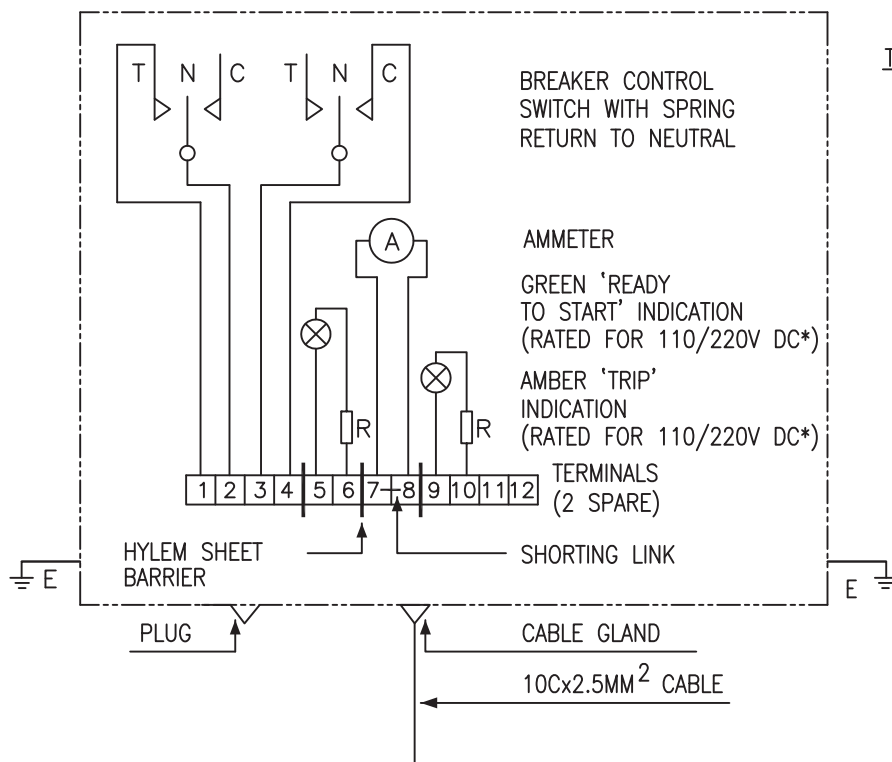
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Date								Description				
Name												
LCS-CONTROL WIRING DIAGRAM												
TYPE G & H												



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		Con. Unit	Scale		Order No.		ThyssenKrupp Industrial Solutions (India)		Copyright 2015 : All rights reserved ThyssenKrupp Industrial Solutions (India) Private Limited		
		Date		Name		Description					
		Drawn	22.12.15	RDK							
		Prepared	22.12.15	VMS							
		Checked	22.12.15	VMS							
		Approved	22.12.15	RPM							
										LCS-CONTROL WIRING DIAGRAM TYPE J & K	

LOCAL CONTROL STATION – TYPE L1,L2 & L3

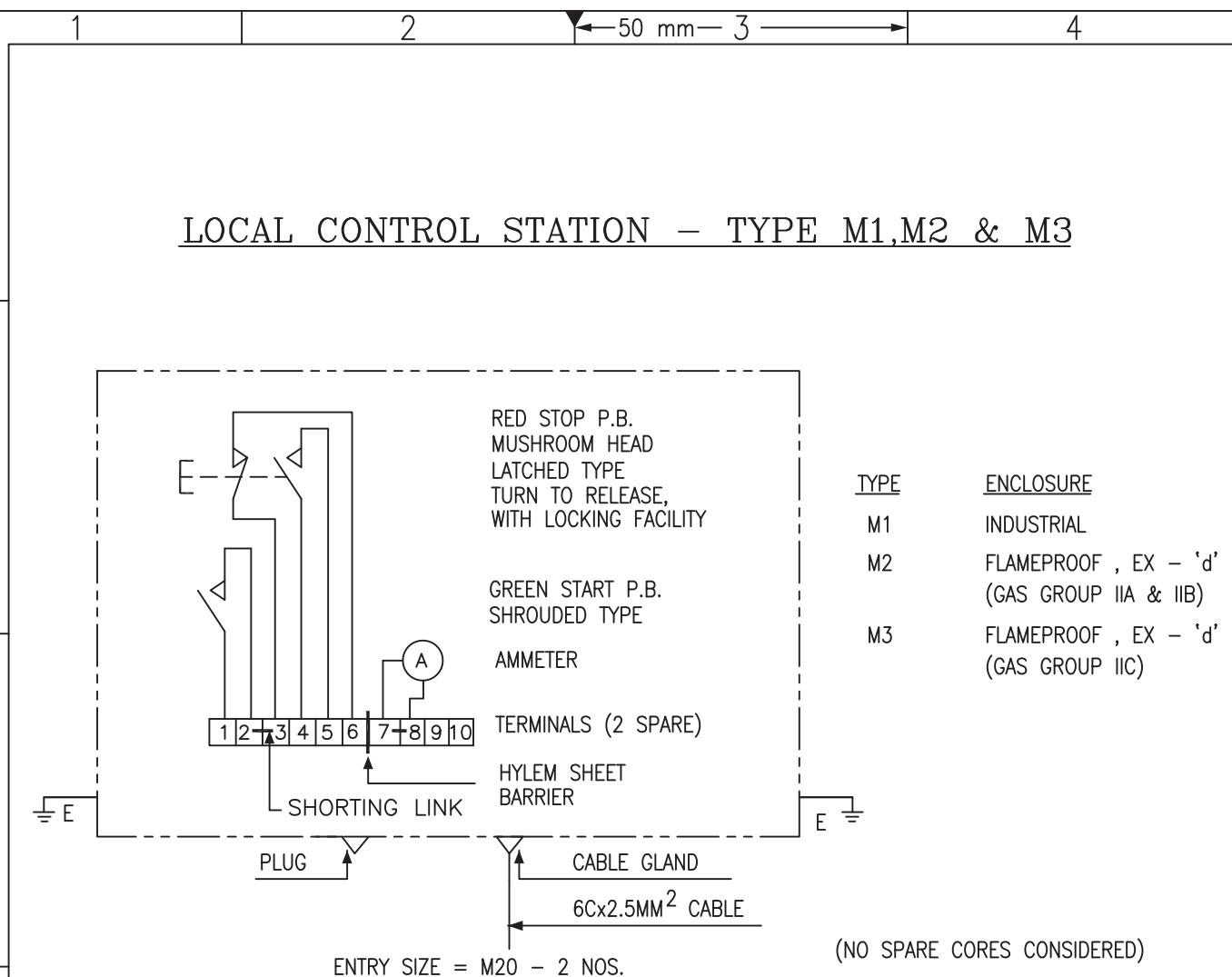


TYPE	ENCLOSURE
L1	INDUSTRIAL
L2	FLAMEPROOF , EX – 'd' (GAS GROUP IIA & IIB)
L3	FLAMEPROOF , EX – 'd' (GAS GROUP IIC)

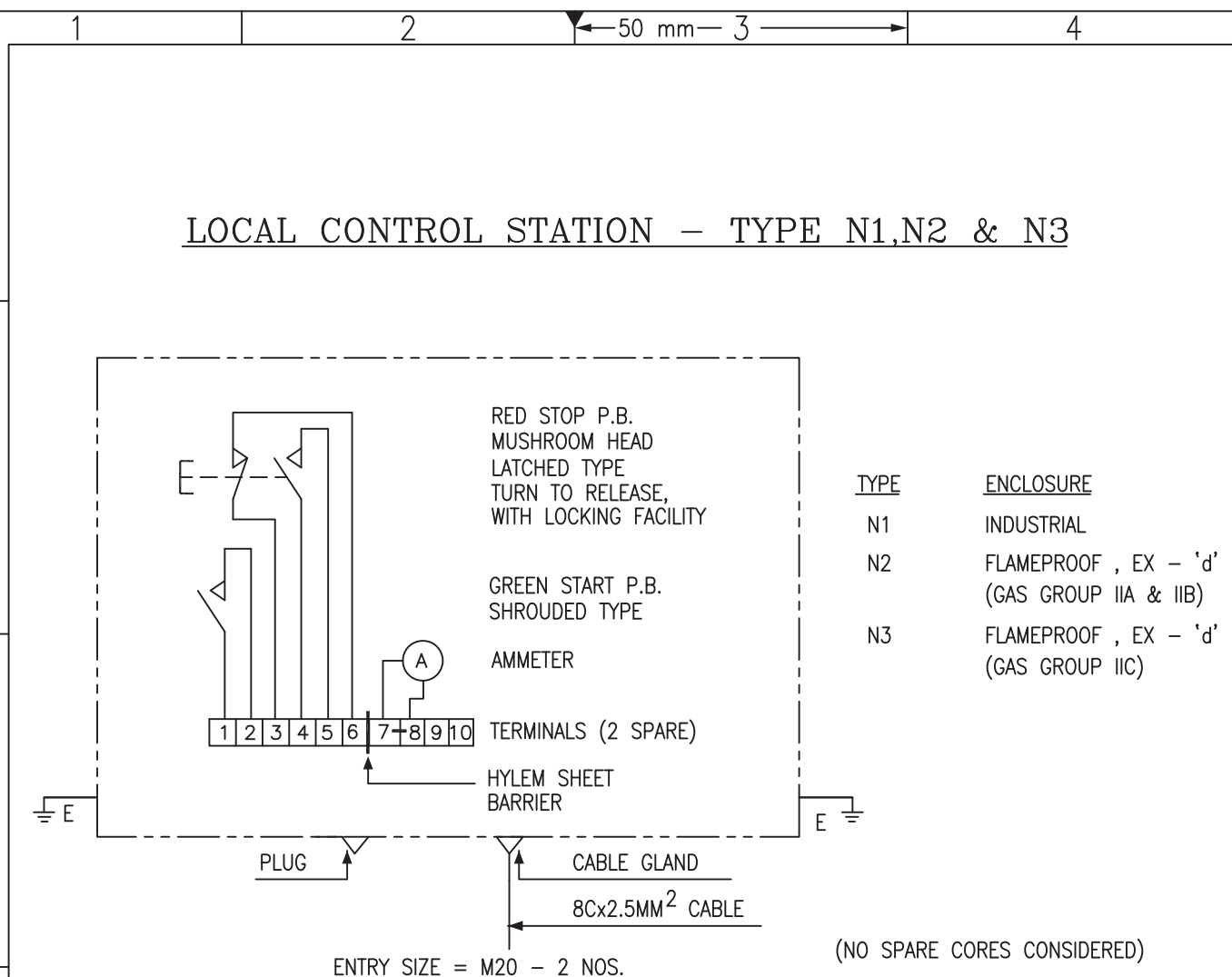
ENTRY SIZE = M25 – 2 NOS.

(NO SPARE CORES CONSIDERED)
* PROJECT SPECIFIC

Code		Contract No.		Document ID				Part		Rev. 00																
0	22.12.15	RDK	RDK	22.12.15	VMS	22.12.15	RPM	ISSUED AS STANDARD		Cat. Code	Acc. Code	Status														
Rev.	Date	Name Drawn/Prepared		Date	Name Checked	Date	Name Approved	Description		Acc. Code																
BAR-Code								Store Location: Server/Share																		
								Store Location: Folder																		
								Store Name LCS-L																		
Pro. Unit		TON		Group		Type of Document		Sheet		1 / 1																
Con. Unit		Scale		Order No.		ThyssenKrupp Industrial Solutions (India)		Copyright 2015. All rights reserved ThyssenKrupp Industrial Solutions (India) Private Limited																		
<table border="1"> <tr> <td></td> <td>Date</td> <td>Name</td> </tr> <tr> <td>Drawn</td> <td>22.12.15</td> <td>RDK</td> </tr> <tr> <td>Prepared</td> <td>22.12.15</td> <td>VMS</td> </tr> <tr> <td>Checked</td> <td>22.12.15</td> <td>VMS</td> </tr> <tr> <td>Approved</td> <td>22.12.15</td> <td>RPM</td> </tr> </table>									Date	Name	Drawn	22.12.15	RDK	Prepared	22.12.15	VMS	Checked	22.12.15	VMS	Approved	22.12.15	RPM	Description			
	Date	Name																								
Drawn	22.12.15	RDK																								
Prepared	22.12.15	VMS																								
Checked	22.12.15	VMS																								
Approved	22.12.15	RPM																								
								LCS-CONTROL WIRING DIAGRAM TYPE L																		



Code			Contract No.			Document ID					Part		Rev.	
0	13.07.16	LDK	MNH	13.07.16	VMS	13.07.16	RPM	ISSUED AS STANDARD			Cat. Code	Acc. Code	Status	
Rev.	Date	Name		Date	Name		Date	Name		Description		Acc. Code		
		Drawn/Prepared				Checked				Approved				
BAR—Code								Store Location: Server/Share						
								Store Location: Folder						
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												1 / 1		
								Con. Unit	Scale		Order No.		ThyssenKrupp Industrial Solutions (India) <small>© Copyright 2015 : All rights reserved ThyssenKrupp Industrial Solutions (India) Private Limited</small>	
		Date	Name							Description				
Drawn	13.07.16	LDK							LCS—CONTROL WIRING DIAGRAM TYPE M					
Prepared	13.07.16	MNH												
Checked	13.07.16	VMS												
Approved	13.07.16	RPM												



Code			Contract No.				Document ID				Part		Rev. 00
0	13.07.16	LDK	MNH	13.07.16	VMS	13.07.16	RPM	ISSUED AS STANDARD			Cat. Code	Acc. Code	Status
Rev.	Date	Name Drawn/Prepared		Date	Name Checked		Date	Name Approved		Description			
BAR—Code								Store Location: Server/Share					
								Store Location: Folder					
								Store Name LCS—N					
								Pro. Unit	TON		Group	Type of Document	Sheet 1 / 1
								Con. Unit	Scale		Order No.		ThyssenKrupp Industrial Solutions (India) <small>© Copyright 2015 ; All rights reserved ThyssenKrupp Industrial Solutions (India) Private Limited</small>
	Date	Name						Description					
Drawn	13.07.16	LDK											
Prepared	13.07.16	MNH											
Checked	13.07.16	VMS											
Approved	13.07.16	RPM											
								LCS—CONTROL WIRING DIAGRAM TYPE N					

1	2	3	4								
<h2 style="margin: 0;">LOCAL CONTROL STATION – TYPE 01,02 & 03</h2>											
<p>RED STOP P.B. MUSHROOM HEAD LATCHED TYPE TURN TO RELEASE, WITH LOCKING FACILITY</p> <p>GREEN START P.B. SHROUDED TYPE</p> <p>AUTO MANUAL SELECTOR SWITCH</p> <p>AMMETER</p> <p>TERMINALS (2 SPARE)</p>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">TYPE</th> <th style="text-align: left;">ENCLOSURE</th> </tr> <tr> <td>01</td> <td>INDUSTRIAL</td> </tr> <tr> <td>02</td> <td>FLAMEPROOF , EX – 'd' (GAS GROUP IIA & IIB)</td> </tr> <tr> <td>03</td> <td>FLAMEPROOF , EX – 'd' (GAS GROUP IIC)</td> </tr> </table>		TYPE	ENCLOSURE	01	INDUSTRIAL	02	FLAMEPROOF , EX – 'd' (GAS GROUP IIA & IIB)	03	FLAMEPROOF , EX – 'd' (GAS GROUP IIC)
TYPE	ENCLOSURE										
01	INDUSTRIAL										
02	FLAMEPROOF , EX – 'd' (GAS GROUP IIA & IIB)										
03	FLAMEPROOF , EX – 'd' (GAS GROUP IIC)										
<p>ENTRY SIZE = M20 – 2 NOS. (NO SPARE CORES CONSIDERED)</p>											
<p>ISO A4</p>											
<p>Rev. 00</p>											
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<p>Part Rev. 00</p>											
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<p>Pro. Unit TON Group Type of Document Sheet 1 / 1</p>											
<p>Con. Unit Scale Order No. ThyssenKrupp Industrial Solutions (India) Private Limited</p>											
<p>Description</p>											
<p>LCS-CONTROL WIRING DIAGRAM TYPE 0</p>											