

# *P & I Design Ltd*

Process Instrumentation Consultancy & Design

2 Reed Street, Gladstone Industrial Estate,  
Thornaby, TS17 7AF, United Kingdom.  
Tel. +44 (0)1642 617444 Fax. +44 (0)1642 616447  
Web Site: [www.pidesign.co.uk](http://www.pidesign.co.uk)

## **INTER TERMINALS IMMINGHAM LTD**

### **EAST TERMINAL**

### **SITE PLC – OPERATIONS’ OFFICE**

### **DOCUMENTATION MANUAL**

<b>Rev</b>	<b>Date</b>	<b>By</b>	<b>Checked</b>	<b>Approved</b>	<b>Description</b>	<b>Client Ref.</b>
A	12.06.14	D. Smith	MM	MM	Original Issue	<b>Document No.</b> <b>SI353001_MNL</b>  <b>Page 1 of 3</b>
B	12.05.15	D. Smith	MM	MM	General Update	
C	20.10.15	D. Smith	MM	MM	General Update	
D	15.07.16	D. Smith	MM	MM	General Update	

*IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED*

## Contents

1. Reports
2. Drawings and Schedules
3. Testing & Handover



## Register Control System

<u>Register No</u>	<u>Description</u>	<u>Issue</u>
SI353001_REG	Drawing Register	C
SI353002_REG	Report Register	C
SI353003_REG	Specification Register	A



**CLIENT:**  
Inter Terminals Immingham Ltd  
East Terminal

REV	DATE	BY	CHKD	APPD
A	12.06.14	DS	MM	MM
B	12.05.15	DS	MM	MM
C	15.07.16	DS	MM	MM

**CLIENT REF.**  
Site Services  
**P & I REF.**  
SI353001\_REG  
**SHT** 1 OF 1

DRAWING NO	REVISION					DESCRIPTION
	ISSUE 0	A	B	C	D	
SI353001_DWG		B	C			Logic Panel Internal Layout
SI353002_DWG		B	D			Logic Panel Wiring Details
SI353003_DWG			A			Logic Drawing 1
SI353004_DWG			A	B		Logic Drawing 3
SI394005_DWG					D	Boiler Feed Water Low Pressure Loop Sheet
SI353002_SCH			B			PLC Control System Alarms Schedule

***P & I Design Ltd.***

***Report Register***

**CLIENT:**  
Inter Terminals Immingham Ltd  
East Terminal

REV	DATE	BY	CHKD	APPD
A	12.06.14	DS	MM	MM
B	20.10.15	DS	MM	MM
C	15.07.16	DS	MM	MM

**CLIENT REF.**  
Site Services  
**P & I REF.**  
SI353002\_REG  
**SHT** 1 OF 1

REPORT NO	REVISION					DATE	DESCRIPTION
	ISSUE	0	A	B	C		
SI353001_RPT		A				30.09.13	Functional Specification
SI353002_RPT		A				09.12.13	Site Acceptance Test (CC 02.06.14)
SI353001_SCH		A	D	E		19.04.16	A680 I/O Schedule

***P & I Design Ltd***

***Specification Register***

**CLIENT:**  
Inter Terminals Immingham Ltd  
East Terminal

**ISSUE**   **DATE**   **BY**   **CHKD**   **APPD**  
A   15.07.16   DS   MM   MM

**CLIENT REF**

**P & I REF.**  
SI353003\_REG  
SHT 1 OF 1

<b>P&amp;I REF.</b>	<b>ISSUE</b>	<b>REVISION</b>	<b>SUPPLIER</b>	<b>TAG No.</b>	<b>ITEM</b>
	<b>0</b>	<b>A B C D E</b>			
SI394001_SPC		A	Endress & Hauser	PT-004	Pressure Transmitter

## **Section 2**

### **Reports**



# P & I Design Ltd

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Web Site: www.pidesign.co.uk

**IMMINGHAM STORAGE Co LTD**

**ISCO EAST TERMINAL**

**SITE SERVICES**

**PLC CONTROL SYSTEM**

**SITE ACCEPTANCE TEST**



Rev	Date	By	Checked	Approved	Description	Client Reference
A	09.12.13	Chris Dales	Martin Morgan	Martin Morgan	Original Issue	Site Services
						Document Number SI353002_RPT

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED



## Contents

1	REVISION HISTORY .....	3
2	INTRODUCTION .....	3
3	TESTING.....	3
4	DOCUMENTATION .....	4
5	PLC/SCADA SYSTEM TESTING.....	5

## Appendix

### I. Additional Testing Sheets



## 1 REVISION HISTORY

Rev	Description
A	Original Issue

## 2 INTRODUCTION

The purpose of this testing is to demonstrate full ‘end to end’ functionality of the final installation.

The tests documented within this procedure are designed to demonstrate the system functionality as required by the functional design specification listed in the documentation section.

## 3 TESTING

All tests performed are detailed in this report, with results recorded and action points noted. The word PASS or FAIL should be written as applicable and the tester shall initial and date.

Test *.*.* – Flow	Pass Date/ Snag No.
<i>Alarm Message Correct</i>	<i>Pass **/**/**</i>
<i>Window illuminated</i>	<i>Snag 1</i>

In the case of a test failing, a comment should be made outlining the problem. If the problem can be easily fixed and re-tested, it is not necessary to record a failure.

If rectification work is required, a note should be made of the action taken and the re-test performed, normally by copying the blank relevant test sheet, completing and attaching to the rear of this document

ACTIONS/COMMENTS
<i>Window not Illuminated (Snag 1)</i>  <i>Rectified by Software modification 2.0A, refer to supplementary test sheet for re-test</i>

The approval section should be signed when all testing in the relevant section is complete. All tests do not necessarily have to be passed, failures will be dealt with under the snag list and re-test procedures.

Approvals (Note: Signature indicates acceptance of test with actions/comments noted)	Sign	Date
Tested by	<i>D.B.Faulkner</i>	<i>**/**/**</i>



**4 DOCUMENTATION**

<b>Purpose of Test</b>		
To record the documentation used for testing.		
<b>Method of Test</b>		
Confirm documentation and revisions used for testing.		
<b>Report Number</b>	<b>Title</b>	<b>Revision/Date</b>
SI353001_RPT	Functional Specification	
SI353002_RPT	Site Acceptance Testing Report	
<b>Schedules</b>	<b>Title</b>	<b>Revision/Date</b>
SI353001_SCH	I/O Schedule	
SI353002_SCH	System Trip Matrix	
<b>Software Versions</b>		
A375	Site SCADA	
A680	Site Services PLC	
<b>Actions/Comments</b>		
<b>Approvals (Note: Signature indicates acceptance of test with actions/comments noted)</b>	<b>Sign</b>	<b>Date</b>
Tested by		



## 5 PLC/SCADA SYSTEM TESTING

### 5.1 Analogue Input Simulations

Purpose of Test													
To verify the correct functionality of the PLC/SCADA System.													
Each analogue input to be simulated to verify the correct display on all associated SCADA screens, trends, alarm pages, annunciator windows and to verify the correct display of limit alarms and open circuit failures.													
Note* Alarm set points adjustable at SCADA.													
Test 5.1.1 – Plant Air Pressure													
Loop	Range					Units		√Square Root		Tolerance		Hysteresis	
PT-SPA001	0 to 16					BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.		
	0.00	4.00	8.00	12.00	16.00	N/A	2.8*	N/A	N/A	Open Circ			
Site Services Page	✓	4.03	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03-06-14		
Trend	✓	4.03	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03-06-14		
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓			
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓			
Test 5.1.2 – Instrument Air Supply Pressure													
Loop	Range					Units		√Square Root		Tolerance		Hysteresis	
PT-SIA002	0 to 16					BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.		
	0.00	4.00	8.00	12.00	16.00	N/A	2.8*	N/A	N/A	Open Circ			
Site Services Page	✓	✓	7.99	✓	✓	N/A	<del>N/A</del>	N/A	N/A	N/A	PASS 03-06-14		
Trend	✓	✓	7.99	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03-06-14		
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	PASS 03-06-14		
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	PASS 03-06-14		



5.1 Analogue Input Simulations

<b>Test 5.1.3 – Nitrogen Supply Low Pressure</b>												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
PT-SNS003		0 to 16			BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
		0.00	4.00	8.00	12.00	16.00	N/A	4.1*	N/A	N/A	Open Circ	
Site Services Page	✓	✓	8.03	12.05	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Trend	✓	✓	8.03	12.05	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	PASS 03.06.14	
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	03.06.14	

<b>Test 5.1.4 – Fire Main Water Pressure</b>												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
PT-FM004		0 to 16			BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
		0.00	4.00	8.00	12.00	16.00	N/A	N/A	12.2*	N/A	Open Circ	
Site Services Page	0.06	4.05	8.08	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Trend	0.06	4.05	8.08	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	✓	03.06.14 PASS	
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	✓	PASS 03.06.14	

<b>Test 5.1.5 – Fire Main Water Flow</b>												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
FT-FM005		0 to 500			m3/h		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
		0.00	125	250	375	500	N/A	N/A	N/A	N/A	Open Circ	
Site Services Page	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Trend	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	03.06.14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			



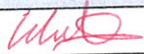
**Appendix I**  
**Additional Testing Sheets**  
**Snag List**



**METHOD OF TEST**

	PASS	FAIL	SNAG REF.

**ACTIONS/COMMENTS**

APPROVALS (NOTE: Signature indicates acceptance of test with actions/comments noted)	SIGN	DATE
P & I Design		03.06.14
Client or Client's Appointee		





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## **IMMINGHAM STORAGE COMPANY LTD**

### **EAST TERMINAL**

## **SITE SERVICES PLC CONTROL SYSTEM**

### **A680 I/O SCHEDULE**

<b>Rev</b>	<b>Date</b>	<b>By</b>	<b>Checked</b>	<b>Approved</b>	<b>Description</b>	
A	30.09.13	Andrew Boalch	M. Morgan	M. Morgan	Original Issue for ISCo Approval	Client Reference <b>Services</b>
B	25.09.14	Chris Dales	M.Morgan	M.Morgan	Fire Main Water Range Added	
C	10.02.15	Andrew Boalch	M.Morgan	M.Morgan	Biomass Boiler Interface Signals	Document Number <b>SI353001_SCH</b>
D	09.10.15	Chris Dales	M.Morgan	M.Morgan	PLC Upgraded to ControlLogix	
E	19.04.16	Chris Dales	D.Faulkner	D.Faulkner	PAL004 Added	

*IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED*

## Contents

<b>1</b>	<b>REVISION HISTORY .....</b>	<b>3</b>
<b>2</b>	<b>GENERAL INFORMATION.....</b>	<b>3</b>
<b>3</b>	<b>RACK LAYOUT .....</b>	<b>3</b>
<b>4</b>	<b>LOCAL I/O .....</b>	<b>4</b>
<b>4.1</b>	<b>Analogue Inputs.....</b>	<b>4</b>
<b>4.2</b>	<b>Digital Inputs .....</b>	<b>4</b>
<b>4.3</b>	<b>Digital Outputs.....</b>	<b>5</b>



## 1 REVISION HISTORY

Rev	Description
A	Original Issue – For ISCo Approval
B	Biomass Boiler Annunciator Interface Signals Added <ul style="list-style-type: none"> <li>Analogue Input I:02.00 Range Changed to 0 – 800m3/hr</li> </ul>
C	Biomass Boiler Annunciator Interface Signals Added <ul style="list-style-type: none"> <li>Digital Output O:00.00.4 BMB Alarm 02 Added</li> <li>Digital Output O:00.00.5 BMB Alarm 01 Added</li> </ul>
D	PLC Upgraded To Control Logix
E	PAL004 Added <ul style="list-style-type: none"> <li>Digital Output O:00.00.6 PAL004 Added</li> </ul>

## 2 GENERAL INFORMATION

The Site Services PLC control system utilises an Allen Bradley Control Logix PLC, for signal monitoring and alarming. The Control Logix PLC is a rack based PLC.

The I/O capabilities can be increased by adding additional I/O modules in the spare slots shown below.

## 3 RACK LAYOUT

PSU	CPU (L71)	E/Net (SCADA)	Analogue In	Digital In	Digital Out	Spare	Spare	Spare	Modbus	Modbus
Slot	0	1	2	3	4	5	6	7	8	9



## 4 LOCAL I/O

### 4.1 Analogue Inputs

Rack 01 Slot 02

ADDRESS	TAGNAME	TYPE	RANGE	SERVICE
I:02.00	PTSPA001	4-20mA	0 to 16 BarG	PTSPA001 – Plant Air Supply Pressure Tx
I:02.01	PTSIA002	4-20mA	0 to 16 BarG	PTSIA002 – Instrument Air Pressure Tx
I:02.02	PTSNS003	4-20mA	0 to 16 BarG	PTSNS003 – Plant Nitroge Pressure Tx
I:02.03	PTFM004	4-20mA	0 to 16 BarG	PTFM004 – Fire Main Water Pressure Tx
I:02.04	FTFM005	4-20mA	0-800 m3/hr	FTFM005 – Fire Main Water Flow Tx
I:02.05	-	-	-	Spare
I:02.06	-	-	-	Spare
I:02.07	-	-	-	Spare

### 4.2 Digital Inputs

Rack 01 Slot 03

ADDRESS	TAGNAME	TYPE	RANGE	SERVICE
I:00.03.0	-	24V dc	N/A	Spare
I:00.03.1	-	24V dc	N/A	Spare
I:00.03.2	-	24V dc	N/A	Spare
I:00.03.3	-	24V dc	N/A	Spare
I:00.03.4	-	24V dc	N/A	Spare
I:00.03.5	-	24V dc	N/A	Spare
I:00.03.6	-	24V dc	N/A	Spare
I:00.03.7	-	24V dc	N/A	Spare
I:00.03.8	-	24V dc	N/A	Spare
I:00.03.9	-	24V dc	N/A	Spare
I:00.03.10	-	24V dc	N/A	Spare
I:00.03.11	-	24V dc	N/A	Spare
I:00.03.12	-	24V dc	N/A	Spare
I:00.03.13	-	24V dc	N/A	Spare
I:00.03.14	-	24V dc	N/A	Spare
I:00.03.15	-	24V dc	N/A	Spare



### 4.3 Digital Outputs

#### Rack 01 Slot 04

ADDRESS	TAGNAME	TYPE	RANGE	SERVICE
O:00.04.0	PALSPA001	Relay	N/A	PALSPA001 – Plant Air Low Pressure (Annunciator)
O:00.04.1	PALSIA002	Relay	N/A	PALSIA002 – Instrument Air Low Pressure (Annunciator)
O:00.04.2	PALSNS003	Relay	N/A	PALSN003 – Plant Nitrogen Low Pressure (Annunciator)
O:00.4.3	PAHFM004	Relay	N/A	PAHFM004 – Fire Main Water High Pressure (Annunciator)
O:00.04.4	BMB_Alarm_02	Relay	N/A	BMB Alarm 02 – Biomass Boiler High CO (Annunciator)
O:00.04.5	BMB_Alarm_01	Relay	N/A	BMB Alarm 01 – Biomass Boiler Common Fault (Annunciator)
O:00.04.6	PALPT004	Relay	N/A	Boiler Feed Water Low Pressure (Annunciator)
O:00.04.7	-	Relay	N/A	Spare
O:00.04.8	-	Relay	N/A	Spare
O:00.04.9	-	Relay	N/A	Spare
O:00.04.10	-	Relay	N/A	Spare
O:00.04.11	-	Relay	N/A	Spare
O:00.04.12	-	Relay	N/A	Spare
O:00.04.13	-	Relay	N/A	Spare
O:00.04.14	-	Relay	N/A	Spare
O:00.04.15	-	Relay	N/A	Spare



**CLIENT:**  
Simon Storage  
Immingham East Terminal

**REV DATE BY CHKD APPD**  
A 29.02.16 CD MM MM

**CLIENT REF.**  
SI394  
**P & I REF.**  
SI394001.SPC  
**SHT 1 OF 2**

**ITEM:** Pressure Transmitter  
(Electronic)

**GENERAL** Tag Number PT-004  
Service Boiler Feed Water Pressure

Area Classification Non-Hazardous

**MEASURING UNIT** Type Pressure Transmitter  
Materials: Diaphragm Stainless Steel  
Body Stainless Steel  
Trim Stainless Steel  
Seals N/A  
Process Conn. : Size 1/2"  
Type ANSI MNPT  
Static Pressure: Max N/A  
Range: Limits N/A  
Calibrated 0 – 4 barg  
Elevation N/A  
Suppression N/A

**TRANSMISSION** Type 2 Wire  
Supply 24V dc  
Output 4 - 20mA HART with local LCD Display

**HOUSING** Material F31 Aluminium Alloy  
Enclosure Class IP66/68  
Electrical Classification Non-Hazardous  
Certificate Reference N/A  
Electrical Connection M20

**OPTIONS**

**PROCESS DATA** Fluid Boiler Feed Water  
Temperature Max./Min. TBA  
Temperature Oper. TBA  
Pressure Max./Min TBA  
Pressure Oper. 2 barg  
Calibrated Range 0 – 4 barg

**MANUFACTURERS DATA** Supplier Endress and Hauser  
Model Number Transmitter :- PMP51 AA 2 1 J A 1P G B RKJ A 1 78 Z1

**DOCUMENTATION** See Attached Documentation Specification

REVISION HISTORY	
Rev	Description
A	Original Issue

**CLIENT:**  
Simon Storage  
Immingham East Terminal

**REV DATE BY CHKD APPD**  
A 29.02.16 CD MM MM

**CLIENT REF.**  
SI394  
**P & I REF.**  
SI394001.SPC  
SHT 2 OF 2

<u>Item</u>	<u>Quantity</u>	<u>Description</u>
1.	n/a	<b>APPROVAL DOCUMENTATION</b> To be supplied before manufacture commences
2.	1	<b>GENERAL ARRANGEMENT DRAWING</b> Cross-sectioned to show all details necessary for repair and maintenance purposes.
3.		<b>MATERIALS TEST CERTIFICATES</b>
	n/a	a. Mechanical.
	n/a	b. Chemical analysis.
4.		<b>ITEMISED PARTS LIST</b>
	n/a	Cross-referenced with G.A. drawing(s) and illustrating manufacturers references for all proprietary items such as bearings, oilseals, mechanical seals, etc.
5.		<b>RECOMMEND SPARES QUOTATION</b>
	n/a	a. Two years service.
	n/a	b. Commissioning only.
6.		<b>INSTALLATION, OPERATING AND MAINTENANCE MANUALS</b>
		To include calibration instructions where applicable.
	1	a. Paper Copy
	1	b. Electronic copy (Preferably Adobe Acrobat)
7.		<b>SOFTWARE</b>
	n/a	a. Programming manual.
	n/a	b. Operating manual.
8.		<b>PRESSURE VESSELS</b>
	n/a	Calculation sheets, spark test certificates (for lined vessels),hydraulic test certificates.
9.		<b>ELECTRICAL</b>
	n/a	a. Schematic and circuit diagrams.
	n/a	b. Certificates of conformity (to include EMC Directive 89/336/EEC).
	n/a	c. Hazardous area certification.
10.		<b>INSTRUMENTATION</b>
	n/a	a. Certificates of conformity (to include EMC Directive 89/336/EEC).
	1	b. Calibration certificates.
	n/a	c. Hazardous area certification.
11.		<b>SPECIAL REQUIREMENTS</b>

**IMPORTANT NOTICE:**

Vendors acceptance of this order is conditional on the provision of the Documentation.

Should the vendor not wish to supply the whole or part of the details herein requested, he shall state in writing any exceptions with the quotation or order acceptance.

P & I Design reserve the right to cancel any order where the documentation does not comply with P & I requirements. No item will be paid in full until documentation specified has been received.

**Section 3**  
**Specifications**





**CLIENT:**  
Simon Storage  
Immingham East Terminal

**REV DATE BY CHKD APPD**  
A 29.02.16 CD MM MM

**CLIENT REF.**  
SI394  
**P & I REF.**  
SI394001.SPC  
**SHT 1 OF 2**

**ITEM:** Pressure Transmitter  
(Electronic)

**GENERAL** Tag Number PT-004  
Service Boiler Feed Water Pressure

Area Classification Non-Hazardous

**MEASURING UNIT** Type Pressure Transmitter  
Materials: Diaphragm Stainless Steel  
Body Stainless Steel  
Trim Stainless Steel  
Seals N/A  
Process Conn. : Size 1/2"  
Type ANSI MNPT  
Static Pressure: Max N/A  
Range: Limits N/A  
Calibrated 0 – 4 barg  
Elevation N/A  
Suppression N/A

**TRANSMISSION** Type 2 Wire  
Supply 24V dc  
Output 4 - 20mA HART with local LCD Display

**HOUSING** Material F31 Aluminium Alloy  
Enclosure Class IP66/68  
Electrical Classification Non-Hazardous  
Certificate Reference N/A  
Electrical Connection M20

**OPTIONS**

**PROCESS DATA** Fluid Boiler Feed Water  
Temperature Max./Min. TBA  
Temperature Oper. TBA  
Pressure Max./Min TBA  
Pressure Oper. 2 barg  
Calibrated Range 0 – 4 barg

**MANUFACTURERS DATA** Supplier Endress and Hauser  
Model Number Transmitter :- PMP51 AA 2 1 J A 1P G B RKJ A 1 78 Z1

**DOCUMENTATION** See Attached Documentation Specification

REVISION HISTORY	
Rev	Description
A	Original Issue

**CLIENT:**  
Simon Storage  
Immingham East Terminal

**REV DATE BY CHKD APPD**  
A 29.02.16 CD MM MM

**CLIENT REF.**  
SI394  
**P & I REF.**  
SI394001.SPC  
SHT 2 OF 2

<b>Item</b>	<b>Quantity</b>	<b>Description</b>
1.	n/a	<b>APPROVAL DOCUMENTATION</b> To be supplied before manufacture commences
2.	1	<b>GENERAL ARRANGEMENT DRAWING</b> Cross-sectioned to show all details necessary for repair and maintenance purposes.
3.		<b>MATERIALS TEST CERTIFICATES</b>
	n/a	a. Mechanical.
	n/a	b. Chemical analysis.
4.		<b>ITEMISED PARTS LIST</b>
	n/a	Cross-referenced with G.A. drawing(s) and illustrating manufacturers references for all proprietary items such as bearings, oilseals, mechanical seals, etc.
5.		<b>RECOMMEND SPARES QUOTATION</b>
	n/a	a. Two years service.
	n/a	b. Commissioning only.
6.		<b>INSTALLATION, OPERATING AND MAINTENANCE MANUALS</b>
		To include calibration instructions where applicable.
	1	a. Paper Copy
	1	b. Electronic copy (Preferably Adobe Acrobat)
7.		<b>SOFTWARE</b>
	n/a	a. Programming manual.
	n/a	b. Operating manual.
8.		<b>PRESSURE VESSELS</b>
	n/a	Calculation sheets, spark test certificates (for lined vessels),hydraulic test certificates.
9.		<b>ELECTRICAL</b>
	n/a	a. Schematic and circuit diagrams.
	n/a	b. Certificates of conformity (to include EMC Directive 89/336/EEC).
	n/a	c. Hazardous area certification.
10.		<b>INSTRUMENTATION</b>
	n/a	a. Certificates of conformity (to include EMC Directive 89/336/EEC).
	1	b. Calibration certificates.
	n/a	c. Hazardous area certification.
11.		<b>SPECIAL REQUIREMENTS</b>

**IMPORTANT NOTICE:**

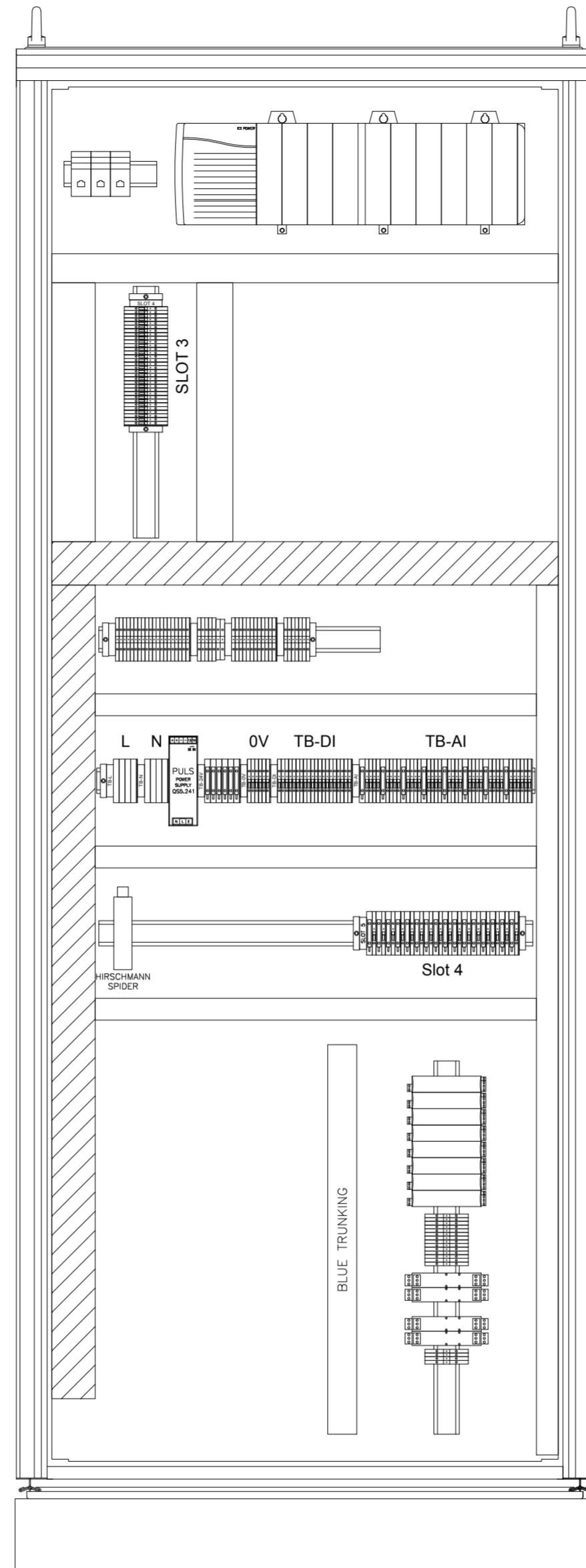
Vendors acceptance of this order is conditional on the provision of the Documentation.

Should the vendor not wish to supply the whole or part of the details herein requested, he shall state in writing any exceptions with the quotation or order acceptance.

P & I Design reserve the right to cancel any order where the documentation does not comply with P & I requirements. No item will be paid in full until documentation specified has been received.

**Section 4**  
**Drawings & Schedules**





TERMINAL BLOCKS

TB	QTY	DESCRIPTION
TB-L	4	WEIDMULLER SAKS 1/35/G20
TB-N	4	WEIDMULLER SAKS 1/35/G20
TB-E	4	WEIDMULLER EK2.5/35
24V	6	WEIDMULLER WS16
0V	6	WEIDMULLER WTR 2.5
TB-DO	12	WEIDMULLER WTR 2.5
TB-DI	20	WEIDMULLER WTR 2.5
TB-AI	8	WEIDMULLER WS16
	34	WEIDMULLER WTR 2.5
SLOT 3	32	WEIDMULLER WTR 2.5
	16	WEIDMULLER WS16
SLOT 4	16	WEIDMULLER WS16
	16	WEIDMULLER WTR 2.5

WIRING DETAILS

DESCRIPTION

ELECTRICAL 440V / 240V AC:	
SIZE:	n/a
COLOUR:	n/a
INSTRUMENT 230Vac SUPPLIES:	
SIZE:	Suitably Rated with Minimum 0.5mm <sup>2</sup>
COLOUR:	Live (Brown) / Neutral (Blue) / Earth (Green/Yellow)
INSTRUMENT 110Vdc SUPPLIES:	
SIZE:	n/a
COLOUR:	n/a
24V DC SUPPLIES:	
SIZE:	Suitably Rated with Minimum 0.5mm <sup>2</sup>
COLOUR:	Positive (Red) / 0V (Black)
DIGITAL SWITCHED AC:	
SIZE:	n/a
COLOUR:	n/a
DIGITAL SWITCHED DC:	
SIZE:	0.5mm <sup>2</sup>
COLOUR:	White
ANALOGUE:	
SIZE:	0.5mm <sup>2</sup>
COLOUR:	Grey
CRIMPS:	
TYPE:	Bootlace or Twin Grip Insulated
FERRULES:	
TYPE:	Heat Shrink Thermal Printed Sleeves

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION		
A	14/10/13	C.D.	D.A.Y	M.M.	M.M.	M.M.	M.M.	ISSUED FOR CONSTRUCTION
B	04/06/14	C.D.	D.A.Y	M.M.	M.M.	M.M.	M.M.	AS BUILT
C	02/04/15	C.D.	P.P.	M.M.		M.M.		AS BUILT - SI394 PROJECT

PLANT IMMINGHAM STORAGE Co. - EAST TERMINAL

TITLE SITE PLC (OPERATIONS OFFICE)  
LOGIC PANEL INTERNAL LAYOUT

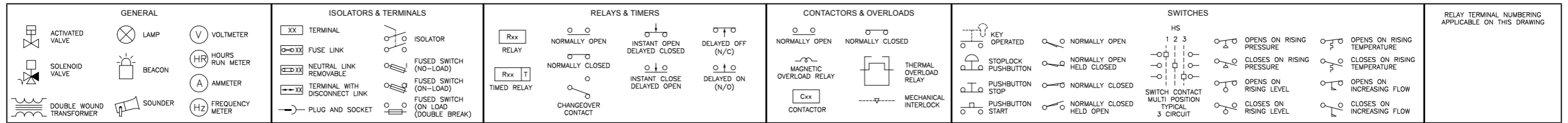
**inter terminals**  
Immingham Storage Co Ltd  
Immingham East Terminal  
Immingham Dock Immingham  
N.E. Lincolnshire  
DN40 2QW

**P & I Design Ltd**  
Tel. 01642 617444  
www.pidesign.co.uk

SHEET 1 OF 1

CLIENT DRG. No. P&I DRG No. SI353001\_DWG

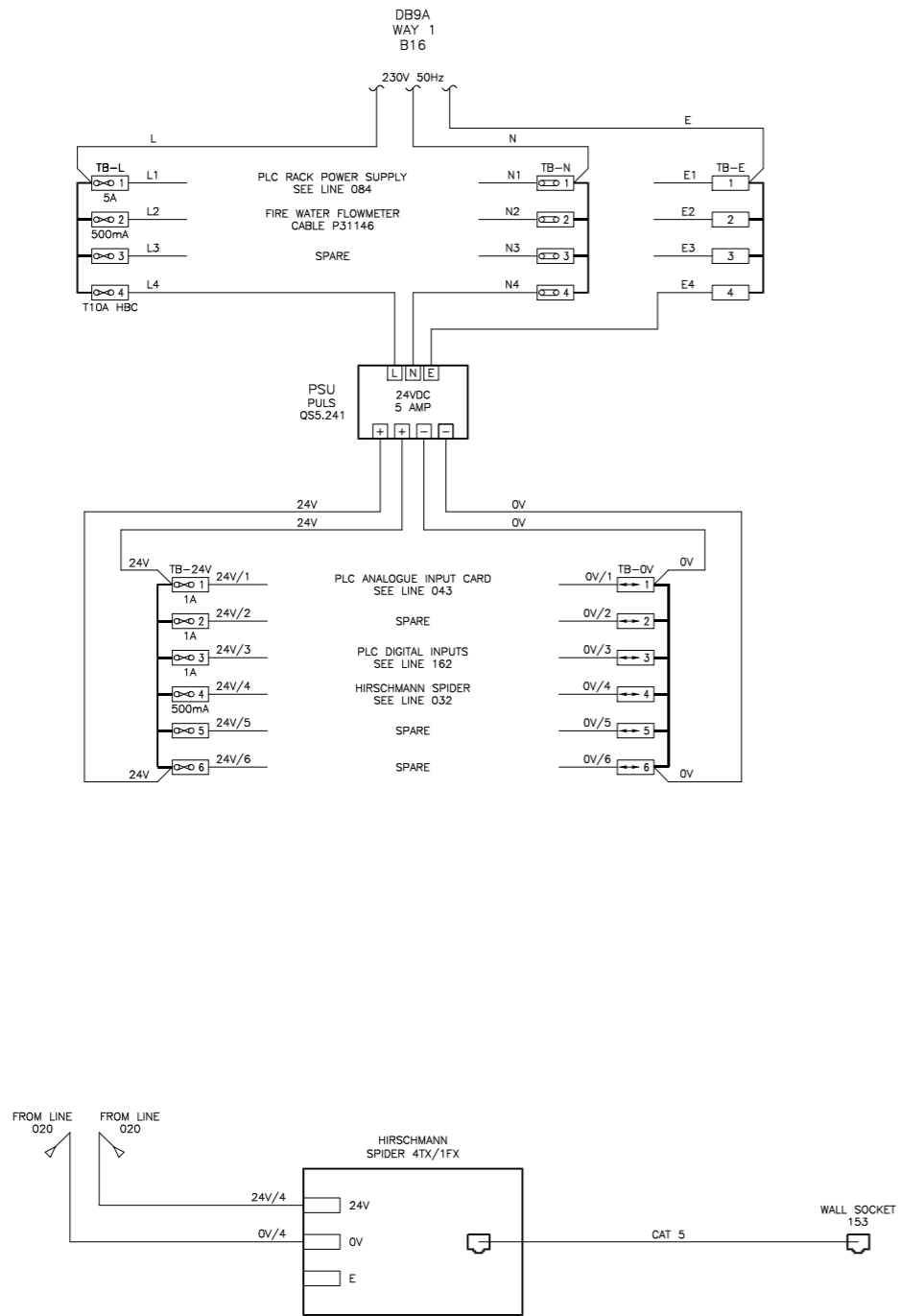
LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)



POWER DISTRIBUTION

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LAST NUMBER USED : xxx  
SPARE TO : xxx

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED							PLANT	IMMINGHAM STORAGE Co. - EAST TERMINAL
REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION	TITLE	SITE PLC (OPERATIONS OFFICE) LOGIC DRAWING 1
A	18/10/13	C.D.	P.P.	M.M.	M.M.	M.M.	ISSUED FOR CONSTRUCTION	
B	04/06/14	C.D.	D.A.Y	M.M.	M.M.	M.M.	AS BUILT	
C	24/10/14	D.B.F	P.P.	D.B.F	D.B.F	M.M.	AS BUILT - SI394	
D	02/04/15	C.D.	P.P.	M.M.	M.M.	M.M.	AS BUILT - PLC UPGRADE	
							CLIENT DRG. No.	

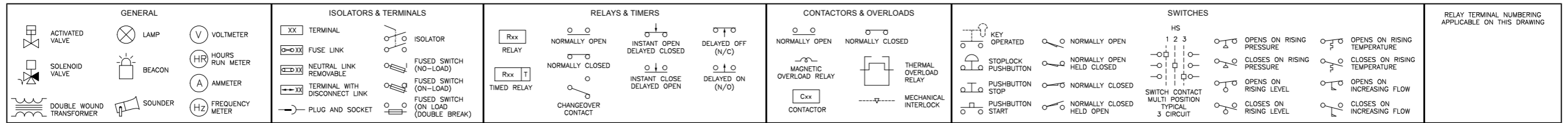
**inter terminals**  
Immingham Storage Co Ltd  
Immingham East Terminal  
Immingham Dock Immingham  
N.E. Lincolnshire  
DN40 2QW

**P & I Design Ltd**  
Tel. 01642 617444  
www.pidesign.co.uk

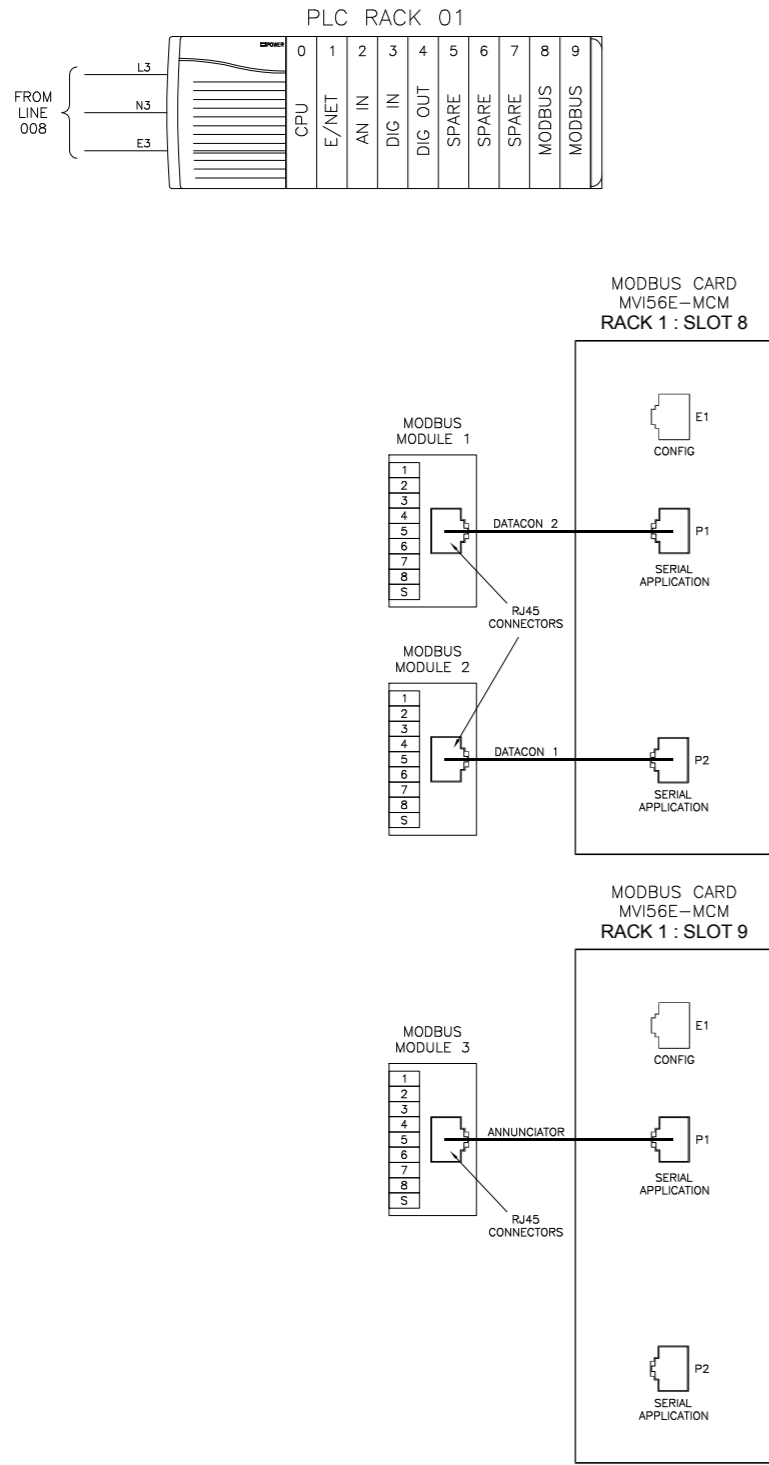
SHEET 1 OF 1  
P&I DRG No. SI353002\_DWG



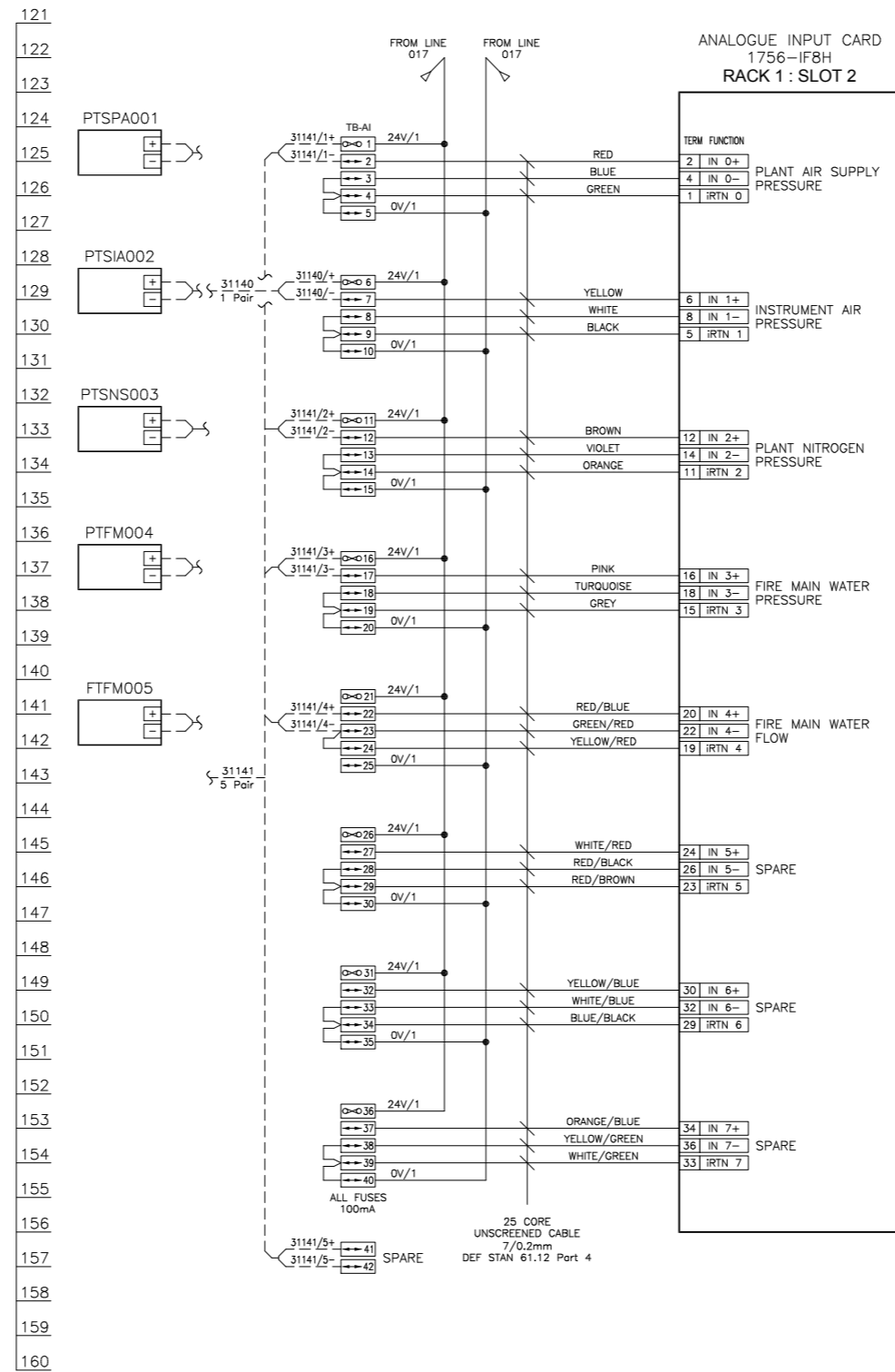
LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)



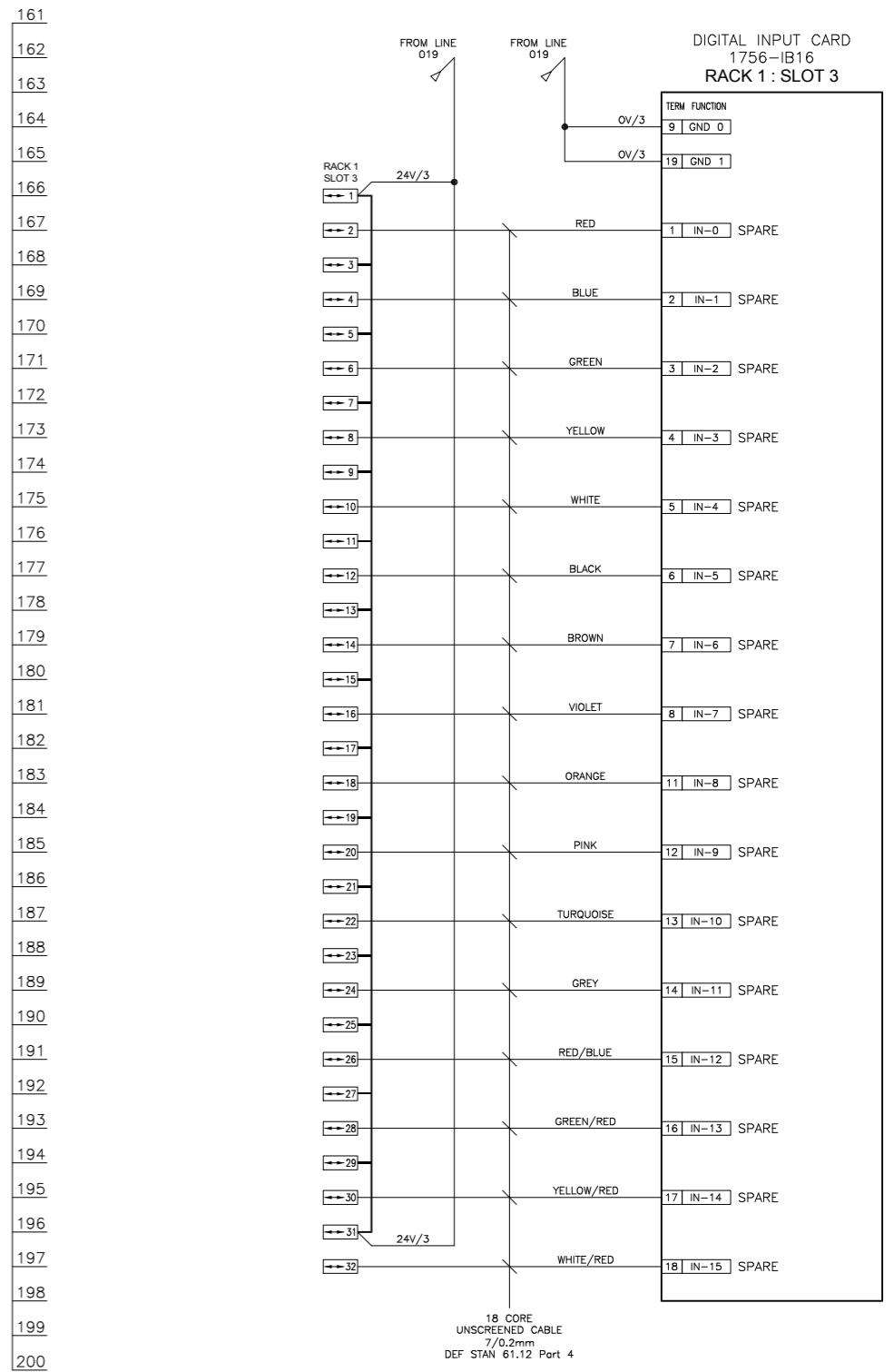
PLC RACK 1 - LAYOUT



PLC RACK 1 - SLOT 2



PLC RACK 1 - SLOT 3



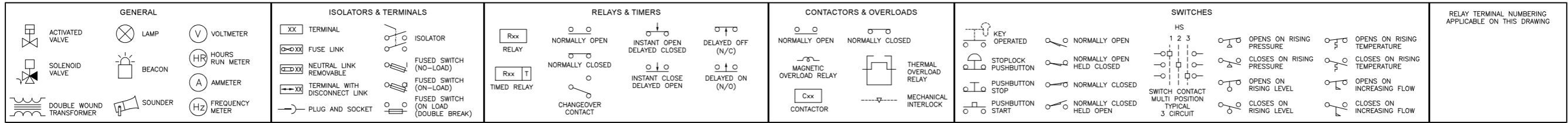
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IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED							PLANT	IMMINGHAM STORAGE Co. - EAST TERMINAL
REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION	TITLE	SITE PLC (OPERATIONS OFFICE) LOGIC DRAWING 2
A	02/04/15	C.D.	P.P.	M.M.	M.M.	AS BUILT		
							<b>inter terminals</b> Immingham Storage Co Ltd Immingham East Terminal Immingham Dock Immingham N.E. Lincolnshire DN40 2QW	
							<b>P &amp; I Design Ltd</b> Tel. 01642 617444 www.pidesign.co.uk	
							SHEET 1 OF 1	
							CLIENT DRG. No. P&I DRG No. SI353003_DWG	

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

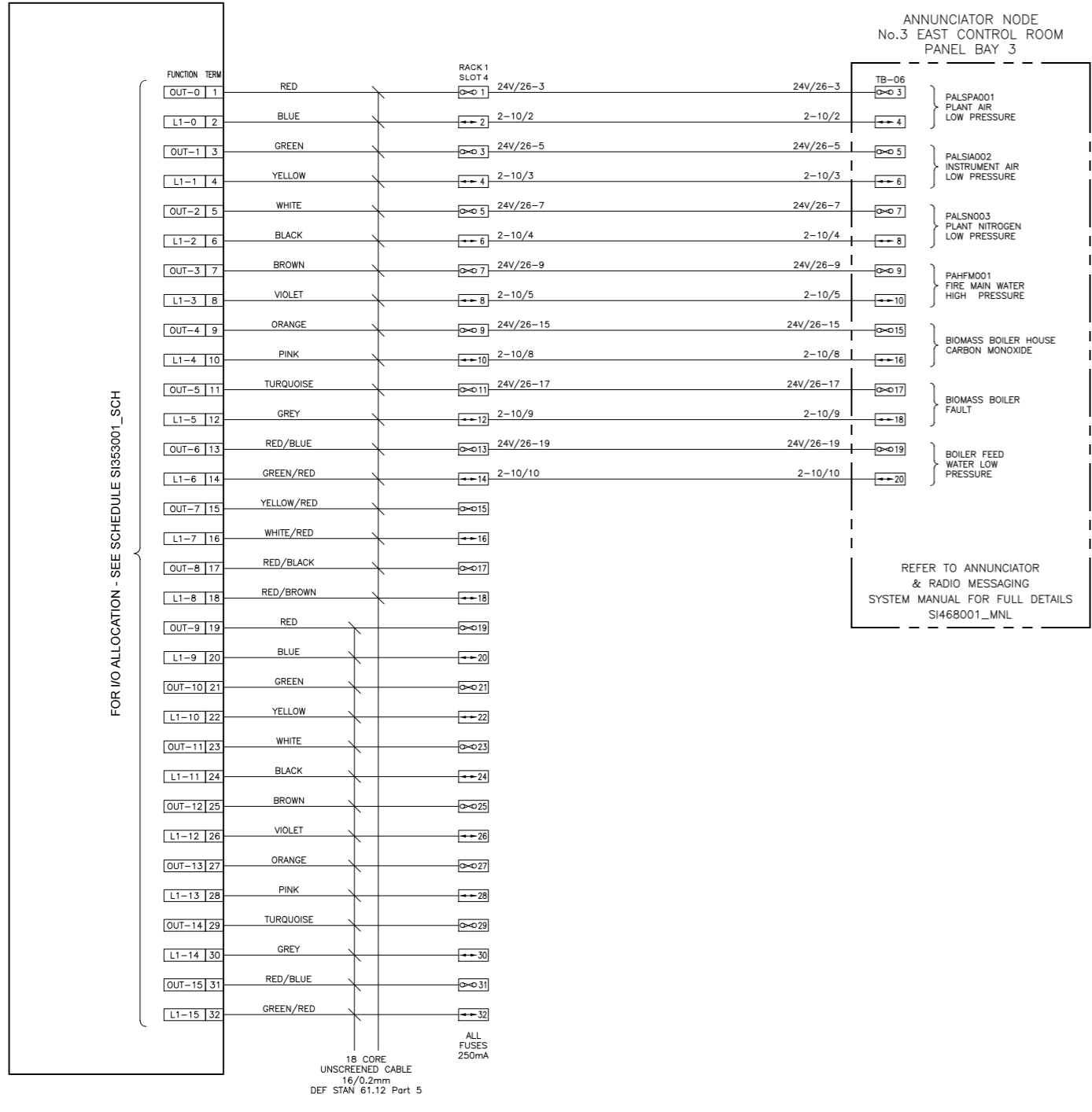


PLC RACK 1 - SLOT 4

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RELAY OUTPUT CARD  
1756-OW16I  
RACK 1 : SLOT 4



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SPARE TO : xxx

LAST NUMBER USED : xxx  
SPARE TO : xxx

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED								PLANT	IMMINGHAM STORAGE Co. - EAST TERMINAL		
REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION		TITLE	SITE PLC (OPERATIONS OFFICE) LOGIC DRAWING 3		
A	02/04/15	C.D.	P.P.	M.M.	M.M.	M.M.	M.M.	AS BUILT			
B	18/04/15	D.B.F.	P.P.	D.B.F.	M.M.	AS BUILT - SI394 PROJECT					
								Immingham Storage Co Ltd Immingham East Terminal Immingham Dock Immingham N.E. Lincolnshire DN40 2QW		Tel. 01642 617444 www.pidesign.co.uk	
								SHEET 1 OF 1		P&I DRG No. SI353004_DWG	
								CLIENT DRG. No.			



**Section 5**  
**Testing & Handover**



# P & I Design Ltd

Process Instrumentation Consultancy & Design

2 Reed Street, Gladstone Industrial Estate,  
Thornaby, TS17 7AF, United Kingdom.  
Tel. +44 (0) 1642 617444 Fax. +44 (0) 1642 616447  
Web Site: www.pidesign.co.uk

**IMMINGHAM STORAGE Co LTD**

**ISCO EAST TERMINAL**

**SITE SERVICES**

**PLC CONTROL SYSTEM**

**SITE ACCEPTANCE TEST**



Rev	Date	By	Checked	Approved	Description	Client Reference
A	09.12.13	Chris Dales	Martin Morgan	Martin Morgan	Original Issue	Site Services
						Document Number SI353002_RPT

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

## Contents

1	REVISION HISTORY .....	3
2	INTRODUCTION .....	3
3	TESTING.....	3
4	DOCUMENTATION .....	4
5	PLC/SCADA SYSTEM TESTING.....	5

## Appendix

### I. Additional Testing Sheets



## 1 REVISION HISTORY

Rev	Description
A	Original Issue

## 2 INTRODUCTION

The purpose of this testing is to demonstrate full ‘end to end’ functionality of the final installation.

The tests documented within this procedure are designed to demonstrate the system functionality as required by the functional design specification listed in the documentation section.

## 3 TESTING

All tests performed are detailed in this report, with results recorded and action points noted. The word PASS or FAIL should be written as applicable and the tester shall initial and date.

Test *.*.* – Flow	Pass Date/ Snag No.
<i>Alarm Message Correct</i>	<i>Pass **/**/**</i>
<i>Window illuminated</i>	<i>Snag 1</i>

In the case of a test failing, a comment should be made outlining the problem. If the problem can be easily fixed and re-tested, it is not necessary to record a failure.

If rectification work is required, a note should be made of the action taken and the re-test performed, normally by copying the blank relevant test sheet, completing and attaching to the rear of this document

ACTIONS/COMMENTS
<i>Window not Illuminated (Snag 1)</i>
<i>Rectified by Software modification 2.0A, refer to supplementary test sheet for re-test</i>

The approval section should be signed when all testing in the relevant section is complete. All tests do not necessarily have to be passed, failures will be dealt with under the snag list and re-test procedures.

Approvals (Note: Signature indicates acceptance of test with actions/comments noted)	Sign	Date
Tested by	<i>D.B.Faulkner</i>	<i>**/**/**</i>



**4 DOCUMENTATION**

<b>Purpose of Test</b>		
To record the documentation used for testing.		
<b>Method of Test</b>		
Confirm documentation and revisions used for testing.		
<b>Report Number</b>	<b>Title</b>	<b>Revision/Date</b>
SI353001_RPT	Functional Specification	
SI353002_RPT	Site Acceptance Testing Report	
<b>Schedules</b>	<b>Title</b>	<b>Revision/Date</b>
SI353001_SCH	I/O Schedule	
SI353002_SCH	System Trip Matrix	
<b>Software Versions</b>		
A375	Site SCADA	
A680	Site Services PLC	
<b>Actions/Comments</b>		
<b>Approvals (Note: Signature indicates acceptance of test with actions/comments noted)</b>	<b>Sign</b>	<b>Date</b>
Tested by		



## 5 PLC/SCADA SYSTEM TESTING

### 5.1 Analogue Input Simulations

Purpose of Test												
To verify the correct functionality of the PLC/SCADA System.												
Each analogue input to be simulated to verify the correct display on all associated SCADA screens, trends, alarm pages, annunciator windows and to verify the correct display of limit alarms and open circuit failures.												
Note* Alarm set points adjustable at SCADA.												
Test 5.1.1 – Plant Air Pressure												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
PT-SPA001		0 to 16			BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
	0.00	4.00	8.00	12.00	16.00	N/A	2.8*	N/A	N/A	Open Circ		
Site Services Page	✓	4.03	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03-06-14	
Trend	✓	4.03	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03-06-14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓		
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓		
Test 5.1.2 – Instrument Air Supply Pressure												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
PT-SIA002		0 to 16			BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
	0.00	4.00	8.00	12.00	16.00	N/A	2.8*	N/A	N/A	Open Circ		
Site Services Page	✓	✓	7.99	✓	✓	N/A	<del>N/A</del>	N/A	N/A	N/A	PASS 03-06-14	
Trend	✓	✓	7.99	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03-06-14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	PASS 03-06-14	
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	PASS 03-06-14	



5.1 Analogue Input Simulations

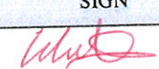
<b>Test 5.1.3 – Nitrogen Supply Low Pressure</b>												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
PT-SNS003		0 to 16			BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
		0.00	4.00	8.00	12.00	16.00	N/A	4.1*	N/A	N/A	Open Circ	
Site Services Page	✓	✓	8.03	12.05	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Trend	✓	✓	8.03	12.05	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	PASS 03.06.14	
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	✓	03.06.14	
<b>Test 5.1.4 – Fire Main Water Pressure</b>												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
PT-FM004		0 to 16			BarG		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
	0.00	4.00	8.00	12.00	16.00	N/A	N/A	12.2*	N/A	Open Circ		
Site Services Page	0.06	4.05	8.08	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Trend	0.06	4.05	8.08	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	✓	03.06.14 PASS	
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	✓	PASS 03.06.14	
<b>Test 5.1.5 – Fire Main Water Flow</b>												
Loop		Range			Units		√Square Root		Tolerance		Hysteresis	
FT-FM005		0 to 500			m3/h		No		+/- 1 %		1 %	
Desired	0%	25%	50%	75%	100%	LL	L	H	HH	AIF	Pass Date/ Snag No.	
	0.00	125	250	375	500	N/A	N/A	N/A	N/A	Open Circ		
Site Services Page	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	PASS 03.06.14	
Trend	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	03.06.14	
Current Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Ann Alarm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			



**Appendix I**  
**Additional Testing Sheets**  
**Snag List**

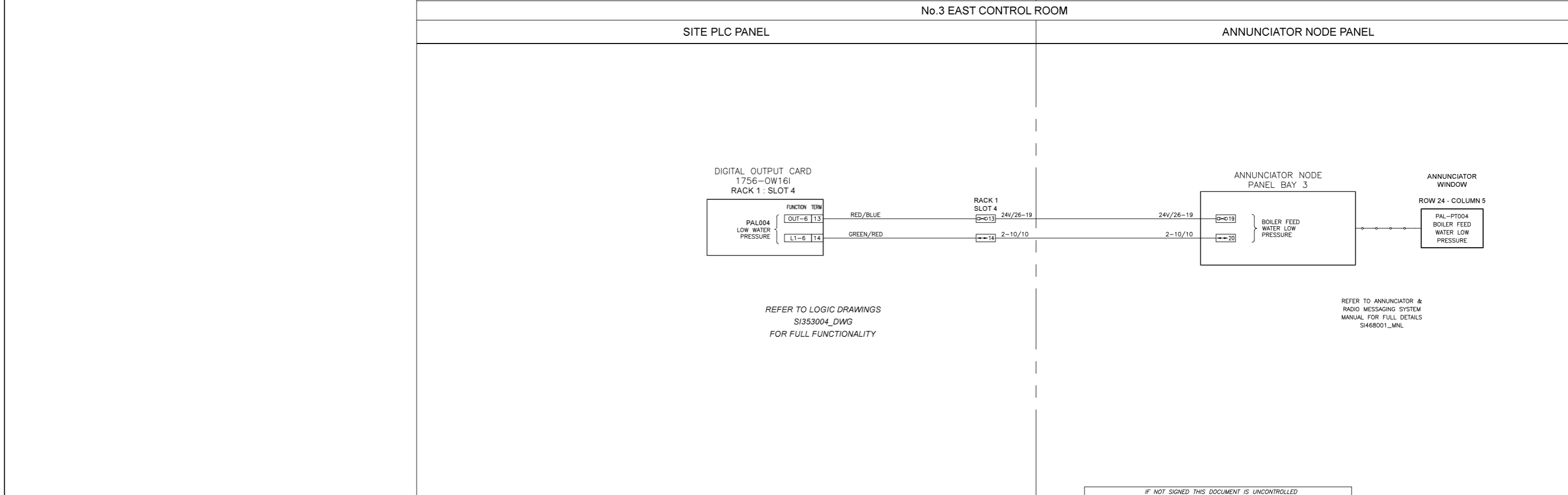
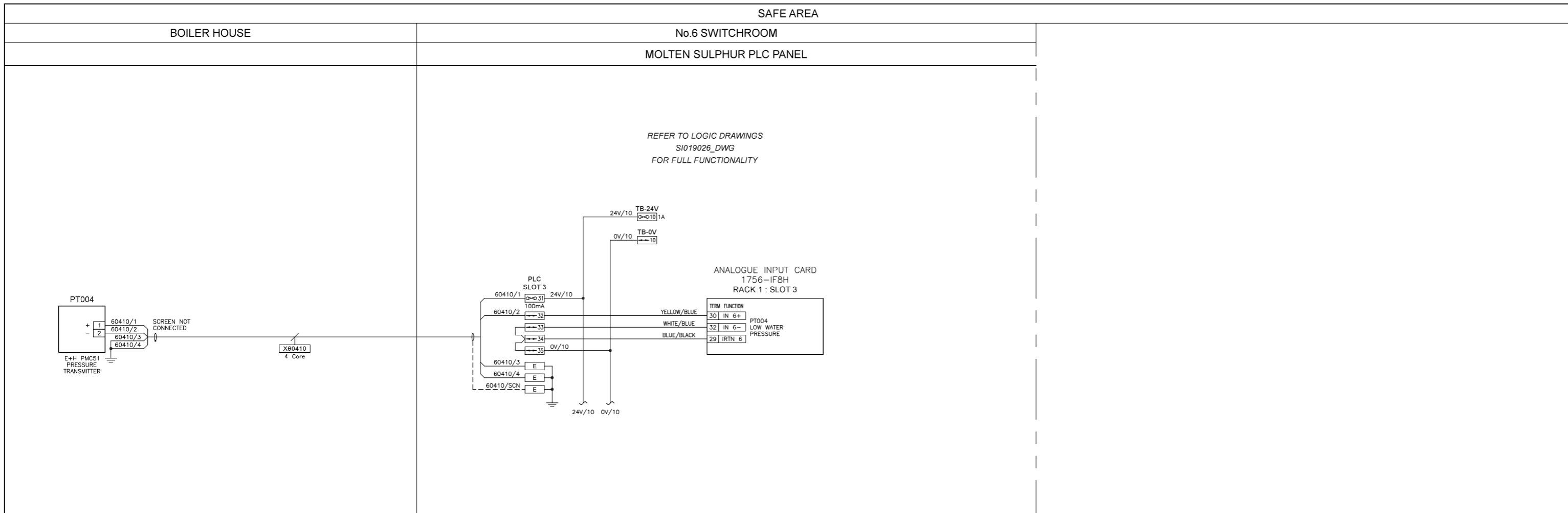




METHOD OF TEST			
	PASS	FAIL	SNAG REF.
ACTIONS/COMMENTS			
APPROVALS (NOTE: Signature indicates acceptance of test with actions/comments noted)	SIGN	DATE	
P & I Design		03.06.14	
Client or Client's Appointee			

SNAG LIST		
REF	DESCRIPTION	COMPLETED





IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	04/04/16	P.P.	P.P.	C.D.	C.D.	D.B.F D.B.F ISSUED FOR CONSTRUCTION
B	04/04/16	P.P.	P.P.	C.D.	C.D.	D.B.F D.B.F INPUT SIGNAL MOVED TO No.6 S/R
C	18/04/16	D.B.F	P.P.	D.B.F	D.B.F	D.B.F D.B.F AS BUILT
D	15/07/16	P.P.	P.P.	M.M.	M.M.	TEXT ERROR CORRECTED

PLANT	IMMINGHAM STORAGE Co. - EAST TERMINAL
TITLE	BOILER FEED WATER LOW PRESSURE LOOP SHEET
CLIENT	inter terminals Inter Terminals Immingham Ltd Immingham East Terminal Immingham Dock Immingham N.E. Lincolnshire DN40 2QW
CLIENT DRG. No.	P&I DRG No. SI394005_DWG

P & I Design Ltd  
Tel. 01642 617444  
www.pidesign.co.uk

SHEET 1 OF 1