SIEMENS

MANUFACTURERS DATA REPORT

SUPPLY AND INSTALLATION OF VSD DRIVES FOR SP10 EAGLE FARM SEWAGE PUMP STATION DRY WELL NO.1 2MW PUMPS 11, 12 & 13

Prepared for:

Central SEQ Distributor-Retailer
trading as
QUEENSLAND URBAN UTILITIES

Contract Number: C1112-032

Equipment TAG Numbers:
0110-SR11, 0110-SR12, 0110-SR13

Table of Contents

Certificate of Compliance for Electrical Equipment and Installation

J. & P. RICHARDSON INDUSTRIES PTY. LTD.

A.B.N. 23 001 952 325

114 CAMPBELL AVENUE, WACOL, BRISBANE, QLD. 4076
POSTAL ADDRESS: P.O. BOX 124, SUMNER PARK, QLD. 4074
Phone: (07) 3271 2911 - All Hours Fax: (07) 3271 3623
Email: jpr@jpr.com.au

ELECTRICAL CONTRACTORS & ENGINEERS
INDUSTRIAL - COMMERCIAL - MINING

Web: www.jpr.com.au

Lic No. 756

- ELECTRICAL INSTALLATION AND MAINTENANCE
- 24 HOUR BREAKDOWN SERVICE
- SWITCHBOARD DESIGN AND MANUFACTURE
- DATA & COMMUNICATIONS
- HIGH VOLTAGE INSTALLATIONS
- ELECTRICAL ENGINEERING, PLC & PROCESS SOFTWARE DESIGN
- OVERHEAD RETICULATION & UNDERGROUND RETICULATION
- ROADWAY LIGHTING & TRAFFIC SIGNALLING
- MUNICIPAL PUMPING INSTALLATIONS
- PUMPING EQUIPMENT MECHANICAL SERVICE & REPAIRS
- SHEETMETAL FABRICATION

BRANCHES

EAGLE FARM
PH: (07) 3868 3535

IPSWICH
PH: (07) 3281 1399

TOOWOOMBA
PH: (07) 4634 3800

GOLD COAST
PH: (07) 5591 6340

SUNSHINE COAST
PH: (07) 5476 5133

CHINCHILLA
PH: (07) 4662 7452

YATALA
PH: (07) 3386 1355

NCS INTERNATIONAL CERTIFIED ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14001

NCS INTERNATIONAL CERTIFIED SAFETY MANAGEMENT SYSTEM AS/NZS 4801

ca1308/lb

Job No: C64800

6 May 2014

Siemens

Attention: Mr. Pieter Taljaard

Dear Sir,

Eagle Farm Pump Station VSD Replacement

Please be advised that the VSD replacement at Eagle Farm has been completed as per the contract requirements.

All applicable work was carried out to AS3000:2007 and has been tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the electrical safety regulation 2002.

Thank you for your order, we trust that yourself and your team has been impressed by our commitment to Siemens and we look forward to assisting you in the future.

Should you require any further information or clarification please do not hesitate in contacting the undersigned.

Yours faithfully,

Chris Andersen
Electrical Installation Assistant Manager
J & P Richardson Industries Pty Ltd

1) 0110-SR11 Variable Speed Drive System

A. MV Cable Test Sheets

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project: SEIMANS **Job No:** I64800

Date of Test: 14-02-2014

Cable Circuit: From: FEEDER PANEL A24 SR11 To: INPUT TERMINALS 0110-SR11

Type: SINGLE CORE XLPE 6.6 kV 150 sq mm AL

Reason for Test: RETERMINATE. **Cable Temperature:** HOT

Loop Resistance in Ohms (is Loop Resistance Applicable?) Yes/(No)

Measured with No: _____

Type: Leads: ohms

Phasing: AS IT WAS.

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Insulation Resistance in Megohms

Measured with No: M00148.

Type: KYORITSU

	Volts	1 Min	2 Min
A-Earth	5000	200,000	200,000
B-Earth	5000	200,000	200,000
C-Earth	5000	200,000	200,000
A - B	5000	200,000	200,000
B - C	5000	200,000	200,000
C - A	5000	200,000	200,000

High Voltage Test Sheet N/A. 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: Fine Amb. Temp. °C: -

Result of Test: Passed Label Attached at: -

Comments:

Testing Officer: S. CUNNINGHAM **Date:** 14-02-14. **Engineer if Required:** **Date:** / /

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project: SEIMANS		**Job No:** I64800.
Date of Test: 14-02-2014.		
Cable Circuit: From: OUTPUT TERMINALS 0110-SR11	To: ISOLATOR 0110-I & ES11.	
Type: SINGLE CORE XLPE	6.6 kV	120 sq mm CU.
Reason for Test: NEW INSTALLATION.	**Cable Temperature:** COLD.	

Loop Resistance in Ohms (is Loop Resistance Applicable?) Yes (No)
Measured with No: _____
Type: Leads: ohms

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Phasing:
A B C
R W B.

Insulation Resistance in Megohms

Measured with No: M00148.

Type: IKFORITSU.

	Volts	1 Min	2 Min
A-Earth	5000	100,000	100,000
B-Earth	5000	100,000	100,000
C-Earth	5000	100,000	100,000
A - B	5000	200,000	200,000
B - C	5000	200,000	200,000
C - A	5000	200,000	200,000

High Voltage Test Sheet N/A. 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: Fine
Result of Test: Passed
Amb. Temp. °C: -
Label Attached at: -

Comments:

Testing Officer: S. CUNNINGHAM **Date:** 14-02-14
Engineer if Required: **Date:** / /

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project: SEIMANS **Job No:** I64800

Date of Test: 14-02-2014.

Cable Circuit: From: ISOLATOR 0110-1 ESK To: MOTOR SR11-

Type: SINGLE CORE XLPE 6.6 kV 150 sq mm AC

Reason for Test: RETERMINATION. **Cable Temperature:** HOT

Loop Resistance in Ohms (is Loop Resistance Applicable?) Yes/(No)

Measured with No: _____

Type: Leads: ohms

Phasing: AS IT WAS.

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Insulation Resistance in Megohms

Measured with No: MOO 148.

Type: KYORITSU.

	Volts	1 Min	2 Min
A-Earth	5000	1100	1100
B-Earth	5000	1100	1100
C-Earth	5000	1100	1100
A - B	5000	–	–
B - C	5	–	–
C - A		–	–

High Voltage Test Sheet N/A. 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: Fine Amb. Temp. °C: -

Result of Test: Passed Label Attached at: -

Comments:

CABLE TEST INCLUDES MOTOR WINDINGS.

Testing Officer: S. GUNNINGHAM **Date:** 14-02-14. **Engineer if Required:** **Date:** / /

1) 0110-SR11 Variable Speed Drive System

B. LV cable Test Sheets

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	P212		**SIZE**	10	mm²
FROM	SR11	4cte	**TYPE**	PVC	XLPE/PVC
TO	DIST BOARD		**LENGTH**	35m	

CORE No.	**INSULATION**					**FAULT LOOP**		**EARTH CONTINUITY**
	TO EARTH	**TO RED**	**TO WHITE**	**TO BLUE**	**TO NEUTRAL**	**IMPEDANCE**	**PSC**	Ω
RED	200 MΩ+	**N/A** MΩ	200 MΩ+	200 MΩ+	200 MΩ+	— Ω	— AMPS	1.1
WHITE	200 MΩ+	200 MΩ+	**N/A** MΩ	200 MΩ+	200 MΩ+	— Ω	— AMPS	
BLUE	200 MΩ+	200 MΩ+	200 MΩ+	**N/A** MΩ	200 MΩ+	— Ω	— AMPS	
NEUTRAL	200 MΩ+	200 MΩ+	200 MΩ+	200 MΩ+	**N/A** MΩ	**N/A** Ω	**N/A** AMPS	

Verification

Lugs/Pin Ends		**Glands**		**Heat Shrink**		**Shrouds**		**Cable lable**	
Start End	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**
✓	✓	✓	✓	✓	✓	NA	NA	✓	✓

PRINT NAME Glenn Cerretto

SIGNATURE JPR

DATE 14/2/14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	P232		**SIZE**	2.5	mm²
FROM	SR11	2c+E	**TYPE**	PVC	XLPE/PVC
TO	MOTOR HEATER		**LENGTH**	55m	

CORE No.	**INSULATION**					**FAULT LOOP**		**EARTH CONTINUITY**
	TO EARTH	**TO RED**	**TO WHITE**	**TO BLUE**	**TO NEUTRAL**	**IMPEDANCE**	**PSC**	Ω
RED	MΩ	**N/A** MΩ	MΩ	MΩ	MΩ	Ω	**AMPS**	
WHITE	MΩ	MΩ	**N/A** MΩ	MΩ	MΩ	Ω	**AMPS**	
BLUE	MΩ	MΩ	MΩ	**N/A** MΩ	MΩ	Ω	**AMPS**	
NEUTRAL	MΩ	MΩ	MΩ	MΩ	**N/A** MΩ	**N/A** Ω	**N/A** **AMPS**	

Verification

Lugs/Pin Ends		**Glands**		**Heat Shrink**		**Shrouds**		**Cable lable**	
Start End	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA.

PRINT NAME Glenn Cervetto

SIGNATURE JPR

DATE 14.12.14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	P231		**SIZE**	2.5	mm²
FROM	SR11	2C+E	**TYPE**	AC	XLPE/PVC
TO	DIST BOARD		**LENGTH**	35m	

CORE No.	**INSULATION**					**FAULT LOOP**		**EARTH CONTINUITY**
	TO EARTH	**TO RED**	**TO WHITE**	**TO BLUE**	**TO NEUTRAL**	**IMPEDANCE**	**PSC**	Ω
RED	100 MΩ+	**N/A** MΩ	— MΩ	— MΩ	100 MΩ+	— Ω	— **AMPS**	1.2
WHITE	— MΩ	— MΩ	**N/A** MΩ	— MΩ	— MΩ	— Ω	— **AMPS**	
BLUE	— MΩ	— MΩ	— MΩ	**N/A** MΩ	— MΩ	— Ω	— **AMPS**	
NEUTRAL	100 MΩ+	100 MΩ+	— MΩ	— MΩ	**N/A** MΩ	**N/A** Ω	**N/A** **AMPS**	

Verification

Lugs/Pin Ends		**Glands**		**Heat Shrink**		**Shrouds**		**Cable lable**	
Start End	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**
✓	✓	✓	✓	✓	NA	NA	NA	✓	✓

PRINT NAME Glenn Cervetto

SIGNATURE

DATE 14/02/14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	VFD FAN		**SIZE**	2.5	mm²
FROM	SR11	3 c + E	**TYPE**	PVC XLPE/PVC	SCREENED
TO	VFD FAN		**LENGTH**		

CORE No.	**INSULATION**					**FAULT LOOP**		**EARTH CONTINUITY**
	TO EARTH	**TO RED**	**TO WHITE**	**TO BLUE**	**TO NEUTRAL**	**IMPEDANCE**	**PSC**	Ω
RED	200 MΩ +	N/A MΩ	200 MΩ +	200 MΩ +	NA MΩ	— Ω	— AMPS	0.8
WHITE	200 MΩ +	200 MΩ +	N/A MΩ	200 MΩ +	NA MΩ	— Ω	— AMPS	
BLUE	200 MΩ +	200 MΩ +	200 MΩ +	N/A MΩ	NA MΩ	— Ω	— AMPS	
NEUTRAL	NA MΩ	NA MΩ	NA MΩ	NA MΩ	N/A MΩ	N/A Ω	N/A AMPS	

Verification

Lugs/Pin Ends		**Glands**		**Heat Shrink**		**Shrouds**		**Cable lable**	
Start End	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**
✓		✓		✓		NA	NA	NA	NA

PRINT NAME Glenn Cervetto

SIGNATURE JPR

DATE 14 / 2 / 14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	P11-7J		SIZE	1.5mm²
FROM	SR11	6 PR	TYPE	IND SCN
TO	ENCODER		LENGTH	55m.

CORE No.		WIRE NUMBER		FROM TERMINAL TB2 ELV		TO TERMINAL	
			Correct		Correct		Correct
1	WHITE	PP11+15V	✓	30	✓	NA	
1	BLACK	PP11-Com	✓	31	✓	NA	
2	WHITE	PP11-B/	✓	28	✓	NA	
2	BLACK	PP11-B	✓	29	✓	NA	
3	WHITE	PP11-A/	✓	26	✓	NA	
3	BLACK	PP11-A	✓	27	✓	NA.	
4	WHITE						
4	BLACK						
5	WHITE						
5	BLACK						
6	WHITE						
6	BLACK						
7	WHITE						
7	BLACK						
8	WHITE						
8	BLACK						
9	WHITE						
9	BLACK						
10	WHITE						
10	BLACK						
11	WHITE						
11	BLACK						
12	WHITE						
12	BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cervetto

SIGNATURE

DATE 14/2/14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C170		SIZE	1.5mm²
FROM	SR11.	2c	TYPE	PVC/PVC
TO	PUMP FLOOR ESTOP		LENGTH	55m

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	101K-2	✓	TB6-7	✓	NA	
2	102K-1	✓	TB6-6	✓	NA.	
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cornetto

SIGNATURE GPC

DATE 14/2/14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C309		SIZE	1.5mm²
FROM	SR11	DC	TYPE	PVC/PVC
TO	HV SWITCHROOM SB		LENGTH	

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	138K	✓	TB6-2	✓	NA	
2	139K	✓	TB6-3	✓	NA	
3	101K	✓	TB6-9	✓		
4	102K	✓	TB6-4	✓		
5	102K-1	✓	TB6-5	✓		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Corretb

SIGNATURE GC

DATE 14/2/14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C310		SIZE	1.5mm²
FROM	SR11	6C	TYPE	MULTICORE
TO	MK11		LENGTH	55m

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	BK11-2	✓	TB2-4	✓	BK11-196	✓
2	BK11-7	✓	TB2-3	✓	BK11-192	✓
3						
4						
5	BK11-3	✓	TB6-1	✓	BK11-194	✓
6	BK11-5	✓	TB6-2	✓	BK11-199	✓
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cervetto

SIGNATURE GPC

DATE 14/2/14.

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	P444		SIZE	1.5mm²
FROM	SR11	1PR	TYPE	SCREENED
TO	24V DC DIST BD		LENGTH	NA.

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	SR11+VE	✓	317	✓	NA	
1 BLACK	SR11-VE	✓	321	✓	NA.	
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cervetto

SIGNATURE JPR

DATE 14/2/14.

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LAN 11-2		SIZE	1.5mm²
FROM	SR11.	1 PR	TYPE	SCREENED
TO			LENGTH	NA.

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	NA	NA	BLOCK2	✓	NA	
1 BLACK	NA	NA	BLOCK2	✓	NA	
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cervetto

SIGNATURE

DATE 14/2/14

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LAN 11-3		SIZE	1.5mm²
FROM	SR11	1 PR	TYPE	SCREENED
TO			LENGTH	NA.

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	NA		BLOCK3	✓	NA	
1 BLACK	NA		BLOCK3	✓	NA	
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cerretto

SIGNATURE JPR

DATE 14/2/14.

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LT003-25		SIZE	1.5mm²
FROM	SR11	1PR	TYPE	SCREENED
TO			LENGTH	NA.

CORE No.		WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
			Correct		Correct		Correct
1	WHITE	11-3-1	✓	357	✓	NA	
1	BLACK	WW+1	✓	358	✓	NA.	
2	WHITE						
2	BLACK						
3	WHITE						
3	BLACK						
4	WHITE						
4	BLACK						
5	WHITE						
5	BLACK						
6	WHITE						
6	BLACK						
7	WHITE						
7	BLACK						
8	WHITE						
8	BLACK						
9	WHITE						
9	BLACK						
10	WHITE						
10	BLACK						
11	WHITE						
11	BLACK						
12	WHITE						
12	BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cervetto

SIGNATURE JPR

DATE 14/2/14.

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LT003-35		SIZE	1.5mm²
FROM	SR11	1 PR	TYPE	SCREENED
TO			LENGTH	NA.

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	WW —	✓	359	✓	NA	
1 BLACK	12-3-1	✓	360	✓	NA.	
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME Glenn Cervetto

SIGNATURE

DATE 14/2/14

1) 0110-SR11 Variable Speed Drive System

C. Electrical Installation Report.

Jantec Compliance
PO Box 1067 | Tewantin 4565 | PH:0438 394 269
EMAIL: auditor@jantec.com.au | WEB: www.jantec.com.au

REPORT No.: JPR-QUU-022-SD

ELECTRICAL INSTALLATION REPORT

Issued in accordance with the *Electrical Safety Regulation 2002 (*Qld)
Section 221 for electrical work in a Hazardous Area
or on a High Voltage installation.

Occupier:	**Location of Installation:**
Qld Urban Utilities	Violet Street/Kingsford Smith Drive, Eagle Farm 4009

Electrical Installation Audited (Audit Scope):

Replacement of existing VVVF 0110-SR11

- Isolator & earthing panel 0110-0 ES11
- Motor Feeder from Panel A24 SR11 to VVVF 0110-SR11
- Feeder from VVVF to Isolator
- Feeder from Isolator to motor

Electrical Contractor Responsible for the installation:	**Electrical Contractors Lic:**
J&P Richardson Industries	756

Audit Limitations

Inherent Limitations:

Because of the inherent limitations of any internal control structure, it is possible non-compliance with standards may occur and not be detected. An audit is not designed to detect all weaknesses in compliance as an audit is not performed continuously throughout the period of installation.

Scope Limitations:

Test results of VVVF have not been verified

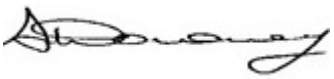
Audit Result:

☐ The auditor issuing this notification reasonably believes that the installation work described in the Audit Scope above is **not in compliance** with the relevant standards.

☒ I advise that the audit of the electrical installation work described in the Audit Scope above, was successfully executed and compliance with the relevant parts of AS2067 and AS/NZS3000 is demonstrated (subject to the audit limitations) at the time of the audit.

From the evidence provided, conclusion can be drawn that the onsite test results recorded by the installer, satisfy the minimum test requirements of AS2067 , AS/NZS3000 and other relevant standards.

It is reasonable to believe that the electrical installation described in the Audit Scope above is electrically safe to connect.

Audit Date:	**Auditor:**	**Auditors Signature:**	**Auditors No:**	**Phone No:**
14/02/14	S.Downey		02/0114	0438 394 269

Comments/Observations:

1. Phasing out across any tie switches and phase rotation (where applicable) must be verified before operation.
2. The High Voltage system must be operated under a safe system of work by persons competent in high voltage switching and authorised to do so.
3. To ensure continued safe and satisfactory operation of an electrical system with a minimum risk of breakdown and the consequent interruption of supply, it is recommended the system be subject to periodic examination and inspection as per AS2467 and the manufacturer's instructions.

1) 0110-SR11 Variable Speed Drive System

D. Commissioning Report and Parameter List

SIEMENS

STARTUP & COMMISSIONING MANUAL

FOR SIEMENS
PERFECT HARMONY, AIR-COOLED,
MEDIUM VOLTAGE,
VARIABLE FREQUENCY DRIVES

A5E32168985
VSD 0110-SR11
Queensland Urban Utilities – Eagle Farm

Important Note:

These Startup & Commissioning instructions are solely intended as working instructions or information for Field Service specialist personnel of the SII DT LD, Customer Services Division.

Even where product specific information is included, these instructions are not to be regarded as operating Instructions for a particular product.

Revision	Description of Change	Initials	Date

Table of Contents

List of Tables

Tables **Page**

Reference Material (for Siemens Personnel)

For Gen IV Drives:

SIEMENS Gen IV Product User Manual A5E01454341C

SIEMENS Gen IV Commissioning and Maintenance Manual A5E01454341D

For Gen III/e Drives:

SIEMENS Perfect Harmony Gen III/e User's Manual A1A19000405A

SIEMENS Perfect Harmony Gen III/Gen III/e Startup and Advanced Topics Manual A1A19000404A

SIEMENS Perfect Harmony Gen III/e Installation Manual A1A19000403A

SIEMENS NXG Manual A1A19001588

Tech Notes (Applications)

Abbreviations

The following abbreviations are used throughout this procedure.

Table 1: Abbreviations

Abbreviation	Description
A	Ampere(s); Amp(s)
AC	Alternating Current
ACH	Anti-Condensation Heater
ACU	Air Conditioning Unit
CB	Circuit Breaker
CDS	Circuit Disconnect Switch
CPS	Control Power Supply
CT	Current Transformer
DC	Direct Current
DCR	Digital Card Rack
DWG	Drawing
ES	Emergency Shutdown
ESD	Electrostatic Discharge
F	Fuse
FSR	Field Service Representative
ICP	Installation and Commissioning Procedure
GA	General Arrangement
HESPS	Hall Effect Sensor Power Supply
HMI	Human-Machine Interface
LV	Low Voltage
MV	Medium Voltage
N/A	Not Applicable
OEM	Original Equipment Manufacturer
P/N	Part Number
PDC	Power Distribution Center
PPE	Personal Protective Equipment
PSD	Process Shutdown
S/N	Serial Number
SOP	System Operating Program
TB	Terminal Block
UPS	Uninterruptible Power Supply
V	Volt(s)
VAC	Volt(s) / -Alternating Current
VDC	Volt(s) / -Direct Current
VFD	Variable Frequency Drive
WPS	Wago Power Supply

1.0 INTRODUCTION

This document is for all Air-Cooled Perfect Harmony Drives with NXG Controls.

1.1 Purpose of Manual

The purpose of this document is to effectively guide competent and trained Siemens personnel through Startup and Commissioning for the Air-Cooled Perfect Harmony Variable Frequency Drive (VFD). The individual checks must be performed within each of the separate sections of this procedure. Following any introductory text and precautions, each section contains a series of checkboxes that indicate the completion of the individual steps.

In addition to the checkboxes, tables may be included in some sections. Such tables are used to record information like the following: a) parameter settings; b) test point data values; c) any errors or deviations. Major sub-sections also contain initials/date fields that must be completed by the individual performing and completing that section of the Startup and Commissioning procedure.

1.2 Startup Task Agenda

1.2.1 Punch List for Open Items During Startup & Commissioning

- List any issues as open items. (Attachment #1, CCF-004)
- Assign responsibility, due date, and date of completion.
- Review with Customer and return copy to Project Manager (PM) at end of Commissioning.

1.2.2 Drive Cabinet Inspections

- Installation Inspections - Perform a visual inspection to detect signs of deterioration and discoloration. Inspection detects issues in the equipment where components may need replacement and/or corrective action.
- Equipment Cleanliness Check – Check each of the enclosures of the equipment for cleanliness of power and control circuitry. This should include removal of installation dirt and debris.
- Connection Checks - Perform a variety of connection and torque mark checks on the Drive system including inspection for loose wires, loose hardware, stripped or cut wires, poor/melted insulation, and proper torquing on the component mountings.

1.2.3 Power-up Checks

- Power-up the equipment and perform a functional and operational evaluation running at various operation levels.
- Inspection verifies the equipment is in operating condition.

1.2.4 Customer / Performance Review

- Meet with the customer to review the current site conditions.
- Record any issues with the installation of the Siemens equipment.
- Record training classes taken by on-site personnel and recommend any to be taken.

1.2.5 Spare Parts Checkout

- Perform a visual inspection of Spare Power Cells, Spare Control PCBs, and other components.
- Spare Control PCBs or Power Cells should be installed in the Drive to verify setup and operation.
- Record recommended spare parts.
- Recommend a backup flash disk of the operating system.

1.3 Symbols and Conventions

1.3.1 Symbol Definitions

The following words and symbols found throughout this manual mark special messages to alert the operator of specific information concerning of the PERSONNEL, the EQUIPMENT or the PROCESS.

 WARNING	**Text set off in this manner provides warning notice that failure to follow these directions in this WARNING can result in bodily harm or loss of life and/or extensive damage to equipment.**
 CAUTION	**Text set off in this manner provides warning notice that failure to follow these directions in this CAUTION can result in damage to equipment.**
 NOTE	**Text set off in this manner present clarifying information or specific instructions pertinent to the immediate instruction.**

1.3.2 Warnings and Caution Notes

 WARNING	**Personnel performing this procedure MUST read the entire document before beginning the procedure.**
 NOTE	**Personnel executing this procedure shall acquire the necessary permits prior to commencing any work activity.**
 WARNING	**Before performing this procedure, the Customer Personnel and Siemens Field Service Representative MUST conduct a job safety briefing for all participants. The briefing shall cover hazards, special precautions, energy source controls and personal protective equipment requirements.**
 WARNING	**Always work with one hand, wear safety shoes rated electrical hazard/composite and safety glasses. Always work with another person present who is acting as a safety monitor.**
 WARNING	**Only qualified Siemens Field Service Representatives should install, operate, troubleshoot, and maintain this Drive. A qualified individual is "one familiar with the commissioning and operation of the equipment and the hazards involved.**

 WARNING	**Always use extreme caution when handling or measuring components that are inside the enclosure. Be careful to prevent meter leads from shorting together or from touching other terminals.**
 WARNING	**Use only instrumentation (e.g., meters, oscilloscopes, etc.) intended for high voltage measurements (that is, isolation is provided inside the instrument, not provided by isolating the chassis ground of the instrument).**
 WARNING	**Never touch anything within the Perfect Harmony cabinets until verifying that it is neither thermally hot nor electrically alive.**
 WARNING	**Never remove safety shields (marked with a HIGH VOLTAGE sign) or attempt to measure points beneath the shields.**
 WARNING	**Never connect any grounded instrumentation (i.e., non-isolated meters or oscilloscopes) to the Perfect Harmony system.**
 WARNING	**Never connect or disconnect wiring or printed circuit boards while the Drive is energized.**
 WARNING	**Hazardous voltages may still exist within the Perfect Harmony cabinets even when the disconnect switch is open (off) and the supply power is shut off.**
 CAUTION	**Be sure to make appropriate connections/disconnection to equipment in order to perform this test correctly and safely. Failure to do so may result in DAMAGE to equipment.**
 WARNING	**Only personnel performing the test shall be in the area while the test is being performed. Test area shall be barricaded and unauthorized personnel shall not be allowed inside.**

2.0 SITE AND SAFETY INSTRUCTIONS

2.1 Test Equipment and Tool Check

2.1.1 All test instruments, supporting tools, and accessories shall be rated for intended use. Initial ___

2.1.2 Perform a visual inspection of all test instruments, equipment and all associated test leads, cables, power cords, probes, and connectors for external defects and damage. Initial ___

2.1.3 Ensure that all test instruments, equipment, and their accessories are calibrated and valid throughout the ENTIRE test period. Initial ___

2.1.4 Verify customer can supply the following accessories for possible use during Startup and Commissioning activities:

☒Barrier	☐Guards	☒Caution Tape	☐Cell Lifter
☐Rags	☐Step Stool	☐Alcohol based Cleaning Fluid	☐Grease Gun
☐Air Filters	☐Ladder	☐Shop Vacuum	☐Soft Brush
☐Compressed Air	☐Hoses	☐Water & Hose	

Initial ___

Table 2: Test Equipment and Tool List

Equipment/Tool	Manufacturer & Model Number	Serial Number	Calibration/ Inspection Date
PPE Arc Flash Jacket	Stanco Temp Test Salisbury		
Meter	Fluke 1587, Megger		
	Fluke 43B, PQM		
	Fluke 787, Process Mtr		
	Fluke 87 V, DVM		
	Simpson 260-8P		
	AEMC JM810A, 2000A		
	Fluke i400s		
Torque Wrenches	Craftsman 250 ft-lbs		
	Craftsman 250 in-lbs		
	Craftsman 50 in-lbs		
ESD Pad & Wrist Strap			

2.2 Site and Safety Activities

2.2.1 Meet with Site Supervisor

- Review of safety requirements.
- Site Specific Safety Training, as required.
- Plan for the day's progress.
- Discuss any open issues.
- Complete Daily Safety Log Form.

2.2.2 Review the Equipment Location and Drive Information

- Be certain your work area is clear of debris.
- Confirm that barriers, guards or Caution Tape are in place to prevent. unauthorized personnel form entering into the work area.
- Collect the site and Drive information.

2.2.3 Follow Lockout/Tagout Procedures

- Coordinate with customer on local Lockout/Tagout Procedures.
- If the customer has no requirements, follow Siemens' LD A Lockout/Tagout Procedures.
- Insure Personal Protection Equipment (PPE) and Safety Tools are available.

5 Safety Rules of LOTO

1. Switch off power sources
2. Lock the circuit against re-closure
3. Establish that system is de-energized
4. Earth and short circuit phases
5. Cover or enclose "live" parts

2.2.4 At the end of each day

- Clean your area.
- Pack your tools and equipment.
- Meet with the site supervisor.
- Review what was done that day.
- Equipment status at end of day.
- Determine what time you will be returning in the morning.
- Ask if there are any questions or other issues that need to be addressed.
- Complete entries in service report.

2.2.5 At the end of the Startup and Commissioning service

- Review daily service reports.
- Obtain Customer signature on service report.
- Ensure any warranty or repair parts have RMAs and are shipped for return.
- Ensure any FSKits used during Startup are packaged for return. Obtain an RMA number and handle shipping back to Siemens.
- Review checklist:
  - Spare parts review
  - Customer review
  - Record follow-up items
  - Contact in-house support personnel
- Complete the Startup and Commissioning Acceptance and Sign Off Sheet.

3.0 SITE AND DRIVE INFORMATION Date: 17/02/2014

3.1 Customer Information

Customer Name:	Queensland Urban Utilities		
Street Address:	Eagle Farm	City, State Zip code:	Eagle Farm
Primary Contact:	Wayne Henricksen	Primary Phone No:	0401 688 731
Primary Fax No:		Primary Email Addr:	
Secondary Contact:	Eddie Granic	Secondary Phone No:	0414 576 390
Secondary Fax No:		Secondary Email Addr:	
Date Completed Pre-Startup Checklist:	17/02/2014	Client's Drive ID:	0110-SR11

3.2 Dispatch Information

Notification No:	52-204606	Original SO No:	3002133943
Field Service Rep:	Mohamed Ayad	Drive Type:	Gen3
Technical Support:	SCCC: Ph. 1300 369 515	Drive P/N:	M6SR3
Project Engineer:	Pieter Taljaard (Siemens Aust.)	Drive S/N:	Z831501002460
Location of Drive:	Eagle Farm	Drive Date Code:	13-23

3.3 Location Environment

Elevation:	Ft, Above Mean Sea Level	Air Conditioning:	☐ Yes ☒ No
Enclosure:	☐ PDC ☒ Building	Air Conditioning:	BTU, or Ton
Room Temperature:	°C, Indoors	Heating:	☐ Yes ☒ No
Ambient Temperature:	30+ °C, Outdoors	Humidity:	☐ High ☒ Low
Outside Air Blown In:	☐ Yes ☒ No	Dusty Environment:	☐ Yes ☒ No
Drive Blowers Ducted Outdoors:	☒ Yes ☐ No	Conductive Dusts:	☐ Yes ☒ No
Other Influences: List all.		Corrosive Gases:	☒ Yes ☐ No Type(s): Sewage

3.4 Drive Information

Power	Load Type/Description	Voltage	Ampacity	Frequency
Input Power:	2750 KVA	6600V	214A	50Hz
Output Power:	2051 KW	0-6600 V	260 A	0-75Hz
Control #1 Power:	Control and Blower	415V 3ph	20A	50Hz
Control #2 Power:	Motor Heater external power (customer)	110Vac 1Ph	Power=KW	50Hz
Control #3 Power:				
Control #4 Power:				

Xfmr Blower Motors:	Voltage:	HP/KW: HP, or KW	FLA: Amp RPM:
Xfmr Blower Motor OL Settings:			
Cell Blower Motors:	Voltage:	HP/KW: HP, or KW	FLA: Amp RPM:
Cell Blower Motor OL Settings:			

Transformer:	Mfg: TBA		KVA: 2750
	Model No: HZ50	Part No: A5E03071254	Serial No:
	Input Voltage: 6600 V	Sec Voltage: 630 V	Tap Setting: ☐ -5% ☐ 0% ☒ +5%
	Reason if Tap Setting is not +5%:		

Input CT'S:	Ratio: 250 **:** 5	No. per Phase: 1	
Attenuator Resistors:	Input: 4.8 MΩ	Output: 4.8 MΩ	

3.5 Drive Options

Cell Bypass	☐ Yes ☒ No		UPS:	☐ Yes ☒ No
Drive Bypass:	☐ Yes ☒ No		Communication Protocol:	☐ No ☒ Yes Type: Modbus RS485
Sync Motor:	☐ Yes ☒ No		Sync Transfer	☐ Yes ☒ No
Sync Motor Exciter:	Voltage:		Manufacturer:	
	Configuration:		Serial No.:	
	Model:			

Table 3: Cell Information

Power Cells:	VSD P/N: 6SR3502-6HF42-7BH-Z	Size: ____ Amp 260	Total No of Cells: 18

Cell				Cell Control Board		
Location	**CELLS P/N**	**S/N**		**P/N**	**S/N**	**Rev.**
A1	LDZ14501002.260	130162		A1A10000432.30M	U13020XXXBR	BR
A2	LDZ14501002.260	130160		A1A10000432.30M	U13020410BR	BR
A3	LDZ14501002.260	130165		A1A10000432.30M	U13020395BR	BR
A4	LDZ14501002.260	130169		A1A10000432.30M	U13020407BR	BR
A5	LDZ14501002.260	130166		A1A10000432.30M	U13020440BR	BR
A6	LDZ14501002.260	130171		A1A10000432.30M	U13020427BR	BR
B1	LDZ14501002.260	130163		A1A10000432.30M	U13020XXXBR	BR
B2	LDZ14501002.260	130161		A1A10000432.30M	U13020433BR	BR
B3	LDZ14501002.260	130164		A1A10000432.30M	U13020468BR	BR
B4	LDZ14501002.260	130173		A1A10000432.30M	U13020392BR	BR
B5	LDZ14501002.260	130172		A1A10000432.30M	U13020439BR	BR
B6	LDZ14501002.260	130176		A1A10000432.30M	U13020455BR	BR
C1	LDZ14501002.260	130175		A1A10000432.30M	U13020XXXBR	BR
C2	LDZ14501002.260	130174		A1A10000432.30M	U13020403BR	BR
C3	LDZ14501002.260	130177		A1A10000432.30M	U13020479BR	BR
C4	LDZ14501002.260	130168		A1A10000432.30M	U13020391BR	BR
C5	LDZ14501002.260	130167		A1A10000432.30M	U13020481BR	BR
C6	LDZ14501002.260	130170		A1A10000432.30M	U13020452BR	BR

3.6 Motor Information

Manufacturer:	TBA	Model Number:	
HP/KW Rating:	HP, 2000 KW	Serial Number:	
Rated Voltage:	6600 V	Type:	☒ Induction ☐ Synchronous
Full Load Data:	Amp: 217 A, Eff: , PF: 0.86, RPM: 593		
Locked KVA Code:		Speed Encoder:	☒ Yes ☒ No
Service Factor:		Encoder Model:	, 1024 PPR, Incremental
Motor Cooling:	Air, Other:	RTD's:	☒ Stator ☒ Bearings
Stator Connection:	☒ Wye ☐ Delta	RTD Type:	PT100
Line Start Capability:	☐ Yes ☒ No	RTD Alarm/Trip:	Stator: N/A °C, Bearing: N/A °C
Exciter Manufacturer:		Exciter Voltage:	V, ☐ AC ☐ DC
Exciter Model No:		Exciter Config:	

4.0 CUSTOMER PRE-STARTUP CHECKLIST REVIEW

4.1 Customer Responsibilities

4.1.1 Customer is responsible for completing the pre-startup items on the Customer Pre-Startup Checklist (See Attachment #2). Complete ☒ Incomplete ☐

4.2 Review and record checklist items status

4.2.1 Review each item in the checklist with the Customer and record status of completion in the Attachment #2. Complete ☒ Incomplete ☐

5.0 DRIVE PRE-POWER INSPECTIONS AND CHECKS

Description	Initial
Visually check the equipment for any shipping or installation damage.	MA
Ensure that the entire system is earth grounded at one of the system grounding points. (Customer specified where ground to be connected in VFD. Either to input or output cabinet.)	MA
Confirm Siemens drawings are the same at the Customer's drawings. Note: *Drawings need to be updated for new encoder connection.*	MA
Verify the source voltage to the Drive matches the Drive specification. The Drive's intended input voltage is specified on the foil label located inside the control panel door. (Note: This foil label may be located in the customer connection cabinet.)	MA
Ensure the control power (typically 120 VAC or 125 VDC) and auxiliary power (typically 415 or 690 VAC) sources are connected per the VFD schematics and that they match the Drive's control voltage ratings as stated on the foil label.	MA
Verify the presence of markings/labels on all terminal strips, mounted components, cell and other sub-assemblies. Notify the factory of any discrepancies. List discrepancies: NA	MA
Verify the presence and proper installation of all protective covers. List discrepancies: *415V for PLC I/O Transformer protection barrier to be fitted->Done!*	MA
Verify the installation of the fan hood. Verify that the fan rotates freely while mounted.	MA
Check Blower Assembly installation and check hardware connections.	MA
Confirm all air gaps are blocked between cabinets.	MA
Confirm Shipping Splits are internally bolted together. n/a	MA

Description	Initial
Confirm Shipping Splits are externally bolted together (near floor). N/A	MA
Confirm cabinet to cabinet sealing.	MA
Confirm conduit entrance to cabinets is sealed.	MA
Confirm cabinet to floor is sealed.	MA
Confirm gland plates are installed properly.	MA
Verify that the ground bonding jumpers are present and connected (between shipping splits, cabinets to doors, cabinets to panels, motor).	N/A
Confirm MV and LV cables are installed in separate conduits (observe for proper spacing).	MA
Confirm LV (415V & 120V) and Analog Signal cables are installed in separate conduits.	MA
Check all cabling for insulation nicks, splitting and/or cracking.	MA
Verify that no conductors are exposed due to chafing or other shipping abuse.	MA
Input MV Power Cables: Verify insulation voltage rating is adequate.	MA
Input MV Power cables: Verify bend radii meet NEC requirements.	MA
Input MV Power cables: Check distance from cabinet/other cables.	MA
Input MV Power cables: Verify stress cones installed/mounted properly and shields are grounded at MV Switchgear end only – not at drive end. Ensure shield ground wires are adequately separated from bus work and GTO wires.	MA
Output MV Power Cables: Verify insulation voltage rating is adequate.	MA
Output MV Power cables: Verify bend radii meet NEC requirements.	MA
Output MV Power cables: Check distance from cabinet/other cables.	MA
Output MV Power cables: Verify stress cones installed/mounted properly and shields are grounded at VSD end only – not at Motor. Ensure shield ground wires are adequately separated from bus work and GTO wires.	MA
Verify that the transformer neutral is ungrounded.	MA
Check the tap jumper to be sure it is not touching the cabinet.	MA
Ensure that control and main power are installed and connected properly. Source to input. Output to motor.	MA
Check and inspect Motor Terminations in motor termination box. (done by JPR)	MA
Shipping split Bus Bar terminations complete, torqued and covers in place.	N/A
Ensure that VFD electrical connections are tight and that all torque marks are present. * Re-examine for bolts bottoming out.	MA
Check Amp connector pins. Refer to “Test Procedure for Holding Tension Testing of Amp Connector Female Sockets” and complete the associated testing form.	N/A
Have the control wire plugs at each shipping split been reconnected and tie-wrapped? (Confirms that all connnections that deal with shipping splits are addressed).	N/A
Control wires (visually inspected and landed per customer connection drawings).	MA
Check Input Attenuator Resistors are the correct value for the rated voltage.	MA
Check Output Attenuator Resistors are the correct value for the rated voltage.	MA

Description	Initial
Verify all Transorbs are grounded (located at/near input & output attenuator resistors).	MA
Check Fuses and Relays (inserted snugly into holders).	MA
Verify Wago wiring secure.	N/A
Verify Break Out Board wiring secure.	MA
Verify Signal Conditioning Board wiring secure.	MA
Verify DCR is properly grounded to ground point.	MA
Verify Plug/Ribbon cables are secured.	MA
Verify Keypad is grounded.	MA
Verify for Communication protocol only: termination resistor.	MA
Check Fiber optics (point to point) and verify that bend radii are acceptable. A3 fiber bent at Modulator Board End, light goes through.	MA
External air path in/out (distance from blower 30mm (minimum) - pass/fail. Pass	MA
Inlet/outlet located opposite side of room. ok	MA
All covers and doors installed and secured with the correct fasteners and ground straps.	MA
All Safety Interlock hardware (Fortress Locks) are installed and properly aligned.	MA
All Doors open/close properly.	MA
Drive door filters.	MA
Verify all components match the drawings: component location, labels, wire tags and Drive labels. (The drawing must reflect the Drive and vice-versa – internal connections only).	MA
Adjust Blower Motor Thermal OL's to correct settings.	MA

6.0 CONTROL POWER CHECKS

Description	Initial
Ensure that all control power sources are available for Drive operation.	MA
Verify free rotation of cell and transformer blowers. (A double-check before closing the cabinets.)	MA
Verify Network Cabling is the correct type and landed on the correct terminals.	N/A
Verify Speed Controls are terminated correctly (4-20 mA speed control or network control).	MA
Verify Start/Stop commands terminated correctly (digital input or network control).	MA

Energize the Control Power Circuits feeding the drive.

DON'T energize MV Power.

Confirm the following parameters and document values:	Rated input current (2020)	214 A
	Rated output current (2040)	260 A
	Neutral connection (2630)	T2
	CT turns (3035)	250 :5
Measure all control power voltage sources being fed to the Drive. Verify that these voltages match the drawings.	415 V_{AC} (373V_{AC} to 466V_{AC})	**425** V_{AC}
	240 V_{AC} (220V_{AC} to 260V_{AC})	**NA** V_{AC}
	120 V_{AC} (110V_{AC} to 130V_{AC})	**127** V_{AC}
If supplied, verify the UPS voltage.	120 V_{AC} (110V_{AC} to 130V_{AC})	**NA** V_{AC}

Energize the control power circuits at the drive – close breakers and fuse holders.

Description	Initial
Verify phasing for the blower motor power circuit (verified by checking that suction holds a sheet of paper firmly on drive cabinet filters).	MA

Record Drive address.	TCP/IP Address:	172.17.20.16
Verify **DCS** or **PLC** addresses across communication link, if applicable. PLC via Network2 Modbus TCP	TCP/IP Address:	**NA**
Power supply voltage checks. *Please see FAT docs.*	+5 V_{DC} (+5.10 to +5.13 V_{DC})	**5.15** V_{DC}
	-5 V_{DC} (-4.85 to -5.15 V_{DC})	**--5.10** V_{DC}
	+12 V_{DC} (+11.64 to +12.36 V_{DC})	**12.07** V_{DC}
	-12 V_{DC} (-11.64 to -12.36 V_{DC})	**-12.05** V_{DC}
	+15 V_{DC} (+14.30 to +15.70 V_{DC})	**15.01** V_{DC}
	-15 V_{DC} (-14.30 to -15.70 V_{DC})	**-15.00** V_{DC}
	24 V_{DC} (21.6 to 26.4 V_{DC})	**24.04** V_{DC}
DCR voltage checks:	+5 V_{DC}	**5.14** V_{DC}
	-5 V_{DC}	**-5.15** V_{DC}
	+12 V_{DC}	**12.06** V_{DC}
	-12 V_{DC}	**-12.07** V_{DC}

DON'T ENERGIZE MV POWER – FURTHER CHECKS REQUIRED IN SECTION 10.

Table 4: SOP, Parameters and Fault Logs

Upload/Review:	Initials		Upload:	Initials
SOP File: A5E32168985B	MA		Historical Log:	MA
Parameter File (Level 7 Security):	MA		Fault Log:	MA
Check Clock Time: to AEST only	RD		Event Log (NXG only):	MA
			Cell Fault Log (Legacy only):	NA
Were any existing issues found after reviewing SOP, Parameters and Logs?	Normal commissioning code modification. Digital I/O wiring modified as per Asbuilt drawings. Added to SOP, DI-0B for Keypad local control, wiring and key-sw yet to be fitted. Added interlock for Ventilation running DI.			

Verify the following are functional under control power:		
MV Input Protection Interlock:		☒ Yes ☐ No
		☒ Yes ☐ No

7.0 SOFTWARE AND FIRMWARE VERSION RECORDING

Record the SOP Software (DRCTRY File) and NXG Firmware (8090) version.	Software Ver:	Version 4.39
	(8090) Firmware Ver:	Ver 5.2.3
Record HMI software version, if applicable. NA	Software Version:	NA
	Firmware Version:	NA
	Windows Version:	NA

8.0 BYPASS CONTACTOR TEST

8.1 Reference Bypass Contactor Procedure located in Bypass Contactor Kit.

Table 5: By-Pass Contactor Testing. Dynamic test pulling FO off for each cell, and then reset from parameter ID:XXXX.

NOT FITTED.

Contactor Name	Voltage	Initial
BPKA1	Pick-up Voltage: Drop-out Voltage:	
BPKA2	Pick-up Voltage: Drop-out Voltage:	
BPKA3	Pick-up Voltage: Drop-out Voltage:	
BPKA4	Pick-up Voltage: Drop-out Voltage:	
BPKA5	Pick-up Voltage: Drop-out Voltage:	
BPKA6	Pick-up Voltage: Drop-out Voltage:	
BPKB1	Pick-up Voltage: Drop-out Voltage:	
BPKB2	Pick-up Voltage: Drop-out Voltage:	
BPKB3	Pick-up Voltage: Drop-out Voltage:	
BPKB4	Pick-up Voltage: Drop-out Voltage:	
BPKB5	Pickup Voltage: Drop-out Voltage:	
BPKB6	Pick-up Voltage: Drop-out Voltage:	
BPKC1	Pick-up Voltage: Drop-out Voltage:	
BPKC2	Pick-up Voltage: Drop-out Voltage:	
BPKC3	Pick-up Voltage: Drop-out Voltage:	
BPKC4	Pick-up Voltage: Drop-out Voltage:	
BPKC5	Pick-up Voltage: Drop-out Voltage:	
BPKC 6	Pick-up Voltage: Drop-out Voltage:	
Confirm Customer I/O and communications Confirm Customer hard wiring into the VFD	This is the time to fine tune what is being received and if changes need to be done.	

Description	Initial
Install the covers and button up the Drives.	
Prepare the Drive for full input power. (Remove test equipment, motor free, etc.)	

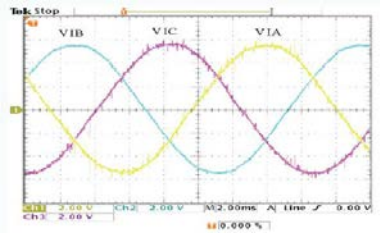
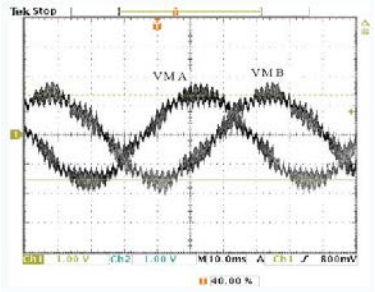
9.0 OPEN LOOP TESTS

N/A

The following steps verify operation of the Drive (without a motor) in Open Loop Test Mode (No motor current feedback).

Warning! Do not connect a grounded PC or laptop to a communications board with an isolator or while the Drive is running. To do so could damage the computer and/or the digital control rack.

Description	Initial
Review and follow safety procedures per Daily Safety Log.	
Make sure all safety grounds have been removed from input.	
Re-energize the AC or DC control power.	
Connect the PC/Laptop to the Ethernet Port (for access to the CPU Board). Connect Tool-Suite and the Debug Tool.	
Set the control loop type (2050) to Open Loop Test Mode (OLTM).	
Verify that the input current (3030) and input voltage (3040) scalers (stability →input processing) are set to the default values of 1.0.	
DISABLE spinning load using Drive → spinning load (2420) → spinning load mode (2430).	
Make sure the fast by-pass (2600) is DISABLED. Access this parameter through Drive → cells → fast by-pass.	
Configure the keypad to display input voltage (VDIN), input frequency (FRIN), and motor voltage (VLTS). – function of keypad	
Set the motor rated voltage (1040) parameter	
Energize MV Power to the system. **(Everyone should leave the room the first time MV is applied to the Drive.)**	

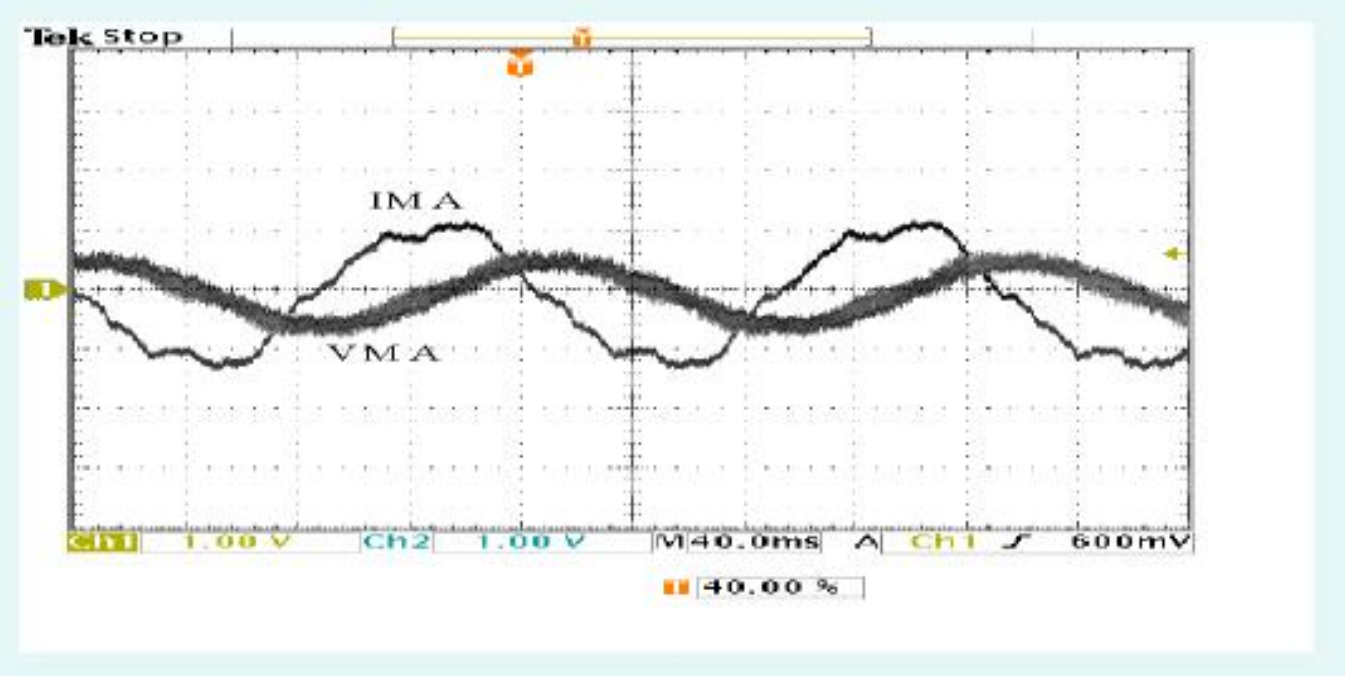
Description	Figures and Records	Initial
Verify that the keypad or drive tool displays the correct value of drive input voltage and frequency. At rated primary voltage, the AC input voltage feedback on Test Points VIA VIB, and VIC should be 5.4Vpp or 1.9Vrms. See the figure in the Comments Section. These test points are on the system interface card. Perform the following corrective step if the input (or line) voltage is too high or too low. If the input voltage to the Drive is too high, then this needs to be corrected. Harmony Drives are shipped with the transformer tap set to +5%, which reduces the voltage by that percentage on the secondary side of the transformer. If the voltage is low (5% less than rated), then change the tap on the transformer to the neutral ("O") or if the voltage is lower than 5% less than rated then change the tap on the transformer to -5% tap. If the input frequency is displayed as a negative number, then one pair of input phases has to be switched to change the phase rotation.	 Confirm Values using an oscilloscope and digital multimeter.	
Enter a speed demand of 25% and give the RUN command. The AC output voltage feedback signals on Test-Points VMA, VMB, and VMC should be 1.35Vpp ±0.27V (measure the average peak-to-peak voltage) or 0.48 Vrms ±0.20V. See the figure in the Comments Section for signals on TestP-points VMA and VMB at 25% speed (15Hz).	 Confirm Values using an oscilloscope and digital multimeter	
Increase the speed demand to 50% (30 Hz). The output voltage feedback signals should increase in proportion for both frequency and amplitude. Note that in Open Loop Test Mode, the flux regulator is not enabled and hence the output voltage will read higher or lower than calculated value corresponding to 50% of rated voltage. Adjust the flux demand parameter (3150) so that the motor voltage (on the keypad or tool) is approximately equal to 50% of rated voltage. Further increase the speed demand to 100% (60 Hz). The AC output voltage on Test-Points VMA, VMB, and VMC should be 5.4Vpp ±0.27V or 1.9 Vrms ±0.20V. The motor voltage on the keypad should read the rated value output voltage ±5%.		

10.0 DRIVE TEST IN OPEN LOOP TEST MODE WITH MOTOR CONNECTED

10.1 The following steps verify operation of the Drive (with a motor connected at its output) in Open Loop Test Mode (No Current Feedback). This test is required only when the operation of the output Hall Effect Transducers requires to be verified. During this test the motor should be unloaded. If this test is not required then proceed to the next test.

Description [This procedure not followed, OLVC method used]				**Initial**
Disconnect control voltage and medium voltage sources & follow LOTO procedures.				
Connect the motor feeder cables or enable motor contactor.				
Re-energize the AC or DC control power.				
Set the motor rated voltage (1040) and frequency (1020) parameters (access it through motor → motor parameters) to be equal to the motor nameplate values.				
Make sure that **spinning load mode (2430)** and **fast by-pass (2600)** are **DISABLED**.				
Slow down Drive acceleration and deceleration. **Set to 60 Sec or greater.** "Drive/Speed Ramp Setup"	Accel time 1	(2270)	Sec	
	Decel time 1	(2280)	Sec	
DON"T operate the drive beyond 10% speed without reducing the Flux Demand (3150) to 0.5. "Stability/Output Processing/Flux Control"				
Energize the medium voltage feed to the VFD. Push the fault reset button on the keypad to reset faults and push the button a second time to acknowledge any alarms. If the mode on the keypad display reads RLBK, then change the control loop type (2050) to open loop vector control and exit out of the menu entry. This should force the RLBK on the keypad to change back to mode. Then **change the control loop type (2050) back to open loop test mode.**				
Configure the keypad to display motor magnetizing current, motor torque current and motor voltage.				
Spin the motor at 1% and observe proper rotation. Motor rotation correct or corrected: ☐ Yes ☐ No				
Operate the Drive with a speed demand of 10%. Observe the AC output voltage feedback and motor current for phase A on test-points VMA and IMA using an oscilloscope. Since the motor is unloaded the current waveform should lead the voltage waveform by almost 90°. The hall effect current transducers introduce a negative sign since they are configured to measure the incoming current. Check test-points VMB, IMB and VMC, IMC for similar waveforms. **See Figure 10.1**				

Figure 10.1 Open Loop Test Mode operation at 10% speed with an unloaded motor.



(AC motor voltage and motor current at test-points VMA and IMA are shown.)

11.0 DRIVE TEST IN OPEN LOOP VECTOR CONTROL MODE FOR UNLOADED MOTOR APPLICATION

11.1 At this point the VFD is ready for actual (induction) motor operation. The following steps verify operation of the Drive and the load induction motor in open loop vector control mode.

Description	Initial
Re-energize the AC or DC control power, if de-energized.	
Change the Drive control loop type (2050) to open loop vector control.	

Description			Value
Setup the speed ramp parameters according to the following recommendations: The acceleration and deceleration rate for a fan should be set to around 60 seconds and for a pump around 30 seconds. "Drive/Speed Ramp Setup"	Accel time 1	(2270)	45 Sec
	Decel time 1	(2280)	45 Sec
Verify that fast (cell) by-pass is DISABLED at this time if you have that option	Fast by-pass	(2600)	NA Sec

11.2 Verify that the following parameters are set correctly – default values are shown.

***Note: Auto-Tuning modifies the italicized menu items*.**

****Note*: Param_List= Please see Completed Parameter List asbuilt attached**

Description				Value
Setup the following motor parameters according to the nameplate values. "Motor/Motor Parameter"	Motor frequency	(1020)	HZ	50
	Full load speed	(1030)	RPM	593
	Motor Rated Voltage	(1040)	V	6600
	Full load current	(1050)	A	217
Use default values for the other motor parameters as shown below. For this test set the stator resistance to 0.1%.	Leakage inductance	(1070)	16.0%	24.6
	Stator resistance	(1080)	0.1%	0.83%
	No load current	(1060)	25.0%	34%
	Inertia	(1090)	30.0 KgM²	389.1
Setup the motor overload and torque limits. Set the motor trip volts to be equal to 120% of the motor rated voltage or to the value required by the customer. Set the over-speed parameter to be 120% or to the value required by the customer. "Motor/Limits"	Overload select	(1130)	Inv. Time with Speed Derate	Inv Time w Sp
	I overload pending	(1139)	105.0%	**Param_List**
	I overload	(1140)	110.0%	**Param_List**
	Overload timeout	(1150)	5 Sec	**Param_List**
	Max. Motor Inertia	(1159)	0.0 KgM^2	**Param_List**
	Motor trip volts	(1160)	4800 V	**Param_List**
	Over-speed	(1170)	120%	**Param_List**
	Motor torque limit 1	(1190)	100.0%	**Param_List**
	Regen torque limit 1	(1200)	-0.25%	**Param_List**

Description				Value
Verify that these control loop gains are at their default values.	Flux reg prop gain	(3110)	1.72	**Param_List**
	Flux reg integral gain	(3120)	1.00	**Param_List**
	Flux filter time const	(3130)	0.0667 Sec	**Param_List**
	Flux demand	(3150)	1.0	**Param_List**
	Flux ramp rate	(3160)	0.5 Sec	**Param_List**
	Energy saver min flux	(3170)	100%	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Speed Loop"	Speed reg prop gain	(3210)	0.02	**Param_List**
	Speed reg integral gain	(3220)	0.046	**Param_List**
	Speed reg Kf gain	(3230)	0.60	**Param_List**
	Speed filter time const	(3240)	0.0488 Sec	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Current Loop"	**Current reg prop gain*	(3260)	0.50	**Param_List**
	**Current reg integral gain*	(3270)	25	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Braking"	Enable braking	(3360)	Off	**Param_List**
	Pulsation frequency	(3370)	275 Hz	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing"	Output current scaler	(3440)	1.000000	**Param_List**
	Output voltage scaler	(3450)	1.000000	**Param_List**
Verify that these control loop gains are at their default values. "Stability"	Dead time comp	(3550)	16.0 µSec	**Param_List**
	Feed forward constant	(3560)	0.0000	**Param_List**
	Carrier frequency	(3580)	400.0 Hz	**Param_List**

Description		Initial
Verify the system operational program (SOP) and customer interface per Customer specification.		**MA**
Verify that the Customer has completed their entire interface testing at this time.		**MA**
Energize the medium voltage feed to the VFD. Push the fault reset button on the keypad to reset faults and push the button a second time to acknowledge any alarms.		**MA**
Configure the keypad to display Speed Demand, Motor Magnetizing Current, Motor Torque Current, and Motor Voltage.		**MA**
Operate the Drive with a speed demand of 10%. Observe the AC output voltage feedback and motor current for phase A on test-points VMA and IMA using an oscilloscope.	• If the motor is unloaded, then the current waveform should lead the voltage waveform by almost 90° (see Figure 11.1 - top frame) The hall effect current transducers introduce a negative sign since they are configured to measure the incoming current. • If the motor is loaded then the current waveform will lead the motor voltage by an angle small than 90° (see Figure 11.1 - bottom frame). • The motor voltage should be 10% of the motor rated voltage.	**MA**

Description	Initial
Increase the speed demand while monitoring the motor voltage. The motor voltage should read according to the following table. See Figure 11.2 for waveforms at 100% spread (50Hz). Table 6 shows the Drive voltage scaling for signals on test-points VMA, VMB and VMC as a function speed. Table 7 lists the scaling for the currents and voltage feedback signals available on the signal conditioning board at the rated operating point of the Drive.	**MA**

Table 6: Scaling of Drive output voltage as a function of speed

Speed Command (%)	Motor Speed (Hz)	Motor Voltage Feedback, (V_{P-P}) NXG Sys Intrf Brd (NXGII Sys I/O Brd)	Motor Voltage Feedback, (V_{RMS}) NXG Sys Intrf Brd (NXGII Sys I/O Brd)
10	6	1.08 (0.54) V_{P-P}	0.38 (0.19) V_{RMS}
25	15	2.70 (1.35) V_{P-P}	0.96 (0.48) V_{RMS}
50	30	5.40 (2.70) V_{P-P}	1.91 (0.96) V_{RMS}
75	45	8.10 (4.05) V_{P-P}	2.87 (1.44) V_{RMS}
100	60	10.80 (5.40) V_{P-P}	3.82 (1.91) V_{RMS}

Table 7: Scaling of Drive input and output voltages and currents

Variable	Rated value at Drive terminals (RMS)	Feedback value under rated conditions (V_P) NXG Sys Interface Board or (NXGII Sys I/O Board)	Feedback value under rated conditions (V_{RMS}) NXG Sys Interface Board or (NXGII Sys I/O Board)
Input Current	Primary Current Rating of Input CT	5.0 (2.5) V_P	3.54 (1.77) V_{RMS}
Input Voltage	(Rated Input Voltage L-L) / 1.732	5.4 (2.7) V_P	3.82 (1.91) V_{RMS}
Output Current	Output Current Rating = Cell Rating	5.0 (2.5) V_P	3.54 (1.77) V_{RMS}
Output Voltage	(Rated Output Voltage L-L) / 1.732	5.4 (2.7) V_P	3.82 (1.91) V_{RMS}
Examples: Output Current Scaling: Cell current rating = 3.54 (1.77) V_{RMS} Output Voltage Scaling: [(Rated output voltage L-L) / 1.732] * 1.414 = 5.4 (2.7) V_P			

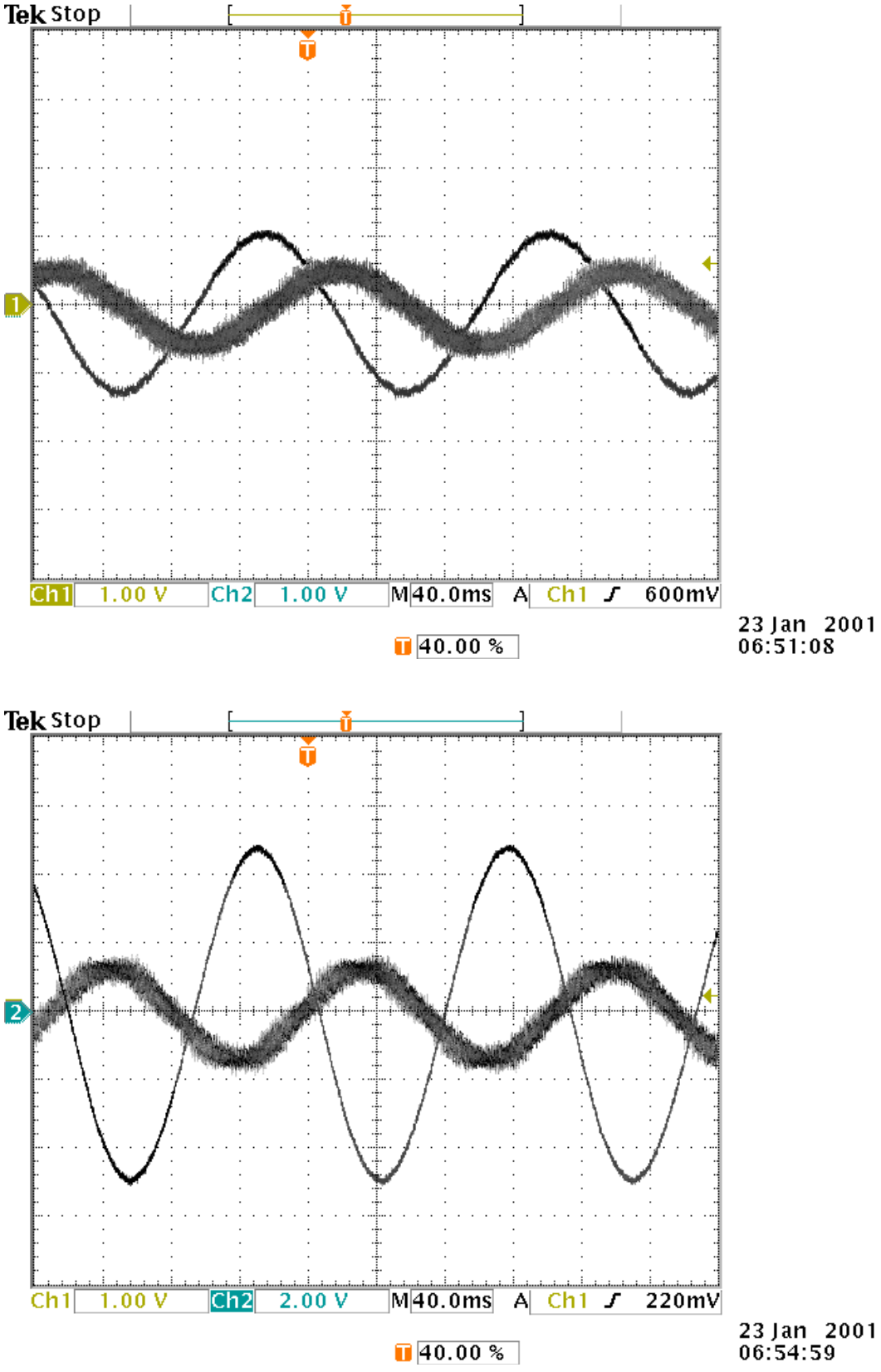


Figure 11.1 and 11.2
AC motor voltage and motor current at test-points VMA and IMA at 10% speed in Open Loop Vector Control
Top frame: Unloaded Operation

Bottom frame: Full Load Operation

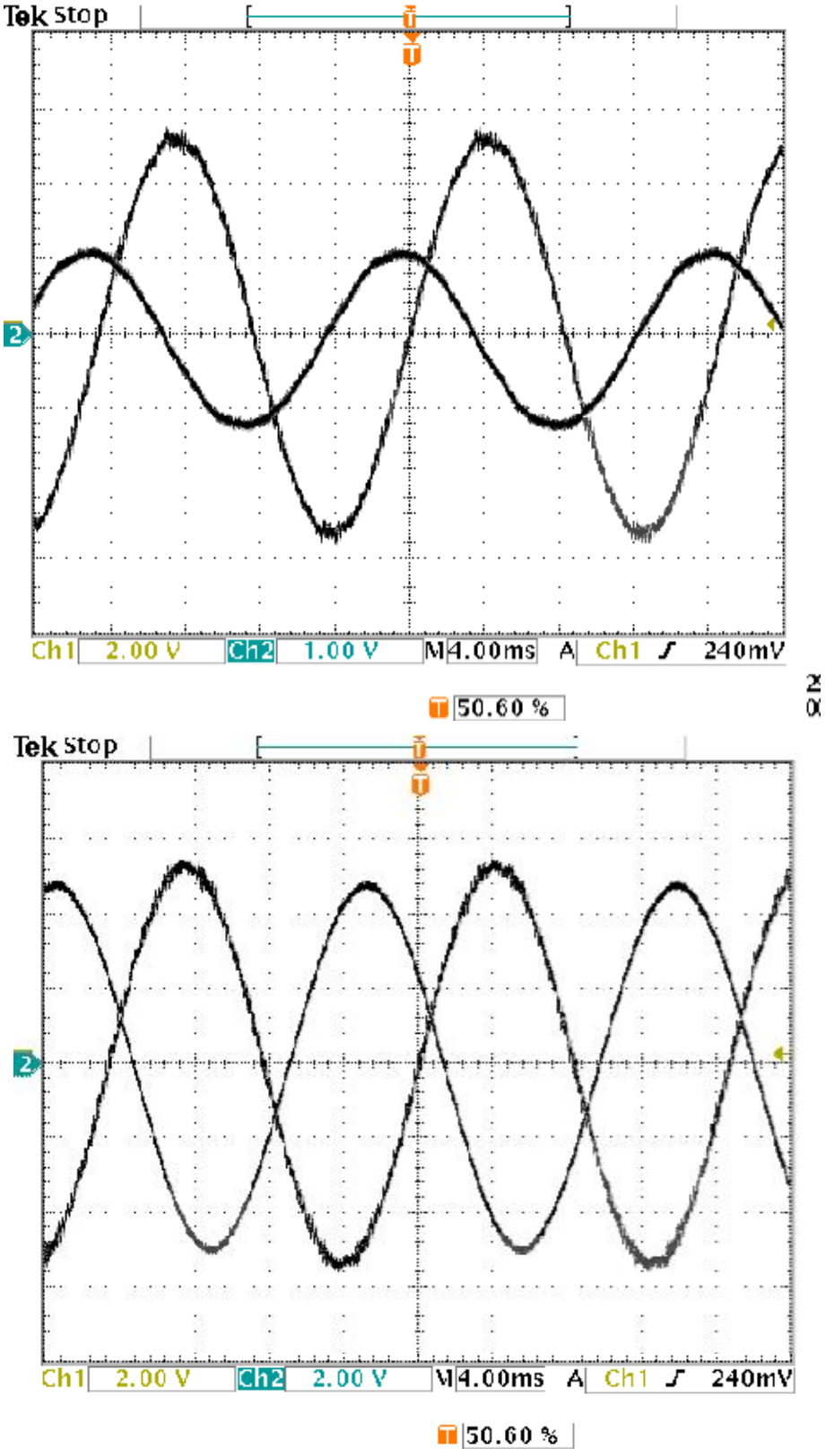


Figure 11.3 and 11.4
AC motor voltage and motor current at test-points VMA and IMA at 10% speed Open
Top frame: Unloaded Operation
Bottom frame: Full Load Operation Drive Test in Synchronous Motor Control Mode

12.0 TUNING

Note: Spinning Load is disabled with V/Hz and OLTM control. IT is automatically enabled if fast by-pass is enabled regardless of menu settings.

Note: Spinning Load should be enabled if one or more of the following operating modes/features are selected:

- **Fast By-Pass**
- **Auto-Restart (controlled through the auto reset parameters 7120-7150 and the SOP)**
- **Synchronous Motor Control (SMC and CSMC)**
- **Closed Loop Vector Control (CLVC)**

Description		Initial
Use the drive tool to monitor motor flux (FluxDS), motor speed, and speed reference.		**MA**
Step 1: To enable spinning load and make sure the following parameters are set to the values shown.		**MA**
Step 2: Spinning Load Menu (2420)		**MA**
	Spinning load mode (2430) forward or reverse, whichever is appropriate	**MA**
	Scan end threshold (%) (2440) 20%	**MA**
	Current level set point (%) (2450) 15% [or equal to the no-load current setting]	**MA**
	Current ramp(s) (2460) 0.01 s	**MA**
	Max current (%) (2470) 50%	**MA**
	Frequency scan rate(s) (2480) 3.0 s (scan time). Check NXG Control manual for this feature	**MA**
Step 3: Operate the Drive with a demand of 30%.		**MA**
Step 4: On the drive tool monitor, the speed reference and motor speed at the moment the Drive “catches” the motor.		**MA**
Repeat Steps 3-4 for different cells. Save the screen shots from tool suite noting which cell was by-passed.		**NA**

13.0 SYNCHRONOUS TRANSFER PROCEDURE (if applicable) N/A

13.1 This section of the startup procedure involves optional synchronous transfer checks. The Pefect Harmony may be configured for optional synchronous transfer operation, in which the Drive can be used to control multiple motors, one motor at a time. If such a configuration is not defined for the application, then this section may be skipped.

13.2 Use the following steps to setup the Drive control for Synchronous Transfer:

Description		Initial
Step 1: Configure Synchronous Transfer Menu parameters as shown below.		
	Synchronous Transfer (2700)	
	Phase I gain (2710) 2	

	Phase P gain (2720) 4	
	Phase offset (2730) 2 deg	
	Phase error threshold (2740) 1.5 deg	
	Frequency Offset (2750) 0.5%	
	Up Transfer Timeout (2760) 0 sec	
	Down Transfer Timeout (2770) 0 sec	
Step 2: Enable Spinning Load by setting Spinning Load Mode (2430) to forward.		
Step 3: Set the Speed Fwd Max limit 1 (2080) to at least 105%		

13.3 Go through the following checklist to complete the setup of Synchronous Transfer:

Description	Initial
Configure the Drive control as described from OLTM/CLVC	
Ensure that PLC-related hardware is properly connected (for information, see the respective PLC communications network manuals supplied by the vendor) to the analog I/O modules.	
Verify wiring of all VFD control and line control electrical contactors.	
Ensure that the system operating program for the “up transfer” and “down transfer” process logic is implemented.	
The state machines for up and down transfers reside in the Perfect Harmony’s control program. These interface with the control system integrator’s PLC network via the VFD system operating program to handle handshaking between each motor control center (MCC) and the VFD. All controls for the VFD and line reactors are controlled from the system integrator’s PLC. Verify that these controls are operational.	
Verify all communications flags. (debugger screen)	
For Synchronous Motor (SM) synchronous transfer, an external field controller source is required when the SM is connected to the line and the Drive is disabled. This alalog source and the source from the Drive must be switched via external logic and in a digital manner, 4-20ma current loops are used for analog sources (current loops cannot be switched via a relay). The final output from the PLC must be connected to the field excitor directly. Verify that there are two sources to the PLC (one of which may be internal), and that the PLC logic is set to switch between the two sources at the appropriate time. The PLC also controls the enable of the field exciter any time the motor is active.	

14.0 DRIVE TEST WITH SYNCHRONOUS MOTOR : N/A

14.1 Procedure to verify operation of Drive with synchronous motor in Synchronous Motor Control Mode.

Description	Initial
Connect the synchronous motor to the Drive. Enter motor parameters and use default gains except for the following parameters: 1. Enter Synch Motor Field no-load current as the No-load Current setting (1060). This parameter should be calculated (in %) on the basis of the actual no-load field current and the maximum capability of the field excitor. a) Example: Drive with a synchronous motor that requires 24A of no-load field current and a field supply that is tuned so that 75A is the maximum output (at 20mA command input), then the No-Load Current Parameter should be set to: No-Load Current Setting = 100% * 24/75A = 32.0% 2. Enable Spinning Load (2430) 3. Change the Drive control loop type (2050) to Synchronous Motor Control. 4. Use default control loop gains except for the flux loop gains that should be changed as follows: a) Flux reg prop gain (3110) 0.50 b) Flux reg integral gain (3120) 0.50 c) Flux Filter Time Const (3130) 0.022 sec d) Saliency (1091) .02 5. The SOP should have been modified to include the logic for controlling the field supply output contactor. The contactor should be ON as soon as the Start command to the Drive is given, and should be turned OFF immediately when the Drive trips on a Fault or when the Drive goes to Coast State (while stopping).	
Energize medium voltage Drive. Run the Drive with a speed demand of 10%.	
Verify that after Start command is given, the field supply first starts by applying current and building motor flux During this time, Ids and Iqs should be zero.	
After a time period equal to the Flux Ramp Rate parameter (3160), the Drive starts by increasing the Speed Reference to the Speed Demand.	
With Synchronous Motors, the Drive current is always in phase with the voltage, i.3e., Ids ≈ 0 under steady-state conditions. At no-load, there is very little current supplied from the Drive (on the keypad, motor current display, ITOT ≈ 0).	
Run the Drive to 10% speed. Verify that the no-load and full load (if possible) current waveforms, along with the Drive voltage waveforms, areas shown in Figure 14.1)	
Run the Drive to 100% speed. Verify that the no-load and full-load (if possible) current waveforms, along with the Drive voltage waveforms, are as shown in Figure 14.2. Note that the Drive output currents at 100% speeds are distorted. This is due to the shape of the poles in the synchronous motor. At low speeds, the current regulator bandwidth is sufficient to correct for the distortion introduced by the motor poles as shown in 14.2 b. However, at high speeds, the current regulator gains are insufficient to maintain sinusoidal output currents when the distortion is due to motor pole construction.	

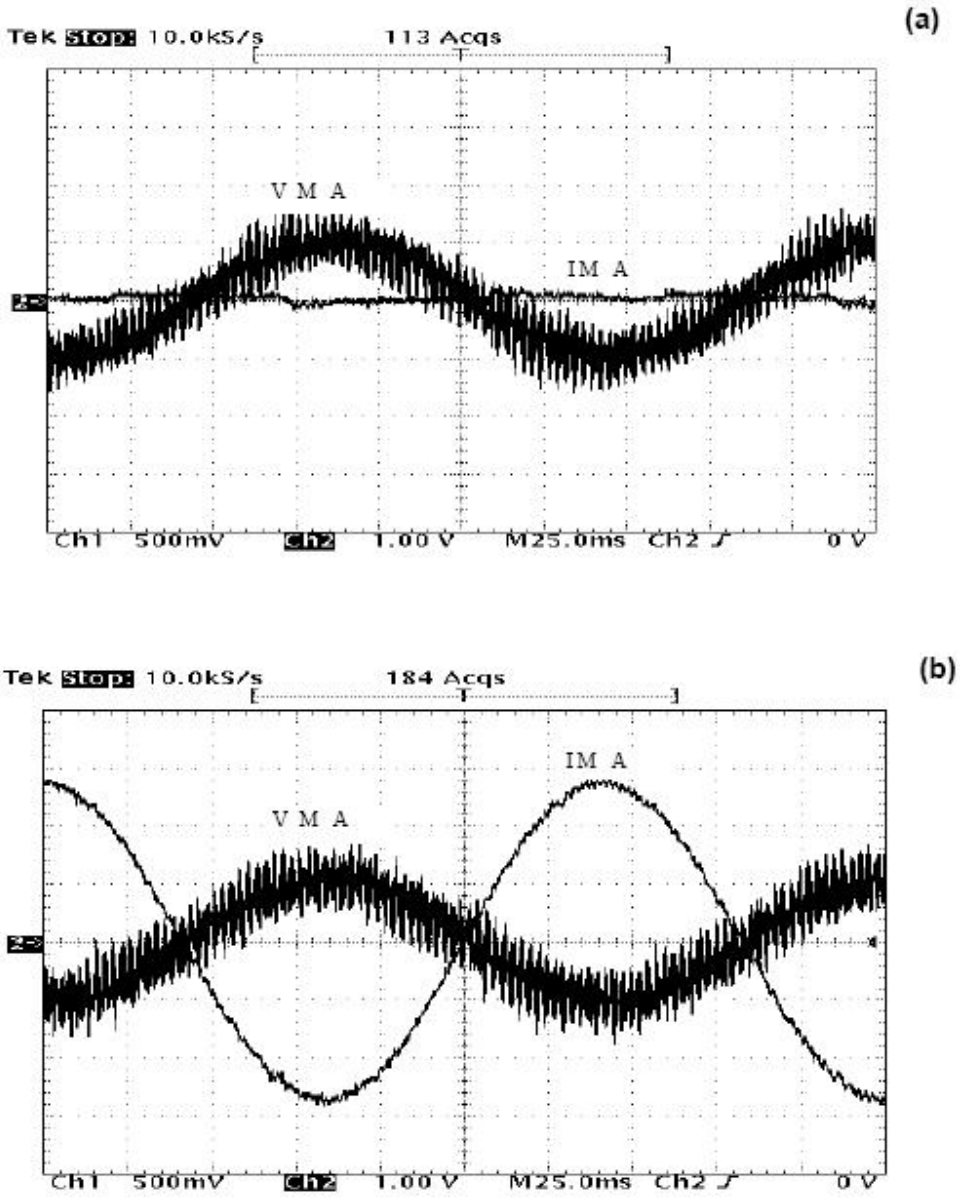


Figure 14.1

AC Motor Voltage and Motor Current at Test-points VMA and IMA at 10% speed with Synchronous Motor Control (a) Unloaded and (b) 75% torque operation.

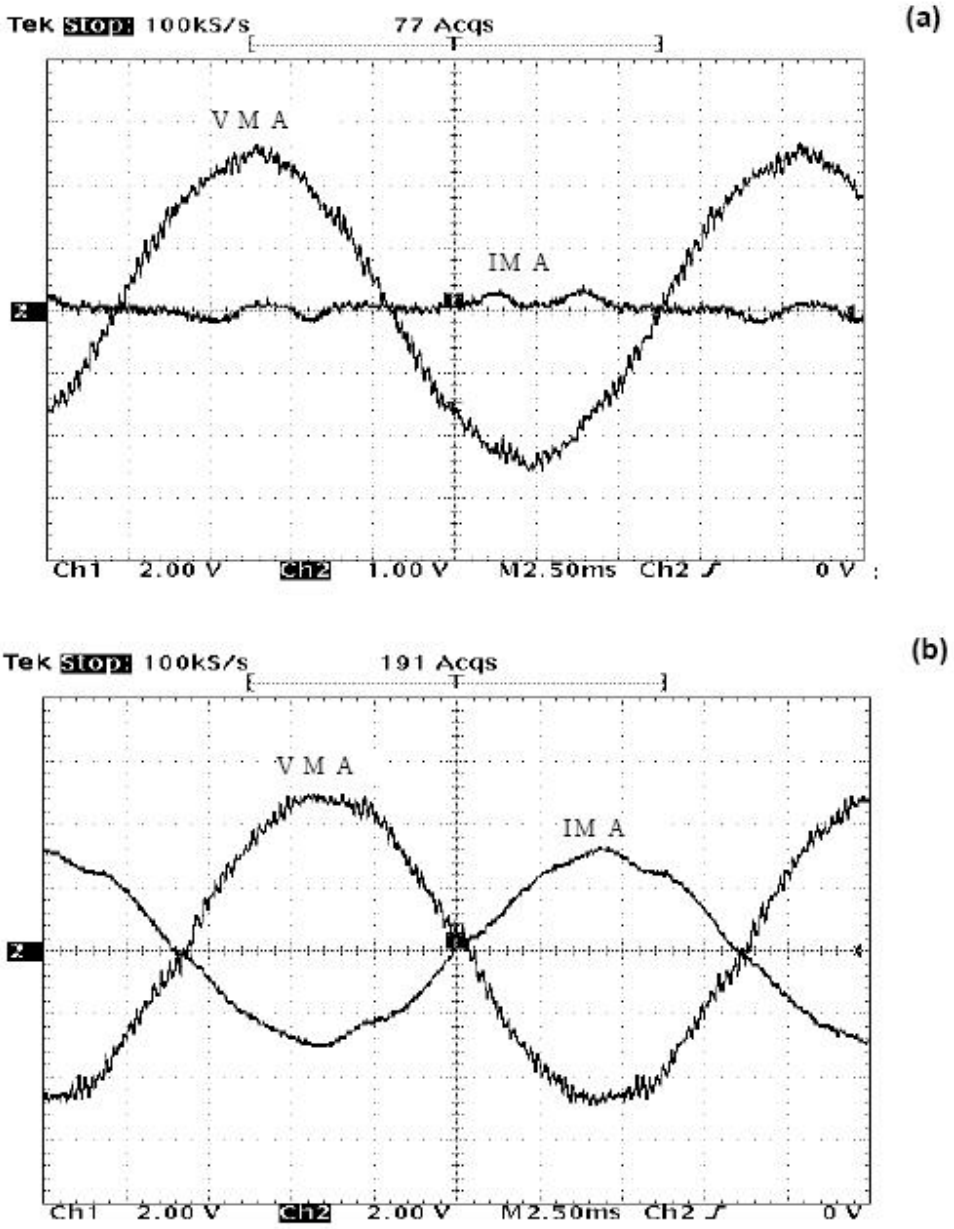


Figure 14.2

AC Motor and Motor Current at Test-point VMA and IMA at 100% speed with Synchronous Motor Control

(a) Unloaded and (b) 75% torque operation

15.0 ALARMS AND ADDRESSES See Param_List attached

Description		Initial
Verify the following parameters are set.		**MA**
Motor limits (1120) including phase imbalance limit (1244) and ground fault limit (1245)		**MA**
Speed profile menu (4000)		**MA**
Bypass type menu (2590) and fast bypass menu (2600)		**MA**
Critical frequency menu (2340)		**MA**
Drive protection menu (7)		**MA**
Display parameters menu (8000)		**MA**
The Drive is functional at this time.		**MA**
Verify alarm indications per the site confirm the input protection E-stop is working.		**MA**
Depress local E-Stop	VFD coast to stop	**MA**
Measure contact status on TB2-1 & 2	Open = E-stop	**MA**
Verify Fault contact on TB2-31 & 32 changes state	Closed = Fault	**MA**
Verify Run contact on TB2-23 & 24 changes state	Open = Not Running	**MA**
Remove Jumper on TB2-3 & 4	VFD coasts to stop	**MA**

The commissioning process is now complete.

The Customer's signature provides acceptance of the Siemens equipment listed on the site information page.

16.0 APPROVAL & ACCEPTANCE OF STARTUP & COMMISSIONING

16.1 Documentation Provided

16.1.1 Configure keypad to display desired parameters.

16.1.2 Upload the parameter (configuration) file, SOP file, event log file.

16.1.3 Provide Customer with the following:

16.1.3.1 Copy of parameter, SOP, event log file

16.1.3.2 Copy of operating flash drive

16.1.3.3 Copy of this checklist

I, the undersigned, validate that this system Commissioning has been completed as per this procedure. Any discrepancies have been noted alongside the appropriate steps in the document. Additionally, any outstanding items or recommendations have been listed.

SIEMENS FSR

Print Name:	**Mohamed Ayad**
Signature:	Ayad Mohamed Digitally signed by Ayad Mohamed DN: cn=Ayad Mohamed, o=Siemens, email=mohamed.ayad@siemens.com Date: 2014.03.06 14:52:12 +10'00'
Date:	**Completion - 21 February 2014**

CUSTOMER REPRESENTATIVE

Print Name:	JOHN CLAYTON
Signature:	J Clayton
Date:	21/02/2014

CUSTOMER REPRESENTATIVE

Print Name:	EDDIE GRANIC
Signature:	
Date:	17-3-2014

Description	ID	Lvl	RH
Main - Sec. level: 7	5	0	0 0
Motor	1	0	0 0
Motor parameter	1000	0	0 0
Motor frequency = 50.0 Hz	*1020	5	1 0
Full load speed = 593 rpm	*1030	5	1 0
Motor voltage = 6600 V	*1040	5	1 0
Full load current = 217.0 A	*1050	5	1 0
No load current = 34.0 %	*1060	5	0 0
Motor kW Rating = 2000.0 kW	*1010	5	1 0
Leakage inductance = 24.6 %	*1070	5	0 0
Stator resistance = 0.83 %	*1080	5	0 0
Inertia = 389.1 Kgm2	*1090	5	0 0
Current Profile	1092	0	0 0
Motor current limit 1 = 100 %	1193	7	0 0
Speed at current lim 1 = 100 %	1194	7	0 0
Motor current limit 2 = 100 %	1195	7	0 0
Speed at current lim 2 = 100 %	1196	7	0 0
Motor current limit 3 = 100 %	1197	7	0 0
Speed at current lim 3 = 100 %	1198	7	0 0
Motor current limit 4 = 100 %	1202	7	0 0
Speed at current lim 4 = 100 %	1203	7	0 0
Motor current limit 5 = 100 %	1204	7	0 0
Speed at current lim 5 = 100 %	1205	7	0 0
Motor current limit 6 = 100 %	1206	7	0 0
Speed at current lim 6 = 100 %	1207	7	0 0
Motor current limit 7 = 100 %	1208	7	0 0
Speed at current lim 7 = 100 %	1209	7	0 0
Motor current limit 8 = 100 %	1301	7	0 0
Speed at current lim 8 = 100 %	1302	7	0 0
Motor current limit 9 = 100 %	1303	7	0 0
Speed at current lim 9 = 100 %	1304	7	0 0
Limits	1120	5	0 0
Overload select = Inv Time w/ derate	1130	5	0 0
Overload Pending = 100.0 %	*1139	5	0 0
Overload = 110.0 %	1140	5	0 0
Overload timeout = 5.0 sec	1150	5	0 0
Speed Derate Curve	1151	5	0 0
0 Percent Break Point = 0.0 %	1152	5	0 0
10 Percent Break Point = 31.6 %	1153	5	0 0
17 Percent Break Point = 41.2 %	1154	5	0 0
25 Percent Break Point = 50.0 %	1155	5	0 0
50 Percent Break Point = 70.7 %	1156	5	0 0
100 Percent Break Point = 100.0 %	1157	5	0 0
Motor trip volts = 8300 V	*1160	5	0 0
Maximum Motor Inertia = 0.0 Kgm2	1159	5	1 0
Overspeed = 120.0 %	1170	5	0 0
Underload enable = Disable	1180	5	0 0
I underload = 10.0 %	1182	5	0 0
Under load timeout = 10.0 sec	1186	5	0 0
Motor torque limit 1 = 100.0 %	1190	5	0 0
Regen torque limit 1 = -0.25 %	1200	5	0 0
Motor torque limit 2 = 100.0 %	1210	7	0 0
Regen torque limit 2 = -0.25 %	1220	7	0 0

Description		ID	Lvl RH
	Motor torque limit 3 = 100.0 %	1230	7 0 0
	Regen torque limit 3 = -0.25 %	1240	7 0 0
	Phase Imbalance Limit = 40.0 %	1244	5 0 0
	Ground Fault Limit = 5.0 %	1245	5 0 0
	Ground Fault Time Const = 0.017 sec	1246	5 0 0
	H/W Ground Fault Enable = Yes	1247	7 1 0
	Peak Reduction Enable = VFD volt rating	1248	7 0 0
	Loss of field level = 40.0 %	1141	7 0 0
	Loss of field timeout = 10.0 sec	1142	7 0 0
Encoder		1280	0 0 0
	Encoder 1 PPR = 1024	*1290	5 1 0
	Encoder filter gain = 0.7500	1300	7 0 0
	Encoder loss threshold = 5.0 %	1310	7 0 0
	Encoder loss response = stop (fault)	1320	7 0 0
	Low speed operation = Disable	1330	7 0 0
Drive		2	0 0 0
Drive parameters		2000	0 0 0
	Rated input voltage = 6600 V	*2010	7 1 0
	Rated input current = 214.0 A	*2020	7 1 0
	Rated output voltage = 6600 V	*2030	7 1 0
	Rated output current = 260.0 A	*2040	7 1 0
	Control loop type = OLVC	2050	7 1 0
	Parallel system = Disable	2051	0 0 0
Speed setup		2060	0 0 0
	Ratio control = 100.0 %	2070	5 0 0
	Speed fwd max limit 1 = 100.0 %	2080	5 0 0
	Speed fwd min limit 1 = 1.0 %	*2090	5 0 0
	Speed fwd max limit 2 = 0.0 %	*2100	7 0 0
	Speed fwd min limit 2 = 0.0 %	2110	7 0 0
	Speed fwd max limit 3 = 0.0 %	*2120	7 0 0
	Speed fwd min limit 3 = 0.0 %	2130	7 0 0
	Speed rev max limit 1 = 0.0 %	*2140	5 0 0
	Speed rev min limit 1 = 0.0 %	2150	5 0 0
	Speed rev max limit 2 = 0.0 %	*2160	7 0 0
	Speed rev min limit 2 = 0.0 %	2170	7 0 0
	Speed rev max limit 3 = 0.0 %	*2180	7 0 0
	Speed rev min limit 3 = 0.0 %	2190	7 0 0
	Zero speed = 0.0 %	2200	5 0 0
Torque reference		2210	0 0 0
	Sop / Menu control = Sop flag	2211	5 0 0
	Torque setpoint = 0.0 %	2220	0 0 0
	Holding torque = 0.0 %	2230	0 0 0
	Torque ramp increase = 1.00 sec	2240	0 0 0
	Torque ramp decrease = 1.00 sec	2250	0 0 0
	Torque command scalar = 1.00	2242	5 0 0
Speed ramp setup		2260	0 0 0
	Accel time 1 = 45.0 sec	*2270	5 0 0
	Decel time 1 = 45.0 sec	*2280	5 0 0
	Accel time 2 = 5.0 sec	2290	7 0 0
	Decel time 2 = 5.0 sec	2300	7 0 0

Description	ID	Lvl	RH
Accel time 3 = 5.0 sec	2310	7	0 0
Decel time 3 = 5.0 sec	2320	7	0 0
Jerk rate = 0.1	2330	7	1 0
Critical freq	2340	5	0 0
Skip center freq 1 = 15.0 Hz	2350	5	0 0
Skip center freq 2 = 30.0 Hz	2360	5	0 0
Skip center freq 3 = 45.0 Hz	2370	5	0 0
Skip bandwidth 1 = 0.0 Hz	2380	5	0 0
Skip bandwidth 2 = 0.0 Hz	2390	5	0 0
Skip bandwidth 3 = 0.0 Hz	2400	5	0 0
Spinning load	2420	0	0 0
Spinning load mode = Both	*2430	5	0 0
Scan end threshold = 20.0 %	2440	5	0 0
Current Level SetPoint = 15.0 %	2450	5	0 0
Current ramp = 0.01 sec	2460	5	0 0
Max current = 50.0 %	2470	5	0 0
Frequency scan rate = 3.00 sec	2480	5	0 0
Cond time setup	2490	0	0 0
Cond stop timer = 0.8 sec	2500	5	0 0
Cond run timer = 0.8 sec	2510	5	0 0
Cells	2520	0	0 0
Installed cells/phase = 6	*2530	5	1 0
Min cell count (n/3) = 6	*2540	5	1 0
Cell voltage = 630	2550	5	1 0
Thermistor warn level = 20.0 %	2560	5	1 0
Bypass type = None	*2590	7	1 0
Neutral connection = T1	*2630	7	1 0
Precharge Enable = Off	2635	7	1 0
Sync transfer	2700	7	0 0
Phase I gain = 2.0	2710	7	0 0
Phase P gain = 4.0	2720	7	0 0
Phase offset = 2.00 deg	2730	7	0 0
Phase error threshold = 1.50 deg	2740	7	0 0
Frequency offset = 0.5 %	2750	7	0 0
Up transfer timeout = 0.0 sec	2760	7	0 0
Down transfer timeout = 0.0 sec	2770	7	0 0
External I/O	2800	5	0 0
Analog inputs = 0	2810	5	1 0
Analog outputs = 2	*2820	5	1 0
Digital inputs = 0	2830	5	1 0
Digital outputs = 0	2840	5	1 0
Wago timeout = 0.0 sec	*2850	5	1 0
Internal I/O	2805	5	0 0
Int Analog In1	2815	5	0 0
Hardware Span = 1.0420	*2818	5	1 0
Int Analog In2	2825	5	0 0
Type = 4 - 20ma	2826	5	1 0

Description	ID	Lvl	RH
Hardware Span = 1.0860	*2828	5	0 0
Int Analog In3	2835	5	0 0
Type = 4 - 20ma	2836	5	1 0
Hardware Span = 1.0730	*2838	5	0 0
Int Analog Out1	2845	5	0 0
Analog variable = Total Current	2846	5	0 0
Output Mode = 4-20 mA	2848	5	0 0
Output Min = 0.0 %	2841	5	0 0
Output Max = 100.0 %	2842	5	0 0
Hardware Span = 1.0000	2844	5	0 0
Int Analog Out2	2855	5	0 0
Analog variable = Motor Speed	*2856	5	0 0
Output Mode = 4-20 mA	2858	5	0 0
Output Min = 0.0 %	2851	5	0 0
Output Max = 100.0 %	2852	5	0 0
Hardware Span = 1.0253	*2854	5	0 0
Int Test Point #28	2860	5	0 0
Analog variable = None	2861	5	0 0
TP 28 Scaler = 0.00	2862	5	0 0
Int Test Point #29	2865	5	0 0
Analog variable = None	2866	5	0 0
TP 29 Scaler = 0.00	2867	5	0 0
Int Test Point #31	2870	5	0 0
Analog variable = None	2871	5	0 0
TP 31 Scaler = 0.00	2872	5	0 0
Int Test Point #24	2875	5	0 0
Analog variable = None	2876	5	0 0
TP 24 Scaler = 0.00	2877	5	0 0
Int Test Point #25	2880	5	0 0
Analog variable = None	2881	5	0 0
TP 25 Scaler = 0.00	2882	5	0 0
Int Test Point #26	2885	5	0 0
Analog variable = None	2886	5	0 0
TP 26 Scaler = 0.00	2887	5	0 0
Output Connection	2900	0	0 0
Filter CT sec turns = 0	2910	5	1 0
Filter inductance = 0.0 %	2920	5	0 0
Filter capacitance = 0.0 %	2930	5	0 0
Cable resistance = 0.0 %	2940	5	0 0
Cable inductance = 0.0 %	2941	5	0 0
Filter damping gain = 0.50	2950	5	0 0
High starting Torque	2960	7	0 0
Enable high torque = Disable	2961	7	1 0
Torque current = 50.0 %	2962	5	0 0

Description	ID	Lvl RH
Current ramp time = 0.5 sec	2963	5 0 0
PLL Acq time = 2.0 sec	2964	5 0 0
Watchdog	2970	7 0 0
Enable watchdog = Enable	2971	7 0 0
Stability	3	0 0 0
Input processing	3000	7 0 0
PLL prop gain = 70.0	3010	7 0 0
PLL integral gain = 3840.00	3020	7 0 0
Input current scaler = 1.000000	3030	7 1 0
CT secondary turns = 250	*3035	7 1 0
Input voltage scaler = 1.000000	3040	7 1 0
PT secondary turns = 1	3011	7 1 0
Input Attenuator Sum = 4800 kOhm	*3045	7 1 0
Output processing	3050	7 0 0
Low freq comp	3060	7 0 0
Low Freq Wo = 12.566 Rad	3070	7 1 0
Low freq com gain = 1.00	3080	7 0 0
S/W compensator pole = 2.000	3090	7 0 0
Flux control	3100	7 0 0
Flux reg prop gain = 2.544	*3110	7 0 0
Flux reg integral gain = 3.271	*3120	7 0 0
Flux filter time const = 0.06461	*3130	7 0 0
Flux demand = 1.00	3150	7 0 0
Flux ramp rate = 0.500 sec	3160	7 0 0
Energy saver min flux = 100.0 %	3170	7 0 0
Flux droop = 0.0 %	3195	7 0 0
Speed loop	3200	7 0 0
Speed reg prop gain = 0.010	*3210	7 0 0
Speed reg integral gain = 0.020	*3220	7 0 0
Speed reg Kf gain = 0.600	3230	7 0 0
Speed filter time const = 0.08038	*3240	7 0 0
Droop in % @ FL current = 0.0 %	3245	7 0 0
Current loop	3250	7 0 0
Current reg prop gain = 0.745	*3260	7 0 0
Current reg integ gain = 19.356	*3270	7 0 0
Prop gain during brake = 0.149	*3280	7 0 0
Integ gain during brake = 3.871	*3290	7 0 0
Stator resis est	3300	7 0 0
Stator resistance est = Off	3310	7 1 0
Stator resis filter gain = 0.0	3320	7 0 0
Stator resis integ gain = 0.00200	3330	7 0 0
Braking	3350	7 0 0
Enable braking = Off	3360	7 0 0
Pulsation frequency = 277.5 Hz	*3370	7 0 0
Brake power loss = 0.3 %	3390	7 0 0
VD Loss Max = 0.250	3400	7 0 0
Braking constant = 1.05	3410	7 0 0

Description	ID	Lvl RH
Output current scaler = 1.000000	3440	7 0 0
Output voltage scaler = 1.000000	3450	7 0 0
Output Attenuator Sum = 4800 kOhm	*3455	7 1 0
Control loop test	3460	7 0 0
Test type = Speed	3470	7 0 0
Test positive = 30.0 %	3480	7 0 0
Test negative = -30.0 %	3490	7 0 0
Test time = 30.1 sec	3500	7 0 0
Dead time comp = 16.0000 usec	3550	7 1 0
Feed forward constant = 0.0000	3560	7 1 0
Sampling Delay Comp = 0.0 %	3570	7 0 0
Carrier frequency = 601.3 Hz	*3580	7 1 0
Auto	4	5 0 0
Speed profile	4000	5 0 0
Entry point = 0.0 %	4010	5 0 0
Exit point = 100.0 %	*4020	5 0 0
Entry speed = 48.0 %	*4030	5 0 0
Exit speed = 98.3 %	*4040	5 0 0
Auto off = 0.0 %	4050	5 0 0
Delay off = 0.5 sec	4060	5 0 0
Auto on = 0.0 %	4070	5 0 0
Delay on = 0.5 sec	4080	5 0 0
Analog inputs	4090	5 0 0
Analog input #1	4100	5 0 0
Source = Int AI1	*4105	5 1 0
Type = 4 - 20ma	4110	5 1 0
Min input = 0.0 %	4120	5 1 0
Max input = 100.0 %	4130	5 1 0
Loss point threshold = 15.0 %	4140	5 1 0
Loss of signal action = Preset	4150	5 1 0
Loss of signal setpoint = 20.0 %	4160	5 0 0
Analog input #2	4170	5 0 0
Source = Off	4175	5 0 0
Type = 4 - 20ma	4180	5 1 0
Min input = 0.0 %	4190	5 1 0
Max input = 100.0 %	4200	5 1 0
Loss point threshold = 15.0 %	4210	5 1 0
Loss of signal action = Preset	4220	5 1 0
Loss of signal setpoint = 20.0 %	4230	5 0 0
Analog input #3	4232	5 0 0
Source = Off	4233	5 1 0
Type = 4 - 20ma	4234	5 1 0
Min input = 0.0 %	4235	5 1 0
Max input = 100.0 %	4236	5 1 0
Loss point threshold = 15.0 %	4237	5 1 0
Loss of signal action = Preset	4238	5 1 0
Loss of signal setpoint = 20.0 %	4239	5 0 0
Analog input #4	4332	5 0 0

Description	ID	Lvl	RH
Source = Off	4333	5	1 0
Type = 4 - 20ma	4334	5	1 0
Min input = 0.0 %	4335	5	1 0
Max input = 100.0 %	4336	5	1 0
Loss point threshold = 15.0 %	4337	5	1 0
Loss of signal action = Preset	4338	5	1 0
Loss of signal setpoint = 20.0 %	4339	5	0 0
Analog input #5	4341	5	0 0
Source = Off	4342	5	1 0
Type = 4 - 20ma	4343	5	1 0
Min input = 0.0 %	4344	5	1 0
Max input = 100.0 %	4345	5	1 0
Loss point threshold = 15.0 %	4346	5	1 0
Loss of signal action = Preset	4347	5	1 0
Loss of signal setpoint = 20.0 %	4348	5	0 0
Auxillary input #1	4500	5	0 0
Source = Off	4510	5	1 0
Type = 4 - 20ma	4520	5	1 0
Min input = 0.0 %	4530	5	1 0
Max input = 100.0 %	4540	5	1 0
Loss point threshold = 15.0 %	4550	5	1 0
Loss of signal action = Preset	4560	5	1 0
Loss of signal setpoint = 20.0 %	4570	5	0 0
Auxillary input #2	4580	5	0 0
Source = Off	4590	5	1 0
Type = 4 - 20ma	4600	5	1 0
Min input = 0.0 %	4610	5	1 0
Max input = 100.0 %	4620	5	1 0
Loss point threshold = 15.0 %	4630	5	1 0
Loss of signal action = Preset	4640	5	1 0
Loss of signal setpoint = 20.0 %	4650	5	0 0
Analog outputs	4660	5	0 0
Analog output #1	4661	5	0 0
Analog variable = Average Power	*4662	5	0 0
Output module type = Unip	4663	5	0 0
Full range = 81.0 %	*4664	5	0 0
Analog output #2	4665	5	0 0
Analog variable = Motor Speed	*4666	5	0 0
Output module type = Unip	4667	5	0 0
Full range = 100.0 %	*4668	5	0 0
Speed setpoints	4240	5	0 0
Speed setpoint 1 = 0 rpm	4250	5	0 0
Speed setpoint 2 = 0 rpm	4260	5	0 0
Speed setpoint 3 = 0 rpm	4270	5	0 0
Speed setpoint 4 = 0 rpm	4280	5	0 0
Speed setpoint 5 = 0 rpm	4290	5	0 0
Speed setpoint 6 = 0 rpm	4300	5	0 0
Speed setpoint 7 = 0 rpm	4310	5	0 0
Speed setpoint 8 = 0 rpm	4320	5	0 0

Description	ID	Lvl	RH
Jog speed = 0 rpm	4330	5	0 0
Safety setpoint = 0 rpm	4340	5	0 0
Incremental speed setup	4970	7	0 0
Speed increment 1 = 1.00 %	4971	7	0 0
Speed decrement 1 = 1.00 %	4972	7	0 0
Speed increment 2 = 5.00 %	4973	7	0 0
Speed decrement 2 = 5.00 %	4974	7	0 0
Speed increment 3 = 10.00 %	4975	7	0 0
Speed decrement 3 = 10.00 %	4976	7	0 0
PID select	4350	5	0 0
Prop gain = 0.390	4360	5	0 0
Integral gain = 0.390	4370	5	0 0
Diff gain = 0.000	4380	5	0 0
Min clamp = 0.0 %	4390	5	0 0
Max clamp = 100.0 %	4400	5	0 0
Setpoint = 0.0 %	4410	5	0 0
Comparator setup	4800	5	0 0
Comparator 1 setup	4810	5	0 0
Comp 1 A in variable = Mtr Spd	*4811	5	1 0
Comp 1 B in variable = Manual value	4812	5	1 0
Comp 1 manual value = 2.500 %	*4813	5	0 0
Compare 1 type = Mag	*4815	5	1 0
Comparator 2 setup	4820	5	0 0
Comp 2 A in variable = Manual value	4821	5	1 0
Comp 2 B in variable = Manual value	4822	5	1 0
Comp 2 manual value = 0.000 %	4823	5	0 0
Compare 2 type = Off	4825	5	1 0
Comparator 3 setup	4830	5	0 0
Comp 3 A in variable = Manual value	4831	5	1 0
Comp 3 B in variable = Manual value	4832	5	1 0
Comp 3 manual value = 0.000 %	4833	5	0 0
Compare 3 type = Off	4835	5	1 0
Comparator 4 setup	4840	5	0 0
Comp 4 A in variable = Manual value	4841	5	1 0
Comp 4 B in variable = Manual value	4842	5	1 0
Comp 4 manual value = 0.000 %	4843	5	0 0
Compare 4 type = Off	4845	5	1 0
Comparator 5 setup	4850	5	0 0
Comp 5 A in variable = Manual value	4851	5	1 0
Comp 5 B in variable = Manual value	4852	5	1 0
Comp 5 manual value = 0.000 %	4853	5	0 0
Compare 5 type = Off	4855	5	1 0
Comparator 6 setup	4860	5	0 0
Comp 6 A in variable = Manual value	4861	5	1 0
Comp 6 B in variable = Manual value	4862	5	1 0
Comp 6 manual value = 0.000 %	4863	5	0 0
Compare 6 type = Off	4865	5	1 0

Description	ID	Lvl	RH
Comparator 7 setup	4870	5	0 0
Comp 7 A in variable = Manual value	4871	5	1 0
Comp 7 B in variable = Manual value	4872	5	1 0
Comp 7 manual value = 0.000 %	4873	5	0 0
Compare 7 type = Off	4875	5	1 0
Comparator 8 setup	4880	5	0 0
Comp 8 A in variable = Manual value	4881	5	1 0
Comp 8 B in variable = Manual value	4882	5	1 0
Comp 8 manual value = 0.000 %	4883	5	0 0
Compare 8 type = Off	4885	5	1 0
Comparator 9 setup	4890	5	0 0
Comp 9 A in variable = Manual value	4891	5	1 0
Comp 9 B in variable = Manual value	4892	5	1 0
Comp 9 manual value = 0.000 %	4893	5	0 0
Compare 9 type = Off	4895	5	1 0
Comparator 10 setup	4900	5	0 0
Comp 10 A in variable = Manual value	4901	5	1 0
Comp 10 B in variable = Manual value	4902	5	1 0
Comp 10 manual value = 0.000 %	4903	5	0 0
Compare 10 type = Off	4905	5	1 0
Comparator 11 setup	4910	5	0 0
Comp 11 A in variable = Manual value	4911	5	1 0
Comp 11 B in variable = Manual value	4912	5	1 0
Comp 11 manual value = 0.000 %	4913	5	0 0
Compare 11 type = Off	4915	5	1 0
Comparator 12 setup	4920	5	0 0
Comp 12 A in variable = Manual value	4921	5	1 0
Comp 12 B in variable = Manual value	4922	5	1 0
Comp 12 manual value = 0.000 %	4923	5	0 0
Compare 12 type = Off	4925	5	1 0
Comparator 13 setup	4930	5	0 0
Comp 13 A in variable = Manual value	4931	5	1 0
Comp 13 B in variable = Manual value	4932	5	1 0
Comp 13 manual value = 0.000 %	4933	5	0 0
Compare 13 type = Off	4935	5	1 0
Comparator 14 setup	4940	5	0 0
Comp 14 A in variable = Manual value	4941	5	1 0
Comp 14 B in variable = Manual value	4942	5	1 0
Comp 14 manual value = 0.000 %	4943	5	0 0
Compare 14 type = Off	4945	5	1 0
Comparator 15 setup	4950	5	0 0
Comp 15 A in variable = Manual value	4951	5	1 0
Comp 15 B in variable = Manual value	4952	5	1 0
Comp 15 manual value = 0.000 %	4953	5	0 0
Compare 15 type = Off	4955	5	1 0
Comparator 16 setup	4960	5	0 0

Description	ID	Lvl	RH
Comp 16 A in variable = Manual value	4961	5	1 0
Comp 16 B in variable = Manual value	4962	5	1 0
Comp 16 manual value = 0.000 %	4963	5	0 0
Compare 16 type = Off	4965	5	1 0
Comparator 17 setup	4411	5	0 0
Comp 17 A in variable = Manual value	4412	5	1 0
Comp 17 B in variable = Manual value	4413	5	1 0
Comp 17 manual value = 0.000 %	4414	5	0 0
Compare 17 type = Off	4416	5	1 0
Comparator 18 setup	4417	5	0 0
Comp 18 A in variable = Manual value	4418	5	1 0
Comp 18 B in variable = Manual value	4419	5	1 0
Comp 18 manual value = 0.000 %	4420	5	0 0
Compare 18 type = Off	4422	5	1 0
Comparator 19 setup	4423	5	0 0
Comp 19 A in variable = Manual value	4424	5	1 0
Comp 19 B in variable = Manual value	4425	5	1 0
Comp 19 manual value = 0.000 %	4426	5	0 0
Compare 19 type = Off	4428	5	1 0
Comparator 20 setup	4429	5	0 0
Comp 20 A in variable = Manual value	4430	5	1 0
Comp 20 B in variable = Manual value	4431	5	1 0
Comp 20 manual value = 0.000 %	4432	5	0 0
Compare 20 type = Off	4434	5	1 0
Comparator 21 setup	4435	5	0 0
Comp 21 A in variable = Manual value	4436	5	1 0
Comp 21 B in variable = Manual value	4437	5	1 0
Comp 21 manual value = 0.000 %	4438	5	0 0
Compare 21 type = Off	4440	5	1 0
Comparator 22 setup	4441	5	0 0
Comp 22 A in variable = Manual value	4442	5	1 0
Comp 22 B in variable = Manual value	4443	5	1 0
Comp 22 manual value = 0.000 %	4444	5	0 0
Compare 22 type = Off	4446	5	1 0
Comparator 23 setup	4447	5	0 0
Comp 23 A in variable = Manual value	4448	5	1 0
Comp 23 B in variable = Manual value	4449	5	1 0
Comp 23 manual value = 0.000 %	4450	5	0 0
Compare 23 type = Off	4452	5	1 0
Comparator 24 setup	4453	5	0 0
Comp 24 A in variable = Manual value	4454	5	1 0
Comp 24 B in variable = Manual value	4455	5	1 0
Comp 24 manual value = 0.000 %	4456	5	0 0
Compare 24 type = Off	4458	5	1 0
Comparator 25 setup	4459	5	0 0
Comp 25 A in variable = Manual value	4460	5	1 0

Description	ID	Lvl	RH
Comp 25 B in variable = Manual value	4461	5	1 0
Comp 25 manual value = 0.000 %	4462	5	0 0
Compare 25 type = Off	4464	5	1 0
Comparator 26 setup	4465	5	0 0
Comp 26 A in variable = Manual value	4466	5	1 0
Comp 26 B in variable = Manual value	4467	5	1 0
Comp 26 manual value = 0.000 %	4468	5	0 0
Compare 26 type = Off	4470	5	1 0
Comparator 27 setup	4471	5	0 0
Comp 27 A in variable = Manual value	4472	5	1 0
Comp 27 B in variable = Manual value	4473	5	1 0
Comp 27 manual value = 0.000 %	4474	5	0 0
Compare 27 type = Off	4476	5	1 0
Comparator 28 setup	4477	5	0 0
Comp 28 A in variable = Manual value	4478	5	1 0
Comp 28 B in variable = Manual value	4479	5	1 0
Comp 28 manual value = 0.000 %	4480	5	0 0
Compare 28 type = Off	4482	5	1 0
Comparator 29 setup	4483	5	0 0
Comp 29 A in variable = Manual value	4484	5	1 0
Comp 29 B in variable = Manual value	4485	5	1 0
Comp 29 manual value = 0.000 %	4486	5	0 0
Compare 29 type = Off	4488	5	1 0
Comparator 30 setup	4489	5	0 0
Comp 30 A in variable = Manual value	4490	5	1 0
Comp 30 B in variable = Manual value	4491	5	1 0
Comp 30 manual value = 0.000 %	4492	5	0 0
Compare 30 type = Off	4494	5	1 0
Comparator 31 setup	4496	5	0 0
Comp 31 A in variable = Manual value	4497	5	1 0
Comp 31 B in variable = Manual value	4498	5	1 0
Comp 31 manual value = 0.000 %	4499	5	0 0
Compare 31 type = Off	4501	5	1 0
Comparator 32 setup	4502	5	0 0
Comp 32 A in variable = Manual value	4503	5	1 0
Comp 32 B in variable = Manual value	4504	5	1 0
Comp 32 manual value = 0.000 %	4505	5	0 0
Compare 32 type = Off	4507	5	1 0
Logs	6	0	0 0
Historic log	6250	0	0 0
Store in Event Log = On	6255	7	0 0
Historic log variable 1 = Mtr Speed	*6260	5	0 0
Historic log variable 2 = Spd Dmd	6270	5	0 0
Historic log variable 3 = Trq I Cmd	*6280	5	0 0
Historic log variable 4 = Trq I Fdbk	*6290	5	0 0
Historic log variable 5 = I Total Out	*6300	5	0 0
Historic log variable 6 = V Avail	*6310	5	0 0

Description	ID	Lvl RH
Historic log variable 7 = V Avail RMS	*6320	5 0 0
Drive protect	7	0 0 0
Input protection	7000	0 0 0
Single phasing	7010	0 0 0
SPD prop gain = 0.0	7020	7 0 0
SPD integral gain = 0.0010	7030	7 0 0
SPD threshold = 50.0 %	7040	7 0 0
Undervoltage prop gain = 0.0	7060	7 0 0
Undervoltage integ gain = 0.001	7070	7 0 0
1 Cyc Protect integ gain = 0.0025	7080	7 0 0
1 Cycle Protect Limit = 50.0 %	7081	7 0 0
Excess Loss Idle = 5.0 %	7084	7 0 0
Excess Loss Running = 7.0 %	7086	7 0 0
Xformer tap setting = +5 %	*7050	7 1 0
Xformer thermal gain = 0.0133	7090	7 0 0
Xformer protection const = 0.500	7100	7 0 0
Phase Imbalance Limit = 40.0 %	7105	7 0 0
Ground Fault Limit = 40.0 %	7106	7 0 0
Ground Fault Time Const = 0.200 sec	7107	7 0 0
Drive IOC setpoint = 150.0 %	7110	7 0 0
Cell Overload Level = 100.0 %	7112	7 0 0
Auto reset enable = No	7120	7 0 0
Auto reset time = 1 sec	7130	5 0 0
Auto reset attempts = 4	7140	5 0 0
Auto reset memory time = 10 sec	7150	5 0 0
Meter	8	0 0 0
Display params	8000	0 0 0
Status variable 1 = DEMD	8001	0 0 0
Status variable 2 = RPM	8002	0 0 0
Status variable 3 = ITOT	*8003	0 0 0
Status variable 4 = KWO	*8004	0 0 0
Status variable 5 = VAVI	*8005	0 0 0
Status variable 6 = VLTS	*8006	0 0 0
Status variable 7 = IMRF	8007	0 0 0
Input harmonics	8140	0 0 0
Selection for HA = IA	8150	0 0 0
Harmonics order = 1.0	8160	0 0 0
Harmonics integral gain = 0.001	8170	0 0 0
Customer order = 2133943	*8101	0 0 0
Customer drive = 1	8110	0 0 0
Communications	9	0 0 0
Serial port setup	9010	0 0 0
Serial port use = Local	9020	5 1 0
Flow Control = Xon/Xoff	9030	5 1 0
Baud rate = 9600	9040	5 1 0
Network Control	9943	7 0 0
Net Control Type = Sop	9944	7 1 0

Description	ID	Lvl	RH
Start Stop Control = Maintained	9945	7	1 0
Network 1 Configure	9900	7	0 0
Network 1 Type = None	9901	7	1 0
Network 2 Configure	9914	7	0 0
Network 2 Type = None	9915	7	0 0
SOP & serial functions	9110	0	0 0
Menu based Timer setup	9111	7	0 0
MenuTimer1 = 30.0 sec	*9112	7	0 0
MenuTimer2 = 0.0 sec	9113	7	0 0
MenuTimer3 = 0.0 sec	9114	7	0 0
MenuTimer4 = 10.0 sec	*9115	7	0 0
MenuTimer5 = 0.0 sec	9116	7	0 0
MenuTimer6 = 0.0 sec	9117	7	0 0
MenuTimer7 = 0.0 sec	9118	7	0 0
MenuTimer8 = 0.0 sec	9119	7	0 0
MenuTimer9 = 0.0 sec	9121	7	0 0
MenuTimer10 = 0.0 sec	9122	7	0 0
MenuTimer11 = 0.0 sec	9123	7	0 0
MenuTimer12 = 0.0 sec	9124	7	0 0
MenuTimer13 = 0.0 sec	9125	7	0 0
MenuTimer14 = 0.0 sec	9126	7	0 0
MenuTimer15 = 0.0 sec	9127	7	0 0
MenuTimer16 = 0.0 sec	9128	7	0 0
Select system program = 2168985F.HEX	*9146	7	1 0
Multiple config files = OFF	9185	5	1 0
TCP/IP server name = 172.17.20.16	*9000	0	0 0
Graphing	10	0	0 0
Time scale = 10.00 sec	10000	0	0 0
Variable 1	10010	0	0 0
Graph variable = Spd ref	10020	0	0 0
Offset = 0.00	10030	0	0 0
Scale factor = 1.20	10040	0	0 0
Variable 2	10050	0	0 0
Graph variable = Mtr speed	10060	0	0 0
Offset = 0.00	10070	0	0 0
Scale factor = 1.20	10080	0	0 0
Variable 3	10090	0	0 0
Graph variable = Flux ref	10100	0	0 0
Offset = 0.00	10110	0	0 0
Scale factor = 1.25	10120	0	0 0
Variable 4	10130	0	0 0
Graph variable = Flux DS	10140	0	0 0
Offset = 0.00	10150	0	0 0
Scale factor = 1.25	10160	0	0 0
Variable 5	10170	0	0 0

Description	ID	Lvl RH
Graph variable = Ids ref	10180	0 0 0
Offset = 0.00	10190	0 0 0
Scale factor = 1.00	10200	0 0 0
Variable 6	10210	0 0 0
Graph variable = Ids	10220	0 0 0
Offset = 0.00	10230	0 0 0
Scale factor = 1.00	10240	0 0 0
Variable 7	10250	0 0 0
Graph variable = Iqs ref	10260	0 0 0
Offset = 0.00	10270	0 0 0
Scale factor = 1.00	10280	0 0 0
Variable 8	10290	0 0 0
Graph variable = Iqs	10300	0 0 0
Offset = 0.00	10310	0 0 0
Scale factor = 1.00	10320	0 0 0
Variable 9	10330	0 0 0
Graph variable = Drv State	10340	0 0 0
Offset = 0.00	10350	0 0 0
Scale factor = 1.00	10360	0 0 0
Variable 10	10370	0 0 0
Graph variable = PreChrg St	10380	0 0 0
Offset = 0.00	10390	0 0 0
Scale factor = 1.00	10400	0 0 0
Select language = English	5081	0 0 0

1) 0110-SR11 Variable Speed Drive System

E. Ventilation System Data

Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

FAN DATA FOR MODEL AP0804GP6/20

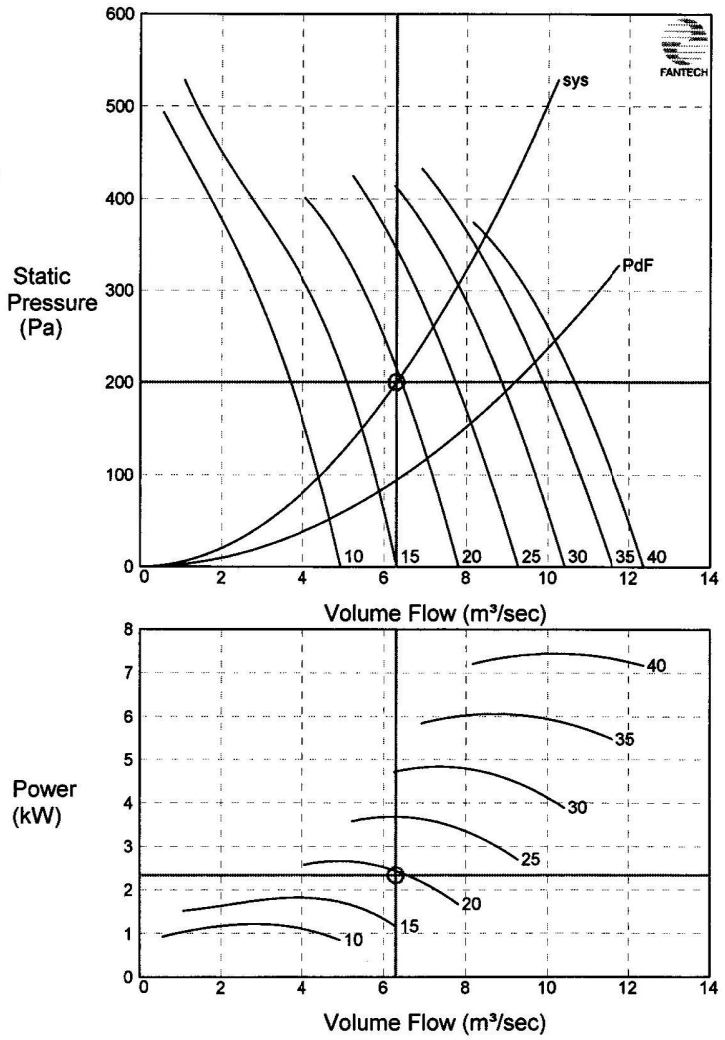
Fan Code: **AP0804GP6/20**

Requirements

Volume:	6300 L/s
Static Pressure:	200 Pa
Selection Pressure:	200 Pa at std conditions
Installation Category:	TYPE D
Temperature:	20 deg C
Altitude:	0 m

Fan Data (at STP)

Type:	In-line direct drive axial fan
Diameter:	800
Hub:	255 mm
Impeller Blades:	6
Pitch:	20 degrees
Blade Material:	GRP
Speed:	24 revs/sec
Absorbed Power:	2.34 kW
Peak Power:	2.59 kW
Total Efficiency:	79 %
Fan Weight:	84.3 kg.



Motor Data (at STP)

Motor Type:	Standard
Electrical Supply:	415V/3ph/50Hz
Motor Frame/Power:	D100L / 3.00 kW
Current FLC/Start:	6.2A / 37.2
Motor Speed:	Single Speed (4 Pole)

Energy Efficiency, BCA Volume 1 2008, Table J5.2 compliant selection

Density: 1.2 kg/m³

Inlet PWL

Spectrum (Hz)	63	125	250	500	1K	2K	4K	8K	dBW	dBA @ 3m
Outlet PWL (dB)	92	86	86	84	85	81	77	73	95	68
Inlet PWL (dB)	90	86	87	85	85	81	78	73	94	69

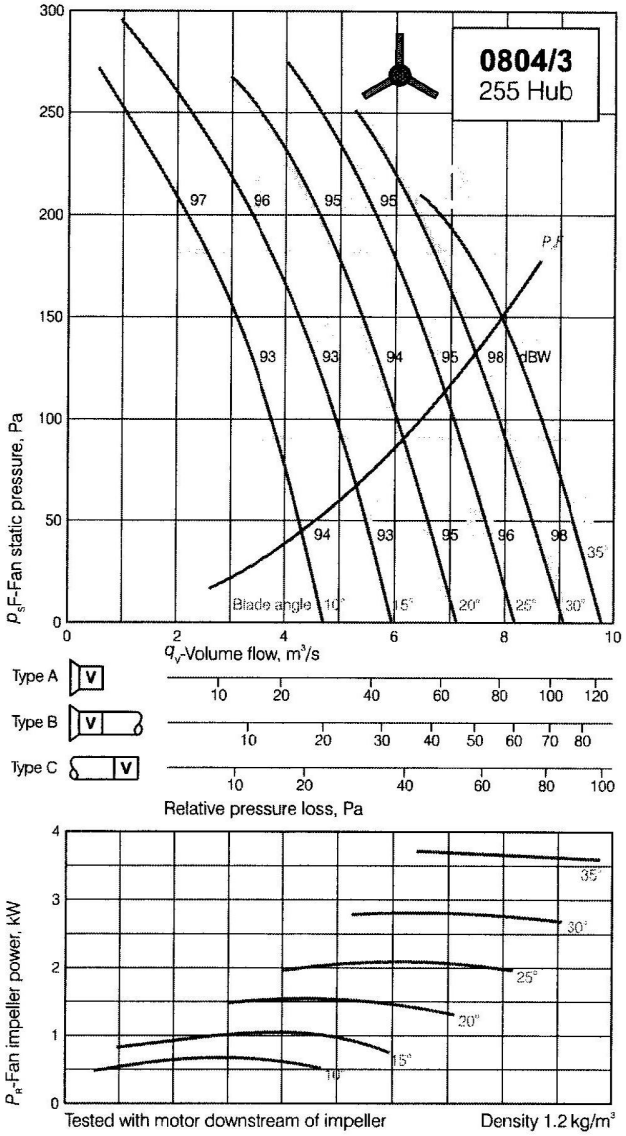
Note: Levels are quoted as in-duct values.

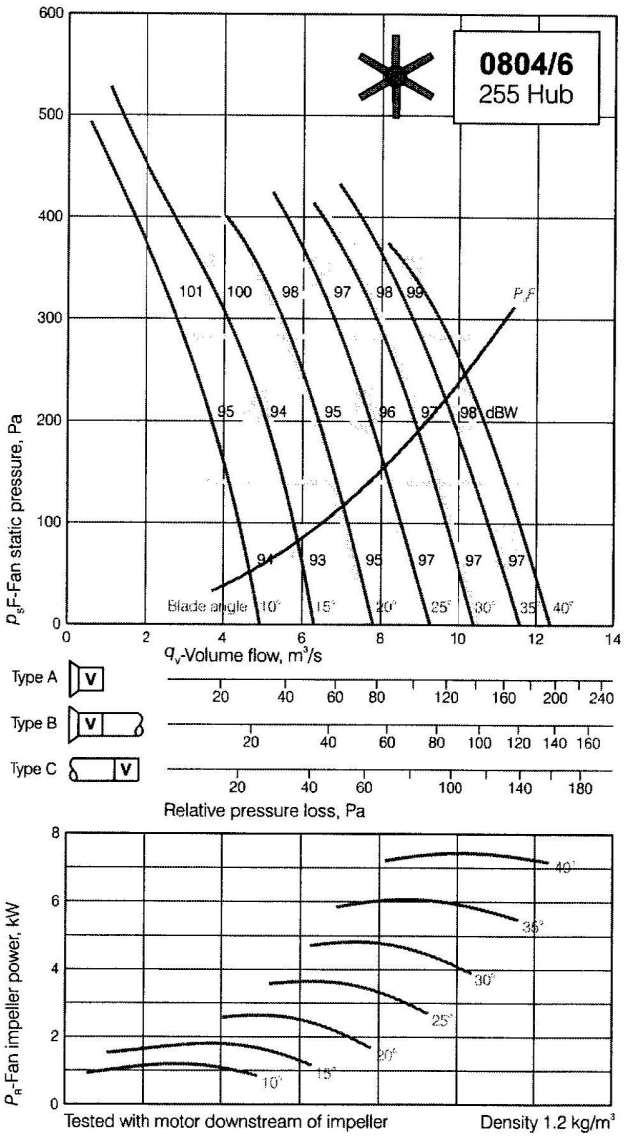
Version 4.20: On-going product improvements may result in fan data changes without notice.

Size **800**
24 rev/sec

AXIAL FLOW FANS PERFORMANCE DATA

BS848:Part 1, 1980
Part 2 1985
Type D Installation





SOUND DATA

Zone	In-Duct dB	Total	In-Duct Spectrum Corrections, dB 63	125	250	500	1k	2k	4k	8k	dB(A)
	Inlet	1	6	10	8	6	8	13	18	24	4
	Outlet	0	4	11	10	7	10	15	19	24	6
	Inlet	+1	2	9	12	11	12	16	19	22	8
	Outlet	0	2	8	10	12	12	16	18	20	8
	Inlet		Not Required								
	Outlet										
	Inlet	1	3	10	11	10	11	13	16	22	6
	Outlet	0	1	10	13	12	13	15	18	22	8
	Inlet	0	2	9	11	9	10	15	18	23	6
	Outlet	0	3	9	10	10	12	15	18	21	7
	Inlet	+1	3	9	12	10	12	16	19	22	7
	Outlet	0	3	9	11	10	11	15	17	19	7
	Inlet	1	2	10	11	10	10	13	15	21	6
	Outlet	0	2	11	12	12	12	14	17	22	7
	Inlet	0	2	9	11	10	12	15	19	24	7
	Outlet	0	3	9	11	11	12	16	19	23	8
	Inlet	+2	2	9	13	11	12	17	20	23	8
	Outlet	0	2	8	11	10	11	15	18	19	7

For Free Field conditions apply the following corrections to the In-Duct figures.
All figures are negative unless otherwise stated.

	In/Out	O/A	7	3	1	0	0	0	0	0	O/A

SOUND DATA

Zone	In-Duct dB	Total	In-Duct Spectrum Corrections, dB 63	125	250	500	1k	2k	4k	8k	dB(A)
	Inlet	1	9	9	6	4	8	14	20	26	3
	Outlet	0	6	9	7	7	10	16	21	27	6
	Inlet	0	4	9	8	9	10	13	17	22	6
	Outlet	0	4	8	8	10	10	14	16	21	6
	Inlet	0	4	9	9	8	10	13	17	21	5
	Outlet	0	3	9	9	9	10	13	16	19	5
	Inlet	0	6	11	8	9	8	11	14	20	4
	Outlet	0	4	10	8	9	9	12	15	20	5
	Inlet	1	4	8	7	9	9	13	16	21	5
	Outlet	0	3	9	9	11	10	14	18	22	6
	Inlet	+1	3	9	9	10	11	15	18	22	7
	Outlet	0	3	8	8	9	11	14	17	19	6
	Inlet	+1	5	9	7	8	8	11	13	20	4
	Outlet	0	5	9	7	8	8	11	13	19	4
	Inlet	1	4	8	8	9	9	13	16	21	5
	Outlet	0	4	9	8	11	11	14	18	22	7
	Inlet	0	9	7	9	6	8	12	16	20	4
	Outlet	0	8	6	9	8	9	12	15	18	4

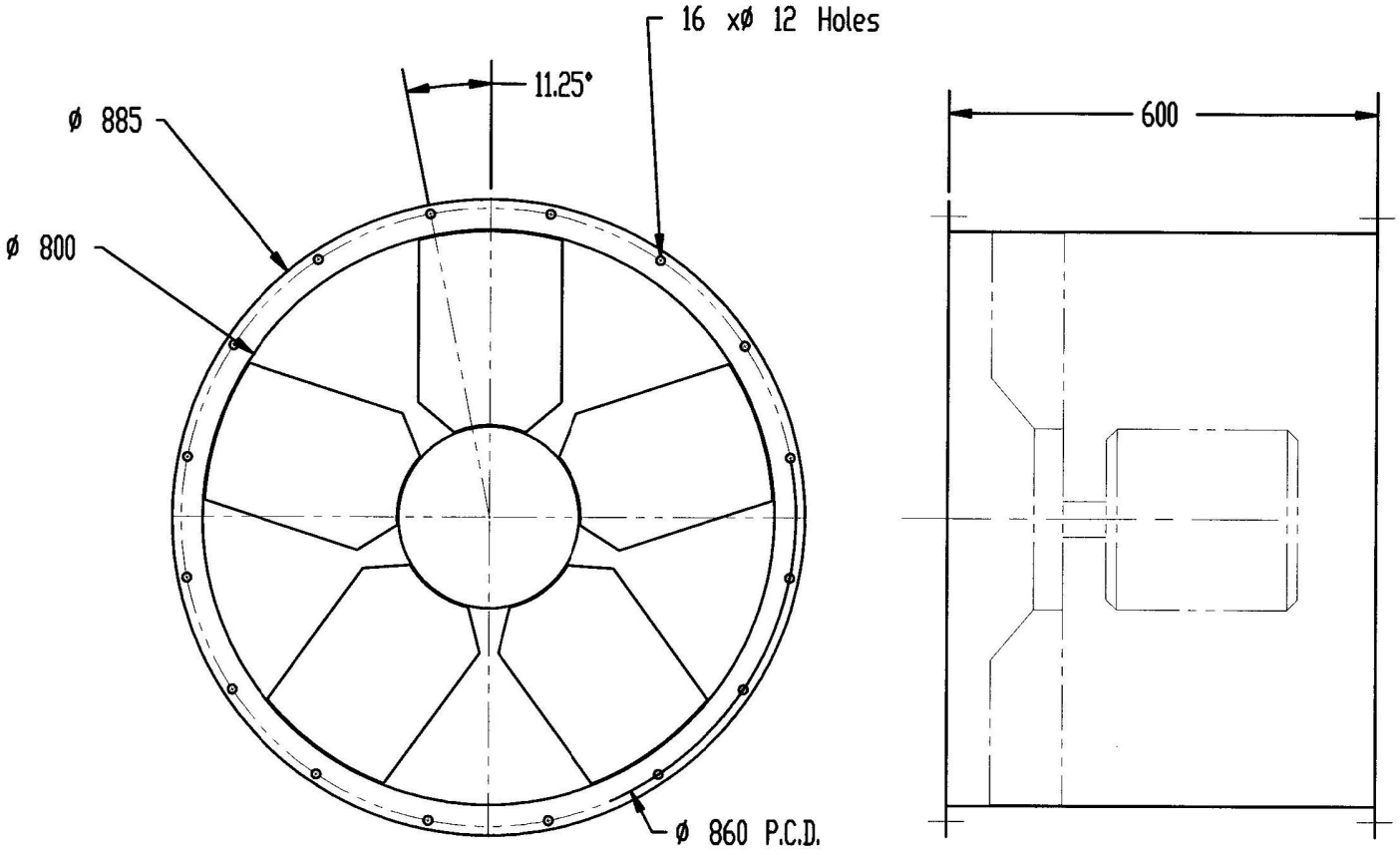
For Free Field conditions apply the following corrections to the In-Duct figures.
All figures are negative unless otherwise stated.

	In/Out	O/A	7	3	1	0	0	0	0	0	O/A

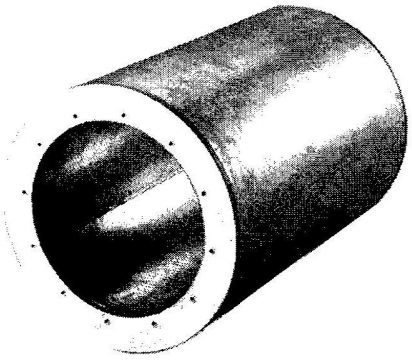
Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

DRAWING FOR MODEL AP0804GP6/20

Version 4.20: On-going product improvements may result in dimensional changes without notice.



CIRCULAR DUCT ATTENUATORS



FEATURES

These notes apply to both the open and pod type attenuators.

Construction

The units are rigidly constructed and consist of an outer cylindrical galvanised steel casing, lined internally with non-hygroscopic and incombustible sound-absorbent material. This material is retained by an inner perforated metal cylinder.

When a pod is fitted it is of perforated metal, retaining an infill of acoustic material.

An impervious lining of the acoustic infill can be provided to prevent the ingress of moisture or grease. There is a small performance penalty in high frequencies when an impervious lining is fitted. Refer to our Sales Engineers if more information is required.

Also available is the Q-Seal range which offers impervious lining with features to optimise acoustic performance.

The ends of the attenuators are drilled and tapped to match the Fantech 'AP' series of axial flow fans.

Non-standard flange drillings or sizes can be supplied to the customer's specifications.

Insertion Loss

The values quoted in the table represent the difference between the sound power level (L_W) of a fan and attenuator combination and that of the fan alone.

(continued next page)

PERFORMANCE DATA - OPEN TYPE

Matching Fan Dia. cm	Length mm	Static Insertion Loss, dB Octave Band Centre Frequency (Hz) 63	125	250	500	1k	2k	4k	8k
C1-Dia. 1 Diameter Long (nom.)									
-031	300	1	3	5	9	13	10	8	7
-035	300	2	3	5	9	13	10	8	7
-040	600	2	3	5	9	13	10	8	7
-045	600	2	3	5	10	13	10	8	7
-050	600	2	3	6	10	14	10	8	7
-056	600	2	4	6	10	14	10	8	7
-063	600	3	4	7	13	14	9	8	6
-071	900	3	4	8	14	14	9	7	6
-080	900	3	4	8	14	13	9	7	6
-090	1150	3	4	9	14	13	8	7	6
-100	1150	3	4	9	14	12	8	7	6
-125	1150	3	4	10	14	12	8	6	6
-140	1150	3	5	10	13	11	8	5	5
-160	1800	4	6	11	13	10	7	5	5
-180	1800	4	6	11	13	10	6	5	5
-200	1800	4	6	11	13	9	6	5	5
C2-Dia. 2 Diameters Long (nom.)									
-031	600	3	6	9	15	21	17	14	13
-035	600	4	6	10	15	21	17	14	13
-040	900	4	6	10	16	21	18	15	13
-045	900	4	7	10	17	21	18	15	13
-050	1150	4	7	10	18	21	17	15	12
-056	1150	5	7	11	18	21	17	15	12
-063	1150	5	8	11	21	23	17	15	10
-071	1500	5	8	12	22	23	16	15	10
-080	1500	5	8	12	22	23	16	15	10
-090	1800	5	8	13	22	19	13	12	10
-100	1800	6	8	13	22	19	13	12	10
-125	2400	6	8	13	21	18	13	12	11
-140	2400	7	9	15	21	18	11	11	10
-160	3600	8	9	15	20	17	11	9	8
-180	3600	8	9	15	20	17	10	9	8
-200	3600	8	9	15	20	17	10	9	8

HOW TO ORDER - OPEN TYPE

C [ ] - [ ] [ ]

C - circular

1 - 1D long nominal
2 - 2D long nominal

Diameter in cm

Variations to standard
QS - Q-Seal Impervious lining (refer page *H-4/5*)
A - aluminium construction
S - stainless steel construction
E - epoxy coating

(Default is standard construction)

Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

Technical Data for Silencer Model C1-080

Location: ATT-2

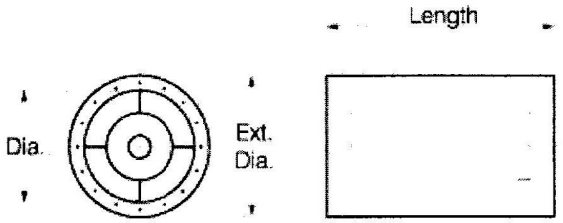
Designation:

Performance - Required / Actual

Air Flow:	6.30 m³/s	Velocity :	12.5 m/s
Pressure Drop:	60 Pa	Pressure Drop:	2 Pa

Silencer Data

Catalogue Code:	C1-080
Description:	Circular 1D Open
Diameter:	800 mm
Ext. Diameter:	977mm
Length:	900 mm
Weight:	55.0 kg



Sound Data

Spectrum (Hz) :	63	125	250	500	1K	2K	4K	8K
Insertion Loss (dB) :	3	4	8	14	13	9	7	6

1) 0110-SR11 Variable Speed Drive System

F. Ventilation System Airflow and Sound Levels report

Air Equipment (Sales) Pty Ltd

david@airequip.com.au ABN 67 650 093 954

2 / 36 Randall Street Slacks Creek 4127 **Phone: (07) 3209 4201**
PO Box 542 Springwood Qld 4127 **Facsimile: (07) 3209 4204**

Friday, 28 February 2014

J. & P. Richardson Industries Pty Ltd
114 Campbell Street
Wacol QLD

Attention: Chris Anderson
Reference: **Urban Utilities Eagle Farm Pump Station-VSD Drive Cabinet 0110-SR11 Verification of Airflow and Sound level Measurements**

Required Airflow: Transformer Cabinet: 3000l/s
Cell Cabinet: 3200l/s
Total: 6200l/s

Equipment Used:
NATA Certified Vane Anemometer – Certificate No: WT109572
NATA Certified Lutron Sound Level Meter – Certificate No: SLM 39486
Magnehelic Gauge- Fitted to duct work

Airflow readings were taken at the filtered intake grilles on the transformer and cell cabinets with the booster fan VSD set 1180rpm as follows

Transformer Cabinet Intakes:	No 1: 575l/s	No 2: 485l/s	No 3: 485l/s
	No 4: 555l/s	No 5: 395l/s	No 6: 420l/s
	Total: 2915l/s		
Cell Cabinet Intakes:	No 1: 730l/s	No 2: 675l/s	No 3: 715l/s
	No 4: 715l/s	No 5: 605l/s	No 6: 725l/s
	Total: 4165l/s		

With the booster fan in the off position the following airflow readings were taken using the cabinet fans only

Transformer Cabinet Intakes:	No 1: 490l/s	No 2: 420l/s	No 3: 450l/s
	No 4: 445l/s	No 5: 360l/s	No 6: 375l/s
	Total: 2540l/s		
Cell Cabinet Intakes:	No 1: 675l/s	No 2: 655l/s	No 3: 600l/s
	No 4: 560l/s	No 5: 465l/s	No 6: 625l/s
	Total: 3580l/s		

The magnehelic gauge was fitted to the duct prior to the booster fan. The gauge is to indicate the correct airflow only and at the required airflow reading the gauge was marked at 100Pa

Sound Level Measurements:

Outdoor readings were taken at the boundary directly down for the fan outlet and 1 meter from the outlet face.
The background noise level was 70-75dBA due to the high traffic movement on the main road. A reading of 68.8 dBA 1 meter from the face was registered

Indoor readings were taken with the other two drive units turned off but with the pit pumping motors running. Background noise levels around the pit barrier cage were between 73-75dBA

Readings one meter out from the cabinet were between 70-71dBA but this was mainly from background noise

A reading from the side of the cabinet below the booster fan was 70.8dBA

Hoping the above report is satisfactory and if you have any queries on the information above please do not hesitate to call

Yours faithfully,
Air Equipment (Sales) Pty Ltd.

David Meredith.

1) 0110-SR11 Variable Speed Drive System

G. Spare Part List

SIEMENS

Perfect Harmony VSD Recommended Spare Parts List

VFD SO:	3002133943	VFD SN:	Z831501002460

Location	Part Description	Part Number	Installed	Recommended
Control cabinet	CPU Board	A1A10000623.00M	1	1
	I/O board	A1A10000423.00M	1	1
	Modulator Board	A1A10000350.00M	1	1
	Fiber Optic Hub Board	A1A461D85.00M	1	1
	Backplane	A1A098194	1	1
	Communication Board	A5E03407403	1	1
	CPS Power	A1A0100275	1	1
	Signal Conditioninig Board	A5E01708486	1	1
	Keypad	A5E02363383	1	1
	I/O breakout	A5E01649374	1	1
Blower	Cabinet Blower	LDZ10501601	4	1
Doors	Filter on Transformer Cabinet	LDZ10501351	9	9
	Filter on Cell Cabinet	LDZ10501353	9	9
Cell cabinet	Power cell	LDZ14501002.260	15	1
	CCB Fuse	A1A10000432.30M	15	2
	Power Cell Input Fuse	LDZ10501435	45	3

1) 0110-SR11 Variable Speed Drive System

H. Drawing List

SIEMENS

Perfect Harmony VSD - 0110-SR11

Drawing Register

Drawing Number	Description
	VSD
486/5/7-0368-001	General Arrangement 1
486/5/7-0368-002	General Arrangement 2
486/5/7-0368-003	General Arrangement 3
486/5/7-0368-004	Control and Power Overview
486/5/7-0368-005	Termination
486/5/7-0368-007	Schematic 1
486/5/7-0368-008	Schematic 2
486/5/7-0368-009	Schematic 3
486/5/7-0368-010	Schematic 4
486/5/7-0368-011	Schematic 5
486/5/7-0368-012	Schematic 6
486/5/7-0368-013	Schematic 7
	Field Control and Interface
486/5/7-0368-120	Schematic 1
486/5/7-0368-121	Schematic 2
486/5/7-0368-122	Schematic 3
486/5/7-0368-123	Schematic 4
486/5/7-0368-124	Schematic 5
	Isolator and Earthswitch Cabinet
486/5/7-0368-100	General Arrangement and Schematic
486/5/7-0368-101	Fortress Interlocking System
486/5/7-0368-102	Legend
	Ventilation
486/5/7-0368-112	General Arrangement

1) 0110-SR11 Variable Speed Drive System

I. Factory Acceptance Test (FAT)

SIEMENS
Electrical Drives (Shanghai) Ltd.

GEN III

Factory Acceptance Test

Medium Voltage

Air Cooled

SO - 3002133943
Queensland urban utilities - eagle farm

FAT- A5E32168984 A
REV- AA

P/N- M6SR3
S/N- Z831501002460
MLFB- 6SR3502-6HF42-7BH0-Z

V12+Y06+K69+G22+G28+K73+M42+M38+
M12+M35+L55+L03+K50+T76+D15+D02+D
76+P31

Revision History		
Revision Level	Details	Date
AA	Original	5/15/2013
Tested By		2013.6.5
Approved By	Zhou Liao Lei	2013-6-5

SIEMENS

Customer Name Queensland urban utilities - eagle farm SO 3002133943

P/N M6SR3 S/N Z831501002460 SOP M6SR3 C

Agency Listing ☐ CSA ☐ UL ☐ CE ☐ Other ☑ No Listing

Agency Testing Required ☐ YES ☑ NO

Input Voltage:	6600 V	Output Voltage:	6600 V
Input Current:	214 A	Cell Size:	260 A
XFMR KVA:	2750 KVA	Total # of Cell:	18

Table of Contents

Definitions

R	Routine Test	Test to which each individual device is subjected during or after manufacturer to ascertain whether it complies with certain criteria.
A	Acceptance Test	Contractual test to prove to the customer that the device meets certain conditions of its specification.
O	Option Test	Test additional to type and routine test, determined to be any device or logic added to the drive that is not a pre-engineered option.
W	Witness Test	Any of the above tests performed in the presence of the customer, the user or his representative (Reference STSI-055)

Air Cooled Test Plan

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002460

1.1 Visual Inspection STSI-061G:4.3

Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R		Hardware Check		Emp# 347
	Metering	Pt. To Pt. Wire Check		Emp# 347
		Fiber Optics		Emp# 347
		Ground Wires		Emp# 347
	Measuring	Burden Resistor Value (hall effect)	34.00 Ω,2W, .1%	34.2/34.2 Ω
	Measuring	Input attenuator resistor value	4.8 MΩ	4.77/4.76/4.78 MΩ
	Measuring	Output attenuator resistor value	4.8 MΩ	4.78/4.78/4.77 MΩ
		Set Dip Switch (FR)	Pos. 2 only is "On", all others "Off"	Emp# 347
		Set Dip Switch (P)	Pos. 4 & 5 only are "On", all others "Off"	Emp# 347
		Set Address 1X	1X=1	Emp# 347
		Set Address 10X	10X=0	Emp# 347
		Set Communication Board (JP1 to JP10)	JP1 & JP2 set to 2,3	Emp# 347
			JP3,JP4&JP5 set to1,2	Emp# 347
			JP6 set to 2,3	Emp# 347
			JP7,JP8,JP9&JP10 set to 1,2	Emp# 347
O	Interlocks	Record all Interlock model #'s and keycode #'s for the	K2 – VFD11 - K2	Emp# 347
		Verify correct operation of Interlocks	K3 – VFD11 - K3	Emp# 347
		Ensure hardware and adapter plates are supplied		Emp# 347

1.2 Insulation Test/Hipot STSI-061G:4.4

Test Type	Test Item	Test Procedure	Applied Volt.	Test Criteria (Eng) Pass/Fail(<0.5mA)	Signature/Value
R	MV	Power circuit to GND			Emp# 214
		L1,L2,L3 to GND	28300	25 uA	
		L1 with L2, L3 to GND	28300	15 uA	
		L2 with L1, L3 to GND	28300	7 uA	
		L3 with L1, L2 to GND	28300	11 uA	
		T1,T2,T3 to GND	28850	104 uA	
		T1 with T2, T3 to GND	18500	16 uA	
		T2 with T1, T3 to GND	18500	19 uA	
		T3 with T1, T2 to GND	18500	27 uA	
	LV	Control Power to GND	2500VOM	2000 MΩ	Emp# 347
	Control	120Vac to GND	1000VOM	684 MΩ	Emp# 347
		24Vdc to GND	500VOM	∞	Emp# 347

1.3 Initial Power-Up STSI-061G:4.5

Test Type	Test Item	Test Procedure		Test Criteria (Eng)	Signature/Value
R	Control Power	Control Power Supply			
		CPS,+5VDC(Slot 6 I/O Board Plug P6 Pin 1 to 4)		(5.10 to 5.15Vdc)	5.13 Vdc
		CPS,+12VDC(Slot 6 I/O Board Plug P6 Pin 2 to 4)		(+11.64 to +12.36Vdc)	12.02 Vdc
		CPS,-12VDC(Slot 6 I/O Board Plug P6 Pin 3 to 4)		(-11.64 to -12.36Vdc)	-12.06 Vdc
		CPS, + 15 VDC (SCB Pin 2 to 6)		(+14.55 to +15.45)	15.01 Vdc
		CPS, - 15 VDC (SCB Pin 4 to 6)		(-14.55 to -15.45)	-15.01 Vdc
		CPS,+24VDC(I/O Board J11-11 to J11-9)		(+21.6 to+26.4Vdc)	24.04 Vdc
		CPS,Power Supply Fault			Emp# 214
		Encoder Power Supply, +15 VDC (IOB board J7-5 to J7-		(+14.25 to +15.75)	Emp# 15.11 Vdc
		T5 (secondary:X1-X4)		(114 to 126Vac)	114 Vac
		Software Version #		Latest Version	Vers.: 5.2.2
		Establish Wago Communications			Emp# 214
	Parameters Configuration	Set correct # of			
		Analog Outputs	ID 2820	2	
		Set correct Drive Parameters			Emp# 214
		Input Voltage	ID 2010	6600 V	
		Input Current	ID 2020	214 A	
		Output Voltage	ID 2030	6600 V	
		Output Current (equal to 'Cell Rating')	ID 2040	260 A	
		Control Loop Type	ID 2050	OLTM	
		Spinning Load Mode	ID 2430	Off	
		Installed Cells/ Phase	ID 2530	6	
		Cell Voltage	ID 2550	630 V	
		Bypass Type	ID 2590	None	
		Neutral Connection	ID 2630	T1	
		Input CT Ratio	ID 3035	250 :5	
		Tap Setting (+5% typical)	ID 7050	+5%	

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002460

1.3 Initial Power-Up[continued]				STSI-061G:4.5
Test Type	**Test Item**	**Test Procedure**	**Test Criteria (Eng)**	**Signature/Value**
R	Parameters Configuration	Set correct Drive Parameters (con't)		
		MenuTimer1 ID 9112	30 S	214
		MenuTimer4 ID 9115	10 S	214
		Program Clock ID 8080		Emp# 214
		Program SO ID 8101	2133943	Emp# 214
		Program Drive Number ID 8110		Emp# 214
		Download SOP	M6SR3C	Emp# 214
		Ethernet Connection Verified		Emp# 214
R	MODBUS	Connect computer to MODBUS port Open MODBUS program and verify communication	Receiving data from Drive	Emp# 214
O	Space Heater Control	1. Verify VFD space heater relay CR4 energized 60s after control voltage is swtiched on.	Verify Functionality	Emp# 214
		2. Adjust thermostat(TST1) setting to more than ambient temperature and verify HTR1are heater up.Reset TST1 to less than ambient temperature and verify HTR1 are off.		
		3. Adjust thermostat(TST2) setting to more than ambient temperature and verify HTR2 & HTR3 are heater up. Reset TST2 to less than ambient temperature and verify HTR2 & HTR3 are off.		Emp# 214
		4. Verify VFD space heater relay CR4 released after medium voltage is energized.		Emp# 214
		5. Verify Motor Heater Relay BM5 energize 60s after drive is not running.		Emp# 214
R		Check Blower Rotation	Verify Rotation	Emp# 347
	Blower 1 Op. XFMR Cab.	Set CB1 equal to 1.2*TBLW1 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.55 A Ib= 1.55 A Ic= 1.56 A	Emp# 347
	Blower 2 Op. XFMR Cab.	Set CB2 equal to 1.2*TBLW2 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.53 A Ib= 1.54 A Ic= 1.53 A	Emp# 347
	Blower 1 Op. CELL Cab.	Set CB3 equal to 1.2*CBLW1 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.49 A Ib= 1.53 A Ic= 1.48 A	Emp# 347
	Blower 2 Op. CELL Cab.	Set CB4 equal to 1.2*CBLW2 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.59 A Ib= 1.60 A Ic= 1.61 A	Emp# 347

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002460

1.4 System Test Without Motor				STSI-061G:4.6
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
O	Electrical Door Interlocks	Open a door to cause DIS1 open and verify that Drive trip message "TRIP - MV DOOR OPENED" displayed and check "INPUT MV BREAKER ENABLE" contact on TB2-43 & 44, 45 & 46 change state. Repeat the test for remaining of electrical door interlock switched DIS2~ DIS5.	TB2-43 & 44 Closed and TB2-45 & 46 Open when a door open	Emp# 347 Emp# 347
R	Backfeed Modulation & Clipping	Power Supply & Hall Effect Pwr Supply Fault Output Transorbs Note: Remove Series Link & Backfeed Cell B1 Disconnect plug P1 from SCB board Input Transorbs Verify all Cells Primary Voltage Modulation of Cells	 Approx. 56Vp-p Approx. 56Vp-p 100Vac±10% for all (0 to 100% demand)	Emp# 347 Emp# 347 Emp# 347 Emp# 347 Emp# 347
R	Medium Voltage Testing	With Cell Series Links Reconnected Set Motor Voltage = Drive Rating VMA, VMB, VMC | ID 2050 - OLTM 25Hz VMA, VMB, VMC | ID 2050 - OLTM 50Hz	 3.0V-peak +/- 0.3V 6.0V-peak +/- 0.3V	 Emp# 347 Emp# 347

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	Check E-stop Logic	Depress Local E-Stop Verify Drive coasts to stop and fault message displayed Measure on TB2-3 & 4 Verify Fault contact on TB2-33 & 34 changes state Depress"FAULT RESET"on keypad and Restart Drive Verify Run contact on TB2-29 & 30 changes state Remove Jumper on TB2-1 & 2 - Remote E-Stop Verify Drive coasts to stop and fault message displayed	 Open for E-stop Closed for Fault Closed for Run 	 Emp# 347 Emp# 347 Emp# 347 Emp# 347 Emp# 347 Emp# 347 Emp# 347

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002460

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	Transformer Thermal Switches	Remove alarm wire from IOB DI-3C, 1).Verify fault light blinks and keypad displays alarm message. 2).Verify the "Drive Alarm" outputs on TB2-31&32 change state.	Verify alarm message Closed for Alarm	Emp# 347 Emp# 347
		Remove trip wire from IOB DI-0D, 1).Verify fault light blinks and keypad displays alarm message. 2).Verify the "Drive Alarm" outputs on TB2-31&32 change state.	Verify alarm message Closed for Alarm	Emp# 347 Emp# 347
		Remove trip both wires from IOB DI-3C & DI-0D and wait for 30 seconds; 1). Verify Drive fault, Drive coasts to a stop and keypad displays trip message 2).Verify the "Drive Tripped" output on TB2-33&34.	Verify Drive Fault Closed for Fault	Emp# 347 Emp# 347
R	Remote Start/Stop	Momentarily close contact between TB2-5 & 6 and verify Drive starts running. Momentarily close contacts between TB2-5 & 6.	Drive is running Drive ramps to stop	Emp# 347 Emp# 347
R	Remote Fault Reset	Cause system fault and check Drive Ready contact TB2-27 & 28 (changes state) Momentarily close Remote Fault Reset contact on TB2-7 & 8. Verify the "Drive Ready to Run" output on TB2-27 & 28 changes state. Verify Keypad reset is functioning. Verify the "Fault Reset"button on the touch panel is functioning.	Open for Fault Drive should reset Closed for Ready to Run	Emp# 347 Emp# 347 Emp# 347 Emp# 347
R	Local Start/Stop	Place Drive in the Local mode by pressing "AUTOMATIC"on keypad and depress "MANUAL START" on keypad. Verify Drive is running. Depress "MANUAL STOP" on keypad	Drive is running Drive ramps to stop	Emp# 347 Emp# 347
R	4 to 20mA Remote Freq Command	Place Drive in the Remote mode by pressing "AUTOMATIC"again on keypad and connect 4-20mA signal to TB2ELV-7 & 8. Scale 4-20 mA signal to be proportional to 0-100% Freq.	Verify system Freq change 4mA=0%Freq 12mA=50% Freq 20mA=100% Freq	Emp# 347
R	4 to 20mA Spare Input	Program Spare Input as Remote Signal command via Keypad menu and connect 4-20mA signal to TB2ELV-10 & 11.Scale 4-20 mA signal to be proportional to 0-100% output. RE-PROGRAM REMOTE SIGNAL INPUT TO ANALOG 1!	4mA=0% spare 12mA=50% spare 20mA=100% spare	Emp# 347 Emp# 347

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002460

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	4 to 20mA Motor KW Output	Monitor KW output on TB2ELV-18 & 19 and verify output	4mA=0% KW 20mA=100% KW	 Emp# 347
	4 to 20mA Motor AMPS Output	Monitor AMPS output on TB2ELV-1 & 2and verify output	4mA=0% Amps 20mA=100% Amps	 Emp# 347
	4 to 20mA Motor FREQ Output	Monitor FREQ output on TB2ELV-4 & 5 and verify output	4mA=0% Freq 20mA=100% Freq	 Emp# 347
	4 to 20mA Spare Output	Monitor SPARE output on TB2ELV-21 & 22 and verify output	4mA=0% Spare 20mA=100% Spare	 Emp# 347
R	Blower 1 Op. XFMR Cab.	With Transformer Cabinet blower TBLW1 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
	Blower 2 Op. XFMR Cab.	With Transformer Cabinet blower TBLW2 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
	Blower 1 Op. CELL Cab.	With Cell Cabinet blower CBLW1 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
	Blower 2 Op. CELL Cab.	With Cell Cabinet blower CBLW2 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
R	Medium Voltage Testing	Set Control Loop Type	OLVC	
		With Motor Connected to the Drive Output	IMA Leads VMA by 90° IMB Leads VMB by 90°	Emp# 347 Emp# 347
R	Spinning Load	1. Enable spinning load feature (Set Spinning Load Mode true) via keypad 2. Run Drive at 100% speed 3. Trip Drive by pressing E-Stop 4. Pull out E-Stop 5. Push Fault Reset 6. Restart Drive 7. Verify Drive goes back to full speed	Motor returns to full speed	Emp# 214
R	Motor Overload Protection	Adjust motor parameters[Menu 1000]and overload settings[Menu 1120]to verify overload operates after 60s.		Emp# 214
R	Non-latching Run request with No Medium Voltage Input	1.Remove Medium Voltage Power 2.Reboot NXG Control 3.Clear/Reset all fault on drive 4.Monitor SOP Runrequest flag via debugger 5.Verify that SOP Runrequest flag remains false when all start inputs are set		Emp# 214
R	Input Protection	Simulate IP trip and verify "input MV breaker enable" output contact on TB2-43 & 44 changes state The fault only reset via keyed pushbutton KR	Closed for fault Fault reset	Emp# 214 Emp# 214
O	Closed Loop Vector Control Testing	Set Control Loop Type ID 2050 Set Encoder 1 PPR ID 1290 Set Encoder loss response ID 1320 With Motor Connected to the Drive Output Connected the encoder signal to TB2ELV-26-31 Scale 4-20 mA signal to 50% and 100% speed Verify the Drive and Motor Speed output if normal	CLVC 1024 Stop 12mA=50% Speed 20mA=100% Speed	 Emp# 214 Emp# 214

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002460

1.6 System Load Test:				STSI-061G:4.8
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	System Load Test	Run Load Test using Dyno Load Run at input current (full load input current)	214 Amps, 4 hrs	Emp# 214
A	Efficiency Testing	Run Drive at following speed points: 100% Speed 100% Load 100% Speed 50% Load	Record actual 96.58 % 97.21 %	 TSF-056 TSF-056
A	Power Factor Testing	Run Drive at following speed points: 100% Speed 100% Load	0.95PF	TSF-006
A	Harmonic Testing	Run Drive at 100% speed and 100% load Record actual THD for Voltage & Current (Background Distortion must be THDv <2.0%)	< THD 3 %Voltage < THD 5 %Current	Emp# 153 Emp# 153

1.7 Final Inspection				STSI-061G:4.9
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	File Save	Save Files under the Project Files Folder SOP, HEX, Event Log, Fault Log, Parameter and Configure Files	Parameter upload (Level 7)	Emp# 153
R	Flash Card	All Test versions of SOP & HEX files have been removed from Flash No Wago SOP & HEX is on Flash Final SOP is on Flash and correct Hex file is selected		Emp# 153 Emp# 153 Emp# 153
R	Disconnect Test Wires	Remove all input and output power and control wiring.		Emp# 153
R	Torque Mark Check	Check that all proper torque marks exist. Check that all existing torque marks are properly marked		Emp# 153

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002460

1.8 Equipment STSI-061G:4.1

Record Hipoter Used

Model	Manufacturer	SEDS CTN	Cal. Due
DH60/5	Lanpotronics	AS110720001	2013-7-19

Record Voltmeter Used

Model	Manufacturer	SEDS CTN	Cal. Due
175	FLUKE	AS050526001	2014-05-21
789	FLUKE	AS080131001	2015-03-19
/	/	/	/
/	/	/	/
/	/	/	/

Oscilloscope

Model	Manufacturer	SEDS CTN	Cal. Due
DPO3034	TEK	AS090831001	2013-09-04
/	/	/	/

Clamp on C.T./Clamp-On

Model	Manufacturer	SEDS CTN	Cal. Due
LH41	AMPROBE	AS100826001	2013-09-02
/	/	/	/

Humidity

65%

2) 0110-SR12 Variable Speed Drive System

A. MV Cable Test Sheets

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project:	SIEMANS	**Job No:**	C64800
Date of Test:	24/10/2013		
Cable Circuit:	From: 0110-SR12 INPUT TERMINALS	To:	HV SW/ROOM SR12 FEEDER PANEL A24
Type:	SINGLE CORE XLPE 6.6 kV		AL- 150 sq mm
Reason for Test:	NEW DRIVE INSTALLATION	**Cable Temperature:**	HOT

Loop Resistance in Ohms (is Loop Resistance Applicable?) N/A Yes/No
Measured with No:
Type: Leads: ohms

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Phasing:

AS IT WAS

Insulation Resistance in Megohms

Measured with No: MOO148

Type: KYORITSU

	Volts	1 Min	2 Min
A-Earth	5000	200,000	200,000
B-Earth	5000	35,000	35,000
C-Earth	5000	14,000	14,000
A - B	5000	200,000	200,000
B - C	5000	35,000	35,000
C - A	5000	14,000	14,000

High Voltage Test Sheet **N/A** 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: FINE
Amb. Temp. °C:
Result of Test: PASS
Label Attached at:

Comments:

Earth continuity from panel 0110-SR12 to HV SW/ROOM SR 12 FEEDER PANEL A24= 0.01Ω

Testing Officer:	S.CUNNINGHAM	**Date:**	24/10/13	**Engineer if Required:**	**Date:** / /

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project:	SIEMANS			**Job No:**	C64800
Date of Test:	24/010/2013				
Cable Circuit:	From:	**0110-SR12 OUTPUT TERMINALS**	To:	**0110-1 ISOLATOR/EARTHING PANEL**	
Type:	SINGLE CORE XLPE	6.6 kV		CU- 150 sq mm	
Reason for Test:	NEW DRIVE INSTALLATION	**Cable Temperature:**		COLD	

Loop Resistance in Ohms (is Loop Resistance Applicable?) N/A Yes/No
Measured with No:
Type: Leads: ohms

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Phasing:

ABC
RWB

Insulation Resistance in Megohms

Measured with No: MOO148

Type: KYORITSU

	Volts	1 Min	2 Min
A-Earth	5000	100,000	100,000
B-Earth	5000	100,000	100,000
C-Earth	5000	100,000	100,000
A - B	5000	100,000	100,000
B - C	5000	100,000	100,000
C - A	5000	100,000	100,000

High Voltage Test Sheet N/A 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: FINE
Amb. Temp. °C:
Result of Test: PASS
Label Attached at:

Comments:

Testing Officer:	S.CUNNINGHAM **Date:** 24/10/13	**Engineer if Required:**	**Date:** / /

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project:	SIEMANS	**Job No:**	C64800
Date of Test:	24/10/2013		
Cable Circuit:	From: SR12 MOTOR	To:	0110-1 ISOLATOR/EARTHING PANEL
Type:	SINGLE CORE XLPE 6.6 kV		AL- 150 sq mm
Reason for Test:	NEW DRIVE INSTALLATION	**Cable Temperature:**	HOT

Loop Resistance in Ohms (is Loop Resistance Applicable?) N/A Yes/No
Measured with No: _____
Type: Leads: ohms

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Phasing: AS IT WAS

Insulation Resistance in Megohms

Measured with No: MOO148

Type: KYORITSU

	Volts	1 Min	2 Min
A-Earth	5000	1000	1000
B-Earth	5000	1000	1000
C-Earth	5000	1000	1000
A - B	5000	1000	1000
B - C	5000	1000	1000
C - A	5000	1000	1000

High Voltage Test Sheet N/A 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: FINE
Amb. Temp. °C:
Result of Test: PASS
Label Attached at:

Comments:

:Cables connected to motor terminals when testing conducted

:Earth continuity from Panel 0110-SR12 TO Panel 0110-1= 0.05Ω

Testing Officer:	S.CUNNINGHAM	**Date:**	24/10/13	**Engineer if Required:**	**Date:** / /

2) 0110-SR12 Variable Speed Drive System

B. LV cable Test Sheets

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.			SIZE	10 mm²
FROM	ESSENTIAL SERVICES S/B NO1	4c+E	TYPE	PVC/PVC XLPE/PVC
TO	0110 - SR12		LENGTH	40m

CORE No.	INSULATION					FAULT LOOP		EARTH CONTINUITY
	TO EARTH	TO RED	TO WHITE	TO BLUE	TO NEUTRAL	IMPEDANCE	PSC	Ω
RED	200 MΩ	N/A MΩ	200 MΩ	200 MΩ	200 MΩ	Ω	AMPS	0.1
WHITE	200 MΩ	200 MΩ	N/A MΩ	200 MΩ	200 MΩ	Ω	AMPS	
BLUE	200 MΩ	200 MΩ	200 MΩ	N/A MΩ	200 MΩ	Ω	AMPS	
NEUTRAL	200 MΩ	200 MΩ	200 MΩ	200 MΩ	N/A MΩ	N/A Ω	N/A AMPS	

Verification

Lugs/Pin Ends		Glands		Heat Shrink		Shrouds		Cable lable	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
NA	✓	✓	✓	✓	✓	NA	✓		

PRINT NAME G. CERVETTO

SIGNATURE G. Cervetto

DATE 24 / 10 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	P234		**SIZE**	2.5	mm²
FROM	0110 - SR10	ZONE	**TYPE**	PVC/PVC	XLPE/PVC
TO	PUMP MOTOR HEATER		**LENGTH**	2	

CORE No.	**INSULATION**					**FAULT LOOP**		**EARTH CONTINUITY**
	TO EARTH	**TO RED**	**TO WHITE**	**TO BLUE**	**TO NEUTRAL**	**IMPEDANCE**	**PSC**	Ω
RED	* 0.1 MΩ	**N/A** MΩ	— MΩ	— MΩ	— MΩ	Ω	**AMPS**	0.
WHITE	— MΩ	— MΩ	**N/A** MΩ	— MΩ	— MΩ	Ω	**AMPS**	
BLUE	— MΩ	— MΩ	— MΩ	**N/A** MΩ	— MΩ	Ω	**AMPS**	
NEUTRAL	— MΩ	— MΩ	— MΩ	— MΩ	**N/A** MΩ	**N/A** Ω	**N/A** **AMPS**	

Verification

Lugs/Pin Ends		**Glands**		**Heat Shrink**		**Shrouds**		**Cable lable**	
Start End	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**	**Start End**	**Finish End**
✓	NA	✓	NA	✓	NA	NA	NA	NO	NA

PRINT NAME G. GERVETTO

SIGNATURE

DATE 24 / 10 / 13

* HEATING ELEMENT.

-1

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	P233		SIZE	2.5 mm²
FROM	ESSENTIAL SERVICES S/B No1	2c4E	TYPE	PVC/PVC XLPE/PVC
TO	0110-SR12		LENGTH	40m

CORE No.	INSULATION					FAULT LOOP		EARTH CONTINUITY
	TO EARTH	TO RED	TO WHITE	TO BLUE	TO NEUTRAL	IMPEDANCE	PSC	Ω
RED	200 MΩ	N/A MΩ	— MΩ	— MΩ	200 MΩ	Ω	AMPS	0.1
WHITE	— MΩ	— MΩ	N/A MΩ	— MΩ	— MΩ	Ω	AMPS	
BLUE	— MΩ	— MΩ	— MΩ	N/A MΩ	— MΩ	Ω	AMPS	
NEUTRAL	200 MΩ	200 MΩ	— MΩ	— MΩ	N/A MΩ	N/A Ω	N/A AMPS	

Verification

Lugs/Pin Ends		Glands		Heat Shrink		Shrouds		Cable lable	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
NA	✓	✓	✓	✓	✓	NA	NA	✓	✓

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24 / 10 / 13

HV TORQUE SETTINGS

8mm BOLTS 22Nm
10mm BOLTS 28Nm
12mm BOLTS 34Nm.

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	PP12-7J	SIZE	1.5mm²
FROM	0110-SR12	TYPE	6PR IND SCN
TO	PUMP ENCODER	LENGTH	NA.

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	PP12+15V	✓	30	✓	NA	
1 BLACK	PP12-COM	✓	31	✓		
2 WHITE	PP12-B/	✓	28	✓		
2 BLACK	PP12-B	✓	29	✓		
3 WHITE	PP12-A/	✓	26	✓		
3 BLACK	PP12-A	✓	27	✓		
4 WHITE	NA	✓	32	✓		
4 BLACK	NA	✓	32	✓		
5 WHITE	NA	✓	32	✓		
5 BLACK	NA.	✓	32	✓		
6 WHITE	NA	✓	32	✓		
6 BLACK	NA	✓	32	✓		
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24/10/13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C312		SIZE	1.5mm²
FROM	0110-SR12		TYPE	10C+E
TO	HV SWITCHROOM SB62		LENGTH	NA.

CORE No.	WIRE NUMBER		FROM TERMINAL TB6		TO TERMINAL	
		Correct		Correct		Correct
1	138L	✓	2	✓	NA	
2	139L	✓	3	✓	NA.	
3	101L	✓	9	✓	NA	
4	102L	✓	4	✓	NA	
5	102L-1	✓	5	✓	NA	
6	SP	✓	—			
7	SP	✓	—			
8	SP	✓	—			
9	SP	✓	—			
10	SP	✓	—			
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24/10/13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C171		SIZE	1.5mm²
FROM	0110 - SR12		TYPE	2C+E
TO	PUMP FLOOR ESTOPS		LENGTH	NA

CORE No.	WIRE NUMBER		FROM TERMINAL TB6		TO TERMINAL	
		Correct		Correct		Correct
1	101 L	✓	7	✓	NA	
2	102L-1	✓	6	✓	NA	
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24/10/13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C312		SIZE	1.5mm²
FROM	0110-SR12		TYPE	10 CORE
TO	HV SWITCHROOM SB62		LENGTH	NA.

CORE No.	WIRE NUMBER		FROM TERMINAL TB6		TO TERMINAL	
		Correct		Correct		Correct
1	138L	✓	2	✓	NA	
2	139L	✓	3	✓	NA.	
3	101L	✓	9	✓	NA	
4	102L	✓	4	✓	NA	
5	102L-1	✓	5	✓	NA	
6	SP	✓	—			
7	SP	✓	—			
8	SP	✓	—			
9	SP	✓	—			
10	SP	✓	—			
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24/10/13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C313			SIZE	1.5mm²	
FROM	0110 - SR12			TYPE	6C4E	
TO	MARSHALLING CUBICLE MK12			LENGTH	NA	
CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	BK12-2	✓	TB2-4	✓	NA	
2	BK12-7	✓	TB2-3	✓	NA	
3	SP	✓	NA			
4	SP	✓	NA.			
5	BK12-3	✓	TB6-1	✓	NA	
6	BK12-5	✓	TB6-2	✓	NA	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24 / 10 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	P450		SIZE	1.5mm²
FROM	CUBICLE BC61		TYPE	DEKORON
TO	0110 – SR12		LENGTH	45m

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	SR12 +VE	✓		NA	317	✓
1 BLACK	SR12 –VE	✓		NA	321	✓
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
NA	✓	✓	✓	NA	✓	NA	NA	✓	✓

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24 / 10 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph. (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	LAN 12-2		SIZE	1.5mm²
FROM	0110 - SR12		TYPE	1 PR
TO			LENGTH	NA

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	Y	✓	GENIUS	✓	NA	
2	BK	✓	BLOCK	✓	NA	
3	SH	✓	1	✓	NA	
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24/10/13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	LAN 12-3		SIZE	1.5mm²
FROM	0110-SR12		TYPE	IPR
TO			LENGTH	NA

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	Y	✓	GENUS	✓	NA	
2	BK	✓	BLOCK	✓	NA	
3	BN	✓	3	✓	NA	
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24/10/13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LT003-3J		SIZE	1.5mm²
FROM	0110-SR12		TYPE	DEKORON
TO	0110-SR11		LENGTH	50M

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	12-3-1	✓	357	✓	NA	
1 BLACK	WW1-	✓	358	✓	NA	
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	✓	✓	NA	NA	NA	✓	✓

PRINT NAME G. GERVETTO

SIGNATURE

DATE 24 / 10 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LT003-4J		SIZE	1.5mm²
FROM	0110-SR12		TYPE	DEKORON
TO	0110-SR13		LENGTH	20m

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	13-3-1	✓	360	✓	NA	
1 BLACK	WW1-	✓	359	✓	NA	
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	✓	✓	NA	NA	NA	✓	✓

PRINT NAME G. GERVETTO

SIGNATURE

DATE 24 / 10 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.		SIZE	1.5mm²
FROM	0110-SR12	TYPE	4PR
TO	0110-1&ES12	LENGTH	10m

CORE No.	WIRE NUMBER		FROM TERMINAL TB2		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	326	✓	8	✓	1	✓
1 BLACK	13	✓	13	✓	3	✓
2 WHITE	11	✓	11	✓	8	✓
2 BLACK	9	✓	9	✓	14	✓
3 WHITE	15	✓	15	✓	20	✓
3 BLACK	NA	✓				
4 WHITE	NA	✓				
4 BLACK	NA	✓				
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	✓	✓	✓	✓	✓	NA	NA	NA	NA.

PRINT NAME G. CERVETTO

SIGNATURE

DATE 24/10/13

2) 0110-SR12 Variable Speed Drive System

C. Electrical Installation Report.

Jantec Compliance

PO Box 1067 | Tewantin 4565 | PH:0438 394 269
EMAIL: auditor@jantec.com.au | WEB: www.jantec.com.au

REPORT No.: JPR-QUU-021-SD

ELECTRICAL INSTALLATION REPORT

Issued in accordance with the *Electrical Safety Regulation 2002* (Qld)
Section 153 for electrical work in a Hazardous Area
or on a High Voltage installation.

Occupier:	Location of Installation:
Qld Urban Utilities	Violet Street/Kingsford Smith Drive, Eagle Farm 4009

Electrical Installation Audited (Audit Scope):
Replacement of existing VVVF 0110-SR12 and new isolator & earthing panel 0110-0 ES12 to Pump Motor

Electrical Contractor Responsible for the installation:	Electrical Contractors Lic:
J&P Richardson Industries	756

Audit Limitations

Inherent Limitations:

Because of the inherent limitations of any internal control structure, it is possible non-compliance with standards may occur and not be detected. An audit is not designed to detect all weaknesses in compliance as an audit is not performed continuously throughout the period of installation.

Scope Limitations:

nil

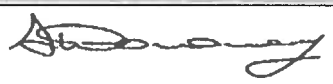
Audit Result:

☐ The auditor issuing this notification reasonably believes that the installation work described in the Audit Scope above is **not in compliance** with the relevant standards.

☒ I advise that the audit of the electrical installation work described in the Audit Scope above, was successfully executed and compliance with the relevant parts of AS2067 and AS/NZS3000 is demonstrated (subject to the audit limitations) at the time of the audit.

From the evidence provided, conclusion can be drawn that the onsite test results recorded by the installer, satisfy the minimum test requirements of AS2067 , AS/NZS3000 and other relevant standards.

It is reasonable to believe that the electrical installation described in the Audit Scope above is electrically safe to connect.

Audit Date:	Auditor:	Auditors Signature:	Auditors No:	Phone No:
25/10/13	S.Downey		02/0114	0438 394 269

Comments/Observations:

If you are not the person having responsibility for the safety of the electrical installation/equipment identified above, it is important that you pass this report to such a person without delay.

A copy of this report must be retained in the site verification dossier and a copy is also forwarded to the relevant regulator as part of the legislative requirements for electrical auditors.

2) 0110-SR12 Variable Speed Drive System

D. Commissioning Report and Parameter List

SIEMENS

STARTUP & COMMISSIONING MANUAL

FOR SIEMENS
PERFECT HARMONY, AIR-COOLED,
MEDIUM VOLTAGE,
VARIABLE FREQUENCY DRIVES

A5E32168985
VSD 0110-SR12
Queensland Urban Utilities – Eagle Farm

Important Note:

These Startup & Commissioning instructions are solely intended as working instructions or information for Field Service specialist personnel of the SII DT LD, Customer Services Division.

Even where product specific information is included, these instructions are not to be regarded as operating instructions for a particular product.

Revision	Description of Change	Initials	Date

Table of Contents

List of Tables

Tables **Page**

Reference Material (for Siemens Personnel)

For Gen IV Drives:

SIEMENS Gen IV Product User Manual A5E01454341C

SIEMENS Gen IV Commissioning and Maintenance Manual A5E01454341D

For Gen III/e Drives:

SIEMENS Perfect Harmony Gen III/e User's Manual A1A19000405A

SIEMENS Perfect Harmony Gen III/Gen III/e Startup and Advanced Topics Manual A1A19000404A

SIEMENS Perfect Harmony Gen III/e Installation Manual A1A19000403A

SIEMENS NXG Manual A1A19001588

Tech Notes (Applications)

Abbreviations

The following abbreviations are used throughout this procedure.

Table 1: Abbreviations

Abbreviation	Description
A	Ampere(s); Amp(s)
AC	Alternating Current
ACH	Anti-Condensation Heater
ACU	Air Conditioning Unit
CB	Circuit Breaker
CDS	Circuit Disconnect Switch
CPS	Control Power Supply
CT	Current Transformer
DC	Direct Current
DCR	Digital Card Rack
DWG	Drawing
ES	Emergency Shutdown
ESD	Electrostatic Discharge
F	Fuse
FSR	Field Service Representative
ICP	Installation and Commissioning Procedure
GA	General Arrangement
HESPS	Hall Effect Sensor Power Supply
HMI	Human-Machine Interface
LV	Low Voltage
MV	Medium Voltage
N/A	Not Applicable
OEM	Original Equipment Manufacturer
P/N	Part Number
PDC	Power Distribution Center
PPE	Personal Protective Equipment
PSD	Process Shutdown
S/N	Serial Number
SOP	System Operating Program
TB	Terminal Block
UPS	Uninterruptible Power Supply
V	Volt(s)
VAC	Volt(s) / -Alternating Current
VDC	Volt(s) / -Direct Current
VFD	Variable Frequency Drive
WPS	Wago Power Supply

1.0 INTRODUCTION

This document is for all Air-Cooled Perfect Harmony Drives with NXG Controls.

1.1 Purpose of Manual

The purpose of this document is to effectively guide competent and trained Siemens personnel through Startup and Commissioning for the Air-Cooled Perfect Harmony Variable Frequency Drive (VFD). The individual checks must be performed within each of the separate sections of this procedure. Following any introductory text and precautions, each section contains a series of checkboxes that indicate the completion of the individual steps.

In addition to the checkboxes, tables may be included in some sections. Such tables are used to record information like the following: a) parameter settings; b) test point data values; c) any errors or deviations. Major sub-sections also contain initials/date fields that must be completed by the individual performing and completing that section of the Startup and Commissioning procedure.

1.2 Startup Task Agenda

1.2.1 Punch List for Open Items During Startup & Commissioning

- List any issues as open items. (Attachment #1, CCF-004)
- Assign responsibility, due date, and date of completion.
- Review with Customer and return copy to Project Manager (PM) at end of Commissioning.

1.2.2 Drive Cabinet Inspections

- Installation Inspections - Perform a visual inspection to detect signs of deterioration and discoloration. Inspection detects issues in the equipment where components may need replacement and/or corrective action.
- Equipment Cleanliness Check – Check each of the enclosures of the equipment for cleanliness of power and control circuitry. This should include removal of installation dirt and debris.
- Connection Checks - Perform a variety of connection and torque mark checks on the Drive system including inspection for loose wires, loose hardware, stripped or cut wires, poor/melted insulation, and proper torquing on the component mountings.

1.2.3 Power-up Checks

- Power-up the equipment and perform a functional and operational evaluation running at various operation levels.
- Inspection verifies the equipment is in operating condition.

1.2.4 Customer / Performance Review

- Meet with the customer to review the current site conditions.
- Record any issues with the installation of the Siemens equipment.
- Record training classes taken by on-site personnel and recommend any to be taken.

1.2.5 Spare Parts Checkout

- Perform a visual inspection of Spare Power Cells, Spare Control PCBs, and other components.
- Spare Control PCBs or Power Cells should be installed in the Drive to verify setup and operation.
- Record recommended spare parts.
- Recommend a backup flash disk of the operating system.

1.3 Symbols and Conventions

1.3.1 Symbol Definitions

The following words and symbols found throughout this manual mark special messages to alert the operator of specific information concerning of the PERSONNEL, the EQUIPMENT or the PROCESS.

 WARNING	**Text set off in this manner provides warning notice that failure to follow these directions in this WARNING can result in bodily harm or loss of life and/or extensive damage to equipment.**
 CAUTION	**Text set off in this manner provides warning notice that failure to follow these directions in this CAUTION can result in damage to equipment.**
 NOTE	**Text set off in this manner present clarifying information or specific instructions pertinent to the immediate instruction.**

1.3.2 Warnings and Caution Notes

 WARNING	**Personnel performing this procedure MUST read the entire document before beginning the procedure.**
 NOTE	**Personnel executing this procedure shall acquire the necessary permits prior to commencing any work activity.**
 WARNING	**Before performing this procedure, the Customer Personnel and Siemens Field Service Representative MUST conduct a job safety briefing for all participants. The briefing shall cover hazards, special precautions, energy source controls and personal protective equipment requirements.**
 WARNING	**Always work with one hand, wear safety shoes rated electrical hazard/composite and safety glasses. Always work with another person present who is acting as a safety monitor.**
 WARNING	**Only qualified Siemens Field Service Representatives should install, operate, troubleshoot, and maintain this Drive. A qualified individual is "one familiar with the commissioning and operation of the equipment and the hazards involved.**

 WARNING	**Always use extreme caution when handling or measuring components that are inside the enclosure. Be careful to prevent meter leads from shorting together or from touching other terminals.**
 WARNING	**Use only instrumentation (e.g., meters, oscilloscopes, etc.) intended for high voltage measurements (that is, isolation is provided inside the instrument, not provided by isolating the chassis ground of the instrument).**
 WARNING	**Never touch anything within the Perfect Harmony cabinets until verifying that it is neither thermally hot nor electrically alive.**
 WARNING	**Never remove safety shields (marked with a HIGH VOLTAGE sign) or attempt to measure points beneath the shields.**
 WARNING	**Never connect any grounded instrumentation (i.e., non-isolated meters or oscilloscopes) to the Perfect Harmony system.**
 WARNING	**Never connect or disconnect wiring or printed circuit boards while the Drive is energized.**
 WARNING	**Hazardous voltages may still exist within the Perfect Harmony cabinets even when the disconnect switch is open (off) and the supply power is shut off.**
 CAUTION	**Be sure to make appropriate connections/disconnection to equipment in order to perform this test correctly and safely. Failure to do so may result in DAMAGE to equipment.**
 WARNING	**Only personnel performing the test shall be in the area while the test is being performed. Test area shall be barricaded and unauthorized personnel shall not be allowed inside.**

2.0 SITE AND SAFETY INSTRUCTIONS

2.1 Test Equipment and Tool Check

2.1.1 All test instruments, supporting tools, and accessories shall be rated for intended use. Initial ___

2.1.2 Perform a visual inspection of all test instruments, equipment and all associated test leads, cables, power cords, probes, and connectors for external defects and damage. Initial ___

2.1.3 Ensure that all test instruments, equipment, and their accessories are calibrated and valid throughout the ENTIRE test period. Initial ___

2.1.4 Verify customer can supply the following accessories for possible use during Startup and Commissioning activities:

☒ Barrier	☐ Guards	☒ Caution Tape	☐ Cell Lifter
☐ Rags	☐ Step Stool	☐ Alcohol based Cleaning Fluid	☐ Grease Gun
☐ Air Filters	☐ Ladder	☐ Shop Vacuum	☐ Soft Brush
☐ Compressed Air	☐ Hoses	☐ Water & Hose	

Initial ___

Table 2: Test Equipment and Tool List

Equipment/Tool	Manufacturer & Model Number	Serial Number	Calibration/ Inspection Date
PPE Arc Flash Jacket	Stanco Temp Test Salisbury		
Meter	Fluke 1587, Megger		
	Fluke 43B, PQM		
	Fluke 787, Process Mtr		
	Fluke 87 V, DVM		
	Simpson 260-8P		
	AEMC JM810A, 2000A		
	Fluke i400s		
Torque Wrenches	Craftsman 250 ft-lbs		
	Craftsman 250 in-lbs		
	Craftsman 50 in-lbs		
ESD Pad & Wrist Strap			

2.2 Site and Safety Activities

2.2.1 Meet with Site Supervisor

- Review of safety requirements.
- Site Specific Safety Training, as required.
- Plan for the day's progress.
- Discuss any open issues.
- Complete Daily Safety Log Form.

2.2.2 Review the Equipment Location and Drive Information

- Be certain your work area is clear of debris.
- Confirm that barriers, guards or Caution Tape are in place to prevent. unauthorized personnel form entering into the work area.
- Collect the site and Drive information.

2.2.3 Follow Lockout/Tagout Procedures

- Coordinate with customer on local Lockout/Tagout Procedures.
- If the customer has no requirements, follow Siemens' LD A Lockout/Tagout Procedures.
- Insure Personal Protection Equipment (PPE) and Safety Tools are available.

5 Safety Rules of LOTO

1. Switch off power sources
2. Lock the circuit against re-closure
3. Establish that system is de-energized
4. Earth and short circuit phases
5. Cover or enclose "live" parts

2.2.4 At the end of each day

- Clean your area.
- Pack your tools and equipment.
- Meet with the site supervisor.
- Review what was done that day.
- Equipment status at end of day.
- Determine what time you will be returning in the morning.
- Ask if there are any questions or other issues that need to be addressed.
- Complete entries in service report.

2.2.5 At the end of the Startup and Commissioning service

- Review daily service reports.
- Obtain Customer signature on service report.
- Ensure any warranty or repair parts have RMAs and are shipped for return.
- Ensure any FSKits used during Startup are packaged for return. Obtain an RMA number and handle shipping back to Siemens.
- Review checklist:
  - Spare parts review
  - Customer review
  - Record follow-up items
  - Contact in-house support personnel
- Complete the Startup and Commissioning Acceptance and Sign Off Sheet.

3.0 SITE AND DRIVE INFORMATION

Date: 28/10/2013

3.1 Customer Information

Customer Name:	Queensland Urban Utilities		
Street Address:	Eagle Farm	City, State Zip code:	Eagle Farm
Primary Contact:	Jim Kirkland	Primary Phone No:	0410 548 794
Primary Fax No:		Primary Email Addr:	
Secondary Contact:	Brett Lawrence	Secondary Phone No:	0400 723 752
Secondary Fax No:		Secondary Email Addr:	
Date Completed Pre-Startup Checklist:	29/10/2013	Client's Drive ID:	0110-SR12

3.2 Dispatch Information

Notification No:	52-199755	Original SO No:	3002133943
Field Service Rep:	Ruben Diaz	Drive Type:	Gen3
Technical Support:	SCCC: Ph. 1300 369 515	Drive P/N:	M6SR3
Project Engineer:	Pieter Taljaard (Siemens Aust.)	Drive S/N:	Z831501002461
Location of Drive:	Eagle Farm	Drive Date Code:	13-25

3.3 Location Environment

Elevation:	Ft, Above Mean Sea Level	Air Conditioning:	☐ Yes ☒ No
Enclosure:	☐ PDC ☒ Building	Air Conditioning:	BTU, or Ton
Room Temperature:	°C, Indoors	Heating:	☐ Yes ☒ No
Ambient Temperature:	30+ °C, Outdoors	Humidity:	☐ High ☒ Low
Outside Air Blown In:	☐ Yes ☒ No	Dusty Environment:	☐ Yes ☒ No
Drive Blowers Ducted Outdoors:	☒ Yes ☐ No	Conductive Dusts:	☐ Yes ☒ No
Other Influences: List all.		Corrosive Gases:	☒ Yes ☐ No Type(s): Sewage

3.4 Drive Information

Power	Load Type/Description	Voltage	Ampacity	Frequency
Input Power:	2750 KVA	6600V	214A	50Hz
Output Power:	2051 KW	0-6600 V	260 A	0-75Hz
Control #1 Power:	Control and Blower	415V 3ph	20A	50Hz
Control #2 Power:	Motor Heater external power (customer)	110Vac 1Ph	Power=KW	50Hz
Control #3 Power:				
Control #4 Power:				

Xfmr Blower Motors:	Voltage:	HP/KW: HP, or KW	FLA: Amp RPM:
Xfmr Blower Motor OL Settings:			
Cell Blower Motors:	Voltage:	HP/KW: HP, or KW	FLA: Amp RPM:
Cell Blower Motor OL Settings:			

Transformer:	Mfg: TBA		KVA: 2750
	Model No: HZ50	Part No: A5E03460937	Serial No:
	Input Voltage: 6600 V	Sec Voltage: 630 V	Tap Setting: ☐ -5% ☐ 0% ☒ +5%
	Reason if Tap Setting is not +5%:		

Input CT'S:	Ratio: 250 **:** 5	No. per Phase: 1	
Attenuator Resistors:	Input: 4.8 MΩ	Output: 4.8 MΩ	

3.5 Drive Options

Cell Bypass	☐ Yes ☒ No		UPS:	☐ Yes ☒ No
Drive Bypass:	☐ Yes ☒ No		Communication Protocol:	☐ No ☒ Yes Type: Modbus RS485
Sync Motor:	☐ Yes ☒ No		Sync Transfer	☐ Yes ☒ No
Sync Motor Exciter:	Voltage:		Manufacturer:	
	Configuration:		Serial No.:	
	Model:			

Table 3: Cell Information

Power Cells:	VSD P/N: 6SR3502-6HF42-7BH-Z	Size: _____ Amp 260	Total No of Cells: 18

Cell				Cell Control Board		
Location	**CELLS P/N**	**S/N**		**P/N**	**S/N**	**Rev.**
A1	LDZ14501002.260			A1A10000432.30M		BR
A2	LDZ14501002.260			A1A10000432.30M		BR
A3	LDZ14501002.260			A1A10000432.30M		BR
A4	LDZ14501002.260			A1A10000432.30M		BR
A5	LDZ14501002.260			A1A10000432.30M		BR
A6	LDZ14501002.260			A1A10000432.30M		BR
B1	LDZ14501002.260			A1A10000432.30M		BR
B2	LDZ14501002.260			A1A10000432.30M		BR
B3	LDZ14501002.260			A1A10000432.30M		BR
B4	LDZ14501002.260			A1A10000432.30M		BR
B5	LDZ14501002.260			A1A10000432.30M		BR
B6	LDZ14501002.260			A1A10000432.30M		BR
C1	LDZ14501002.260			A1A10000432.30M		BR
C2	LDZ14501002.260			A1A10000432.30M		BR
C3	LDZ14501002.260			A1A10000432.30M		BR
C4	LDZ14501002.260			A1A10000432.30M		BR
C5	LDZ14501002.260			A1A10000432.30M		BR
C6	LDZ14501002.260			A1A10000432.30M		BR

3.6 Motor Information

Manufacturer:	TBA	Model Number:	
HP/KW Rating:	HP, 2000 KW	Serial Number:	
Rated Voltage:	6600 V	Type:	☒ Induction ☐ Synchronous
Full Load Data:	Amp: 217 A, Eff: , PF: 0.86, RPM: 593		
Locked KVA Code:		Speed Encoder:	☒ Yes ☒ No
Service Factor:		Encoder Model:	1024 PPR, Incremental
Motor Cooling:	Air, Other:	RTD's:	☒ Stator ☒ Bearings
Stator Connection:	☒ Wye ☐ Delta	RTD Type:	PT100
Line Start Capability:	☐ Yes ☒ No	RTD Alarm/Trip:	Stator: N/A °C, Bearing: N/A °C
Exciter Manufacturer:		Exciter Voltage:	V, ☐ AC ☐ DC
Exciter Model No:		Exciter Config:	

4.0 CUSTOMER PRE-STARTUP CHECKLIST REVIEW

4.1 Customer Responsibilities

4.1.1 Customer is responsible for completing the pre-startup items on the Customer Pre-Startup Checklist (See Attachment #2). Complete ☒ Incomplete ☐

4.2 Review and record checklist items status

4.2.1 Review each item in the checklist with the Customer and record status of completion in the Attachment #2. Complete ☒ Incomplete ☐

5.0 DRIVE PRE-POWER INSPECTIONS AND CHECKS

Description	Initial
Visually check the equipment for any shipping or installation damage.	RD
Ensure that the entire system is earth grounded at one of the system grounding points. (Customer specified where ground to be connected in VFD. Either to input or output cabinet.)	RD
Confirm Siemens drawings are the same at the Customer's drawings. Note: *Drawings need to be updated for new encoder connection. Obs.* Encoder Working properly in this drive	RD
Verify the source voltage to the Drive matches the Drive specification. The Drive's intended input voltage is specified on the foil label located inside the control panel door. (Note: This foil label may be located in the customer connection cabinet.)	RD
Ensure the control power (typically 120 VAC or 125 VDC) and auxiliary power (typically 415 or 690 VAC) sources are connected per the VFD schematics and that they match the Drive's control voltage ratings as stated on the foil label.	RD
Verify the presence of markings/labels on all terminal strips, mounted components, cell and other sub-assemblies. Notify the factory of any discrepancies. List discrepancies: NA	RD
Verify the presence and proper installation of all protective covers. List discrepancies: *415V for PLC I/O Transformer protection barrier to be fitted->Done!*	RD
Verify the installation of the fan hood. Verify that the fan rotates freely while mounted.	RD
Check Blower Assembly installation and check hardware connections.	RD
Confirm all air gaps are blocked between cabinets.	RD
Confirm Shipping Splits are internally bolted together. n/a	RD

Description	Initial
Confirm Shipping Splits are externally bolted together (near floor). N/A	RD
Confirm cabinet to cabinet sealing.	RD
Confirm conduit entrance to cabinets is sealed.	RD
Confirm cabinet to floor is sealed.	RD
Confirm gland plates are installed properly.	RD
Verify that the ground bonding jumpers are present and connected (between shipping splits, cabinets to doors, cabinets to panels, motor).	N/A
Confirm MV and LV cables are installed in separate conduits (observe for proper spacing).	RD
Confirm LV (415V & 120V) and Analog Signal cables are installed in separate conduits.	RD
Check all cabling for insulation nicks, splitting and/or cracking.	RD
Verify that no conductors are exposed due to chafing or other shipping abuse.	RD
Input MV Power Cables: Verify insulation voltage rating is adequate.	RD
Input MV Power cables: Verify bend radii meet NEC requirements.	RD
Input MV Power cables: Check distance from cabinet/other cables.	RD
Input MV Power cables: Verify stress cones installed/mounted properly and shields are grounded at MV Switchgear end only – not at drive end. Ensure shield ground wires are adequately separated from bus work and GTO wires.	RD
Output MV Power Cables: Verify insulation voltage rating is adequate.	RD
Output MV Power cables: Verify bend radii meet NEC requirements.	RD
Output MV Power cables: Check distance from cabinet/other cables.	RD
Output MV Power cables: Verify stress cones installed/mounted properly and shields are grounded at VSD end only – not at Motor. Ensure shield ground wires are adequately separated from bus work and GTO wires.	RD
Verify that the transformer neutral is ungrounded.	RD
Check the tap jumper to be sure it is not touching the cabinet.	RD
Ensure that control and main power are installed and connected properly. Source to input. Output to motor.	RD
Check and inspect Motor Terminations in motor termination box. (done by JPR)	RD
Shipping split Bus Bar terminations complete, torqued and covers in place.	N/A
Ensure that VFD electrical connections are tight and that all torque marks are present. * Re-examine for bolts bottoming out.	RD
Check Amp connector pins. Refer to “Test Procedure for Holding Tension Testing of Amp Connector Female Sockets” and complete the associated testing form.	N/A
Have the control wire plugs at each shipping split been reconnected and tie-wrapped? (Confirms that all connnections that deal with shipping splits are addressed).	N/A
Control wires (visually inspected and landed per customer connection drawings).	RD
Check Input Attenuator Resistors are the correct value for the rated voltage.	RD
Check Output Attenuator Resistors are the correct value for the rated voltage.	RD

Description	Initial
Verify all Transorbs are grounded (located at/near input & output attenuator resistors).	RD
Check Fuses and Relays (inserted snugly into holders).	RD
Verify Wago wiring secure.	RD
Verify Break Out Board wiring secure.	RD
Verify Signal Conditioning Board wiring secure.	RD
Verify DCR is properly grounded to ground point.	RD
Verify Plug/Ribbon cables are secured.	RD
Verify Keypad is grounded.	RD
Verify for Communication protocol only: termination resistor.	RD
Check Fiber optics (point to point) and verify that bend radii are acceptable. A3 fiber bent at Modulator Board End, light goes through.	RD
External air path in/out (distance from blower 30mm (minimum) - pass/fail. Pass	RD
Inlet/outlet located opposite side of room. ok	RD
All covers and doors installed and secured with the correct fasteners and ground straps.	RD
All Safety Interlock hardware (Fortress Locks) are installed and properly aligned.	RD
All Doors open/close properly.	RD
Drive door filters.	RD
Verify all components match the drawings: component location, labels, wire tags and Drive labels. (The drawing must reflect the Drive and vice-versa – internal connections only).	RD
Adjust Blower Motor Thermal OL's to correct settings.	RD

6.0 CONTROL POWER CHECKS

Description	Initial
Ensure that all control power sources are available for Drive operation.	RD
Verify free rotation of cell and transformer blowers. (A double-check before closing the cabinets.)	RD
Verify Network Cabling is the correct type and landed on the correct terminals.	N/A
Verify Speed Controls are terminated correctly (4-20 mA speed control or network control).	RD
Verify Start/Stop commands terminated correctly (digital input or network control).	RD

Energize the Control Power Circuits feeding the drive.

DON'T energize MV Power.

Confirm the following parameters and document values:	Rated input current (2020)	214 A
	Rated output current (2040)	260 A
	Neutral connection (2630)	T2
	CT turns (3035)	250 :5
Measure all control power voltage sources being fed to the Drive. Verify that these voltages match the drawings.	415 V_{AC} (373V_{AC} to 466V_{AC})	**433** V_{AC}
	240 V_{AC} (220V_{AC} to 260V_{AC})	**NA** V_{AC}
	120 V_{AC} (110V_{AC} to 130V_{AC})	**127** V_{AC}
If supplied, verify the UPS voltage.	120 V_{AC} (110V_{AC} to 130V_{AC})	**NA** V_{AC}

Energize the control power circuits at the drive – close breakers and fuse holders.

Description	Initial
Verify phasing for the blower motor power circuit (verified by checking that suction holds a sheet of paper firmly on drive cabinet filters).	RD

Record Drive address.	TCP/IP Address:	172.017.020.16
Verify **DCS** or **PLC** addresses across communication link, if applicable. PLC via Network2 Modbus TCP	TCP/IP Address:	**NA**
Power supply voltage checks. *Please see FAT docs.*	+5 V_{DC} (+5.10 to +5.13 V_{DC})	**5.07** V_{DC}
	-5 V_{DC} (-4.85 to -5.15 V_{DC})	**--5.10** V_{DC}
	+12 V_{DC} (+11.64 to +12.36 V_{DC})	**12.1** V_{DC}
	-12 V_{DC} (-11.64 to -12.36 V_{DC})	**-12.1** V_{DC}
	+15 V_{DC} (+14.30 to +15.70 V_{DC})	**15.2** V_{DC}
	-15 V_{DC} (-14.30 to -15.70 V_{DC})	**-15.3** V_{DC}
	24 V_{DC} (21.6 to 26.4 V_{DC})	**24.05** V_{DC}
DCR voltage checks:	+5 V_{DC}	**5.12** V_{DC}
	-5 V_{DC}	**-5.14** V_{DC}
	+12 V_{DC}	**12.07** V_{DC}
	-12 V_{DC}	**-12.06** V_{DC}

DON'T ENERGIZE MV POWER – FURTHER CHECKS REQUIRED IN SECTION 10.

Table 4: SOP, Parameters and Fault Logs

Upload/Review:	Initials		Upload:	Initials
SOP File: A5E32168985D	RD		Historical Log:	RD
Parameter File (Level 7 Security):	RD		Fault Log:	RD
Check Clock Time: to AEST only	RD		Event Log (NXG only):	RD
			Cell Fault Log (Legacy only):	NA
Were any existing issues found after reviewing SOP, Parameters and Logs?	Normal commissioning code modification. Digital I/O wiring modified as per Asbuilt drawings. Added to SOP, DI-0B for Keypad local control, wiring and Key-Sw yet to be fitted. Added interlock for Ventilation running DI.			

Verify the following are functional under control power:		
MV Input Protection Interlock:		☒ Yes ☐ No
		☒ Yes ☐ No

7.0 SOFTWARE AND FIRMWARE VERSION RECORDING

Record the SOP Software (DRCTRY File) and NXG Firmware (8090) version.	Software Ver:	Version 4.39
	(8090) Firmware Ver:	Ver 5.2.3
Record HMI software version, if applicable. NA	Software Version:	NA
	Firmware Version:	NA
	Windows Version:	NA

8.0 BYPASS CONTACTOR TEST

8.1 Reference Bypass Contactor Procedure located in Bypass Contactor Kit.

Table 5: By-Pass Contactor Testing. Dynamic test pulling FO off for each cell, and then reset from parameter ID:XXXX.

NOT FITTED.

Contactor Name	Voltage	Initial
BPKA1	Pick-up Voltage: Drop-out Voltage:	
BPKA2	Pick-up Voltage: Drop-out Voltage:	
BPKA3	Pick-up Voltage: Drop-out Voltage:	
BPKA4	Pick-up Voltage: Drop-out Voltage:	
BPKA5	Pick-up Voltage: Drop-out Voltage:	
BPKA6	Pick-up Voltage: Drop-out Voltage:	
BPKB1	Pick-up Voltage: Drop-out Voltage:	
BPKB2	Pick-up Voltage: Drop-out Voltage:	
BPKB3	Pick-up Voltage: Drop-out Voltage:	
BPKB4	Pick-up Voltage: Drop-out Voltage:	
BPKB5	Pickup Voltage: Drop-out Voltage:	
BPKB6	Pick-up Voltage: Drop-out Voltage:	
BPKC1	Pick-up Voltage: Drop-out Voltage:	
BPKC2	Pick-up Voltage: Drop-out Voltage:	
BPKC3	Pick-up Voltage: Drop-out Voltage:	
BPKC4	Pick-up Voltage: Drop-out Voltage:	
BPKC5	Pick-up Voltage: Drop-out Voltage:	
BPKC 6	Pick-up Voltage: Drop-out Voltage:	
Confirm Customer I/O and communications Confirm Customer hard wiring into the VFD	This is the time to fine tune what is being received and if changes need to be done.	

Description	Initial
Install the covers and button up the Drives.	
Prepare the Drive for full input power. (Remove test equipment, motor free, etc.)	

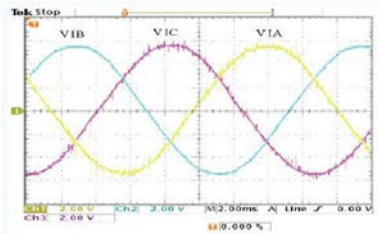
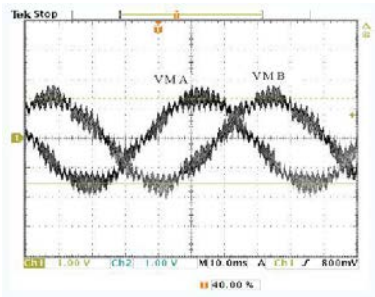
9.0 OPEN LOOP TESTS

N/A

The following steps verify operation of the Drive (without a motor) in Open Loop Test Mode (No motor current feedback).

Warning! Do not connect a grounded PC or laptop to a communications board with an isolator or while the Drive is running. To do so could damage the computer and/or the digital control rack.

Description	Initial
Review and follow safety procedures per Daily Safety Log.	
Make sure all safety grounds have been removed from input.	
Re-energize the AC or DC control power.	
Connect the PC/Laptop to the Ethernet Port (for access to the CPU Board). Connect Tool-Suite and the Debug Tool.	
Set the control loop type (2050) to Open Loop Test Mode (OLTM).	
Verify that the input current (3030) and input voltage (3040) scalers (stability →input processing) are set to the default values of 1.0.	
DISABLE spinning load using Drive → spinning load (2420) → spinning load mode (2430).	
Make sure the fast by-pass (2600) is DISABLED. Access this parameter through Drive → cells → fast by-pass.	
Configure the keypad to display input voltage (VDIN), input frequency (FRIN), and motor voltage (VLTS). – function of keypad	
Set the motor rated voltage (1040) parameter	
Energize MV Power to the system. **(Everyone should leave the room the first time MV is applied to the Drive.)**	

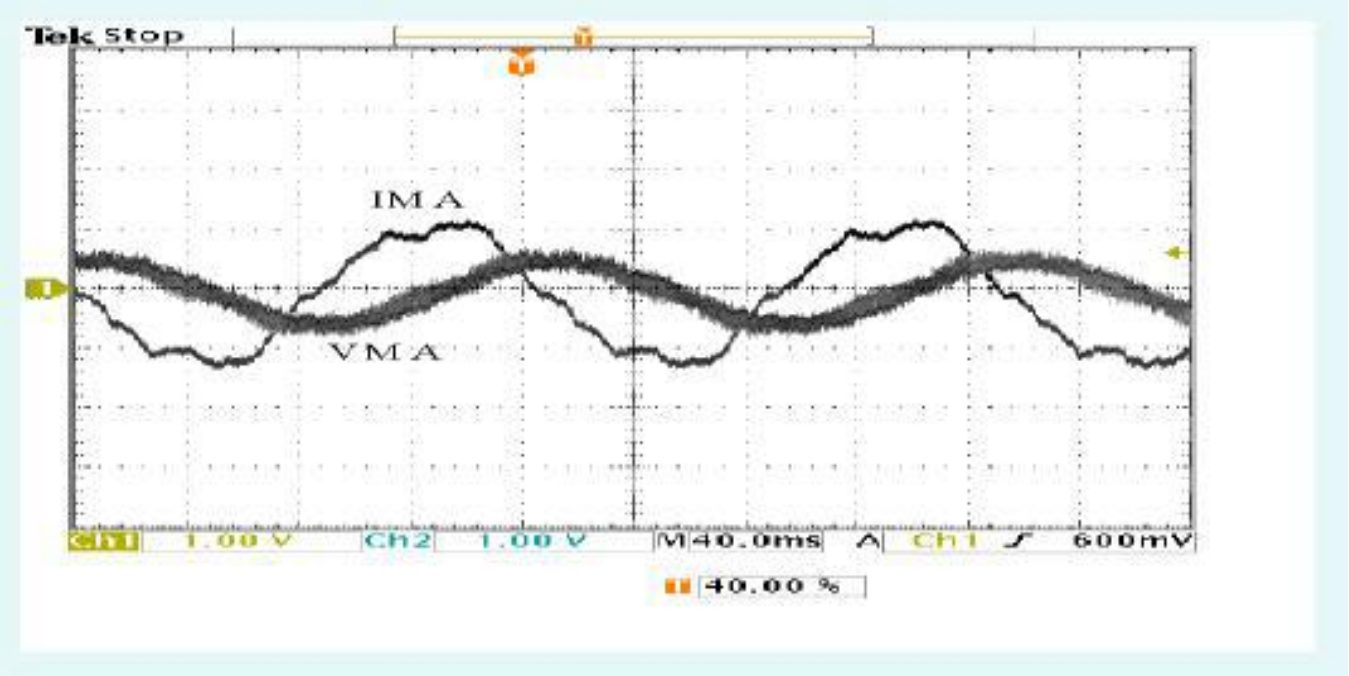
Description	Figures and Records	Initial
Verify that the keypad or drive tool displays the correct value of drive input voltage and frequency. At rated primary voltage, the AC input voltage feedback on Test Points VIA VIB, and VIC should be 5.4Vpp or 1.9Vrms. See the figure in the Comments Section. These test points are on the system interface card. Perform the following corrective step if the input (or line) voltage is too high or too low. If the input voltage to the Drive is too high, then this needs to be corrected. Harmony Drives are shipped with the transformer tap set to +5%, which reduces the voltage by that percentage on the secondary side of the transformer. If the voltage is low (5% less than rated), then change the tap on the transformer to the neutral ("O") or if the voltage is lower than 5% less than rated then change the tap on the transformer to -5% tap. If the input frequency is displayed as a negative number, then one pair of input phases has to be switched to change the phase rotation.	 Confirm Values using an oscilloscope and digital multimeter.	
Enter a speed demand of 25% and give the RUN command. The AC output voltage feedback signals on Test-Points VMA, VMB, and VMC should be 1.35Vpp ±0.27V (measure the average peak-to-peak voltage) or 0.48 Vrms ±0.20V. See the figure in the Comments Section for signals on TestP-points VMA and VMB at 25% speed (15Hz).	 Confirm Values using an oscilloscope and digital multimeter	
Increase the speed demand to 50% (30 Hz). The output voltage feedback signals should increase in proportion for both frequency and amplitude. Note that in Open Loop Test Mode, the flux regulator is not enabled and hence the output voltage will read higher or lower than calculated value corresponding to 50% of rated voltage. Adjust the flux demand parameter (3150) so that the motor voltage (on the keypad or tool) is approximately equal to 50% of rated voltage. Further increase the speed demand to 100% (60 Hz). The AC output voltage on Test-Points VMA, VMB, and VMC should be 5.4Vpp ±0.27V or 1.9 Vrms ±0.20V. The motor voltage on the keypad should read the rated value output voltage ±5%.		

10.0 DRIVE TEST IN OPEN LOOP TEST MODE WITH MOTOR CONNECTED

10.1 The following steps verify operation of the Drive (with a motor connected at its output) in Open Loop Test Mode (No Current Feedback). This test is required only when the operation of the output Hall Effect Transducers requires to be verified. During this test the motor should be unloaded. If this test is not required then proceed to the next test.

Description [This procedure not followed, OLVC method used]				**Initial**
Disconnect control voltage and medium voltage sources & follow LOTO procedures.				
Connect the motor feeder cables or enable motor contactor.				
Re-energize the AC or DC control power.				
Set the motor rated voltage (1040) and frequency (1020) parameters (access it through motor → motor parameters) to be equal to the motor nameplate values.				
Make sure that **spinning load mode (2430)** and **fast by-pass (2600)** are **DISABLED**.				
Slow down Drive acceleration and deceleration. **Set to 60 Sec or greater.** "Drive/Speed Ramp Setup"	Accel time 1	(2270)	Sec	
	Decel time 1	(2280)	Sec	
DON"T operate the drive beyond 10% speed without reducing the Flux Demand (3150) to 0.5. "Stability/Output Processing/Flux Control"				
Energize the medium voltage feed to the VFD. Push the fault reset button on the keypad to reset faults and push the button a second time to acknowledge any alarms. If the mode on the keypad display reads RLBK, then change the control loop type (2050) to open loop vector control and exit out of the menu entry. This should force the RLBK on the keypad to change back to mode. Then **change the control loop type (2050) back to open loop test mode.**				
Configure the keypad to display motor magnetizing current, motor torque current and motor voltage.				
Spin the motor at 1% and observe proper rotation. Motor rotation correct or corrected: ☐ Yes ☐ No				
Operate the Drive with a speed demand of 10%. Observe the AC output voltage feedback and motor current for phase A on test-points VMA and IMA using an oscilloscope. Since the motor is unloaded the current waveform should lead the voltage waveform by almost 90°. The hall effect current transducers introduce a negative sign since they are configured to measure the incoming current. Check test-points VMB, IMB and VMC, IMC for similar waveforms. **See Figure 10.1**				

Figure 10.1 Open Loop Test Mode operation at 10% speed with an unloaded motor.



(AC motor voltage and motor current at test-points VMA and IMA are shown.)

11.0 DRIVE TEST IN OPEN LOOP VECTOR CONTROL MODE FOR UNLOADED MOTOR APPLICATION

11.1 At this point the VFD is ready for actual (induction) motor operation. The following steps verify operation of the Drive and the load induction motor in open loop vector control mode.

Description	Initial
Re-energize the AC or DC control power, if de-energized.	
Change the Drive control loop type (2050) to open loop vector control.	

Description			Value
Setup the speed ramp parameters according to the following recommendations: The acceleration and deceleration rate for a fan should be set to around 60 seconds and for a pump around 30 seconds. "Drive/Speed Ramp Setup"	Accel time 1	(2270)	45 Sec
	Decel time 1	(2280)	45 Sec
Verify that fast (cell) by-pass is DISABLED at this time if you have that option	Fast by-pass	(2600)	NA Sec

11.2 Verify that the following parameters are set correctly – default values are shown.

***Note: Auto-Tuning modifies the italicized menu items*.**

****Note*: Param_List= Please see Completed Parameter List asbuilt attached**

Description				Value
Setup the following motor parameters according to the nameplate values. "Motor/Motor Parameter"	Motor frequency	(1020)	HZ	50
	Full load speed	(1030)	RPM	593
	Motor Rated Voltage	(1040)	V	6600
	Full load current	(1050)	A	217
Use default values for the other motor parameters as shown below. For this test set the stator resistance to 0.1%.	Leakage inductance	(1070)	16.0%	24.4
	Stator resistance	(1080)	0.1%	0.78%
	No load current	(1060)	25.0%	34%
	Inertia	(1090)	30.0 KgM²	389.1
Setup the motor overload and torque limits. Set the motor trip volts to be equal to 120% of the motor rated voltage or to the value required by the customer. Set the over-speed parameter to be 120% or to the value required by the customer. "Motor/Limits"	Overload select	(1130)	Inv. Time with Speed Derate	Inv Time w Sp
	I overload pending	(1139)	105.0%	**Param_List**
	I overload	(1140)	110.0%	**Param_List**
	Overload timeout	(1150)	5 Sec	**Param_List**
	Max. Motor Inertia	(1159)	0.0 KgM^2	**Param_List**
	Motor trip volts	(1160)	4800 V	**Param_List**
	Over-speed	(1170)	120%	**Param_List**
	Motor torque limit 1	(1190)	100.0%	**Param_List**
	Regen torque limit 1	(1200)	-0.25%	**Param_List**

Description				Value
Verify that these control loop gains are at their default values.	Flux reg prop gain	(3110)	1.72	**Param_List**
	Flux reg integral gain	(3120)	1.00	**Param_List**
	Flux filter time const	(3130)	0.0667 Sec	**Param_List**
	Flux demand	(3150)	1.0	**Param_List**
	Flux ramp rate	(3160)	0.5 Sec	**Param_List**
	Energy saver min flux	(3170)	100%	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Speed Loop"	Speed reg prop gain	(3210)	0.02	**Param_List**
	Speed reg integral gain	(3220)	0.046	**Param_List**
	Speed reg Kf gain	(3230)	0.60	**Param_List**
	Speed filter time const	(3240)	0.0488 Sec	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Current Loop"	**Current reg prop gain*	(3260)	0.50	**Param_List**
	**Current reg integral gain*	(3270)	25	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Braking"	Enable braking	(3360)	Off	**Param_List**
	Pulsation frequency	(3370)	275 Hz	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing"	Output current scaler	(3440)	1.000000	**Param_List**
	Output voltage scaler	(3450)	1.000000	**Param_List**
Verify that these control loop gains are at their default values. "Stability"	Dead time comp	(3550)	16.0 µSec	**Param_List**
	Feed forward constant	(3560)	0.0000	**Param_List**
	Carrier frequency	(3580)	400.0 Hz	**Param_List**

Description		Initial
Verify the system operational program (SOP) and customer interface per Customer specification.		**RD**
Verify that the Customer has completed their entire interface testing at this time.		**RD**
Energize the medium voltage feed to the VFD. Push the fault reset button on the keypad to reset faults and push the button a second time to acknowledge any alarms.		**RD**
Configure the keypad to display Speed Demand, Motor Magnetizing Current, Motor Torque Current, and Motor Voltage.		**RD**
Operate the Drive with a speed demand of 10%. Observe the AC output voltage feedback and motor current for phase A on test-points VMA and IMA using an oscilloscope.	• If the motor is unloaded, then the current waveform should lead the voltage waveform by almost 90° (see Figure 11.1 - top frame) The hall effect current transducers introduce a negative sign since they are configured to measure the incoming current. • If the motor is loaded then the current waveform will lead the motor voltage by an angle small than 90° (see Figure 11.1 - bottom frame). • The motor voltage should be 10% of the motor rated voltage.	**RD**

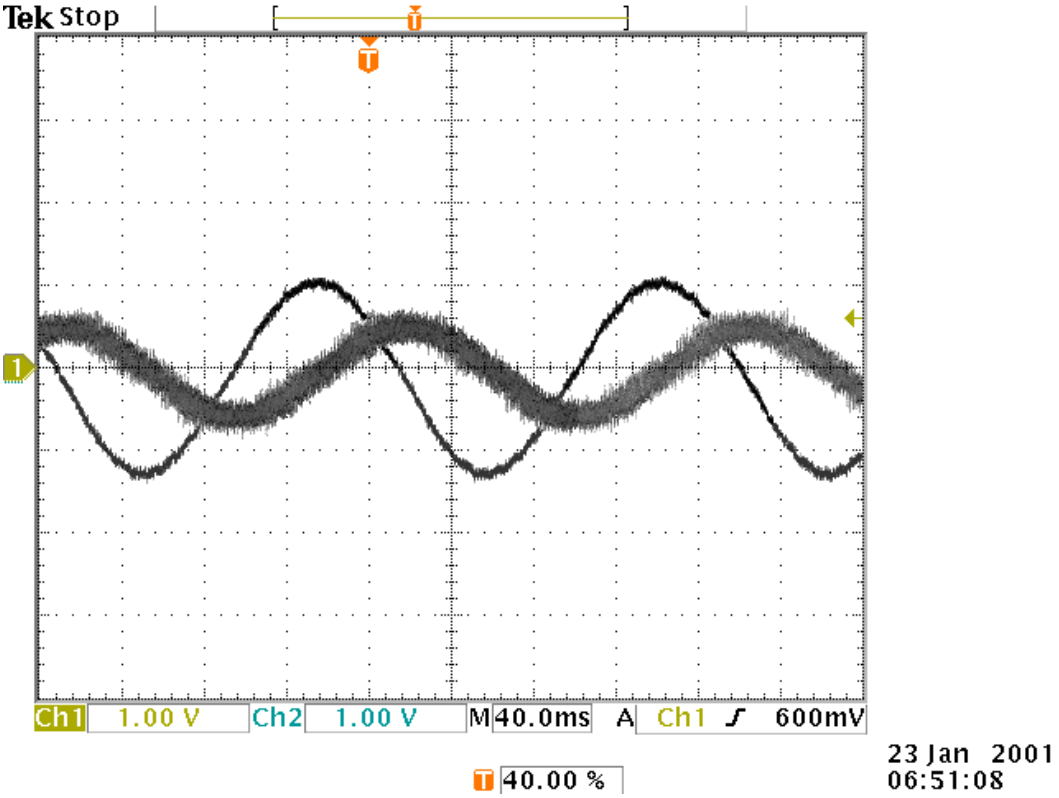
Description	Initial
Increase the speed demand while monitoring the motor voltage. The motor voltage should read according to the following table. See Figure 11.2 for waveforms at 100% spread (50Hz). Table 6 shows the Drive voltage scaling for signals on test-points VMA, VMB and VMC as a function speed. Table 7 lists the scaling for the currents and voltage feedback signals available on the signal conditioning board at the rated operating point of the Drive.	**RD**

Table 6: Scaling of Drive output voltage as a function of speed

Speed Command (%)	Motor Speed (Hz)	Motor Voltage Feedback, (V_{P-P}) NXG Sys Intrf Brd (NXGII Sys I/O Brd)	Motor Voltage Feedback, (V_{RMS}) NXG Sys Intrf Brd (NXGII Sys I/O Brd)
10	6	1.08 (0.54) V_{P-P}	0.38 (0.19) V_{RMS}
25	15	2.70 (1.35) V_{P-P}	0.96 (0.48) V_{RMS}
50	30	5.40 (2.70) V_{P-P}	1.91 (0.96) V_{RMS}
75	45	8.10 (4.05) V_{P-P}	2.87 (1.44) V_{RMS}
100	60	10.80 (5.40) V_{P-P}	3.82 (1.91) V_{RMS}

Table 7: Scaling of Drive input and output voltages and currents

Variable	Rated value at Drive terminals (RMS)	Feedback value under rated conditions (V_P) NXG Sys Interface Board or (NXGII Sys I/O Board)	Feedback value under rated conditions (V_{RMS}) NXG Sys Interface Board or (NXGII Sys I/O Board)
Input Current	Primary Current Rating of Input CT	5.0 (2.5) V_P	3.54 (1.77) V_{RMS}
Input Voltage	(Rated Input Voltage L-L) / 1.732	5.4 (2.7) V_P	3.82 (1.91) V_{RMS}
Output Current	Output Current Rating = Cell Rating	5.0 (2.5) V_P	3.54 (1.77) V_{RMS}
Output Voltage	(Rated Output Voltage L-L) / 1.732	5.4 (2.7) V_P	3.82 (1.91) V_{RMS}
Examples: Output Current Scaling: Cell current rating = 3.54 (1.77) V_{RMS} Output Voltage Scaling: [(Rated output voltage L-L) / 1.732] * 1.414 = 5.4 (2.7) V_P			



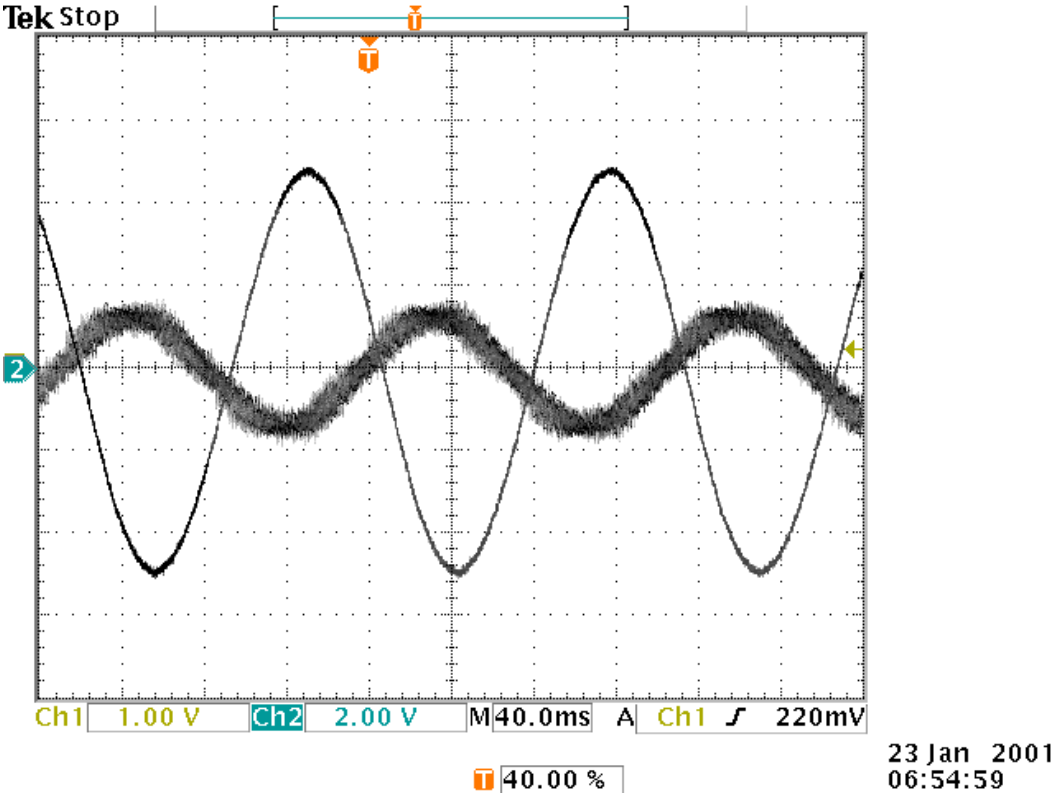


Figure 11.1 and 11.2
AC motor voltage and motor current at test-points VMA and IMA at 10% speed in Open Loop Vector Control
Top frame: Unloaded Operation

Bottom frame: Full Load Operation

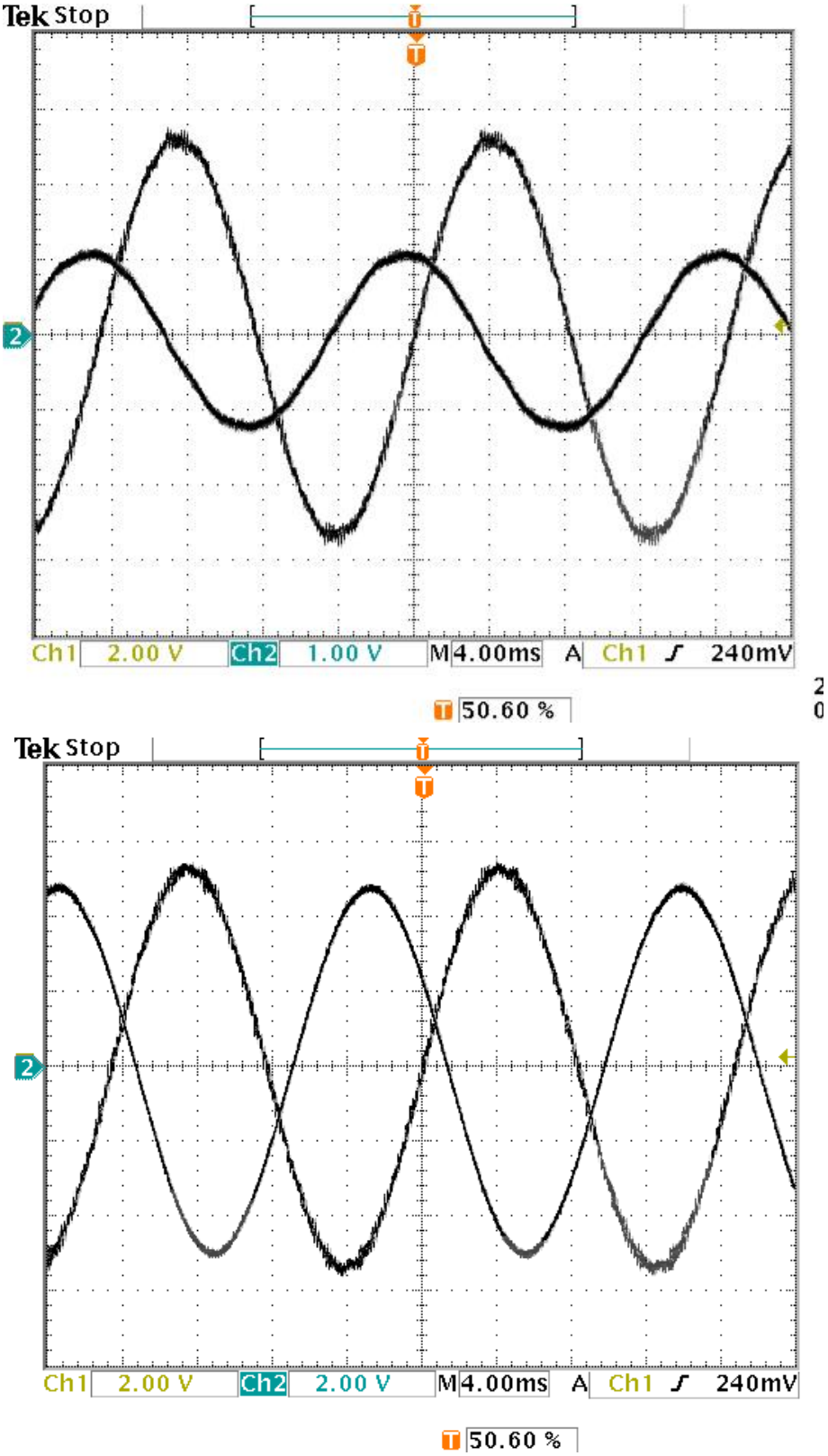


Figure 11.3 and 11.4
AC motor voltage and motor current at test-points VMA and IMA at 10% speed Open
Top frame: Unloaded Operation
Bottom frame: Full Load Operation Drive Test in Synchronous Motor Control Mode

12.0 TUNING

Note: Spinning Load is disabled with V/Hz and OLTM control. IT is automatically enabled if fast by-pass is enabled regardless of menu settings.

Note: Spinning Load should be enabled if one or more of the following operating modes/features are selected:

- **Fast By-Pass**
- **Auto-Restart (controlled through the auto reset parameters 7120-7150 and the SOP)**
- **Synchronous Motor Control (SMC and CSMC)**
- **Closed Loop Vector Control (CLVC)**

Description		Initial
Use the drive tool to monitor motor flux (FluxDS), motor speed, and speed reference.		**RD**
Step 1: To enable spinning load and make sure the following parameters are set to the values shown.		**RD**
Step 2: Spinning Load Menu (2420)		**RD**
	Spinning load mode (2430) forward or reverse, whichever is appropriate	**RD**
	Scan end threshold (%) (2440) 20%	**RD**
	Current level set point (%) (2450) 15% [or equal to the no-load current setting]	**RD**
	Current ramp(s) (2460) 0.01 s	**RD**
	Max current (%) (2470) 50%	**RD**
	Frequency scan rate(s) (2480) 3.0 s (scan time). Check NXG Control manual for this feature	**RD**
Step 3: Operate the Drive with a demand of 30%.		**RD**
Step 4: On the drive tool monitor, the speed reference and motor speed at the moment the Drive “catches” the motor.		**RD**
Repeat Steps 3-4 for different cells. Save the screen shots from tool suite noting which cell was by-passed.		**NA**

13.0 SYNCHRONOUS TRANSFER PROCEDURE (if applicable) N/A

13.1 This section of the startup procedure involves optional synchronous transfer checks. The Pefect Harmony may be configured for optional synchronous transfer operation, in which the Drive can be used to control multiple motors, one motor at a time. If such a configuration is not defined for the application, then this section may be skipped.

13.2 Use the following steps to setup the Drive control for Synchronous Transfer:

Description		Initial
Step 1: Configure Synchronous Transfer Menu parameters as shown below.		
	Synchronous Transfer (2700)	
	Phase I gain (2710) 2	

	Phase P gain (2720) 4	
	Phase offset (2730) 2 deg	
	Phase error threshold (2740) 1.5 deg	
	Frequency Offset (2750) 0.5%	
	Up Transfer Timeout (2760) 0 sec	
	Down Transfer Timeout (2770) 0 sec	
Step 2: Enable Spinning Load by setting Spinning Load Mode (2430) to forward.		
Step 3: Set the Speed Fwd Max limit 1 (2080) to at least 105%		

13.3 Go through the following checklist to complete the setup of Synchronous Transfer:

Description	Initial
Configure the Drive control as described from OLTM/CLVC	
Ensure that PLC-related hardware is properly connected (for information, see the respective PLC communications network manuals supplied by the vendor) to the analog I/O modules.	
Verify wiring of all VFD control and line control electrical contactors.	
Ensure that the system operating program for the “up transfer” and “down transfer” process logic is implemented.	
The state machines for up and down transfers reside in the Perfect Harmony’s control program. These interface with the control system integrator’s PLC network via the VFD system operating program to handle handshaking between each motor control center (MCC) and the VFD. All controls for the VFD and line reactors are controlled from the system integrator’s PLC. Verify that these controls are operational.	
Verify all communications flags. (debugger screen)	
For Synchronous Motor (SM) synchronous transfer, an external field controller source is required when the SM is connected to the line and the Drive is disabled. This alalog source and the source from the Drive must be switched via external logic and in a digital manner, 4-20ma current loops are used for analog sources (current loops cannot be switched via a relay). The final output from the PLC must be connected to the field excitor directly. Verify that there are two sources to the PLC (one of which may be internal), and that the PLC logic is set to switch between the two sources at the appropriate time. The PLC also controls the enable of the field exciter any time the motor is active.	

14.0 DRIVE TEST WITH SYNCHRONOUS MOTOR : N/A

14.1 Procedure to verify operation of Drive with synchronous motor in Synchronous Motor Control Mode.

Description	Initial
Connect the synchronous motor to the Drive. Enter motor parameters and use default gains except for the following parameters: 1. Enter Synch Motor Field no-load current as the No-load Current setting (1060). This parameter should be calculated (in %) on the basis of the actual no-load field current and the maximum capability of the field excitor. a) Example: Drive with a synchronous motor that requires 24A of no-load field current and a field supply that is tuned so that 75A is the maximum output (at 20mA command input), then the No-Load Current Parameter should be set to: No-Load Current Setting = 100% * 24/75A = 32.0% 2. Enable Spinning Load (2430) 3. Change the Drive control loop type (2050) to Synchronous Motor Control. 4. Use default control loop gains except for the flux loop gains that should be changed as follows: a) Flux reg prop gain (3110) 0.50 b) Flux reg integral gain (3120) 0.50 c) Flux Filter Time Const (3130) 0.022 sec d) Saliency (1091) .02 5. The SOP should have been modified to include the logic for controlling the field supply output contactor. The contactor should be ON as soon as the Start command to the Drive is given, and should be turned OFF immediately when the Drive trips on a Fault or when the Drive goes to Coast State (while stopping).	
Energize medium voltage Drive. Run the Drive with a speed demand of 10%.	
Verify that after Start command is given, the field supply first starts by applying current and building motor flux During this time, Ids and Iqs should be zero.	
After a time period equal to the Flux Ramp Rate parameter (3160), the Drive starts by increasing the Speed Reference to the Speed Demand.	
With Synchronous Motors, the Drive current is always in phase with the voltage, i.3e., Ids ≈ 0 under steady-state conditions. At no-load, there is very little current supplied from the Drive (on the keypad, motor current display, ITOT ≈ 0).	
Run the Drive to 10% speed. Verify that the no-load and full load (if possible) current waveforms, along with the Drive voltage waveforms, areas shown in Figure 14.1)	
Run the Drive to 100% speed. Verify that the no-load and full-load (if possible) current waveforms, along with the Drive voltage waveforms, are as shown in Figure 14.2. Note that the Drive output currents at 100% speeds are distorted. This is due to the shape of the poles in the synchronous motor. At low speeds, the current regulator bandwidth is sufficient to correct for the distortion introduced by the motor poles as shown in 14.2 b. However, at high speeds, the current regulator gains are insufficient to maintain sinusoidal output currents when the distortion is due to motor pole construction.	

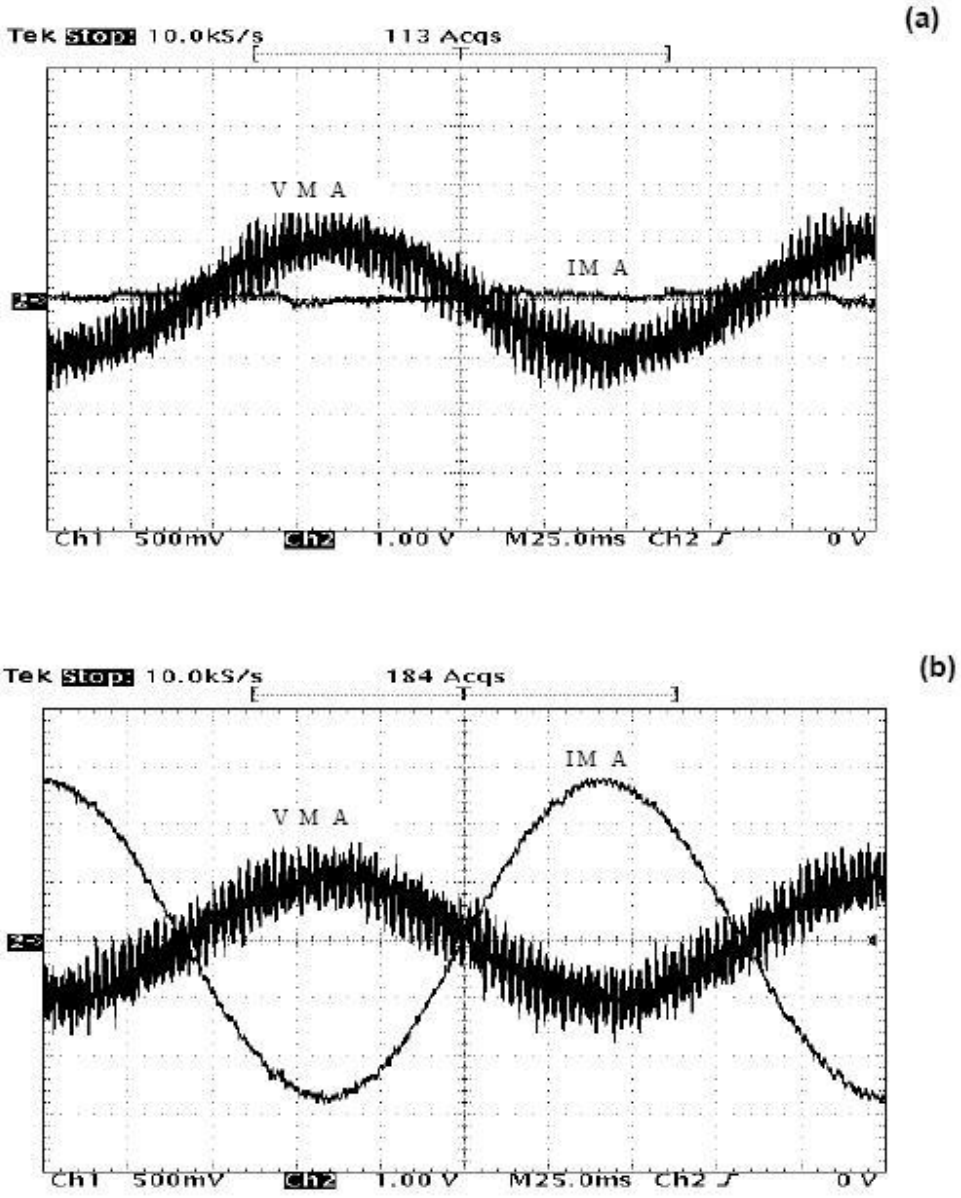


Figure 14.1

AC Motor Voltage and Motor Current at Test-points VMA and IMA at 10% speed with Synchronous Motor Control (a) Unloaded and (b) 75% torque operation.

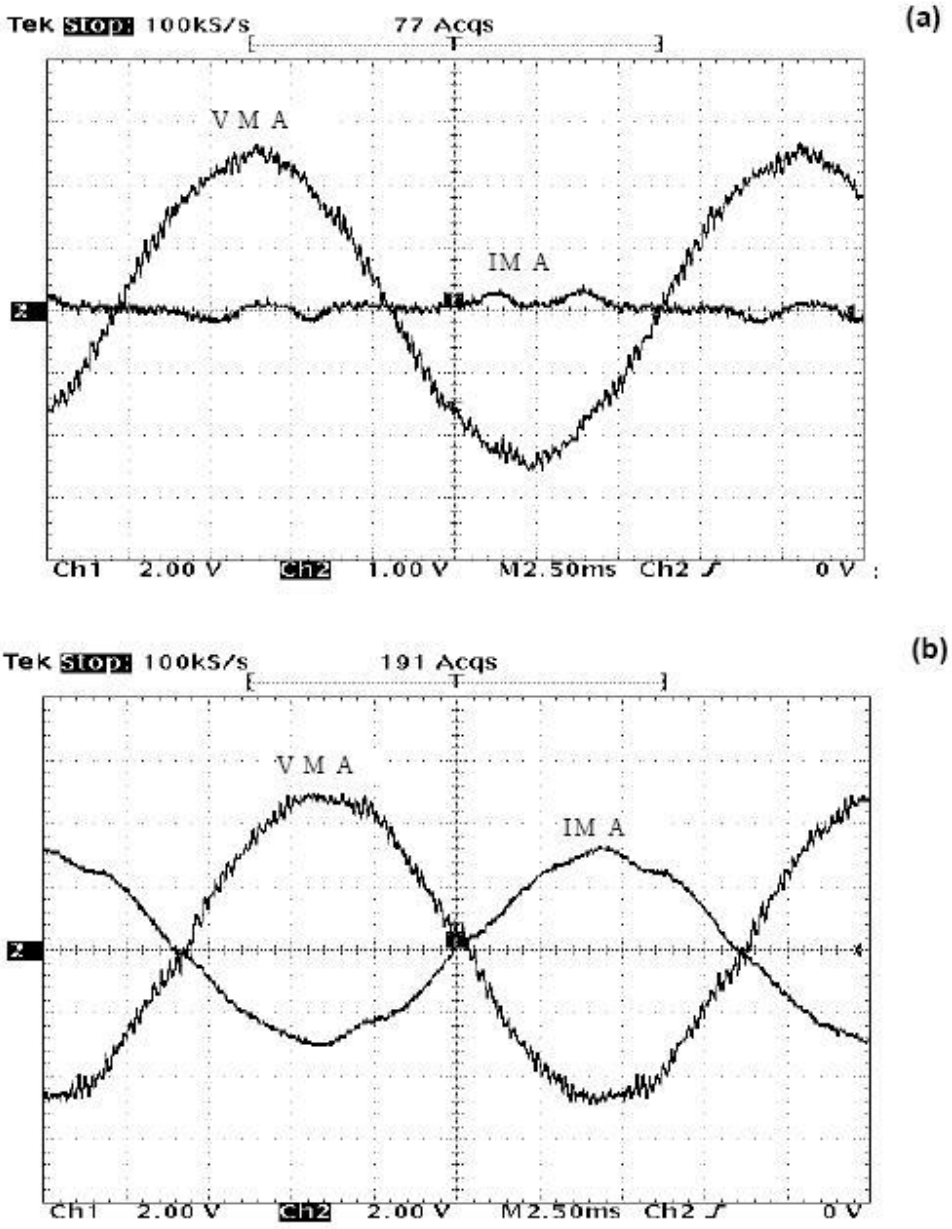


Figure 14.2

AC Motor and Motor Current at Test-point VMA and IMA at 100% speed with Synchronous Motor Control

(a) Unloaded and (b) 75% torque operation

15.0 ALARMS AND ADDRESSES See Param_List attached

Description		Initial
Verify the following parameters are set.		**RD**
Motor limits (1120) including phase imbalance limit (1244) and ground fault limit (1245)		**RD**
Speed profile menu (4000)		**RD**
Bypass type menu (2590) and fast bypass menu (2600)		**RD**
Critical frequency menu (2340)		**RD**
Drive protection menu (7)		**RD**
Display parameters menu (8000)		**RD**
The Drive is functional at this time.		**RD**
Verify alarm indications per the site confirm the input protection E-stop is working.		**RD**
Depress local E-Stop	VFD coast to stop	**RD**
Measure contact status on TB2-1 & 2	Open = E-stop	**RD**
Verify Fault contact on TB2-31 & 32 changes state	Closed = Fault	**RD**
Verify Run contact on TB2-23 & 24 changes state	Open = Not Running	**RD**
Remove Jumper on TB2-3 & 4	VFD coasts to stop	**RD**

The commissioning process is now complete.

The Customer's signature provides acceptance of the Siemens equipment listed on the site information page.

16.0 APPROVAL & ACCEPTANCE OF STARTUP & COMMISSIONING

16.1 Documentation Provided

16.1.1 Configure keypad to display desired parameters.

16.1.2 Upload the parameter (configuration) file, SOP file, event log file.

16.1.3 Provide Customer with the following:

16.1.3.1 Copy of parameter, SOP, event log file

16.1.3.2 Copy of operating flash drive

16.1.3.3 Copy of this checklist

I, the undersigned, validate that this system Commissioning has been completed as per this procedure. Any discrepancies have been noted alongside the appropriate steps in the document. Additionally, any outstanding items or recommendations have been listed.

SIEMENS FSR	
Print Name:	**Ruben Diaz**
Signature:	R. D.
Date:	**Completion - 30 October 2013**

CUSTOMER REPRESENTATIVE	
Print Name:	JOHN CLAYTON.
Signature:	J Clayton.
Date:	30/10/2013.

CUSTOMER REPRESENTATIVE	
Print Name:	EDDIE GERMANIC
Signature:	
Date:	17-3-2014

Description	ID	Lvl	RH
Main - Sec. level: 7	5	0	0 0
Motor	1	0	0 0
Motor parameter	1000	0	0 0
Motor frequency = 50.0 Hz	*1020	5	1 0
Full load speed = 593 rpm	*1030	5	1 0
Motor voltage = 6600 V	*1040	5	1 0
Full load current = 217.0 A	*1050	5	1 0
No load current = 33.4 %	*1060	5	0 0
Motor kW Rating = 2000.0 kW	*1010	5	1 0
Leakage inductance = 24.7 %	*1070	5	0 0
Stator resistance = 0.81 %	*1080	5	0 0
Inertia = 388.5 Kgm2	*1090	5	0 0
Current Profile	1092	0	0 0
Motor current limit 1 = 100 %	1193	7	0 0
Speed at current lim 1 = 100 %	1194	7	0 0
Motor current limit 2 = 100 %	1195	7	0 0
Speed at current lim 2 = 100 %	1196	7	0 0
Motor current limit 3 = 100 %	1197	7	0 0
Speed at current lim 3 = 100 %	1198	7	0 0
Motor current limit 4 = 100 %	1202	7	0 0
Speed at current lim 4 = 100 %	1203	7	0 0
Motor current limit 5 = 100 %	1204	7	0 0
Speed at current lim 5 = 100 %	1205	7	0 0
Motor current limit 6 = 100 %	1206	7	0 0
Speed at current lim 6 = 100 %	1207	7	0 0
Motor current limit 7 = 100 %	1208	7	0 0
Speed at current lim 7 = 100 %	1209	7	0 0
Motor current limit 8 = 100 %	1301	7	0 0
Speed at current lim 8 = 100 %	1302	7	0 0
Motor current limit 9 = 100 %	1303	7	0 0
Speed at current lim 9 = 100 %	1304	7	0 0
Limits	1120	5	0 0
Overload select = Inv Time w/ derate	1130	5	0 0
Overload Pending = 100.0 %	*1139	5	0 0
Overload = 110.0 %	1140	5	0 0
Overload timeout = 5.0 sec	1150	5	0 0
Speed Derate Curve	1151	5	0 0
0 Percent Break Point = 0.0 %	1152	5	0 0
10 Percent Break Point = 31.6 %	1153	5	0 0
17 Percent Break Point = 41.2 %	1154	5	0 0
25 Percent Break Point = 50.0 %	1155	5	0 0
50 Percent Break Point = 70.7 %	1156	5	0 0
100 Percent Break Point = 100.0 %	1157	5	0 0
Motor trip volts = 8300 V	*1160	5	0 0
Maximum Motor Inertia = 0.0 Kgm2	1159	5	1 0
Overspeed = 120.0 %	1170	5	0 0
Underload enable = Disable	1180	5	0 0
I underload = 10.0 %	1182	5	0 0
Under load timeout = 10.0 sec	1186	5	0 0
Motor torque limit 1 = 100.0 %	1190	5	0 0
Regen torque limit 1 = -0.25 %	1200	5	0 0
Motor torque limit 2 = 100.0 %	1210	7	0 0
Regen torque limit 2 = -0.25 %	1220	7	0 0

Description		ID	Lvl RH
	Motor torque limit 3 = 100.0 %	1230	7 0 0
	Regen torque limit 3 = -0.25 %	1240	7 0 0
	Phase Imbalance Limit = 40.0 %	1244	5 0 0
	Ground Fault Limit = 5.0 %	1245	5 0 0
	Ground Fault Time Const = 0.017 sec	1246	5 0 0
	H/W Ground Fault Enable = Yes	1247	7 1 0
	Peak Reduction Enable = VFD volt rating	1248	7 0 0
	Loss of field level = 40.0 %	1141	7 0 0
	Loss of field timeout = 10.0 sec	1142	7 0 0
Encoder		1280	0 0 0
	Encoder 1 PPR = 1024	*1290	5 1 0
	Encoder filter gain = 0.7500	1300	7 0 0
	Encoder loss threshold = 5.0 %	1310	7 0 0
	Encoder loss response = stop (fault)	1320	7 0 0
	Low speed operation = Disable	1330	7 0 0
Drive		2	0 0 0
Drive parameters		2000	0 0 0
	Rated input voltage = 6600 V	*2010	7 1 0
	Rated input current = 214.0 A	*2020	7 1 0
	Rated output voltage = 6600 V	*2030	7 1 0
	Rated output current = 260.0 A	*2040	7 1 0
	Control loop type = OLVC	2050	7 1 0
	Parallel system = Disable	2051	0 0 0
Speed setup		2060	0 0 0
	Ratio control = 100.0 %	2070	5 0 0
	Speed fwd max limit 1 = 100.0 %	2080	5 0 0
	Speed fwd min limit 1 = 1.0 %	*2090	5 0 0
	Speed fwd max limit 2 = 0.0 %	*2100	7 0 0
	Speed fwd min limit 2 = 0.0 %	2110	7 0 0
	Speed fwd max limit 3 = 0.0 %	*2120	7 0 0
	Speed fwd min limit 3 = 0.0 %	2130	7 0 0
	Speed rev max limit 1 = 0.0 %	*2140	5 0 0
	Speed rev min limit 1 = 0.0 %	2150	5 0 0
	Speed rev max limit 2 = 0.0 %	*2160	7 0 0
	Speed rev min limit 2 = 0.0 %	2170	7 0 0
	Speed rev max limit 3 = 0.0 %	*2180	7 0 0
	Speed rev min limit 3 = 0.0 %	2190	7 0 0
	Zero speed = 0.0 %	2200	5 0 0
Torque reference		2210	0 0 0
	Sop / Menu control = Sop flag	2211	5 0 0
	Torque setpoint = 0.0 %	2220	0 0 0
	Holding torque = 0.0 %	2230	0 0 0
	Torque ramp increase = 1.00 sec	2240	0 0 0
	Torque ramp decrease = 1.00 sec	2250	0 0 0
	Torque command scalar = 1.00	2242	5 0 0
Speed ramp setup		2260	0 0 0
	Accel time 1 = 45.0 sec	*2270	5 0 0
	Decel time 1 = 45.0 sec	*2280	5 0 0
	Accel time 2 = 5.0 sec	2290	7 0 0
	Decel time 2 = 5.0 sec	2300	7 0 0

Description	ID	Lvl RH
Accel time 3 = 5.0 sec	2310	7 0 0
Decel time 3 = 5.0 sec	2320	7 0 0
Jerk rate = 0.1	2330	7 1 0
Critical freq	2340	5 0 0
Skip center freq 1 = 15.0 Hz	2350	5 0 0
Skip center freq 2 = 30.0 Hz	2360	5 0 0
Skip center freq 3 = 45.0 Hz	2370	5 0 0
Skip bandwidth 1 = 0.0 Hz	2380	5 0 0
Skip bandwidth 2 = 0.0 Hz	2390	5 0 0
Skip bandwidth 3 = 0.0 Hz	2400	5 0 0
Spinning load	2420	0 0 0
Spinning load mode = Both	*2430	5 0 0
Scan end threshold = 20.0 %	2440	5 0 0
Current Level SetPoint = 15.0 %	2450	5 0 0
Current ramp = 0.01 sec	2460	5 0 0
Max current = 50.0 %	2470	5 0 0
Frequency scan rate = 3.00 sec	2480	5 0 0
Cond time setup	2490	0 0 0
Cond stop timer = 0.8 sec	2500	5 0 0
Cond run timer = 0.8 sec	2510	5 0 0
Cells	2520	0 0 0
Installed cells/phase = 6	*2530	5 1 0
Min cell count (n/3) = 6	*2540	5 1 0
Cell voltage = 630	2550	5 1 0
Thermistor warn level = 20.0 %	2560	5 1 0
Bypass type = None	*2590	7 1 0
Neutral connection = T1	*2630	7 1 0
Precharge Enable = Off	2635	7 1 0
Sync transfer	2700	7 0 0
Phase I gain = 2.0	2710	7 0 0
Phase P gain = 4.0	2720	7 0 0
Phase offset = 2.00 deg	2730	7 0 0
Phase error threshold = 1.50 deg	2740	7 0 0
Frequency offset = 0.5 %	2750	7 0 0
Up transfer timeout = 0.0 sec	2760	7 0 0
Down transfer timeout = 0.0 sec	2770	7 0 0
External I/O	2800	5 0 0
Analog inputs = 0	2810	5 1 0
Analog outputs = 2	*2820	5 1 0
Digital inputs = 0	2830	5 1 0
Digital outputs = 0	2840	5 1 0
Wago timeout = 0.0 sec	*2850	5 1 0
Internal I/O	2805	5 0 0
Int Analog In1	2815	5 0 0
Hardware Span = 1.0860	*2818	5 1 0
Int Analog In2	2825	5 0 0
Type = 4 - 20ma	2826	5 1 0

Description	ID	Lvl	RH
Hardware Span = 1.0635	*2828	5	1 0
Int Analog In3	2835	5	0 0
Type = 4 - 20ma	2836	5	1 0
Hardware Span = 1.0705	*2838	5	1 0
Int Analog Out1	2845	5	0 0
Analog variable = Total Current	2846	5	0 0
Output Mode = 4-20 mA	2848	5	0 0
Output Min = 0.0 %	2841	5	0 0
Output Max = 150.0 %	*2842	5	0 0
Hardware Span = 1.0120	*2844	5	0 0
Int Analog Out2	2855	5	0 0
Analog variable = Motor Speed	*2856	5	0 0
Output Mode = 4-20 mA	2858	5	0 0
Output Min = 0.0 %	2851	5	0 0
Output Max = 100.0 %	2852	5	0 0
Hardware Span = 1.0030	*2854	5	0 0
Int Test Point #28	2860	5	0 0
Analog variable = None	2861	5	0 0
TP 28 Scaler = 0.00	2862	5	0 0
Int Test Point #29	2865	5	0 0
Analog variable = None	2866	5	0 0
TP 29 Scaler = 0.00	2867	5	0 0
Int Test Point #31	2870	5	0 0
Analog variable = None	2871	5	0 0
TP 31 Scaler = 0.00	2872	5	0 0
Int Test Point #24	2875	5	0 0
Analog variable = None	2876	5	0 0
TP 24 Scaler = 0.00	2877	5	0 0
Int Test Point #25	2880	5	0 0
Analog variable = None	2881	5	0 0
TP 25 Scaler = 0.00	2882	5	0 0
Int Test Point #26	2885	5	0 0
Analog variable = None	2886	5	0 0
TP 26 Scaler = 0.00	2887	5	0 0
Output Connection	2900	0	0 0
Filter CT sec turns = 0	2910	5	1 0
Filter inductance = 0.0 %	2920	5	0 0
Filter capacitance = 0.0 %	2930	5	0 0
Cable resistance = 0.0 %	2940	5	0 0
Cable inductance = 0.0 %	2941	5	0 0
Filter damping gain = 0.50	2950	5	0 0
High starting Torque	2960	7	0 0
Enable high torque = Disable	2961	7	1 0
Torque current = 50.0 %	2962	5	0 0

Description	ID	Lvl RH
Current ramp time = 0.5 sec	2963	5 0 0
PLL Acq time = 2.0 sec	2964	5 0 0
Watchdog	2970	7 0 0
Enable watchdog = Enable	2971	7 0 0
Stability	3	0 0 0
Input processing	3000	7 0 0
PLL prop gain = 70.0	3010	7 0 0
PLL integral gain = 3840.00	3020	7 0 0
Input current scaler = 1.000000	3030	7 1 0
CT secondary turns = 250	*3035	7 1 0
Input voltage scaler = 1.000000	3040	7 1 0
PT secondary turns = 1	3011	7 1 0
Input Attenuator Sum = 4800 kOhm	*3045	7 1 0
Output processing	3050	7 0 0
Low freq comp	3060	7 0 0
Low Freq Wo = 12.566 Rad	3070	7 1 0
Low freq com gain = 1.00	3080	7 0 0
S/W compensator pole = 2.000	3090	7 0 0
Flux control	3100	7 0 0
Flux reg prop gain = 2.552	*3110	7 0 0
Flux reg integral gain = 3.208	*3120	7 0 0
Flux filter time const = 0.06561	*3130	7 0 0
Flux demand = 1.00	3150	7 0 0
Flux ramp rate = 0.500 sec	3160	7 0 0
Energy saver min flux = 100.0 %	3170	7 0 0
Flux droop = 0.0 %	3195	7 0 0
Speed loop	3200	7 0 0
Speed reg prop gain = 0.010	*3210	7 0 0
Speed reg integral gain = 0.020	*3220	7 0 0
Speed reg Kf gain = 0.600	3230	7 0 0
Speed filter time const = 0.08038	*3240	7 0 0
Droop in % @ FL current = 0.0 %	3245	7 0 0
Current loop	3250	7 0 0
Current reg prop gain = 0.750	*3260	7 0 0
Current reg integ gain = 18.861	*3270	7 0 0
Prop gain during brake = 0.150	*3280	7 0 0
Integ gain during brake = 3.772	*3290	7 0 0
Stator resis est	3300	7 0 0
Stator resistance est = Off	3310	7 1 0
Stator resis filter gain = 0.0	3320	7 0 0
Stator resis integ gain = 0.00200	3330	7 0 0
Braking	3350	7 0 0
Enable braking = Off	3360	7 0 0
Pulsation frequency = 277.5 Hz	*3370	7 0 0
Brake power loss = 0.3 %	3390	7 0 0
VD Loss Max = 0.250	3400	7 0 0
Braking constant = 1.05	3410	7 0 0

Description	ID	Lvl RH
Output current scaler = 1.000000	3440	7 0 0
Output voltage scaler = 1.000000	3450	7 0 0
Output Attenuator Sum = 4800 kOhm	*3455	7 1 0
Control loop test	3460	7 0 0
Test type = Speed	3470	7 0 0
Test positive = 30.0 %	3480	7 0 0
Test negative = -30.0 %	3490	7 0 0
Test time = 30.1 sec	3500	7 0 0
Dead time comp = 16.0000 usec	3550	7 1 0
Feed forward constant = 0.0000	3560	7 1 0
Sampling Delay Comp = 0.0 %	3570	7 0 0
Carrier frequency = 601.3 Hz	*3580	7 1 0
Auto	4	5 0 0
Speed profile	4000	5 0 0
Entry point = 0.0 %	4010	5 0 0
Exit point = 100.0 %	*4020	5 0 0
Entry speed = 48.0 %	*4030	5 0 0
Exit speed = 98.3 %	*4040	5 0 0
Auto off = 0.0 %	4050	5 0 0
Delay off = 0.5 sec	4060	5 0 0
Auto on = 0.0 %	4070	5 0 0
Delay on = 0.5 sec	4080	5 0 0
Analog inputs	4090	5 0 0
Analog input #1	4100	5 0 0
Source = Int AI1	*4105	5 1 0
Type = 4 - 20ma	4110	5 1 0
Min input = 0.0 %	4120	5 1 0
Max input = 100.0 %	4130	5 1 0
Loss point threshold = 15.0 %	4140	5 1 0
Loss of signal action = Preset	4150	5 1 0
Loss of signal setpoint = 20.0 %	4160	5 0 0
Analog input #2	4170	5 0 0
Source = Off	4175	5 1 0
Type = 4 - 20ma	4180	5 1 0
Min input = 0.0 %	4190	5 1 0
Max input = 100.0 %	4200	5 1 0
Loss point threshold = 15.0 %	4210	5 1 0
Loss of signal action = Preset	4220	5 1 0
Loss of signal setpoint = 20.0 %	4230	5 0 0
Analog input #3	4232	5 0 0
Source = Off	4233	5 1 0
Type = 4 - 20ma	4234	5 1 0
Min input = 0.0 %	4235	5 1 0
Max input = 100.0 %	4236	5 1 0
Loss point threshold = 15.0 %	4237	5 1 0
Loss of signal action = Preset	4238	5 1 0
Loss of signal setpoint = 20.0 %	4239	5 0 0
Analog input #4	4332	5 0 0

Description	ID	Lvl RH
Source = Off	4333	5 1 0
Type = 4 - 20ma	4334	5 1 0
Min input = 0.0 %	4335	5 1 0
Max input = 100.0 %	4336	5 1 0
Loss point threshold = 15.0 %	4337	5 1 0
Loss of signal action = Preset	4338	5 1 0
Loss of signal setpoint = 20.0 %	4339	5 0 0
Analog input #5	4341	5 0 0
Source = Off	4342	5 1 0
Type = 4 - 20ma	4343	5 1 0
Min input = 0.0 %	4344	5 1 0
Max input = 100.0 %	4345	5 1 0
Loss point threshold = 15.0 %	4346	5 1 0
Loss of signal action = Preset	4347	5 1 0
Loss of signal setpoint = 20.0 %	4348	5 0 0
Auxillary input #1	4500	5 0 0
Source = Off	4510	5 1 0
Type = 4 - 20ma	4520	5 1 0
Min input = 0.0 %	4530	5 1 0
Max input = 100.0 %	4540	5 1 0
Loss point threshold = 15.0 %	4550	5 1 0
Loss of signal action = Preset	4560	5 1 0
Loss of signal setpoint = 20.0 %	4570	5 0 0
Auxillary input #2	4580	5 0 0
Source = Off	4590	5 1 0
Type = 4 - 20ma	4600	5 1 0
Min input = 0.0 %	4610	5 1 0
Max input = 100.0 %	4620	5 1 0
Loss point threshold = 15.0 %	4630	5 1 0
Loss of signal action = Preset	4640	5 1 0
Loss of signal setpoint = 20.0 %	4650	5 0 0
Analog outputs	4660	5 0 0
Analog output #1	4661	5 0 0
Analog variable = Average Power	*4662	5 0 0
Output module type = Unip	4663	5 0 0
Full range = 81.0 %	*4664	5 0 0
Analog output #2	4665	5 0 0
Analog variable = Motor Speed	*4666	5 0 0
Output module type = Unip	4667	5 0 0
Full range = 100.0 %	*4668	5 0 0
Speed setpoints	4240	5 0 0
Speed setpoint 1 = 0 rpm	4250	5 0 0
Speed setpoint 2 = 0 rpm	4260	5 0 0
Speed setpoint 3 = 0 rpm	4270	5 0 0
Speed setpoint 4 = 0 rpm	4280	5 0 0
Speed setpoint 5 = 0 rpm	4290	5 0 0
Speed setpoint 6 = 0 rpm	4300	5 0 0
Speed setpoint 7 = 0 rpm	4310	5 0 0
Speed setpoint 8 = 0 rpm	4320	5 0 0

Description	ID	Lvl	RH
Jog speed = 0 rpm	4330	5	0 0
Safety setpoint = 0 rpm	4340	5	0 0
Incremental speed setup	4970	7	0 0
Speed increment 1 = 1.00 %	4971	7	0 0
Speed decrement 1 = 1.00 %	4972	7	0 0
Speed increment 2 = 5.00 %	4973	7	0 0
Speed decrement 2 = 5.00 %	4974	7	0 0
Speed increment 3 = 10.00 %	4975	7	0 0
Speed decrement 3 = 10.00 %	4976	7	0 0
PID select	4350	5	0 0
Prop gain = 0.390	4360	5	0 0
Integral gain = 0.390	4370	5	0 0
Diff gain = 0.000	4380	5	0 0
Min clamp = 0.0 %	4390	5	0 0
Max clamp = 100.0 %	4400	5	0 0
Setpoint = 0.0 %	4410	5	0 0
Comparator setup	4800	5	0 0
Comparator 1 setup	4810	5	0 0
Comp 1 A in variable = Mtr Spd	*4811	5	1 0
Comp 1 B in variable = Manual value	4812	5	1 0
Comp 1 manual value = 2.500 %	*4813	5	0 0
Compare 1 type = Mag	*4815	5	1 0
Comparator 2 setup	4820	5	0 0
Comp 2 A in variable = Manual value	4821	5	1 0
Comp 2 B in variable = Manual value	4822	5	1 0
Comp 2 manual value = 0.000 %	4823	5	0 0
Compare 2 type = Off	4825	5	1 0
Comparator 3 setup	4830	5	0 0
Comp 3 A in variable = Manual value	4831	5	1 0
Comp 3 B in variable = Manual value	4832	5	1 0
Comp 3 manual value = 0.000 %	4833	5	0 0
Compare 3 type = Off	4835	5	1 0
Comparator 4 setup	4840	5	0 0
Comp 4 A in variable = Manual value	4841	5	1 0
Comp 4 B in variable = Manual value	4842	5	1 0
Comp 4 manual value = 0.000 %	4843	5	0 0
Compare 4 type = Off	4845	5	1 0
Comparator 5 setup	4850	5	0 0
Comp 5 A in variable = Manual value	4851	5	1 0
Comp 5 B in variable = Manual value	4852	5	1 0
Comp 5 manual value = 0.000 %	4853	5	0 0
Compare 5 type = Off	4855	5	1 0
Comparator 6 setup	4860	5	0 0
Comp 6 A in variable = Manual value	4861	5	1 0
Comp 6 B in variable = Manual value	4862	5	1 0
Comp 6 manual value = 0.000 %	4863	5	0 0
Compare 6 type = Off	4865	5	1 0

Description	ID	Lvl	RH
Comparator 7 setup	4870	5	0 0
Comp 7 A in variable = Manual value	4871	5	1 0
Comp 7 B in variable = Manual value	4872	5	1 0
Comp 7 manual value = 0.000 %	4873	5	0 0
Compare 7 type = Off	4875	5	1 0
Comparator 8 setup	4880	5	0 0
Comp 8 A in variable = Manual value	4881	5	1 0
Comp 8 B in variable = Manual value	4882	5	1 0
Comp 8 manual value = 0.000 %	4883	5	0 0
Compare 8 type = Off	4885	5	1 0
Comparator 9 setup	4890	5	0 0
Comp 9 A in variable = Manual value	4891	5	1 0
Comp 9 B in variable = Manual value	4892	5	1 0
Comp 9 manual value = 0.000 %	4893	5	0 0
Compare 9 type = Off	4895	5	1 0
Comparator 10 setup	4900	5	0 0
Comp 10 A in variable = Manual value	4901	5	1 0
Comp 10 B in variable = Manual value	4902	5	1 0
Comp 10 manual value = 0.000 %	4903	5	0 0
Compare 10 type = Off	4905	5	1 0
Comparator 11 setup	4910	5	0 0
Comp 11 A in variable = Manual value	4911	5	1 0
Comp 11 B in variable = Manual value	4912	5	1 0
Comp 11 manual value = 0.000 %	4913	5	0 0
Compare 11 type = Off	4915	5	1 0
Comparator 12 setup	4920	5	0 0
Comp 12 A in variable = Manual value	4921	5	1 0
Comp 12 B in variable = Manual value	4922	5	1 0
Comp 12 manual value = 0.000 %	4923	5	0 0
Compare 12 type = Off	4925	5	1 0
Comparator 13 setup	4930	5	0 0
Comp 13 A in variable = Manual value	4931	5	1 0
Comp 13 B in variable = Manual value	4932	5	1 0
Comp 13 manual value = 0.000 %	4933	5	0 0
Compare 13 type = Off	4935	5	1 0
Comparator 14 setup	4940	5	0 0
Comp 14 A in variable = Manual value	4941	5	1 0
Comp 14 B in variable = Manual value	4942	5	1 0
Comp 14 manual value = 0.000 %	4943	5	0 0
Compare 14 type = Off	4945	5	1 0
Comparator 15 setup	4950	5	0 0
Comp 15 A in variable = Manual value	4951	5	1 0
Comp 15 B in variable = Manual value	4952	5	1 0
Comp 15 manual value = 0.000 %	4953	5	0 0
Compare 15 type = Off	4955	5	1 0
Comparator 16 setup	4960	5	0 0

Description	ID	Lvl	RH
Comp 16 A in variable = Manual value	4961	5	1 0
Comp 16 B in variable = Manual value	4962	5	1 0
Comp 16 manual value = 0.000 %	4963	5	0 0
Compare 16 type = Off	4965	5	1 0
Comparator 17 setup	4411	5	0 0
Comp 17 A in variable = Manual value	4412	5	1 0
Comp 17 B in variable = Manual value	4413	5	1 0
Comp 17 manual value = 0.000 %	4414	5	0 0
Compare 17 type = Off	4416	5	1 0
Comparator 18 setup	4417	5	0 0
Comp 18 A in variable = Manual value	4418	5	1 0
Comp 18 B in variable = Manual value	4419	5	1 0
Comp 18 manual value = 0.000 %	4420	5	0 0
Compare 18 type = Off	4422	5	1 0
Comparator 19 setup	4423	5	0 0
Comp 19 A in variable = Manual value	4424	5	1 0
Comp 19 B in variable = Manual value	4425	5	1 0
Comp 19 manual value = 0.000 %	4426	5	0 0
Compare 19 type = Off	4428	5	1 0
Comparator 20 setup	4429	5	0 0
Comp 20 A in variable = Manual value	4430	5	1 0
Comp 20 B in variable = Manual value	4431	5	1 0
Comp 20 manual value = 0.000 %	4432	5	0 0
Compare 20 type = Off	4434	5	1 0
Comparator 21 setup	4435	5	0 0
Comp 21 A in variable = Manual value	4436	5	1 0
Comp 21 B in variable = Manual value	4437	5	1 0
Comp 21 manual value = 0.000 %	4438	5	0 0
Compare 21 type = Off	4440	5	1 0
Comparator 22 setup	4441	5	0 0
Comp 22 A in variable = Manual value	4442	5	1 0
Comp 22 B in variable = Manual value	4443	5	1 0
Comp 22 manual value = 0.000 %	4444	5	0 0
Compare 22 type = Off	4446	5	1 0
Comparator 23 setup	4447	5	0 0
Comp 23 A in variable = Manual value	4448	5	1 0
Comp 23 B in variable = Manual value	4449	5	1 0
Comp 23 manual value = 0.000 %	4450	5	0 0
Compare 23 type = Off	4452	5	1 0
Comparator 24 setup	4453	5	0 0
Comp 24 A in variable = Manual value	4454	5	1 0
Comp 24 B in variable = Manual value	4455	5	1 0
Comp 24 manual value = 0.000 %	4456	5	0 0
Compare 24 type = Off	4458	5	1 0
Comparator 25 setup	4459	5	0 0
Comp 25 A in variable = Manual value	4460	5	1 0

Description	ID	Lvl	RH
Comp 25 B in variable = Manual value	4461	5	1 0
Comp 25 manual value = 0.000 %	4462	5	0 0
Compare 25 type = Off	4464	5	1 0
Comparator 26 setup	4465	5	0 0
Comp 26 A in variable = Manual value	4466	5	1 0
Comp 26 B in variable = Manual value	4467	5	1 0
Comp 26 manual value = 0.000 %	4468	5	0 0
Compare 26 type = Off	4470	5	1 0
Comparator 27 setup	4471	5	0 0
Comp 27 A in variable = Manual value	4472	5	1 0
Comp 27 B in variable = Manual value	4473	5	1 0
Comp 27 manual value = 0.000 %	4474	5	0 0
Compare 27 type = Off	4476	5	1 0
Comparator 28 setup	4477	5	0 0
Comp 28 A in variable = Manual value	4478	5	1 0
Comp 28 B in variable = Manual value	4479	5	1 0
Comp 28 manual value = 0.000 %	4480	5	0 0
Compare 28 type = Off	4482	5	1 0
Comparator 29 setup	4483	5	0 0
Comp 29 A in variable = Manual value	4484	5	1 0
Comp 29 B in variable = Manual value	4485	5	1 0
Comp 29 manual value = 0.000 %	4486	5	0 0
Compare 29 type = Off	4488	5	1 0
Comparator 30 setup	4489	5	0 0
Comp 30 A in variable = Manual value	4490	5	1 0
Comp 30 B in variable = Manual value	4491	5	1 0
Comp 30 manual value = 0.000 %	4492	5	0 0
Compare 30 type = Off	4494	5	1 0
Comparator 31 setup	4496	5	0 0
Comp 31 A in variable = Manual value	4497	5	1 0
Comp 31 B in variable = Manual value	4498	5	1 0
Comp 31 manual value = 0.000 %	4499	5	0 0
Compare 31 type = Off	4501	5	1 0
Comparator 32 setup	4502	5	0 0
Comp 32 A in variable = Manual value	4503	5	1 0
Comp 32 B in variable = Manual value	4504	5	1 0
Comp 32 manual value = 0.000 %	4505	5	0 0
Compare 32 type = Off	4507	5	1 0
Logs	6	0	0 0
Historic log	6250	0	0 0
Store in Event Log = On	6255	7	0 0
Historic log variable 1 = Mtr Speed	*6260	5	0 0
Historic log variable 2 = Spd Dmd	6270	5	0 0
Historic log variable 3 = Trq I Cmd	*6280	5	0 0
Historic log variable 4 = Trq I Fdbk	*6290	5	0 0
Historic log variable 5 = I Total Out	*6300	5	0 0
Historic log variable 6 = V Avail	*6310	5	0 0

Description	ID	Lvl RH
Historic log variable 7 = V Avail RMS	*6320	5 0 0
Drive protect	7	0 0 0
Input protection	7000	0 0 0
Single phasing	7010	0 0 0
SPD prop gain = 0.0	7020	7 0 0
SPD integral gain = 0.0010	7030	7 0 0
SPD threshold = 50.0 %	7040	7 0 0
Undervoltage prop gain = 0.0	7060	7 0 0
Undervoltage integ gain = 0.001	7070	7 0 0
1 Cyc Protect integ gain = 0.0025	7080	7 0 0
1 Cycle Protect Limit = 50.0 %	7081	7 0 0
Excess Loss Idle = 5.0 %	7084	7 0 0
Excess Loss Running = 7.0 %	7086	7 0 0
Xformer tap setting = +5 %	*7050	7 1 0
Xformer thermal gain = 0.0133	7090	7 0 0
Xformer protection const = 0.500	7100	7 0 0
Phase Imbalance Limit = 40.0 %	7105	7 0 0
Ground Fault Limit = 40.0 %	7106	7 0 0
Ground Fault Time Const = 0.200 sec	7107	7 0 0
Drive IOC setpoint = 150.0 %	7110	7 0 0
Cell Overload Level = 100.0 %	7112	7 0 0
Auto reset enable = No	7120	7 0 0
Auto reset time = 1 sec	7130	5 0 0
Auto reset attempts = 4	7140	5 0 0
Auto reset memory time = 10 sec	7150	5 0 0
Meter	8	0 0 0
Display params	8000	0 0 0
Status variable 1 = DEMD	8001	0 0 0
Status variable 2 = RPM	8002	0 0 0
Status variable 3 = ITOT	*8003	0 0 0
Status variable 4 = KWO	*8004	0 0 0
Status variable 5 = IMRF	8005	0 0 0
Status variable 6 = IMRF	8006	0 0 0
Status variable 7 = IMRF	8007	0 0 0
Input harmonics	8140	0 0 0
Selection for HA = IA	8150	0 0 0
Harmonics order = 1.0	8160	0 0 0
Harmonics integral gain = 0.001	8170	0 0 0
Customer order = 2133943	*8101	0 0 0
Customer drive = 1	8110	0 0 0
Communications	9	0 0 0
Serial port setup	9010	0 0 0
Serial port use = Remote	*9020	5 1 0
Baud rate = 9600	9040	5 1 0
Network Control	9943	7 0 0
Net Control Type = Sop	9944	7 1 0
Start Stop Control = Maintained	9945	7 1 0

Description	ID	Lvl	RH
Network 1 Configure	9900	7	0 0
Network 1 Type = None	9901	7	1 0
Network 2 Configure	9914	7	0 0
Network 2 Type = None	9915	7	0 0
SOP & serial functions	9110	0	0 0
Menu based Timer setup	9111	7	0 0
MenuTimer1 = 30.0 sec	*9112	7	0 0
MenuTimer2 = 0.0 sec	9113	7	0 0
MenuTimer3 = 0.0 sec	9114	7	0 0
MenuTimer4 = 10.0 sec	*9115	7	0 0
MenuTimer5 = 0.0 sec	9116	7	0 0
MenuTimer6 = 0.0 sec	9117	7	0 0
MenuTimer7 = 0.0 sec	9118	7	0 0
MenuTimer8 = 0.0 sec	9119	7	0 0
MenuTimer9 = 0.0 sec	9121	7	0 0
MenuTimer10 = 0.0 sec	9122	7	0 0
MenuTimer11 = 0.0 sec	9123	7	0 0
MenuTimer12 = 0.0 sec	9124	7	0 0
MenuTimer13 = 0.0 sec	9125	7	0 0
MenuTimer14 = 0.0 sec	9126	7	0 0
MenuTimer15 = 0.0 sec	9127	7	0 0
MenuTimer16 = 0.0 sec	9128	7	0 0
Select system program = 2168985F.HEX	*9146	7	1 0
Multiple config files = OFF	9185	5	1 0
TCP/IP server name = 172.17.20.16	*9000	0	0 0
Graphing	10	0	0 0
Time scale = 10.00 sec	10000	0	0 0
Variable 1	10010	0	0 0
Graph variable = Spd ref	10020	0	0 0
Offset = 0.00	10030	0	0 0
Scale factor = 1.20	10040	0	0 0
Variable 2	10050	0	0 0
Graph variable = Mtr speed	10060	0	0 0
Offset = 0.00	10070	0	0 0
Scale factor = 1.20	10080	0	0 0
Variable 3	10090	0	0 0
Graph variable = Flux ref	10100	0	0 0
Offset = 0.00	10110	0	0 0
Scale factor = 1.25	10120	0	0 0
Variable 4	10130	0	0 0
Graph variable = Flux DS	10140	0	0 0
Offset = 0.00	10150	0	0 0
Scale factor = 1.25	10160	0	0 0
Variable 5	10170	0	0 0
Graph variable = Ids ref	10180	0	0 0
Offset = 0.00	10190	0	0 0

Description	ID	Lvl	RH
Scale factor = 1.00	10200	0	0 0
Variable 6	10210	0	0 0
Graph variable = Ids	10220	0	0 0
Offset = 0.00	10230	0	0 0
Scale factor = 1.00	10240	0	0 0
Variable 7	10250	0	0 0
Graph variable = Iqs ref	10260	0	0 0
Offset = 0.00	10270	0	0 0
Scale factor = 1.00	10280	0	0 0
Variable 8	10290	0	0 0
Graph variable = Iqs	10300	0	0 0
Offset = 0.00	10310	0	0 0
Scale factor = 1.00	10320	0	0 0
Variable 9	10330	0	0 0
Graph variable = Drv State	10340	0	0 0
Offset = 0.00	10350	0	0 0
Scale factor = 1.00	10360	0	0 0
Variable 10	10370	0	0 0
Graph variable = PreChrg St	10380	0	0 0
Offset = 0.00	10390	0	0 0
Scale factor = 1.00	10400	0	0 0
Select language = English	5081	0	0 0

2) 0110-SR12 Variable Speed Drive System

E. Ventilation System Data

Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

FAN DATA FOR MODEL AP0804GP6/20

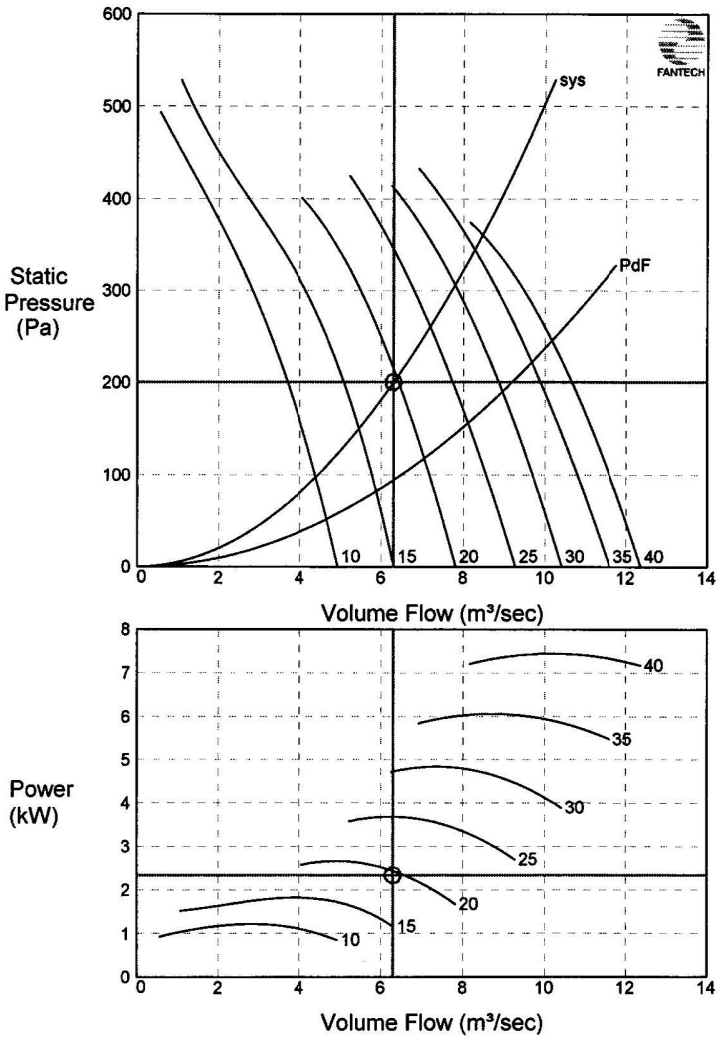
Fan Code: **AP0804GP6/20**

Requirements

Volume:	6300 L/s
Static Pressure:	200 Pa
Selection Pressure:	200 Pa at std conditions
Installation Category:	TYPE D
Temperature:	20 deg C
Altitude:	0 m

Fan Data (at STP)

Type:	In-line direct drive axial fan
Diameter:	800
Hub:	255 mm
Impeller Blades:	6
Pitch:	20 degrees
Blade Material:	GRP
Speed:	24 revs/sec
Absorbed Power:	2.34 kW
Peak Power:	2.59 kW
Total Efficiency:	79 %
Fan Weight:	84.3 kg.



Motor Data (at STP)

Motor Type:	Standard
Electrical Supply:	415V/3ph/50Hz
Motor Frame/Power:	D100L / 3.00 kW
Current FLC/Start:	6.2A / 37.2
Motor Speed:	Single Speed (4 Pole)

Energy Efficiency, BCA Volume 1 2008, Table J5.2 compliant selection

Density: 1.2 kg/m³

Inlet PWL

Spectrum (Hz)	63	125	250	500	1K	2K	4K	8K	dBW	dBA @ 3m
Outlet PWL (dB)	92	86	86	84	85	81	77	73	95	68
Inlet PWL (dB)	90	86	87	85	85	81	78	73	94	69

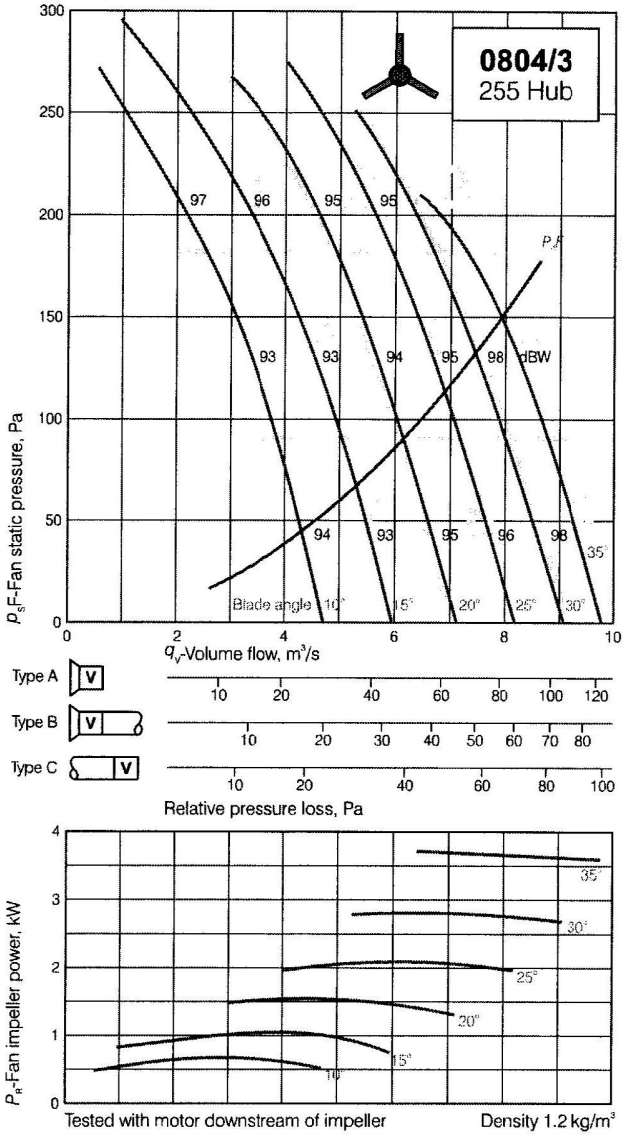
Note: Levels are quoted as in-duct values.

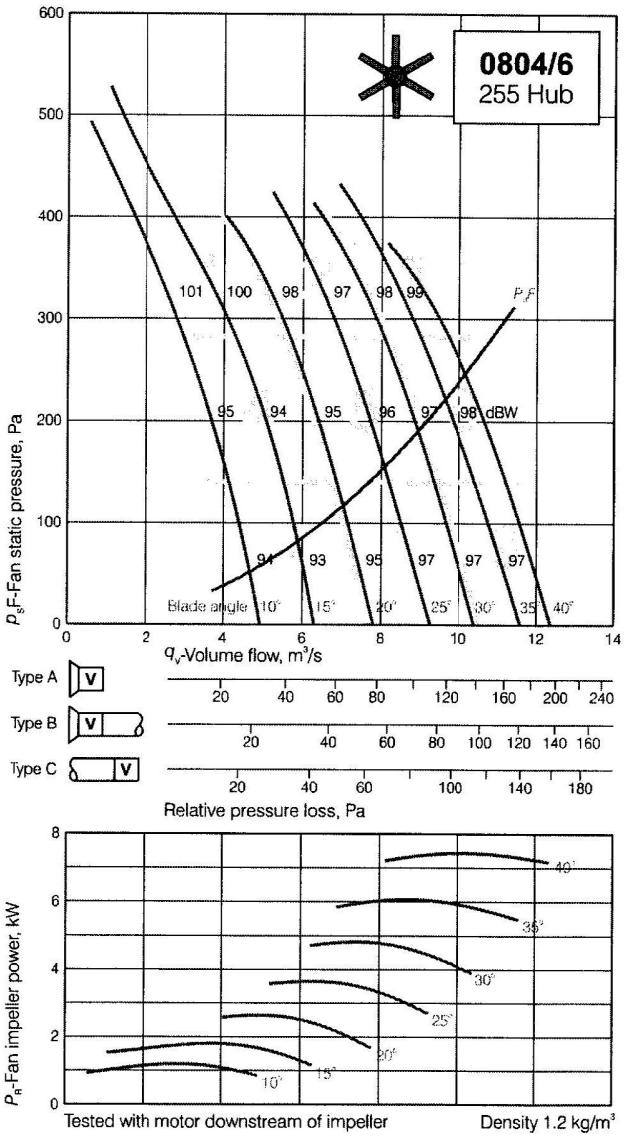
Version 4.20: On-going product improvements may result in fan data changes without notice.

Size **800**
24 rev/sec

AXIAL FLOW FANS PERFORMANCE DATA

BS848:Part 1, 1980
Part 2 1985
Type D Installation





SOUND DATA

Zone	In-Duct dB	Total	In-Duct Spectrum Corrections, dB 63	125	250	500	1k	2k	4k	8k	dB(A)
	Inlet	1	6	10	8	6	8	13	18	24	4
	Outlet	0	4	11	10	7	10	15	19	24	6
	Inlet	+1	2	9	12	11	12	16	19	22	8
	Outlet	0	2	8	10	12	12	16	18	20	8
	Inlet		Not Required								
	Outlet										
	Inlet	1	3	10	11	10	11	13	16	22	6
	Outlet	0	1	10	13	12	13	15	18	22	8
	Inlet	0	2	9	11	9	10	15	18	23	6
	Outlet	0	3	9	10	10	12	15	18	21	7
	Inlet	+1	3	9	12	10	12	16	19	22	7
	Outlet	0	3	9	11	10	11	15	17	19	7
	Inlet	1	2	10	11	10	10	13	15	21	6
	Outlet	0	2	11	12	12	12	14	17	22	7
	Inlet	0	2	9	11	10	12	15	19	24	7
	Outlet	0	3	9	11	11	12	16	19	23	8
	Inlet	+2	2	9	13	11	12	17	20	23	8
	Outlet	0	2	8	11	10	11	15	18	19	7

For Free Field conditions apply the following corrections to the In-Duct figures.
All figures are negative unless otherwise stated.

	In/Out	O/A	7	3	1	0	0	0	0	0	O/A

SOUND DATA

Zone	In-Duct dB	Total	In-Duct Spectrum Corrections, dB 63	125	250	500	1k	2k	4k	8k	dB(A)
	Inlet	1	9	9	6	4	8	14	20	26	3
	Outlet	0	6	9	7	7	10	16	21	27	6
	Inlet	0	4	9	8	9	10	13	17	22	6
	Outlet	0	4	8	8	10	10	14	16	21	6
	Inlet	0	4	9	9	8	10	13	17	21	5
	Outlet	0	3	9	9	9	10	13	16	19	5
	Inlet	0	6	11	8	9	8	11	14	20	4
	Outlet	0	4	10	8	9	9	12	15	20	5
	Inlet	1	4	8	7	9	9	13	16	21	5
	Outlet	0	3	9	9	11	10	14	18	22	6
	Inlet	+1	3	9	9	10	11	15	18	22	7
	Outlet	0	3	8	8	9	11	14	17	19	6
	Inlet	+1	5	9	7	8	8	11	13	20	4
	Outlet	0	5	9	7	8	8	11	13	19	4
	Inlet	1	4	8	8	9	9	13	16	21	5
	Outlet	0	4	9	8	11	11	14	18	22	7
	Inlet	0	9	7	9	6	8	12	16	20	4
	Outlet	0	8	6	9	8	9	12	15	18	4

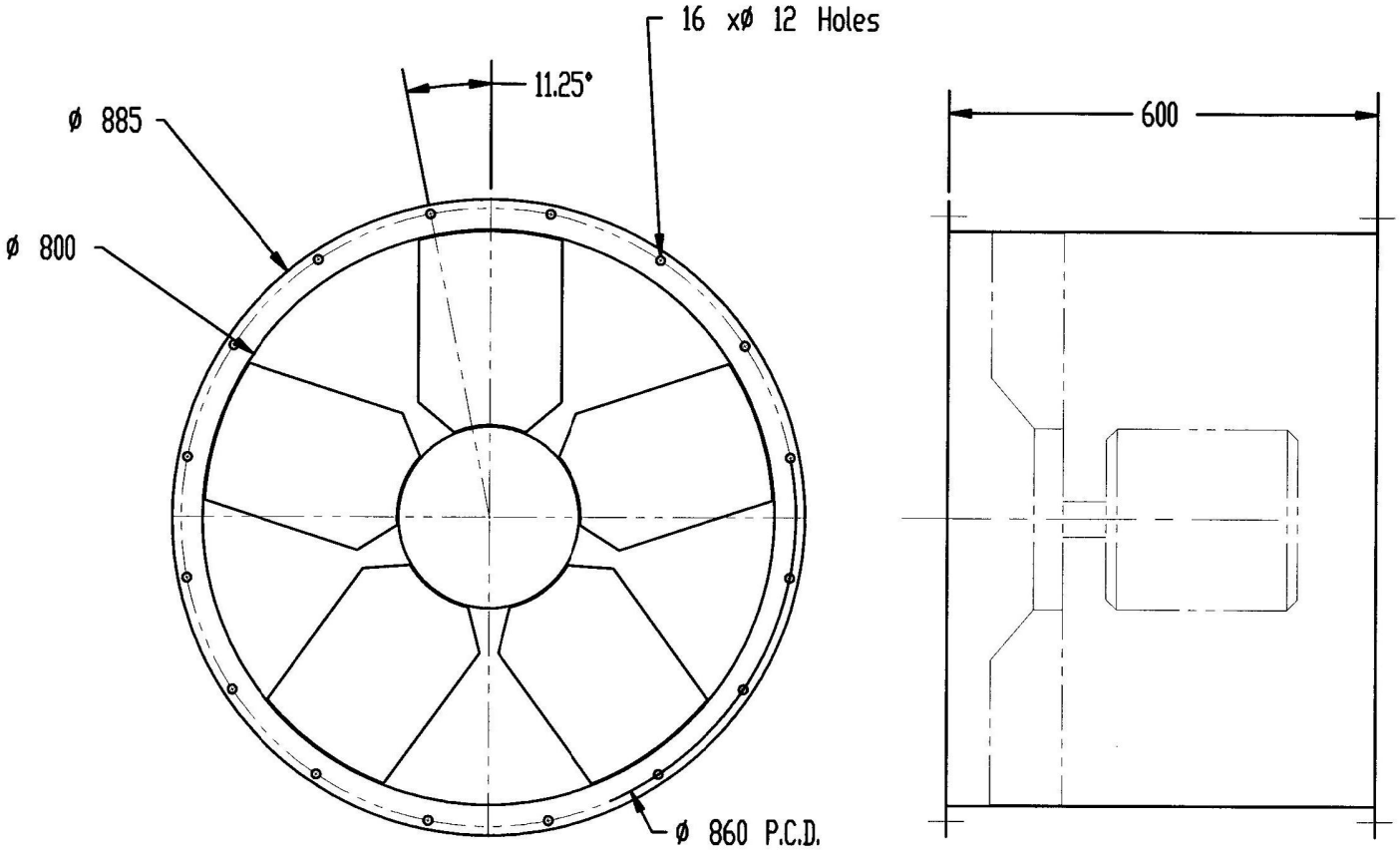
For Free Field conditions apply the following corrections to the In-Duct figures.
All figures are negative unless otherwise stated.

	In/Out	O/A	7	3	1	0	0	0	0	0	O/A

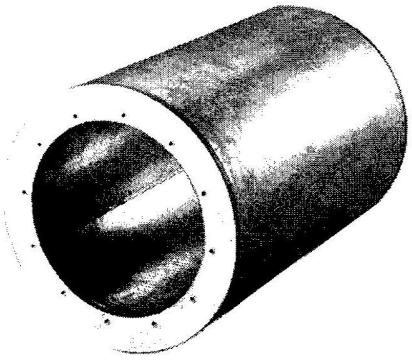
Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

DRAWING FOR MODEL AP0804GP6/20

Version 4.20: On-going product improvements may result in dimensional changes without notice.



CIRCULAR DUCT ATTENUATORS



FEATURES

These notes apply to both the open and pod type attenuators.

Construction

The units are rigidly constructed and consist of an outer cylindrical galvanised steel casing, lined internally with non-hygroscopic and incombustible sound-absorbent material. This material is retained by an inner perforated metal cylinder.

When a pod is fitted it is of perforated metal, retaining an infill of acoustic material.

An impervious lining of the acoustic infill can be provided to prevent the ingress of moisture or grease. There is a small performance penalty in high frequencies when an impervious lining is fitted. Refer to our Sales Engineers if more information is required.

Also available is the Q-Seal range which offers impervious lining with features to optimise acoustic performance.

The ends of the attenuators are drilled and tapped to match the Fantech 'AP' series of axial flow fans.

Non-standard flange drillings or sizes can be supplied to the customer's specifications.

Insertion Loss

The values quoted in the table represent the difference between the sound power level (L_W) of a fan and attenuator combination and that of the fan alone.

(continued next page)

PERFORMANCE DATA - OPEN TYPE

Matching Fan Dia. cm	Length mm	Static Insertion Loss, dB Octave Band Centre Frequency (Hz) 63	125	250	500	1k	2k	4k	8k
C1-Dia. 1 Diameter Long (nom.)									
-031	300	1	3	5	9	13	10	8	7
-035	300	2	3	5	9	13	10	8	7
-040	600	2	3	5	9	13	10	8	7
-045	600	2	3	5	10	13	10	8	7
-050	600	2	3	6	10	14	10	8	7
-056	600	2	4	6	10	14	10	8	7
-063	600	3	4	7	13	14	9	8	6
-071	900	3	4	8	14	14	9	7	6
-080	900	3	4	8	14	13	9	7	6
-090	1150	3	4	9	14	13	8	7	6
-100	1150	3	4	9	14	12	8	7	6
-125	1150	3	4	10	14	12	8	6	6
-140	1150	3	5	10	13	11	8	5	5
-160	1800	4	6	11	13	10	7	5	5
-180	1800	4	6	11	13	10	6	5	5
-200	1800	4	6	11	13	9	6	5	5
C2-Dia. 2 Diameters Long (nom.)									
-031	600	3	6	9	15	21	17	14	13
-035	600	4	6	10	15	21	17	14	13
-040	900	4	6	10	16	21	18	15	13
-045	900	4	7	10	17	21	18	15	13
-050	1150	4	7	10	18	21	17	15	12
-056	1150	5	7	11	18	21	17	15	12
-063	1150	5	8	11	21	23	17	15	10
-071	1500	5	8	12	22	23	16	15	10
-080	1500	5	8	12	22	23	16	15	10
-090	1800	5	8	13	22	19	13	12	10
-100	1800	6	8	13	22	19	13	12	10
-125	2400	6	8	13	21	18	13	12	11
-140	2400	7	9	15	21	18	11	11	10
-160	3600	8	9	15	20	17	11	9	8
-180	3600	8	9	15	20	17	10	9	8
-200	3600	8	9	15	20	17	10	9	8

HOW TO ORDER - OPEN TYPE

C [ ] - [ ] [ ]

C - circular

1 - 1D long nominal
2 - 2D long nominal

Diameter in cm

Variations to standard
QS - Q-Seal Impervious lining (refer page *H-4/5*)
A - aluminium construction
S - stainless steel construction
E - epoxy coating

(Default is standard construction)

Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

Technical Data for Silencer Model C1-080

Location: ATT-2

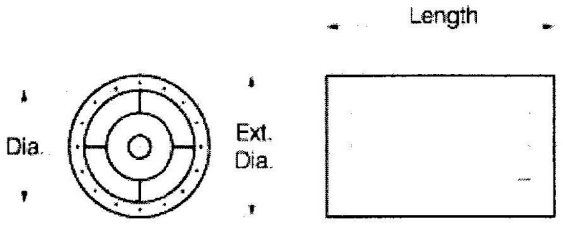
Designation:

Performance - Required / Actual

Air Flow:	6.30 m³/s	Velocity :	12.5 m/s
Pressure Drop:	60 Pa	Pressure Drop:	2 Pa

Silencer Data

Catalogue Code:	C1-080
Description:	Circular 1D Open
Diameter:	800 mm
Ext. Diameter:	977mm
Length:	900 mm
Weight:	55.0 kg



Sound Data

Spectrum (Hz) :	63	125	250	500	1K	2K	4K	8K
Insertion Loss (dB) :	3	4	8	14	13	9	7	6

2) 0110-SR12 Variable Speed Drive System

F. Ventilation System Airflow and Sound Levels report

Air Equipment (Sales) Pty Ltd

david@airequip.com.au ABN 67 650 093 954

2 / 36 Randall Street Slacks Creek 4127 **Phone: (07) 3209 4201**
PO Box 542 Springwood Qld 4127 **Facsimile: (07) 3209 4204**

Wednesday 4th December 2013

J. & P. Richardson Industries Pty Ltd
114 Campbell Street
Wacol QLD

Attention: Chris Anderson
Reference: **Urban Utilities Eagle Farm Pump Station-VSD Drive Cabinet 0110-SR12 Verification of Airflow and Sound level Measurements**

Required Airflow: Transformer Cabinet: 3000l/s
Cell Cabinet: 3200l/s
Total: 6200l/s

Equipment Used:
NATA Certified Vane Anemometer – Certificate No: WT109572
NATA Certified Lutron Sound Level Meter – Certificate No: SLM 39486
Magnehelic Gauge- Fitted to duct work

Initial airflow readings were taken at the filtered intake grilles on the transformer and cell cabinets with the booster fan VSD set at 50Hz. The VSD was adjusted back to 39Hz and readings taken at all points as follows

Transformer Cabinet Intakes:	No 1: 620l/s	No 2: 590l/s	No 3: 540l/s
	No 4: 575l/s	No 5: 510l/s	No 6: 490l/s
	Total: 3325l/s		
Cell Cabinet Intakes:	No 1: 730l/s	No 2: 690l/s	No 3: 640l/s
	No 4: 660l/s	No 5: 630l/s	No 6: 580l/s
	Total: 3930l/s		

The magnehelic gauge was fitted to the duct prior to the booster fan. The gauge is to indicate the correct airflow only and at the required airflow reading the gauge was marked at 75Pa

Sound Level Measurements:

Outdoor readings were taken at the boundary directly down for the fan outlet and 1 meter from the outlet face.
The background noise level was 70-75dBA due to the high traffic movement on the main road. On the odd occasion when there was no vehicle's directly outside the building we registered a reading of 63dBA at the boundary and 68 dBA 1 meter from the face

Indoor readings were taken with the other two drive units turned off but with the pit pumping motors running. Background noise levels around the pit barrier cage were between 71-73dBA

Readings one meter out from the cabinet were between 70-71dBA but this was mainly from background noise

A reading from the side of the cabinet below the booster fan was 69dBA

Hoping the above report is satisfactory and if you have any queries on the information above please do not hesitate to call

Yours faithfully,
Air Equipment (Sales) Pty Ltd.

David Meredith.

2) 0110-SR12 Variable Speed Drive System

G. Spare Part List

SIEMENS

Perfect Harmony VSD Recommended Spare Parts List

VFD SO:	3002133943	VFD SN:	Z831501002461

Location	Part Description	Part Number	Installed	Recommended
Control cabinet	CPU Board	A1A10000623.00M	1	1
	I/O board	A1A10000423.00M	1	1
	Modulator Board	A1A10000350.00M	1	1
	Fiber Optic Hub Board	A1A461D85.00M	1	1
	Backplane	A1A098194	1	1
	Communication Board	A5E03407403	1	1
	CPS Power	A1A0100275	1	1
	Signal Conditioninig Board	A5E01708486	1	1
	Keypad	A5E02363383	1	1
	I/O breakout	A5E01649374	1	1
Blower	Cabinet Blower	LDZ10501601	4	1
Doors	Filter on Transformer Cabinet	LDZ10501351	9	9
	Filter on Cell Cabinet	LDZ10501353	9	9
Cell cabinet	Power cell	LDZ14501002.260	15	1
	CCB Fuse	A1A10000432.30M	15	2
	Power Cell Input Fuse	LDZ10501435	45	3

2) 0110-SR12 Variable Speed Drive System

H. Drawing List

SIEMENS

Perfect Harmony VSD - 0110-SR12

Drawing Register

Drawing Number	Description
	VSD
486/5/7-0368-014	General Arrangement 1
486/5/7-0368-015	General Arrangement 2
486/5/7-0368-016	General Arrangement 3
486/5/7-0368-017	Control and Power Overview
486/5/7-0368-018	Termination
486/5/7-0368-020	Schematic 1
486/5/7-0368-021	Schematic 2
486/5/7-0368-022	Schematic 3
486/5/7-0368-023	Schematic 4
486/5/7-0368-024	Schematic 5
486/5/7-0368-025	Schematic 6
486/5/7-0368-026	Schematic 7
	Field Control and Interface
486/5/7-0368-130	Schematic 1
486/5/7-0368-131	Schematic 2
486/5/7-0368-132	Schematic 3
486/5/7-0368-133	Schematic 4
486/5/7-0368-134	Schematic 5
	Isolator and Earthswitch Cabinet
486/5/7-0368-103	General Arrangement and Schematic
486/5/7-0368-104	Fortress Interlocking System
486/5/7-0368-105	Legend
	Ventilation
486/5/7-0368-111	General Arrangement

2) 0110-SR12 Variable Speed Drive System

I. Factory Acceptance Test (FAT)

SIEMENS
Electrical Drives (Shanghai) Ltd.

GEN III

Factory Acceptance Test

Medium Voltage

Air Cooled

SO - 3002133943

Queensland urban utilities - eagle farm

FAT- A5E32168984 A

REV- AA

P/N- M6SR3

S/N- Z831501002461

MLFB- 6SR3502-6HF42-7BH0-Z

V12+Y06+K69+G22+G28+K73+M42+M38+
M12+M35+L55+L03+K50+T76+D15+D02+D
76+P31

Revision History		
Revision Level	Details	Date
AA	Original	5/15/2013
Tested By	杨洪金	2013-6-6
Approved By	陈晓峰	2013-6-6

SIEMENS

Customer Name Queensland urban utilities - eagle farm SO 3002133943

P/N M6SR3 S/N Z831501002461 SOP M6SR3 C

Agency Listing ☐ CSA ☐ UL ☐ CE ☐ Other ☑ No Listing

Agency Testing Required ☐ YES ☑ NO

Input Voltage:	6600 V	Output Voltage:	6600 V
Input Current:	214 A	Cell Size:	260 A
XFMR KVA:	2750 KVA	Total # of Cell:	18

Table of Contents

Definitions

R	Routine Test	Test to which each individual device is subjected during or after manufacturer to ascertain whether it complies with certain criteria.
A	Acceptance Test	Contractual test to prove to the customer that the device meets certain conditions of its specification.
O	Option Test	Test additional to type and routine test, determined to be any device or logic added to the drive that is not a pre-engineered option.
W	Witness Test	Any of the above tests performed in the presence of the customer, the user or his representative (Reference STSI-055)

Air Cooled Test Plan

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002461

1.1 Visual Inspection STSI-061G:4.3

Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R		Hardware Check		Emp# 347
	Metering	Pt. To Pt. Wire Check		Emp# 214
		Fiber Optics		Emp# 214
		Ground Wires		Emp# 214
	Measuring	Burden Resistor Value (hall effect)	34.00 Ω,2W, .1%	34.2/34.2 Ω
	Measuring	Input attenuator resistor value	4.8 MΩ	4.79/4.77/4.78 MΩ
	Measuring	Output attenuator resistor value	4.8 MΩ	4.16/4.76/4.75 MΩ
		Set Dip Switch (FR)	Pos. 2 only is "On", all others "Off"	Emp# 347
		Set Dip Switch (P)	Pos. 4 & 5 only are "On", all others "Off"	Emp# 347
		Set Address 1X	1X=1	Emp# 347
		Set Address 10X	10X=0	Emp# 347
		Set Communication Board (JP1 to JP10)	JP1 & JP2 set to 2,3	Emp# 347
			JP3,JP4&JP5 set to1,2	Emp# 347
			JP6 set to 2,3	Emp# 347
			JP7,JP8,JP9&JP10 set to 1,2	Emp# 347
O	Interlocks	Record all Interlock model #'s and keycode #'s for the	K2 –VFD12 - K2	Emp# 347
		Verify correct operation of Interlocks	K3 –VFD12 - K3	Emp# 347
		Ensure hardware and adapter plates are supplied		Emp# 347

1.2 Insulation Test/Hipot STSI-061G:4.4

Test Type	Test Item	Test Procedure	Applied Volt.	Test Criteria (Eng)	Signature/Value
R	MV			Pass/Fail(<0.5mA)	
		Power circuit to GND			Emp# 331
		L1,L2,L3 to GND	28300	25 uA	
		L1 with L2, L3 to GND	28300	10 uA	
		L2 with L1, L3 to GND	28300	6 uA	
		L3 with L1, L2 to GND	28300	4 uA	
		T1,T2,T3 to GND	28850	83 uA	
		T1 with T2, T3 to GND	18500	32 uA	
		T2 with T1, T3 to GND	18500	23 uA	
		T3 with T1, T2 to GND	18500	25 uA	
	LV	Control Power to GND	2500VOM	800 MΩ	Emp# 153
	Control	120Vac to GND	1000VOM	392 MΩ	Emp# 153
		24Vdc to GND	500VOM	∞	Emp# 153

1.3 Initial Power-Up STSI-061G:4.5

Test Type	Test Item	Test Procedure		Test Criteria (Eng)	Signature/Value
R	Control Power	Control Power Supply			
		CPS,+5VDC(Slot 6 I/O Board Plug P6 Pin 1 to 4)		(5.10 to 5.15Vdc)	5.13 Vdc
		CPS,+12VDC(Slot 6 I/O Board Plug P6 Pin 2 to 4)		(+11.64 to +12.36Vdc)	12.10 Vdc
		CPS,-12VDC(Slot 6 I/O Board Plug P6 Pin 3 to 4)		(-11.64 to -12.36Vdc)	-12.07 Vdc
		CPS, + 15 VDC (SCB Pin 2 to 6)		(+14.55 to +15.45)	15.01 Vdc
		CPS, - 15 VDC (SCB Pin 4 to 6)		(-14.55 to -15.45)	-15.01 Vdc
		CPS,+24VDC(I/O Board J11-11 to J11-9)		(+21.6 to+26.4Vdc)	24.03 Vdc
		CPS,Power Supply Fault			Emp# 214
		Encoder Power Supply, +15 VDC (IOB board J7-5 to J7-		(+14.25 to +15.75)	Emp# 15.08 Vdc
		T5 (secondary:X1-X4)		(114 to 126Vac)	114 Vac
		Software Version #		Latest Version	Vers: 5.2.2
		Establish Wago Communications			Emp# 214
	Parameters Configuration	Set correct # of			
		Analog Outputs	ID 2820	2	
		Set correct Drive Parameters			Emp# 214
		Input Voltage	ID 2010	6600 V	
		Input Current	ID 2020	214 A	
		Output Voltage	ID 2030	6600 V	
		Output Current (equal to 'Cell Rating')	ID 2040	260 A	
		Control Loop Type	ID 2050	OLTM	
		Spinning Load Mode	ID 2430	Off	
		Installed Cells/ Phase	ID 2530	6	
		Cell Voltage	ID 2550	630 V	
		Bypass Type	ID 2590	None	
		Neutral Connection	ID 2630	T1	
		Input CT Ratio	ID 3035	250 :5	
		Tap Setting (+5% typical)	ID 7050	+5%	

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002461

1.3 Initial Power-Up[continued]				STSI-061G:4.5
Test Type	**Test Item**	**Test Procedure**	**Test Criteria (Eng)**	**Signature/Value**
R	Parameters Configuration	Set correct Drive Parameters (con't)		
		MenuTimer1 ID 9112	30 S	214
		MenuTimer4 ID 9115	10 S	214
		Program Clock ID 8080		Emp# 214
		Program SO ID 8101	2133943	Emp# 214
		Program Drive Number ID 8110		Emp# 214
		Download SOP	M6SR3C	Emp# 214
		Ethernet Connection Verified		Emp# 214
R	MODBUS	Connect computer to MODBUS port Open MODBUS program and verify communication	Receiving data from Drive	Emp# 214
O	Space Heater Control	1. Verify VFD space heater relay CR4 energized 60s after control voltage is swtiched on.	Verify Functionality	Emp# 214
		2. Adjust thermostat(TST1) setting to more than ambient temperature and verify HTR1are heater up.Reset TST1 to less than ambient temperature and verify HTR1 are off.		
		3. Adjust thermostat(TST2) setting to more than ambient temperature and verify HTR2 & HTR3 are heater up. Reset TST2 to less than ambient temperature and verify HTR2 & HTR3 are off.		Emp# 214
		4. Verify VFD space heater relay CR4 released after medium voltage is energized.		Emp# 214
		5. Verify Motor Heater Relay BM5 energize 60s after drive is not running.		Emp# 214
R		Check Blower Rotation	Verify Rotation	Emp# 347
	Blower 1 Op. XFMR Cab.	Set CB1 equal to 1.2*TBLW1 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.57 A Ib= 1.56 A Ic= 1.53 A	Emp# 347
	Blower 2 Op. XFMR Cab.	Set CB2 equal to 1.2*TBLW2 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.49 A Ib= 1.51 A Ic= 1.51 A	Emp# 347
	Blower 1 Op. CELL Cab.	Set CB3 equal to 1.2*CBLW1 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.46 A Ib= 1.47 A Ic= 1.44 A	Emp# 347
	Blower 2 Op. CELL Cab.	Set CB4 equal to 1.2*CBLW2 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.	Ia= 1.55 A Ib= 1.55 A Ic= 1.56 A	Emp# 347

1.4 System Test Without Motor				STSI-061G:4.6
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
O	Electrical Door Interlocks	Open a door to cause DIS1 open and verify that Drive trip message "TRIP - MV DOOR OPENED" displayed and check "INPUT MV BREAKER ENABLE" contact on TB2 43 & 44, 45 & 46 change state.	TB2-43 & 44 Closed and TB2-45 & 46 Open when a door open	Emp# 347
		Repeat the test for remaining of electrical door interlock switched DIS2~ DIS5.		Emp# 347
R	Backfeed Modulation & Clipping	Power Supply & Hall Effect Pwr Supply Fault		Emp# 347
		Output Transorbs	Approx. 56Vp-p	Emp# 347
		Note: Remove Series Link & Backfeed Cell B1 Disconnect plug P1 from SCB board		
		Input Transorbs	Approx. 56Vp-p	Emp# 347
		Verify all Cells Primary Voltage	100Vac±10% for all	Emp# 347
		Modulation of Cells	(0 to 100% demand)	Emp# 347
R	Medium Voltage Testing	With Cell Series Links Reconnected Set Motor Voltage = Drive Rating		
		VMA, VMB, VMC | ID 2050 - OLTM 25Hz	3.0V-peak +/- 0.3V	Emp# 347
		VMA, VMB, VMC | ID 2050 - OLTM 50Hz	6.0V-peak +/- 0.3V	Emp# 347

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	Check E-stop Logic	Depress Local E-Stop		
		Verify Drive coasts to stop and fault message displayed		Emp# 214
		Measure on TB2-3 & 4	Open for E-stop	Emp# 214
		Verify Fault contact on TB2-33 & 34 changes state	Closed for Fault	Emp# 214
				Emp# 214
		Depress"FAULT RESET"on keypad and Restart Drive		
		Verify Run contact on TB2-29 & 30 changes state	Closed for Run	Emp# 214
		Remove Jumper on TB2-1 & 2 - Remote E-Stop		Emp# 214
		Verify Drive coasts to stop and fault message displayed		Emp# 214

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	Transformer Thermal Switches	Remove alarm wire from IOB DI-3C, 1).Verify fault light blinks and keypad displays alarm message. 2).Verify the "Drive Alarm" outputs on TB2-31&32 change state.	Verify alarm message Closed for Alarm	Emp# 347 Emp# 347
		Remove trip wire from IOB DI-0D, 1).Verify fault light blinks and keypad displays alarm message. 2).Verify the "Drive Alarm" outputs on TB2-31&32 change state.	Verify alarm message Closed for Alarm	Emp# 347 Emp# 347
		Remove trip both wires from IOB DI-3C & DI-0D and wait for 30 seconds; 1). Verify Drive fault, Drive coasts to a stop and keypad displays trip message 2).Verify the "Drive Tripped" output on TB2-33&34.	Verify Drive Fault Closed for Fault	Emp# 347 Emp# 347
R	Remote Start/Stop	Momentarily close contact between TB2-5 & 6 and verify Drive starts running. Momentarily close contacts between TB2-5 & 6.	Drive is running Drive ramps to stop	Emp# 347 Emp# 347
R	Remote Fault Reset	Cause system fault and check Drive Ready contact TB2-27 & 28 (changes state) Momentarily close Remote Fault Reset contact on TB2-7 & 8. Verify the "Drive Ready to Run" output on TB2-27 & 28 changes state. Verify Keypad reset is functioning. Verify the "Fault Reset"button on the touch panel is functioning.	Open for Fault Drive should reset Closed for Ready to Run	Emp# 347 Emp# 347 Emp# 347 Emp# 347 Emp# 347
R	Local Start/Stop	Place Drive in the Local mode by pressing "AUTOMATIC"on keypad and depress "MANUAL START" on keypad. Verify Drive is running. Depress "MANUAL STOP" on keypad	Drive is running Drive ramps to stop	Emp# 347 Emp# 347
R	4 to 20mA Remote Freq Command	Place Drive in the Remote mode by pressing "AUTOMATIC"again on keypad and connect 4-20mA signal to TB2ELV-7 & 8. Scale 4-20 mA signal to be proportional to 0-100% Freq.	Verify system Freq change 4mA=0%Freq 12mA=50% Freq 20mA=100% Freq	Emp# 347
R	4 to 20mA Spare Input	Program Spare Input as Remote Signal command via Keypad menu and connect 4-20mA signal to TB2ELV-10 & 11.Scale 4-20 mA signal to be proportional to 0-100% output. RE-PROGRAM REMOTE SIGNAL INPUT TO ANALOG 1!	4mA=0% spare 12mA=50% spare 20mA=100% spare	Emp# 347 Emp# 347
R	4 to 20mA Spare Input	Program Spare Input as Remote Signal command via Keypad menu. Using connect 4-20mA or 0-10V signal (See Customer Drawings) to TB2ELV-13 & 14 and debug Screen. Scale 4-20 mA signal to be proportional to 0-100% output. RE-PROGRAM REMOTE SIGNAL INPUT TO ANALOG 1!	4mA=0% spare 12mA=50% spare 20mA=100% spare	Emp# 347 Emp# 347

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002461

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	**Test Item**	**Test Procedure**	**Test Criteria (Eng)**	**Signature/Value**
R	4 to 20mA Motor KW Output	Monitor KW output on TB2ELV-18 & 19 and verify output	4mA=0% KW 20mA=100% KW	 Emp# 347
	4 to 20mA Motor AMPS Output	Monitor AMPS output on TB2ELV-1 & 2and verify output	4mA=0% Amps 20mA=100% Amps	 Emp# 347
	4 to 20mA Motor FREQ Output	Monitor FREQ output on TB2ELV-4 & 5 and verify output	4mA=0% Freq 20mA=100% Freq	 Emp# 347
	4 to 20mA Spare Output	Monitor SPARE output on TB2ELV-21 & 22 and verify output	4mA=0% Spare 20mA=100% Spare	 Emp# 347
R	Blower 1 Op. XFMR Cab.	With Transformer Cabinet blower TBLW1 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
	Blower 2 Op. XFMR Cab.	With Transformer Cabinet blower TBLW2 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
	Blower 1 Op. CELL Cab.	With Cell Cabinet blower CBLW1 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
	Blower 2 Op. CELL Cab.	With Cell Cabinet blower CBLW2 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 347
R	Medium Voltage Testing	Set Control Loop Type	OLVC	
		With Motor Connected to the Drive Output	IMA Leads VMA by 90°	Emp# 347
			IMB Leads VMB by 90°	Emp# 347
R	Spinning Load	1. Enable spinning load feature (Set Spinning Load Mode true) via keypad 2. Run Drive at 100% speed 3. Trip Drive by pressing E-Stop 4. Pull out E-Stop 5. Push Fault Reset 6. Restart Drive 7. Verify Drive goes back to full speed	Motor returns to full speed	Emp# 214
R	Motor Overload Protection	Adjust motor parameters[Menu 1000]and overload settings[Menu 1120]to verify overload operates after 60s.		Emp# 214
R	Non-latching Run request with No Medium Voltage Input	1.Remove Medium Voltage Power 2.Reboot NXG Control 3.Clear/Reset all fault on drive 4.Monitor SOP Runrequest flag via debugger 5.Verify that SOP Runrequest flag remains false when all start inputs are set		Emp# 214
R	Input Protection	Simulate IP trip and verify "input MV breaker enable" output contact on TB2-43 & 44 changes state The fault only reset via keyed pushbutton KR	Closed for fault Fault reset	Emp# 214 Emp# 214
O	Closed Loop Vector Control Testing	Set Control Loop Type ID 2050 Set Encoder 1 PPR ID 1290 Set Encoder loss response ID 1320 With Motor Connected to the Drive Output Connected the encoder signal to TB2ELV-26-31 Scale 4-20 mA signal to 50% and 100% speed Verify the Drive and Motor Speed output if normal	CLVC 1024 Stop 12mA=50% Speed 20mA=100% Speed	 Emp# 214 Emp# 214

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002461

1.6 System Load Test:				STSI-061G:4.8
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	System Load Test	Run Load Test using Dyno Load Run at input current (full load input current)	214 Amps, 4 hrs	Emp# 214
A	Efficiency Testing	Run Drive at following speed points: 100% Speed 100% Load 100% Speed 50% Load	Record actual 96.91 % 96.98 %	 TSF-056 TSF-056
A	Power Factor Testing	Run Drive at following speed points: 100% Speed 100% Load	0.95PF	TSF-006
A	Harmonic Testing	Run Drive at 100% speed and 100% load Record actual THD for Voltage & Current (Background Distortion must be THDv <2.0%)	< THD 3 %Voltage < THD 5 %Current	Emp# 153 Emp# 153

1.7 Final Inspection				STSI-061G:4.9
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	File Save	Save Files under the Project Files Folder SOP, HEX, Event Log, Fault Log, Parameter and Configure Files	Parameter upload (Level 7)	Emp# 153
R	Flash Card	All Test versions of SOP & HEX files have been removed from Flash No Wago SOP & HEX is on Flash Final SOP is on Flash and correct Hex file is selected		Emp# 153 Emp# 153 Emp# 153
R	Disconnect Test Wires	Remove all input and output power and control wiring.		Emp# 331
R	Torque Mark Check	Check that all proper torque marks exist. Check that all existing torque marks are properly marked		Emp# 331

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002461

1.8 Equipment STSI-061G:4.1

Record Hipoter Used

Model	Manufacturer	SEDS CTN	Cal. Due
DH60/5	Lanpotronics	AS110720001	2013-7-19

Record Voltmeter Used

Model	Manufacturer	SEDS CTN	Cal. Due
175	FLUKE	AS050526001	2014-05-21
789	FLUKE	AS080131001	2015-03-19
/	/	/	/
/	/	/	/
/	/	/	/

Oscilloscope

Model	Manufacturer	SEDS CTN	Cal. Due
DPO3034	TEK	AS090831001	2013-09-04
/	/	/	/

Clamp on C.T./Clamp-On

Model	Manufacturer	SEDS CTN	Cal. Due
LH41	AMPROBE	AS100826001	2013-09-02
/	/	/	/

Humidity

65%

3) 0110-SR13 Variable Speed Drive System

A. MV Cable Test Sheets

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project:	SIEMANS	**Job No:**	C64800
Date of Test:	05/09/2013		
Cable Circuit:	From: SR13 FEEDER PANEL A25	To:	0110-SR13 INPUT TERMINALS
Type:	SINGLE CORE XLPE 6.6 kV		AL- 95 sq mm
Reason for Test:	NEW DRIVE INSTALLATION	**Cable Temperature:**	HOT

Loop Resistance in Ohms (is Loop Resistance Applicable?) N/A Yes/No
Measured with No:
Type: Leads: ohms

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Phasing:

AS IT WAS

Insulation Resistance in Megohms

Measured with No: MOO131

Type: KYORITSU

	Volts	1 Min	2 Min
A-Earth	5000	40,000	40,000
B-Earth	5000	40,000	40,000
C-Earth	5000	40,000	40,000
A - B	5000	40,000	40,000
B - C	5000	40,000	40,000
C - A	5000	40,000	40,000

High Voltage Test Sheet **N/A** 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: FINE Amb. Temp. °C:

Result of Test: PASS Label Attached at:

Comments:

All bolts tightened to the following torque settings and marked with permanent marker

8mm-22Nm

10mm-27Nm

12mm-34Nm

Testing Officer:	S.CUNNINGHAM	**Date:**	05/09/13	**Engineer if Required:**	**Date:** / /

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project:	SIEMANS	**Job No:**	C64800
Date of Test:	05/09/2013		
Cable Circuit:	From: 0110-SR13 OUTPUT TERMINALS	To:	0110-1 ISOLATOR/EARTHING PANEL
Type:	SINGLE CORE XLPE 6.6 kV		AL- 95 sq mm
Reason for Test:	NEW DRIVE INSTALLATION	**Cable Temperature:**	HOT

Loop Resistance in Ohms (is Loop Resistance Applicable?) N/A Yes/No
Measured with No:
Type: Leads: ohms

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Phasing:

AS IT WAS

Insulation Resistance in Megohms

Measured with No: MOO131

Type: KYORITSU

	Volts	1 Min	2 Min
A-Earth	5000	200,000	200,000
B-Earth	5000	200,000	200,000
C-Earth	5000	200,000	200,000
A - B	5000	200,000	200,000
B - C	5000	200,000	200,000
C - A	5000	200,000	200,000

High Voltage Test Sheet N/A 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: FINE
Amb. Temp. °C:
Result of Test: PASS
Label Attached at:

Comments:

All bolts tightened to the following torque settings and marked with permanent marker

8mm-22Nm

10mm-27Nm

12mm-34Nm

Testing Officer:	S.CUNNINGHAM	**Date:**	05/09/13	**Engineer if Required:**	**Date:** / /

J & P RICHARDSON INDUSTRIES PTY. LTD

114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

HV CABLE TEST SHEET

Project:	SIEMANS	**Job No:**	C64800
Date of Test:	05/09/2013		
Cable Circuit:	From: SR13 MOTOR	To:	0110-1 ISOLATOR/EARTHING PANEL
Type:	SINGLE CORE XLPE 6.6 kV		AL- 95 sq mm
Reason for Test:	NEW DRIVE INSTALLATION	**Cable Temperature:**	HOT

Loop Resistance in Ohms (is Loop Resistance Applicable?) N/A Yes/No
Measured with No: _____
Type: Leads: ohms

Phasing: AS IT WAS

Circuit	Loop					
	A-B		B-C		C-A	
	Total	Net	Total	Net	Total	Net

Insulation Resistance in Megohms

Measured with No: MOO131

Type: KYORITSU

	Volts	1 Min	2 Min
A-Earth	5000	200,000	200,000
B-Earth	5000	200,000	200,000
C-Earth	5000	200,000	200,000
A - B	5000	200,000	200,000
B - C	5000	200,000	200,000
C - A	5000	200,000	200,000

High Voltage Test Sheet N/A 1 Start; 1 Finish – Leakage Currents in mA

Connections			Time Mins	Negative			Positive		
-	+	Earth		kV	1 Start	1 Finish	kV	1 Start	1 Finish
A B C									
A	B	C							
B	C	A							
C	A	B							

Weather Conditions: FINE — Amb. Temp. °C:
Result of Test: PASS — Label Attached at:

Comments:

All bolts tightened to the following torque settings and marked with permanent marker

8mm-22Nm

10mm-27Nm

12mm-34Nm

Testing Officer:	S.CUNNINGHAM	**Date:**	05/09/13	**Engineer if Required:**	**Date:** / /

3) 0110-SR13 Variable Speed Drive System

B. LV cable Test Sheets

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	REPLACES P214	4c+2	SIZE	10	mm²
FROM	ESSENTIAL SERVICES SB No 1	PVC/PVC	TYPE		XLPE/PVC
TO	0110 - SR13		LENGTH	35m	

CORE No.	INSULATION					FAULT LOOP		EARTH CONTINUITY
	TO EARTH	TO RED	TO WHITE	TO BLUE	TO NEUTRAL	IMPEDANCE	PSC	Ω
RED	200 MΩ +	N/A MΩ	200 MΩ +	200 MΩ +	200 MΩ +	Ω	AMPS	0.1
WHITE	200 MΩ +	200 MΩ +	N/A MΩ	200 MΩ +	200 MΩ +	Ω	AMPS	
BLUE	200 MΩ +	200 MΩ +	200 MΩ +	N/A MΩ	200 MΩ +	Ω	AMPS	
NEUTRAL	200 MΩ +	200 MΩ +	200 MΩ +	200 MΩ +	N/A MΩ	N/A Ω	N/A AMPS	

Verification

Lugs/Pin Ends		Glands		Heat Shrink		Shrouds		Cable lable	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	✓	✓	✓	NA	✓	NA	✓	NO	NO

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

8mm BOLTS MAIN SWITCH TORQUED TO 22NM

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	P236	2c+E	SIZE	2.5	mm²
FROM	0110 - SR13	PVC/PVC	TYPE		XLPE/PVC
TO	MOTOR HEATER		LENGTH	?	

CORE No.	INSULATION					FAULT LOOP		EARTH CONTINUITY
	TO EARTH	TO RED	TO WHITE	TO BLUE	TO NEUTRAL	IMPEDANCE	PSC	Ω
RED	200 MΩ+	N/A MΩ	— MΩ	— MΩ	200 MΩ+	Ω	AMPS	
WHITE	— MΩ	— MΩ	N/A MΩ	— MΩ	— MΩ	Ω	AMPS	
BLUE	— MΩ	— MΩ	— MΩ	N/A MΩ	— MΩ	Ω	AMPS	
NEUTRAL	200 MΩ+	— MΩ	— MΩ	— MΩ	N/A MΩ	N/A Ω	N/A AMPS	

Verification

Lugs/Pin Ends		Glands		Heat Shrink		Shrouds		Cable lable	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	NA	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

POWER CABLE INSPECTION AND TEST SHEET

CABLE No.	P235	2c+E	SIZE	2.5	mm²
FROM	ESSENTIAL SERVICES SB NO 1	PVC/PVC	TYPE		XLPE/PVC
TO	0110 - SR13		LENGTH	35m	

CORE No.	INSULATION					FAULT LOOP		EARTH CONTINUITY
	TO EARTH	TO RED	TO WHITE	TO BLUE	TO NEUTRAL	IMPEDANCE	PSC	Ω
RED	200 MΩ+	N/A MΩ	— MΩ	— MΩ	200 MΩ+	Ω	AMPS	0.3
WHITE	— MΩ	— MΩ	N/A MΩ	— MΩ	— MΩ	Ω	AMPS	
BLUE	— MΩ	— MΩ	— MΩ	N/A MΩ	— MΩ	Ω	AMPS	
NEUTRAL	— MΩ	200 MΩ+	— MΩ	— MΩ	N/A MΩ	N/A Ω	N/A AMPS	

Verification

Lugs/Pin Ends		Glands		Heat Shrink		Shrouds		Cable lable	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
NA	✓	NA	✓	NA	NA	NA	NA	✓	NO

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	PP13-7J		SIZE	1.5mm²
FROM	0110-SR13		TYPE	6 PR
TO	TACHO.		LENGTH	?

CORE No.		WIRE NUMBER		FROM TERMINAL		TO TERMINAL TACHO	
			Correct	TB2ELV	Correct	~~EARTH~~	Correct
1	WHITE	PP13+15V	✓	30	✓		
1	BLACK	PP13-Com	✓	31	✓		
2	WHITE	PP13-B	✓	29	✓		
2	BLACK	PP13-B	✓	28	✓		
3	WHITE	PP13-A	✓	27	✓		
3	BLACK	PP13-A	✓	26	✓		
4	WHITE	—	✓	32	✓		
4	BLACK	—	✓	32	✓		
5	WHITE	—	✓	32	✓		
5	BLACK	—	✓	32	✓		
6	WHITE	—	✓	32	✓		
6	BLACK	—	✓	32	✓		
7	WHITE						
7	BLACK						
8	WHITE						
8	BLACK						
9	WHITE						
9	BLACK						
10	WHITE						
10	BLACK						
11	WHITE						
11	BLACK						
12	WHITE						
12	BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE [signature]

DATE 10/9/13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C172		SIZE	1.5mm²
FROM	0110 - SR13		TYPE	2c4E
TO	PUMP FLOOR ESTOP		LENGTH	2

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	102N-2	✓	7	✓		
2	102N-1	✓	6	✓		
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C315		SIZE	1.5mm²
FROM	0110 - SR13		TYPE	10 C+E
TO	HV SWITCHROOM A25		LENGTH	

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	138N	✓	2	✓		
2	139N	✓	3	✓		
3	101N	✓	9	✓		
4	102N	✓	4	✓		
5	102N-1	✓	5	✓		
6	SP	✓	—			
7	SP	✓	—			
8	SP	✓	—			
9	SP	✓	—			
10	SP	✓	—			
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	NA	NA

NO THROUGH J BOX

PRINT NAME G CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

CONTROL CABLE INSPECTION & TEST SHEET

CABLE No.	C316		SIZE	1.5mm²
FROM	0110 – SR13		TYPE	6 c+E
TO	MARSHALLING CUBICLE MK13		LENGTH	?

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1	BK13-2	✓	TB2-4	✓		
2	BK13-7	✓	TB2-3	✓		
3	SP	✓	NA			
4	SP	✓	NA.			
5	BK13-3	✓	1	✓		
6	BK13-5	✓	2	✓		
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13.

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	P447		SIZE	1.5mm²
FROM	0110 - SR13		TYPE	1PR
TO	CUBICLE BC61		LENGTH	

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	SR13 +VE	✓	320	✓		
1 BLACK	SR13 -VE	✓	324	✓		
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	NO	NA

NO THROUGH JBOX

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LAN 13-2		SIZE	1.5mm²
FROM	0110-SR13		TYPE	IPR
TO			LENGTH	

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
YLW 1 ~~WHITE~~	NA		GENIUS	✓		
1 BLACK	NA		MODULE	✓		
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	NO	NA

THROUGH J BOX

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LA13-3		SIZE	1.5mm²
FROM	0110-SR13		TYPE	1PR
TO	?		LENGTH	?

CORE No.		WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
			Correct		Correct		Correct
YLW 1	WHITE	NA		GENIUS	✓		
1	BLACK	NA		MODULE	✓		
2	WHITE						
2	BLACK						
3	WHITE						
3	BLACK						
4	WHITE						
4	BLACK						
5	WHITE						
5	BLACK						
6	WHITE						
6	BLACK						
7	WHITE						
7	BLACK						
8	WHITE						
8	BLACK						
9	WHITE						
9	BLACK						
10	WHITE						
10	BLACK						
11	WHITE						
11	BLACK						
12	WHITE						
12	BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	✓	NA

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.	LT 003 - 4J		SIZE	1.5mm²
FROM	0110 - SR13		TYPE	IPR
TO	WET WELL No1 LEVEL TX		LENGTH	

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct		Correct		Correct
1 WHITE	13-3-1	✓	357	✓		
1 BLACK	WW-	✓	358	✓		
2 WHITE						
2 BLACK						
3 WHITE						
3 BLACK						
4 WHITE						
4 BLACK						
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	NA	✓	NA	✓	NA	NA	NA	NO	NA

NO THROUGH J BOX

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

J & P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au

INSTRUMENTATION CABLE INSPECTION TEST SHEET

CABLE No.				SIZE	1.5mm²
FROM	110-SR13			TYPE	4PR
TO	0110-1 # ES13			LENGTH	12m

CORE No.	WIRE NUMBER		FROM TERMINAL		TO TERMINAL	
		Correct	TB2	Correct		Correct
1 WHITE	326	✓	10	✓	1, 7, 13, 19	✓
1 BLACK	13	✓	13		2	✓
2 WHITE	11	✓	11		9	✓
2 BLACK	9	✓	9		14	✓
3 WHITE	15	✓	15		20	✓
3 BLACK	SP	✓				
4 WHITE	SP	✓				
4 BLACK	SP	✓				
5 WHITE						
5 BLACK						
6 WHITE						
6 BLACK						
7 WHITE						
7 BLACK						
8 WHITE						
8 BLACK						
9 WHITE						
9 BLACK						
10 WHITE						
10 BLACK						
11 WHITE						
11 BLACK						
12 WHITE						
12 BLACK						

Verification

Pin ends		Glands		Heat Shrink		Shrouds		Cable Label	
Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End	Start End	Finish End
✓	✓	✓	✓	✓	✓	NA	NA	NO	NO

PRINT NAME G. CERVETTO

SIGNATURE

DATE 10 / 9 / 13

3) 0110-SR13 Variable Speed Drive System

C. Electrical Installation Report.

Jantec Compliance

PO Box 1067 | Tewantin 4565 | PH:0438 394 269
EMAIL: auditor@jantec.com.au | WEB: www.jantec.com.au

REPORT No.: JPR-QUU-020-SD

ELECTRICAL INSTALLATION REPORT

Issued in accordance with the *Electrical Safety Regulation 2002* (Qld)
Section 153 for electrical work in a Hazardous Area
or on a High Voltage installation.

Occupier:	Location of Installation:
Qld Urban Utilities	Violet Street/Kingsford Smith Drive, Eagle Farm 4009

Electrical Installation Audited (Audit Scope):
Replacement of existing VVVF and new isolator & earthing panel to SR13 Pump Motor

Electrical Contractor Responsible for the installation:	Electrical Contractors Lic:
J&P Richardson Industries	756

Audit Limitations

Inherent Limitations:

Because of the inherent limitations of any internal control structure, it is possible non-compliance with standards may occur and not be detected. An audit is not designed to detect all weaknesses in compliance as an audit is not performed continuously throughout the period of installation.

Scope Limitations:

nil

Audit Result:

☐ The auditor issuing this notification reasonably believes that the installation work described in the Audit Scope above is **not in compliance** with the relevant standards.

☒ I advise that the audit of the electrical installation work described in the Audit Scope above, was successfully executed and compliance with the relevant parts of AS2067 and AS/NZS3000 is demonstrated (subject to the audit limitations) at the time of the audit.

From the evidence provided, conclusion can be drawn that the onsite test results recorded by the installer, satisfy the minimum test requirements of AS2067 , AS/NZS3000 and other relevant standards.

It is reasonable to believe that the electrical installation described in the Audit Scope above is electrically safe to connect.

Audit Date:	Auditor:	Auditors Signature:	Auditors No:	Phone No:
12/09/13	S.Downey		02/0114	0438 394 269

Comments/Observations:

If you are not the person having responsibility for the safety of the electrical installation/equipment identified above, it is important that you pass this report to such a person without delay.

A copy of this report must be retained in the site verification dossier and a copy is also forwarded to the relevant regulator as part of the legislative requirements for electrical auditors.

3) 0110-SR13 Variable Speed Drive System

D. Commissioning Report and Parameter List

SIEMENS

STARTUP & COMMISSIONING MANUAL

FOR SIEMENS
PERFECT HARMONY, AIR-COOLED,
MEDIUM VOLTAGE,
VARIABLE FREQUENCY DRIVES

A5E32168985
VSD 0110-SR13
Queensland Urban Utilities – Eagle Farm

Important Note:

These Startup & Commissioning instructions are solely intended as working instructions or information for Field Service specialist personnel of the SII DT LD, Customer Services Division.

Even where product specific information is included, these instructions are not to be regarded as operating instructions for a particular product.

Revision	Description of Change	Initials	Date

Table of Contents

List of Tables

Tables **Page**

Reference Material (for Siemens Personnel)

For Gen IV Drives:

SIEMENS Gen IV Product User Manual A5E01454341C

SIEMENS Gen IV Commissioning and Maintenance Manual A5E01454341D

For Gen III/e Drives:

SIEMENS Perfect Harmony Gen III/e User's Manual A1A19000405A

SIEMENS Perfect Harmony Gen III/Gen III/e Startup and Advanced Topics Manual A1A19000404A

SIEMENS Perfect Harmony Gen III/e Installation Manual A1A19000403A

SIEMENS NXG Manual A1A19001588

Tech Notes (Applications)

Abbreviations

The following abbreviations are used throughout this procedure.

Table 1: Abbreviations

Abbreviation	Description
A	Ampere(s); Amp(s)
AC	Alternating Current
ACH	Anti-Condensation Heater
ACU	Air Conditioning Unit
CB	Circuit Breaker
CDS	Circuit Disconnect Switch
CPS	Control Power Supply
CT	Current Transformer
DC	Direct Current
DCR	Digital Card Rack
DWG	Drawing
ES	Emergency Shutdown
ESD	Electrostatic Discharge
F	Fuse
FSR	Field Service Representative
ICP	Installation and Commissioning Procedure
GA	General Arrangement
HESPS	Hall Effect Sensor Power Supply
HMI	Human-Machine Interface
LV	Low Voltage
MV	Medium Voltage
N/A	Not Applicable
OEM	Original Equipment Manufacturer
P/N	Part Number
PDC	Power Distribution Center
PPE	Personal Protective Equipment
PSD	Process Shutdown
S/N	Serial Number
SOP	System Operating Program
TB	Terminal Block
UPS	Uninterruptible Power Supply
V	Volt(s)
VAC	Volt(s) / -Alternating Current
VDC	Volt(s) / -Direct Current
VFD	Variable Frequency Drive
WPS	Wago Power Supply

1.0 INTRODUCTION

This document is for all Air-Cooled Perfect Harmony Drives with NXG Controls.

1.1 Purpose of Manual

The purpose of this document is to effectively guide competent and trained Siemens personnel through Startup and Commissioning for the Air-Cooled Perfect Harmony Variable Frequency Drive (VFD). The individual checks must be performed within each of the separate sections of this procedure. Following any introductory text and precautions, each section contains a series of checkboxes that indicate the completion of the individual steps.

In addition to the checkboxes, tables may be included in some sections. Such tables are used to record information like the following: a) parameter settings; b) test point data values; c) any errors or deviations. Major sub-sections also contain initials/date fields that must be completed by the individual performing and completing that section of the Startup and Commissioning procedure.

1.2 Startup Task Agenda

1.2.1 Punch List for Open Items During Startup & Commissioning

- List any issues as open items. (Attachment #1, CCF-004)
- Assign responsibility, due date, and date of completion.
- Review with Customer and return copy to Project Manager (PM) at end of Commissioning.

1.2.2 Drive Cabinet Inspections

- Installation Inspections - Perform a visual inspection to detect signs of deterioration and discoloration. Inspection detects issues in the equipment where components may need replacement and/or corrective action.
- Equipment Cleanliness Check – Check each of the enclosures of the equipment for cleanliness of power and control circuitry. This should include removal of installation dirt and debris.
- Connection Checks - Perform a variety of connection and torque mark checks on the Drive system including inspection for loose wires, loose hardware, stripped or cut wires, poor/melted insulation, and proper torquing on the component mountings.

1.2.3 Power-up Checks

- Power-up the equipment and perform a functional and operational evaluation running at various operation levels.
- Inspection verifies the equipment is in operating condition.

1.2.4 Customer / Performance Review

- Meet with the customer to review the current site conditions.
- Record any issues with the installation of the Siemens equipment.
- Record training classes taken by on-site personnel and recommend any to be taken.

1.2.5 Spare Parts Checkout

- Perform a visual inspection of Spare Power Cells, Spare Control PCBs, and other components.
- Spare Control PCBs or Power Cells should be installed in the Drive to verify setup and operation.
- Record recommended spare parts.
- Recommend a backup flash disk of the operating system.

1.3 Symbols and Conventions

1.3.1 Symbol Definitions

The following words and symbols found throughout this manual mark special messages to alert the operator of specific information concerning of the PERSONNEL, the EQUIPMENT or the PROCESS.

 WARNING	**Text set off in this manner provides warning notice that failure to follow these directions in this WARNING can result in bodily harm or loss of life and/or extensive damage to equipment.**
 CAUTION	**Text set off in this manner provides warning notice that failure to follow these directions in this CAUTION can result in damage to equipment.**
 NOTE	**Text set off in this manner present clarifying information or specific instructions pertinent to the immediate instruction.**

1.3.2 Warnings and Caution Notes

 WARNING	**Personnel performing this procedure MUST read the entire document before beginning the procedure.**
 NOTE	**Personnel executing this procedure shall acquire the necessary permits prior to commencing any work activity.**
 WARNING	**Before performing this procedure, the Customer Personnel and Siemens Field Service Representative MUST conduct a job safety briefing for all participants. The briefing shall cover hazards, special precautions, energy source controls and personal protective equipment requirements.**
 WARNING	**Always work with one hand, wear safety shoes rated electrical hazard/composite and safety glasses. Always work with another person present who is acting as a safety monitor.**
 WARNING	**Only qualified Siemens Field Service Representatives should install, operate, troubleshoot, and maintain this Drive. A qualified individual is "one familiar with the commissioning and operation of the equipment and the hazards involved.**

 WARNING	**Always use extreme caution when handling or measuring components that are inside the enclosure. Be careful to prevent meter leads from shorting together or from touching other terminals.**
 WARNING	**Use only instrumentation (e.g., meters, oscilloscopes, etc.) intended for high voltage measurements (that is, isolation is provided inside the instrument, not provided by isolating the chassis ground of the instrument).**
 WARNING	**Never touch anything within the Perfect Harmony cabinets until verifying that it is neither thermally hot nor electrically alive.**
 WARNING	**Never remove safety shields (marked with a HIGH VOLTAGE sign) or attempt to measure points beneath the shields.**
 WARNING	**Never connect any grounded instrumentation (i.e., non-isolated meters or oscilloscopes) to the Perfect Harmony system.**
 WARNING	**Never connect or disconnect wiring or printed circuit boards while the Drive is energized.**
 WARNING	**Hazardous voltages may still exist within the Perfect Harmony cabinets even when the disconnect switch is open (off) and the supply power is shut off.**
 CAUTION	**Be sure to make appropriate connections/disconnection to equipment in order to perform this test correctly and safely. Failure to do so may result in DAMAGE to equipment.**
 WARNING	**Only personnel performing the test shall be in the area while the test is being performed. Test area shall be barricaded and unauthorized personnel shall not be allowed inside.**

2.0 SITE AND SAFETY INSTRUCTIONS

2.1 Test Equipment and Tool Check

2.1.1 All test instruments, supporting tools, and accessories shall be rated for intended use. Initial ___

2.1.2 Perform a visual inspection of all test instruments, equipment and all associated test leads, cables, power cords, probes, and connectors for external defects and damage. Initial ___

2.1.3 Ensure that all test instruments, equipment, and their accessories are calibrated and valid throughout the ENTIRE test period. Initial ___

2.1.4 Verify customer can supply the following accessories for possible use during Startup and Commissioning activities:

☒ Barrier	☐ Guards	☒ Caution Tape	☐ Cell Lifter
☐ Rags	☐ Step Stool	☐ Alcohol based Cleaning Fluid	☐ Grease Gun
☐ Air Filters	☐ Ladder	☐ Shop Vacuum	☐ Soft Brush
☐ Compressed Air	☐ Hoses	☐ Water & Hose	

Initial ___

Table 2: Test Equipment and Tool List

Equipment/Tool	Manufacturer & Model Number	Serial Number	Calibration/ Inspection Date
PPE Arc Flash Jacket	Stanco Temp Test Salisbury		
Meter	Fluke 1587, Megger		
	Fluke 43B, PQM		
	Fluke 787, Process Mtr		
	Fluke 87 V, DVM		
	Simpson 260-8P		
	AEMC JM810A, 2000A		
	Fluke i400s		
Torque Wrenches	Craftsman 250 ft-lbs		
	Craftsman 250 in-lbs		
	Craftsman 50 in-lbs		
ESD Pad & Wrist Strap			

2.2 Site and Safety Activities

2.2.1 Meet with Site Supervisor

- Review of safety requirements.
- Site Specific Safety Training, as required.
- Plan for the day's progress.
- Discuss any open issues.
- Complete Daily Safety Log Form.

2.2.2 Review the Equipment Location and Drive Information

- Be certain your work area is clear of debris.
- Confirm that barriers, guards or Caution Tape are in place to prevent. unauthorized personnel form entering into the work area.
- Collect the site and Drive information.

2.2.3 Follow Lockout/Tagout Procedures

- Coordinate with customer on local Lockout/Tagout Procedures.
- If the customer has no requirements, follow Siemens' LD A Lockout/Tagout Procedures.
- Insure Personal Protection Equipment (PPE) and Safety Tools are available.

5 Safety Rules of LOTO

1. Switch off power sources
2. Lock the circuit against re-closure
3. Establish that system is de-energized
4. Earth and short circuit phases
5. Cover or enclose "live" parts

2.2.4 At the end of each day

- Clean your area.
- Pack your tools and equipment.
- Meet with the site supervisor.
- Review what was done that day.
- Equipment status at end of day.
- Determine what time you will be returning in the morning.
- Ask if there are any questions or other issues that need to be addressed.
- Complete entries in service report.

2.2.5 At the end of the Startup and Commissioning service

- Review daily service reports.
- Obtain Customer signature on service report.
- Ensure any warranty or repair parts have RMAs and are shipped for return.
- Ensure any FSKits used during Startup are packaged for return. Obtain an RMA number and handle shipping back to Siemens.
- Review checklist:
  - Spare parts review
  - Customer review
  - Record follow-up items
  - Contact in-house support personnel
- Complete the Startup and Commissioning Acceptance and Sign Off Sheet.

3.0 SITE AND DRIVE INFORMATION

Date: 16/09/2013

3.1 Customer Information

Customer Name:	Queensland Urban Utilities		
Street Address:	Eagle Farm	City, State Zip code:	Eagle Farm
Primary Contact:	Jim Kirkland	Primary Phone No:	0410 548 794
Primary Fax No:		Primary Email Addr:	
Secondary Contact:	Brett Lawrence	Secondary Phone No:	0400 723 752
Secondary Fax No:		Secondary Email Addr:	
Date Completed Pre-Startup Checklist:	17/09/2013	Client's Drive ID:	0110-SR13

3.2 Dispatch Information

Notification No:	52-199755	Original SO No:	3002133943
Field Service Rep:	Ruben Diaz	Drive Type:	Gen3
Technical Support:	SCCC: Ph. 1300 369 515	Drive P/N:	M6SR3
Project Engineer:	Pieter Taljaard (Siemens Aust.)	Drive S/N:	Z831501002462
Location of Drive:	Eagle Farm	Drive Date Code:	13-24

3.3 Location Environment

Elevation:	Ft, Above Mean Sea Level	Air Conditioning:	☐ Yes ☒ No
Enclosure:	☐ PDC ☒ Building	Air Conditioning:	BTU, or Ton
Room Temperature:	°C, Indoors	Heating:	☐ Yes ☒ No
Ambient Temperature:	30+ °C, Outdoors	Humidity:	☐ High ☒ Low
Outside Air Blown In:	☐ Yes ☒ No	Dusty Environment:	☐ Yes ☒ No
Drive Blowers Ducted Outdoors:	☒ Yes ☐ No	Conductive Dusts:	☐ Yes ☒ No
Other Influences: List all.		Corrosive Gases:	☒ Yes ☐ No Type(s): Sewage

3.4 Drive Information

Power	Load Type/Description	Voltage	Ampacity	Frequency
Input Power:	2750 KVA	6600V	214A	50Hz
Output Power:	2051 KW	0-6600 V	260 A	0-75Hz
Control #1 Power:	Control and Blower	415V 3ph	20A	50Hz
Control #2 Power:	Motor Heater external power (customer)	110Vac 1Ph	Power=KW	50Hz
Control #3 Power:				
Control #4 Power:				

Xfmr Blower Motors:	Voltage:	HP/KW: HP, or KW	FLA: Amp RPM:
Xfmr Blower Motor OL Settings:			
Cell Blower Motors:	Voltage:	HP/KW: HP, or KW	FLA: Amp RPM:
Cell Blower Motor OL Settings:			

Transformer:	Mfg: TBA		KVA: 2750
	Model No: HZ50	Part No: A5E03460937	Serial No:
	Input Voltage: 6600 V	Sec Voltage: 630 V	Tap Setting: ☐ -5% ☐ 0% ☒ +5%
	Reason if Tap Setting is not +5%:		

Input CT'S:	Ratio: 250 **:** 5	No. per Phase: 1	
Attenuator Resistors:	Input: 4.8 MΩ	Output: 4.8 MΩ	

3.5 Drive Options

Cell Bypass	☐ Yes ☒ No		UPS:	☐ Yes ☒ No
Drive Bypass:	☐ Yes ☒ No		Communication Protocol:	☐ No ☒ Yes Type: Modbus RS485
Sync Motor:	☐ Yes ☒ No		Sync Transfer	☐ Yes ☒ No
Sync Motor Exciter:	Voltage:		Manufacturer:	
	Configuration:		Serial No.:	
	Model:			

Table 3: Cell Information

Power Cells:	VSD P/N: 6SR3502-6HF42-7BH-Z	Size: _____ Amp 260	Total No of Cells: 18

Cell				Cell Control Board		
Location	**CELLS P/N**	**S/N**		**P/N**	**S/N**	**Rev.**
A1	LDZ14501002.260	130212		A1A10000432.30M	L11090XXXBR	BR
A2	LDZ14501002.260	130209		A1A10000432.30M	L11090187BR	BR
A3	LDZ14501002.260	130204		A1A10000432.30M	L11090222BR	BR
A4	LDZ14501002.260	130199		A1A10000432.30M	L11090244BR	BR
A5	LDZ14501002.260	130196		A1A10000432.30M	L11090237BR	BR
A6	LDZ14501002.260	130201		A1A10000432.30M	L11090140BR	BR
B1	LDZ14501002.260	130210		A1A10000432.30M	L11090241BR	BR
B2	LDZ14501002.260	130211		A1A10000432.30M	L11090155BR	BR
B3	LDZ14501002.260	130213		A1A10000432.30M	L11090158BR	BR
B4	LDZ14501002.260	130205		A1A10000432.30M	L11090224BR	BR
B5	LDZ14501002.260	130202		A1A10000432.30M	L11090219BR	BR
B6	LDZ14501002.260	130201		A1A10000432.30M	L11090208BR	BR
C1	LDZ14501002.260	130206		A1A10000432.30M	L11090207BR	BR
C2	LDZ14501002.260	130203		A1A10000432.30M	L11090147BR	BR
C3	LDZ14501002.260	130208		A1A10000432.30M	L11090210BR	BR
C4	LDZ14501002.260	130198		A1A10000432.30M	L11090217BR	BR
C5	LDZ14501002.260	130197		A1A10000432.30M	L11090218BR	BR
C6	LDZ14501002.260	130200		A1A10000432.30M	L11090233BR	BR

3.6 Motor Information

Manufacturer:	TBA	Model Number:	
HP/KW Rating:	HP, 2000 KW	Serial Number:	
Rated Voltage:	6600 V	Type:	☒ Induction ☐ Synchronous
Full Load Data:	Amp: 217 A, Eff: , PF: 0.86, RPM: 593		
Locked KVA Code:		Speed Encoder:	☒ Yes ☒ No
Service Factor:		Encoder Model:	, 1024 PPR, Incremental
Motor Cooling:	Air, Other:	RTD's:	☒ Stator ☒ Bearings
Stator Connection:	☒ Wye ☐ Delta	RTD Type:	PT100
Line Start Capability:	☐ Yes ☒ No	RTD Alarm/Trip:	Stator: N/A °C, Bearing: N/A °C
Exciter Manufacturer:		Exciter Voltage:	V, ☐ AC ☐ DC
Exciter Model No:		Exciter Config:	

4.0 CUSTOMER PRE-STARTUP CHECKLIST REVIEW

4.1 Customer Responsibilities

4.1.1 Customer is responsible for completing the pre-startup items on the Customer Pre-Startup Checklist (See Attachment #2). Complete ☒ Incomplete ☐

4.2 Review and record checklist items status

4.2.1 Review each item in the checklist with the Customer and record status of completion in the Attachment #2. Complete ☒ Incomplete ☐

5.0 DRIVE PRE-POWER INSPECTIONS AND CHECKS

Description	Initial
Visually check the equipment for any shipping or installation damage.	RD
Ensure that the entire system is earth grounded at one of the system grounding points. (Customer specified where ground to be connected in VFD. Either to input or output cabinet.)	RD
Confirm Siemens drawings are the same at the Customer's drawings. Note: *Drawings need to be updated for new encoder connection. Obs.* Encoder not Working properly in this drive	RD
Verify the source voltage to the Drive matches the Drive specification. The Drive's intended input voltage is specified on the foil label located inside the control panel door. (Note: This foil label may be located in the customer connection cabinet.)	RD
Ensure the control power (typically 120 VAC or 125 VDC) and auxiliary power (typically 415 or 690 VAC) sources are connected per the VFD schematics and that they match the Drive's control voltage ratings as stated on the foil label.	RD
Verify the presence of markings/labels on all terminal strips, mounted components, cell and other sub-assemblies. Notify the factory of any discrepancies. List discrepancies: NA	RD
Verify the presence and proper installation of all protective covers. List discrepancies: *415V for PLC I/O Transformer protection barrier to be fitted->Done!*	RD
Verify the installation of the fan hood. Verify that the fan rotates freely while mounted.	RD
Check Blower Assembly installation and check hardware connections.	RD
Confirm all air gaps are blocked between cabinets.	RD
Confirm Shipping Splits are internally bolted together. n/a	RD

Description	Initial
Confirm Shipping Splits are externally bolted together (near floor). N/A	RD
Confirm cabinet to cabinet sealing.	RD
Confirm conduit entrance to cabinets is sealed.	RD
Confirm cabinet to floor is sealed.	RD
Confirm gland plates are installed properly.	RD
Verify that the ground bonding jumpers are present and connected (between shipping splits, cabinets to doors, cabinets to panels, motor).	N/A
Confirm MV and LV cables are installed in separate conduits (observe for proper spacing).	RD
Confirm LV (415V & 120V) and Analog Signal cables are installed in separate conduits.	RD
Check all cabling for insulation nicks, splitting and/or cracking.	RD
Verify that no conductors are exposed due to chafing or other shipping abuse.	RD
Input MV Power Cables: Verify insulation voltage rating is adequate.	RD
Input MV Power cables: Verify bend radii meet NEC requirements.	RD
Input MV Power cables: Check distance from cabinet/other cables.	RD
Input MV Power cables: Verify stress cones installed/mounted properly and shields are grounded at MV Switchgear end only – not at drive end. Ensure shield ground wires are adequately separated from bus work and GTO wires.	RD
Output MV Power Cables: Verify insulation voltage rating is adequate.	RD
Output MV Power cables: Verify bend radii meet NEC requirements.	RD
Output MV Power cables: Check distance from cabinet/other cables.	RD
Output MV Power cables: Verify stress cones installed/mounted properly and shields are grounded at VSD end only – not at Motor. Ensure shield ground wires are adequately separated from bus work and GTO wires.	RD
Verify that the transformer neutral is ungrounded.	RD
Check the tap jumper to be sure it is not touching the cabinet.	RD
Ensure that control and main power are installed and connected properly. Source to input. Output to motor.	RD
Check and inspect Motor Terminations in motor termination box. (done by JPR)	RD
Shipping split Bus Bar terminations complete, torqued and covers in place.	N/A
Ensure that VFD electrical connections are tight and that all torque marks are present. * Re-examine for bolts bottoming out.	RD
Check Amp connector pins. Refer to “Test Procedure for Holding Tension Testing of Amp Connector Female Sockets” and complete the associated testing form.	N/A
Have the control wire plugs at each shipping split been reconnected and tie-wrapped? (Confirms that all connnections that deal with shipping splits are addressed).	N/A
Control wires (visually inspected and landed per customer connection drawings).	RD
Check Input Attenuator Resistors are the correct value for the rated voltage.	RD
Check Output Attenuator Resistors are the correct value for the rated voltage.	RD

Description	Initial
Verify all Transorbs are grounded (located at/near input & output attenuator resistors).	RD
Check Fuses and Relays (inserted snugly into holders).	RD
Verify Wago wiring secure.	RD
Verify Break Out Board wiring secure.	RD
Verify Signal Conditioning Board wiring secure.	RD
Verify DCR is properly grounded to ground point.	RD
Verify Plug/Ribbon cables are secured.	RD
Verify Keypad is grounded.	RD
Verify for Communication protocol only: termination resistor.	RD
Check Fiber optics (point to point) and verify that bend radii are acceptable. A3 fiber bent at Modulator Board End, light goes through.	RD
External air path in/out (distance from blower 30mm (minimum) - pass/fail. Pass	RD
Inlet/outlet located opposite side of room. ok	RD
All covers and doors installed and secured with the correct fasteners and ground straps.	RD
All Safety Interlock hardware (Fortress Locks) are installed and properly aligned.	RD
All Doors open/close properly.	RD
Drive door filters.	RD
Verify all components match the drawings: component location, labels, wire tags and Drive labels. (The drawing must reflect the Drive and vice-versa – internal connections only).	RD
Adjust Blower Motor Thermal OL's to correct settings.	RD

6.0 CONTROL POWER CHECKS

Description	Initial
Ensure that all control power sources are available for Drive operation.	RD
Verify free rotation of cell and transformer blowers. (A double-check before closing the cabinets.)	RD
Verify Network Cabling is the correct type and landed on the correct terminals.	N/A
Verify Speed Controls are terminated correctly (4-20 mA speed control or network control).	RD
Verify Start/Stop commands terminated correctly (digital input or network control).	RD

Energize the Control Power Circuits feeding the drive.

DON'T energize MV Power.

Confirm the following parameters and document values:	Rated input current (2020)	214 A
	Rated output current (2040)	260 A
	Neutral connection (2630)	T2
	CT turns (3035)	250 :5
Measure all control power voltage sources being fed to the Drive. Verify that these voltages match the drawings.	415 V_{AC} (373V_{AC} to 466V_{AC})	**435** V_{AC}
	240 V_{AC} (220V_{AC} to 260V_{AC})	**NA** V_{AC}
	120 V_{AC} (110V_{AC} to 130V_{AC})	**129** V_{AC}
If supplied, verify the UPS voltage.	120 V_{AC} (110V_{AC} to 130V_{AC})	**NA** V_{AC}

Energize the control power circuits at the drive – close breakers and fuse holders.

Description	Initial
Verify phasing for the blower motor power circuit (verified by checking that suction holds a sheet of paper firmly on drive cabinet filters).	RD

Record Drive address.	TCP/IP Address:	172.017.020.16
Verify **DCS** or **PLC** addresses across communication link, if applicable. PLC via Network2 Modbus TCP	TCP/IP Address:	**NA**
Power supply voltage checks. *Please see FAT docs.*	+5 V_{DC} (+5.10 to +5.13 V_{DC})	**5.15** V_{DC}
	-5 V_{DC} (-4.85 to -5.15 V_{DC})	**--5.10** V_{DC}
	+12 V_{DC} (+11.64 to +12.36 V_{DC})	**12.3** V_{DC}
	-12 V_{DC} (-11.64 to -12.36 V_{DC})	**-12.1** V_{DC}
	+15 V_{DC} (+14.30 to +15.70 V_{DC})	**15.6** V_{DC}
	-15 V_{DC} (-14.30 to -15.70 V_{DC})	**-15.4** V_{DC}
	24 V_{DC} (21.6 to 26.4 V_{DC})	**24.3** V_{DC}
DCR voltage checks:	+5 V_{DC}	**5.2** V_{DC}
	-5 V_{DC}	**-5.15** V_{DC}
	+12 V_{DC}	**12.04** V_{DC}
	-12 V_{DC}	**-12.07** V_{DC}

DON'T ENERGIZE MV POWER – FURTHER CHECKS REQUIRED IN SECTION 10.

Table 4: SOP, Parameters and Fault Logs

Upload/Review:	Initials		Upload:	Initials
SOP File: A5E32168985D	RD		Historical Log:	RD
Parameter File (Level 7 Security):	RD		Fault Log:	RD
Check Clock Time: to AEST only	RD		Event Log (NXG only):	RD
			Cell Fault Log (Legacy only):	NA
Were any existing issues found after reviewing SOP, Parameters and Logs?	Normal commissioning code modification. Digital I/O wiring modified as per Asbuilt drawings. Added to SOP, DI-0B for Keypad local control, wiring and key-sw yet to be fitted. Added interlock for Ventilation running DI.			

Verify the following are functional under control power:		
MV Input Protection Interlock:		☒ Yes ☐ No
		☒ Yes ☐ No

7.0 SOFTWARE AND FIRMWARE VERSION RECORDING

Record the SOP Software (DRCTRY File) and NXG Firmware (8090) version.	Software Ver:	Version 4.39
	(8090) Firmware Ver:	Ver 5.2.3
Record HMI software version, if applicable. NA	Software Version:	NA
	Firmware Version:	NA
	Windows Version:	NA

8.0 BYPASS CONTACTOR TEST

8.1 Reference Bypass Contactor Procedure located in Bypass Contactor Kit.

Table 5: By-Pass Contactor Testing. Dynamic test pulling FO off for each cell, and then reset from parameter ID:XXXX.

NOT FITTED.

Contactor Name	Voltage	Initial
BPKA1	Pick-up Voltage: Drop-out Voltage:	
BPKA2	Pick-up Voltage: Drop-out Voltage:	
BPKA3	Pick-up Voltage: Drop-out Voltage:	
BPKA4	Pick-up Voltage: Drop-out Voltage:	
BPKA5	Pick-up Voltage: Drop-out Voltage:	
BPKA6	Pick-up Voltage: Drop-out Voltage:	
BPKB1	Pick-up Voltage: Drop-out Voltage:	
BPKB2	Pick-up Voltage: Drop-out Voltage:	
BPKB3	Pick-up Voltage: Drop-out Voltage:	
BPKB4	Pick-up Voltage: Drop-out Voltage:	
BPKB5	Pickup Voltage: Drop-out Voltage:	
BPKB6	Pick-up Voltage: Drop-out Voltage:	
BPKC1	Pick-up Voltage: Drop-out Voltage:	
BPKC2	Pick-up Voltage: Drop-out Voltage:	
BPKC3	Pick-up Voltage: Drop-out Voltage:	
BPKC4	Pick-up Voltage: Drop-out Voltage:	
BPKC5	Pick-up Voltage: Drop-out Voltage:	
BPKC 6	Pick-up Voltage: Drop-out Voltage:	
Confirm Customer I/O and communications Confirm Customer hard wiring into the VFD	This is the time to fine tune what is being received and if changes need to be done.	

Description	Initial
Install the covers and button up the Drives.	
Prepare the Drive for full input power. (Remove test equipment, motor free, etc.)	

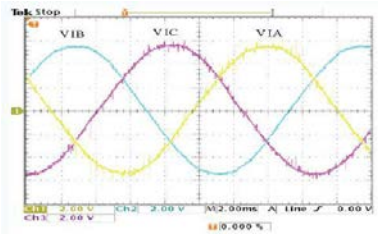
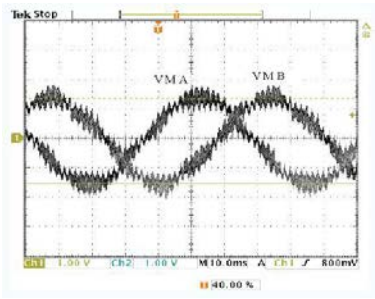
9.0 OPEN LOOP TESTS

N/A

The following steps verify operation of the Drive (without a motor) in Open Loop Test Mode (No motor current feedback).

Warning! Do not connect a grounded PC or laptop to a communications board with an isolator or while the Drive is running. To do so could damage the computer and/or the digital control rack.

Description	Initial
Review and follow safety procedures per Daily Safety Log.	
Make sure all safety grounds have been removed from input.	
Re-energize the AC or DC control power.	
Connect the PC/Laptop to the Ethernet Port (for access to the CPU Board). Connect Tool-Suite and the Debug Tool.	
Set the control loop type (2050) to Open Loop Test Mode (OLTM).	
Verify that the input current (3030) and input voltage (3040) scalers (stability →input processing) are set to the default values of 1.0.	
DISABLE spinning load using Drive → spinning load (2420) → spinning load mode (2430).	
Make sure the fast by-pass (2600) is DISABLED. Access this parameter through Drive → cells → fast by-pass.	
Configure the keypad to display input voltage (VDIN), input frequency (FRIN), and motor voltage (VLTS). – function of keypad	
Set the motor rated voltage (1040) parameter	
Energize MV Power to the system. **(Everyone should leave the room the first time MV is applied to the Drive.)**	

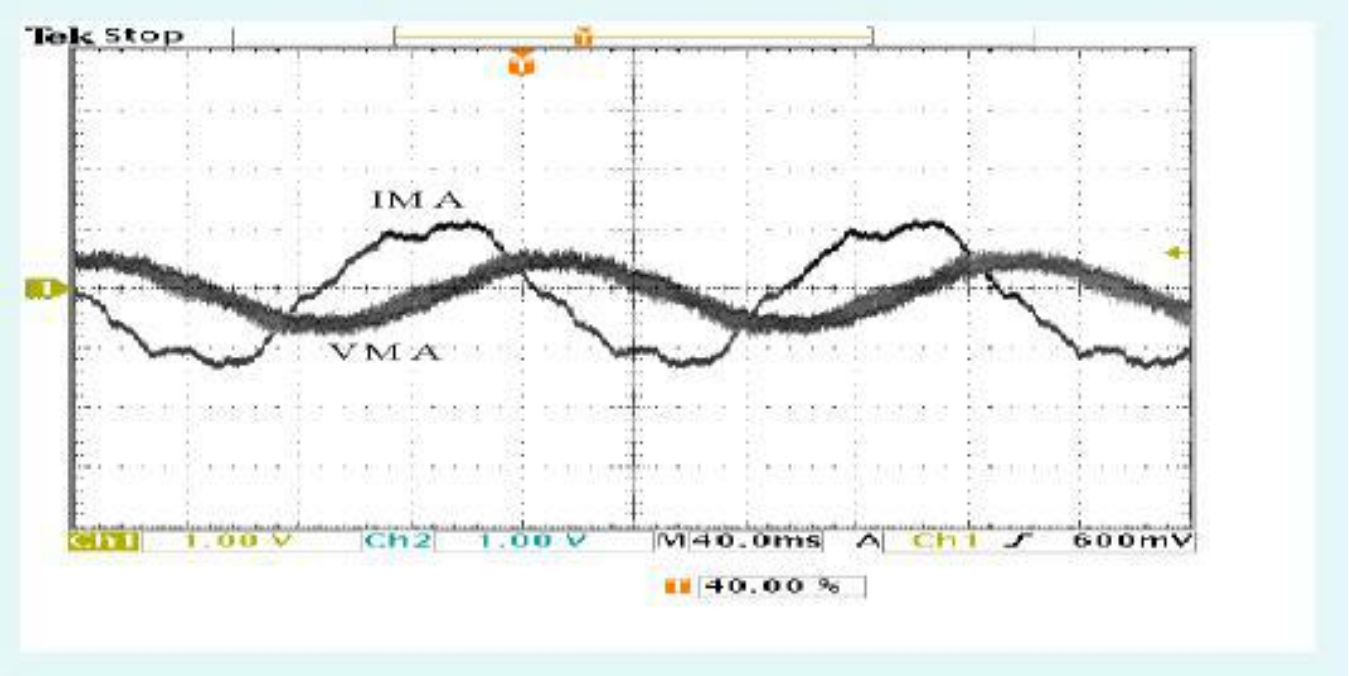
Description	Figures and Records	Initial
Verify that the keypad or drive tool displays the correct value of drive input voltage and frequency. At rated primary voltage, the AC input voltage feedback on Test Points VIA VIB, and VIC should be 5.4Vpp or 1.9Vrms. See the figure in the Comments Section. These test points are on the system interface card. Perform the following corrective step if the input (or line) voltage is too high or too low. If the input voltage to the Drive is too high, then this needs to be corrected. Harmony Drives are shipped with the transformer tap set to +5%, which reduces the voltage by that percentage on the secondary side of the transformer. If the voltage is low (5% less than rated), then change the tap on the transformer to the neutral ("O") or if the voltage is lower than 5% less than rated then change the tap on the transformer to -5% tap. If the input frequency is displayed as a negative number, then one pair of input phases has to be switched to change the phase rotation.	 Confirm Values using an oscilloscope and digital multimeter.	
Enter a speed demand of 25% and give the RUN command. The AC output voltage feedback signals on Test-Points VMA, VMB, and VMC should be 1.35Vpp ±0.27V (measure the average peak-to-peak voltage) or 0.48 Vrms ±0.20V. See the figure in the Comments Section for signals on TestP-points VMA and VMB at 25% speed (15Hz).	 Confirm Values using an oscilloscope and digital multimeter	
Increase the speed demand to 50% (30 Hz). The output voltage feedback signals should increase in proportion for both frequency and amplitude. Note that in Open Loop Test Mode, the flux regulator is not enabled and hence the output voltage will read higher or lower than calculated value corresponding to 50% of rated voltage. Adjust the flux demand parameter (3150) so that the motor voltage (on the keypad or tool) is approximately equal to 50% of rated voltage. Further increase the speed demand to 100% (60 Hz). The AC output voltage on Test-Points VMA, VMB, and VMC should be 5.4Vpp ±0.27V or 1.9 Vrms ±0.20V. The motor voltage on the keypad should read the rated value output voltage ±5%.		

10.0 DRIVE TEST IN OPEN LOOP TEST MODE WITH MOTOR CONNECTED

10.1 The following steps verify operation of the Drive (with a motor connected at its output) in Open Loop Test Mode (No Current Feedback). This test is required only when the operation of the output Hall Effect Transducers requires to be verified. During this test the motor should be unloaded. If this test is not required then proceed to the next test.

Description [This procedure not followed, OLVC method used]				**Initial**
Disconnect control voltage and medium voltage sources & follow LOTO procedures.				
Connect the motor feeder cables or enable motor contactor.				
Re-energize the AC or DC control power.				
Set the motor rated voltage (1040) and frequency (1020) parameters (access it through motor → motor parameters) to be equal to the motor nameplate values.				
Make sure that **spinning load mode (2430)** and **fast by-pass (2600)** are **DISABLED**.				
Slow down Drive acceleration and deceleration. **Set to 60 Sec or greater.** "Drive/Speed Ramp Setup"	Accel time 1	(2270)	Sec	
	Decel time 1	(2280)	Sec	
DON"T operate the drive beyond 10% speed without reducing the Flux Demand (3150) to 0.5. "Stability/Output Processing/Flux Control"				
Energize the medium voltage feed to the VFD. Push the fault reset button on the keypad to reset faults and push the button a second time to acknowledge any alarms. If the mode on the keypad display reads RLBK, then change the control loop type (2050) to open loop vector control and exit out of the menu entry. This should force the RLBK on the keypad to change back to mode. Then **change the control loop type (2050) back to open loop test mode.**				
Configure the keypad to display motor magnetizing current, motor torque current and motor voltage.				
Spin the motor at 1% and observe proper rotation. Motor rotation correct or corrected: ☐ Yes ☐ No				
Operate the Drive with a speed demand of 10%. Observe the AC output voltage feedback and motor current for phase A on test-points VMA and IMA using an oscilloscope. Since the motor is unloaded the current waveform should lead the voltage waveform by almost 90°. The hall effect current transducers introduce a negative sign since they are configured to measure the incoming current. Check test-points VMB, IMB and VMC, IMC for similar waveforms. **See Figure 10.1**				

Figure 10.1 Open Loop Test Mode operation at 10% speed with an unloaded motor.



(AC motor voltage and motor current at test-points VMA and IMA are shown.)

11.0 DRIVE TEST IN OPEN LOOP VECTOR CONTROL MODE FOR UNLOADED MOTOR APPLICATION

11.1 At this point the VFD is ready for actual (induction) motor operation. The following steps verify operation of the Drive and the load induction motor in open loop vector control mode.

Description	Initial
Re-energize the AC or DC control power, if de-energized.	
Change the Drive control loop type (2050) to open loop vector control.	

Description			Value
Setup the speed ramp parameters according to the following recommendations: The acceleration and deceleration rate for a fan should be set to around 60 seconds and for a pump around 30 seconds. "Drive/Speed Ramp Setup"	Accel time 1	(2270)	45 Sec
	Decel time 1	(2280)	45 Sec
Verify that fast (cell) by-pass is DISABLED at this time if you have that option	Fast by-pass	(2600)	NA Sec

11.2 Verify that the following parameters are set correctly – default values are shown.

***Note: Auto-Tuning modifies the italicized menu items*.**

****Note*: Param_List= Please see Completed Parameter List asbuilt attached**

Description				Value
Setup the following motor parameters according to the nameplate values. "Motor/Motor Parameter"	Motor frequency	(1020)	HZ	50
	Full load speed	(1030)	RPM	593
	Motor Rated Voltage	(1040)	V	6600
	Full load current	(1050)	A	217
Use default values for the other motor parameters as shown below. For this test set the stator resistance to 0.1%.	Leakage inductance	(1070)	16.0%	24.4
	Stator resistance	(1080)	0.1%	0.78%
	No load current	(1060)	25.0%	34%
	Inertia	(1090)	30.0 KgM²	389.1
Setup the motor overload and torque limits. Set the motor trip volts to be equal to 120% of the motor rated voltage or to the value required by the customer. Set the over-speed parameter to be 120% or to the value required by the customer. "Motor/Limits"	Overload select	(1130)	Inv. Time with Speed Derate	Inv Time w Sp
	I overload pending	(1139)	105.0%	**Param_List**
	I overload	(1140)	110.0%	**Param_List**
	Overload timeout	(1150)	5 Sec	**Param_List**
	Max. Motor Inertia	(1159)	0.0 KgM^2	**Param_List**
	Motor trip volts	(1160)	4800 V	**Param_List**
	Over-speed	(1170)	120%	**Param_List**
	Motor torque limit 1	(1190)	100.0%	**Param_List**
	Regen torque limit 1	(1200)	-0.25%	**Param_List**

Description				Value
Verify that these control loop gains are at their default values.	Flux reg prop gain	(3110)	1.72	**Param_List**
	Flux reg integral gain	(3120)	1.00	**Param_List**
	Flux filter time const	(3130)	0.0667 Sec	**Param_List**
	Flux demand	(3150)	1.0	**Param_List**
	Flux ramp rate	(3160)	0.5 Sec	**Param_List**
	Energy saver min flux	(3170)	100%	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Speed Loop"	Speed reg prop gain	(3210)	0.02	**Param_List**
	Speed reg integral gain	(3220)	0.046	**Param_List**
	Speed reg Kf gain	(3230)	0.60	**Param_List**
	Speed filter time const	(3240)	0.0488 Sec	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Current Loop"	**Current reg prop gain*	(3260)	0.50	**Param_List**
	**Current reg integral gain*	(3270)	25	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing/Braking"	Enable braking	(3360)	Off	**Param_List**
	Pulsation frequency	(3370)	275 Hz	**Param_List**
Verify that these control loop gains are at their default values. "Stability/Output Processing"	Output current scaler	(3440)	1.000000	**Param_List**
	Output voltage scaler	(3450)	1.000000	**Param_List**
Verify that these control loop gains are at their default values. "Stability"	Dead time comp	(3550)	16.0 µSec	**Param_List**
	Feed forward constant	(3560)	0.0000	**Param_List**
	Carrier frequency	(3580)	400.0 Hz	**Param_List**

Description		Initial
Verify the system operational program (SOP) and customer interface per Customer specification.		**RD**
Verify that the Customer has completed their entire interface testing at this time.		**RD**
Energize the medium voltage feed to the VFD. Push the fault reset button on the keypad to reset faults and push the button a second time to acknowledge any alarms.		**RD**
Configure the keypad to display Speed Demand, Motor Magnetizing Current, Motor Torque Current, and Motor Voltage.		**RD**
Operate the Drive with a speed demand of 10%. Observe the AC output voltage feedback and motor current for phase A on test-points VMA and IMA using an oscilloscope.	• If the motor is unloaded, then the current waveform should lead the voltage waveform by almost 90° (see Figure 11.1 - top frame) The hall effect current transducers introduce a negative sign since they are configured to measure the incoming current. • If the motor is loaded then the current waveform will lead the motor voltage by an angle small than 90° (see Figure 11.1 - bottom frame). • The motor voltage should be 10% of the motor rated voltage.	**RD**

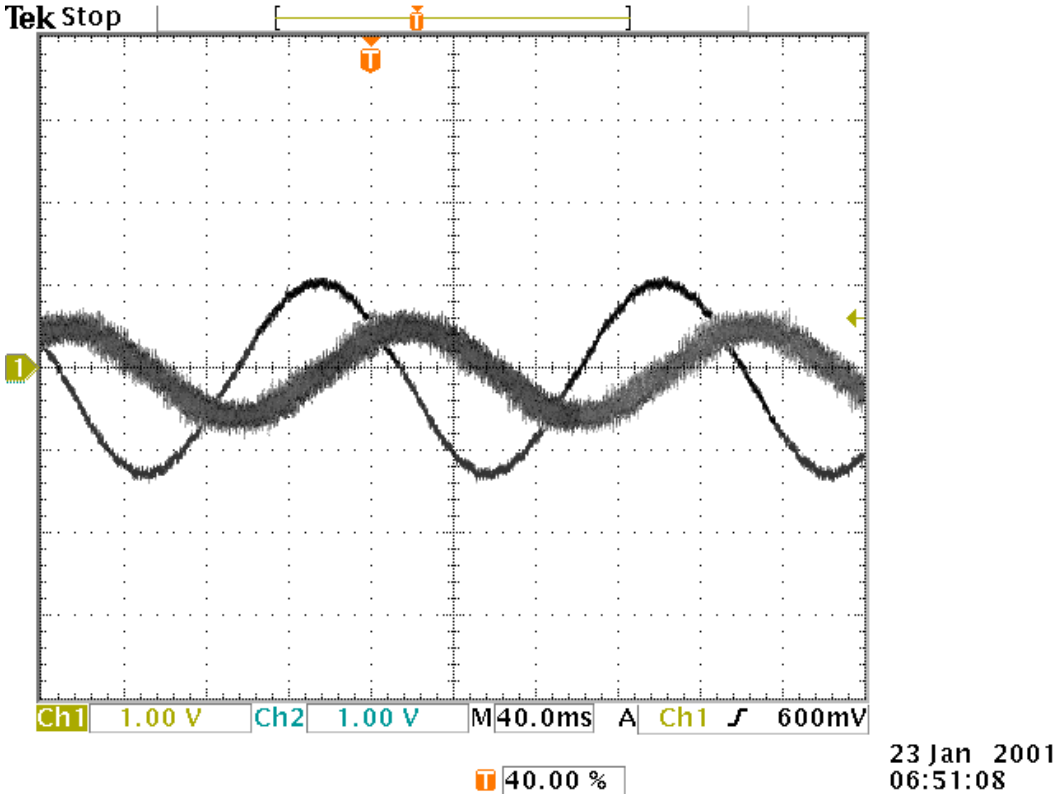
Description	Initial
Increase the speed demand while monitoring the motor voltage. The motor voltage should read according to the following table. See Figure 11.2 for waveforms at 100% spread (50Hz). Table 6 shows the Drive voltage scaling for signals on test-points VMA, VMB and VMC as a function speed. Table 7 lists the scaling for the currents and voltage feedback signals available on the signal conditioning board at the rated operating point of the Drive.	**RD**

Table 6: Scaling of Drive output voltage as a function of speed

Speed Command (%)	Motor Speed (Hz)	Motor Voltage Feedback, (V_{P-P}) NXG Sys Intrf Brd (NXGII Sys I/O Brd)	Motor Voltage Feedback, (V_{RMS}) NXG Sys Intrf Brd (NXGII Sys I/O Brd)
10	6	1.08 (0.54) V_{P-P}	0.38 (0.19) V_{RMS}
25	15	2.70 (1.35) V_{P-P}	0.96 (0.48) V_{RMS}
50	30	5.40 (2.70) V_{P-P}	1.91 (0.96) V_{RMS}
75	45	8.10 (4.05) V_{P-P}	2.87 (1.44) V_{RMS}
100	60	10.80 (5.40) V_{P-P}	3.82 (1.91) V_{RMS}

Table 7: Scaling of Drive input and output voltages and currents

Variable	Rated value at Drive terminals (RMS)	Feedback value under rated conditions (V_P) NXG Sys Interface Board or (NXGII Sys I/O Board)	Feedback value under rated conditions (V_{RMS}) NXG Sys Interface Board or (NXGII Sys I/O Board)
Input Current	Primary Current Rating of Input CT	5.0 (2.5) V_P	3.54 (1.77) V_{RMS}
Input Voltage	(Rated Input Voltage L-L) / 1.732	5.4 (2.7) V_P	3.82 (1.91) V_{RMS}
Output Current	Output Current Rating = Cell Rating	5.0 (2.5) V_P	3.54 (1.77) V_{RMS}
Output Voltage	(Rated Output Voltage L-L) / 1.732	5.4 (2.7) V_P	3.82 (1.91) V_{RMS}
Examples: Output Current Scaling: Cell current rating = 3.54 (1.77) V_{RMS} Output Voltage Scaling: [(Rated output voltage L-L) / 1.732] * 1.414 = 5.4 (2.7) V_P			



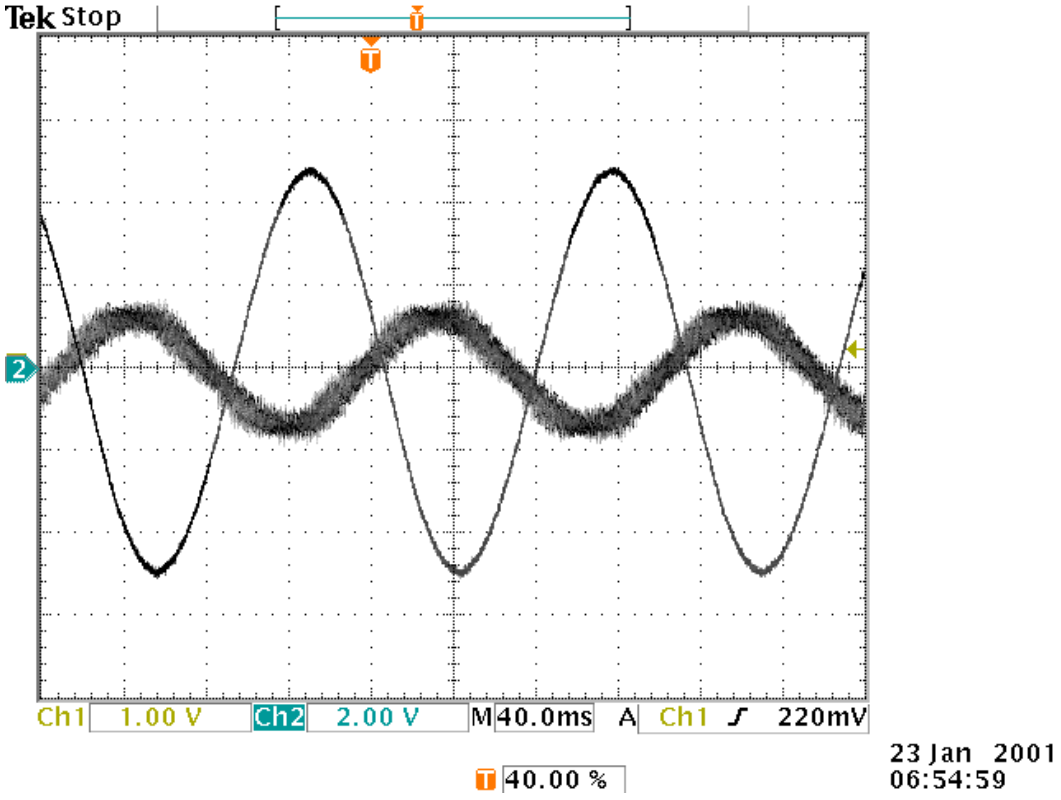


Figure 11.1 and 11.2
AC motor voltage and motor current at test-points VMA and IMA at 10% speed in Open Loop Vector Control
Top frame: Unloaded Operation

Bottom frame: Full Load Operation

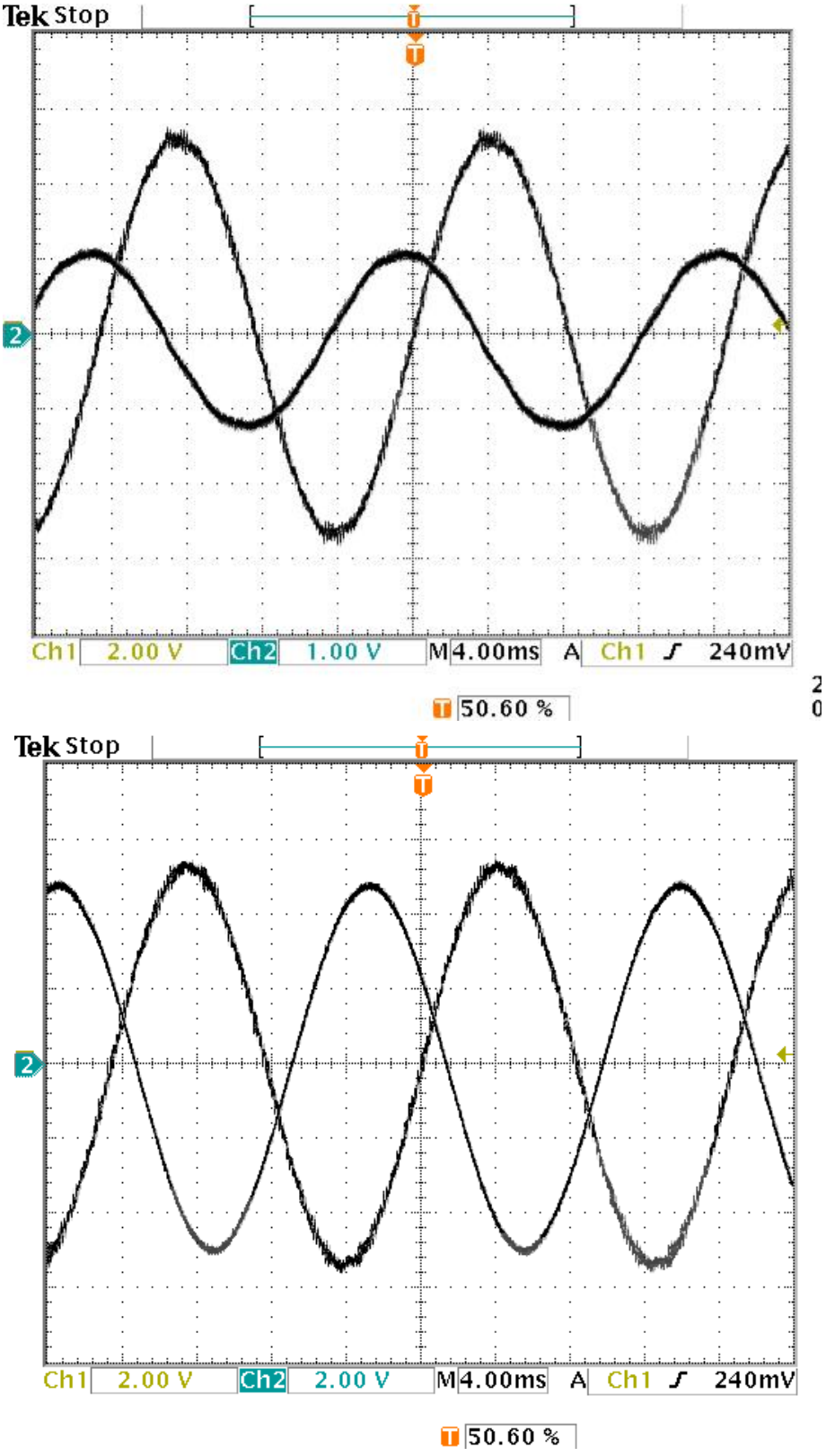


Figure 11.3 and 11.4
AC motor voltage and motor current at test-points VMA and IMA at 10% speed Open
Top frame: Unloaded Operation
Bottom frame: Full Load Operation Drive Test in Synchronous Motor Control Mode

12.0 TUNING

Note: Spinning Load is disabled with V/Hz and OLTM control. IT is automatically enabled if fast by-pass is enabled regardless of menu settings.

Note: Spinning Load should be enabled if one or more of the following operating modes/features are selected:

- **Fast By-Pass**
- **Auto-Restart (controlled through the auto reset parameters 7120-7150 and the SOP)**
- **Synchronous Motor Control (SMC and CSMC)**
- **Closed Loop Vector Control (CLVC)**

Description		Initial
Use the drive tool to monitor motor flux (FluxDS), motor speed, and speed reference.		**RD**
Step 1: To enable spinning load and make sure the following parameters are set to the values shown.		**RD**
Step 2: Spinning Load Menu (2420)		**RD**
	Spinning load mode (2430) forward or reverse, whichever is appropriate	**RD**
	Scan end threshold (%) (2440) 20%	**RD**
	Current level set point (%) (2450) 15% [or equal to the no-load current setting]	**RD**
	Current ramp(s) (2460) 0.01 s	**RD**
	Max current (%) (2470) 50%	**RD**
	Frequency scan rate(s) (2480) 3.0 s (scan time). Check NXG Control manual for this feature	**RD**
Step 3: Operate the Drive with a demand of 30%.		**RD**
Step 4: On the drive tool monitor, the speed reference and motor speed at the moment the Drive “catches” the motor.		**RD**
Repeat Steps 3-4 for different cells. Save the screen shots from tool suite noting which cell was by-passed.		**NA**

13.0 SYNCHRONOUS TRANSFER PROCEDURE (if applicable) N/A

13.1 This section of the startup procedure involves optional synchronous transfer checks. The Pefect Harmony may be configured for optional synchronous transfer operation, in which the Drive can be used to control multiple motors, one motor at a time. If such a configuration is not defined for the application, then this section may be skipped.

13.2 Use the following steps to setup the Drive control for Synchronous Transfer:

Description		Initial
Step 1: Configure Synchronous Transfer Menu parameters as shown below.		
	Synchronous Transfer (2700)	
	Phase I gain (2710) 2	

	Phase P gain (2720) 4	
	Phase offset (2730) 2 deg	
	Phase error threshold (2740) 1.5 deg	
	Frequency Offset (2750) 0.5%	
	Up Transfer Timeout (2760) 0 sec	
	Down Transfer Timeout (2770) 0 sec	
Step 2: Enable Spinning Load by setting Spinning Load Mode (2430) to forward.		
Step 3: Set the Speed Fwd Max limit 1 (2080) to at least 105%		

13.3 Go through the following checklist to complete the setup of Synchronous Transfer:

Description	Initial
Configure the Drive control as described from OLTM/CLVC	
Ensure that PLC-related hardware is properly connected (for information, see the respective PLC communications network manuals supplied by the vendor) to the analog I/O modules.	
Verify wiring of all VFD control and line control electrical contactors.	
Ensure that the system operating program for the “up transfer” and “down transfer” process logic is implemented.	
The state machines for up and down transfers reside in the Perfect Harmony’s control program. These interface with the control system integrator’s PLC network via the VFD system operating program to handle handshaking between each motor control center (MCC) and the VFD. All controls for the VFD and line reactors are controlled from the system integrator’s PLC. Verify that these controls are operational.	
Verify all communications flags. (debugger screen)	
For Synchronous Motor (SM) synchronous transfer, an external field controller source is required when the SM is connected to the line and the Drive is disabled. This alalog source and the source from the Drive must be switched via external logic and in a digital manner, 4-20ma current loops are used for analog sources (current loops cannot be switched via a relay). The final output from the PLC must be connected to the field excitor directly. Verify that there are two sources to the PLC (one of which may be internal), and that the PLC logic is set to switch between the two sources at the appropriate time. The PLC also controls the enable of the field exciter any time the motor is active.	

14.0 DRIVE TEST WITH SYNCHRONOUS MOTOR : N/A

14.1 Procedure to verify operation of Drive with synchronous motor in Synchronous Motor Control Mode.

Description	Initial
Connect the synchronous motor to the Drive. Enter motor parameters and use default gains except for the following parameters: 1. Enter Synch Motor Field no-load current as the No-load Current setting (1060). This parameter should be calculated (in %) on the basis of the actual no-load field current and the maximum capability of the field excitor. a) Example: Drive with a synchronous motor that requires 24A of no-load field current and a field supply that is tuned so that 75A is the maximum output (at 20mA command input), then the No-Load Current Parameter should be set to: No-Load Current Setting = 100% * 24/75A = 32.0% 2. Enable Spinning Load (2430) 3. Change the Drive control loop type (2050) to Synchronous Motor Control. 4. Use default control loop gains except for the flux loop gains that should be changed as follows: a) Flux reg prop gain (3110) 0.50 b) Flux reg integral gain (3120) 0.50 c) Flux Filter Time Const (3130) 0.022 sec d) Saliency (1091) .02 5. The SOP should have been modified to include the logic for controlling the field supply output contactor. The contactor should be ON as soon as the Start command to the Drive is given, and should be turned OFF immediately when the Drive trips on a Fault or when the Drive goes to Coast State (while stopping).	
Energize medium voltage Drive. Run the Drive with a speed demand of 10%.	
Verify that after Start command is given, the field supply first starts by applying current and building motor flux During this time, Ids and Iqs should be zero.	
After a time period equal to the Flux Ramp Rate parameter (3160), the Drive starts by increasing the Speed Reference to the Speed Demand.	
With Synchronous Motors, the Drive current is always in phase with the voltage, i.3e., Ids ≈ 0 under steady-state conditions. At no-load, there is very little current supplied from the Drive (on the keypad, motor current display, ITOT ≈ 0).	
Run the Drive to 10% speed. Verify that the no-load and full load (if possible) current waveforms, along with the Drive voltage waveforms, areas shown in Figure 14.1)	
Run the Drive to 100% speed. Verify that the no-load and full-load (if possible) current waveforms, along with the Drive voltage waveforms, are as shown in Figure 14.2. Note that the Drive output currents at 100% speeds are distorted. This is due to the shape of the poles in the synchronous motor. At low speeds, the current regulator bandwidth is sufficient to correct for the distortion introduced by the motor poles as shown in 14.2 b. However, at high speeds, the current regulator gains are insufficient to maintain sinusoidal output currents when the distortion is due to motor pole construction.	

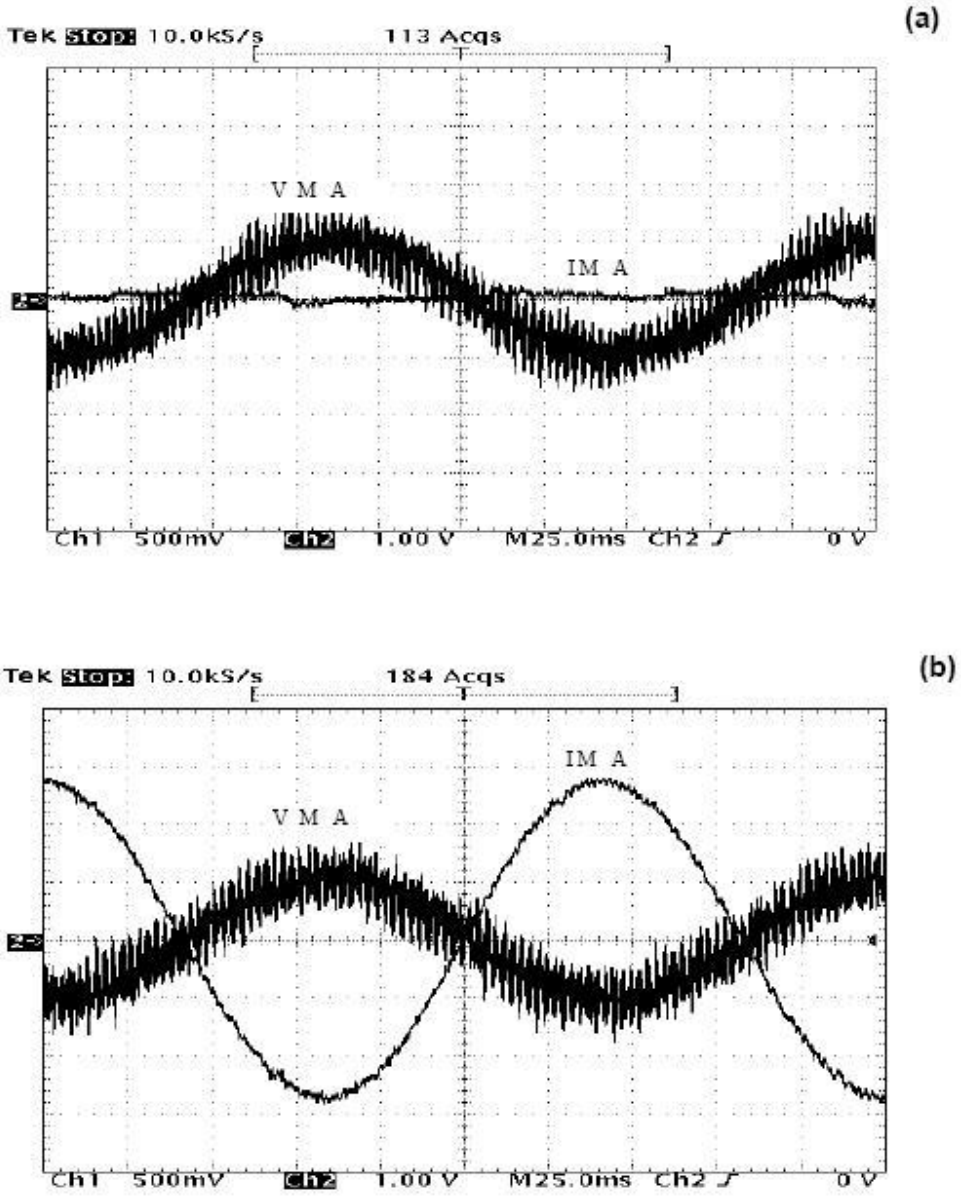


Figure 14.1

AC Motor Voltage and Motor Current at Test-points VMA and IMA at 10% speed with Synchronous Motor Control (a) Unloaded and (b) 75% torque operation.

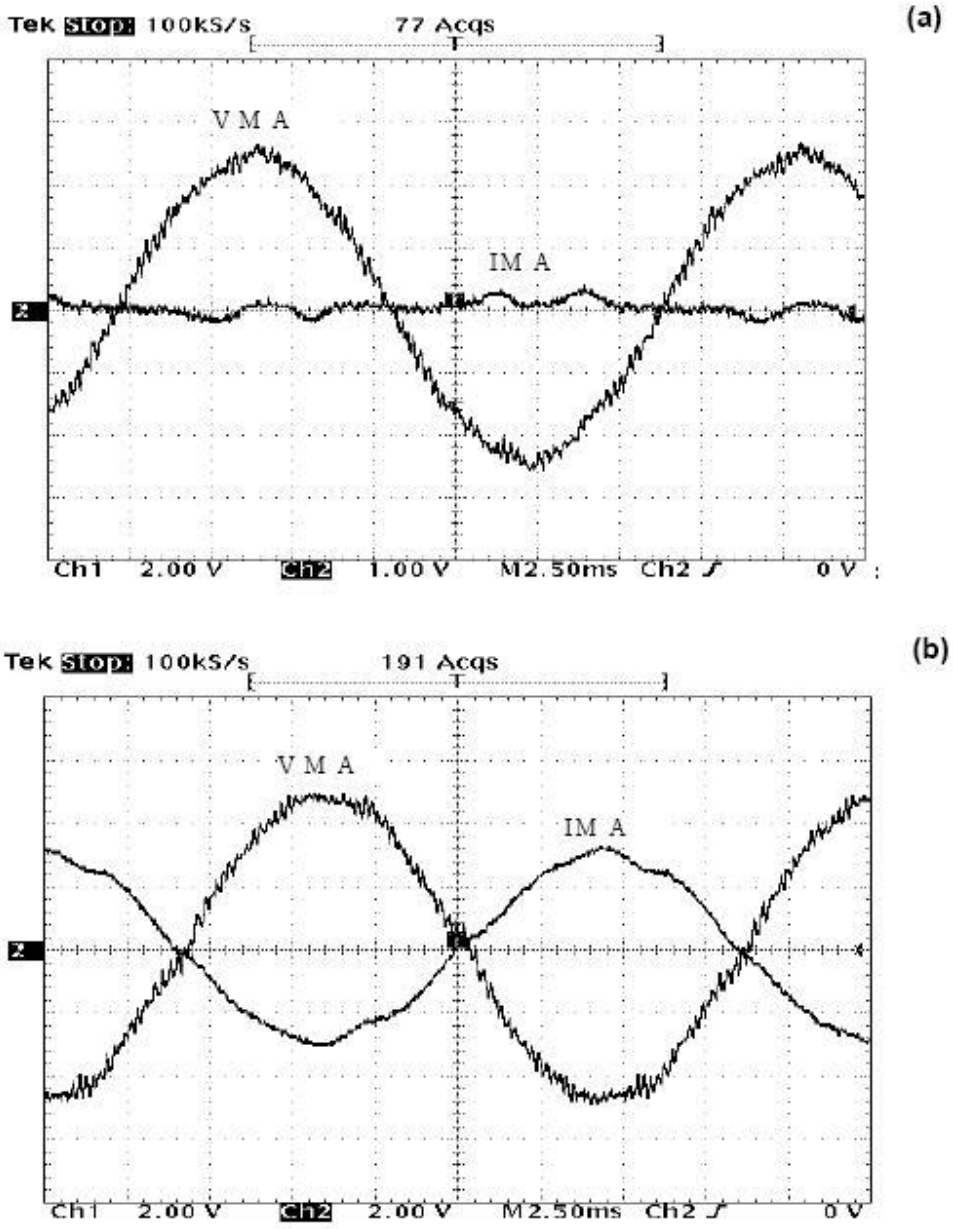


Figure 14.2

AC Motor and Motor Current at Test-point VMA and IMA at 100% speed with Synchronous Motor Control

(a) Unloaded and (b) 75% torque operation

15.0 ALARMS AND ADDRESSES See Param_List attached

Description		Initial
Verify the following parameters are set.		**RD**
Motor limits (1120) including phase imbalance limit (1244) and ground fault limit (1245)		**RD**
Speed profile menu (4000)		**RD**
Bypass type menu (2590) and fast bypass menu (2600)		**RD**
Critical frequency menu (2340)		**RD**
Drive protection menu (7)		**RD**
Display parameters menu (8000)		**RD**
The Drive is functional at this time.		**RD**
Verify alarm indications per the site confirm the input protection E-stop is working.		**RD**
Depress local E-Stop	VFD coast to stop	**RD**
Measure contact status on TB2-1 & 2	Open = E-stop	**RD**
Verify Fault contact on TB2-31 & 32 changes state	Closed = Fault	**RD**
Verify Run contact on TB2-23 & 24 changes state	Open = Not Running	**RD**
Remove Jumper on TB2-3 & 4	VFD coasts to stop	**RD**

The commissioning process is now complete.

The Customer's signature provides acceptance of the Siemens equipment listed on the site information page.

16.0 APPROVAL & ACCEPTANCE OF STARTUP & COMMISSIONING

16.1 Documentation Provided

16.1.1 Configure keypad to display desired parameters.

16.1.2 Upload the parameter (configuration) file, SOP file, event log file.

16.1.3 Provide Customer with the following:

16.1.3.1 Copy of parameter, SOP, event log file

16.1.3.2 Copy of operating flash drive

16.1.3.3 Copy of this checklist

I, the undersigned, validate that this system Commissioning has been completed as per this procedure. Any discrepancies have been noted alongside the appropriate steps in the document. Additionally, any outstanding items or recommendations have been noted on Form CCF-004 – Punch list for Witness Testing and/or Commissioning.

SIEMENS FSR

Print Name: Ruben Diaz

Signature:

Date: 24th September, 2013

CUSTOMER REPRESENTATIVE

Print Name: JOHN CLAYTON

Signature:

Date: 30/9/2013.

CUSTOMER REPRESENTATIVE

Print Name: EDDIE [illegible]

Signature:

Date: 4/11/2013.

Description	ID	Lvl RH
Main - Sec. level: 7	5	0 0 0
Motor	1	0 0 0
Motor parameter	1000	0 0 0
Motor frequency = 50.0 Hz	*1020	5 1 0
Full load speed = 593 rpm	*1030	5 1 0
Motor voltage = 6600 V	*1040	5 1 0
Full load current = 217.0 A	*1050	5 1 0
No load current = 34.0 %	*1060	5 0 0
Motor kW Rating = 2000.0 kW	*1010	5 1 0
Leakage inductance = 24.4 %	*1070	5 0 0
Stator resistance = 0.78 %	*1080	5 0 0
Inertia = 389.1 Kgm2	*1090	5 0 0
Current Profile	1092	0 0 0
Motor current limit 1 = 100 %	1193	7 0 0
Speed at current lim 1 = 100 %	1194	7 0 0
Motor current limit 2 = 100 %	1195	7 0 0
Speed at current lim 2 = 100 %	1196	7 0 0
Motor current limit 3 = 100 %	1197	7 0 0
Speed at current lim 3 = 100 %	1198	7 0 0
Motor current limit 4 = 100 %	1202	7 0 0
Speed at current lim 4 = 100 %	1203	7 0 0
Motor current limit 5 = 100 %	1204	7 0 0
Speed at current lim 5 = 100 %	1205	7 0 0
Motor current limit 6 = 100 %	1206	7 0 0
Speed at current lim 6 = 100 %	1207	7 0 0
Motor current limit 7 = 100 %	1208	7 0 0
Speed at current lim 7 = 100 %	1209	7 0 0
Motor current limit 8 = 100 %	1301	7 0 0
Speed at current lim 8 = 100 %	1302	7 0 0
Motor current limit 9 = 100 %	1303	7 0 0
Speed at current lim 9 = 100 %	1304	7 0 0
Limits	1120	5 0 0
Overload select = Inv Time w/ derate	1130	5 0 0
Overload Pending = 100.0 %	*1139	5 0 0
Overload = 110.0 %	1140	5 0 0
Overload timeout = 5.0 sec	1150	5 0 0
Speed Derate Curve	1151	5 0 0
0 Percent Break Point = 0.0 %	1152	5 0 0
10 Percent Break Point = 31.6 %	1153	5 0 0
17 Percent Break Point = 41.2 %	1154	5 0 0
25 Percent Break Point = 50.0 %	1155	5 0 0
50 Percent Break Point = 70.7 %	1156	5 0 0
100 Percent Break Point = 100.0 %	1157	5 0 0
Motor trip volts = 8300 V	*1160	5 0 0
Maximum Motor Inertia = 0.0 Kgm2	1159	5 1 0
Overspeed = 120.0 %	1170	5 0 0
Underload enable = Disable	1180	5 0 0
I underload = 10.0 %	1182	5 0 0
Under load timeout = 10.0 sec	1186	5 0 0
Motor torque limit 1 = 100.0 %	1190	5 0 0
Regen torque limit 1 = -0.25 %	1200	5 0 0
Motor torque limit 2 = 100.0 %	1210	7 0 0
Regen torque limit 2 = -0.25 %	1220	7 0 0

Description		ID	Lvl RH
	Motor torque limit 3 = 100.0 %	1230	7 0 0
	Regen torque limit 3 = -0.25 %	1240	7 0 0
	Phase Imbalance Limit = 40.0 %	1244	5 0 0
	Ground Fault Limit = 5.0 %	1245	5 0 0
	Ground Fault Time Const = 0.017 sec	1246	5 0 0
	H/W Ground Fault Enable = Yes	1247	7 1 0
	Peak Reduction Enable = VFD volt rating	1248	7 0 0
	Loss of field level = 40.0 %	1141	7 0 0
	Loss of field timeout = 10.0 sec	1142	7 0 0
Encoder		1280	0 0 0
	Encoder 1 PPR = 1024	*1290	5 1 0
	Encoder filter gain = 0.7500	1300	7 0 0
	Encoder loss threshold = 5.0 %	1310	7 0 0
	Encoder loss response = stop (fault)	1320	7 0 0
	Low speed operation = Disable	1330	7 0 0
Drive		2	0 0 0
Drive parameters		2000	0 0 0
	Rated input voltage = 6600 V	*2010	7 1 0
	Rated input current = 214.0 A	*2020	7 1 0
	Rated output voltage = 6600 V	*2030	7 1 0
	Rated output current = 260.0 A	*2040	7 1 0
	Control loop type = OLVC	2050	7 1 0
	Parallel system = Disable	2051	0 0 0
Speed setup		2060	0 0 0
	Ratio control = 100.0 %	2070	5 0 0
	Speed fwd max limit 1 = 100.0 %	2080	5 0 0
	Speed fwd min limit 1 = 1.0 %	*2090	5 0 0
	Speed fwd max limit 2 = 0.0 %	*2100	7 0 0
	Speed fwd min limit 2 = 0.0 %	2110	7 0 0
	Speed fwd max limit 3 = 0.0 %	*2120	7 0 0
	Speed fwd min limit 3 = 0.0 %	2130	7 0 0
	Speed rev max limit 1 = 0.0 %	*2140	5 0 0
	Speed rev min limit 1 = 0.0 %	2150	5 0 0
	Speed rev max limit 2 = 0.0 %	*2160	7 0 0
	Speed rev min limit 2 = 0.0 %	2170	7 0 0
	Speed rev max limit 3 = 0.0 %	*2180	7 0 0
	Speed rev min limit 3 = 0.0 %	2190	7 0 0
	Zero speed = 0.0 %	2200	5 0 0
Torque reference		2210	0 0 0
	Sop / Menu control = Sop flag	2211	5 0 0
	Torque setpoint = 0.0 %	2220	0 0 0
	Holding torque = 0.0 %	2230	0 0 0
	Torque ramp increase = 1.00 sec	2240	0 0 0
	Torque ramp decrease = 1.00 sec	2250	0 0 0
	Torque command scalar = 1.00	2242	5 0 0
Speed ramp setup		2260	0 0 0
	Accel time 1 = 45.0 sec	*2270	5 0 0
	Decel time 1 = 45.0 sec	*2280	5 0 0
	Accel time 2 = 5.0 sec	2290	7 0 0
	Decel time 2 = 5.0 sec	2300	7 0 0

Description	ID	Lvl	RH
Accel time 3 = 5.0 sec	2310	7	0 0
Decel time 3 = 5.0 sec	2320	7	0 0
Jerk rate = 0.1	2330	7	1 0
Critical freq	2340	5	0 0
Skip center freq 1 = 15.0 Hz	2350	5	0 0
Skip center freq 2 = 30.0 Hz	2360	5	0 0
Skip center freq 3 = 45.0 Hz	2370	5	0 0
Skip bandwidth 1 = 0.0 Hz	2380	5	0 0
Skip bandwidth 2 = 0.0 Hz	2390	5	0 0
Skip bandwidth 3 = 0.0 Hz	2400	5	0 0
Spinning load	2420	0	0 0
Spinning load mode = Both	*2430	5	0 0
Scan end threshold = 20.0 %	2440	5	0 0
Current Level SetPoint = 15.0 %	2450	5	0 0
Current ramp = 0.01 sec	2460	5	0 0
Max current = 50.0 %	2470	5	0 0
Frequency scan rate = 3.00 sec	2480	5	0 0
Cond time setup	2490	0	0 0
Cond stop timer = 0.8 sec	2500	5	0 0
Cond run timer = 0.8 sec	2510	5	0 0
Cells	2520	0	0 0
Installed cells/phase = 6	*2530	5	1 0
Min cell count (n/3) = 6	*2540	5	1 0
Cell voltage = 630	2550	5	1 0
Thermistor warn level = 20.0 %	2560	5	1 0
Bypass type = None	*2590	7	1 0
Neutral connection = T1	*2630	7	1 0
Precharge Enable = Off	2635	7	1 0
Sync transfer	2700	7	0 0
Phase I gain = 2.0	2710	7	0 0
Phase P gain = 4.0	2720	7	0 0
Phase offset = 2.00 deg	2730	7	0 0
Phase error threshold = 1.50 deg	2740	7	0 0
Frequency offset = 0.5 %	2750	7	0 0
Up transfer timeout = 0.0 sec	2760	7	0 0
Down transfer timeout = 0.0 sec	2770	7	0 0
External I/O	2800	5	0 0
Analog inputs = 0	2810	5	1 0
Analog outputs = 2	*2820	5	1 0
Digital inputs = 0	2830	5	1 0
Digital outputs = 0	2840	5	1 0
Wago timeout = 0.0 sec	*2850	5	1 0
Internal I/O	2805	5	0 0
Int Analog In1	2815	5	0 0
Hardware Span = 1.0640	*2818	5	1 0
Int Analog In2	2825	5	0 0
Type = 4 - 20ma	2826	5	1 0

Description	ID	Lvl	RH
Hardware Span = 1.0860	*2828	5	0 0
Int Analog In3	2835	5	0 0
Type = 4 - 20ma	2836	5	1 0
Hardware Span = 1.0730	*2838	5	0 0
Int Analog Out1	2845	5	0 0
Analog variable = Total Current	2846	5	0 0
Output Mode = 4-20 mA	2848	5	0 0
Output Min = 0.0 %	2841	5	0 0
Output Max = 150.0 %	*2842	5	0 0
Hardware Span = 1.0000	2844	5	0 0
Int Analog Out2	2855	5	0 0
Analog variable = Motor Speed	*2856	5	0 0
Output Mode = 4-20 mA	2858	5	0 0
Output Min = 0.0 %	2851	5	0 0
Output Max = 100.0 %	2852	5	0 0
Hardware Span = 1.0253	*2854	5	0 0
Int Test Point #28	2860	5	0 0
Analog variable = None	2861	5	0 0
TP 28 Scaler = 0.00	2862	5	0 0
Int Test Point #29	2865	5	0 0
Analog variable = None	2866	5	0 0
TP 29 Scaler = 0.00	2867	5	0 0
Int Test Point #31	2870	5	0 0
Analog variable = None	2871	5	0 0
TP 31 Scaler = 0.00	2872	5	0 0
Int Test Point #24	2875	5	0 0
Analog variable = None	2876	5	0 0
TP 24 Scaler = 0.00	2877	5	0 0
Int Test Point #25	2880	5	0 0
Analog variable = None	2881	5	0 0
TP 25 Scaler = 0.00	2882	5	0 0
Int Test Point #26	2885	5	0 0
Analog variable = None	2886	5	0 0
TP 26 Scaler = 0.00	2887	5	0 0
Output Connection	2900	0	0 0
Filter CT sec turns = 0	2910	5	1 0
Filter inductance = 0.0 %	2920	5	0 0
Filter capacitance = 0.0 %	2930	5	0 0
Cable resistance = 0.0 %	2940	5	0 0
Cable inductance = 0.0 %	2941	5	0 0
Filter damping gain = 0.50	2950	5	0 0
High starting Torque	2960	7	0 0
Enable high torque = Disable	2961	7	1 0
Torque current = 50.0 %	2962	5	0 0

Description	ID	Lvl RH
Current ramp time = 0.5 sec	2963	5 0 0
PLL Acq time = 2.0 sec	2964	5 0 0
Watchdog	2970	7 0 0
Enable watchdog = Enable	2971	7 0 0
Stability	3	0 0 0
Input processing	3000	7 0 0
PLL prop gain = 70.0	3010	7 0 0
PLL integral gain = 3840.00	3020	7 0 0
Input current scaler = 1.000000	3030	7 1 0
CT secondary turns = 250	*3035	7 1 0
Input voltage scaler = 1.000000	3040	7 1 0
PT secondary turns = 1	3011	7 1 0
Input Attenuator Sum = 4800 kOhm	*3045	7 1 0
Output processing	3050	7 0 0
Low freq comp	3060	7 0 0
Low Freq Wo = 12.566 Rad	3070	7 1 0
Low freq com gain = 1.00	3080	7 0 0
S/W compensator pole = 2.000	3090	7 0 0
Flux control	3100	7 0 0
Flux reg prop gain = 2.544	*3110	7 0 0
Flux reg integral gain = 3.271	*3120	7 0 0
Flux filter time const = 0.06461	*3130	7 0 0
Flux demand = 1.00	3150	7 0 0
Flux ramp rate = 0.500 sec	3160	7 0 0
Energy saver min flux = 100.0 %	3170	7 0 0
Flux droop = 0.0 %	3195	7 0 0
Speed loop	3200	7 0 0
Speed reg prop gain = 0.010	*3210	7 0 0
Speed reg integral gain = 0.020	*3220	7 0 0
Speed reg Kf gain = 0.600	3230	7 0 0
Speed filter time const = 0.08038	*3240	7 0 0
Droop in % @ FL current = 0.0 %	3245	7 0 0
Current loop	3250	7 0 0
Current reg prop gain = 0.741	*3260	7 0 0
Current reg integ gain = 18.600	*3270	7 0 0
Prop gain during brake = 0.148	*3280	7 0 0
Integ gain during brake = 3.720	*3290	7 0 0
Stator resis est	3300	7 0 0
Stator resistance est = Off	3310	7 1 0
Stator resis filter gain = 0.0	3320	7 0 0
Stator resis integ gain = 0.00200	3330	7 0 0
Braking	3350	7 0 0
Enable braking = Off	3360	7 0 0
Pulsation frequency = 277.5 Hz	*3370	7 0 0
Brake power loss = 0.3 %	3390	7 0 0
VD Loss Max = 0.250	3400	7 0 0
Braking constant = 1.05	3410	7 0 0

Description	ID	Lvl RH
Output current scaler = 1.000000	3440	7 0 0
Output voltage scaler = 1.000000	3450	7 0 0
Output Attenuator Sum = 4800 kOhm	*3455	7 1 0
Control loop test	3460	7 0 0
Test type = Speed	3470	7 0 0
Test positive = 30.0 %	3480	7 0 0
Test negative = -30.0 %	3490	7 0 0
Test time = 30.1 sec	3500	7 0 0
Dead time comp = 16.0000 usec	3550	7 1 0
Feed forward constant = 0.0000	3560	7 1 0
Sampling Delay Comp = 0.0 %	3570	7 0 0
Carrier frequency = 601.3 Hz	*3580	7 1 0
Auto	4	5 0 0
Speed profile	4000	5 0 0
Entry point = 0.0 %	4010	5 0 0
Exit point = 100.0 %	*4020	5 0 0
Entry speed = 48.0 %	*4030	5 0 0
Exit speed = 98.3 %	*4040	5 0 0
Auto off = 0.0 %	4050	5 0 0
Delay off = 0.5 sec	4060	5 0 0
Auto on = 0.0 %	4070	5 0 0
Delay on = 0.5 sec	4080	5 0 0
Analog inputs	4090	5 0 0
Analog input #1	4100	5 0 0
Source = Int AI1	*4105	5 1 0
Type = 4 - 20ma	4110	5 1 0
Min input = 0.0 %	4120	5 1 0
Max input = 100.0 %	4130	5 1 0
Loss point threshold = 15.0 %	4140	5 1 0
Loss of signal action = Preset	4150	5 1 0
Loss of signal setpoint = 20.0 %	4160	5 0 0
Analog input #2	4170	5 0 0
Source = Off	4175	5 0 0
Type = 4 - 20ma	4180	5 1 0
Min input = 0.0 %	4190	5 1 0
Max input = 100.0 %	4200	5 1 0
Loss point threshold = 15.0 %	4210	5 1 0
Loss of signal action = Preset	4220	5 1 0
Loss of signal setpoint = 20.0 %	4230	5 0 0
Analog input #3	4232	5 0 0
Source = Off	4233	5 1 0
Type = 4 - 20ma	4234	5 1 0
Min input = 0.0 %	4235	5 1 0
Max input = 100.0 %	4236	5 1 0
Loss point threshold = 15.0 %	4237	5 1 0
Loss of signal action = Preset	4238	5 1 0
Loss of signal setpoint = 20.0 %	4239	5 0 0
Analog input #4	4332	5 0 0

Description	ID	Lvl RH
Source = Off	4333	5 1 0
Type = 4 - 20ma	4334	5 1 0
Min input = 0.0 %	4335	5 1 0
Max input = 100.0 %	4336	5 1 0
Loss point threshold = 15.0 %	4337	5 1 0
Loss of signal action = Preset	4338	5 1 0
Loss of signal setpoint = 20.0 %	4339	5 0 0
Analog input #5	4341	5 0 0
Source = Off	4342	5 1 0
Type = 4 - 20ma	4343	5 1 0
Min input = 0.0 %	4344	5 1 0
Max input = 100.0 %	4345	5 1 0
Loss point threshold = 15.0 %	4346	5 1 0
Loss of signal action = Preset	4347	5 1 0
Loss of signal setpoint = 20.0 %	4348	5 0 0
Auxillary input #1	4500	5 0 0
Source = Off	4510	5 1 0
Type = 4 - 20ma	4520	5 1 0
Min input = 0.0 %	4530	5 1 0
Max input = 100.0 %	4540	5 1 0
Loss point threshold = 15.0 %	4550	5 1 0
Loss of signal action = Preset	4560	5 1 0
Loss of signal setpoint = 20.0 %	4570	5 0 0
Auxillary input #2	4580	5 0 0
Source = Off	4590	5 1 0
Type = 4 - 20ma	4600	5 1 0
Min input = 0.0 %	4610	5 1 0
Max input = 100.0 %	4620	5 1 0
Loss point threshold = 15.0 %	4630	5 1 0
Loss of signal action = Preset	4640	5 1 0
Loss of signal setpoint = 20.0 %	4650	5 0 0
Analog outputs	4660	5 0 0
Analog output #1	4661	5 0 0
Analog variable = Average Power	*4662	5 0 0
Output module type = Unip	4663	5 0 0
Full range = 81.0 %	*4664	5 0 0
Analog output #2	4665	5 0 0
Analog variable = Motor Speed	*4666	5 0 0
Output module type = Unip	4667	5 0 0
Full range = 100.0 %	*4668	5 0 0
Speed setpoints	4240	5 0 0
Speed setpoint 1 = 0 rpm	4250	5 0 0
Speed setpoint 2 = 0 rpm	4260	5 0 0
Speed setpoint 3 = 0 rpm	4270	5 0 0
Speed setpoint 4 = 0 rpm	4280	5 0 0
Speed setpoint 5 = 0 rpm	4290	5 0 0
Speed setpoint 6 = 0 rpm	4300	5 0 0
Speed setpoint 7 = 0 rpm	4310	5 0 0
Speed setpoint 8 = 0 rpm	4320	5 0 0

Description	ID	Lvl	RH
Jog speed = 0 rpm	4330	5	0 0
Safety setpoint = 0 rpm	4340	5	0 0
Incremental speed setup	4970	7	0 0
Speed increment 1 = 1.00 %	4971	7	0 0
Speed decrement 1 = 1.00 %	4972	7	0 0
Speed increment 2 = 5.00 %	4973	7	0 0
Speed decrement 2 = 5.00 %	4974	7	0 0
Speed increment 3 = 10.00 %	4975	7	0 0
Speed decrement 3 = 10.00 %	4976	7	0 0
PID select	4350	5	0 0
Prop gain = 0.390	4360	5	0 0
Integral gain = 0.390	4370	5	0 0
Diff gain = 0.000	4380	5	0 0
Min clamp = 0.0 %	4390	5	0 0
Max clamp = 100.0 %	4400	5	0 0
Setpoint = 0.0 %	4410	5	0 0
Comparator setup	4800	5	0 0
Comparator 1 setup	4810	5	0 0
Comp 1 A in variable = Mtr Spd	*4811	5	1 0
Comp 1 B in variable = Manual value	4812	5	1 0
Comp 1 manual value = 2.500 %	*4813	5	0 0
Compare 1 type = Mag	*4815	5	1 0
Comparator 2 setup	4820	5	0 0
Comp 2 A in variable = Manual value	4821	5	1 0
Comp 2 B in variable = Manual value	4822	5	1 0
Comp 2 manual value = 0.000 %	4823	5	0 0
Compare 2 type = Off	4825	5	1 0
Comparator 3 setup	4830	5	0 0
Comp 3 A in variable = Manual value	4831	5	1 0
Comp 3 B in variable = Manual value	4832	5	1 0
Comp 3 manual value = 0.000 %	4833	5	0 0
Compare 3 type = Off	4835	5	1 0
Comparator 4 setup	4840	5	0 0
Comp 4 A in variable = Manual value	4841	5	1 0
Comp 4 B in variable = Manual value	4842	5	1 0
Comp 4 manual value = 0.000 %	4843	5	0 0
Compare 4 type = Off	4845	5	1 0
Comparator 5 setup	4850	5	0 0
Comp 5 A in variable = Manual value	4851	5	1 0
Comp 5 B in variable = Manual value	4852	5	1 0
Comp 5 manual value = 0.000 %	4853	5	0 0
Compare 5 type = Off	4855	5	1 0
Comparator 6 setup	4860	5	0 0
Comp 6 A in variable = Manual value	4861	5	1 0
Comp 6 B in variable = Manual value	4862	5	1 0
Comp 6 manual value = 0.000 %	4863	5	0 0
Compare 6 type = Off	4865	5	1 0

Description	ID	Lvl	RH
Comparator 7 setup	4870	5	0 0
Comp 7 A in variable = Manual value	4871	5	1 0
Comp 7 B in variable = Manual value	4872	5	1 0
Comp 7 manual value = 0.000 %	4873	5	0 0
Compare 7 type = Off	4875	5	1 0
Comparator 8 setup	4880	5	0 0
Comp 8 A in variable = Manual value	4881	5	1 0
Comp 8 B in variable = Manual value	4882	5	1 0
Comp 8 manual value = 0.000 %	4883	5	0 0
Compare 8 type = Off	4885	5	1 0
Comparator 9 setup	4890	5	0 0
Comp 9 A in variable = Manual value	4891	5	1 0
Comp 9 B in variable = Manual value	4892	5	1 0
Comp 9 manual value = 0.000 %	4893	5	0 0
Compare 9 type = Off	4895	5	1 0
Comparator 10 setup	4900	5	0 0
Comp 10 A in variable = Manual value	4901	5	1 0
Comp 10 B in variable = Manual value	4902	5	1 0
Comp 10 manual value = 0.000 %	4903	5	0 0
Compare 10 type = Off	4905	5	1 0
Comparator 11 setup	4910	5	0 0
Comp 11 A in variable = Manual value	4911	5	1 0
Comp 11 B in variable = Manual value	4912	5	1 0
Comp 11 manual value = 0.000 %	4913	5	0 0
Compare 11 type = Off	4915	5	1 0
Comparator 12 setup	4920	5	0 0
Comp 12 A in variable = Manual value	4921	5	1 0
Comp 12 B in variable = Manual value	4922	5	1 0
Comp 12 manual value = 0.000 %	4923	5	0 0
Compare 12 type = Off	4925	5	1 0
Comparator 13 setup	4930	5	0 0
Comp 13 A in variable = Manual value	4931	5	1 0
Comp 13 B in variable = Manual value	4932	5	1 0
Comp 13 manual value = 0.000 %	4933	5	0 0
Compare 13 type = Off	4935	5	1 0
Comparator 14 setup	4940	5	0 0
Comp 14 A in variable = Manual value	4941	5	1 0
Comp 14 B in variable = Manual value	4942	5	1 0
Comp 14 manual value = 0.000 %	4943	5	0 0
Compare 14 type = Off	4945	5	1 0
Comparator 15 setup	4950	5	0 0
Comp 15 A in variable = Manual value	4951	5	1 0
Comp 15 B in variable = Manual value	4952	5	1 0
Comp 15 manual value = 0.000 %	4953	5	0 0
Compare 15 type = Off	4955	5	1 0
Comparator 16 setup	4960	5	0 0

Description	ID	Lvl	RH
Comp 16 A in variable = Manual value	4961	5	1 0
Comp 16 B in variable = Manual value	4962	5	1 0
Comp 16 manual value = 0.000 %	4963	5	0 0
Compare 16 type = Off	4965	5	1 0
Comparator 17 setup	4411	5	0 0
Comp 17 A in variable = Manual value	4412	5	1 0
Comp 17 B in variable = Manual value	4413	5	1 0
Comp 17 manual value = 0.000 %	4414	5	0 0
Compare 17 type = Off	4416	5	1 0
Comparator 18 setup	4417	5	0 0
Comp 18 A in variable = Manual value	4418	5	1 0
Comp 18 B in variable = Manual value	4419	5	1 0
Comp 18 manual value = 0.000 %	4420	5	0 0
Compare 18 type = Off	4422	5	1 0
Comparator 19 setup	4423	5	0 0
Comp 19 A in variable = Manual value	4424	5	1 0
Comp 19 B in variable = Manual value	4425	5	1 0
Comp 19 manual value = 0.000 %	4426	5	0 0
Compare 19 type = Off	4428	5	1 0
Comparator 20 setup	4429	5	0 0
Comp 20 A in variable = Manual value	4430	5	1 0
Comp 20 B in variable = Manual value	4431	5	1 0
Comp 20 manual value = 0.000 %	4432	5	0 0
Compare 20 type = Off	4434	5	1 0
Comparator 21 setup	4435	5	0 0
Comp 21 A in variable = Manual value	4436	5	1 0
Comp 21 B in variable = Manual value	4437	5	1 0
Comp 21 manual value = 0.000 %	4438	5	0 0
Compare 21 type = Off	4440	5	1 0
Comparator 22 setup	4441	5	0 0
Comp 22 A in variable = Manual value	4442	5	1 0
Comp 22 B in variable = Manual value	4443	5	1 0
Comp 22 manual value = 0.000 %	4444	5	0 0
Compare 22 type = Off	4446	5	1 0
Comparator 23 setup	4447	5	0 0
Comp 23 A in variable = Manual value	4448	5	1 0
Comp 23 B in variable = Manual value	4449	5	1 0
Comp 23 manual value = 0.000 %	4450	5	0 0
Compare 23 type = Off	4452	5	1 0
Comparator 24 setup	4453	5	0 0
Comp 24 A in variable = Manual value	4454	5	1 0
Comp 24 B in variable = Manual value	4455	5	1 0
Comp 24 manual value = 0.000 %	4456	5	0 0
Compare 24 type = Off	4458	5	1 0
Comparator 25 setup	4459	5	0 0
Comp 25 A in variable = Manual value	4460	5	1 0

Description	ID	Lvl	RH
Comp 25 B in variable = Manual value	4461	5	1 0
Comp 25 manual value = 0.000 %	4462	5	0 0
Compare 25 type = Off	4464	5	1 0
Comparator 26 setup	4465	5	0 0
Comp 26 A in variable = Manual value	4466	5	1 0
Comp 26 B in variable = Manual value	4467	5	1 0
Comp 26 manual value = 0.000 %	4468	5	0 0
Compare 26 type = Off	4470	5	1 0
Comparator 27 setup	4471	5	0 0
Comp 27 A in variable = Manual value	4472	5	1 0
Comp 27 B in variable = Manual value	4473	5	1 0
Comp 27 manual value = 0.000 %	4474	5	0 0
Compare 27 type = Off	4476	5	1 0
Comparator 28 setup	4477	5	0 0
Comp 28 A in variable = Manual value	4478	5	1 0
Comp 28 B in variable = Manual value	4479	5	1 0
Comp 28 manual value = 0.000 %	4480	5	0 0
Compare 28 type = Off	4482	5	1 0
Comparator 29 setup	4483	5	0 0
Comp 29 A in variable = Manual value	4484	5	1 0
Comp 29 B in variable = Manual value	4485	5	1 0
Comp 29 manual value = 0.000 %	4486	5	0 0
Compare 29 type = Off	4488	5	1 0
Comparator 30 setup	4489	5	0 0
Comp 30 A in variable = Manual value	4490	5	1 0
Comp 30 B in variable = Manual value	4491	5	1 0
Comp 30 manual value = 0.000 %	4492	5	0 0
Compare 30 type = Off	4494	5	1 0
Comparator 31 setup	4496	5	0 0
Comp 31 A in variable = Manual value	4497	5	1 0
Comp 31 B in variable = Manual value	4498	5	1 0
Comp 31 manual value = 0.000 %	4499	5	0 0
Compare 31 type = Off	4501	5	1 0
Comparator 32 setup	4502	5	0 0
Comp 32 A in variable = Manual value	4503	5	1 0
Comp 32 B in variable = Manual value	4504	5	1 0
Comp 32 manual value = 0.000 %	4505	5	0 0
Compare 32 type = Off	4507	5	1 0
Logs	6	0	0 0
Historic log	6250	0	0 0
Store in Event Log = On	6255	7	0 0
Historic log variable 1 = Mtr Speed	*6260	5	0 0
Historic log variable 2 = Spd Dmd	6270	5	0 0
Historic log variable 3 = Trq I Cmd	*6280	5	0 0
Historic log variable 4 = Trq I Fdbk	*6290	5	0 0
Historic log variable 5 = I Total Out	*6300	5	0 0
Historic log variable 6 = V Avail	*6310	5	0 0

Description	ID	Lvl	RH
Historic log variable 7 = V Avail RMS	*6320	5	0 0
Drive protect	7	0	0 0
Input protection	7000	0	0 0
Single phasing	7010	0	0 0
SPD prop gain = 0.0	7020	7	0 0
SPD integral gain = 0.0010	7030	7	0 0
SPD threshold = 50.0 %	7040	7	0 0
Undervoltage prop gain = 0.0	7060	7	0 0
Undervoltage integ gain = 0.001	7070	7	0 0
1 Cyc Protect integ gain = 0.0025	7080	7	0 0
1 Cycle Protect Limit = 50.0 %	7081	7	0 0
Excess Loss Idle = 5.0 %	7084	7	0 0
Excess Loss Running = 7.0 %	7086	7	0 0
Xformer tap setting = +5 %	*7050	7	1 0
Xformer thermal gain = 0.0133	7090	7	0 0
Xformer protection const = 0.500	7100	7	0 0
Phase Imbalance Limit = 40.0 %	7105	7	0 0
Ground Fault Limit = 40.0 %	7106	7	0 0
Ground Fault Time Const = 0.200 sec	7107	7	0 0
Drive IOC setpoint = 150.0 %	7110	7	0 0
Cell Overload Level = 100.0 %	7112	7	0 0
Auto reset enable = No	7120	7	0 0
Auto reset time = 1 sec	7130	5	0 0
Auto reset attempts = 4	7140	5	0 0
Auto reset memory time = 10 sec	7150	5	0 0
Meter	8	0	0 0
Display params	8000	0	0 0
Status variable 1 = DEMD	8001	0	0 0
Status variable 2 = RPM	8002	0	0 0
Status variable 3 = ITOT	*8003	0	0 0
Status variable 4 = KWO	*8004	0	0 0
Status variable 5 = IMRF	8005	0	0 0
Status variable 6 = IMRF	8006	0	0 0
Status variable 7 = IMRF	8007	0	0 0
Input harmonics	8140	0	0 0
Selection for HA = IA	8150	0	0 0
Harmonics order = 1.0	8160	0	0 0
Harmonics integral gain = 0.001	8170	0	0 0
Customer order = 2133943	*8101	0	0 0
Customer drive = 1	8110	0	0 0
Communications	9	0	0 0
Serial port setup	9010	0	0 0
Serial port use = Local	9020	5	1 0
Flow Control = Xon/Xoff	9030	5	1 0
Baud rate = 9600	9040	5	1 0
Network Control	9943	7	0 0
Net Control Type = Sop	9944	7	1 0

Description	ID	Lvl	RH
Start Stop Control = Maintained	9945	7	1 0
Network 1 Configure	9900	7	0 0
Network 1 Type = None	9901	7	1 0
Network 2 Configure	9914	7	0 0
Network 2 Type = None	9915	7	0 0
SOP & serial functions	9110	0	0 0
Menu based Timer setup	9111	7	0 0
MenuTimer1 = 30.0 sec	*9112	7	0 0
MenuTimer2 = 0.0 sec	9113	7	0 0
MenuTimer3 = 0.0 sec	9114	7	0 0
MenuTimer4 = 10.0 sec	*9115	7	0 0
MenuTimer5 = 0.0 sec	9116	7	0 0
MenuTimer6 = 0.0 sec	9117	7	0 0
MenuTimer7 = 0.0 sec	9118	7	0 0
MenuTimer8 = 0.0 sec	9119	7	0 0
MenuTimer9 = 0.0 sec	9121	7	0 0
MenuTimer10 = 0.0 sec	9122	7	0 0
MenuTimer11 = 0.0 sec	9123	7	0 0
MenuTimer12 = 0.0 sec	9124	7	0 0
MenuTimer13 = 0.0 sec	9125	7	0 0
MenuTimer14 = 0.0 sec	9126	7	0 0
MenuTimer15 = 0.0 sec	9127	7	0 0
MenuTimer16 = 0.0 sec	9128	7	0 0
Select system program = 2168985F.HEX	*9146	7	1 0
Multiple config files = OFF	9185	5	1 0
TCP/IP server name = 172.17.20.16	*9000	0	0 0
Graphing	10	0	0 0
Time scale = 10.00 sec	10000	0	0 0
Variable 1	10010	0	0 0
Graph variable = Spd ref	10020	0	0 0
Offset = 0.00	10030	0	0 0
Scale factor = 1.20	10040	0	0 0
Variable 2	10050	0	0 0
Graph variable = Mtr speed	10060	0	0 0
Offset = 0.00	10070	0	0 0
Scale factor = 1.20	10080	0	0 0
Variable 3	10090	0	0 0
Graph variable = Flux ref	10100	0	0 0
Offset = 0.00	10110	0	0 0
Scale factor = 1.25	10120	0	0 0
Variable 4	10130	0	0 0
Graph variable = Flux DS	10140	0	0 0
Offset = 0.00	10150	0	0 0
Scale factor = 1.25	10160	0	0 0
Variable 5	10170	0	0 0

Description	ID	Lvl	RH
Graph variable = Ids ref	10180	0	0 0
Offset = 0.00	10190	0	0 0
Scale factor = 1.00	10200	0	0 0
Variable 6	10210	0	0 0
Graph variable = Ids	10220	0	0 0
Offset = 0.00	10230	0	0 0
Scale factor = 1.00	10240	0	0 0
Variable 7	10250	0	0 0
Graph variable = Iqs ref	10260	0	0 0
Offset = 0.00	10270	0	0 0
Scale factor = 1.00	10280	0	0 0
Variable 8	10290	0	0 0
Graph variable = Iqs	10300	0	0 0
Offset = 0.00	10310	0	0 0
Scale factor = 1.00	10320	0	0 0
Variable 9	10330	0	0 0
Graph variable = Drv State	10340	0	0 0
Offset = 0.00	10350	0	0 0
Scale factor = 1.00	10360	0	0 0
Variable 10	10370	0	0 0
Graph variable = PreChrg St	10380	0	0 0
Offset = 0.00	10390	0	0 0
Scale factor = 1.00	10400	0	0 0
Select language = English	5081	0	0 0

3) 0110-SR13 Variable Speed Drive System

E. Ventilation System Data

Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

FAN DATA FOR MODEL AP0804GP6/20

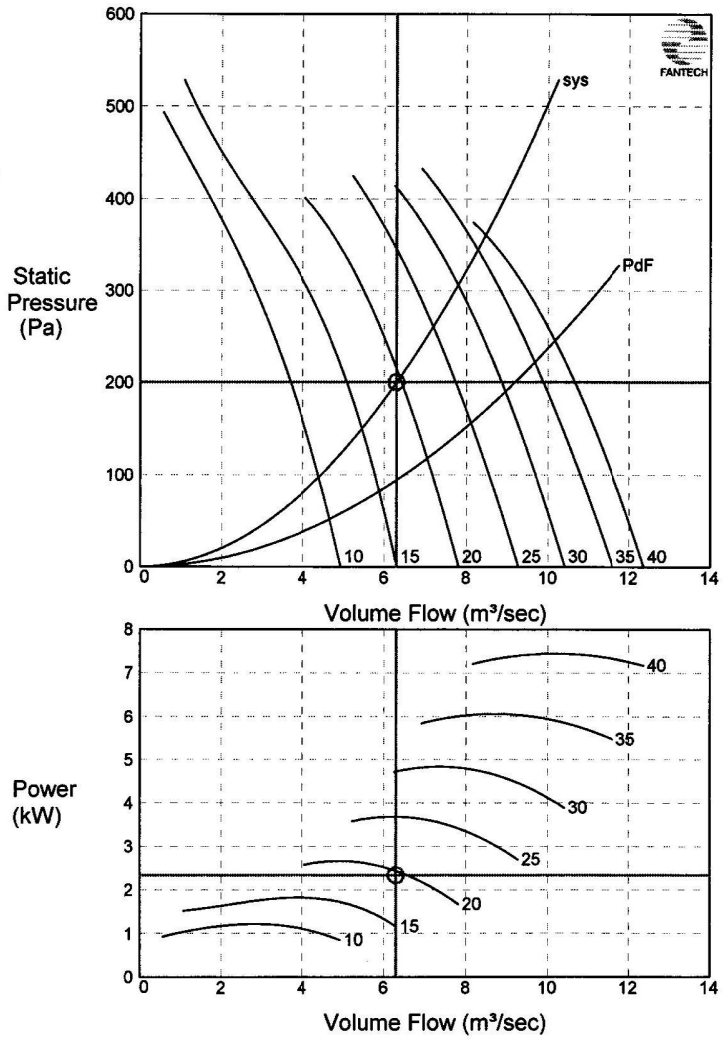
Fan Code: **AP0804GP6/20**

Requirements

Volume:	6300 L/s
Static Pressure:	200 Pa
Selection Pressure:	200 Pa at std conditions
Installation Category:	TYPE D
Temperature:	20 deg C
Altitude:	0 m

Fan Data (at STP)

Type:	In-line direct drive axial fan
Diameter:	800
Hub:	255 mm
Impeller Blades:	6
Pitch:	20 degrees
Blade Material:	GRP
Speed:	24 revs/sec
Absorbed Power:	2.34 kW
Peak Power:	2.59 kW
Total Efficiency:	79 %
Fan Weight:	84.3 kg.



Motor Data (at STP)

Motor Type:	Standard
Electrical Supply:	415V/3ph/50Hz
Motor Frame/Power:	D100L / 3.00 kW
Current FLC/Start:	6.2A / 37.2
Motor Speed:	Single Speed (4 Pole)

Energy Efficiency, BCA Volume 1 2008, Table J5.2 compliant selection

Density: 1.2 kg/m³

Inlet PWL

Spectrum (Hz)	63	125	250	500	1K	2K	4K	8K	dBW	dBA @ 3m
Outlet PWL (dB)	92	86	86	84	85	81	77	73	95	68
Inlet PWL (dB)	90	86	87	85	85	81	78	73	94	69

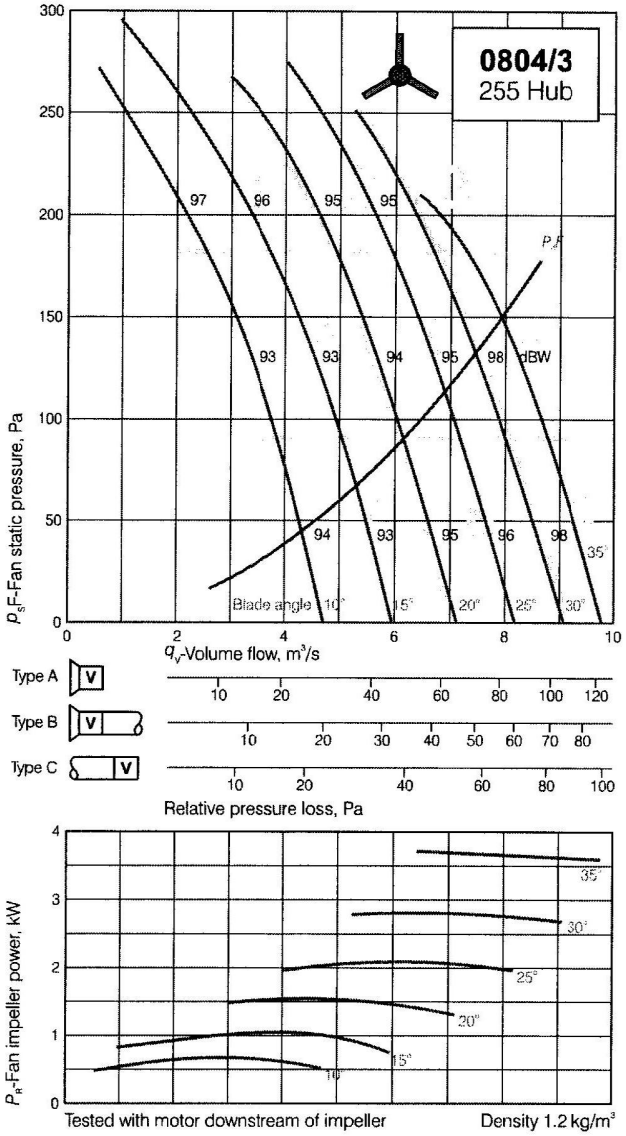
Note: Levels are quoted as in-duct values.

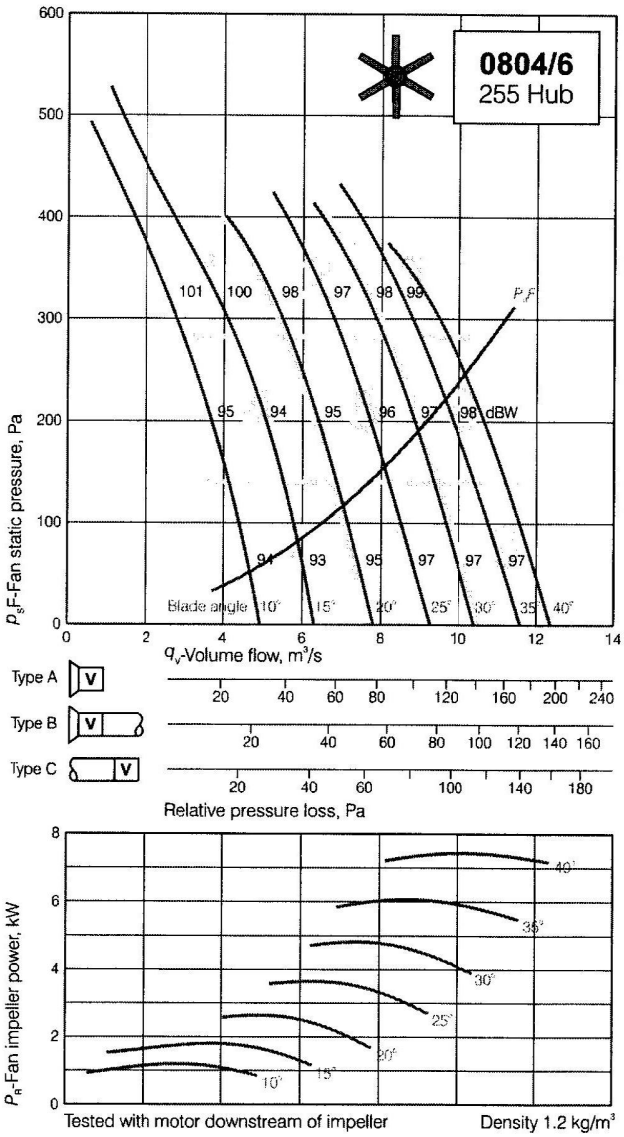
Version 4.20: On-going product improvements may result in fan data changes without notice.

Size **800**
24 rev/sec

AXIAL FLOW FANS PERFORMANCE DATA

BS848:Part 1, 1980
Part 2 1985
Type D Installation





SOUND DATA

Zone	In-Duct dB	Total	In-Duct Spectrum Corrections, dB 63	125	250	500	1k	2k	4k	8k	dB(A)
	Inlet	1	6	10	8	6	8	13	18	24	4
	Outlet	0	4	11	10	7	10	15	19	24	6
	Inlet	+1	2	9	12	11	12	16	19	22	8
	Outlet	0	2	8	10	12	12	16	18	20	8
	Inlet		Not Required								
	Outlet										
	Inlet	1	3	10	11	10	11	13	16	22	6
	Outlet	0	1	10	13	12	13	15	18	22	8
	Inlet	0	2	9	11	9	10	15	18	23	6
	Outlet	0	3	9	10	10	12	15	18	21	7
	Inlet	+1	3	9	12	10	12	16	19	22	7
	Outlet	0	3	9	11	10	11	15	17	19	7
	Inlet	1	2	10	11	10	10	13	15	21	6
	Outlet	0	2	11	12	12	12	14	17	22	7
	Inlet	0	2	9	11	10	12	15	19	24	7
	Outlet	0	3	9	11	11	12	16	19	23	8
	Inlet	+2	2	9	13	11	12	17	20	23	8
	Outlet	0	2	8	11	10	11	15	18	19	7

For Free Field conditions apply the following corrections to the In-Duct figures.
All figures are negative unless otherwise stated.

	In/Out	O/A	7	3	1	0	0	0	0	0	O/A

SOUND DATA

Zone	In-Duct dB	Total	In-Duct Spectrum Corrections, dB 63	125	250	500	1k	2k	4k	8k	dB(A)
	Inlet	1	9	9	6	4	8	14	20	26	3
	Outlet	0	6	9	7	7	10	16	21	27	6
	Inlet	0	4	9	8	9	10	13	17	22	6
	Outlet	0	4	8	8	10	10	14	16	21	6
	Inlet	0	4	9	9	8	10	13	17	21	5
	Outlet	0	3	9	9	9	10	13	16	19	5
	Inlet	0	6	11	8	9	8	11	14	20	4
	Outlet	0	4	10	8	9	9	12	15	20	5
	Inlet	1	4	8	7	9	9	13	16	21	5
	Outlet	0	3	9	9	11	10	14	18	22	6
	Inlet	+1	3	9	9	10	11	15	18	22	7
	Outlet	0	3	8	8	9	11	14	17	19	6
	Inlet	+1	5	9	7	8	8	11	13	20	4
	Outlet	0	5	9	7	8	8	11	13	19	4
	Inlet	1	4	8	8	9	9	13	16	21	5
	Outlet	0	4	9	8	11	11	14	18	22	7
	Inlet	0	9	7	9	6	8	12	16	20	4
	Outlet	0	8	6	9	8	9	12	15	18	4

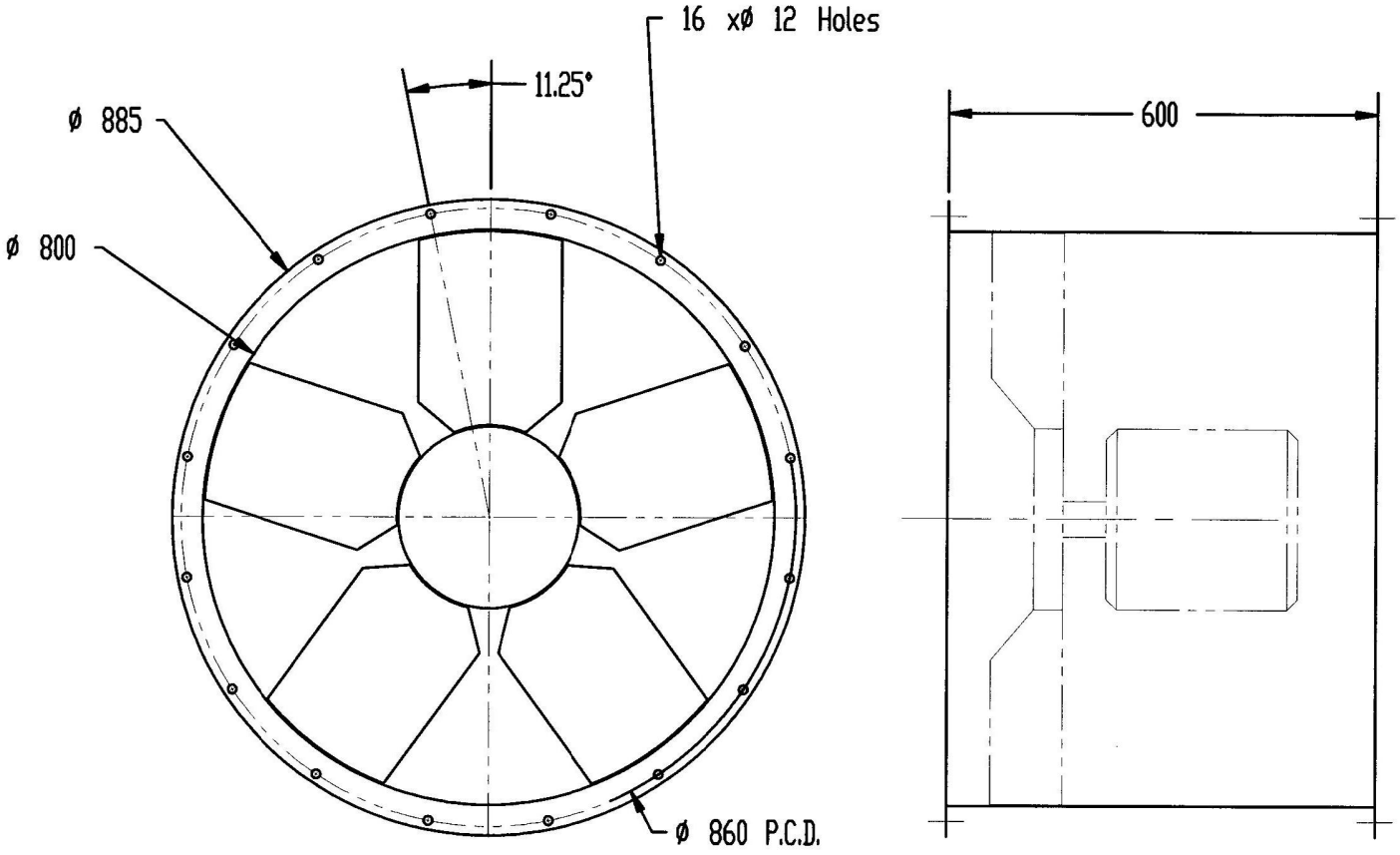
For Free Field conditions apply the following corrections to the In-Duct figures.
All figures are negative unless otherwise stated.

	In/Out	O/A	7	3	1	0	0	0	0	0	O/A

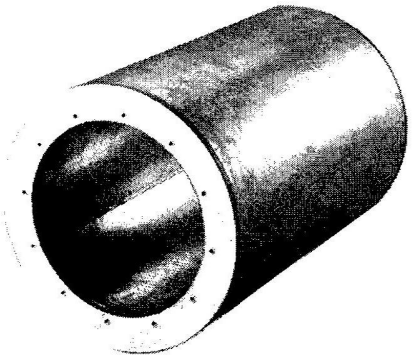
Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

DRAWING FOR MODEL AP0804GP6/20

Version 4.20: On-going product improvements may result in dimensional changes without notice.



CIRCULAR DUCT ATTENUATORS



FEATURES

These notes apply to both the open and pod type attenuators.

Construction

The units are rigidly constructed and consist of an outer cylindrical galvanised steel casing, lined internally with non-hygroscopic and incombustible sound-absorbent material. This material is retained by an inner perforated metal cylinder.

When a pod is fitted it is of perforated metal, retaining an infill of acoustic material.

An impervious lining of the acoustic infill can be provided to prevent the ingress of moisture or grease. There is a small performance penalty in high frequencies when an impervious lining is fitted. Refer to our Sales Engineers if more information is required.

Also available is the Q-Seal range which offers impervious lining with features to optimise acoustic performance.

The ends of the attenuators are drilled and tapped to match the Fantech 'AP' series of axial flow fans.

Non-standard flange drillings or sizes can be supplied to the customer's specifications.

Insertion Loss

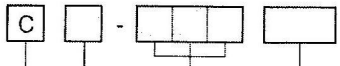
The values quoted in the table represent the difference between the sound power level (L_W) of a fan and attenuator combination and that of the fan alone.

(continued next page)

PERFORMANCE DATA - OPEN TYPE

Matching Fan Dia. cm	Length mm	Static Insertion Loss, dB Octave Band Centre Frequency (Hz) 63	125	250	500	1k	2k	4k	8k
C1-Dia. 1 Diameter Long (nom.)									
-031	300	1	3	5	9	13	10	8	7
-035	300	2	3	5	9	13	10	8	7
-040	600	2	3	5	9	13	10	8	7
-045	600	2	3	5	10	13	10	8	7
-050	600	2	3	6	10	14	10	8	7
-056	600	2	4	6	10	14	10	8	7
-063	600	3	4	7	13	14	9	8	6
-071	900	3	4	8	14	14	9	7	6
-080	900	3	4	8	14	13	9	7	6
-090	1150	3	4	9	14	13	8	7	6
-100	1150	3	4	9	14	12	8	7	6
-125	1150	3	4	10	14	12	8	6	6
-140	1150	3	5	10	13	11	8	5	5
-160	1800	4	6	11	13	10	7	5	5
-180	1800	4	6	11	13	10	6	5	5
-200	1800	4	6	11	13	9	6	5	5
C2-Dia. 2 Diameters Long (nom.)									
-031	600	3	6	9	15	21	17	14	13
-035	600	4	6	10	15	21	17	14	13
-040	900	4	6	10	16	21	18	15	13
-045	900	4	7	10	17	21	18	15	13
-050	1150	4	7	10	18	21	17	15	12
-056	1150	5	7	11	18	21	17	15	12
-063	1150	5	8	11	21	23	17	15	10
-071	1500	5	8	12	22	23	16	15	10
-080	1500	5	8	12	22	23	16	15	10
-090	1800	5	8	13	22	19	13	12	10
-100	1800	6	8	13	22	19	13	12	10
-125	2400	6	8	13	21	18	13	12	11
-140	2400	7	9	15	21	18	11	11	10
-160	3600	8	9	15	20	17	11	9	8
-180	3600	8	9	15	20	17	10	9	8
-200	3600	8	9	15	20	17	10	9	8

HOW TO ORDER - OPEN TYPE



C - circular
1 - 1D long nominal
2 - 2D long nominal
Diameter in cm
Variations to standard
QS - Q-Seal Impervious lining (refer page *H-4/5*)
A - aluminium construction
S - stainless steel construction
E - epoxy coating
(Default is standard construction)

Represented by:
Air Design Pty. Ltd.
A.B.N. 77 512 727 190
45 Nestor Drive
Meadowbrook QLD 4131
Telephone: +61 (07) 3299 9888
Facsimile: +61 (07) 3299 9800
E-mail: sales@airdesign.com.au

Technical Data for Silencer Model C1-080

Location: ATT-2

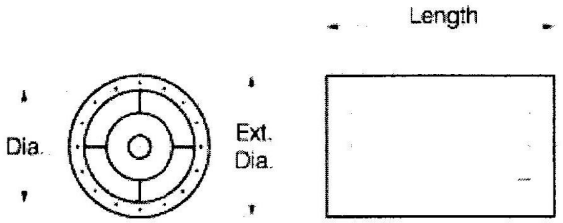
Designation:

Performance - Required

Air Flow:	6.30 m³/s	Velocity :	12.5 m/s
Pressure Drop:	60 Pa	Pressure Drop:	2 Pa

Silencer Data

Catalogue Code:	C1-080
Description:	Circular 1D Open
Diameter:	800 mm
Ext. Diameter:	977mm
Length:	900 mm
Weight:	55.0 kg



Sound Data

Spectrum (Hz) :	63	125	250	500	1K	2K	4K	8K
Insertion Loss (dB) :	3	4	8	14	13	9	7	6

3) 0110-SR13 Variable Speed Drive System

F. Ventilation System Airflow and Sound Levels report

Air Equipment (Sales) Pty Ltd

david@airequip.com.au ABN 67 650 093 954

2 / 36 Randall Street Slacks Creek 4127 **Phone: (07) 3209 4201**
PO Box 542 Springwood Qld 4127 **Facsimile: (07) 3209 4204**

Monday 18th November 2013

J. & P. Richardson Industries Pty Ltd
114 Campbell Street
Wacol QLD

Attention: Chris Anderson
Reference: **Urban Utilities Eagle Farm Pump Station-VSD Drive Cabinet 0110-SR13 Verification of Airflow and Sound level Measurements**

Required Airflow: Transformer Cabinet: 3000l/s
Cell Cabinet: 3200l/s
Total: 6200l/s

Equipment Used:
NATA Certified Vane Anemometer – Certificate No: WT109572
NATA Certified Lutron Sound Level Meter – Certificate No: SLM 39486
Magnehelic Gauge- Fitted to duct work

Initial airflow readings were taken at the filtered intake grilles on the transformer and cell cabinets with the booster fan VSD set at 50Hz. The VSD was adjusted back to 39Hz and readings taken at all points as follows

Transformer Cabinet Intakes:	No 1: 585l/s	No 2: 550l/s	No 3: 500l/s
	No 4: 520l/s	No 5: 450l/s	No 6: 415l/s
	Total: 3020l/s		
Cell Cabinet Intakes:	No 1: 590l/s	No 2: 550l/s	No 3: 550l/s
	No 4: 570l/s	No 5: 560l/s	No 6: 550l/s
	Total: 3370l/s		

The magnehelic gauge was fitted to the duct prior to the booster fan. The gauge is to indicate the correct airflow only and at the required airflow reading the gauge was marked at 75Pa

Sound Level Measurements:

Outdoor readings were taken at the boundary directly down for the fan outlet and 1 meter from the outlet face.
The background noise level was 75-83dBA due to the high traffic movement on the main road. On the odd occasion when there was no vehicle's directly outside the building we registered a reading of 63dBA at the boundary and 69 dBA 1 meter from the face

Indoor readings were taken with the other two drive units turned off but with the pit pumping motors running. Background noise levels around the pit barrier cage were between 76-81dBA

Readings one meter out from the cabinet were between 70-72.7dBA but this was mainly from background noise

A reading from the side of the cabinet below the booster fan was 68dBA

Hoping the above report is satisfactory and if you have any queries on the information above please do not hesitate to call

Yours faithfully,
Air Equipment (Sales) Pty Ltd.

David Meredith.

3) 0110-SR13 Variable Speed Drive System

G. Spare Part List

SIEMENS

Perfect Harmony VSD Recommended Spare Parts List

VFD SO:	3002133943	VFD SN:	Z831501002462

Location	Part Description	Part Number	Installed	Recommended
Control cabinet	CPU Board	A1A10000623.00M	1	1
	I/O board	A1A10000423.00M	1	1
	Modulator Board	A1A10000350.00M	1	1
	Fiber Optic Hub Board	A1A461D85.00M	1	1
	Backplane	A1A098194	1	1
	Communication Board	A5E03407403	1	1
	CPS Power	A1A0100275	1	1
	Signal Conditioninig Board	A5E01708486	1	1
	Keypad	A5E02363383	1	1
	I/O breakout	A5E01649374	1	1
Blower	Cabinet Blower	LDZ10501601	4	1
Doors	Filter on Transformer Cabinet	LDZ10501351	9	9
	Filter on Cell Cabinet	LDZ10501353	9	9
Cell cabinet	Power cell	LDZ14501002.260	15	1
	CCB Fuse	A1A10000432.30M	15	2
	Power Cell Input Fuse	LDZ10501435	45	3

3) 0110-SR13 Variable Speed Drive System

H. Drawing List

SIEMENS

Perfect Harmony VSD - 0110-SR13

Drawing Register

Drawing Number	Description
	VSD
486/5/7-0368-027	General Arrangement 1
486/5/7-0368-028	General Arrangement 2
486/5/7-0368-029	General Arrangement 3
486/5/7-0368-030	Control and Power Overview
486/5/7-0368-031	Termination
486/5/7-0368-033	Schematic 1
486/5/7-0368-034	Schematic 2
486/5/7-0368-035	Schematic 3
486/5/7-0368-036	Schematic 4
486/5/7-0368-037	Schematic 5
486/5/7-0368-038	Schematic 6
486/5/7-0368-039	Schematic 7
	Field Control and Interface
486/5/7-0368-140	Schematic 1
486/5/7-0368-141	Schematic 2
486/5/7-0368-142	Schematic 3
486/5/7-0368-143	Schematic 4
486/5/7-0368-144	Schematic 5
	Isolator and Earthswitch Cabinet
486/5/7-0368-106	General Arrangement and Schematic
486/5/7-0368-107	Fortress Interlocking System
486/5/7-0368-108	Legend
	Ventilation
486/5/7-0368-112	General Arrangement

3) 0110-SR13 Variable Speed Drive System

I. Factory Acceptance Test (FAT)

SIEMENS
Electrical Drives (Shanghai) Ltd.

GEN III

Factory Acceptance Test

Medium Voltage

Air Cooled

SO - 3002133943
Queensland urban utilities - eagle farm

FAT- A5E32168984 A
REV- AA

P/N- M6SR3
S/N- Z831501002462
MLFB- 6SR3502-6HF42-7BH0-Z

V12+Y06+K69+G22+G28+K73+M42+M38+
M12+M35+L55+L03+K50+T76+D15+D02+D
76+P31

Revision History		
Revision Level	Details	Date
AA	Original	5/15/2013
Tested By	杨海亮	2013.6.7
Approved By	陈晓峰	2013.6.7

SIEMENS

Customer Name Queensland urban utilities - eagle farm SO 3002133943

P/N M6SR3 S/N Z831501002462 SOP M6SR3 C

Agency Listing ☐ CSA ☐ UL ☐ CE ☐ Other ☑ No Listing

Agency Testing Required ☐ YES ☑ NO

Input Voltage:	6600 V	Output Voltage:	6600 V
Input Current:	214 A	Cell Size:	260 A
XFMR KVA:	2750 KVA	Total # of Cell:	18

Table of Contents

Definitions

R	Routine Test	Test to which each individual device is subjected during or after manufacturer to ascertain whether it complies with certain criteria.
A	Acceptance Test	Contractual test to prove to the customer that the device meets certain conditions of its specification.
O	Option Test	Test additional to type and routine test, determined to be any device or logic added to the drive that is not a pre-engineered option.
W	Witness Test	Any of the above tests performed in the presence of the customer, the user or his representative (Reference STSI-055)

Air Cooled Test Plan

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002462

1.1 Visual Inspection				STSI-061G:4.3
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R		Hardware Check		Emp# 149
	Metering	Pt. To Pt. Wire Check		Emp# 172
		Fiber Optics		Emp# 172
		Ground Wires		Emp# 172
	Measuring	Burden Resistor Value (hall effect)	34.00 Ω,2W, .1%	34.1/34.2 Ω
	Measuring	Input attenuator resistor value	4.8 MΩ	4.77/4.76/4.77 MΩ
	Measuring	Output attenuator resistor value	4.8 MΩ	4.78/4.77/4.76 MΩ
		Set Dip Switch (FR)	Pos. 2 only is "On", all others "Off"	Emp# 149
		Set Dip Switch (P)	Pos. 4 & 5 only are "On", all others "Off"	Emp# 149
		Set Address 1X	1X=1	Emp# 149
		Set Address 10X	10X=0	Emp# 149
		Set Communication Board (JP1 to JP10)	JP1 & JP2 set to 2,3	Emp# 149
			JP3,JP4&JP5 set to1,2	Emp# 149
			JP6 set to 2,3	Emp# 149
			JP7,JP8,JP9&JP10 set to 1,2	Emp# 149
O	Interlocks	Record all Interlock model #'s and keycode #'s for the	K2 –VFD13 - K2	Emp# 149
		Verify correct operation of Interlocks	K3 –VFD13 - K3	Emp# 149
		Ensure hardware and adapter plates are supplied		Emp# 149

1.2 Insulation Test/Hipot					STSI-061G:4.4
Test Type	Test Item	Test Procedure	Applied Volt.	Test Criteria (Eng)	Signature/Value
R	MV			Pass/Fail(<0.5mA)	
		Power circuit to GND			Emp# 172
		L1,L2,L3 to GND	28300	38 uA	
		L1 with L2, L3 to GND	28300	12 uA	
		L2 with L1, L3 to GND	28300	10 uA	
		L3 with L1, L2 to GND	28300	13 uA	
		T1,T2,T3 to GND	28850	173 uA	
		T1 with T2, T3 to GND	18500	47 uA	
		T2 with T1, T3 to GND	18500	35 uA	
		T3 with T1, T2 to GND	18500	40 uA	
	LV	Control Power to GND	2500VOM	500 MΩ	Emp# 149
	Control	120Vac to GND	1000VOM	537 MΩ	Emp# 149
		24Vdc to GND	500VOM	∞	Emp# 149

1.3 Initial Power-Up					STSI-061G:4.5
Test Type	Test Item	Test Procedure		Test Criteria (Eng)	Signature/Value
R	Control Power	Control Power Supply			
		CPS,+5VDC(Slot 6 I/O Board Plug P6 Pin 1 to 4)		(5.10 to 5.15Vdc)	5.13 Vdc
		CPS,+12VDC(Slot 6 I/O Board Plug P6 Pin 2 to 4)		(+11.64 to +12.36Vdc)	12.01 Vdc
		CPS,-12VDC(Slot 6 I/O Board Plug P6 Pin 3 to 4)		(-11.64 to -12.36Vdc)	-12.03 Vdc
		CPS, + 15 VDC (SCB Pin 2 to 6)		(+14.55 to +15.45)	15.00 Vdc
		CPS, - 15 VDC (SCB Pin 4 to 6)		(-14.55 to -15.45)	-15.00 Vdc
		CPS,+24VDC(I/O Board J11-11 to J11-9)		(+21.6 to+26.4Vdc)	24.02 Vdc
		CPS,Power Supply Fault			Emp# 172
		Encoder Power Supply, +15 VDC (IOB board J7-5 to J7-		(+14.25 to +15.75)	15.04 Vdc
		T5 (secondary:X1-X4)		(114 to 126Vac)	114 Vac
		Software Version #		Latest Version	Vers.: 5.2.3
		Establish Wago Communications			Emp# 153
	Parameters	Set correct # of			
	Configuration	Analog Outputs	ID 2820	2	
		Set correct Drive Parameters			Emp# 153
		Input Voltage	ID 2010	6600 V	
		Input Current	ID 2020	214 A	
		Output Voltage	ID 2030	6600 V	
		Output Current (equal to 'Cell Rating')	ID 2040	260 A	
		Control Loop Type	ID 2050	OLTM	
		Spinning Load Mode	ID 2430	Off	
		Installed Cells/ Phase	ID 2530	6	
		Cell Voltage	ID 2550	630 V	
		Bypass Type	ID 2590	None	
		Neutral Connection	ID 2630	T1	
		Input CT Ratio	ID 3035	250 :5	
		Tap Setting (+5% typical)	ID 7050	+5%	

1.3 Initial Power-Up[continued]					STSI-061G:4.5
Test Type	**Test Item**	**Test Procedure**		**Test Criteria (Eng)**	**Signature/Value**
R	Parameters Configuration	Set correct Drive Parameters (con't)			
		MenuTimer1	ID 9112	30 S	172
		MenuTimer4	ID 9115	10 S	172
		Program Clock	ID 8080		Emp# 172
		Program SO	ID 8101	2133943	Emp# 172
		Program Drive Number	ID 8110		Emp# 172
		Download SOP		M6SR3C	Emp# 172
		Ethernet Connection Verified			Emp# 172
R	MODBUS	Connect computer to MODBUS port Open MODBUS program and verify communication		Receiving data from Drive	Emp# 172
O	Space Heater Control	1. Verify VFD space heater relay CR4 energized 60s after control voltage is swtiched on.		Verify Functionality	Emp# 172
		2. Adjust thermostat(TST1) setting to more than ambient temperature and verify HTR1are heater up.Reset TST1 to less than ambient temperature and verify HTR1 are off.			
		3. Adjust thermostat(TST2) setting to more than ambient temperature and verify HTR2 & HTR3 are heater up. Reset TST2 to less than ambient temperature and verify HTR2 & HTR3 are off.			Emp# 172
		4. Verify VFD space heater relay CR4 released after medium voltage is energized.			Emp# 172
		5. Verify Motor Heater Relay BM5 energize 60s after drive is not running.			Emp# 172
R		Check Blower Rotation		Verify Rotation	Emp# 331
	Blower 1 Op. XFMR Cab.	Set CB1 equal to 1.2*TBLW1 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.		Ia= 1.53 A Ib= 1.57 A Ic= 1.53 A	Emp# 331
	Blower 2 Op. XFMR Cab.	Set CB2 equal to 1.2*TBLW2 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.		Ia= 1.52 A Ib= 1.58 A Ic= 1.49 A	Emp# 331
	Blower 1 Op. CELL Cab.	Set CB3 equal to 1.2*CBLW1 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.		Ia= 1.46 A Ib= 1.51 A Ic= 1.49 A	Emp# 153
	Blower 2 Op. CELL Cab.	Set CB4 equal to 1.2*CBLW2 motor nameplate current. Measure 3 phase line currents and verify actual current is not exceeding TOL setting.		Ia= 1.53 A Ib= 1.52 A Ic= 1.58 A	Emp# 153

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002462

1.4 System Test Without Motor				STSI-061G:4.6
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
O	Electrical Door Interlocks	Open a door to cause DIS1 open and verify that Drive trip message "TRIP - MV DOOR OPENED" displayed and check "INPUT MV BREAKER ENABLE" contact on TB2 43 & 44, 45 & 46 change state. Repeat the test for remaining of electrical door interlock switched DIS2~ DIS5.	TB2-43 & 44 Closed and TB2-45 & 46 Open when a door open	Emp# 149 Emp# 149
R	Backfeed Modulation & Clipping	Power Supply & Hall Effect Pwr Supply Fault Output Transorbs Note: Remove Series Link & Backfeed Cell B1 Disconnect plug P1 from SCB board Input Transorbs Verify all Cells Primary Voltage Modulation of Cells	 Approx. 56Vp-p Approx. 56Vp-p 100Vac±10% for all (0 to 100% demand)	Emp# 149 Emp# 149 Emp# 149 Emp# 149 Emp# 149
R	Medium Voltage Testing	With Cell Series Links Reconnected Set Motor Voltage = Drive Rating VMA, VMB, VMC | ID 2050 - OLTM 25Hz VMA, VMB, VMC | ID 2050 - OLTM 50Hz	 3.0V-peak +/- 0.3V 6.0V-peak +/- 0.3V	 Emp# 153 Emp# 153

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	Check E-stop Logic	Depress Local E-Stop Verify Drive coasts to stop and fault message displayed Measure on TB2-3 & 4 Verify Fault contact on TB2-33 & 34 changes state Depress"FAULT RESET"on keypad and Restart Drive Verify Run contact on TB2-29 & 30 changes state Remove Jumper on TB2-1 & 2 - Remote E-Stop Verify Drive coasts to stop and fault message displayed	 Open for E-stop Closed for Fault Closed for Run 	 Emp# 331 Emp# 331 Emp# 331 Emp# 331 Emp# 331 Emp# 331 Emp# 331

1.5 System Test With Motor (Unloaded)				STSI-061G:4.7
Test Type	**Test Item**	**Test Procedure**	**Test Criteria (Eng)**	**Signature/Value**
R	Transformer Thermal Switches	Remove alarm wire from IOB DI-3C, 1).Verify fault light blinks and keypad displays alarm message. 2).Verify the "Drive Alarm" outputs on TB2-31&32 change state. Remove trip wire from IOB DI-0D, 1).Verify fault light blinks and keypad displays alarm message. 2).Verify the "Drive Alarm" outputs on TB2-31&32 change state. Remove trip both wires from IOB DI-3C & DI-0D and wait for 30 seconds; 1). Verify Drive fault, Drive coasts to a stop and keypad displays trip message 2).Verify the "Drive Tripped" output on TB2-33&34.	Verify alarm message Closed for Alarm Verify alarm message Closed for Alarm Verify Drive Fault Closed for Fault	Emp# 331 Emp# 331 Emp# 331 Emp# 331 Emp# 331 Emp# 331
R	Remote Start/Stop	Momentarily close contact between TB2-5 & 6 and verify Drive starts running. Momentarily close contacts between TB2-5 & 6.	Drive is running Drive ramps to stop	Emp# 153 Emp# 153
R	Remote Fault Reset	Cause system fault and check Drive Ready contact TB2-27 & 28 (changes state) Momentarily close Remote Fault Reset contact on TB2-7 & 8. Verify the "Drive Ready to Run" output on TB2-27 & 28 changes state. Verify Keypad reset is functioning. Verify the "Fault Reset"button on the touch panel is functioning.	Open for Fault Drive should reset Closed for Ready to Run	Emp# 331 Emp# 331 Emp# 331 Emp# 331 Emp# 331
R	Local Start/Stop	Place Drive in the Local mode by pressing "AUTOMATIC"on keypad and depress "MANUAL START" on keypad. Verify Drive is running. Depress "MANUAL STOP" on keypad	Drive is running Drive ramps to stop	Emp# 153 Emp# 153
R	4 to 20mA Remote Freq Command	Place Drive in the Remote mode by pressing "AUTOMATIC"again on keypad and connect 4-20mA signal to TB2ELV-7 & 8. Scale 4-20 mA signal to be proportional to 0-100% Freq.	Verify system Freq change 4mA=0%Freq 12mA=50% Freq 20mA=100% Freq	 Emp# 153
R	4 to 20mA Spare Input	Program Spare Input as Remote Signal command via Keypad menu and connect 4-20mA signal to TB2ELV-10 & 11.Scale 4-20 mA signal to be proportional to 0-100% output. RE-PROGRAM REMOTE SIGNAL INPUT TO ANALOG 1!	4mA=0% spare 12mA=50% spare 20mA=100% spare	 Emp# 153 Emp# 153
R	4 to 20mA Spare Input	Program Spare Input as Remote Signal command via Keypad menu. Using connect 4-20mA or 0-10V signal (See Customer Drawings) to TB2ELV-13 & 14 and debug Screen. Scale 4-20 mA signal to be proportional to 0-100% output. RE-PROGRAM REMOTE SIGNAL INPUT TO ANALOG 1!	4mA=0% spare 12mA=50% spare 20mA=100% spare	 Emp# 153 Emp# 153

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002462

1.5 System Test With Motor (Unloaded) STSI-061G:4.7

Test Type	Test Item	Test Procedure	Test Criteria (Eng)	Signature/Value
R	4 to 20mA Motor KW Output	Monitor KW output on TB2ELV-18 & 19 and verify output	4mA=0% KW 20mA=100% KW	Emp# 331
	4 to 20mA Motor AMPS Output	Monitor AMPS output on TB2ELV-1 & 2and verify output	4mA=0% Amps 20mA=100% Amps	Emp# 331
	4 to 20mA Motor FREQ Output	Monitor FREQ output on TB2ELV-4 & 5 and verify output	4mA=0% Freq 20mA=100% Freq	Emp# 331
	4 to 20mA Spare Output	Monitor SPARE output on TB2ELV-21 & 22 and verify output	4mA=0% Spare 20mA=100% Spare	Emp# 331
R	Blower 1 Op. XFMR Cab.	With Transformer Cabinet blower TBLW1 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 331
	Blower 2 Op. XFMR Cab.	With Transformer Cabinet blower TBLW2 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 331
	Blower 1 Op. CELL Cab.	With Cell Cabinet blower CBLW1 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 331
	Blower 2 Op. CELL Cab.	With Cell Cabinet blower CBLW2 running, trip blower CB and verify Drive will be faulted in 10 seconds.	Drive coasts to stop	Emp# 331
R	Medium Voltage Testing	Set Control Loop Type	OLVC	
		With Motor Connected to the Drive Output	IMA Leads VMA by 90°	Emp# 153
			IMB Leads VMB by 90°	Emp# 153
R	Spinning Load	1. Enable spinning load feature (Set Spinning Load Mode true) via keypad 2. Run Drive at 100% speed 3. Trip Drive by pressing E-Stop 4. Pull out E-Stop 5. Push Fault Reset 6. Restart Drive 7. Verify Drive goes back to full speed	Motor returns to full speed	Emp# 153
R	Motor Overload Protection	Adjust motor parameters[Menu 1000]and overload settings[Menu 1120]to verify overload operates after 60s.		Emp# 153
R	Non-latching Run request with No Medium Voltage Input	1.Remove Medium Voltage Power 2.Reboot NXG Control 3.Clear/Reset all fault on drive 4.Monitor SOP Runrequest flag via debugger 5.Verify that SOP Runrequest flag remains false when all start inputs are set		Emp# 153
R	Input Protection	Simulate IP trip and verify "input MV breaker enable" output contact on TB2-43 & 44 changes state The fault only reset via keyed pushbutton KR	Closed for fault Fault reset	Emp# 153 Emp# 153
O	Closed Loop Vector Control Testing	Set Control Loop Type ID 2050 Set Encoder 1 PPR ID 1290 Set Encoder loss response ID 1320 With Motor Connected to the Drive Output Connected the encoder signal to TB2ELV-26-31 Scale 4-20 mA signal to 50% and 100% speed Verify the Drive and Motor Speed output if normal	CLVC 1024 Stop 12mA=50% Speed 20mA=100% Speed	 Emp# 153 Emp# 153

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002462

1.6 System Load Test:				STSI-061G:4.8
Test Type	**Test Item**	**Test Procedure**	**Test Criteria (Eng)**	**Signature/Value**
R	System Load Test	Run Load Test using Dyno Load Run at input current (full load input current)	214 Amps, 4 hrs	Emp# 153
A	Efficiency Testing	Run Drive at following speed points: 100% Speed 100% Load 100% Speed 50% Load	Record actual 97.08 % 97.29 %	 TSF-056 TSF-056
A	Power Factor Testing	Run Drive at following speed points: 100% Speed 100% Load	0.95PF	TSF-006
A	Harmonic Testing	Run Drive at 100% speed and 100% load Record actual THD for Voltage & Current (Background Distortion must be THDv <2.0%)	< THD 3 %Voltage < THD 5 %Current	Emp# 153 Emp# 153

1.7 Final Inspection				STSI-061G:4.9
Test Type	**Test Item**	**Test Procedure**	**Test Criteria (Eng)**	**Signature/Value**
R	File Save	Save Files under the Project Files Folder SOP, HEX, Event Log, Fault Log, Parameter and Configure Files	Parameter upload (Level 7)	Emp# 153
R	Flash Card	All Test versions of SOP & HEX files have been removed from Flash No Wago SOP & HEX is on Flash Final SOP is on Flash and correct Hex file is selected		Emp# 153 Emp# 153 Emp# 153
R	Disconnect Test Wires	Remove all input and output power and control wiring.		Emp# 153
R	Torque Mark Check	Check that all proper torque marks exist. Check that all existing torque marks are properly marked		Emp# 153

Customer Name Queensland urban utilities - eagle farm REV# AA

SO 3002133943 P/N M6SR3 S/N Z831501002462

1.8 Equipment

STSI-061G:4.1

Record Hipoter Used

Model	Manufacturer	SEDS CTN	Cal. Due
DH60/5	Lanpotronics	AS110720001	2013-7-19

Record Voltmeter Used

Model	Manufacturer	SEDS CTN	Cal. Due
175	FLUKE	AS050526001	2014-05-21
789	FLUKE	AS080131001	2015-03-19
/	/	/	/
/	/	/	/
/	/	/	/

Oscilloscope

Model	Manufacturer	SEDS CTN	Cal. Due
DPO3034	TEK	AS090831001	2013-09-04
/	/	/	/

Clamp on C.T./Clamp-On

Model	Manufacturer	SEDS CTN	Cal. Due
LH41	AMPROBE	AS100826001	2013-09-02
/	/	/	/

Humidity

65%