ETICA BATTERY INC.

Tentative Specifications

ETICA DCC NO. SPE-24XXXX

Client	
Client P/N	
Model	智帆風機
Description	智帆風機周邊 IO 通訊協定(Danfoss PCS、柴油發電機)
P/N	
Client Approval	

Prepared by	Reviewed by	Approved by
Kidian Liu	Ranger Chan	Jack Wu

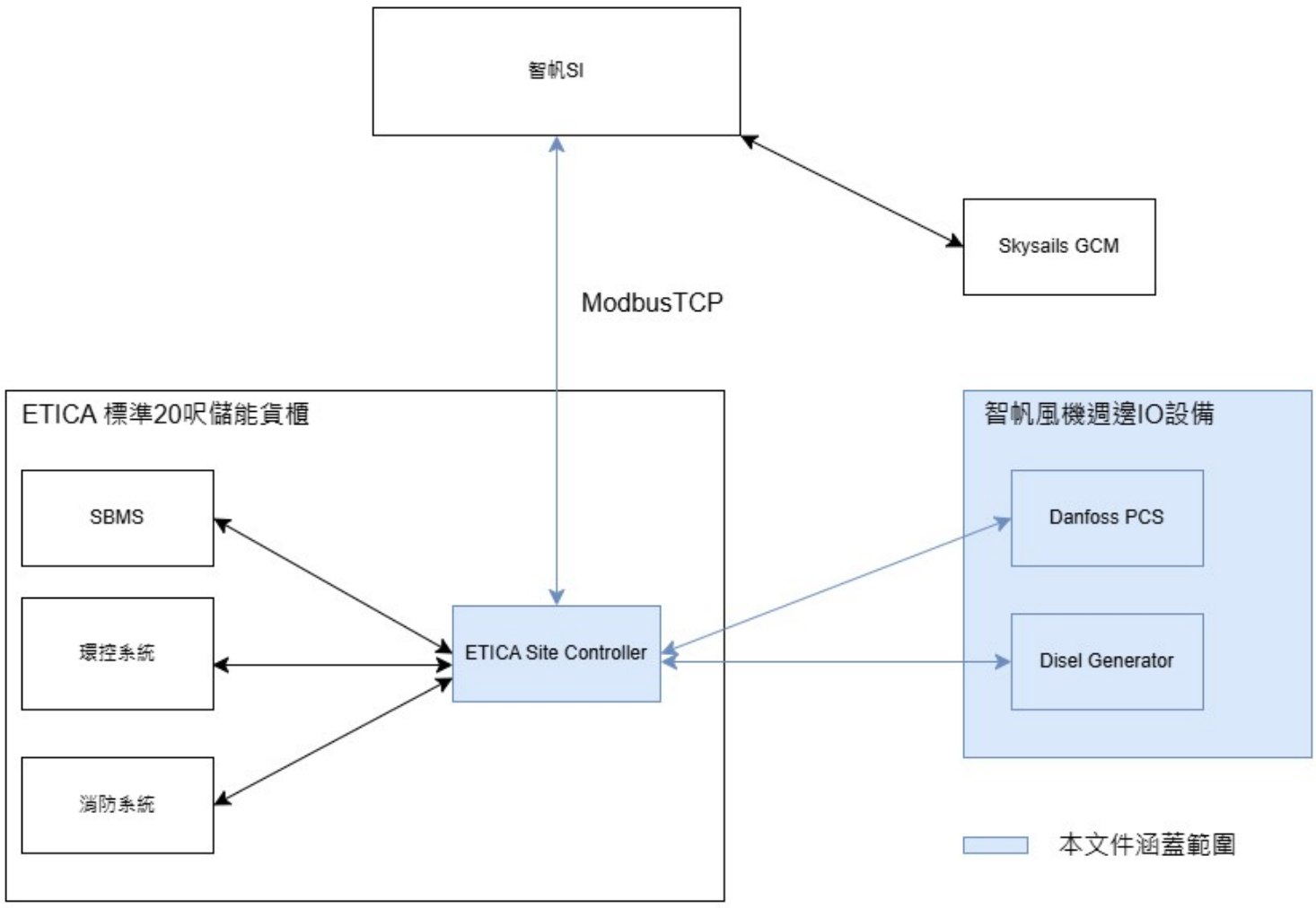
5F., No.6, Lane 122, Sec. 2, Ganyuan St., ShulinDist, New Taipei City 238, Taiwan

Revision History

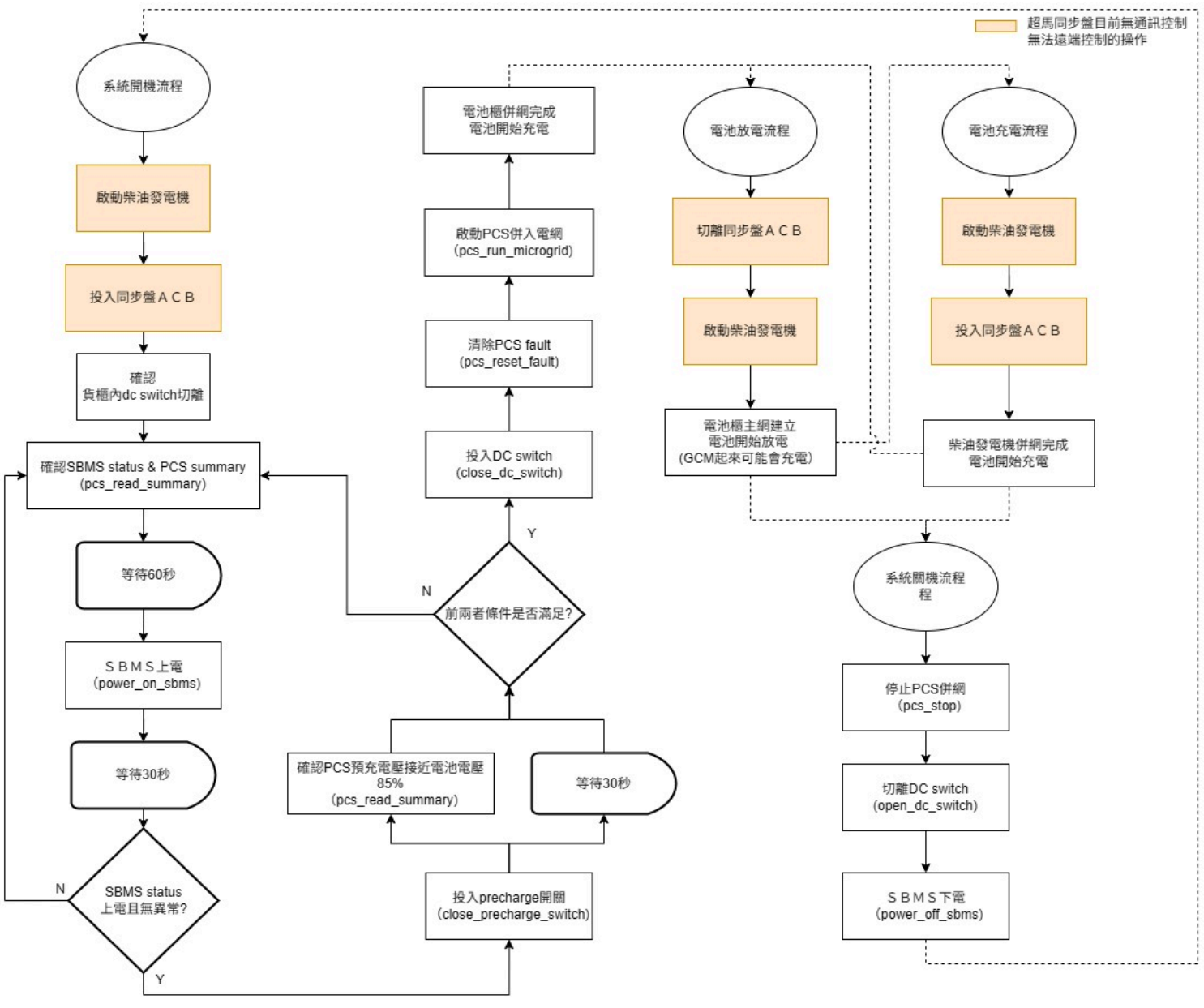
Revision	Description	Date
1	Initial Release (Tentative)	2024/03/25
2	修正系統架構，移除 GCM、新增 Danfoss PCS 控制細節與柴油發電機啟停點位	2025/02/10
2.1	更改 ETICA CIS	2025/02/12
2.2	新增控制流程圖提供智帆系統整合	2025/02/26
2.3	新增貨櫃空調製冷溫度設定點位、修正 PCS 狀態表備註	2025/06/27
2.31	修正柴油發電機啟停狀態數值與流程圖	2025/07/02

Contents

1 System Architecture

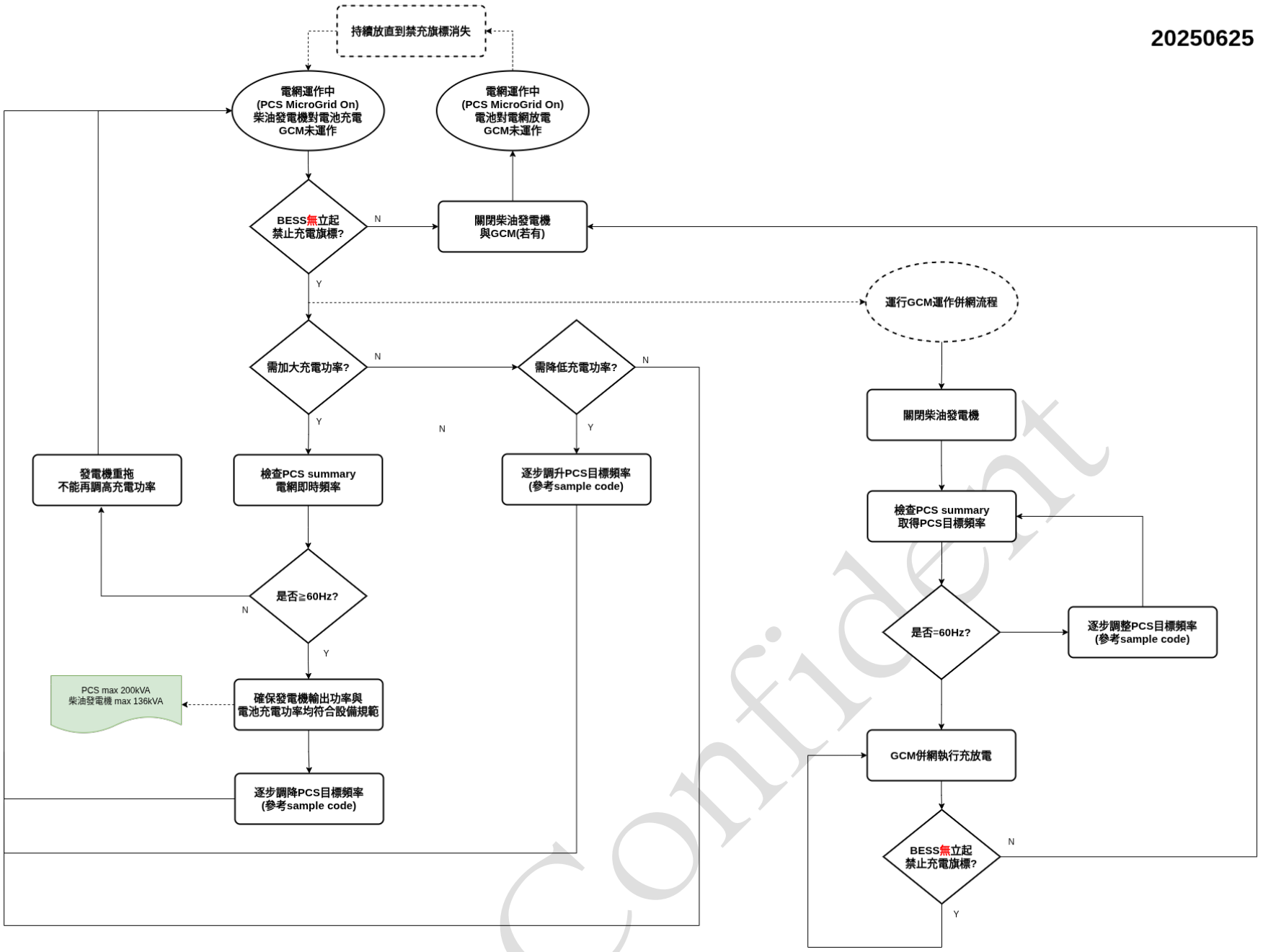


2 Control Flow Chart



ZFO01A0頻率_電池充電功率控制指引

20250625



3 Protocol

3.1 Modbus TCP

3.1.1 Modbus PDU Frame Format

Function Code	Function-Specific Data
1byte	N bytes(N≤253)

3.1.2 Modbus TCP Frame Format

Transaction Identifier	Protocol identifier	Data length	Unit Identifier	Data(Modbus PDUs)
2bytes	2bytes	2bytes	1byte	N bytes (N≤253)

3.1.3 Modbus Function Code

Function code (hex)	Definition	Function description
0x02h	Read discrete Inputs registers	Host computer reads data of guest computer

0x03h	Read multiple registers	Host computer reads data of guest computer
0x04h	Read input registers	Host computer reads data of guest computer
0x10h	Write multiple registers	Host computer modifies data of guest computer
0x06h	Write single register	Host computer modifies data of guest computer

3.1.4 Modbus Data Model Blocks

Memory Block	Data Type	Master Access	Slave Access
Coils	Boolean	Read/Write	Read/Write
Discrete Inputs	Boolean	Read-only	Read/Write
Holding Registers	Unsigned Word	Read/Write	Read/Write
Input Registers	Unsigned Word	Read-only	Read/Write

4 Site Controller Modbus TCP Servers List

Name	IP	Port	Unit ID	Data Scope
IPC	192.168.127.100/24	502	1	PCS Pre-charge Circuit, Container's ACB & DC Switch, Diesel Generator
Danfoss PCS	192.168.127.231/24	502	1	PCS

5 Modbus TCP Register Table

5.1 Danfoss PCS Register Table

5.1.1 Danfoss PCS Holding Register Address Distribution

No	Target	Register address(hex)	Register address(dec)	Byte	Variable description
1	Danfoss PCS	0x0834 ~ 0x83F	2100 ~ 2111	24	Danfoss PCS read data-
2	Danfoss PCS	0x07D0 ~ 0x07D3	2000 ~ 2003	8	Danfoss PCS write data

5.1.2 Danfoss PCS Overall Data Format Definition

No	Data type	Ratio factor	Range	Offset	Actual span	Data quantity	Comment
1	Active / total current	0.1A/bit	0 ~ 30000	0	0 ~ 3000.0A	2byte	
2	Frequency	0.01Hz/bit	0 ~ 24000	0	0 ~ 240.00Hz	2byte	
3	Temperature	1℃/bit	0~100	0	0 ~ 100℃	2byte	
4	Voltage	1V/bit	0 ~ 3000	0	0 ~ 3000V	2byte	

5.1.3 Danfoss PCS Read Data List (holding register)

No	Address(hex)	Address(dec)	Byte	Description	Comment
1	0x0834	2100	2	PCS General status bits, refer to 3.1.4	PCS 通用狀態旗標，參考 5.1.4
2	0x0835	2101	2	Microgrid status bits, refer to 3.1.5	微電網狀態旗標，參考 5.1.5
3	0x0836	2102	2	Total current	總電流
4	0x0837	2103	2	Operation mode	運作模式 0: AFE 1: Island 2: Micro grid
5	0x0838	2104	2	Power(kw)	輸出功率
6	0x0839	2105	2	Frequency reference	目標參考頻率
7	0x083A	2106	2	Supply Frequency	輸出頻率
8	0x083B	2107	2	Temperature	溫度
9	0x083C	2108	2	DC link voltage	直流電壓
10	0x083D	2109	2	Fault	故障代碼
11	0x083E	2110	2	Line voltage	偵測電壓
12	0x083F	2111	2	Line frequency	偵測頻率

5.1.4 Danfoss PCS Write Data List(holding register)

No	Address(hex)	Address(dec)	Byte	Description	Comment
1	0x07D0	2000	2	PCS control bits	PCS 通用狀態旗標，參考 3.1.6
2	0x07D1	2001	2	Reserved	
3	0x07D2	2002	2	DC voltage ref.	直流電壓參考值(%)
4	0x07D3	2003	2	Microgrid control bits	微電網狀態旗標，參考3.1.7

5.1.5 Danfoss PCS Status Bits Table

	Signal	Comment
b0	Ready On	0 = Drive not ready to charge 1 = Drive ready to charge
b1	Ready Run	0 = Drive not ready to run 1 = Drive ready to run and MCB is ON
b2	Running	0 = Drive not running 1 = Drive running with regenerative control ON
b3	Fault	0 = No active fault 1 = Fault is active
b4	Run Enabled	0 = Run Disabled by I/O Commands 1 = Run Enabled by I/O Commands
b5	Quick Stop	0 = Quick Stop Active 1 = Quick Stop Not Active
b6	Switch On Inhibit	0 = CB Control OK 1 = CB Requested open but DC is high
b7	Warning	0 = No warning 1 = Warning active
b8	At Reference	0 = DC Voltage Ref and Act DC Voltage are not same. 1 = DC Voltage Ref and Act DC Voltage are same.
b9	Fieldbus Control Active	0 = Fieldbus control not active 1 = Fieldbus control active
b10	Above Limit	0 = DC voltage is below the level specified by P2.5.7.4 1 = The DC voltage is above the level specified by P2.5.7.4
b11	MCB Control (DO Final)	0= Drive is controlling MCB to be Open. 1= Drive is controlling MCB to be Closed
b12	MCB Feedback	0= Feedback indicates MCB to be Open 1= Feedback indicates MCB to be Closed
b13		Reserved for future use.
b14	DC Charge DO Control	0= DC not charged 1= DC Charging Active
b15	Watchdog	Same as received on bit 11 of the FB Control Word.

5.1.6 Microgrid Status Bits Table

	Signal	Comment
b0	Charge Control active	Charging
b1	Internal Charging switch status	
b2	MCB control	
b3	MCB status	
b4	Run Enabled	
b5	Drive Ready	
b6	AFE mode active	
b7	Island mode active	
b8	Micro Grid mode active	
b9	Run Request active	
b10	Drive in run state	
b11	Fault Active	
b12	SynchronizedToD7	
b13		
b14	D7 measurements OK	
b15		

5.1.7 Danfoss PCS Control Bits Table

	Signal	Comment	SM
B00	DC Charge	**0**= Open MCB. **1**= Close DC charge contactor, MCB closed automatically, see B01.	1,2,3
B01	MCB Close Enable	**0**= Disable Closing of MCB (Also opens if Control Options.B0=TRUE) **1**= Enable Closing of MCB (Works also for reclosing)	3
B02	Quick Stop	**0**= Quick Stop **1**= No Quick Stop	3
B03	Run	**0**= AFE is stopped **1**= AFE is started	1,2,3
B04	Output Power Limit to Zero	**0**= Output Power Limit to Zero **1**= Output Power Limit = P2.5.2.1	3
B05	Disable Power Increase. Input or Output	**0**= Disable increase of power. **1**= Power limits defined by G2.5.2	3
B06	Input Power Limit to Zero	**0**= Input Power Limit to Zero (7%) **1**= Output Power Limit = P2.5.2.2	3
B07	Reset	0>1 Reset fault.	1,2,3
B08	DC Voltage Ref B00	B00 | B01	2,3
B09	DC Voltage Ref B01	**0 | 0** = FB Reference. P2.2.1, if not FB Control & FB Ref > 50,00 % **0 | 1** = 110 % **1 | 0** = 115 % **1 | 1** = 120 %	2,3
B10	Fieldbus Control	**0**= No control from fieldbus **1**=Control from fieldbus	2,3
B11	Watchdog	**0>1>0>1...0,5 sec square wave clock. This is used to check data** communication between fieldbus master and the drive.	2,3
B12	FB DIN2	Can be used to control RO or directly parameter by ID number. G2.4.1	1,2,3
B13	FB DIN3	Can be used to control RO or directly parameter by ID number. G2.4.1	1,2,3
B14	FB DIN4	Can be used to control RO or directly parameter by ID number. G2.4.1	1,2,3
B15		Reserved for future use.	

5.1.8 Microgrid Control Flags Table

	Signal	Comment
b0	Start As Island	If B0 & B1 = FALSE operation mode is AFE. B10 to enable. B11 to change in Run State
b1	Start As Micro Grid	
b2	Start synchronisation D7	Synchronization to external grid with OPT-D7
b3		
b4	Power Down	Same as P2.2.6.2
b5	Power Up	Same as P2.2.6.3
b6	Reset Hz MotPot	Same as P2.4.2.27
b7	Voltage Down	Same as P2.2.6.7
b8	Voltage Up	Same as P2.2.6.8
b9	Reset Volt MotPot	
b10	Enable FB Control Mode	B0 and B1 are controlliong Operation Mode
b11	Live Mode Control	B0 and B1, Mode changed in Run State
b12	P2.10.27 uCW B12	
b13	P2.10.28 uCW B12	
b14	P2.10.29 uCW B12	
b15	P2.10.30 uCW B12	

5.1.9 Danfoss PCS Fault Code List

Code	Comment	code	Comment	code	Comment
1	Over current	37	Device change	64	MCB state fault
2	Over voltage	38	Device added	65	PT100 board 2
3	Earth fault	39	Device removed	66	Klixon
5	Charge switch	40	Device unknown	67	Fieldbus communication fault on slot E
6	Emergency stop	41	IGBT temperature software	68	D7 voltage or frequency fault
7	Saturation fault	42	Brake resistor overtemperature	69	OPT-D7 missing
8	System fault	44	Device changed (default param.)	70	Supply voltage
9	Under voltage	45	Device added(default param.)	71	LCL temperature
10	Line Synchronization fault	50	4mA supervision	72	License
11	Line phase supervision	51	External fault	73	Supply frequency
12	Brake chopper supervision	52	Keypad communication	77	DC ground fault
13	Drive under temperature fault	53	Fieldbus communication fault on slot D	80	Charging fault
14	Drive over temperature fault	54	Slot fault	81	External fault 2
22	EEPROM checksum fault	55	Input switch	83	Over load
24	Counter fault	56	PT100 temperature fault	88	Ambien temperature
25	MCU watchdog fault	57	Identification	89	Grid side fault
26	Start-up prevention	58	Mechanical brake	91	Short circuit
29	Thermistor fault	60	Cooling	92	D7 voltage
31	IGBT temperature hardware	62	Run disabled	93	D7 frequency
32	Fan cooling	63	Quick stop	95	Grid code

5.2 Disel Generator Read/Write Register Table(holding register)

No	Address(hex)	Address(dec)	Byte	Description	Comment
1	0x0007	7	2	Disel Generator Status	1: start 2: stop
2	TBD	TBD	2	Disel Generator ACB Status	TBD
3	0x0064	100	2	L3 – L1 Voltage	
4	0x0065	101	2	L2 – L3 Voltage	
5	0x0066	102	2	L1 – L2 Voltage	
6	0x0067	103	2	L3 Current	
7	0x0068	104	2	L2 Current	
8	0x0069	105	2	L1 Current	
9	0x006A	106	2	Frequency	
10	0x006B	107	2	L3 Active Power	
11	0x006C	108	2	L2 Active Power	
12	0x006D	109	2	L1 Active Power	
13	0x006E	110	2	Oil pressure	
14	0x006F	111	2	Cooler Temperature	
15	0x0070	112	2	Battery Voltage	
16	0x0071	113	2	Charge Magnetic Voltage	充電勵磁電壓
17	0x0072	114	2	Status	0=OFF 1=ON BIT7: Alarm LED BIT9: START LED BIT11: STOP LED

5.3 Container's IO(ACB & DC Switch & AC) Read/Write Register Table(holding register)

No	Address(hex)	Address(dec)	Byte	Description	Comment
1	0x0005	5	2	DC Switch Status	1: close 0: open
2	0x0006	6	2	ACB Status	1: open 2: close
3	0x0009	9	2	Air Conditioner cooling temperature	Unit: 1 / 0.1 ℃ Range: 200 ~ 350