KONGSBERG

Functional Design Specification
Serial Line Interfaces
KM-Drill 8

Project:	12345678		
Product	Integrated Control & Monitoring System		
Synopsis:	Operator documentation together with KM standard K-Chief Operator Manual.		
Document number:		Revision:	A
Customer doc number:		Document version:	5.0
Contract number:		Number of pages:	29

Rev.	Date	Reason for issue	Made by	Checked	Approved
A	25.05.14	Adjusted for Training Purposes	JCS	MS	EH

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1 ABOUT THIS DOCUMENT

1.1 Document history

Revision	Description of Change
A	Adjusted for Training Purposes

1.2 References

No	Doc No	Description
1	N/A	Modicon Modbus Protocol Reference Guide
2		
3		
4		

1.3 Definitions / Abbreviations

ECR   Engine Control Room

EAP   External Alarm Panel

ESD   Emergency Shutdown

FDS   Functional design Specification

F&G   Fire and Gas

FS   Field Station (Cabinet with controller and/or RIO modules)

HS   History Station

HMI   Human Machine Interface

IAS   Integrated Automation System

I/O   Input / Output

ICS   Integrated Control System

KM   Kongsberg Maritime

KFDD   Kongsberg Functional Design Document

NDU   Net Distribution Unit

OS   Operator Station

PCU   Process Control Unit

PMS   Power Management System

PS   Process Station, Process Control Cabinet

RCA   Redundancy and Criticality Assessment

RCU   Remote Controller Unit

RCS   Remote Control System

RIO   Remote Input Output Unit

RPB   Remote Push Button

K-Pos   Kongsberg Dynamic Positioning

K-Pos OS   Operator Station intended for dynamic positioning

K-Thrust OS   Operator Station Thruster Control

K-Thrust-400 Operator Station intended for manual thruster control

K-Chief   KM Vessel Control (equal to IAS in SHI documents)

K-Chief OS   Operator Station for KM Vessel Control system

VDU   Video Display Unit

2 INTRODUCTION

2.1 Purpose

This document describes the parameters and information needed for the serial line communication for Kongsberg Maritime Vessel Control system K-CHIEF as delivered to the specified vessel. Functions within other systems are not described in this document.

This document serves also as operator documentation together with KM standard operator manual.

Note:

KM will always be the master regarding Modbus and Profibus serial line communication.

2.2 General

A protocol controls the language structure or the message format common for all devices on a network. The protocol determines how the devices establish and break off contact, how to identify each other, how to interchange data and how errors are detected.

Simplex means communication in one direction only.

Half duplex means communication in both directions but only one direction at the time.

Full duplex means communication in both direction and both directions at the same time.

OLE (Object Linking and Embedding) is a standard protocol for transferring data between Microsoft programs.

OPC (OLE Process Control) is an industry standard defined for interchanging real time automation data among PC-based clients using Microsoft operating system.

ODBC (Open Database Connectivity) is a standard protocol for accessing information in SQL database servers.

2.2.1 General Profibus Info

The PROFIBUS protocol is positioned at level 1, 2 and 7 of the OSI model. The Process Field Bus (PROFIBUS) standard (EN 50 170, Volume 2 PROFIBUS) defines the physical and logical parameters of a bit-serial bus network. PROFIBUS has an interface for high-speed communications with field devices, as well as exchange of complex data between master stations. One objective of the standard is to create an open system that enables networking of programmable logic controllers and field devices from different vendors. This allows us to include in our system any device from another vendor as long as the device conforms to the standard.

While PROFIBUS includes FMS and DP protocols, there is a universal set of standard physical parameters for PROFIBUS network, as listed in table 2.1:

Features	Parameters
Access mode	Token passing with underlying master/slave
Transmission rate	9,6 Kbaud to 12 Mbaud
Transmission medium	Electrical network: shielded two-wire cable
	Optical network: fibre-optic cable (glass or plastic
Maximum number of devices per segment	32 stations per segments
Maximum number of station addresses per network	126 (including repeaters)
Cable length per network (dependent on cable length and type).	10km for copper cable, more for fibre-optic cable
Topology	Electrical network: line, tree
	Optical network: ring, line, star
Protocols	PROFIBUS-DP
	PROFIBUS-FMS
Data size that can be transmitted in one message	1 to 244 bytes

Table 2.1

The PROFIBUS DP is the version for factory automation and the transmission technologies used for DP is RS-485. This version will be used between K-CHIEF and the rest of the *slave system* where the PROFIBUS will be used.

2.2.2 General MODBUS Info

MODBUS is an application layer messaging protocol, positioned at level 7 of the OSI model that provides client/server communication between devices connected on different types of buses or networks.

The Modbus protocol defines a message structure that controllers will recognize and use, regardless of the type of networks over which they communicate. It describes the process a controller uses to request access to another device, how it will respond to requests from the other devices, and how errors will be detected and reported. It establishes a common format for the layout and contents of message fields.

The nature of the Modbus protocol is such that it eliminates the need for time-consuming telegram definition/message layout which normally must be done by the computer manufacturer. The RTU protocol must be used.

The Modbus protocol provides for one master and up to 247 PLC slaves on a common communication channel. Although the protocol supports up to 247 slaves, certain device restrictions may limit the number of slaves to a number less than 247.

Note: The IAS is defined to be the master.

The following Modbus functions can be used:

01	Read Coil Status	Obtain current status (0/1) of a group of logical coils.
02	Read Input Status	Obtain current status (0/1) of a group of discrete inputs.
03	Read Holding Registers	Obtain current binary value in one or more H-registers.
04	Read Input Registers	Obtain current binary value in one or more I-registers.
05	Force Single Coil	Force logic coil to a state of ON or OFF.
06	Preset Single Register	Place a specific binary value into an H-register.
08	Loop back Diagnostic Test	Diagnostic test message sent to slave to evaluate the com.
15	Force Multiple Coils	Force a series of logical coils to a state of ON or OFF.
16	Preset Multiple Registers	Place specific binary values into a series of H-registers.

In addition, a number of "Exception Response" messages are implemented to report exceptions either by the master set up or the communication device. The exception response message codes are:

01	"Illegal function"
02	"Illegal data address"
03	"Illegal data value"
04	"Failure in associated device"
05	"Acknowledge"
06	"Busy, message rejected"
07	"NAK, negative acknowledge"

2.2.3 General OPC Info

Used to move real-time data from PLCs and other control devices to HMIs and other display clients. The Data Access 3 specification is now a Release Candidate. It leverages earlier versions while improving the browsing capabilities and incorporating XML-DA Schema.

Specification Type	Industry Standard Specification		
Title:	**Functional Design Specification**	Date:	March 4, 2003
Version:	3.0	Soft	MS-Word
		Source:	Opcda30_cust
Author:		Status:	**Released**

For a technical overview of OPC and downloadable OPC specifications, see
http://www.opcfoundation.org/ and select "Downloads and Specifications".

2.2.3.1 KM OPC Installation

AimOPCServer is installed on K-CHIEF-OS-31 connected to the process network. The OPC
Server should always be running even when no OPC Clients are connected to it. To start the
OPC Server automatically, **OPC** is added as a Station Type parameter to the startup-script
(StartAim.bat) like this example:

AIM-OS OS31 0 %AIM_LEV% NOPANEL NOPANEL OS+**OPC** R

NOTE: If the machine hosting AimOPCServer should run with the minimum configuration
(without AIM-OS), AimOPCServer.exe must be started manually.

2.2.4 General NMEA Info

The communication principle is a one-way communication with one talker and possibility for
multiple listeners. The amount of output signals can be in the range of 200-300, and due to
the functionality these signals are collected on the actual FS which has the NMEA output
line. The telegrams are ASCII sentences.

3 SERIAL INTERFACE

3.1 Serial Interface - Modbus

Note: IAS needs to be in master.

No.	System / Supplier	Type of Serial Line	FS-no.	Channel	Baud rate	Elec. Interf.
1	Diesel Generator #1 Doosan/Man	MODBUS RTU Master / Slave	53	1	19200	RS-485
2	Diesel Generator #2 Doosan/Man	MODBUS RTU Master / Slave	54	1	19200	RS-485
3	Diesel Generator #3 Doosan/Man	MODBUS RTU Master / Slave	55	1	19200	RS-485
4	Diesel Generator #4 Doosan/Man	MODBUS RTU Master / Slave	56	1	19200	RS-485
5	Diesel Generator #5 Doosan/Man	MODBUS RTU Master / Slave	57	1	19200	RS-485
6	Diesel Generator #6 Doosan/Man	MODBUS RTU Master / Slave	58	1	19200	RS-485
7	Remote Sounding System #1	MODBUS RTU Master / Slave	45	1	19200	RS-485
8	Thruster #1 Wartsila Condition Monitoring System	MODBUS RTU Master / Slave	46	4	9600	RS-485
9	Ballast Water Treatment System	MODBUS RTU Master / Slave	47	1	9600	RS-422
10	CCTV System	MODBUS RTU Master / Slave	71	1	9600	RS-422
11	HVAC TopSide Hi Air Korea	MODBUS RTU Master / Slave	91	2	1920	RS-485

3.2 Serial Interface – NMEA Telegram

No.	System / Supplier	Type of Serial Line	FS-no.	Channel	TB Type	Elec. Interf.
1	Upper riser inclinometer	NMEA	91	1	19200	RS-422
2	Voyage Data Recorder	NMEA ASCII Master / Slave	45	2	9600	RS-422
3	Thruster Conning Display / Furuno	NMEA ASCII Master/Slave	45	4	9600	RS-422
4	Speed Log	NMEA ASCII Master/Slave	45	3	9600	RS-422
5	Tetra System Alarm Monitoring	NMEA ASCII Master/Slave	45	1	9600	RS-422

3.3 Serial Interface - Profibus

No.	System / Supplier	Type of Serial Line	FS-no.	HW Channel	TB Type	Elec. Interf.
1	Thruster Drive #1 ABB	PROFIBUS DP Master/ Master	201	1	Splitter (DP/DP Coupler)	Profibus Cable
2	Thruster Drive #2 ABB	PROFIBUS DP Master/ Master	202	1	Splitter (DP/DP Coupler)	Profibus Cable
3	Thruster Drive #3 ABB	PROFIBUS DP Master/ Master	203	1	Splitter (DP/DP Coupler)	Profibus Cable
4	Thruster Drive #4 ABB	PROFIBUS DP Master/ Master	204	1	Splitter (DP/DP Coupler)	Profibus Cable
5	Thruster Drive #5 ABB	PROFIBUS DP Master/ Master	205	1	Splitter (DP/DP Coupler)	Profibus Cable
6	Thruster Drive #6 ABB	PROFIBUS DP Master/ Master	206	1	Splitter (DP/DP Coupler)	Profibus Cable
7	Drilling Control Interface (DCI) NOV	PROFIBUS DP Master/ Master	91	1	Splitter (DP/DP Coupler)	Profibus Cable
8	HVAC Hull #1 Hi Air Korea	PROFIBUS DP Master/ Master	46	1	Splitter (DP/DP Coupler)	Profibus Cable
9	Drawwork Control Interface NOV	PROFIBUS DP Master/ Master	53	1	Splitter (DP/DP Coupler)	Profibus Cable
10	Drawwork Control Interface NOV	PROFIBUS DP Master/ Master	55	1	Splitter (DP/DP Coupler)	Profibus Cable
11	Drawwork Control Interface NOV	PROFIBUS DP Master/ Master	57	1	Splitter (DP/DP Coupler)	Profibus Cable
12						

3.4 Serial Interface – OPC

No.	System / Supplier	Type of Serial Line	From OS-no.	To OS-no.	Elec. Interf.
1	Load and Stability Computer Lodic	OPC	K-Chief 31	K-Chief 69	Net - C

3.5 Serial Interface – Field Ethernet

No.	System / Supplier	Type of Serial Line	FS-no.	Port	Elec. Interf.
1	F&G central #1 Autronica	Ethernet	71 71-1	1	Network
2	F&G central #2 Autronica	Ethernet	72	1	Network
3	Coin System Ships Server	Ethernet	NDU A1/C1		Network
4	Master Clock NOV	NTP	K-Chief OS-55		Net-C Fibre Optical cable

3.6 Serial Line Communication Setup

3.6.1 FS-45

3.6.1.1 Modbus communication to Remote Sounding System

Communication Setup:

Description	Setting	Remarks
Serial channel	1 (RSER1)	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.1.2 NMEA communication to Voyage Data Recorder

Communication Setup:

Description	Setting	Remarks
Serial channel	2 (RSER2)	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	9600	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	1	(RTU/ASCII NMEA) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.1.3 Modbus communication to Tetra System

Communication Setup:

Description	Setting	Remarks
Serial channel	1 (RSER2)	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	9600	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII NMEA) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.2 Protocol

The protocol is:

- NMEA 0183 (IEC 61162-1)

3.6.3 Electrical Interface

The electrical interface is:

- RS-485

- 2-wire

External System

| Serial Port | | RS-422 | RS-422 | TETRA |

Serial Port
P11
GND 1 & 16   1
RXP 1   2
TXP 1   3
RXN 1   14
TXN 1   15
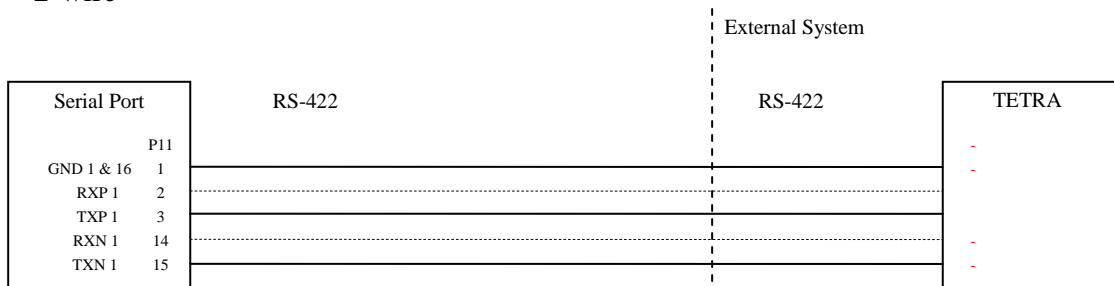
.... Dotted lines are not required since this is a one-way communication. The Vessel Management System will transmit telegrams continuously to the VDR system.

Serial Line Ch.:	1
Block / Sentence No.	1
Sentence:	GEN
Address:	0001
Size:	16-bit iobt

Description	Group / Bit (Field 3)			Remarks
PROPULSION ALARMS	1 / 0			
ENGINE ALARMS	1 / 1			
POWER ALARMS	1 / 2			
FIRE&GAS ALARMS	1 / 3			
BILGE ALARMS	1 / 4			
COMMON ALARMS	1 / 5			
BRIDGE ALARMS	1 / 6			
----- not defined-----	1 / 7..15			

3.6.3.1 NMEA communication to Conning Display

Communication Setup:

Description	Setting	Remarks
Serial channel	2 (RSER2)	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	9600	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	1	(RTU/ASCII NMEA) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.3.2 NMEA communication to Speed Log

Communication Setup:

Description	Setting	Remarks
Serial channel	3 (RSER2)	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	9600	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	1	(RTU/ASCII NMEA) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.4 FS-46

3.6.4.1 Profibus communication to HVAC Hull #1

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr HiAir Korea	30	Slave
DP adr IAS	3	Master
Transmission rate HiAir Korea	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	N/A	
OLM HiAir Korea	N/A	
OLM IAS	N/A	
HW Selection		Profibus copper cable

3.6.4.2 Modbus communication to Thruster Condition Monitoring

Communication Setup:

Description	Setting	Remarks
Serial channel	4	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	9600	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.5 FS-47

3.6.5.1 Modbus communication to Ballast Water Treatment System

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	9600	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.6 FS-53

3.6.6.1 Profibus ring communication to Drawwork (NOV)

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr NOV	1	Master
DP adr IAS	1	Master
Transmission rate NOV	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by NOV
OLM NOV	Siemens	Delivered by NOV
OLM IAS	Siemens	Placed in FS-53
HW Selection		Fibre optic cable

Connection vice, see appendix 1

3.6.6.2 Modbus communication to Diesel Generator #1

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.7 FS-54

3.6.7.1 Modbus communication to Diesel Generator #2

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.8 FS-55

3.6.8.1 Profibus ring communication to Drawwork (NOV)

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr NOV	1	Master
DP adr IAS	1	Master
Transmission rate NOV	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by NOV
OLM NOV	Siemens	Delivered by NOV
OLM IAS	Siemens	Placed in FS-53
HW Selection		Fibre optic cable

Connection vice, see appendix 1

3.6.8.2 Modbus communication to Diesel Generator #3

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.9 FS-56

3.6.9.1 Modbus communication to Diesel Generator #4

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.10 FS-57

3.6.10.1 Profibus ring communication to Drawwork (NOV)

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr NOV	1	Master
DP adr IAS	1	Master
Transmission rate NOV	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by NOV
OLM NOV	Siemens	Delivered by NOV
OLM IAS	Siemens	Placed in FS-53
HW Selection		Fibre optic cable

Connection vice, see appendix 1

3.6.10.2 Modbus communication to Diesel Generator #5

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.11 FS-58

3.6.11.1 Modbus communication to Diesel Generator #6

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.12 FS-71

3.6.12.1 Modbus communication to CCTV

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	9600	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.13 FS-91

3.6.13.1 Profibus communication to DCI (NOV)

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr NOV	48	Master
DP adr IAS	3	Master
Transmission rate NOV	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by NOV
OLM NOV	Siemens	Delivered by NOV
OLM IAS	Siemens	Placed in FS-91
HW Selection		Fibre optic cable

3.6.13.2 Modbus communication to HVAC Topside

Communication Setup:

Description	Setting	Remarks
Serial channel	2	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	0	(RTU/ASCII) (0/1)
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.13.3 Modbus communication to Upper Riser Inclinometer

Communication Setup:

Description	Setting	Remarks
Serial channel	1	(1-15)
No. of data bit	8	(5/6/7/8)
Baud rate	19200	(1200-38400)
No. of stop bit	1	(1/2)
Parity	2	(odd/even/no-1/2/3)
Protocol	NMEA	
Master/Slave	0	(0/1)
Slave Address	1	Excel Macro

3.6.14 FS-92

3.6.14.1 Profibus communication to ABB Topside

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr ABB	2	Slave
DP adr IAS	3	Master
Transmission rate ABB	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	N/A	
OLM ABB	N/A	
OLM IAS	N/A	
HW Selection		Profibus copper cable

3.6.15 FS-201

3.6.15.1 Profibus communication to ABB Thruster #1

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr ABB	30	Master
DP adr IAS	3	Master
Transmission rate ABB	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by ABB
OLM ABB	Siemens	Delivered by ABB
OLM IAS	Siemens	Placed in FS-201
HW Selection		Fibre optic cable

3.6.16 FS-202

3.6.16.1 Profibus communication to ABB Thruster #2

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr ABB	30	Master
DP adr IAS	3	Master
Transmission rate ABB	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by ABB
OLM ABB	Siemens	Delivered by ABB
OLM IAS	Siemens	Placed in FS-202
HW Selection		Fibre optic cable

3.6.17 FS-203

3.6.17.1 Profibus communication to ABB Thruster #3

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr ABB	30	Master
DP adr IAS	3	Master
Transmission rate ABB	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by ABB
OLM ABB	Siemens	Delivered by ABB
OLM IAS	Siemens	Placed in FS-203
HW Selection		Fibre optic cable

3.6.18 FS-204

3.6.18.1 Profibus communication to ABB Thruster #4

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr ABB	30	Master
DP adr IAS	3	Master
Transmission rate ABB	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by ABB
OLM ABB	Siemens	Delivered by ABB
OLM IAS	Siemens	Placed in FS-204
HW Selection		Fibre optic cable

3.6.19 FS-205

3.6.19.1 Profibus communication to ABB Thruster #5

Performance and Settings:

Description	Type	Remarks
Profibus	DP	GSD file SI018070.GSE
DP adr ABB	30	Master
DP adr IAS	3	Master
Transmission rate ABB	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by ABB
OLM ABB	Siemens	Delivered by ABB
OLM IAS	Siemens	Placed in FS-205

HW Selection		Fibre optic cable	

3.6.20 FS-206

3.6.20.1 Profibus communication to ABB Thruster #6

Performance and Settings:

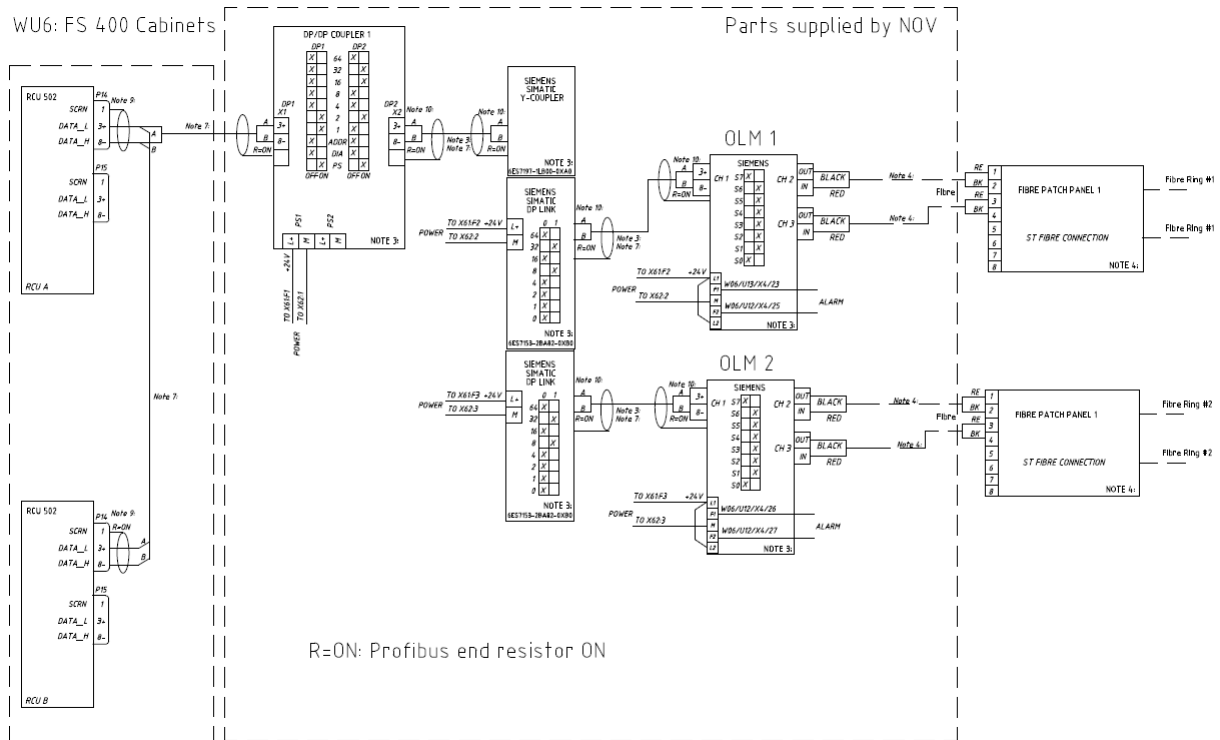| **Description**	**Type**	**Remarks**
Profibus	DP	GSD file SI018070.GSE
DP adr ABB	30	Master
DP adr IAS	3	Master
Transmission rate ABB	1500kpbs	
Transmission rate IAS	1500 kpbs	
DP/DP-coupler	Siemens	Delivered by ABB
OLM ABB	Siemens	Delivered by ABB
OLM IAS	Siemens	Placed in FS-206
HW Selection		Fibre optic cable

4 APPENDIX 1

Figure show the interface connection for the profibus line coming form the DPLS (NOV).