Freshwater cooling pump software description

FW VFD implementation

Onbaord Deepsea Aberdeen there are eight main freshwater cooling pumps, two in each pump room. All the pumps will be fitted with Variable speed drives (VFD) to actively regulate the flow of the FW cooling system by regulating for pressure. The relevant pumps are listed below:

Tag	Description	Disch. PT
722-PA-001A	FRESH WATER COOLING PUMP PORT FWD	722-PT-103
722-PA-001B	FRESH WATER COOLING PUMP PORT FWD	722-PT-106
722-PA-001C	FRESH WATER COOLING PUMP STBD FWD	722-PT-203
722-PA-001D	FRESH WATER COOLING PUMP STBD FWD	722-PT-206
722-PA-002A	FRESH WATER COOLING PUMP PORT AFT	722-PT-303
722-PA-002B	FRESH WATER COOLING PUMP PORT AFT	722-PT-306
722-PA-002C	FRESH WATER COOLING PUMP STBD AFT	722-PT-403
722-PA-002D	FRESH WATER COOLING PUMP STBD AFT	722-PT-406

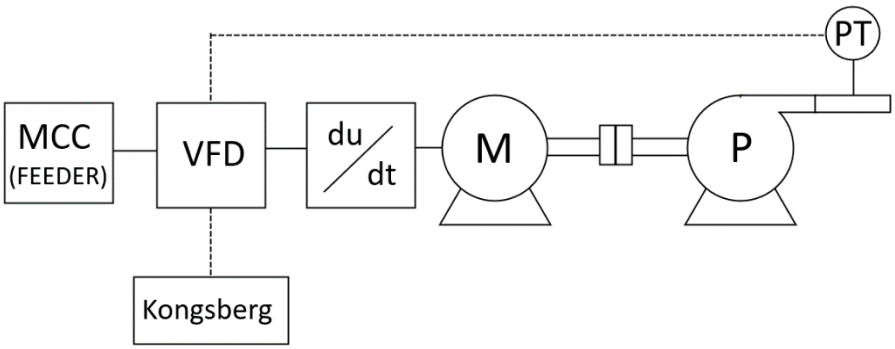
The VFDs for the FW pumps will be controlled by the IAS via Profibus-DP communication. The existing Main/standby pump logic will remain as is. The existing power fault detection is to be eliminated and replaced with pressure fault detection logic. In the following cases below, the main pump is to stop and the standby pump is to start:

- VFD Tripped
- VFD Pressure fault
- VFD Pressure sensor failure

In the case of a fault, the control room operator has the option to reset the fault in IAS.

In the case of communication failure, the IAS is only to start backup pump when a pressure drop is detected, or if manually overridden. Even with a communication failure the VFD should continue to work normally, running on integrated controller unless it has had a power loss.

The VFDs speed will be determined by a pressure controller integrated in the VFD's software. The pressure setpoint will be written to the VFD by IAS as a 16 bit. The VFD will be connected to the relevant PT sensor in series with the IAS, giving both the VFD and IAS access to the same PT data.



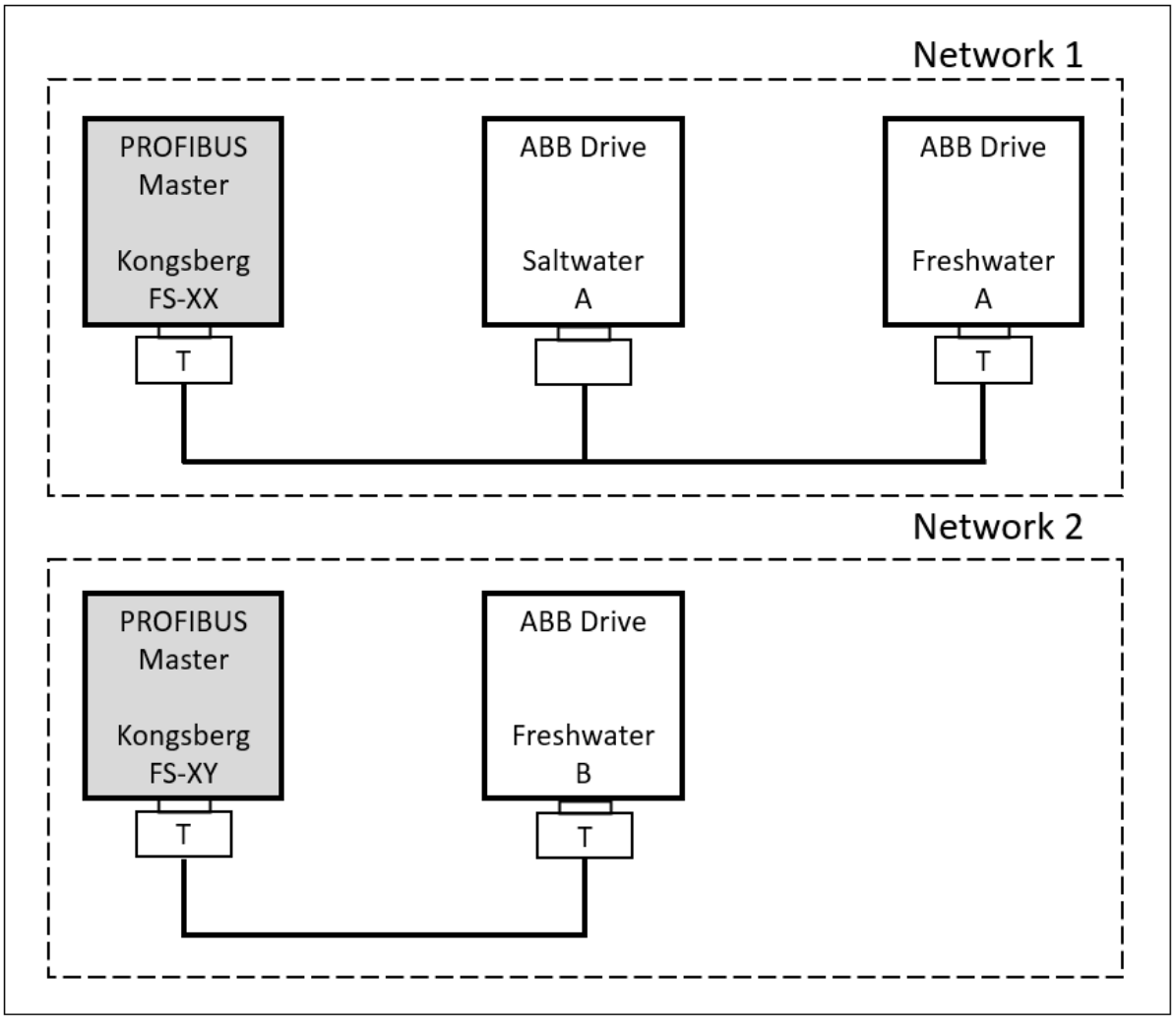
Speed in % and kW output is to be displayed on IAS control panel.
In the case of High Du/dt temp, a warning is to be displayed on control panel and recommended to change drive.

Profibus-DPv1 Communication

Communication:

DSG File	Telegram Name	Cyclic telegram Length
https://new.abb.com/drives/connectivity/fieldbus-connectivity/profibus/profibus-dp-fpba	**PPO 6**	**0 PKW + 10PZD In/Out**

Each quadrant will consist of two Profibus-networks to ensure redundancy. Each network consists of a Kongsberg RCU (remote controller unit), one SW pump VFD, and one FW pump VFD. The Kongsberg RCU will act as the Master, and the VFD's will act as slaves.



Input

Address	Name	Length	Description
FBA Data out 1	Control Word	16bit	See control Word description below. (Start, Stop, Reset)
FBA Data out 2	Pressure reference	16bit	Pressure reference = pressure setpoint in IAS*100. Example: 7.2Bar = 720.

Output

Address	Name	Length	Description
FBA Data in 1	Status Word	16bit	See status Word description below.
FBA Data in 2	Speed %	16bit	Range 0-100%
FBA Data in 3	KW output	16bit	Power output = (Value from drive)/10000. Example: 16000/10000 = 1.6kW

Control Word

Bit	Name	Description
0 (LSB)	Off1 Control (Start Stop)	True = start, False = stop
1	Off2 Control	ALWAYS TRUE
2	Off3 Control	ALWAYS TRUE
3	Run	ALWAYS TRUE
4	Ramp out zero	ALWAYS TRUE
5	Ramp Hold	ALWAYS TRUE
6	Ramp In zero	ALWAYS TRUE
7	Reset	True = reset alarm and faults
8	Inching 1	ALWAYS FALSE
9	Inching 2	ALWAYS FALSE
10	Remote cmd	ALWAYS TRUE
11	Extr ctrl loc	ALWAYS FALSE
12	User bit0	ALWAYS FALSE
13	User bit1	ALWAYS FALSE
14	User bit2	ALWAYS FALSE
15 (MSB)	User bit3	ALWAYS FALSE

The highlighted bits are the relevant bits for control of the drive

Example:

Command	Binary	Hex
Start Drive	0000 0100 0111 1111	047F
Stop Drive	0000 0100 0111 1111	047E
Reset Alarm	0000 0100 1111 1111	04FE

Status Word

Bit	Name	Description
0 (LSB)	Ready to switch on	True = ready
1	Ready run	True = running
2	Ready ref	NA
3	Tripped	True = tripped
4	Off2 Inactive	NA
5	Off3 Inactive	NA
6	Switch-on inhibited	NA
7	Warning	True = warning
8	At setpoint	NA
9	Remote	True = System in remote mode
10	Above limit	NA
11	User bit0	NA
12	User bit1 (PT sensor failure)	False = Pressure sensor failure. pump stops and stby pump has to start
13	User bit2 (Du/dt cabinet temperature too high)	True = high, alarm needs to be displayed in IAS.
14	User bit3	NA
15 (MSB)		NA

The highlighted bits are the relevant for monitoring the Drive