■ Contents

■ Introduction

■ About this manual

This manual does not cover the basics of the AS-i system. Whenever it is necessary for gaining an understanding of the AS-i system please refer to the AS-i specification or master manual.

■ Assumptions

This manual assumes, that you are using a DANFOSS FCD300 with AS-i bus. The AS-I function is integrated in the FCD 300 AS-I bus version. Apart from an AS-i master no external components are necessary for achieving the function. Up to 31 slaves can be connected to the bus with a maximum bus length of 100 m without repeaters. For bus topologies refer to the AS-i specification.

■ Installation

■ Connection of the AS-i bus wire

The AS-I bus lines are to be connected to terminals 68 and 69 of the internal terminal strip. A round drop cable can be wired directly into the terminals by using a cable gland. A sealed M12 connector can be mounted into one of the M16 gland holes in the FCD enclosure. The M12 connector is to be wired to the terminals 68, 69 on the control terminal block. The connection is in the following way: AS-I+ to 68, AS-I- to 69.

■ Node address set up

The node address can be set up by a standard AS-i setting module or by the master according to the AS-i procedures.

■ Data Communication

■ Master considerations

The AS-i protocol version 2.11 profile 7.F is used.
The AS-i parameters 0-F are used to control the operation mode of the FCD300.

0 Reserved
1 Select set up 1
2 Select set up 2
3 Select set up 3
4 Select set up 4
5-9 Reserved
A Reference mode
B Status mode
C Status mode
D Diagnosis mode
E Reserved
F Inactive mode (default)

Operation of the unit requires the setting of the relevant AS-i parameter.
Normal mode uses parameters 1-4.

■ Cyclic Data transfer

Output data from the master is transmitted as a 4 bits control signal. Input data to the master is transmitted as a 4 bits status signal and a one bit information indicating, that the status of the FCD has changed to a predefined state (see FCD parameter 815).

■ Control signals

Control signals are used to control the function of the FCD. The functions are the same as available for the serial control word like start/stop, selection of pre set reference, selection of set up, reset of fault trip. The functions of the 4 bits are selectable to control any of the bits in the control word. (see section "serial communication with FCD300" in the *Design Guide MG.04.AX.YY*, FC protocol).
The digital inputs can still be programmed for the normal functions. AND and OR combinations are possible between the AS-i bus bits and the digital inputs. (FCD parameters 502-507).

Mode (AS-i parameter)	Bit 3	Bit 2	Bit 1	Bit 0
Normal mode (1-4)	Preset ref. MSB	Preset ref. LSB	Quick stop	Start
Reference mode (A)	Reference 15 steps. Stop, 0%, 7%, 14%,.....93%, 100%			
Status mode (B-C)	Same as Normal mode			
Diagnosis mode (D)	No function			Reset (toggle)
Inactive mode (F)	No function (bus time out initiated)			
Other modes (0, 5-9, E)	No function (bus time out initiated)			

Normal mode = default setting, the function is selectable (see parameters 811–814).

■ Reference signal

The reference signal is transmitted in reference mode (AS-i parameter A) as a 4 bit 15 step reference between min reference (1) and max reference (F) (resolution around 7 %). 0 forces a stop. The normal mode control configuration is frozen during this procedure. The reference is used as the basic reference, which can be added to the fixed references.

■ Status signals

The status word is the same as the serial bus status word with information like unit ready, running, tripped, and various warnings. The choice of status word bits are depending on the used AS-i parameter (0-F) Following status word bits are available as the 4 AS-i input bits to the master:

	Bit 3	Bit 2	Bit 1	Bit 0
Normal mode (1–4)	Warning	Run	Remote	Ready
Reference mode (A)	Actual speed			
Status mode (B)	In range	On reference	Coasted	Tripped
Status mode (C) Diagnosis mode (D)	Current	Thermal	Voltage	Tripped

One “peripheral fault bit” is available for the master indicating, that the status word has changed to a pre-defined state. The user can select the combination of relevant bits for triggering the peripheral fault bit.

■ Programming

811 CONTROL WORD CONFIG bit 00 (CW CONFIG 00)

Value:

Preset ref lsb (PRESET REF LSB)	[0]
Preset ref msb (PRESET REF MSB)	[1]
DC Braking (DC BRAKING)	[2]
Coasting stop (COASTING STOP)	[3]
Quick stop (QUICK STOP)	[4]
Freeze out freq (FREEZE OUT FREQ)	[5]
★Ramp stop start (RAMP STOP START)	[6]
Reset (RESET)	[7]
Jog (JOG)	[8]
Ramp 1 or ramp 2 (RAMP 1 OR RAMP 2)	[9]
Data valid (DATA VALID)	[10]
Relay 1-3 (RELAY 1-3)	[11]
No function (NO FUNCTION)	[12]
Select set up lsb (SELECT SET UP LSB)	[13]
Select set up msb (SELECT SET UP MSB)	[14]
Reversing (REVERSING)	[15]
No function (NO FUNCTION)	[16]

Function:

Select the function of this bit, to be the same as the function for one of the bits in theusual FCD control word.
(16 = no operation)

812 CONTROL WORD CONFIG bit 01 (CW CONFIG 01)

Value:

Preset ref lsb (PRESET REF LSB)	[0]
Preset ref msb (PRESET REF MSB)	[1]
DC Braking (DC BRAKING)	[2]
Coasting stop (COASTING STOP)	[3]
★Quick stop (QUICK STOP)	[4]
Freeze out freq (FREEZE OUT FREQ)	[5]
Ramp stop start (RAMP STOP START)	[6]
Reset (RESET)	[7]
Jog (JOG)	[8]
Ramp 1 or ramp 2 (RAMP 1 OR RAMP 2)	[9]
Data valid (DATA VALID)	[10]
Relay 1-3 (RELAY 1-3)	[11]
No function (NO FUNCTION)	[12]
Select set up lsb (SELECT SET UP LSB)	[13]
Select set up msb (SELECT SET UP MSB)	[14]
Reversing (REVERSING)	[15]
No function (NO FUNCTION)	[16]

Function:

Select the function of this bit, to be the same as the function for one of the bits in the usual FCD control word.
(16 = no operation)

813 CONTROL WORD CONFIG bit 02 (CW CONFIG 02)

Value:

★Preset ref lsb (PRESET REF LSB)	[0]
Preset ref msb (PRESET REF MSB)	[1]
DC Braking (DC BRAKING)	[2]
Coasting stop (COASTING STOP)	[3]
Quick stop (QUICK STOP)	[4]
Freeze out freq (FREEZE OUT FREQ)	[5]
Ramp stop start (RAMP STOP START)	[6]
Reset (RESET)	[7]
Jog (JOG)	[8]
Ramp 1 or ramp 2 (RAMP 1 OR RAMP 2)	[9]
Data valid (DATA VALID)	[10]
Relay 1-3 (RELAY 1-3)	[11]
No function (NO FUNCTION)	[12]
Select set up lsb (SELECT SET UP LSB)	[13]
Select set up msb (SELECT SET UP MSB)	[14]
Reversing (REVERSING)	[15]
No function (NO FUNCTION)	[16]

Function:

Select the function of this bit, to be the same as the function for one of the bits in the usual FCD control word.
(16 = no operation)

814 CONTROL WORD CONFIG bit 03 (CW CONFIG 03)

Value:

Preset ref lsb (PRESET REF LSB)	[0]
★Preset ref msb (PRESET REF MSB)	[1]
DC Braking (DC BRAKING)	[2]
Coasting stop (COASTING STOP)	[3]
Quick stop (QUICK STOP)	[4]
Freeze out freq (FREEZE OUT FREQ)	[5]
Ramp stop start (RAMP STOP START)	[6]
Reset (RESET)	[7]
Jog (JOG)	[8]
Ramp 1 or ramp 2 (RAMP 1 OR RAMP 2)	[9]
Data valid (DATA VALID)	[10]
Relay 1-3 (RELAY 1-3)	[11]
No function (NO FUNCTION)	[12]
Select set up lsb (SELECT SET UP LSB)	[13]
Select set up msb (SELECT SET UP MSB)	[14]
Reversing (REVERSING)	[15]
No function (NO FUNCTION)	[16]

Function:

Select the function of this bit, to be the same as the function for one of the bits in the usual FCD control word.
(16 = no operation)

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815 PERIPHERAL FAULT CONFIG
(PERIP FAULT CONF)

Value:

0	[0]
1	[1]
★2	[2]
3	[3]
4	[4]
5	[5]
6	[6]
7	[7]
8	[8]
9	[9]
10	[10]

Function:

This parameter is used to select for which combinations of bits in the status word, the user wants the Peripheral fault bit set.

■ **Changes par. 811-815**

Changes in the AS-i related Parameters 811-817 will not take effect until the AS-i supply has been removed and applied or if the communication is inactive (eg AS-i Parameter F).

Parameters 811–814, The default configuration will be:

AS-i Bit	Bit = 0	Bit = 1	Corresponds to control word bit
00	Ramp stop	Start	06
01	Q-stop		04
02		Ref. select, LSB	00
03		Ref. select, MSB	01

The control word bits not selected in parameters 811-814 will be set as follows (043C):

Bit no	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Value	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0

Parameter 815

The peripheral fault bit will be set if the bit value in the status word equals the table value:

Bit	Bit = 0	Bit = 1	Parameter value:										
			0	1	2*	3	4	5	6	7	8	9	10
00		Control ready			0	0	0	0	0	0	0	0	0
01		Drive ready			0	0	0	0	0	0	0	0	0
02	Coasting stop							0	0		0	0	0
03	No trip	Trip		1	1	1	1	1	1	1	1	1	1
04	Not used												
05	Not used												
06	Not used												
07	No warning	Warning				1	1	1		1	1	1	1
08	Speed <> ref	Speed = ref											0
09	Local control	Serial communication			0		0	0	0		0	0	0
10	Outside freq range	Freq limit OK										0	0
11		Motor running							0	0	0	0	0
12													
13		Voltage warning				1	1	1		1	1	1	1
14		Current limit				1	1	1		1	1	1	1
15		Thermal warning				1	1	1		1	1	1	1

NOTICE: If any of the above parameters 810-815 are to be changed, the FCD has to be powered off and on again, before the change will take effect.

■ Additional Information

■ Bus cycle times

Cyclic transfer 150 ms.

■ Bus time out

For bus time out function and setting see FCD300 series handbook. The bus time out will be activated if the control via the AS-i bus stops after it has been active at least once. Change to parameter 5-9,E,F will activate the bus time out, so the master should return to active control within the set time- out time.

■ Fault indication

The communication interface is powered via 24 V on the bus line. That means, no internal initialisation can be performed, before the bus line is connected. The green BUS LED indicates following status:

OFF	Communication interface has not been operating since power up of FCD (maybe missing bus connection).
Flashing fast	Communication interface operating, no communication with master.
Short flash	Operating in inactive mode (AS-i parameter F). If bus time out is activated, it will be executed.
Flashing slow	Communication ok, local control or local stop, bus control not possible.
ON	Communication ok, remote (bus) control.

■ Explanations

AS-I	Actor Sensor Interface.
AS-I parameter	Parameters (0-F) sent from the master used for setting a mode of operation.
FCD parameter	Parameters for setting up the function of the FCD300.
Control	Control the state of operation of the FCD300 (start, stop, set speed).

■ Warnings

If the AS-i wire is disconnected, or the AS- supply is interrupted the unit will be initialised to AS-i parameter F and will be inactive until a new valid parameter is transmitted (typically 1-4).

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