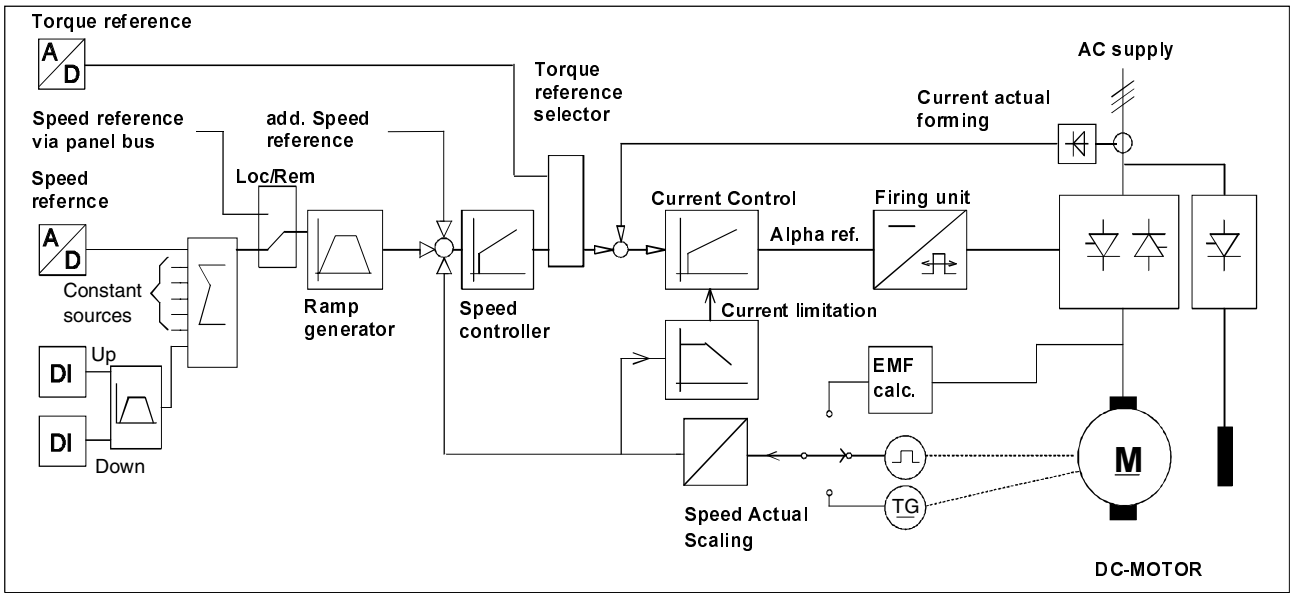
DCS 500 Thyristor Power Converter

for DC Drive Systems
25 to 5150 A

Software Description
DCS 500B



DC Drives 25 to 5150 A

SOFTWARE DESCRIPTION
for version 21.233

Code: 3ADW 000 078 R0301 Rev C

SWDB_E_C.DOC

EFFECTIVE: Aug. 1st, 2001
SUPERSEDES: Rev B Dec. 2nd, 1998

Contents

• General

The DC drive named DCS 500B is equipped with a SDCS-CON-2 microprocessor board. The original version was called DCS 500 and was equipped with a SDCS-CON-1 board.

The DCS 500B has a MODBUS communication bus connection, which is a common bus protocol for ABB Drives products for the panel link.

The DCS 500B drive can be controlled by means of digital and analog inputs or via the CDP 312 Control Panel.

The DCS 500B software contains the function blocks of a standard application program and function blocks which can be connected to each other to form more advanced application programs. A standard program is designed so that it contains numerous functions, is flexible and suitable for most of the basic drive applications.
Typical application areas for DCS 500B are:

- Winder control
- Master Follower
- Positioning Control
- Ski Lifts
- Battery Charging
- Cranes

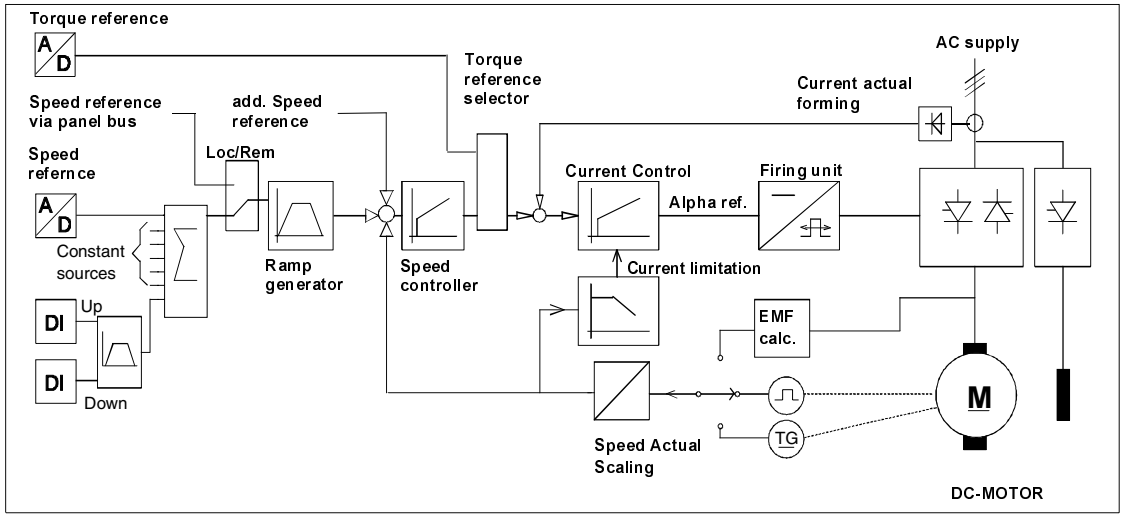


Figure 1 DCS 500B armature control

Software Overview

Parameter Sets

Two parameter sets are available for two different applications in a drive.
Example: A digital input can be used to select 1 of 2 parameter sets. Parameter set 1 is for motor set 1 and parameter set 2 is for motor set 2. A digital output is used to control external hardware which selects the actual motor 1 or motor 2 connection.

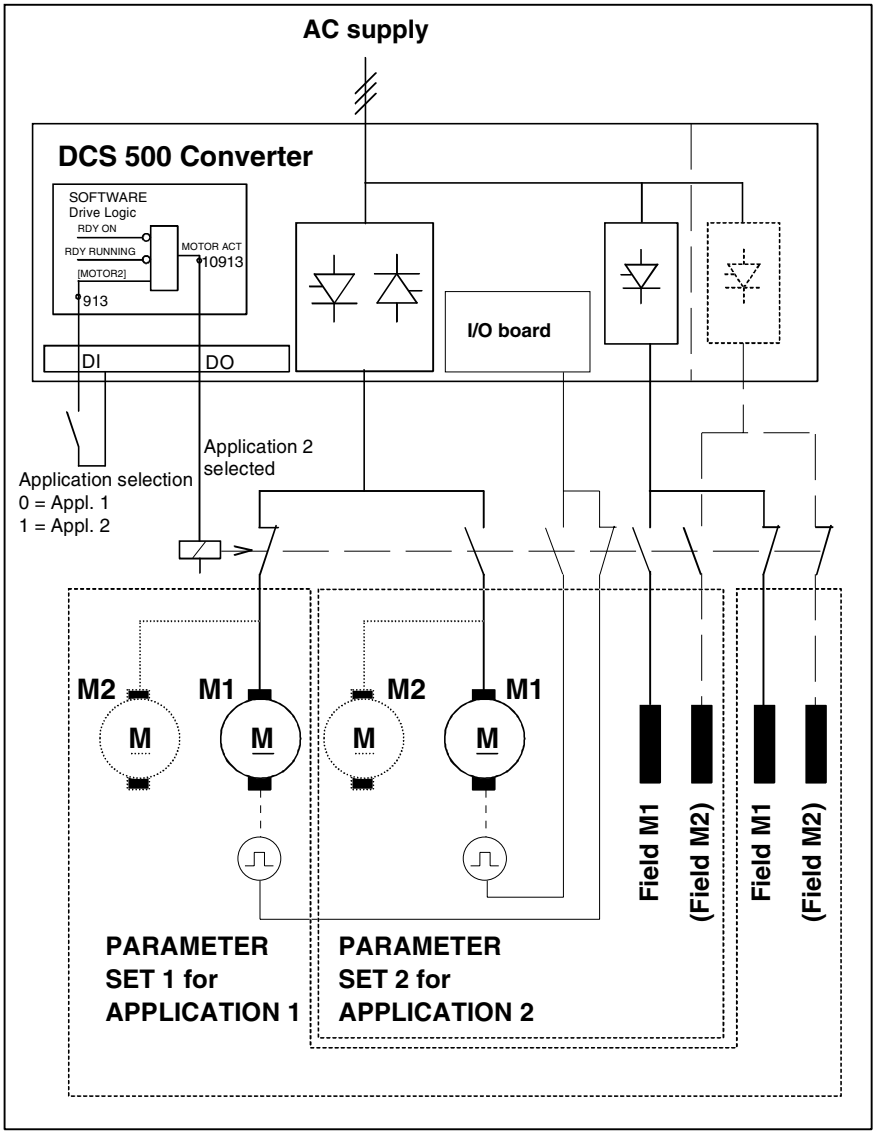


Figure 2 Two different applications in one drive

Saving the program

The **converter program** is stored in a FPROM memory circuit **(D33)**.The **parameters** for the converter and the field exciter are stored in one FPROM memory circuit **(D35)**. The circuits are installed on the control board SCDS-CON-2.

Parameter values will be saved by means of the parameter **BACKUP STORE MODE (11202)**. When the action is finished after writing or reading of parameters the mode is changed to 0 [NONE].

BACKUPSTORE MODE:

0 = **[NONE]**	no backup
1 = **[SAVE MOT1 SET]**	save motor set 1 to FPROM memory.
2 = **[SAVE MOT2 SET]**	save motor set 2 to FPROM memory.
3 = **[FACTORY SET VALUE]**	default values are restored to the RAM memory
4 = **[SELECT MOT1 SET]**	read motor set 1 from the FPROM memory
5 = **[SELECT MOT2 SET]**	read motor set 2 from the FPROM memory

Identification of the Converter Software version

The version of the software can be identified in two ways:

- software version is printed on the label which is located on the memory circuits D33.
- the signal **CNT SW VERSION (11218)** indicates the converter program version.

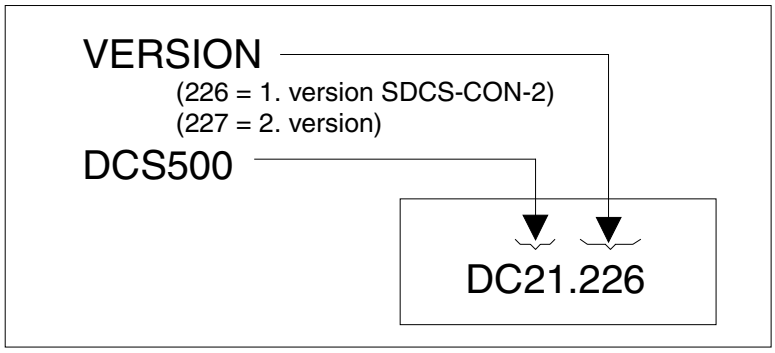


Figure 3 Identification labels of memory circuit D33

Identification of the Field Exciter Software version

If a **field exciter module SDCS-FEX-2 or DCF 503/4 (SDCS-FEX-3x)** is used the version of the field exciter software can be identified in two ways:

- software version is printed on a label on the micro controller of the field supply unit SDCS-FEX-2 or DCF 503/4
- the signal **FEXC1 SW VERSION (11220)** indicates the converter program version.
  when two field exciter units are installed in the drive, the program version of the second unit can be read from signal **FEXC2 SW VERSION (11221)**.

All the parameters of two-phase field exciter units are stored in the FPROM memory circuit (D35) of the converter.

Function Blocks

DCS 500B control program is made completely by function blocks. The program can be modified with the control panel CDP312 or a PC-based tool program CMT/DCS500B. Every function block, used in the control program, has a structure similar to the one shown in figure 4. Additional function blocks exist in every converter. They can be used in the same way as the ones, shown in this document. For more information, please see the *APPLICATION BLOCKS* manual.

If additional function blocks are used, the converter should be labeled with a sticker indicating the type of application by any code or plain text.

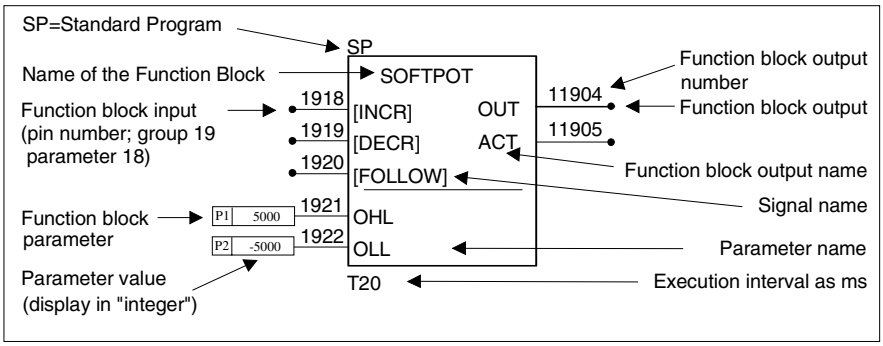


Figure *4* *Structure of a Standard Program Function Block*

All function block inputs characterized by a 3 or 4 digit number with no Px box (Px box displays values either in integer, relative or physical; see below) on the left hand side can be connected to a function block output. Inputs can only be connected to each other via a function block output (see next figure). Connections will be made by selecting the input and using the number of the output as a “parameter” value. Connecting more than one output to one input is not allowed!
All the values shown within the Px boxes within this document are given in Integer (micro processor) values. The scaling is according to the PARAMETER LIST. Using the CMT/DCS500 PC tool, the display can be altered between Integer, Relative (e.g. 78%) and Physical (1432 rpm). The CDP 312 panel will always show physical numbers.

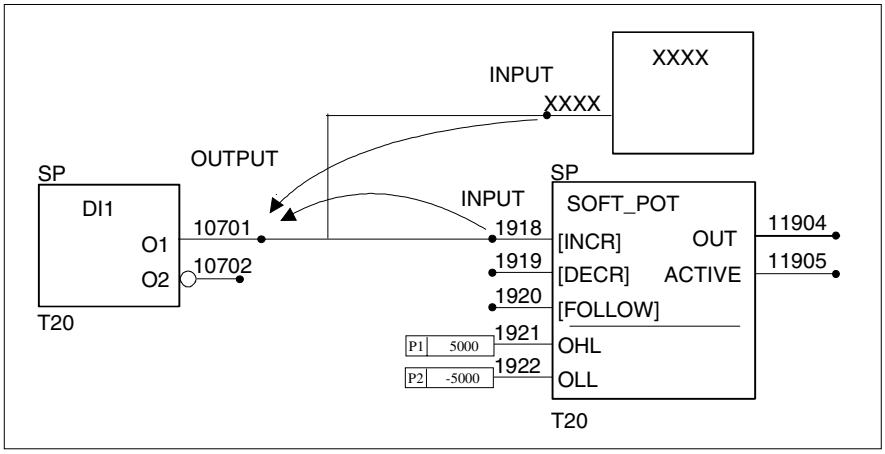


Figure *5* *Function block connection.*

Digital and Analog I/O

The analog and digital inputs and outputs are connected to the function blocks of the standard program to build up the drive application.

Digital Inputs

Standard I/O has eight digital inputs (DI1...DI8) which are connected via SDCS-IOB-2x or directly to the Control Board SDCS-CON-2.

I/O extension board SDCS-IOE-1 contains seven isolated digital inputs (DI9...DI15).

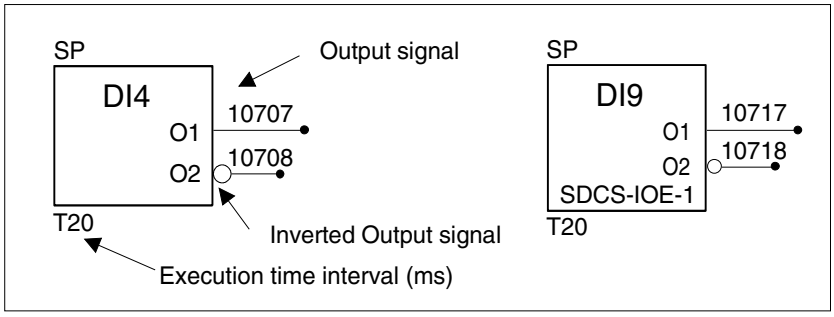


Figure *6* *Digital Input Function Blocks*

Digital Outputs

There are eight digital outputs and the connections are made to the SDCS-CON-2 or SDCS-IOB-2x boards.

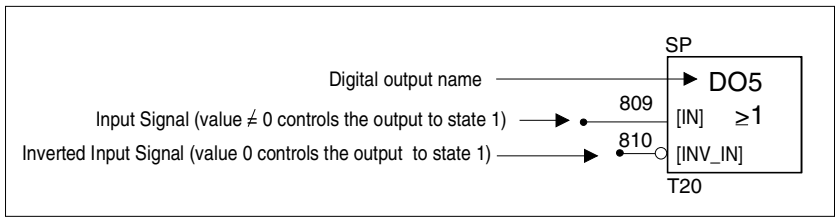


Figure *7* *Digital Output Function Block*

Analog Inputs

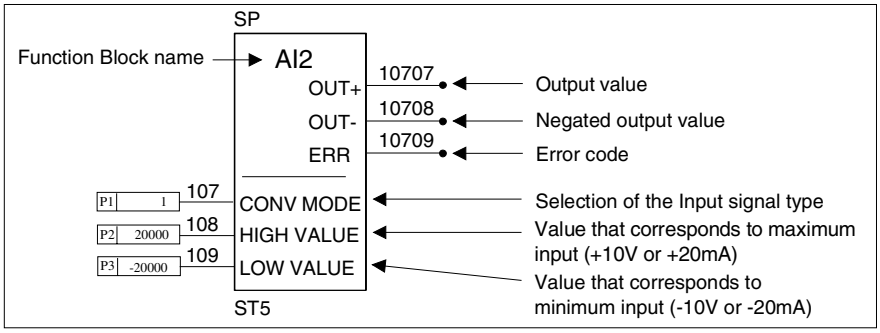


Figure *8* *Analog Input Function Block*

Maximum number of analog inputs is seven. The first five channels, AITAC, AI1, AI2, AI3 and AI4, are available with the SDCS-CON-2 or SDCS-IOB-3 boards. The last two channels, AI5 and AI6, are connected by means of the SDCS-IOE-1 extension I/O board.

Analog inputs are scaled with parameters:
HIGH VALUE (1XX) = value in OUT+ (XXXXX) that corresponds to maximum input value (normally +10V or +20 mA).
and
LOW VALUE (1XX) = value in OUT+ (XXXXX) that corresponds to minimum input value (normally -10V or +20 mA).
If offset balancing is needed, the value of the HIGH and LOW VALUE has to be increased or decreased slightly.

Note. The temperature measurements are scaled internally in AI2 and AI3 (Ω or °C). The parameters HIGH VALUE and LOW VALUE have no significance in that case.

Signal Type Selection for Inputs

The input signal type is defined by parameter **CONV** MODE **(1XX)**. The following table shows all possible values for analog input signals in the DCS500B software.

Analog Input	AIx CONV MODE-parameter selection	Terminal boards & settings:
AITAC	1 = -10...+10V -20...+20mA	IOB-3: ---- IOB-3: S1:1-2 connected
	2 = 4...20mA, unipolar	IOB-3: S1:1-2 connected
	3 = Tacho generator voltage - 10V...+10V	CON-2: 3:1-4: 90-270V X3:2-4: 30-90V X3:3-4: 0-30V
AI1	1 = -10...+10V -20...+20mA	CON-2; IOB-3: ---- CON-2: 500Ω connected X3:5-6 IOB-3: S1:3-4 connected
	2 = 4...20mA, unipolar	CON-2: 500Ω connected X3:5-6 IOB-3: S1:3-4 connected

Analog Input	AIx CONV MODE-parameter selection	Terminal boards & settings:
AI2	1 = -10...+10V -20...+20mA	CON-2; IOB-3: ---- CON-2: 500Ω connected X3:7-8 IOB-3: S1:5-6 connected
	2 = 4...20mA, unipolar	CON-2: 500Ω connected X3:7-8 IOB-3: S1:5-6 connected
	3 = Motor temperature measurement 1 x PT100; output scale: °C	IOB-3: S5:3-4 (5 mA), gain=10
	4 = 2 x PT100; output scale: °C	IOB-3: S5:3-4 (5 mA), gain =1
	5 = 3 x PT100; output scale: °C	IOB-3: S5:3-4 (5 mA), gain =1
	6 = PTC; output scale: ohm (Ω)	IOB-3: S5:1-2 (1.5 mA), gain =1
	7 = PTC; output scale: ohm (Ω)	CON-2: S1:23-24 (+10V source)
AI3	1 = -10...+10V -20...+20mA	CON-2; IOB-3: ---- CON-2: 500Ω connected X3:9-10 IOB-3: S1:7-8 connected
	2 = 4...20mA, unipolar	CON-2: 500Ω connected X3:9-10 IOB-3: S1:7-8 connected
	3 = Motor temperature measurement 1 x PT100; output scale: °C	IOB-3: S5:3-4 (5 mA), gain=10
	4 = 2 x PT100; output scale: °C	IOB-3: S5:3-4 (5 mA), gain =1
	5 = 3 x PT100; output scale: °C	IOB-3: S5:3-4 (5 mA), gain =1
	6 = PTC; output scale: ohm (Ω)	IOB-3: S5:1-2 (1.5 mA), gain =1
AI4	1 = -10...+10V -20...+20mA	CON-2: ---- IOB-3: S1:11-12 not connected S1:13-14 not connected CON-2: 500Ω connected X4:1-2 IOB-3: S1: 9-10 connected S1:11-12 not connected S1:13-14 not connected
	2 = 4...20mA, unipolar	CON-2: 500Ω connected X4:1-2 IOB-3: S1: 9-10 connected S1:11-12 not connected S1:13-14 not connected
	3 = Earth fault current measurement Output scale: A	IOB-3: S1:11-12 connected 13-14 connected 9-10 not connected Connection terminals: X3:11-12
AI5 on SDCS-IOE-1	1 = -10...+10V -20...+20mA	no action S1:3-4 connected
	2 = 4...20mA, unipolar	S1:3-4 connected
AI6 on SDCS-IOE-1	1 = -10...+10V -20...+20mA	no action S2:3-4 connected
	2 = 4...20mA, unipolar	S2:3-4 connected

Analog Input Error Codes

Analog input error codes can be seen from the ERR pin, if the hardware and software scalings are not compatible. Error codes are shown below.

Error Code	Text	Description
0	NO FAULT	No faults or CONV MODE = 0
1	I < 4 mA	CONV MODE = 2 and I < 4 mA
2	NO IOB-1/IOB-3	No IOB-1 or IOB-3 board connected
3	WRONG IOB:	
	AITAC	Only IOB-2 board connected, CONV MODE = 1 or 2 and IOB-3 is not connected CONV MODE = 3 and IOB-1 is not connected
	AI1	Only IOB-2 board connected
	AI2	Only IOB-2 board connected CONV MODE = 3,4,5,6 and IOB-3 is not connected CONV MODE = 7 and IOB-1 is not connected
	AI3	Only IOB-2 board connected CONV MODE = 3,4,5,6 and IOB-3 is not connected
	AI4	Only IOB-2 board connected CONV MODE = 3 and IOB-1 is not connected
4	LOW VAL.>HIGH VAL.	Low value > high value
5	NO IOE 1	Extension board not connected

EXAMPLE:
Rescaling, if reference is different to +/- 10V

A speed reference 0 ... +/- 8V is connected to analog input AI1:
- 0V = corresponds to zero speed
- +/- 8V corresponds to max speed

The speed loop at the control program is scaled to 20000 equal to top speed. The value in rpm, the program uses is specified at parameter SPEED_SCALING (2103).

Parameters have to be set:

CONV MODE (104) = 1 (voltage signal)
HIGH VALUE (105) = 25000 (see below)
LOW VALUE (106) = -25000 (see below)
If the reference is +4V, the speed reference value at output of the AI1 block (10104) is 10000.

general:

$$P10x = \frac{10V}{\max.reference} \bullet 20000$$

- don´t forget the sign!
- reference values higher than 10V can not be rescaled by the converter; the rescaling has to be done outside the converter
- references below 6,25V cannot be rescaled, because of the high limit of the scaling parameters

Analog Outputs

There are three analog output channels. Connections are made to either SDCS-CON-2 or SDCS-IOB-3 boards. The first two outputs (AO1 and AO2) are programmable, and the range of the outputs is +10V...-10V. The third output is an armature current actual measurement from the HW-circuit. For more detailed information, see TECHNICAL DATA.

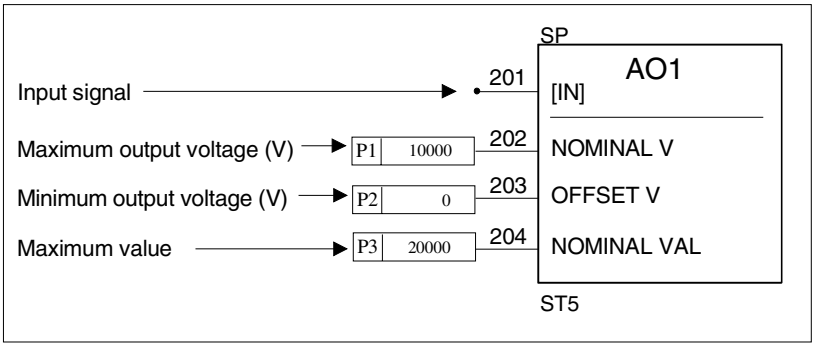
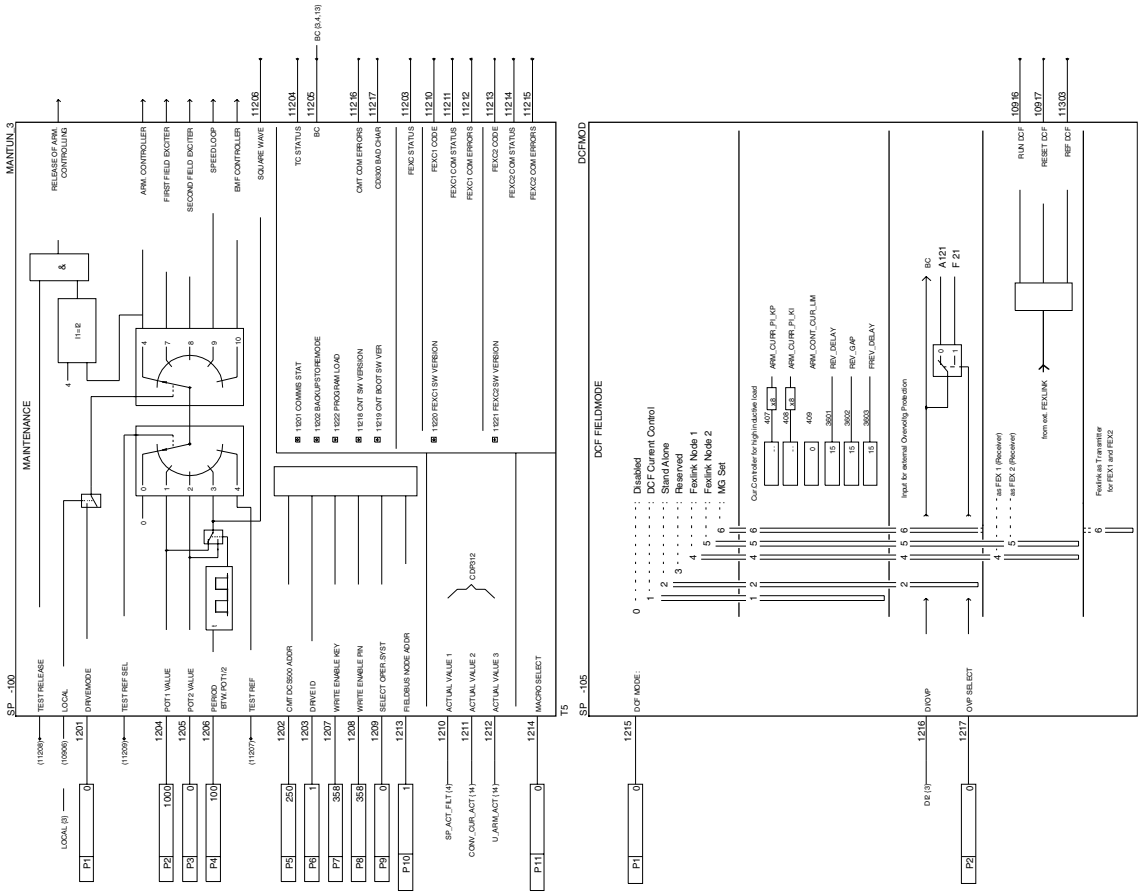


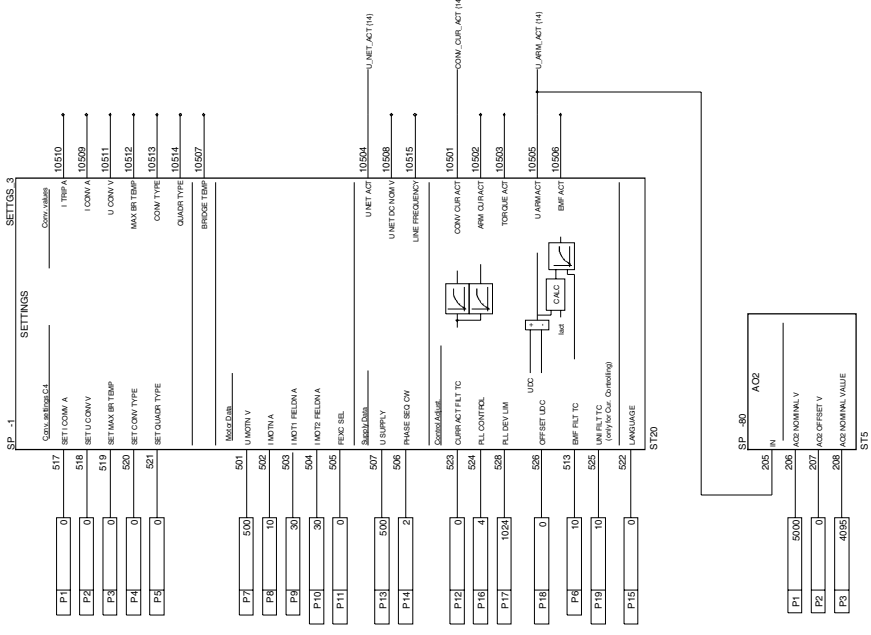
Figure *9* *Analog Output Function Block*

Example:
If the signal SPEED ACT (12102) is used in the analog output1, the settings are:

AO1 [IN] (201) = 12102
AO1 NOMINAL V (202) = 10
AO1 OFFSET V (203) = 0
AO1 NOMINAL VAL (204) = 20 000
With these settings the actual speed value 20000 corresponds to +10V output voltage.

$$U_{out} = \frac{[IN]}{NOMINAL\ VAL} \times NOMINAL\ V + OFFSET\ V$$


MANTUN_3
MAINTENANCE
SP -100
TEST RELEASE
LOCAL
DRIVEMODE
TEST REF SEL
POT1 VALUE
POT2 VALUE
PERIOD BTW POT1/2
TEST REF
CMT DCS500 ADDR
DRIVE ID
WRITE ENABLE KEY
WRITE ENABLE PIN
SELECT OPER SYST
FIELDBUS NODE ADDR
ACTUAL VALUE 1
ACTUAL VALUE 2
ACTUAL VALUE 3
MACRO SELECT
RELEASE OF ARM. CONTROLLING
ARM. CONTROLLER
FIRST FIELD EXCITER
SECOND FIELD EXCITER
SPEED LOOP
EMF CONTROLLER
SQUARE WAVE
TC STATUS
BC
CMT COM ERRORS
CMT BAD CHAR
FEXC STATUS
FEXC1 CODE
FEXC1 COM STATUS
FEXC1 COM ERRORS
FEXC2 CODE
FEXC2 COM STATUS
FEXC2 COM ERRORS
1300 FEXC1 SW VERSION
1321 FEXC2 SW VERSION
DCFMOD
DCF FIELDMODE
SP -105
DCF MODE
Disabled
DCF Current Control
Stand Alone
Reserved
Fexlink Node 1
Fexlink Node 2
MG Set
Cur.Controller for high inductive load
ARM_CURR_PI_KP
ARM_CURR_PI_KI
ARM_CONT_CUR_LIM
REV_DELAY
REV_GAP
FREV_DELAY
Input for external Overvolty Protection
DI/OVP
OVP SELECT
RUN DCF
RESET DCF
REF DCF
from ext. FEXLINK
Fexlink as Transmitter for FEX1 and FEX2


SP -1
SETTGS_3
SETTINGS
Conv.settings C4
Conv.values
SET I CONV A
SET U CONV V
SET MAX BR TEMP
SET CONV TYPE
SET QUADR TYPE
Motor Data
MOTN V
MOTN A
MOT1 FIELDN A
MOT2 FIELDN A
FEXC SEL
Supply Data
U NET DC NOM V
LINE FREQUENCY
Control Adjust
CURR ACT FILT TC
PLL CONTROL
PLL DEV LIM
OFF SET LDC
EMF FILT TC
UNI FILT TC (only for Cur. Controlling)
LANGUAGE
I TRIP A
I CONV A
U CONV V
MAX BR TEMP
CONV TYPE
QUADR TYPE
BRIDGE TEMP
U NET ACT
U SUPPLY
PHASE SEQ CW
CONV CUR ACT
ARM CUR ACT
TORQUE ACT
U ARM ACT
EMF ACT
U_NET_ACT [14]
CONV_CUR_ACT [14]
U_ARM_ACT [14]
ST20
SP -80
AO2
AO2 NOMINAL V
AO2 OFFSET V
AO2 NOMINAL VALUE
ST5

• *Settings and commissioning functions*

SETTINGS function block

This block serves for scaling all important signals. It is subdivided into 5 parts.
The parameters 517 to 521 are only needed, if a C4 type converter is used. For more details, please see OPERATING INSTRUCTION.

In special cases, the calculated EMF needs to be smoothed. Parameter **EMF_FILT_TC (513)** serves for this reason.

The converter can display parameters and internal signals in physical values. To be able to do so, some basic values have to be scaled:

U_MOTN_V (501)	nominal motor voltage
I_MOTN_A (502)	nominal motor current
I_MOT1_FIELDN_A (503)	nominal field current for field supply unit 1
I_MOT2_FIELDN_A (504)	nominal field current for field supply unit 2, if there is one
FEX_SEL (505)	selection of field supply unit

There are several signals, which can be used for indication. The signal armature voltage is already connected to the analog output 2. The scaling of these signals is different.

U_ARM_ACT (10505) actual DC output voltage
scaling: 100% = 4095 equal 1.35 * P507 in volt

TORQUE_ACT (10503) calculated actual torque, based on armature current and flux signal
scaling: 100% = 4000 equal nominal motor torque, if P502 is set to nominal motor current and P503/504 is set to nominal motor field current

CONV_CUR_ACT (10501) actual DC output current
scaling: 100% = 4095 equal nominal converter current in A

ARM_CUR_ACT (10502) actual DC output current
scaling: 100% = 4095 equal nominal motor current in A, if P502 is set to nominal motor current

CURR_ACT_FILT_TC (523) serves for smoothing of current actual signals 10501 and 10502

In a similar way, some basic scalings have to be done for the motor, they have to be done for the network too.

PHASE_SEQ_CW (506)	phase rotation
U_SUPPLY (507)	nominal line voltage

The language, in which you want to read your information on the panel, can be selected by
LANGUAGE (522) selection of language at CDP 312

For more details, refer to the special chapter or the OPERATING INSTRUCTION.

MANUAL TUNING function block

The controllers of the DCS 500B drive can be tuned manually or automatically. There is an automatic tunig function for the armature and field current controller. The speed loop, the armature current, the EMF and field current controller can be manually tuned. Both tuning methods are initalized by a parameter.

Selection of the tuning

The manual tuning can be done if LOCAL-mode is selected with the panel or by external digital I/O.

The selection is made by means of parameter:
DRIVEMODE (1201)
4 = armature current controller
7 = first field exciter
8 = second field exciter
9 = speed loop (reference chain and speed controller)
10 = EMF controller

Selection replaces normal references to the controllers or the speed loop with the manual tuning reference. E.g. in a case of the speed loop the LOCAL SPEED REF is replaced with manual tuning reference.
Source of the manual tuning reference can be selected from four different sources:
POT1 VALUE (1204) range: -32 768...32 767
POT2 VALUE (1205) range: -32 768...32 767
SQUAREWAVE (11206)
generator whose levels are set with POT1 and POT2 VALUE and time interval with **PERIOD btw.POT1/2 (1206)**
TEST REF (11207) range: 0...65 535
The selection is made by the signal **TEST REF SEL (11209)**.

0 = [ZERO] reference is zero
1 = [POT1] **POT1 VALUE (1204)**
2 = [POT2] **POT2 VALUE (1205)**
3 = [SQRW] **SQUAREWAVE (11206)**
4 = [TEST] **TEST REF (11207)**

During the manual tuning measurements can be made e.g. with CMT/DCS500 tool or analog outputs.

To set the level of the POT1/2 and the TEST REF has to be in the normal reference range of destination.

Autotuning

see OPERATING INSTRUCTION

When a DRIVEMODE function was used status codes are indicated by the signal **COMMIS STAT (11201)**:

0 = NOT ACTIVATED
selected function successfully worked out

Messages, which may come up, if a SDCS-CON1 is used:

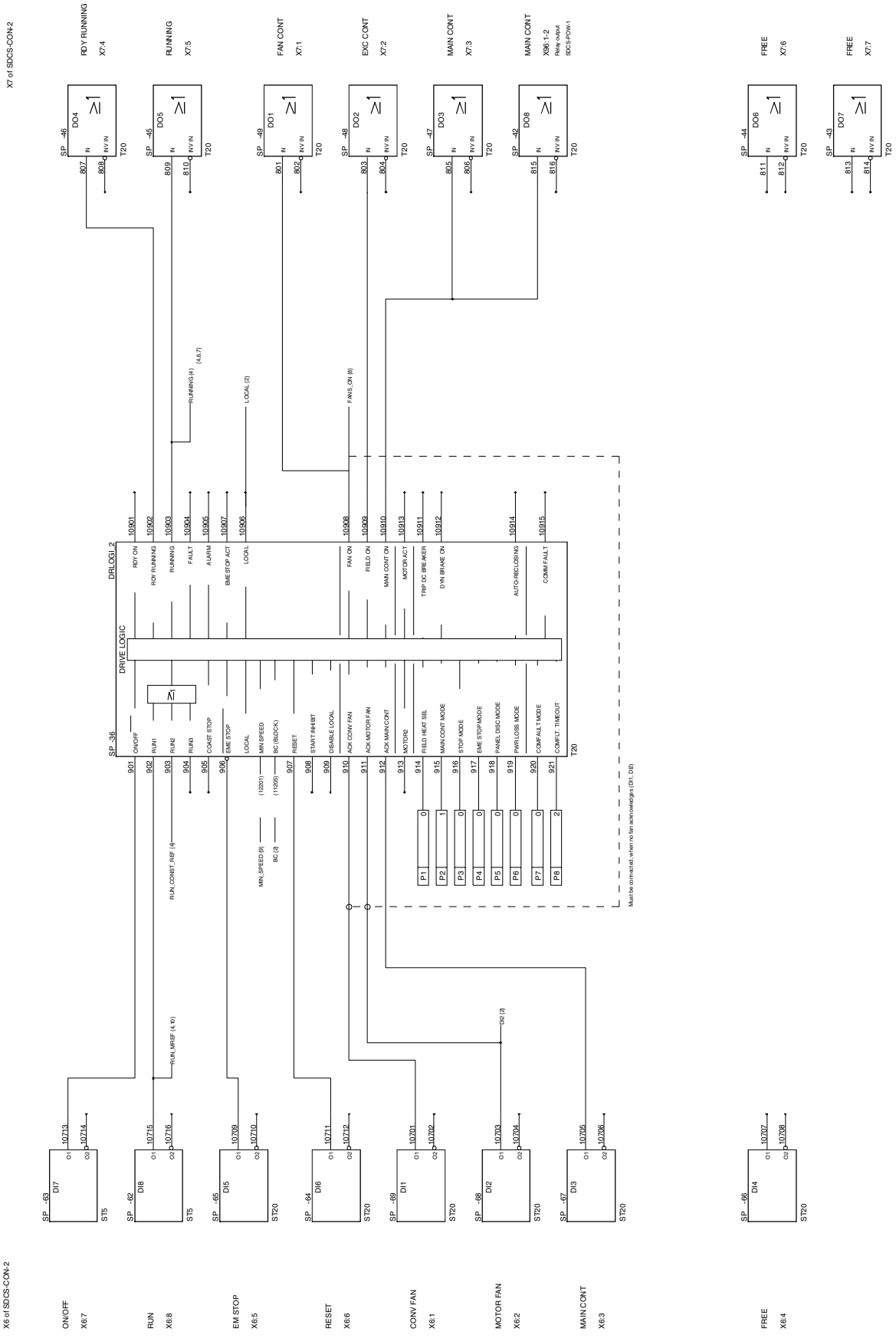
1 = RUN COMMAND ?	See code 53
2 = FEXC SEL ?	Wrong FEX selection
3 = FEXC RDY OPER	FEX1 / 2 or DCF 503/4 not ready for operation
4 = FEXC OK=0	Field supply not o.k.; see error message on the display of the converter
5 = FIELD ON=0	FEX1 / 2 or DCF 503/4 not switched on
6 = IF NOT IN 95-105%	Field current not within 95% 105%
7 = NOT OK AFTER 20s	Drive was not released by hardware within 20s
8...48 = reserved	

Messages, which may come up, if a SDCS-CON2 and DRIVE _MODE = 3 [ARM. AUTOTUNING] autotuning of armature current controller is used:

49 = IF AT START ?	Field current does not reach reference within 10s, when the selftuning is started
50 = OHMIC LOAD	Ohmic load not determined
51 = IACT FEEDBACK	Current feedback is less than current reference during measurement of armature resistance. Current limits are lower than the limit for continous current flow or lower than 20%.
52 = CURRENT CURVE	Bad current curve. Fuse blown,thyristor not firing or no motor load.
53 = RUN COMMAND ?	Wrong starting conditions. The drive is running when the autotuning is started or run command is not given within 20 s after start of autotuning.
54 = TOO HIGH SPEED	Too high speed during autotuning .Speed greater than 1% or EMF greater than 15%.
55 = INDUCTANCE	Inductance cannot be determined. Fuse blown, thyristor not firing or no motor load.
56 = CONT CURR LIM	Limit for continous current flow cannot be determined.
57 = FIELD REMOVAL	The field removal takes longer time than 10 s.
58 = STOP COMMAND	Current regulator blocking or stop command appears during autotuning.

Messages, which may come up, if a SDCS-CON2 and DRIVE _MODE = 5 [FEX2/3 AUTOTUN] autotuning of field current controller with FEX2 or DCF 503/4 is used:

60 = CANNOT AUTOTUNE	The field current controller cannot be set by this function
61 = ILL START COND	Illegal start condition for field autotuning


X7 of SDCS-CON-2
RDY RUNNING
X7:4
RUNNING
X7:5
FAN CONT
X7:1
EXC CONT
X7:2
MAIN CONT
X7:3
MAIN CONT
X36:1-2
Relay output
SDCS-POW-1
FREE
X7:6
FREE
X7:7
DO4
DO5
DO1
DO2
DO3
DO8
DO6
DO7
DRLOGI 2
DRIVE LOGIC
SP -36
ON/OFF
RUN1
RUN2
RUN3
COAST STOP
EME STOP
LOCAL
MIN SPEED
BC (BLOCK)
RESET
START INHIBIT
DISABLE LOCAL
ACK CONV FAN
ACK MOTOR FAN
ACK MAIN CONT
MOTOR
FIELD HEAT SEL
MAIN CONT MODE
STOP MODE
EME STOP MODE
PANEL DISC MODE
PWR LOSS MODE
COMP FALT MODE
COMP LT. TIMEOUT
RDY ON
RDY RUNNING
RUNNING
FAULT
ALARM
EME STOP ACT
LOCAL
FAN ON
FIELD ON
MAIN CONT ON
MOTOR ACT
TRIP DC BREAKER
DYN BRAKE ON
AUTO-RECLOSING
COMM FAULT
RUNNING (4)
(4,6,7)
LOCAL (2)
FANS_ON (8)
RUN_CONST_REF (4)
RUN_MREF (4 10)
MRL_SPEED (9)
(12201)
BC (3)
(11205)
DI2 (2)
Must be connected when no fan acknowledge is (DI1, DI2)
ON/OFF
X6:7
RUN
X6:8
EM STOP
X6:5
RESET
X6:6
CONV FAN
X6:1
MOTOR FAN
X6:2
MAIN CONT
X6:3
FREE
X6:4
X6 of SDCS-CON-2
DI7
DI8
DI5
DI6
DI1
DI2
DI3
DI4
ST5
ST20

• Drive Logic

The purpose of the Drive Logic is to control the main, excitation and fan contactors, start and stop the drive and protect the drive in fault situation. The Drive Logic contains the outputs which indicate the state of the drive.

DRIVE LOGIC function block

The explanation given within the next paragraphs is based on the default structure of the converter. In this case, the configuration is identical to speed control with speed controller and current controller. This logic has been changed compared to earlier software versions. In this version the signals ON/OFF and RUN1/2/3 are edge sensitive. When the electronics of the drive is switched on, the binary inputs must have 0 status. Otherwise, the drive will not start, until the first 0 to 1 transition is received by the input.

Closing Control of the Contactors

If the output **RDY ON (10901) = 1** (no FAULT), then the outputs for handling the main, field and fan contactor(s) of the drive can be closed by giving the logical 1 command (edge sensitive; 0 to 1 transition!) to the input **[ON/OFF] (901)**. Parameter **MAIN_CONT_MODE (915)** defines the main contactor control mode:

0 = closed when both **[ON/OFF] (901)** and ([**RUN1] (902)** or **[RUN2] (903)** or [**RUN3] (904)**) inputs are in state 1

1 = close when **[ON/OFF] (901)** is in logical state 1

The following sequence will take place when **[ON/OFF] (901)** changes from 0 to 1:

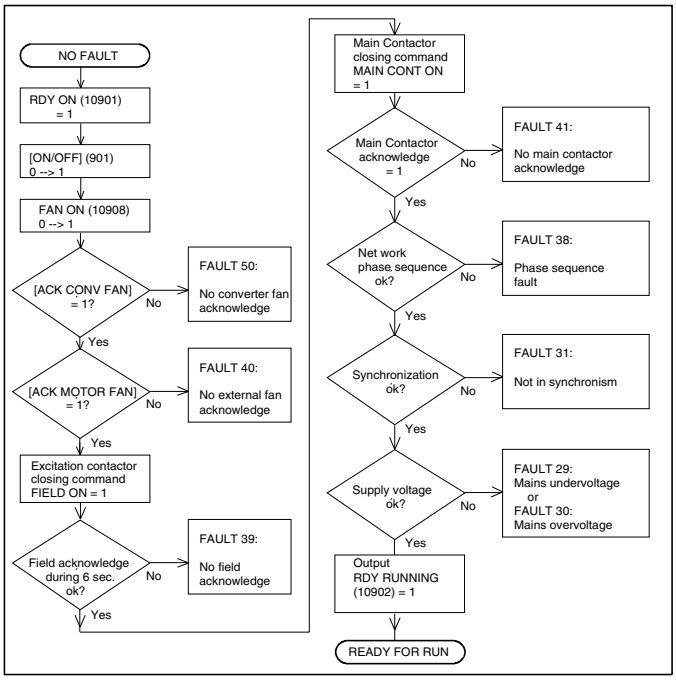


Figure *11* *RDY RUNNING sequence.*

Opening Control of the Contactors

If the signal **[ON/OFF] (901)** changes from 1 to 0 (edge sensitive), the drive will block the controllers immediatelly and start a delay time. Because of the regulator blocking the armature and field current will be forced to zero. When the delay time has elapsed the outputs for handling the contactors will be set to 0; the contactors should drop off.
This input has the second highest priority. The sequence described before will be worked out independant from the drive condition (with / without speed; with / without armature current).

In case of tripping, the fan, field and main contactors are opened in a certain order which depends on the type of the fault. Fault activates the output **FAULT (10904)** to logical state 1.

If a motor or converter overtemperature fault is detected, the outputs for handling the cooling fans are kept high until the measured temperature has decreased below the alarm level.
The drive will accept a reset-command, when the temperature has decreased below the fault level. In this case the outputs for the fan contactors will be reset.

There are 3 different types of faults:
- Faults which trip the main contactor:
- Faults which trip main contactor and field contactor
- Faults which trip main contactor, field contactor and fans

for more detailed information, please see

manual OPERATING INSTRUCTION

The input **START_INHIBIT] (908)** has the highest priority. If this input is set to 1, the outputs for the handling of the contactors can never be forced to level 1, if the drive is at standstill. If the drive is running and the input is set to 1, the drive will act in the same way as if **[ON/OFF] (901)** is set to 0. Afterwards the drive cannot be switched on as long as **START_INHIBIT (908)** has logic 1 level.

When dynamic braking is used (output **DYN BRAKE ON (10912)**), an external resistor is connected in parallel with the armature module. If the drive trips, the field of the motor must be maintained, otherwise the resistor cannot produce fast deceleration.

Run Control

When **RDY RUNNING (10901)** = 1, the drive can be started by setting either input **[RUN1] (901)**, **[RUN2] (902)** or **[RUN3] (903)** to state 1. The drive releases the references and controllers and sets the **RUNNING** (**10903)** signal to logical state 1. Another way to start the drive is by Control Panel CDP312 in local mode using the start button.

Stop Control

The drive can be stopped in the following ways:

- By opening the Main Contactor:
  Controlling **[ON/OFF] (901)** input to zero state. All contactors will open and there is no electrical braking. The drive will stop by coasting (see opening control of the contactors).
  This stop mode cannot interrupt Emergency Stop, Stop because of panel or field bus link problems.

- RUN-command to zero
  If all RUN inputs **[RUN1] (902)**, **[RUN2] (903)** or **[RUN3] (904)** are set to zero , the drive will stop.
  This stop mode can be interrupted by Emergency Stop, Stop because of panel or field bus link problems.

  Parameter **STOP MODE (916)** defines how the stop is made:
  0 = stop by ramp (**DECEL1 (1709)** or **DECEL2 (1712)**) at RAMP GENERATOR function block
  1 = stop by torque limit (TORQ_MAX / TORQ_MIN)
  2 = stop by coasting (torque is zero)

  If the drive is stopped and should be restarted, the actual condition of the drive has to be taken into consideration:
  - if **STARTSEL (1717)** = 0 (start from zero):
    a. and the actual speed is below **MIN_SPEED_L (2201)** the drive accepts the 0 to 1 transition of the RUN command and will accelerate according to the reference without handling the ON/OFF signal
    b. and the actual speed is above **MIN_SPEED_L (2201)** the 0 to 1 transition is ignored as long as the speed is above this level; if this cannot be accepted because of any reason (e.g. stop by coasting) both inputs must have logic 0 level; afterwards, ON/OFF and RUN should be set to 1 (edge sensitive); the drive will force the motor to zero speed by the torque limit at first and afterwards, the drive will accelerate according to the reference; this behaviour is independant from the selected stop mode
    remark: if EMF is selected as a speed feedback signal, it may happen, that the drive reacts according to a, because the MIN_SPEED_L is too smal

- if **STARTSEL (1717)** = 1 (flying start):
  the RUN command is no longer edge sensitive; the drive will accelerate according to the reference, when the RUN command is set to 1, independant, if the actual speed was zero or different to zero before; if the drive was stopped by the ON/OFF command (the RUN command was kept to logic 1 level), it will react when ON/OFF changes from 0 to 1 in the same way, as if the RUN command would have been used

- Coast Stop

  When **[COAST STOP] (905)** input is set to logical state 1, regulators are blocked and contactors remain closed. The drive is allowed to decelerate freely towards zero speed. As long as the drive stops in this way, the stop functions available with the RUN command are disabled and vice versa.
  This stop mode can be interrupted by Emergency Stop, Stop because of panel or field bus link problems.

- Emergency Stop

  If **[EME STOP] (906)** signal is set from 1 to 0, the emergency stop function is activated. The reaction of the drive can be defined by paramter **EME STOP MODE (917)** :

  0 = stop by ramp (**EMSTOP_RAMP (1714)**) at RAMP GENERATOR function block
  1 = stop by torque limit
  2 = coast stop (torque is zero)
  3 = dynamic brake

  The state of the output signal **EMESTOP ACT (10907)** changes 0 -> 1. The drive will come up with an ALARM, which must be reset and which will open all contactors at zero speed (with coasting immediatelly).
  For resetting the fault, see OPERATING INSTRUCTION
  This stop mode can interrupt the Stop because of panel or field bus link problems.

- Stop because of problems with the panel link (communication between drive and control panel CDP 312)
  if the serial link between the drive and the control panel is interrupted by any reason (panel removed from the drive, cable broken, etc) the reaction of the drive can be specified by paramter **PANEL_DISC_MODE (918)**:
  0 = stop by ramp (**DECEL1 (1709)** or **DECEL2 (1712)**) at RAMP GENERATOR function block
  1 = stop by torque limit (TORQ_MAX / TORQ_MIN)
  2 = stop by coasting (torque is zero)
  3 = stop by dynamic brake
  4 = continue remote
  The drive will come up with a FAULT, which must be reset and which will open all contactors at zero speed (with coasting immediatelly).

- Stop because of problems with the field bus serial link (communication between drive and progr. logic controller)
  if something is wrong with the field bus serial link (between PLC and serial link adapter module or between adapter module and drive) the reaction of the drive can be specified by parameter **COMFAULT_MODE (920)**:
  0 = stop by ramp (**DECEL1 (1709)** or **DECEL2 (1712)**) at RAMP GENERATOR function block
  1 = stop by torque limit (TORQ_MAX / TORQ_MIN)
  2 = stop by coasting (torque is zero)
  3 = no action
  The drive will FAULT and must be reset and will open all contactors at zero speed (with coasting immediatelly).

Reset the drive fault

The drive can be reset using the input **[RESET] (907)** or in local control mode by means of the control panel CDP312 by pressing the **RESET**-button. The drive recognises the rising edge of the signal. To be able to restart the drive after trip, there has to be a rising edge in signal ON/OFF-input . The technique prevents the RESET-input signal from self-commanding the contactors "ON".

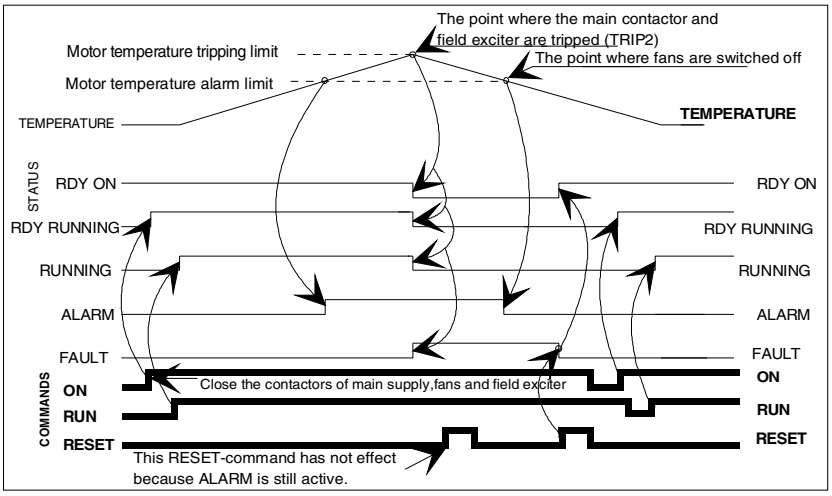


Figure 12 Example of the behaviour of the program in case of motor overtemperature fault

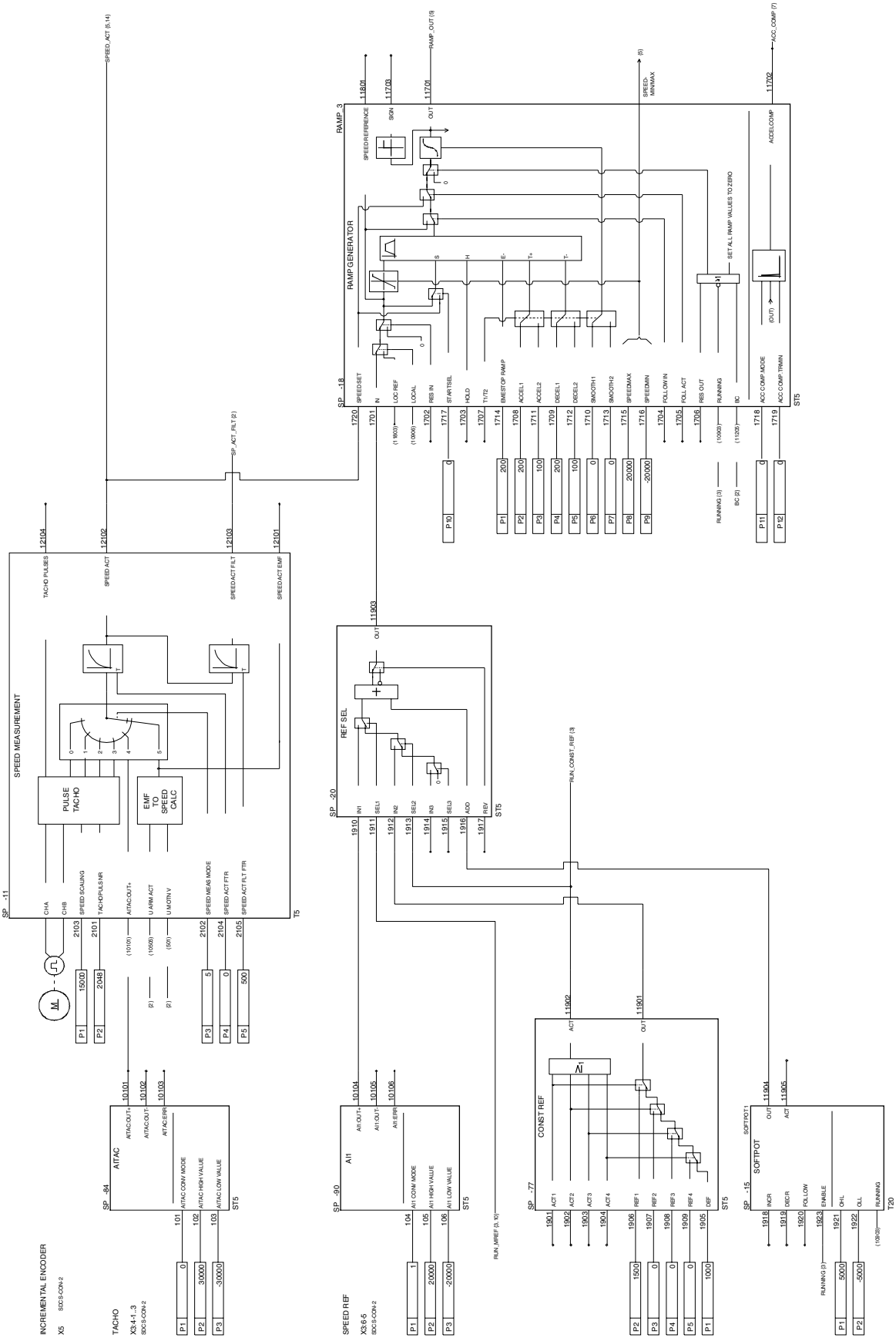
Change between parameter set1 and set2

The DCS 500B software can be discussed from different point of views, depending what is wanted. Within chapter 1 the features are listed by their functionallity. If this functionallity needs to be used at probably two different applications, it is more useful to have a look to the internal structure of the software.

The drive control program is subdivided into 3 blocks:
- parameter set 1 for parameter groups 1 to 24
- parameter set 2 for parameter groups 1 to 24
- application set for parameter groups 25

Local/Remote

The Drive can be controlled either in Remote state by means of the digital inputs or in Local state by the CDP312 control panel or the CMT/DCS500 Commissioning and Maintenance Tool. **LOCAL (10906)** output is in logical state 1, if LOCAL-mode is selected.


SP -11
SPEED MEASUREMENT
PULSE TACHO
EMF TO SPEED CALC
CHA
CHB
SPEED SCALING
TACHOPULS NR
AITAC-OUT+
U ARM ACT
U MOTN V
SPEED MEAS MODE
SPEED ACT FTR
SPEED ACT FLT FTR
TACHO PULSES
SPEED ACT
SPEED ACT FILT
SPEED ACT EMF
SP_ACT_FILT (2)
SPEED_ACT (5,14)
INCREMENTAL ENCODER
X5 SDCS-CON-2
TACHO
X3.4-1..3
SDCS-CON-2
SP -84
AITAC
AITAC-OUT+
AITAC-OUT-
AITAC-ERR
AITAC CONV MODE
AITAC HIGH VALUE
AITAC LOW VALUE
SP -90
AI1
AI1 OUT+
AI1 OUT-
AI1 ERR
AI1 CONV MODE
AI1 HIGH VALUE
AI1 LOW VALUE
SPEED REF
X3.6-5
SDCS-CON-2
SP -20
REF SEL
IN1
SEL1
IN2
SEL2
IN3
SEL3
ADD
REV
OUT
RUN_CONST_REF (3)
RUN_MREF (3, 10)
SP -77
CONST REF
ACT 1
ACT 2
ACT 3
ACT 4
REF1
REF2
REF3
REF4
DEF
ACT
OUT
SP -15
SOFTPOT
INCR
DECR
FOLLOW
ENABLE
OHL
OLL
RUNNING
SOFTPOT1
SP -18
RAMP GENERATOR
SPEED SET
LOC REF
LOCAL
RES IN
START/SEL
HOLD
T1/T2
EMERSTOP RAMP
ACCEL 1
ACCEL 2
DECEL 1
DECEL 2
SMOOTH1
SMOOTH2
SPEEDMAX
SPEEDMIN
FOLLOW IN
FOLL ACT
RES OUT
RUNNING
BC
SET ALL RAMP VALUES TO ZERO
SP -3
RAMP_3
SPEED REFERENCE
SIGN
OUT
SPEED-MINMAX
ACCELCOMP
ACC COMP MODE
ACC COMP TRMIN
ACC_COMP (7)
RAMP_OUT (3)
RUNNING (3)
BC (2)
ST5
T5
T20

• Speed feedback and speed reference handling

The speed feedback signals can be taken from three different sources:

- by means of analog tacho generator
- by means of a pulse encoder
- from the EMF signal, calculated by the converter by means of the converter´s output voltage

The speed reference for speed control can be given in several ways:

- by means of analog input
- from a constant reference source
- reference up/down counter
- application program
- CDP312 panel or CMT/DCS500 Tool

Speed scaling to software

The speed values (ref./act.) are scaled so that 20000 units in software equals to the drive's maximum speed which is set in parameter **SPEED SCALING (2103)** in **0.1 rpm** accuracy. For example, maximum speed is 1000 rpm. SPEED SCALING would be set to 10000. When speed reference is 10000, the motor runs at 500 rpm. The maximum value of the speed reference is -30000 or +30000 depending on which direction of rotation is used.

SPEED_MEASURMENT function block

The speed of the motor can be measured in three different ways: by an incremental encoder, by an analogue tacho generator or by a calculated/measured EMF-voltage. Speed measurement with the pulse encoder has four different modes. The difference between these modes is in the accuracy of the measurement, which depends on the type of pulse encoder.
The analogue tacho generator is connected to the analogue input channel AITAC. The input voltage range is -10V...+10V and accuracy of A/D-conversion is 13 bits. If higher than 10V tacho generator is used, the scaling of incoming voltage can be done on I/O-board SDCS-IOB-1 and in case of I/O-board SDCS-IOB-3 with external circuits (PS5311). The software of the DCS 500B includes scaling parameters for adjusting the analogue speed feedback.

Selection of the speed actual measurement

Speed measurement mode is selected by means of parameter

SPEED MEAS MODE (2102).

0 = [ENCODER A+,B dir]
ch A pos edges for speed; ch B: direction
1 = [ENCODER A+-]
ch A: pos. and neg. edges for speed
2 = [ENCODER A+-,B dir]
ch A pos and neg.edges for speed; ch B: direction
3 = [ENCODER A+-,B+-]
ch A and B and pos. and neg. edges for speed and direction
4 = [ANALOG TACHO]
AITAC is used
5 = [EMF SPEED ACT]
speed actual is calculated from the EMF motor;
this is the default setting

Incremental encoder

If an incremental encoder is used, the number of pulses per revolution has to be set in the parameter **TACHOPULS NR (2101)**, the default setting is 2048. It is possible to monitor the received number of tacho pulses by means of the signal **TACHO PULSES (12104)**, when **SPEED MEAS MODE (2102)** is set to value 0...3 or 5.

Analogue Tacho Generator

The analogue tacho generator output voltage must be scaled with HW circuit so that at maximum drive speed the measured value is below 10V. This provides a reserve between maximum speed and limitation of analogue input and gives a possibility to use overspeed protection. SDCS-CON-2 I/O-board contains the scaling circuit but with SDCS-IOB-3 I/O-board external circuit must be used (PS5311 tacho generator adaption board). After the A/D-conversion an internal value +-4095 corresponds to +-10V. To scale this value to the range of the speed reference 0...20000, there are scaling parameters in AITAC function block:

AITAC CONV MODE (101) = 1 with SDCS-IOB-3 I/O-board
= 3 with SDCS-IOB-1 I/O-board
AITAC HIGH VALUE (102)
min. -32768...max. 32767
AITAC LOW VALUE (103)
min. -32768...max. 32767

Polarity

The polarity of the analogue tacho generator voltage must be positive with positive speed references and negative with negative speed references.
Note. ***If the polarity is false, the drive trips to SPEED MEAS. FAULT.***

Scaling of the actual voltage to control

The function of the analogue tacho generator can be checked by driving the motor at actual speed which is based on the calculated EMF. At the mean time the drive's actual speed is measured by a manual tachometer and incoming feedback of the analogue tacho generator can be checked from the output **OUT+ (10101)** of AITAC function block.

Application example

Example. Let's suppose that speed reference value 20000 corresponds to 1500 rpm of motor. First a value 15 000 is set to parameter **SPEED SCALING (2103)**. The tacho generator gives +8V at actual speed 1500 rpm forward and -8V at 1500 rpm reverse. The actual speed of the motor has to be 1500 rpm with speed reference 20000, so the **AITAC** scaling is made as follows for:
AITAC CONV MODE (101) = 3
AITAC HIGH VALUE (102) = (10V/8V)*20 000=25 000
AITAC LOW VALUE (103) =(10V/-8V)*20 000= -25 000

Actual speed based on EMF

The EMF (Electromotive Force) speed actual is based on the relationship of flux, EMF and actual speed. This method can be used up to the field weakening point. The parameter **U MOTN V (501)** defines the armature voltage of the motor, which corresponds to the speed value 20000 in the software.
The armature autotuning function calculates the **ARM R (411)** and **ARM L(410)** parameter values. See paragraph *"Autotuning"* in this chapter.

Calculation of speed from the EMF

$$n = \frac{Udc - (R_A * I_A + L_A * dI_A / dt)}{FLUX}$$

The resistive voltage drop **ARM R (411)** is calculated:

$$ARM\ R = 22444 * RA[\Omega] * \frac{I\ CONV\ A\ (10509)}{U\ SUPPLY\ (507)}$$

where RA **[**Ω] = armature resistance

The inductive voltage drop **ARM L(410)** is calculated:

$$ARM\ L = \frac{LA[mH] * I\ CONV\ A\ (10509) * 245}{U\ SUPPLY\ (507)\ *\ scantime}$$

where LA [mH] = armature inductance in mH
scan time = 3,33 ms (50 Hz network) or 2,77 ms (60 Hz)

Filtering of the actual speed

Filter time constant for signal **SPEED ACT (12102)** can be adjusted by parameter **SPEED ACT FTR (2104)**. The output of the second filter **SPEED ACT FILT (12103)** can be used as display.

CONST_REF function block

Only one of the five constant reference sources can be selected at a time by means of inputs **[ACT1] (1901)**, **[ACT2] (1902)**, **[ACT3] (1903)** or **[ACT4] (1904)**. The Logic diagram is shown above. If ACT1...ACT4 inputs are all in zero state, the reference value is set to parameter **DEF (1905).** Otherwise the reference value is one of **REF1**...**REF4.**

For example, if constant reference **REF3 (1908)** is used, input **[ACT3] (1903)** has to be set to logical state **1** and inputs **[ACT1]** and **[ACT2]** must be set to zero by the application. Normally, if input pin is not connected at all, its state is zero. Block output **OUT (11901)** value is set equal to parameter **REF3 (1908)**.

SOFTPOT function block

The speed reference generated by the SOFTPOT (software potentiometer) acts as an up/down counter. The function is shown in the following figure.

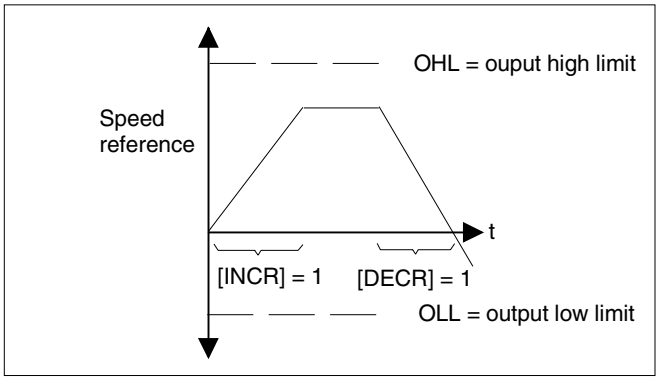


Figure *13* *SOFTPOT up/down function block*

Reference increment and decrement

The input **[INCR] (1918)** activates incrementing of speed reference. The speed reference acceleration time is defined with parameter **ACCEL 1 (1708)** in RAMP GENERATOR function block. The input **[DECR] (1919)** activates decrementing of speed reference. The speed reference deceleration time is defined with parameter **DECEL 1 (1709)** in RAMP GENERATOR function block.

Limitation

The maximum and minimum limits for speed reference are set with parameters **OHL (1921)** and **OLL (1922)**.

If input **[FOLLOW] (1920)** is in logical state **1**, the output of the block **OUT (11904)** follows actual speed of motor (SPEED ACT) signal.

The logical output **ACT (11905)** is in state 1 when either **[INCR] (1918)** or **[DECR] (1919)** input is in state 1.

REF_SEL function block

The speed references from different sources are collected to this function block.

The inputs **[SEL1] (1911)**, **[SEL2] (1913)**, **[SEL3]** and **(1915)** control which of the reference signals ([IN1]...[IN3]) is connected to the SUM block inside the REF SEL function block. Only one of the signals **IN1**, **IN2** or **IN3** can be connected to the SUM block at a time. **[ADD] (1916)** is always connected to the SUM-block.

Changing of the speed direction of rotation

Input **[REV] (1917)** controls the output selection of the SUM-block. If this input is set to logical state 1, the speed reference at the **OUT (10202)** is negated. This can be used to change the rotation of direction on a 4Q-drive.

RAMP GENERATOR function block

The main function of the RAMP GENERATOR function block is to accelerate and decelerate the motor's speed with selected time constants to the value of **[IN] (1701)**.

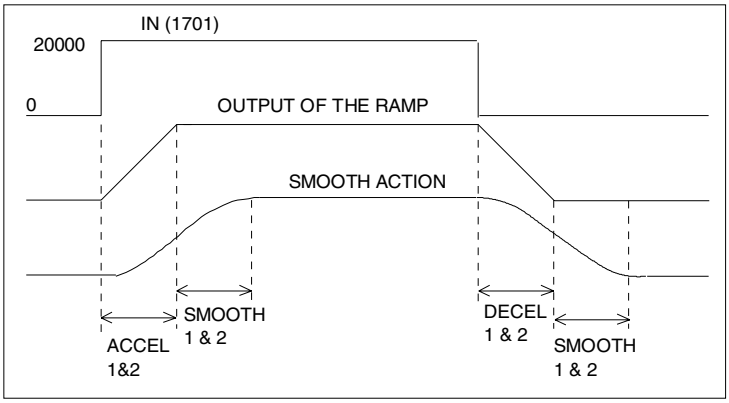


Figure 14 Function of the Ramp Generation function block

Local / Remote Speed Reference

There are two switches in front of the ramp block. The first switch is the **LOCAL/REMOTE** selector. When **LOCAL** control is selected from, for example, the CDP312 control panel, the speed reference comes from the panel link. In **REMOTE** control the reference comes from the input pin **[IN] (1701)**.

The second switch sets the reference to zero at the input of the ramp by means of **[RES IN] (1702)** input pin.

Holding of the reference

If the **[HOLD] (1703)** input is in logical state 1, the output of the ramp is holding the old value.

Ramp Function in Emergency Stop

If emergency stop function is activated by drive logic **EME STOP MODE (907)** = **1,** then the deceleration time is read from the parameter **EMESTOP RAMP (1714)**.

Selecting of the Ramp function

It is possible to define two different acceleration, deceleration and smoothing time constants. A typical application for this feature is two DC-motors connected to one drive and each motor is operated separately. The application program in the drive may also select different ramp times in different control situations.
Selection can be done by input pin **[T1/T2] (1707)**. If input **[T1/T2] (1707)** is in logical state **0**, then the values of the parameters **ACCEL 1 (1708)**, **DECEL 1 (1709)** and **SMOOTH 1 (1710)** define the ramp function as seen in figure above.
If input **[T1/T2]** is in logical state **1** then the values of the parameters **ACCEL 2 (1711)**, **DECEL 2 (1712)** and **SMOOTH 1 (1713)** define the ramp function.

Limitation of the reference

Parameter **SPEEDMAX (1715)** defines the maximum reference value and **SPEEDMIN (1716)** the minimum value after the RAMP block.

Passing of the RAMP function

The ramp function can be bypassed by setting the input **[FOLLOW IN] (1704)** to logical state 1.

Output follows the speed actual

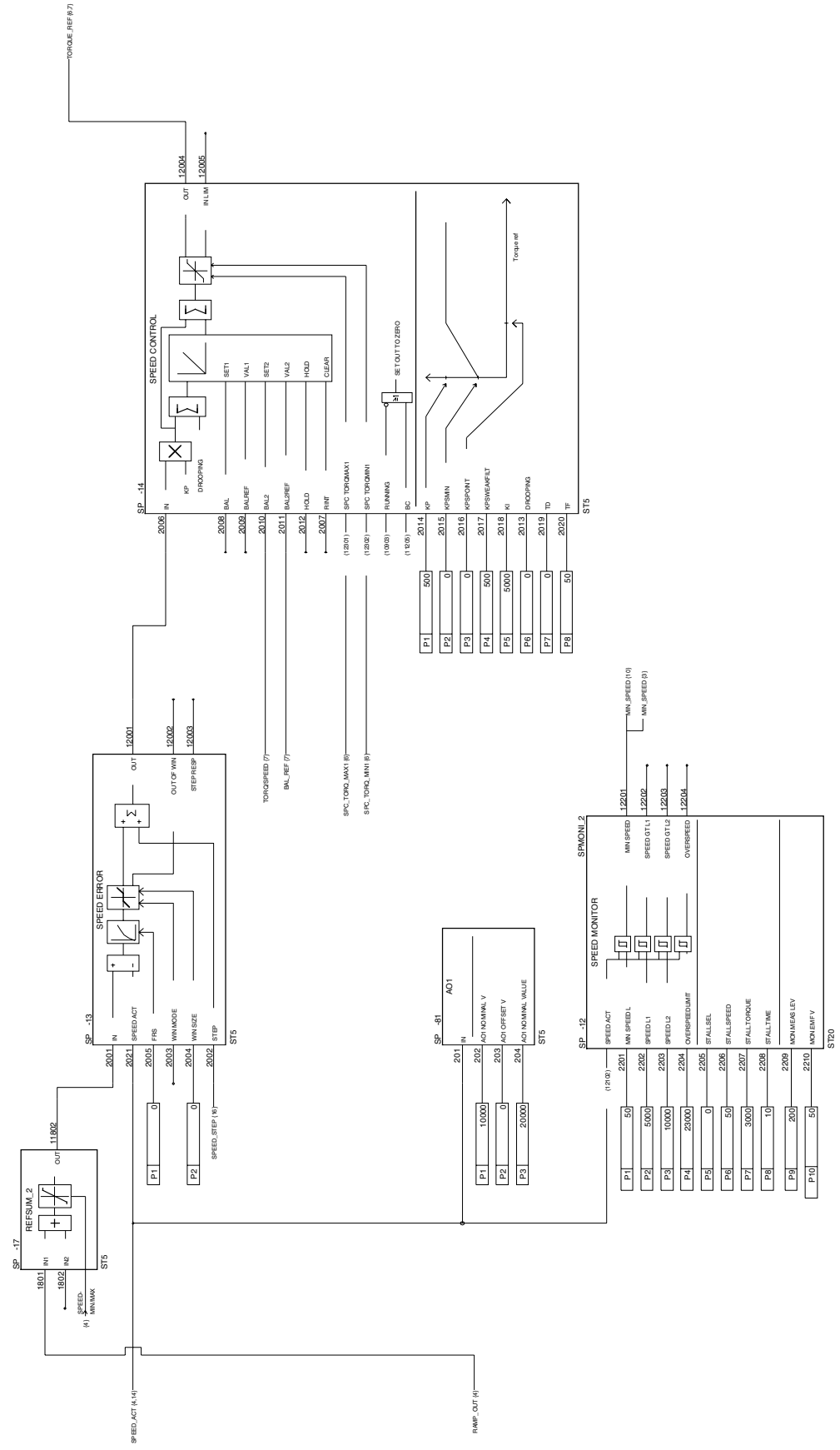
The output **OUT (11701)** can be made to follow the speed actual by setting the input **[FOLL ACT] (1705)** to logical state **1**.

Reset the output

The output **OUT (11701)** can be set to zero by setting the input **[RES OUT] (1706)** to logical state **1**.

Acceleration compensation

The output **ACCEL COMP (11702)** is giving the additional torque reference which is needed to compensate inertia of load. The acceleration compensation mode is selected by parameter **ACC COMP.MODE (1718)**. The time in which the drive will accelerate from zero speed to max. speed using motor nominal torque is set to parameter **ACC COMP.TRMIN (1719)**


TORQUE_REF (6.7)
SP -14
SPEED CONTROL
IN
KP
DROOPING
SET1
VAL1
SET2
VAL2
HOLD
CLEAR
SET OUT TO ZERO
OUT
IN LIM
BAL
BALREF
BAL2
BALPREF
HOLD
RINT
SPC_TORQMAX1
SPC_TORQMIN1
RUNNING
BC
KP
KPSMIN
KPSPOINT
KPSWEAKFILT
KI
DROOPING
TD
TF
Torque ref
ST5
2006
2008
2009
2010
2011
2012
2007
(1.23.01)
(1.23.02)
(1.19.03)
(1.19.05)
2014
2015
2016
2017
2018
2013
2019
2020
P1 500
P2 0
P3 0
P4 500
P5 5000
P6 0
P7 0
P8 50
12004
12005
12001
12002
12003
SP -13
SPEED ERROR
IN
SPEED ACT
FRS
WIN MODE
WIN SIZE
STEP
OUT
OUT OF WIN
STEP RESP
ST5
2001
2021
2005
2003
2004
2002
P1 0
P2 0
SPEED_STEP (6)
TORQ/SPEED (7)
BAL_REF (7)
SPC_TORQ_MAX1 (6)
SPC_TORQ_MIN1 (6)
SP -81
AO1
IN
AO1 NOMINAL V
AO1 OFFSET V
AO1 NOMINAL VALUE
ST5
201
202
203
204
P1 10000
P2 0
P3 20000
SP -17
REFSUM_2
IN1
IN2
OUT
ST5
1801
1802
1902
SPEED MIN/MAX
(4)
P1
P2
SPEED_ACT (4.14)
RAMP_OUT (6)
SP -12
SPEED MONITOR
SPMONI_2
SPEED ACT
MIN SPEED L
SPEED L1
SPEED L2
OVERSPEEDLIMIT
STALLSEL
STALLSPEED
STALLTORQUE
STALLTIME
MONMEAS LEV
MON EMF V
MIN SPEED
SPEED GT L1
SPEED GT L2
OVERSPEED
ST20
(1.21.01)
2201
2202
2203
2204
2205
2206
2207
2208
2209
2210
12201
12202
12203
12204
MIN_SPEED (10)
MIN_SPEED (9)
P1 50
P2 5000
P3 10000
P4 23000
P5 0
P6 50
P7 3000
P8 10
P9 200
P10 50

• Speed Control

The function of the speed control is to adjust the torque reference for the torque control so that the speed actual will be equal to the speed reference.

REFSUM_2 function block

The last function block of the speed reference chain is REF SUM. The block adds [IN1] + [IN2] = OUT. The output **OUT (11701)** of the ramp generator is connected to input **[IN1] (1801)** and possible additional reference to **[IN2] (1802)**.

SPEED_ERROR function block

The main task of the SPEED ERROR function block is to calculate the difference between the speed reference in input **[**IN] **(2001)** and speed actual **SPEED ACT (12102)**.

Speed Step for testing

Input **[STEP] (2002)** can be used, for example, during the commissioning to make step response tests in order to find out the correct PI-values for the speed control. **[STEP RESP] (12003)** output can be used to monitor the speed response during the commissioning.

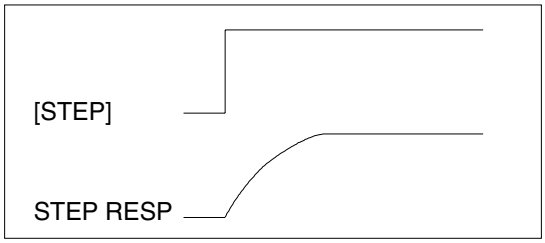


Figure 15 Response for a speed step

Error value filter

The error between the speed reference and actual values can be filtered by means of parameter **FRS (2005)**.
Too much filtering should not be used, because it slows down the control and easily causes transient overshoots in the response. It is reasonable to find out the cause for disturbances, for example, varying load, mechanics, settings of controllers, installation of a pulse encoder, etc.

Window Control Principle

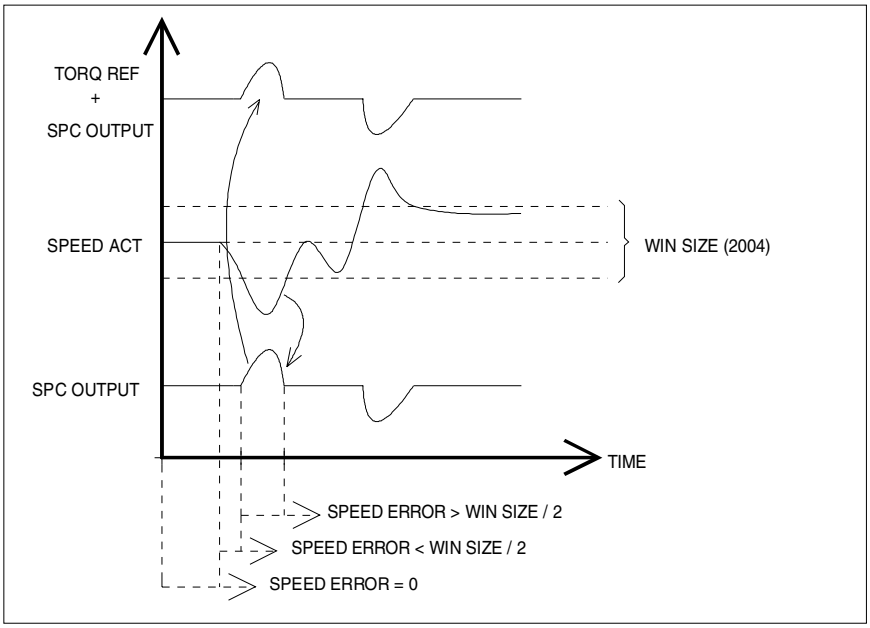


Figure *16* Window control function

The idea of Window control is to deactivate the speed control as long as the speed deviation remains within the set window. This allows the external torque reference to affect the process directly.

Application example for Window Control

In master/follower drives, where the follower section is torque controlled, the window control is used to keep the speed deviation of the section under control. The speed error output to the speed controller is zero when speed error is less than **WINSIZE/2**.

If the load of the follower disappears because of a disturbance in the process, the speed error will be outside the window. The speed controller works and its output **OUT (12004)** is added to the torque reference **[TREF SPC] (2407)**.
Speed control brings the speed difference back to the window. This function could be called overspeed or underspeed protection in the torque control mode.

Enabling the Window Control

The window control is activated by setting the input **[WIN MODE] (2003)** to logical state 1.
The parameter **TREF SEL (2406)** in the TORQ REF HANDLING function block must be set to value 5 when window control is used.

Determining the Window Size

The size of window determined by parameter **WIN SIZE (2004)**, scaling is the same as for the speed reference. See the previous figure *"Window control function"*.

Output connection points

Output **OUT(12001)** is normally connected to **[IN] (2006)** input in the SPEED CONTROL function block.

The output **OUT OF WIN (12002)** is activated to logical state **1**, if the value of speed error is outside the window area (defined in parameter **WIN SIZE (2004)**.

SPEED_CONTROL function block

Gain and Integral time settings

The speed error is formed in the SPEED ERROR function block, and it is connected to input **IN (2006)**. The proportional gain (scaling 100 = 1 gain) **KP (2014)** and integrator time constant (scaling 1 = 1ms) **KI (2018)** are the main parameters of the speed controller PI-function. The output of the integral function can be reset by setting the input **[RINT] (2007)** to state 1. Hold function is activated by setting the input **[HOLD] (2012)** to logical state 1.

The P-gain reduction

The adaptive gain of the speed controller is used to smooth out disturbances which are caused by e.g. low load and backlash. Moderate filtering of speed error **FRS (2005)** is typically not enough to tune the drive. Especially if there is a substantial backlash in the drive and the drive oscillates at a low torque due to the mechanics.

Parameter **KPSMIN (2015)** determines the proportional gain when the controller output is zero. When the output exceeds the value of parameter **KPSPOINT(2016)**, the proportional gain is normal **KP (2014)**. The rate of change of the proportional gain can be smoothened by means of parameter **KPSWEAKFILT (2017)**.

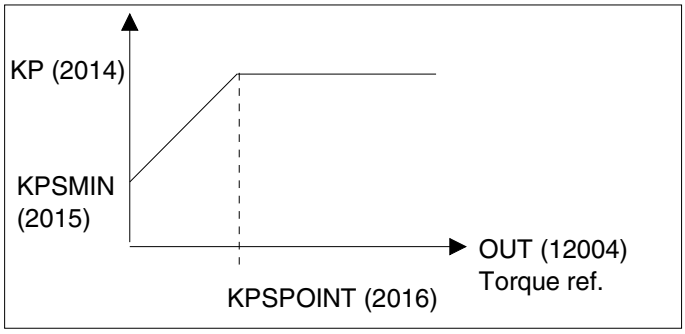


Figure *17* *Reduction of gain as a function of torque reference*

Output Limitation

The speed control output **OUT (12004)** is limited by the TORQUE/CURRENT LIMITATION function block (SPC TORQMAX1 and SPC TORQMIN1). Output **IN LIMIT (12005)** is in logical state 1, when the output of the speed controller is in positive or negative limit.

Integral part Setting during the Control Mode Changing

Output from the integral part can be adjusted to a certain level by setting the **[BAL] (2008)** to logical state 1; then the value of **[BAL REF] (2009)** is set to the output of the integral part. There is another similar function controlled by **[BAL2] (2010)** and **[BAL2 REF] (2011)**.
BAL REF and BAL inputs are used, for example, in the mechanical brake control block of the standard program. BAL2 REF and BAL2 inputs are used in torque control. In torque control the integral part of the speed controller follows the **OUT (12402)** pin of the TORQ REF HANDLING function block. This function provides an bumpless current reference during a change of control mode (for example Torque --> Speed control).

Principle of Drooping

Drooping can be used if a certain amount of speed decrease is needed when the load increases, for example, in the slave drive(s) when they are speed controlled. Then the master and slave drives do not conflict with each other before the slave(s) change to torque control even if there is a slight speed difference between them. On the other hand, drooping is used in drives where mechanical connection is not strong enough to enable use of torque control.

Drooping Adjustment

The amount of speed decrease caused by the load is defined by the parameter **DROOPING (2013)**. The scaling is 10=1%. With the torque reference 4000 the speed will decrease 1% calculated from the rated speed when DROOPING = 10.

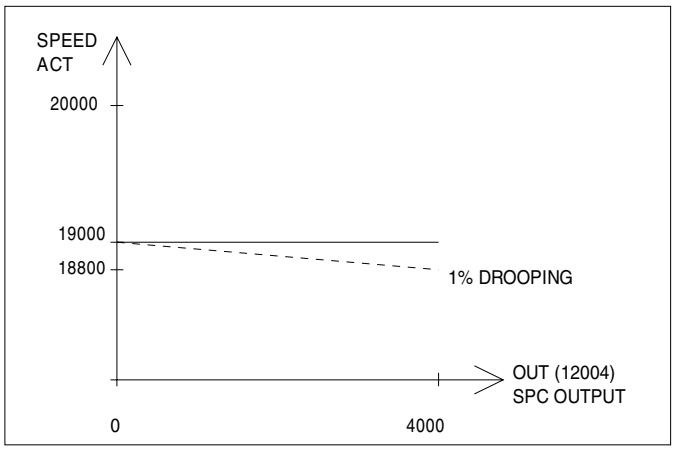


Figure *18* *Drooping as a function of torque reference*

SPEED_MONITOR function block

Speed Actual Comparators

There are four comparators available for speed actual monitoring.

When the speed actual is below the value of parameter **MIN SPEED L (2201)**, the output **MIN SPEED (12201)** is set to logical state 1. This is used as zero speed indication.

Signal output **SPEED GT L1 (12202)** is active when actual speed is above speed level **SPEED L1 (2202)**. Parameter **SPEED L2 (2203)** and output **SPEED GT L2 (12203)** have the same function.

Overspeed limit

The drive can be protected against overspeed e.g. in cases where a drive section is controlled with the torque reference and the load is decreasing rapidly. The overspeed limit is set with parameter **OVERSPEEDLIMIT (2204)**, scale: speed units, range: (0....30 000) 20000 = 100%. Motor overspeed fault (code 37) will be activated, if overspeed limit is exceeded. Default value is 23000.

Speed Measurement Fault

The speed measurement supervision is based on the relationship of the measured speed and measured/calculated EMF. Parameter **MON.MEAS LEV (2209)** is the minimum absolute value that the measured speed must have when **EMF ACT (10506)** is above the limit **MON.EMF (2210)**. Otherwise the speed measurement fault is activated (fault code 14).

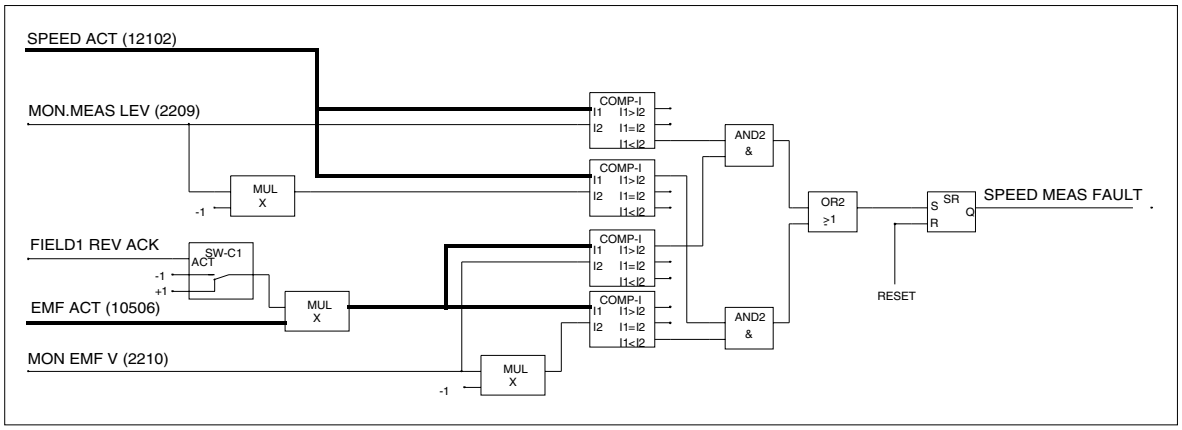


Figure *19* *Speed measurement fault logic diagram*

Stall Protection

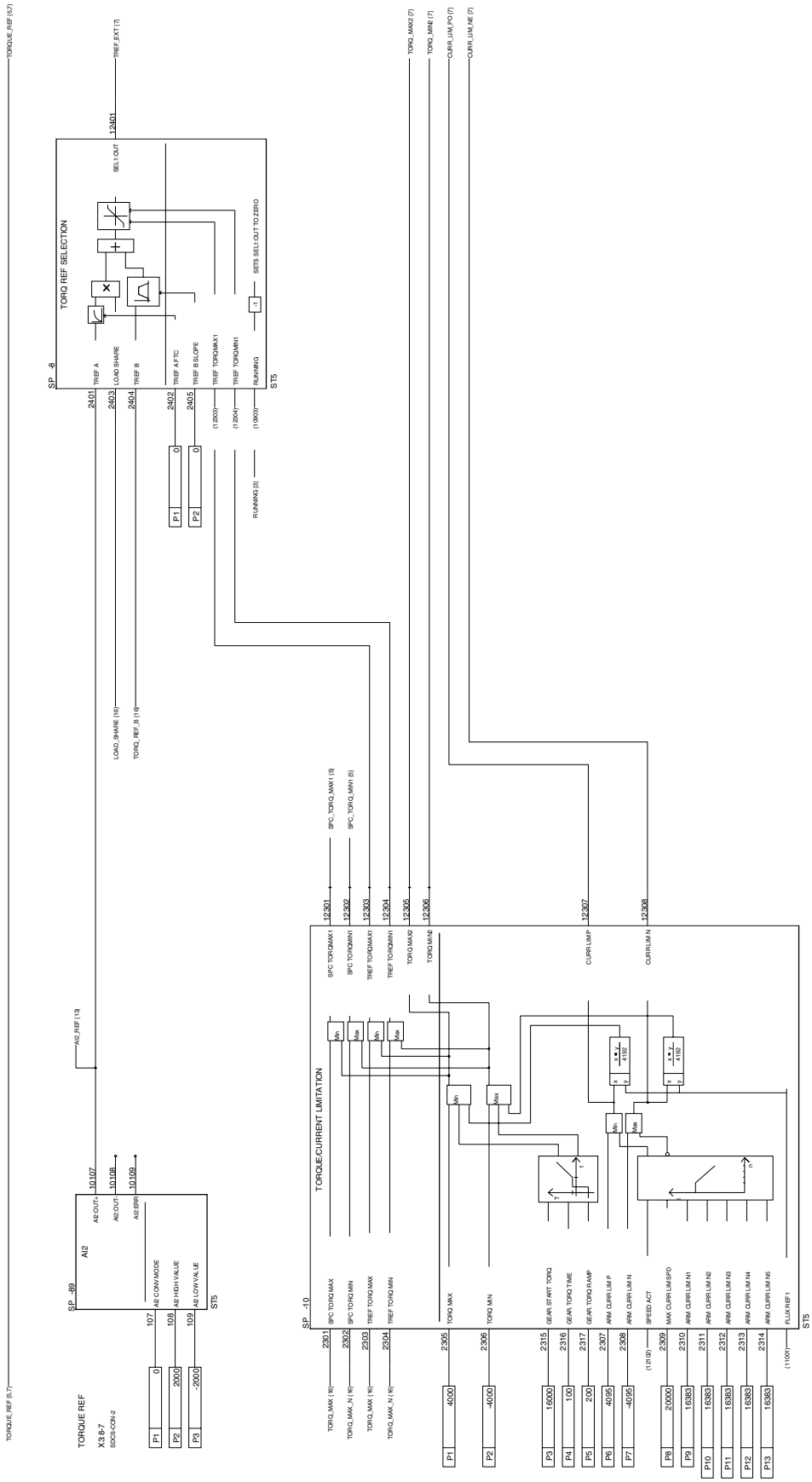
The stall protection stops the converter when the motor is in apparent danger of overheating. The rotor is either mechanically stalled or the load is otherwise continuously too high. The selection of the stall protection is made by parameter **STALL SEL (2205)**.

0 = stall ptotection disabled
1 = stall protection enabled

The stall protection is activated if the following conditions are fullfilled:

- Actual speed **SPEED ACT (12102)** is below the limit set by parameter **STALL SPEED (2206)**
- Actual torque **TORQ ACT (10503)** exceeds the limit set in parameter **STALL TORQUE (2207)** and this condition has been effective for at least the time set in parameter **STALL TIME (2208)**.

When the drive stops, the fault MOTOR STALLED is indicated with fault code **23** and bit number **14** will be set in **FAULT WORD2 (11102)**.


TORQUE_REF (5,7)
TORQUE_REF (5,7)
TORQ REF SELECTION
SP -8
ST5
TREF A
LOAD SHARE
TREF B
TREF A FTC
TREF B SLOPE
TREF TORQMAX1
TREF TORQMIN1
RUNNING
SETS SEL1 OUT TO ZERO
SEL1 OUT
TREF_EXT (7)
LOAD_SHARE (10)
TORQ_REF_B (16)
RUNNING (9)
TORQ_MAX2 (7)
TORQ_MIN (7)
CURR_LIM_PO (7)
CURR_LIM_NE (7)
TORQUE REF
X3:8-7
SDCS-CON-2
AI2
SP -89
AE CONV MODE
AE HIGH VALUE
AE LOW VALUE
AE OUT+
AE OUT-
AI2 ERR
AI2_REF (13)
TORQUE/CURRENT LIMITATION
SP -10
SPC TORQ MAX
SPC TORQ MIN
TREF TORQ MAX
TREF TORQ MIN
TORQ MAX
TORQ MIN
GEAR START TORQ
GEAR TORQ TIME
GEAR TORQ RAMP
ARM CURR LIM P
ARM CURR LIM N
SPEED ACT
MAX CURR LIM SPD
ARM CURR LIM N1
ARM CURR LIM N2
ARM CURR LIM N3
ARM CURR LIM N4
ARM CURR LIM N5
FLUX REF 1
SPC_TORQ_MAX1 (5)
SPC_TORQ_MIN1 (5)
TORQ MAX2
TORQ MIN2
CURR LIM P
CURR LIM N

• *Torque Reference*

The function of the torque reference chain is to form a desired reference for the current regulation.

TORQ_REF_SELECTION function block

An external torque reference can be connected via analog inputs. AI2 function block is connected to **[TREF A] (2401)** in the standard program, and this input contains a filter controlled by parameter **TREF A FTC (2402)** (1000 = 1s), 0 = not in use.
[TREF B] (2404) input is another torque reference input, which contains the ramp generator function controlled by parameter **TREF B SLOPE (2405)** (1000 = 1s), 0 = not in use.

Torque Reference Scaling

The value 4000 is equal to nominal torque of the DC-motor (T_N). Therefore the analog input must be scaled according to this value. For example, an external torque reference -10V...+10 V is connected to analog input AI2 and the torque reference should be -100%...+100% of the motor nominal torque. The parameter settings are:
AI2 CONV MODE (107) = 1
AI2 HIGH VALUE (108) = 4000
AI2 LOW VALUE (109) = -4000

Load sharing in Master / Follower Application

The load of the follower drive can be adjusted by means of input **[LOAD SHARE] (2403)** to the desired value by the application function blocks. The default value is 100 % = 4000.
The output **OUT (12401)** is calculated:

[TREF A] x [LOAD SHARE] / 4000 + [TREF B]

Output Limitation

The final torque reference before limitation is a sum of a [TREF A] multiplied by [LOAD SHARE] and [TREF B].
The output **OUT (12401)** can be limited by internal signals [TREF TORQMAX1] and [TREF TORQMIN1] in the function block TORQUE / CURRENT LIMITATION.

TORQUE/CURRENT_LIMITATION function block

Torque / Current Limitation function block consist of limitation circuits for torque and current references and gear backlash compensation.

Current Limitations

The limitation of armature current is based on fixed current limit parameters and on limits which are the function of the actual speed. There is a function block with given points of speed and maximum current on these points. Finally the current limit selection is based on a maximum/minimum selection of these two limitation sources.

Scaling of these limit values is 4095 = nominal current of the motor **I MOTN A (502)**

ARM CURR LIM P (2307), scale: 4095 = I MOTN A (502)
ARM CURR LIM N (2308), scale: 4095 = I MOTN A (502)

Example. If the nominal current of the motor is 200A and the maximum current is set to +/-230A, the limits are set to 230A/200A*4095=+/-4709.

Torque Limits

Torque limits for the speed controller and the external torque reference chain are set by means of the parameters. The program takes care that these limits cannot exceed the final torque limits, which are based on the given armature current limit and flux reference. This ensures that, e.g. the speed controller does not ask for a larger torque than the current limits allow.
The torque limitation outputs 12301...12306 are internally connected to torque reference chain and speed controller.

The armature current limits are calculated for the torque limits by means of the flux reference in such a way that the nominal current of the motor with nominal flux gives nominal torque of the motor, scaling: 4000 = $T_{N(motor)}$. The final torque limits can be read out from signals **TORQMAX2 (12305)** and **TORQMIN2 (12306)**.

TORQ MIN (2306), scale: 4000==$T_{N(motor)}$
TORQ MAX (2305), scale: 4000==$T_{N(motor)}$

Speed Dependant Current Limitation

With the help of this function the load (motor´s shaft, coupling, gear box and load machine) or the motor itself (commutation problems at high speed) can be protected against overload.
If the drive is used in the field weakening range, the torque produced is lower than in the base speed range. Because of this and together with the design criteria of the mechanics sometimes the current needs to be lowered to avoid damage.
Some motors (most often at high speed motors) the current needs to be reduced depending on the speed because of their electrical design. Especially above the field weakening point the loading current needs to be reduced according to instructions of motor catalogue.
The speed dependant current limitation function is described by 5 (x,y) coordinates. The pairs are:

1.	… _LIM_SPEED	-	… _LIM_N1
2.	point 1/4	-	… _LIM_N2
3.	point 2/4	-	… _LIM_N3
4.	point 3/4	-	… _LIM_N4
5.	100% / 20000 point	-	… _LIM_N5

Linear interpolation is used for values between these coordinates.

The function can be graphed using the 5 points determined by the parameter settings.
Within the next figure there are 3 possibilities shown together with the outlooking of the curve and the parameter setting.

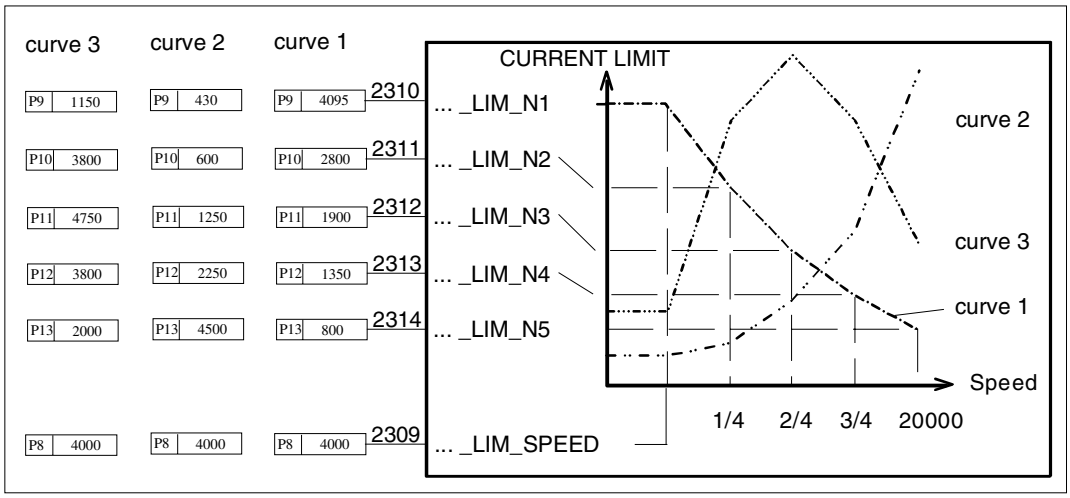


Figure *20* *Speed dependant current limitation (example)*

In default condition the parameters _LIM_Nx are set to 4 times nominal current and _LIM_SPEED is set to 20000 = 100% speed to disable the function. The values of the parameters **P2310** to **P2314** don´t need to be in a specific order (e.g. not constantly increasing / decreasing, see above). Dependend on the function of the armature current over speed range the following steps should be applied:

- specify the **MAX_CURR_LIM_SPEED (2309)**
- set the **ARM_CURR_LIM_N1 (2310)**; the converter will use this value for the speed range between zero speed and **P2309**; please keep in mind, that all other limitations have to be increased, if more than nominal motor current is demanded (scale: 4095 = nominal current of motor)
- the speed range between the speed specified via P2309 and top speed (100% or 20000) is splitted into 4 even parts
- set the **ARM_CURR_LIM_N2 (2311)**; to a current value, needed at point 1/2
- do the same with the other pairs

Gear Backlash Compensation

The gear backlash compensation function can be used for backlash-affected drives. When the torque reference is changing direction, the torque limit is reduced for a while. Parameter **GEAR.START TORQ (2315)** defines the torque limit after the torque direction change. Scale: 4000 = nominal torque of motor

GEAR.TORQ TIME (2316) is the time period after the direction change when **GEAR.START TORQ** torque limit is used. Scale: 1 = 1 ms.

GEAR.TORQ RAMP (2317) defines the rate of change for the torque limit when **GEAR.TORQ TIME** has elapsed. **GEAR.TORQ RAMP** is given as the maximum change of torque limit in 3.3 ms (50Hz). Scale: 4000 = nominal torque of motor

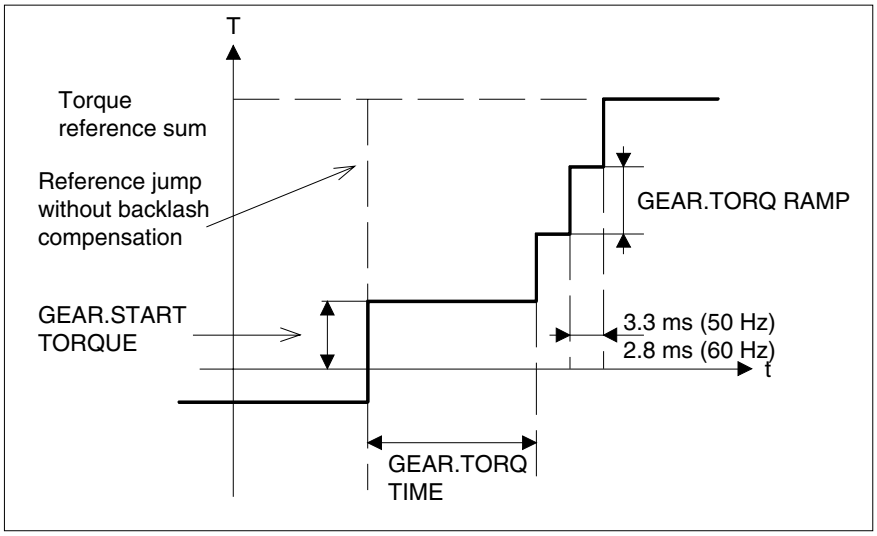
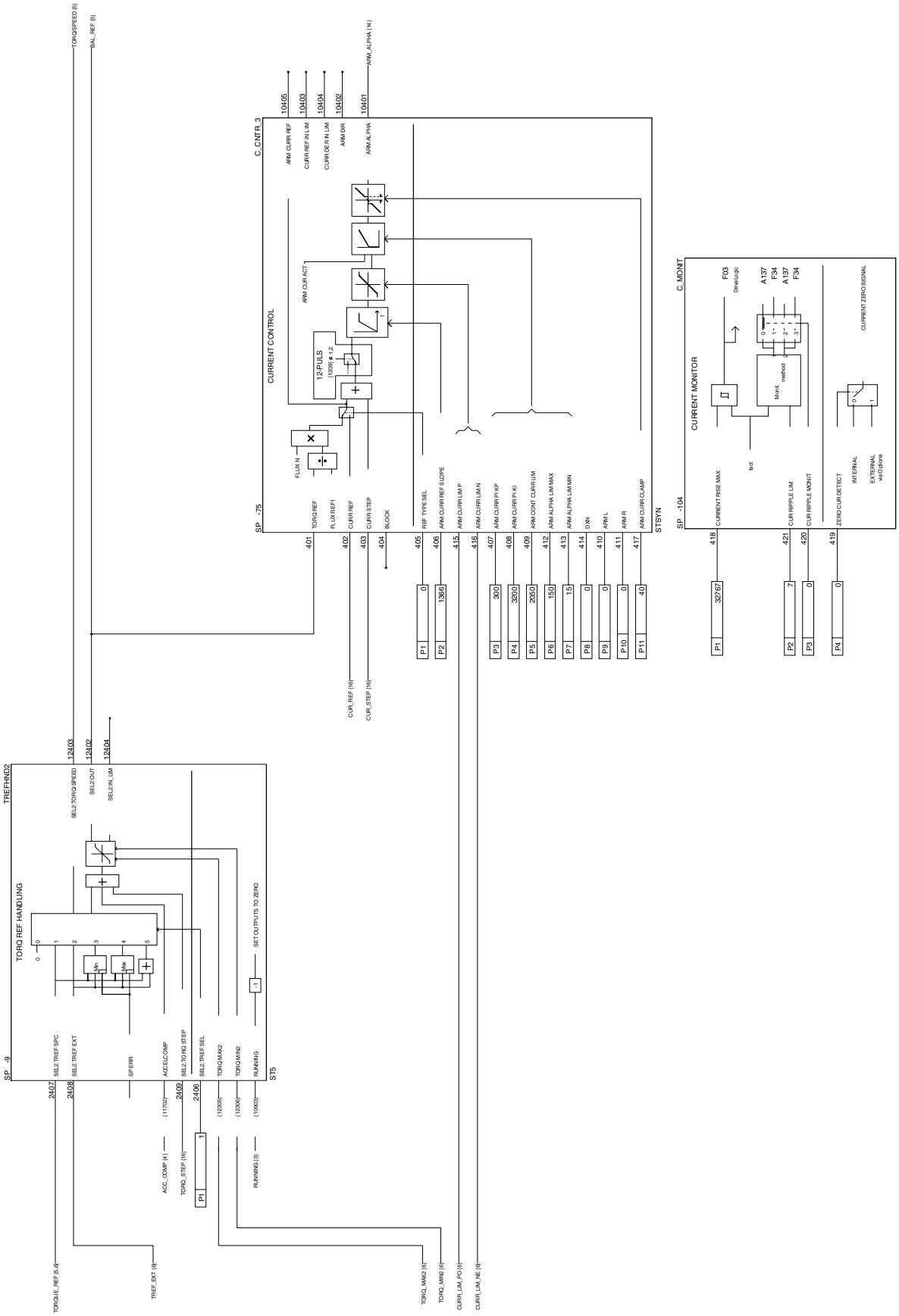


Figure 21 Gear backlash compensation principle


TREFHND2
SP -9
TORQ REF HANDLING
SEL2 TREF SPC
SEL2 TREF EXT
SP ERR
ACCELCOMP
SEL2 TO RQ STEP
SEL2 TREF SEL
TORQ MAX2
TORQ MIN2
RUNNING
SET OUTPUTS TO ZERO
ST5
SEL2 TORQ SPEED
SEL2 OUT
SEL2 RL_LIM
C_CNTR_3
SP -75
CURRENT CONTROL
TORQ REF
FLUX REF1
CURR REF
CURR STEP
BLOCK
REF TYPE SEL
ARM CURR REF SLOPE
ARM CURR LIM P
ARM CURR LIM N
ARM CURR PI KP
ARM CURR PI KI
ARM CONT CURR LIM
ARM ALPHA LIM MAX
ARM ALPHA LIM MIN
DXN
ARM L
ARM R
ARM CURR CLAMP
ARM CURR ACT
12-PULS
FLUX N
ARM CURR REF
CURR REF IN LIM
CURR DER IN LIM
ARM DIR
ARM ALPHA
STSYN
C_MONT
SP -104
CURRENT MONITOR
CURRENT RISE MAX
CUR RIPPLE LIM
CUR RIPPLE MONIT
ZERO CUR DETECT
INTERNAL
EXTERNAL
CURRENT ZERO SIGNAL
STSYN
TORQUE_REF (6,8)
TREF_EXT (8)
ACC_COMP (4)
TORQ_STEP (16)
RUNNING (3)
TORQ_MAX2 (8)
TORQ_MIN2 (8)
CURR_LIM_PO (8)
CURR_LIM_NE (8)
CUR_REF (16)
CUR_STEP (16)
TORQSPEED (6)
RAL_REF (6)
ARM_ALPHA (14)

• Current Control

TORQ_REF_HANDLING function block

The speed controller's output is normally connected to input **[TREF SPC] (2407)** and external torque reference to **[TREF EXT] (2408)**.

Torque Reference Selection

The TORQ REF HANDLING function block consists of the operating mode selector for the torque reference, and it is controlled by parameter **TREF SEL (2406)** which has six different modes.

0 = no torque or speed control

1 = always selects the output of the speed controller **[TREF SPC] (2407)** as the torque reference. This is a normal selection for speed control.

2 = always selects the external torque reference **[TREF EXT] (2408)** as the torque reference. This is a normal selection for torque control.
Note. If the torque reference does not correspond to the load, e.g. the drive load falls down suddenly, it is possible to
prevent overspeed in the drive section by means of parameter **OVERSPEEDLIMIT (2204)**.

3 = selects the minimum value from the external torque reference or the speed controller output. A negative speed difference (SPEED REF < SPEED ACT) causes a change-over to speed control. A change-over from speed control to torque reference takes place when the torque reference is smaller than the speed controller output and speed difference is positive
[TREF EXT] < [TREF SPC] and SPEED REF ≈ SPEED ACT)

4 = selects the maximum value based on the speed difference. A positive speed difference (SPEED REF > -SPEED ACT) causes a change-over to speed control. A change-over from speed control to torque control takes place when the torque reference is greater than the speed controller output, ([TREF EXT] > [TREF SPC] and SPEED REF ≈ SPEED ACT).

5 = Window control, external torque reference and speed controller output are added. See more details in paragraph *Window Control Principle*.

Torque Step

[TORQ STEP] (2409) input is available for testing the current regulation or for direct control of the current regulator.

Output Limitation and its Indication

Output signal **OUT (12402)** can be limited by internal signals [TORQ MAX2] and [TORQ MIN2] in the function block TORQUE / CURRENT LIMITATION.
Output **IN LIM (12404)** is in logical state 0, when the input of the limitation block is within the TORQMAX2 and TORQMIN2.

CURRENT_CONTROL function block

Torque / Current Reference Selection

The current reference is formed by dividing **[TORQ REF] (401)** by the **FLUX REF1** signal according to formula

Current = Torque / Flux
The current reference can be connected to input **[CURR REF] (402)**. Selection between these two references is made with parameter **REF TYPE SEL (405)**, logical state 1 selects the current reference.

Current Response Test

A current regulation response test can be done by connecting the step reference to input **[CURR STEP] (403)**.

Regulation Blocking

The current regulation can be blocked by setting input **[BLOCK] (404)** to logical state 1.

Armature Current Scaling

The torque reference from the torque reference selector is connected to the current reference by means of the flux reference so that with nominal flux and nominal torque the current reference will be equal to nominal current of the motor. The scale of the current reference is 4095 == nominal current of motor **I MOTN A (502)**.

Current Reference Rise Time

The rise time of the current reference can be adjusted by parameter **ARM CURR REF SLOPE (406)**, scaling 1 = 1ms. This is used, for example, if a too fast rise time causes problems in the motor commutator.

Current Reference Limitation

After the slope the armature current reference goes through the current limiter. Positive/negative limits of the current reference are based on parameter **ARM CURR LIM P (2307)** and **ARM CURR LIM N (2308)** or on a speed-dependent current limitation.

Current Difference Alarm

The difference between the ARM CURR REF and the ARM CURR ACT (10502) goes directly to the current regulator. If the difference between these values is larger than 20% (from nominal 4095) and this situation remains at last 5 seconds, then the **ARM. CURR. DEV. ALARM** will be given.

PI- Regulation

The parameters of the PI controller can be set either with the autotuning or manual tuning function. **ARM CURR PI KP (407)** determines the gain of the regulator and **ARM CURR PI KI (408)** determines the integral time constant of the regulator.

Scaling of the gain KP

PI-controller input and output values are scaled so that gain value 100% produces in the output the same value as can be seen in the input. This kind of scaling is used in the current controller of the DCS500B.

$$output = \frac{ARM\ CURR\ PI\ KP * error}{256}$$

So, default value 300 is equal to gain 300/256=1.17 (117%)

Scaling of the Time Constant KI

Integral gain is calculated from the time constant:

$$ARM\ CURR\ PI\ KI = 16384 * \frac{scantime}{TC}$$

where scantime = 3.33 ms in 50Hz network
= 2.77 ms in 60Hz network
TC = time constant in ms.

Discontinuous Current Point

Parameter **ARM CONT CUR LIM (409)** is the converter actual current at the point where discontinuous current of the armature circuit changes to continuous current. By using autotuning this point will be defined automatically. In manual tuning the point must be measured from the armature circuit by means of e.g. an oscilloscope. Actual converter current value **CONV CUR ACT (10501)** is set in parameter **ARM CONT CUR LIM (409)**. There is also a status bit B6 at **TC_STATUS (11204),** bit value 1 = armature current is discontinuous.

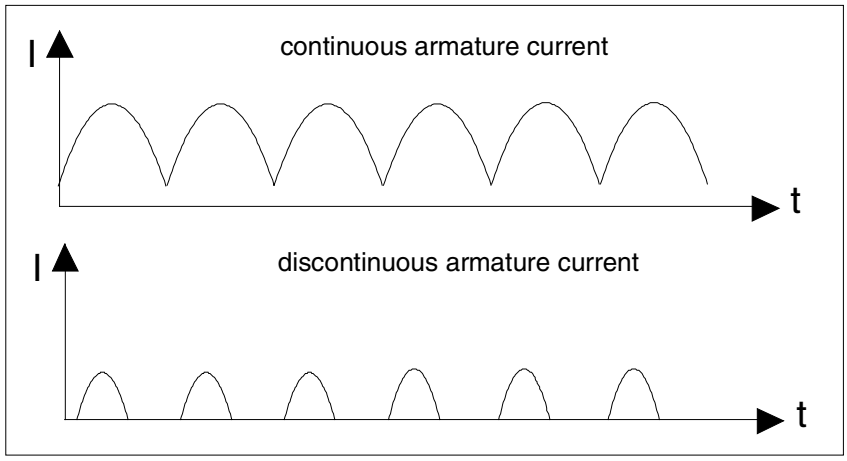


Figure *22* *Waveforms of the armature current*

Tuning of Current Regulator

Tuning of the regulator can be done either manually with response tests or with autotuning function, which is activated by setting parameter **DRIVE MODE (1201)** to 3, when the drive's main contactor is open. After closing of the main contactor and starting of the drive, the autotuning procedure for the armature current controller will start. The DRIVE MODE (1201) value is set to 0 when autotuning is completed. The autotuning proceeds without user intervention. Motor data have to be set correctly before autotuning is started. More information about tuning can be read in chapter *Start-up*.

Firing Angle Limitation

The output signal of the regulator is the firing angle reference (1 = 1°) **ARM ALPHA (10401)**. Its minimum value is limited by means of parameter:

The **maximum output voltage** of the thyristor bridge is limited by parameter **ARM ALPHA LIM MIN (413),** default value =15

The armature voltage is $U = 1.35 * U_{SUPPLY} * \text{Cos } \alpha$, if the current is continuous. α = ARM ALPHA.

For example, if U_{SUPPLY} is 400 V AC, the maximum armature voltage is 1.35 * 400 V * Cos 15° = 521 V.

The maximum firing angle is limited by parameter **ARM ALPHA LIM MAX (412),** default value = 150. Do not change this value without consulting ABB!

Additional Commutation Reserve DXN

The commutation can not take place infinitely fast because of the network reactance. The time for the commutation can be expressed by the commutation angle u, which can be calculated using formula:

$$u = \arccos(\cos \alpha - I_d / I_k) - \alpha$$

where I_k = short circuit current
I_d = load current
U_l = network voltage
X_l = network total reactance

Example

It is wanted that a "weak" network can commutate 600 A current. The nominal voltage of the network is 380 V and frequency 50 Hz. Used transformer:

20 kV/400 V, 500 kVA
R_k = 0.0032 Ω
L_{km} = 48.85 µH/phase

Cable: lenght 50 m, 250 µH/km, L_{kk} = 12.5 µH/phase

Network reactance

$X_k = 2 * \pi * 50\ Hz * (48.85\ \mu H + 12.5\ \mu H)$
$= 0.019274\ \Omega$

Short Circuit Current

$I_k = \sqrt{2} * U / (2 * X_k) = 13941.33\ A$

Let´s calculate what will happen when DC-drive takes 400 A and β-limit is set to 165°.

400 A load

$I_d / I_k = 400\ A / 13941.33\ A = 0.0287$

$\cos 165° = -0.966$

$\cos (\alpha - u) = \cos \alpha - I_d / I_k = -0.9946$

$\arccos (-0.9946) = 174°$ == > OK

600 A load

Same with 600 A current:
$I_d / I_k = 0.043$

$\cos 165° = -1.009$

$\cos (\alpha - u) = \cos \alpha - I_d / I_k = -1.009$

arc cos (-1.009) = unspecified == > **NOT OK, slip over**

DXN

The DXN is proportional network short circuit voltage and it is defined by using the converter nominal current.

The purpose of DXN is to prevent the slip over of the thyristor bridge by changing the β-limit proportionally to the converter current, if the network is "weak". DXN is calculated:

$$DXN\ (414) = \frac{2 * Xk * I\ CONV\ A}{\sqrt{2} * U\ SUPPLY} * 1000$$

Parameter value for DXN (414) in this example is 43 = 4.3 %.
Scale: 1 = 0.1 %.

Firing angle example

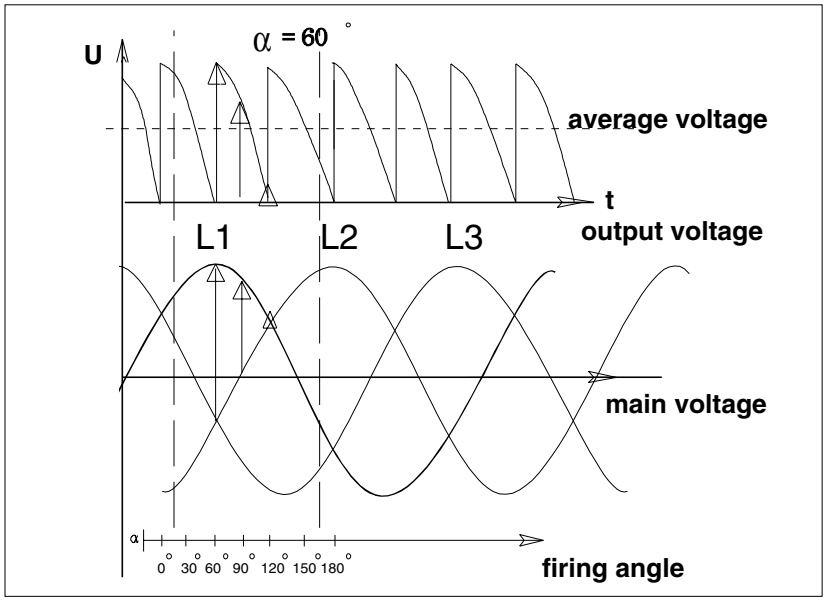


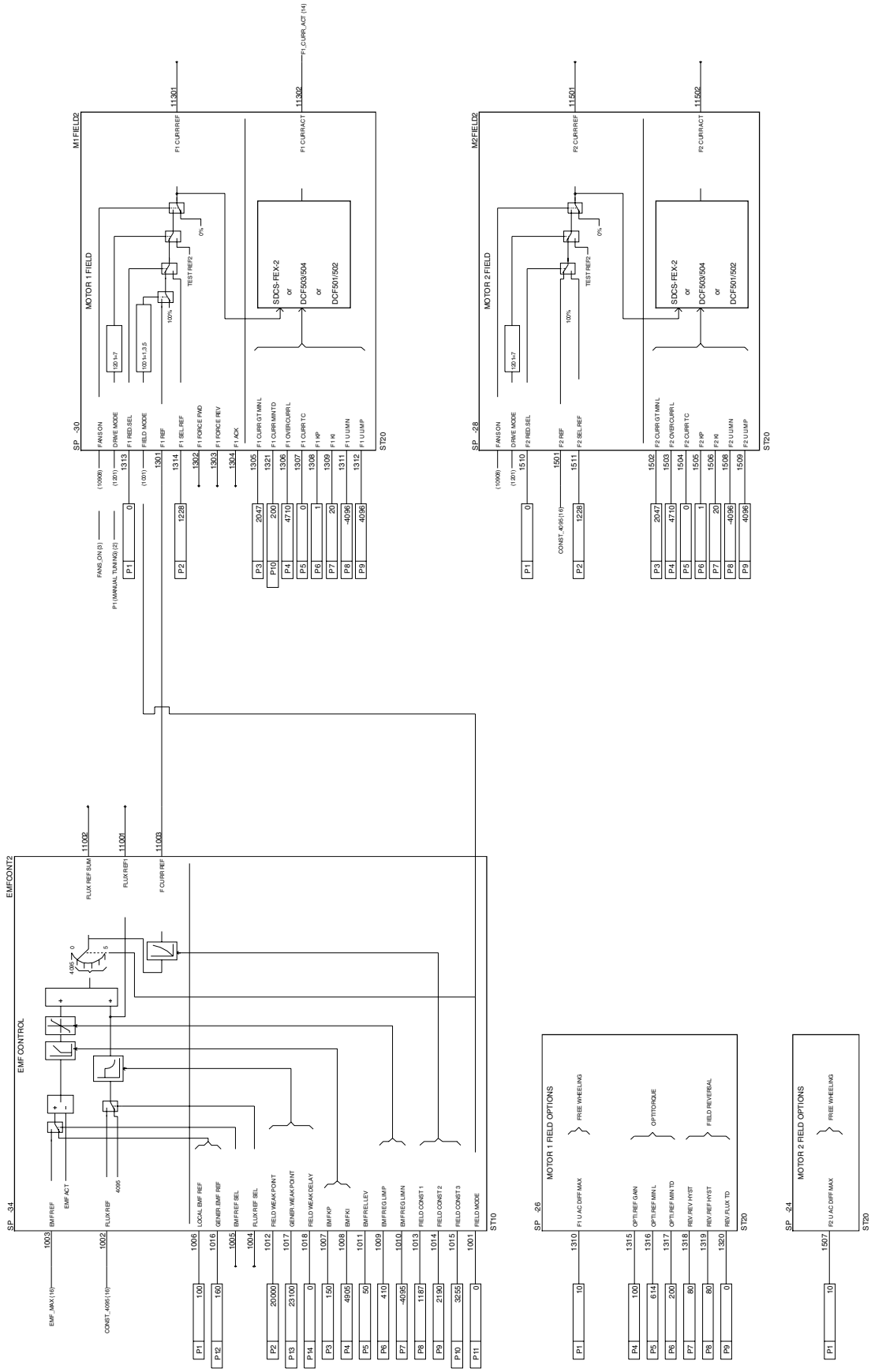
Figure 23 Armature voltage controlled by firing angle 60°

Note. **To avoid shooting through of the converter, the adjusted values of alpha limits should not be changed without consulting ABB.**

Status Indication for Bridge

Output connection point **ARM DIR (10402)** from the firing unit indicates the bridge in use:
0 = no bridge, **1** = motor bridge, **-1** = generator bridge.

Values of the **U MOTN V (501)**, **I MOTN A (502)** and **U SUPPLY (507)** must be given to the program, because these parameters are used for scaling the actual values of e.g. armature current.


EMFCONT2
EMF CONTROL
SP -34
FLUX REF SUM
FLUX REF1
F CURR REF
11002
11001
11003
EMF_MAX (16)
CONST_4095 (16)
BMF REF
EMF ACT
FLUX REF
4095
LOCAL BMF REF
GENER BMF REF
BMF REF SEL
FLUX REF SEL
FIELD WEAK POINT
GENER WEAK POINT
FIELD WEAK DELAY
BMF KP
BMF KI
BMF REL LEV
BMF REG LIMP
BMF REG LIMN
FIELD CONST 1
FIELD CONST 2
FIELD CONST 3
FIELD MODE
ST10
M1 FIELD2
MOTOR 1 FIELD
SP -30
F1 CURR REF
F1 CURR ACT
11301
11302
F1 CURR_ACT (14)
FAN S ON
DRIVE MODE
F1 RED SEL
FIELD MODE
F1 REF
F1 SEL REF
F1 FORCE FWD
F1 FORCE REV
F1 ACK
F1 CURR GT MIN L
F1 CURR MIN TD
F1 OVER CURR L
F1 CURR TC
F1 KP
F1 KI
F1 U LIMN
F1 U LIMP
TEST REF2
SDCS-FEX-2
or
DCF503/504
or
DCF501/502
ST20
M2 FIELD2
MOTOR 2 FIELD
SP -28
F2 CURR REF
F2 CURR ACT
11501
11502
F2 RED SEL
F2 REF
F2 SEL REF
F2 CURR GT MIN L
F2 OVER CURR L
F2 CURR TC
F2 KP
F2 KI
F2 U LIMN
F2 U LIMP
CONST_4095 (16)
MOTOR 1 FIELD OPTIONS
SP -26
F1 U AC DIFF MAX
FREE WHEELING
OPTI TORQUE
FIELD REVERSAL
OPTI REF GAIN
OPTI REF MIN L
OPTI REF MIN TD
REV REF HYST
REV FLUX TD
MOTOR 2 FIELD OPTIONS
SP -24
F2 U AC DIFF MAX

• *Field Excitation*

With DCS 500B it is possible to use several kinds of field exciters or a combination of them, depending on the application. This paragraph describes available field exciter units. Functions which use field exciters are also explained.

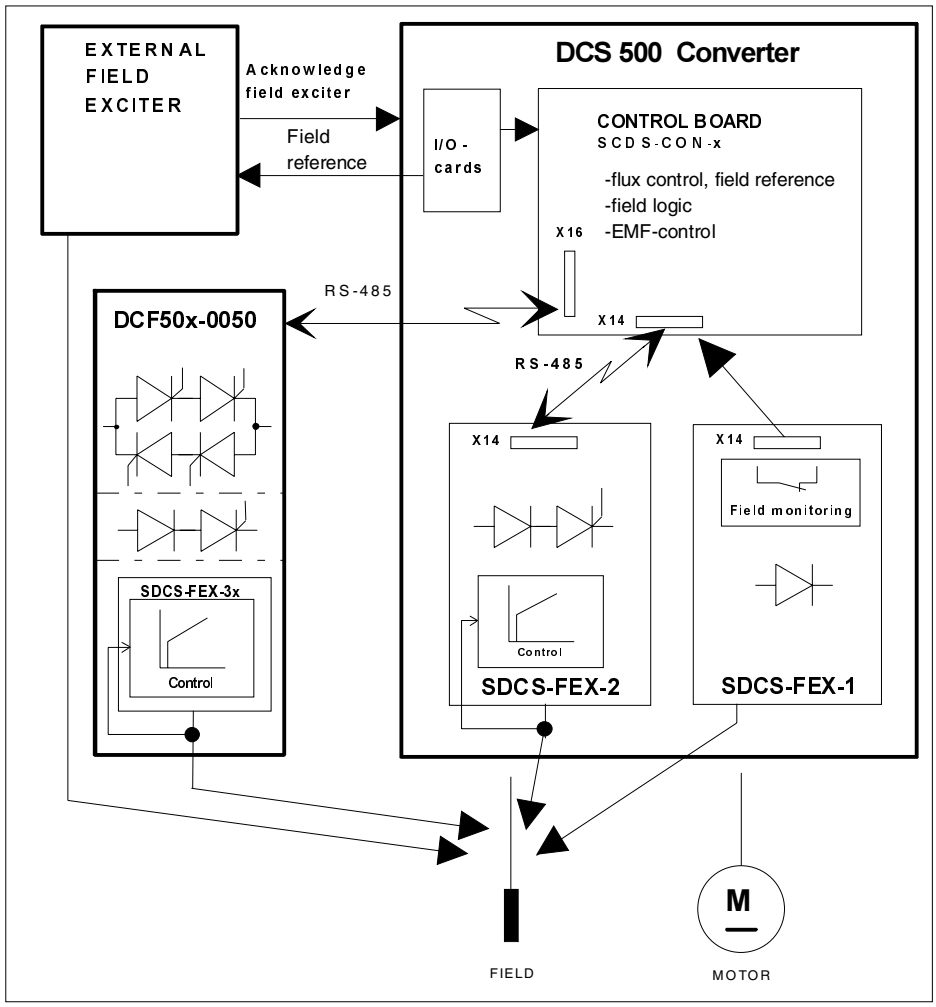


Figure *40* *Basic parts of the field excitation*

Selection of the Field Exciter

The type of field exciter is selected by parameter **FEXC SEL (505)**

0 [NO FIELD EXCITER]
No field exciter selected

1 [DIODE FIELD EXCT]
Internal diode field exciter SDCS-FEX-1

2 [FEX2 OR FEX3]
Internal SDCS-FEX-2 or ext. SDCS-FEX-3

3 [FEX3 FOR MOTOR2]
Ext. DCF50x-0050 for motor 2

4 [FEX2/3 + MOT2=FEX3]
internal SDCS-FEX-2 or ext. DCF50x-0050 as first field exciter and external DCF50x-0050 (FEX3) as a second one

5 [FIELD ACK VIA DI]
Other field exciter, acknowledge through DI

6 [FIELD ACK VIA AI]
Other field exciter, acknowledge through AI

Field Exciter Status

Status of the field exciter(s) can be seen from the maintenance function **FEXC STATUS (11203)**.

FEXC STATUS		**(11203)**
BIT	**Internal name**	**Comment**
0	FEXC1_RDY_OPER	0 = not ready for operation (AC-voltage missing)
1	FEXC1_ OK	0 = selfdiagnostics failed or power failure in fex 1
2	FEXC_2 RDY_OPER	0 = not ready for operation (AC-voltage missing)
3	FEXC2_OK	0 = selfdiagnostics failed or power failure in fex 2
4	ACK_FEXC1_ON	1 = motor 1 field OK
5	ACK_FEXC2_ON	1 = motor 2 field OK
6	FIELD_HEAT_ON	1 = motor heating function active
7	FIELD1_REV_ACK	direction of the field 0 = forward, 1 = reverse
8	ACK_CSC_ON	1 = on-command accepted by sequence control
9	ACK_FEXC_ON	1 = motor field OK

No Field Acknowledge Selected

If **FEXC SEL (505)** = 0, then the field acknowledge signal has no significance. This case is only for testing purposes. The first field exciter and the second field exciter are used with a "Shared motion" function.

Internal Diode Field Exciter SDCS-FEX-1

The current setpoint using the FEX1 is selected by selecting an appropriate voltage output from a field transformer. The program does not measure the current value but an acknowledge signal is formed which supervises whether the field exciter has current or not. Other parameter settings are not needed. The acknowledge signal cannot be read directly but if the signal **TC_RDY_RUN (11204) bit 2** is zero more than 6 second after ON-command, the drive will trip to the fault: NO FIELD ACK.

Internal Field Exciter SDCS-FEX-2

Internal field exciter FEX2 is a half controlled bridge that can control the field current in one (positive) direction. Because of the nature of the half controlled bridge, a very small amount of current (5...10%) flows always through the bridge if the field contactor is closed. SDCS-FEX-2 is controlled via a serial communication link. FEX2 measures the field current and sends the value to the drive via serial communication.

Acknowledge

The measured field current is used to form an acknowledge signal. If the field current exceeds the overcurrent limit, the drive will trip to the fault FIELD EX 1 OVERCURR. A low level of field current blocks the controllers immediately, but the low level must be active at least 6 seconds before the drive will trip to the fault: NO FIELD ACK.

External Field Exciter DCF503-0050

For the control point of view the DCF503-0050 is similar to SDCS-FEX-2. The differences are that DCF503-0050 can handle a higher field current than SDCS-FEX-2, and its mechanical size is larger. The control board type is SDCS-FEX-32.

External Field Exciter DCF504-0050

External field exciter DCF504-0050 can control the field current either to the positive or negative direction. The direction is selected by the sign of the field current reference. A positive sign means "forward" bridge and negative sign "reverse" bridge.
The field current supervision logic is handled in the same way as in SDCS-FEX-2. The control board type is SDCS-FEX-31.

AI/DI Connected Field Exciters

When modifying existing machines ("revamping") the old field exciters are often reused. In this case an acknowledge signal must be formed in order to supervise the field function. This can be done using either digital or analog input.

When a digital input is used to form the acknowledge signal, the function is similar to that used with FEX1, the diode field exciter.

Acknowledge Selection

The acknowledge signal is selected with the same parameter that is used for selecting the field exciter type. Acknowledge signal is connected to input **[F1 ACK] (1304)**

FEXC SEL (505)

...
5 = [FIELD ACK VIA DI]
field acknowledge through DI
6 = [FIELD ACK VIA AI]
field acknowledge through AI

Use of the Analog Input Channel

Analog input is used when the field current is measured or controlled. When controlling an AI-based field exciter, it is also necessary to transfer the reference to the field exciter. This can be done by means of connecting one analog output channel to the signal **F1 CURR REF (11301)**. The scaling of the used analog output must be arranged so that the value 4096 corresponds to the rated nominal excitation value as a voltage reference. The field current actual signal must also be scaled so that the scaled input value is 4096 with rated field current.

Calculation Example

For example, the field exciter nominal current is 32.5A, which corresponds to the 7V field current actual measurement. The connected analog input channel is AI3.

Set:

CONV MODE (110)	= 1
HIGH VALUE (111)	4096*10V/7V = 5851
LOW VALUE (112)	-4096*10V/7V = -5851
I MOT1 FIELDN A (503)	= 3250

For more information on how to scale the AI/AO, see paragraph *Digital and Analog I/O.*

Two Field Exciters at the same time

When the same converter controls two motors as a "shared motion", the armature unit is switched between two motors by means of an extra contactor. Both motors have still their own field exciters. In the documents the main motor field exciter is called the "first field exciter" and that of the second motor the "second field exciter".

Only the "first field exciter" can be current controlled and gets it´s current reference from the EMF CONTROL function block. The "second field exciter" always uses either a fixed field current level or a variable one, generated by an analog input or a similar function.

Motor standstill heating function can be used on the not-used motor by giving a small field current reference to the field exciter.

Field Current Settings

The nominal field current *must be given* to the program in order to have a correctly controlled field. Usually there is no need to change maximum and minimum levels.

The nominal current of field exciters are set with parameters

I MOT1 FIELDN A (503)	100 = 1 A
I MOT2 FIELDN A (504)	100 = 1 A

The minimum field current levels are set with parameters

F1 CURR GT MIN L (1305) 4095 = rated current
F2 CURR GT MIN L (1502) 2047 = 50% of rated current

In field weakning applications minimum field current limit must be checked. Parameter value must be below the minimum field current.

The overcurrent level is set with parameters

F1 OVERCURR L (1306) 4095 = rated current
F2 OVERCURR L (1503) 4710 = 115% of rated current

Free Wheeling Function

Ext. DCF50x-0050 has a free-wheeling function to give a path for the current if the AC-input voltage disappears for some reason, e.g. the field contactor opens. When this happens, the current does not stop but tends to increase the voltage of the field excitation unit very rapidly .

Trigger Point Setting of the Free Feeling Function

The AC input voltage is measured, and if the value changes too fast, the field excitation unit fires two selected thyristors continuously open to provide a path for the current. The sensitivity for starting the free-wheeling function can be adjusted by means of the following parameters

F1 U AC DIFF MAX (1310)
F2 U AC DIFF MAX (1507)

Scaling is in % 1 = 1%.

The initial value is 10 % which means that the free-wheeling function starts if the two successive AC-voltage measurements in field exciter differ more than 10 %.

Filter for Actual Field Current

The field exciter unit has a filter for smoothing the actual field current measurement. The filter has no influence on the PI-controller but only on the measured signal transferred to the drive software. The filter time constant should not be set too high because the same signal is also used for minimum and overcurrent supervision of the field exciter unit.

F1 CURR TC (1307) (scaling 1 = 0.01 s)
F2 CURR TC (1504)

Field Current Controller

The current controller of the field excitation unit is located inside the field excitation unit. Some parameters are accessible via serial communication if the current controller needs manual tuning. The current controller is a PI-type controller that has parameters for P-gain and I-time constant.

P-gain parameters:

F1 KP (1308)
F2 KP (1505)
Scaling: input 4095
P 1
output 4095

I-time constant parameters:

F1 KI (1309) Scale: 1 = 10 ms
F2 KI (1506) Scale: 1 = 10 ms
The maximum output voltage of the PI-controller can be limited by means of two parameters. When the bridge is fully open the output voltage is 0.9 * VAC. This equals the limit value 4095. The limitation is linear so 2048 = 0.5 * 0.9 * VAC.

F1 U LIM N (1311) negative limit
F1 U LIM P (1312) positive limit
F2 U LIM N (1508) negative limit
F2 U LIM P (1509) positive limit

Field Reversal

Field reversal is needed when the drive has only one armature bridge (two-quadrant). This gives the possibility to change the speed direction and also to regenerate the energy back to the network. The sign of the torque reference in armature control defines the direction of the field.

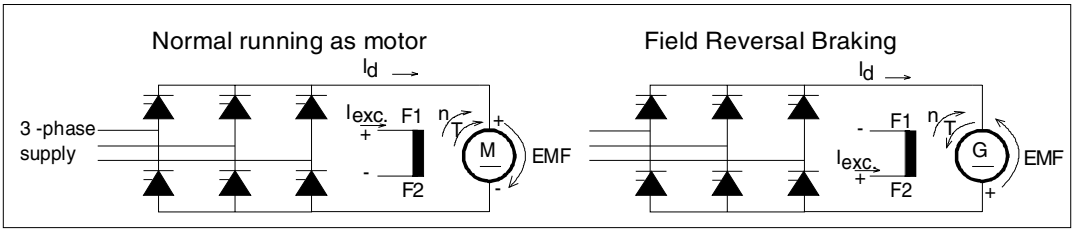


Figure *41* *Field reversal braking principle*

Activating

The field reversal function is enabled by means of parameter **FIELD MODE (1001)**

0	[CONSTANT F]	no EMF-control
1	[EMF, NO FIELD REV]	EMF-control without field reversal
2	**[NO EMF, FIELD REV]**	**Field reversal**
3	**[EMF + FIELD REV]**	**Field rev.** + EMF-control
4	**[NO EMF, OPTITORQUE]**	**Field rev.** + OPTITORQUE
5	**[EMF + OPTITORQUE]**	**Field rev.** + OPTITORQUE + EMF-control

On a four-quadrant drive the field reference value is always positive 100% (4095). If the EMF-controller is activated, the field current is controlled but it still can never be larger than 100%.

Field direction change hysteresis

To avoid a too sensitive field reversal function when the torque reference value is close to zero, a parameter is needed to form a hysteresis around the zero torque reference. The hysteresis is symmetrical around zero. For exampe, the hysteresis value is 80. The drive will change to reverse field when the torque reference is -80 or smaller. Back to forward field the drive can change when the torque ref is +80 or larger.

REV.REF HYST (1319) (default 80)

Force field direction

It is possible to force the drive to use a specified field direction. This gives the user the possibility to allow a change of field direction only when it is needed. For example, it is known when the drive must really change the direction of speed. Using the force-command makes the drive less sensitive to the value of the torque reference. Two inputs are defined for forcing the field direction:

[F1 FORCE FWD] (1302)
[F2 FORCE REV] (1303)

Field monitoring when changing direction

Normally the field current is compared with the minimum level and if the current falls below the limit, all the control functions are blocked and the drive goes to state RDY RUN = 0 and RDY REF = 0. During the field change the situation differs. The current can be below the minimum field level for a certain time because the field current must pass over zero.
In the process of field changing the current controller and the speed controller I-part are blocked and the speed ramp output is updated by the actual speed value.

The field current must change direction during a period of 2 sec, otherwise signal ACK_FEXC1_ON goes to 0 and RDYRUN and RDYREF are set to 0.

Following parameters are needed to supervise the function:

F1 CURR GT MIN L (1305) Defines the minimum level for the field current

REV.REV HYST (1318) The sign of the torque reference defines the field direction. Actual field direction is based on comparison of field current reference and actual. The hysteresis is used in actual current measurement when field reversal acknowledge signal is produced.

REV.FLUX TD (1320) If real FLUX of the motor does not follow rapidly the field current, e.g. in very old DC-motors, it can be necessary to make an extra delay for defining the field direction. Normally this time can be 0.

Following signals are needed for the controllers and for some measurements:

Bit 5 of **TC_STATUS (11204)** is the **TC_FIELD_CHANGE** indication and during field reversal this signal blocks the armature current controller, the I-part of the speed controller and updates the speed ramp output with a measured speed value.

Opti-Torque

The time that is normally needed for changing the field direction is quite long because of the big inductance of the field winding. This time can be reduced in certain cases by using the OPTI-TORQUE-function.

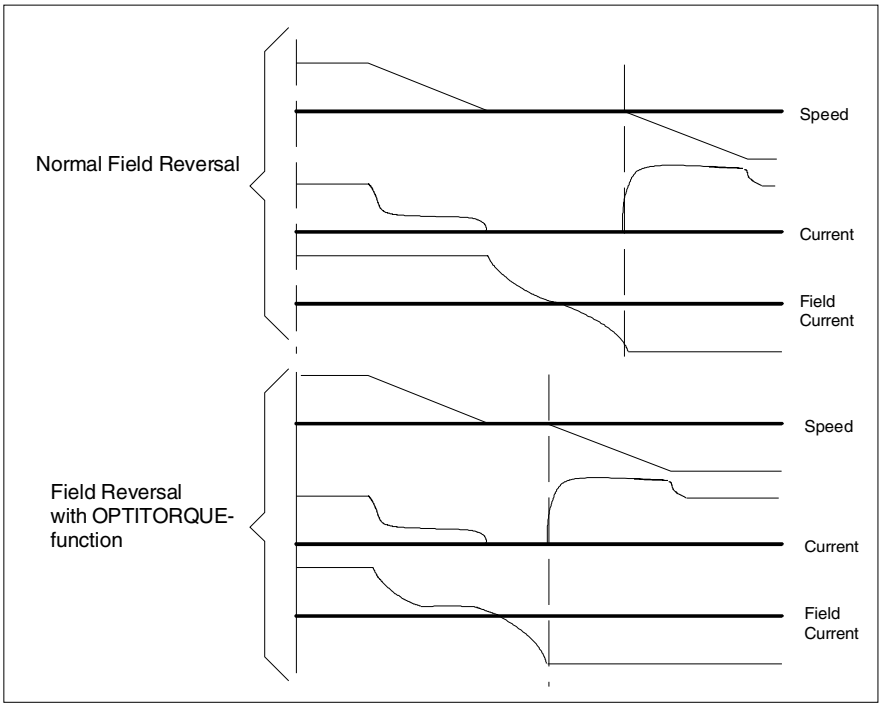


Figure 42 Optitorque function compared with normal field reversal

If the type of the process is such that before the field reversal only a small torque is needed, e.g. changing of the speed direction, it is possible to reduce the field current before the field reversal is activated.

This technique enables for a faster field reversal. The permissible reduction in the field current can be defined by the required torque reference. For example, if the speed direction is changed rather slowly, the required torque can also be quite small, close to zero speed, and so the motor field can also be reduced.

Selection of OPTI-TORQUE

The OPTI-TORQUE can be selected by the parameter:
FIELD MODE (1001)

4 [NO EMF, OPTITORQUE] **Field rev.** + OPTITORQUE
5 [EMF + OPTITORQUE] **Field rev.** + OPTITORQUE + EMF-control

Field current reduction using torque reference

The relationship between torque reference and field current reference is defined by parameter **OPTI.REF GAIN (1315)** (range 0...10000).

$$\text{F1 CURR REF (11301)} = \frac{\text{OPTI.REF GAIN} * \text{Torque reference}}{98}$$

Value 100 means that field current is directly proportional to torque reference. When a 10% torque reference is wanted to produce full field current, **OPTI.REF GAIN (1315)** is set to 1000.

Field monitoring when OPTI-TORQUE changes the field direction

Field monitoring differs from normal field changes in that during field reversal other controllers are not blocked. The bit 5 **TC FIELD CHANGE** in **TC STATUS (11204)** is kept in zero. The minimum field signal is normally delayed by two seconds, and this is a fixed delay. Because the time that the field current remains below the minimum level is also a function of the torque reference, and the torque reference depends on the process and the speed controller´s gain values, two seconds may be too short a time in some applications.
For this reason the minimum field monitoring is by-passed, if the field current reference falls below a certain level. Two parameters are needed for defining the threshold to the reference when minimum level is by-passed.

OPTI.REF MIN L (1316) 614 = 15% of nominal
When the field reference falls below this limit, the minimum field monitoring is by-passed.
OPTI REF MIN TD (1317) 1000 = 1s
This is an additional delay to keep the by-passing activated after the field current has again increased above the reference level. The field reference cannot be below the limit **OPTI.REF MIN L (1316)** longer than this time when OPTI-TORQUE function is active or the field reversal is done.

Field current / FLUX linearisation

When an extremely accurate control of torque is needed, e.g. on unwinder section of winder, the field current has to be linearised. The reason is that torque is the product of motor armature current and motor FLUX but motor FLUX is not directly proportional to the field current.

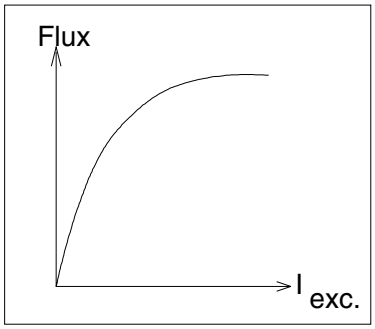


Figure *43* *Flux of DC-motor as a function of field current*

Saturation

The motor starts to saturate after a certain field current, and thus the relation of field current and motor flux is not linear. For this reason the field current cannot be directly used to define FLUX inside the motor. On the other hand, the motor armature voltage without load (= EMF) is directly proportional to the motor flux and motor speed below the field weakening area.

For example, if the motor nominal DC voltage is 440V, and we are running the motor at half speed and full FLUX, then the DC voltage is about 220V. Then, if we reduce the flux to 50% and keep the same speed, the DC voltage is about 110V. (This is only an example!)

Because the motor EMF-voltage is directly proportional to motor FLUX it is possible to define the relationship between the field current and the motor FLUX by measuring the motor armature voltage without load (EMF).
The main idea for linearisation is to find a field current that produces the desired EMF-voltage at a certain speed. Linearisation is done with a function block that needs three defined values, field currents for a 90%, 70% and 40% flux. The other values are interpolated. During the commissioning the values must be defined for the function block if the EMF-controller is to be used. Only the EMF-controller uses the linearisation function.

Linearisation procedure

see OPERATING INSTRUCTION

Field reduction when at standstill

The motor field can be reduced during standstill in order to avoid overheating when the motor is not running. The function can be activated by means of two parameters:

F1 RED SEL (1313) Selection for the first motor
F2 RED SEL (1510) Selection for the second motor in the case of shared motion.

The used current reference can be selected by means of two parameters:

F1 RED REF (1314) Reference for the first motor
F2 RED REF (1511) Reference for the second motor in the case of shared motion.

The function is activated when

- "ON"-command is "1", ie., the main contactor is closed
- the drive is in RDY RUN state.
- 10 seconds has elapsed.

Field heating when in "OFF"-state

The motor field can have a small value in order to avoid condensation when motor is in "OFF"-state. The function can be activated by means of parameter:

FIELD HEAT SEL (914)

The used current references are the same as with the field reduction function:

F1 RED REF (1314)	reference for the first motor
F2 RED REF (1511)	reference for the second motor in the case of shared motion.

The function is activated when command "ON" is 0, ie., the main contactor is open. The function closes the field contactor.

EMF_CONTROL function block

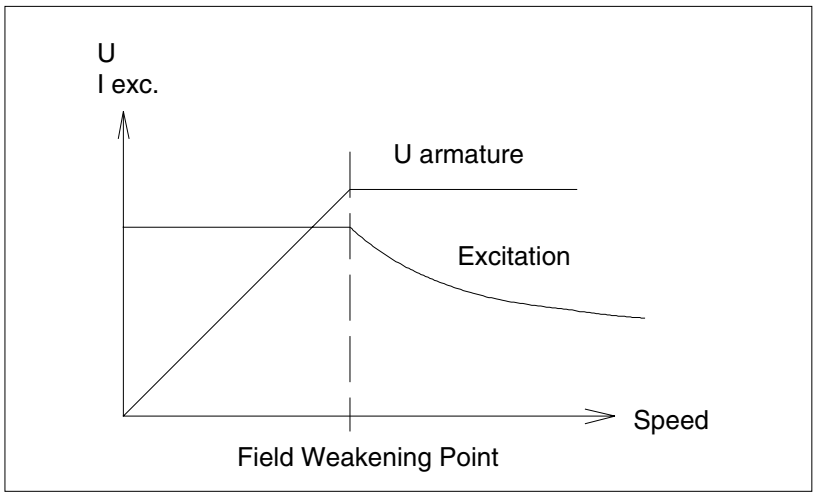


Figure *44* *Field weakening as a function of speed*

The Purpose of EMF Controller

The EMF-controller has two main control functions:

1. When the motor is run above the base speed, the EMF-controller reduces the motor field to keep the EMF-voltage constant at a maximum level. This must be done to avoid armature overvoltage and on the other hand, a maximum EMF is needed to keep the FLUX as high as possible.

2. When an accurate torque controller loop is needed, the EMF controller can be used to form an accurate FLUX value. The application program in the DCS 500B calculates the required value of the motor EMF at the used speed and used FLUX reference. The EMF-controller then adjusts the field current so that the measured EMF corresponds to the EMF-reference.

Selection of EMF-control

The EMF-control function can be activated by means of parameter **FIELD MODE (1001)**

0 No EMF-control (constant field) without field reversal
1 **EMF-control** without field reversal
2 No EMF-control (constant field) with field reversal
3 **EMF-control** with field reversal
4 OPTITORQUE without EMF-control
5 OPTITORQUE with **EMF-control**

Field reversal is normally used on two-quadrant drives. The field exciter must also be such that the field current can be controlled, e.g. SDCS-FEX-2, DCF50x-0050 or DCF500/DCF700.

Resistive and inductive voltage drop

To enable an accurate control, the EMF-voltage must be calculated. Without load the measured DC-voltage equals about the EMF but when the motor is loaded, the EMF starts to decrease because of losses in the motor. The EMF is calculated for the controller using the formula:

$$\mathbf{EMF = U_{dc} - (R_A * i + L_A * di/dt)}$$

where

R_A = armature resistance in ohms
L_A = armature inductance in mH
i = armature current
U_{dc} = measured armature voltage

For more information see paragraph *Speed Measurements.*

Field weakening area

Above a certain speed the motor FLUX must be reduced in order to avoid armature overvoltage. This area is called the "field weakening area" and the speed where the field reduction starts is called the "field weakening point". Above the field weakening point the motor FLUX is reduced by ratio 1/n. Two parameters are needed to carry out the function:

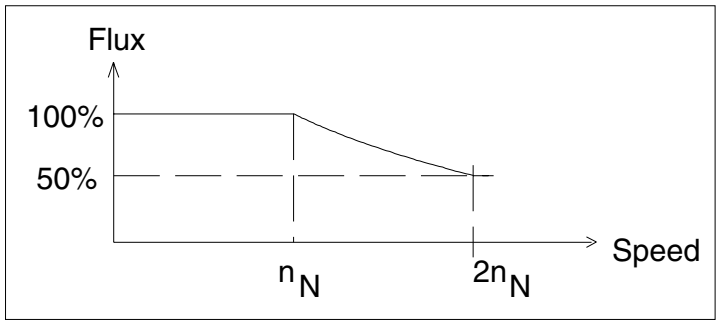


Figure *45* *The flux as a function of speed*

SPEED SCALING (2103) Max. speed of drive in 0.1 rpm. This rpm value equals to spped reference value of 20000.

FIELD WEAK POINT (1012)
Motor field weakening point. Scaling in speed units.

Example. The motor is labeled 1500 - 1800 rpm, 440V
Set **SPEED SCALING (2103)** = 18000
Set **FIELD WEAK POINT (1012)** = 16666 (=1500 * 20000 / 1800)

FLUX reference handling

The FLUX reference can be selected by input **[FLUX REF SEL] (1004)** as follows: The constant 100% flux reference (= 4096 units in software) is selected if input **[FLUX REF SEL] (1004)** has value 0. Value 1 selects the flux reference from input **[FLUX REF] (1002)**, which is connected to the application program (by means of function blocks in DCS 500B), when there are special requirements from the process point of view.

When the motor FLUX is reduced, a larger amount of armature current is needed to create the same torque on the motor shaft. This can be used on some applications, e.g. unwinder section in a winder. Because of a bigger armature current, the resolution of the measurement is better, which helps to control small torques with good accuracy.

Normally the FLUX reference is not changed rapidly. For example, on unwinder the FLUX reference follows the diameter of the roll.

Flux Reference in Emergency Stop

The control range for FLUX is 1:5, so the minimum FLUX reference is 20% of nominal. In case of EMERGENCY STOP, the reduced FLUX reference is changed to maximum possible FLUX reference defined by the field weakening area.

EMF reference handling

The EMF reference is selected by input **[EMF REF SEL] (1005)**. Value 1 selects the EMF-reference from input **[EMF REF] (1003**) , which is connected to the application program. Value 0 selects parameter **LOCAL EMF REF (1006)** as the EMF reference.

The scaling of **LOCAL EMF REF (1006)** is:
100% = U MOTN V

PI - controller

PI-controller is needed to correct inaccuracies caused by the process, e.g. network AC voltage variations.

I-part of the controller is reset below a certain EMF-level because the rotor resistance value I_R would otherwise cause an

erroneous result.
The limit at which the I-part is released can be defined by parameter:

EMF REL LEV (1011) default value is 50
(100 * 50/3786 = 1.3%)

EMF-error value filter

The EMF actual value can be filtered for the controller by means of 1st order filter. The time constant of the filter can be given by parameter

EMF FILT TC (513) scaling 1000 = 1s
(0...10000)

PI -gain value scaling

P-gain of the controller is reduced above the field weakening point by the factor 1/n in order to keep the process gain constant. P-gain can be adjusted by means of parameter

EMF KP (1007) Scaling is internal unit
277 = 100 %
(1...999)

I-time constant does not have 1/n scaling factor, and it is separated from the P-gain value. Time constant = 147200 / EMF KI and it can be adjusted by means of parameter

EMF KI (1008) Scaling is internal unit
20000 = 7.4 ms

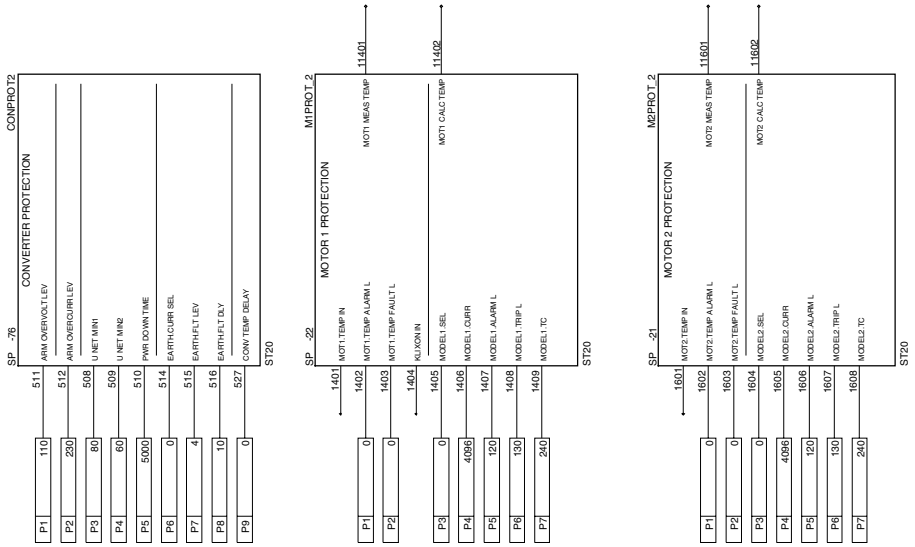
PI - controller output limitation

The output of the PI-controller is limited so that 100% of final FLUX reference is the absolute maximum value. The positive level of the PI-controller is limited so that at exactly the field weakening point the positive limit is zero. Above the field weakening point the positive limit starts to increase to facilitate a smooth transfer to the field weakening area.

Limits for the PI-controller can be adjusted by means of parameters

EMF REG LIM P (1009) 4095 = nominal FLUX
+410 = default (+10%)

EMF REG LIM N (1010) -4095 = -nominal FLUX = def.


SP -76
CONVERTER PROTECTION
CONPROT2
ARM OVERVOLT LEV
ARM OVERCURR LEV
U NET MIN1
U NET MIN2
PWR DOWN TIME
EARTH CURR SEL
EARTH FLT LEV
EARTH FLT DLY
CONV TEMP DELAY
ST20
SP -22
MOTOR 1 PROTECTION
M1PROT 2
MOT1 TEMP IN
MOT1 TEMP ALARM L
MOT1 TEMP FAULT L
KLIXON IN
MODEL1 SEL
MODEL1 CURR
MODEL1 ALARM L
MODEL1 TRIP L
MODEL1 TC
MOT1 MEAS TEMP
MOT1 CALC TEMP
11401
11402
ST20
SP -21
MOTOR 2 PROTECTION
M2PROT 2
MOT2 TEMP IN
MOT2 TEMP ALARM L
MOT2 TEMP FAULT L
MODEL2 SEL
MODEL2 CURR
MODEL2 ALARM L
MODEL2 TRIP L
MODEL2 TC
MOT2 MEAS TEMP
MOT2 CALC TEMP
11601
11602
ST20

• Protections

CONVERTER_PROTECTION function block

Network voltage measurement

The measurement/calculation of network voltage is based on the nominal voltage of the converter, nominal voltage of the supply and the voltage measurement as follows:

$$U\ NET\ ACT\ (10504) = \frac{U_{measured} * U\ CONV\ V(10511)}{U\ SUPPLY\ (507)} = e.g. \frac{3276 * 500}{400} = 4095 = 100\%$$

400 V supply

Note. DCS 500B converter module is exactly the same for 400V and 500V supply. Voltage measurement scaling is constant 500V = 4095. **U CONV V (10511)** signal value **must be 500** also for 400V supply (software reads this value automatically from the SDCS-PINxx board when C1, C2 or C3 modules are used).

Network undervoltage

The nominal net voltage is defined in **U SUPPLY (507)**. The upper limit for network undervoltage is defined in % by parameter **U NET MIN1 (508)**. If the network voltage drops below this limit, the controllers are blocked. An undervoltage trip is generated if network voltage is not restored within the time defined by parameter **PWR DOWN TIME (510)**. Scaling 1 == 1 ms.

The lower limit for network undervoltage is defined in % by parameter **U NET MIN2 (509)**. If the network voltage drops below this limit, the drive is tripped immediately.

Network overvoltage

The overvoltage limit is fixed to 130%. If this limit is exceeded, and the situation continues for at least 10 seconds, an OVERVOLTAGE-fault will occur. Armature overvoltage level is defined in % of nominal voltage of motor by parameter **ARM OVERVOLT LEV (511)**.

Overcurrent

There is a fixed overcurrent limit for the converter, and this value can be read out from the signal
I TRIP A (10510) (scale 1 = 1A)

If there is a need to reduce this limit, it can be done with the parameter:
ARM OVERCURR LEV (512)
scale: 100 = nominal current of converter **I CONV A (10509)**.

When the level is adjusted, the signal **I TRIP A** is updated automatically.

Note. With converter type C4 the nominal values must be given to the program with parameters 517...521.

When the overcurrent limit is exceeded, an OVERCURRENT-fault will appear (fault code 2).

Over - temperature

The maximum temperature of the bridge can be read out from signal **MAX BR TEMP (10512)**, scale: 1 = 1°C. If this limit is exceeded, a CONVERTER OVERTEMP-fault will occur. The alarm limit is 10°C below the tripping limit. Actual bridge temperature is given by signal **BRIDGE TEMP (10507)**, (scale 1 = 1°C).

With converter type C4 the maximum temperature of the bridge must be given to the program with parameter 519.

Earth Fault

Earth fault indication is based on a sum current transformer in the supply. The sum of three phase currents is zero, if there is no earth current.

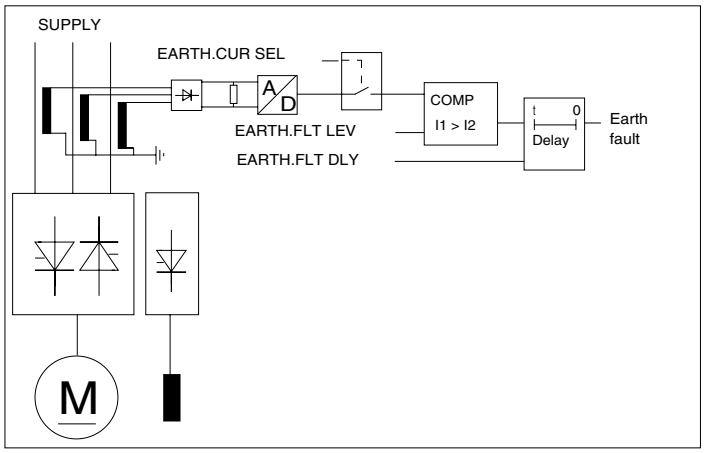


Figure *46* *Principle of earth fault current measurement*

Earth fault protection is activated by parameter
EARTH.CUR SEL (514).
0 = not used
1 = activated
Earth fault current tripping level is defined by parameter
EARTH.FLT LEV (515).
(scaling in amps)
The time after which fault is activated is defined by parameter
EARTH.FLT DLY (516).
(scaling 0.001s)

MOTOR_1_PROTECT ION function block
MOTOR_2_PROTECT ION function block

Measured Motor Temperature

The temperature measurement of the motor is usually measured via analog inputs **AI2** and **AI3** of the DCS 500B. The temperature measurement consists of Motor 1: **[TEMP IN] (1401)** and Motor 2: **[TEMP IN] (1601)** channels with alarm and tripping limits. These channels can be used for temperature supervision of both motors or of one motor and e.g. the bearings.
If temperature measurement elements are used, the temperature value can be monitored either in Celsius degrees (PT100) or in ohms (PTC). It is also possible to use external temperature measurements and therefore give temperature information by means of current (mA) or voltage to the analog inputs.

Measurement selection

When the motor temperature is measured using PT100, PTC or some other type of measuring element, the right type of measuring must be selected. If the PT100 elements are used, the respective number is given (1...3). See the parameter AIx CONV MODE (xxx) in AI2 and AI3 -function block.
When PTC measurement is selected, the conversion result is scaled as a resistance value.

Also the jumpers of the input voltage range and current generator must be set correctly in all cases. The SDCS-IOB3-card has only one current generator; if two temperature measurements are used, the elements of both channels have to be connected in series.

MOT1.[TEMP IN] (1401) is the input for measured temperature from motor 1.
MOT2.[TEMP IN] (1601) is the input for measured temperature from motor 2.

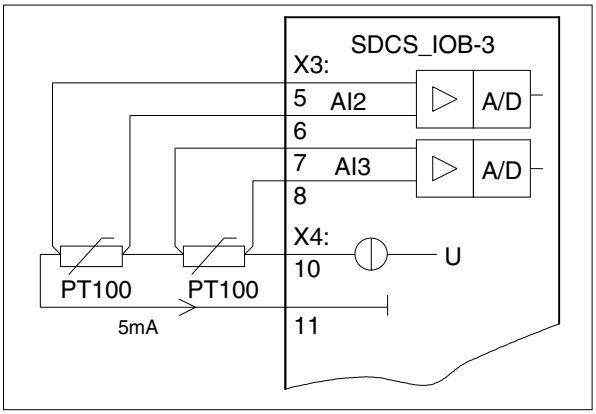


Figure *47* *Two PT100 sensors in a common current source*

See the jumper settings of the input range and constant current generator in Chapter 2 *"Standard hardware description"*. See also paragraph *"Analog Inputs"* in this chapter.

Alarm and tripping limits

There are parameters for thermal measurement (PT100, PTC) alarm limit and tripping limit. If the measured temperature reaches the value set in the alarm parameter, the program gives an alarm indication, MOTOR 1 TEMP. ALARM / MOTOR 2 TEMP. ALARM. If the temperature keeps on rising and reaches the tripping limit, the program trips the drive and gives a fault indication MOTOR 1 OVERTEMP. / MOTOR 2 OVERTEMP. Overtemperature fault belongs to tripping level 2, which means that in case of overtemperature the main and field contactors will open. Fans keep running until temperature falls below the alarm limit.

In the PT100-measurement the alarm and tripping limit parameters are set directly as Celsius-degrees. In the case of thermistor measurement (PTC) the limits are set as resistance values, (0...4000 ohms). The alarm limits are set into parameters:

Motor 1: **MOT1.TEMP ALARM L (1402)**
Motor 2: **MOT2 TEMP ALARM L (1602)**

The temperature tripping limits can be set by the:

Motor 1: **MOT1.TEMP FAULT L (1403)**
Motor 2: **MOT2 TEMP FAULT L (1603)**

If the above parameters are set to zero, the alarm and tripping limits will not be supervised.

Example:
Analog input channel 2 (AI2) has been selected for PT100-measurement of the motor windings (3 elements), and the analog input channel 3 (AI3) has been selected for PT100-measurement of the motor bearings (2 elements). It is supposed that the alarm and tripping limits of the motor winding are 110°C and 120°C. The alarm and tripping limits of the bearings are 40°C and 50°C. The settings in this case are:

AI2 CONV MODE (107) = 5
AI3 CONV MODE (110) = 4
MOT1.[TEMP IN] (1401) = 10107 (connect to output AI2: 10107)
MOT1.TEMP ALARM L (1402) = 110
MOT1.TEMP FAULT L (1403) = 120
MOT2.[TEMP IN] (1601) = 10110 (connect to output AI3: 10110)
MOT2.TEMP ALARM L (1602) = 40
MOT2.TEMP FAULT L (1603) = 50

Note:
HIGH VALUE and LOW VALUE parameters in AI function blocks are not in use when AI output is defined in °C or in ohms (Ω).

Jumper settings of SDCS-IOB3-card are made such that the input voltage range in both channels is +/-10V.

Motor Protection by means of the switch

DC-motor temperature protection can also be supervised by means of the temperature switch in the DC-motor. The contact of the switch opens in a certain temperature. The connection to the software is by means of the digital input,and the input signal **[KLIXON IN] (1404)** is used in software. When the input state changes from 1 to 0, the overtemperature trip will be activated.

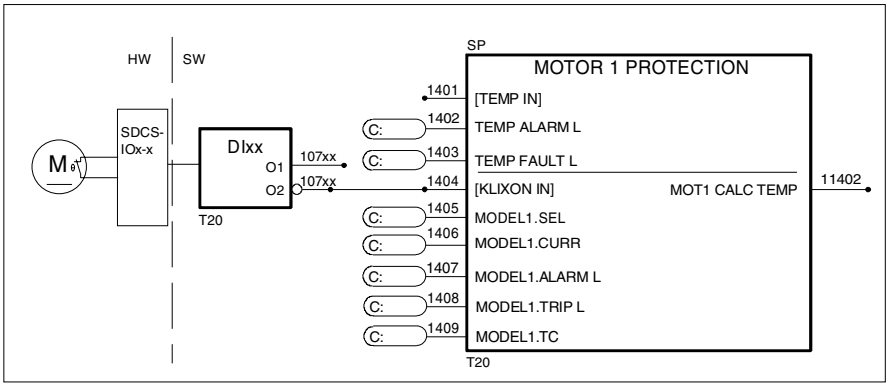


Figure *48* *Overtemperature protection by means of the thermal switch.*

Motor thermal model

The DC-motor must be always protected against overtemperature. If a direct temperature measurement of the motor is not available, the thermal model of the motor can be used when the current limits of the drive are set higher than the nominal motor current.

In the DCS500B there are two thermal models available that can be used at the same time. By means of input signal **[MOTOR2] (913)** the measured armature current is directed to the correct model.

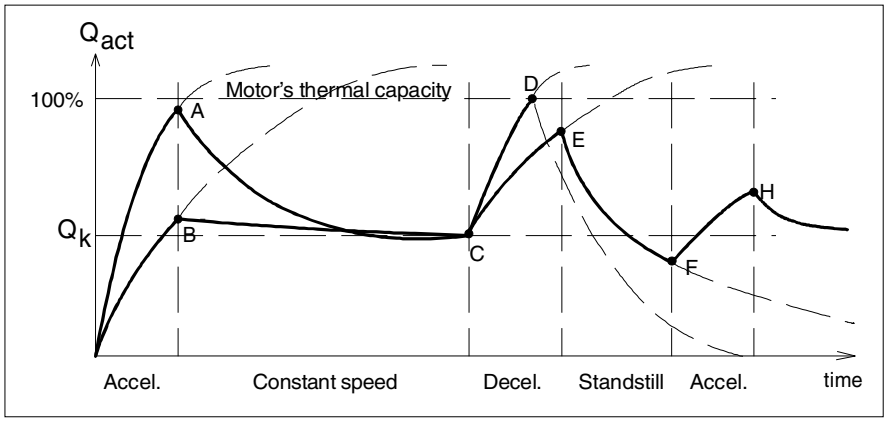


Figure *49* *Q_{act} as a function of different loads*

Previous figure shows how Q_{ACT} (motor's thermal capacity) is formed of rising and falling sections of the time constant function. On curve 0-A-C-D an overload trip occurs at point D owing to a too short time constant even though the heating up clearly does not reach the limit Q_{ACT} = 100% which corresponds to the motor's thermal capacity.

In point A acceleration does not yet cause a trip because a cold start was made

On curve 0-B-C-E-F-H the desired loading cycle can be repeated as many times as necessary because its time constant is sufficiently long.

The temperature rise of the motor behaves as a time constant which is proportional to the motor current in power of two.

$$Q_{act} = \frac{I_{act}^2}{I_{ref}^2} * (1 - e^{-t/\tau}) * 100 \qquad (1)$$

where:

Q_{act}	thermal value
I_{act}	motor current actual
I_{ref}	reference current, normally rated current of motor
τ	temperature time constant.
100	scaling factor
t	time

When the motor is cooling, the temperature model follows the formula

$$Q_{act} = \frac{I_{act}^2}{I_{ref}^2} * e^{-t/\tau}) * 100 \qquad (2)$$

As can be seen from formulas (1) and (2) , the thermal model uses the same time constant for a warming motor and a cooling motor.

Preloading

Formulas 1 and 2 do not take into account the thermal preloading which in practical cases precedes currents that are higher than the rated current. In the model these can cause a trip.
Preloading current is I_0.

$$Q_{act} = \frac{I_{act}^2 - I_0^2}{I_{ref}^2 - I_0^2} * (1 - e^{-t/\tau}) * 100 \qquad (3)$$

Thermal model selection

The activation of thermal model is made by parameters **MODEL1.SEL (1405)** and **MODEL2.SEL (1605)**. If the thermal model is not activated (0), its output is set to zero.

Input signal **[MOTOR2] (913)** selects which of the thermal models follows the armature current measurement.

[MOTOR2] (913)
0 = MODEL 1 follows the armature current measurement
1 = MODEL 2 follows the armature current measurement

One thermal model thus follows the armature current and the other is cooling.

Alarm and tripping limits

Alarm and tripping limit calculation uses as the base current (I_{ref}) the values given by parameters

MODEL1.CURR (1406)
MODEL2.CURR (1605)

The normal value is 4096 (≅ motor rated current). This value should not normally be changed. If for some reason it is not possible to run the motor continuously with rated current, e.g. due to poor cooling environment, then the value can be decreased. E.g. the target continuous load is 85% of the used motor rated current. Then the parameters are 0.85 * 4096 = 3481.

Alarm and tripping limits can be selected by means of four parameters

MODEL1.ALARM L (1407)
MODEL1.TRIP L (1408)
MODEL2.ALARM L (1506)
MODEL2.TRIP L (1507)

Initial values are selected so that the overloadability is quite high. For example, the current must continuously be √120 * 100 = 109.5 % before alarm is given and for trippings the current must be √130 * 100 = 114 %.

Recommended value for alarm is 90...100% and for tripping 106...110%.

MODELx.ALARM L (xxxx) = (alarm $\%^2$/100)
MODELx.TRIP L (xxxx) = (trip $\%^2$/100)

Example. The tripping limit is 106% --> **MODELx.TRIP L (xxxx) = 112**

Thermal time constant

Time constants for thermal models are given by two parameters

MODEL1.TC (1409)
MODEL2.TC (1608)

It has to be noted that the thermal time constant cannot be used directly when calculating the tripping time. Often the motor manufacturer presents a curve that defines how long the motor can be overloaded with a certain overload factor. Parameters **MODEL1.TC (1409)** and **MODEL2.TC (1608)** can be selected by means of figure on the next page.

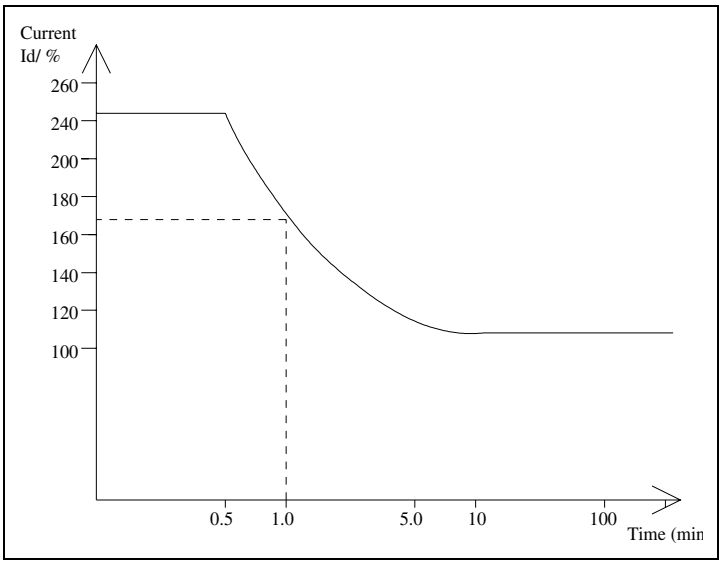


Figure *50* *Example of motor loadability curve.*
***Note**. This is an example and does not necessarily correspond to any actual motor.*

Example:
The drive should trip if motor current rises above 170% of motor nominal current for a time longer than 1 minute. Motor's preload is 50% of nominal armature current. See the following figure. Parameter **MODEL1.TC (1409)** value is **150**.
Selected tripping base level is 106%. **MODEL1.TRIP L (1408)** = 106^2 /100 = 102.

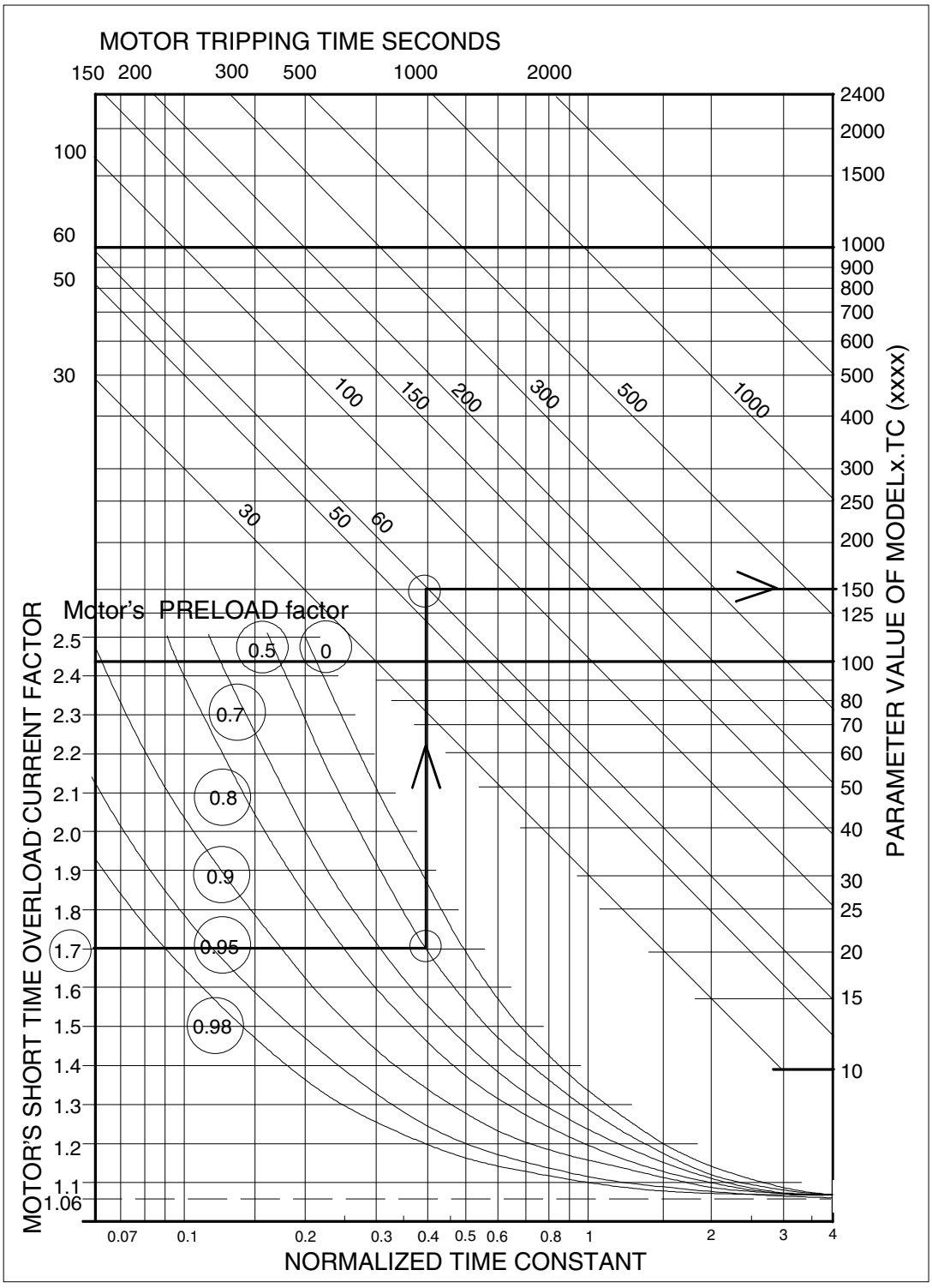
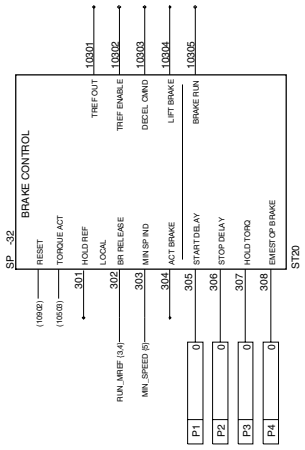


Figure *51* *MODELx.TC selection curves with tripping base level 106%.*


SP -32
BRAKE CONTROL
ST20
RESET
TORQUE ACT
HOLD REF
LOCAL
BR RELEASE
MIN SP IND
ACT BRAKE
START DELAY
STOP DELAY
HOLD TORQ
EMERGY OP BRAKE
TREF OUT
TREF ENABLE
DECEL CMND
LIFT BRAKE
BRAKE RUN
301
302
303
304
305
306
307
308
10301
10302
10303
10304
10305
(10/02)
(10/03)
RUN_MREF (3-4)
MIN_SPEED (6)
P1
P2
P3
P4
0

• Brake Control

Specific drives such as hoisting or travelling drives must keep in their current position even the regulator switched off. Control of the brake and converter has to be synchronised to avoid moving of load when the brake is released. The motor has to produce a holding torque before a release command is given to the brake. DCS 500B has a full sequence control for a mechanical brake provided by the BRAKE CONTROL function block. It is designed to operate in co-operation with speed controller.

Safety

If a fault has occurred or watchdog trips in control board SDCS-CON-2, the brake is immediately controlled to close state
(**LIFT BRAKE (10304) = 0**).

If emergency stop is activated, the function of brake can be defined by parameter **EMESTOP BRAKE (307)**:
0 = DISABLE (brake is closed when speed is zero)
1 = ENABLE (brake is closed immediately)

BRAKE_CONTROL function block

Holding Torque

Holding torque reference can be connected to input **[HOLD REF] (301)** from the application or analog input. If constant holding torque is used, it can be set with parameter **HOLD TORQ (307)**. If **[HOLD REF] (301)** is not connected, the reference is defined by parameter **HOLD TORQ (307)**.

Brake Release

The mechanical brake is released by means of input **[BR RELEASE] (302)**. The RUN command from the output of digital input is normally connected to here.

Minimum Speed Indication

Input **[MIN SP IND] (303)** is the minimum speed indication for the block. This input should be active when actual speed of the drive is below the minimum speed limit. Minimum speed indication is available from the SPEED MONITOR function block or it can be generated by external device or DCS 500B function block application

Brake Acknowledge

The brake released acknowledge can be connected by means of digital input to input **[ACK BRAKE] (304)** in BRAKE CONTROL function block. Otherwise acknowledge is done in software by connecting **[ACK BRAKE] (304)** directly to brake release command **LIFT BRAKE (10304)**.

Start Delay

After the start command is given with BR RELEASE-input and the actual torque has reached the holding torque level, the LIFT BRAKE output is set. After that during the time **START DELAY (304)** the DECEL CMND is active keeping the speed reference in zero. When start delay has elapsed, speed controller and ramp generator are released. (scaling: 1 = 0.01s).

Stop Delay

Stop delay is set equal to the closing time of the brake. When BR RELEASE command is removed, the BRAKE CONTROL - function block will reset the input of RAMP GENERATOR with DECEL CMND. When actual speed is low enough, the MIN SP IND - input is set active. Then LIFT BRAKE - command is removed and during stop delay, the BRAKE RUN - command will keep the speed controller operating with zero speed reference. When **STOP DELAY (305)** has elapsed, the BRAKE RUN - command is removed. The mechanical brake is now holding the load by itself. (scaling: 1 = 0.01s)

Function

Following figure shows the timings of the BRAKE CONTROL in case of starting and stopping.

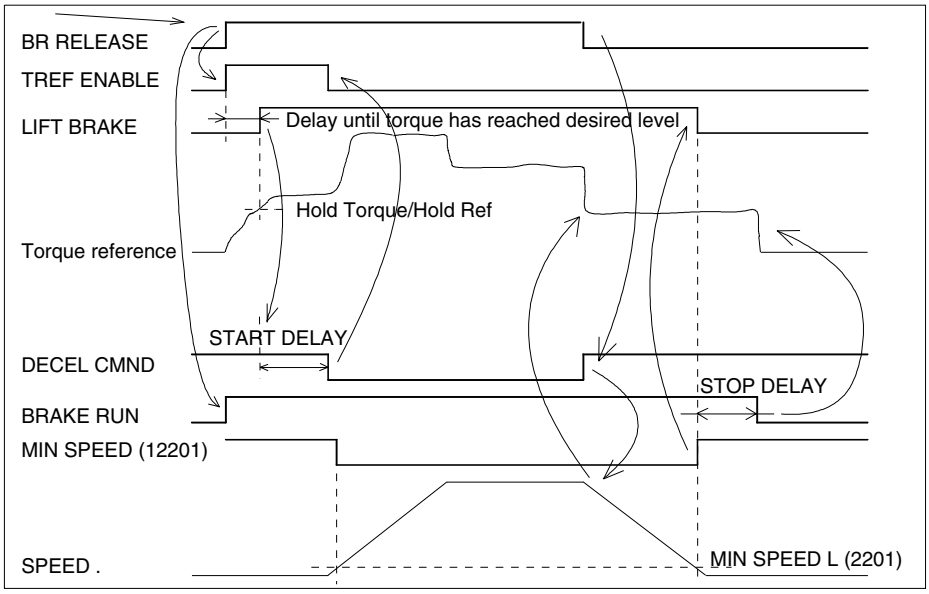


Figure *51* *Brake control function*

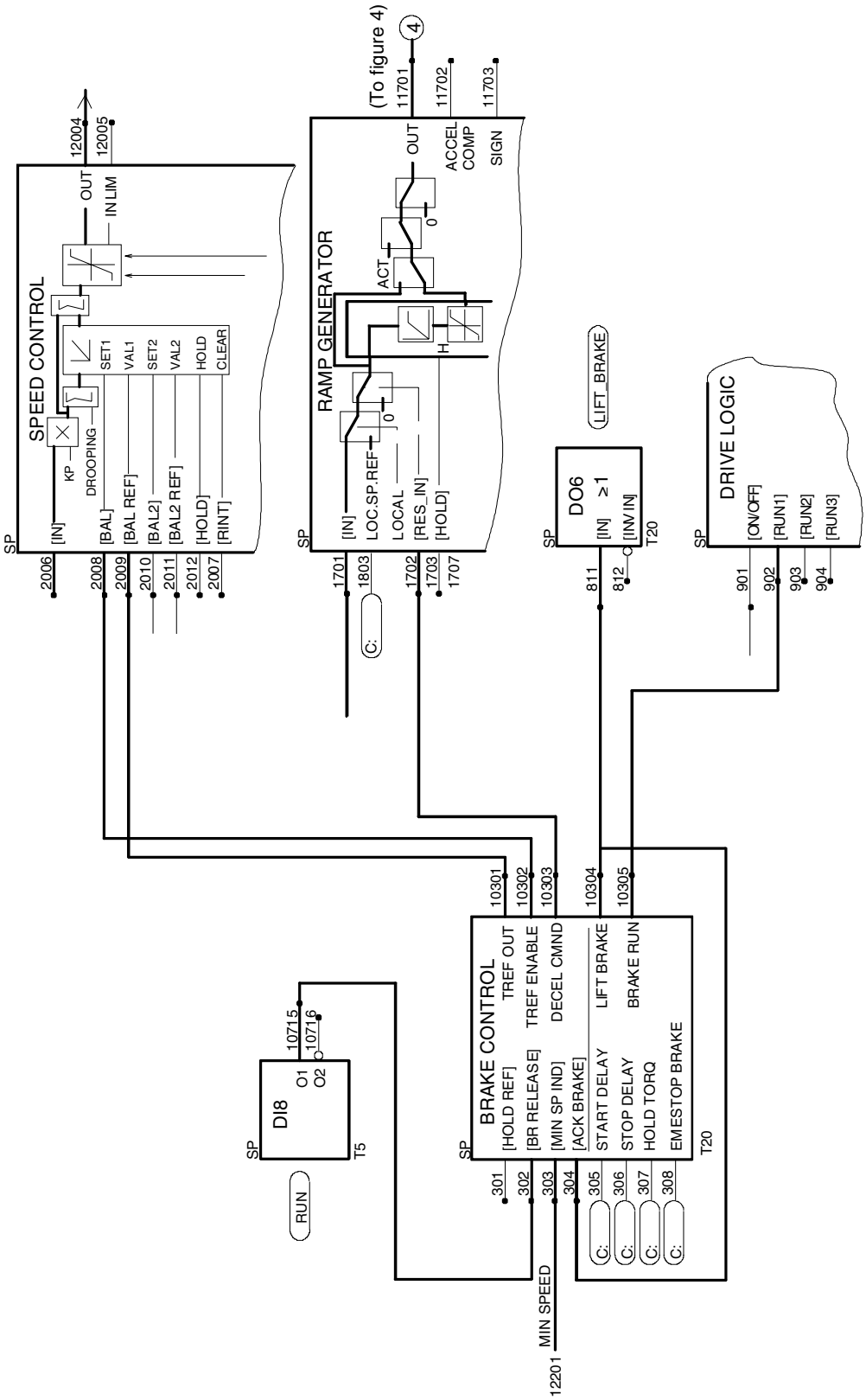


Figure *52* *Brake control example connection*

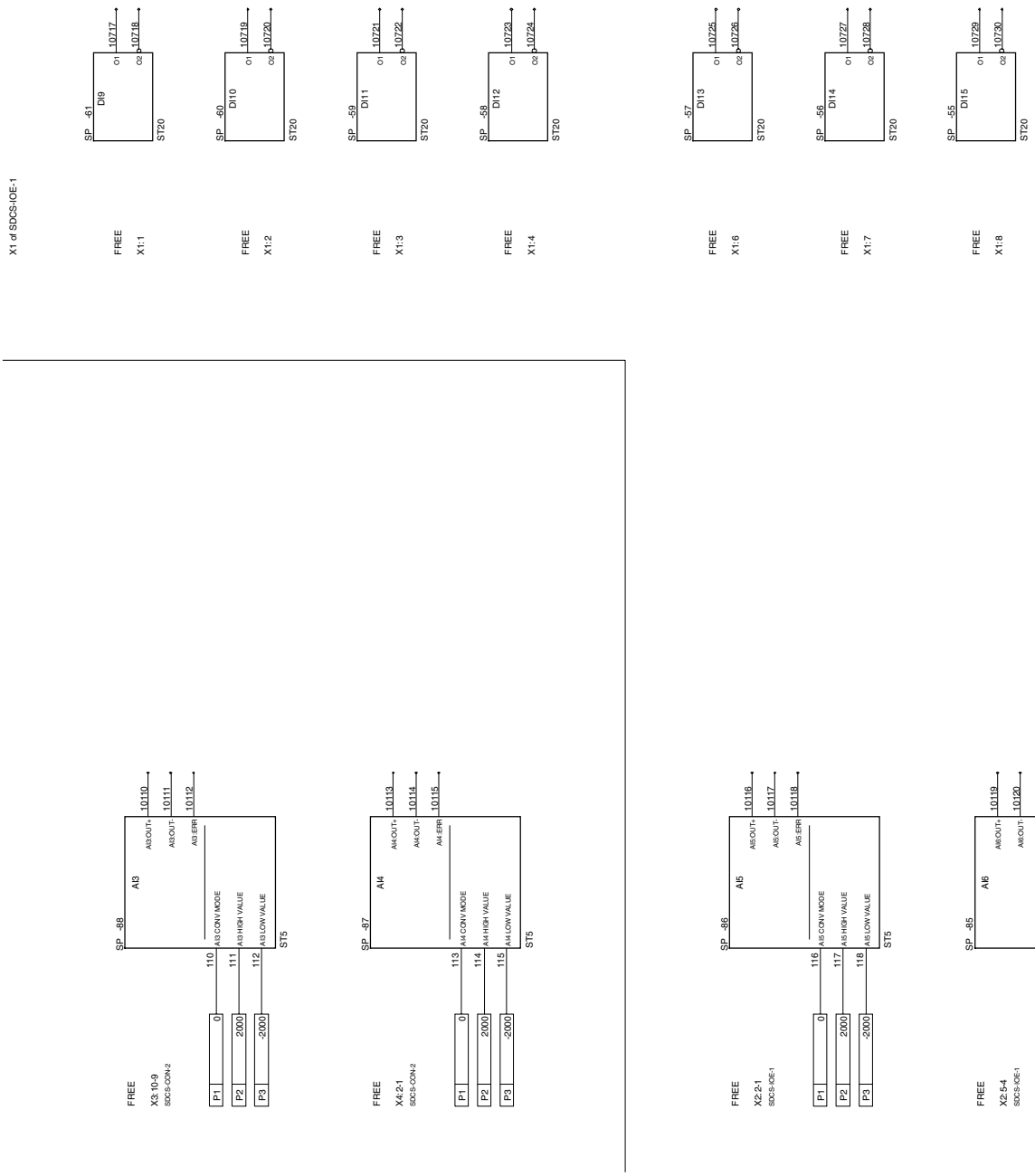
TREF OUT **TREF OUT (10301)** is a output for torque reference which is used when the brake is opened. This is normally connected to SPEED CONTROL **[BAL REF] (2009)**. This torque reference is set to integral part of speed controller by means of TREF ENABLE output

TREF ENABLE Logical output **TREF ENABLE (10302)** is activated when the BR RELEASE changes 0 -->1 and is removed when START DELAY has elapsed.
0 = **TREF OUT (10301)** is zero
-1 = **TREF OUT (10301)** is used as torque reference

DECEL CMND Logical output **DECEL CMND (10303)** is used to control the speed reference. It is active until acceleration starts when brake is released and it is activated again when **[BR RELEASE] (302)** changes 1--> 0. By means of this output the speed reference of ramp generator input is connected to zero before acceleration starts and after stop command is given.

LIFT BRAKE Output **LIFT BRAKE (10304)** is used to open the mechanical brake when the motor is able to produce torque (torque act = TREF OUT).

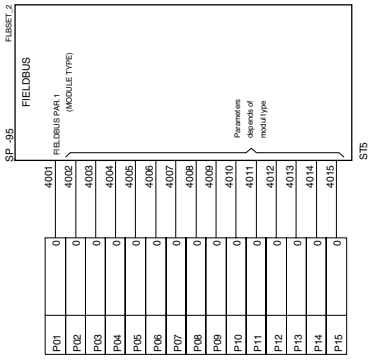
BRAKE RUN Output **BRAKE RUN (10305)** is used for controlling one of input signals RUN1, RUN2 or RUN3 in DRIVE LOGIC to give a RUN - command for the converter.

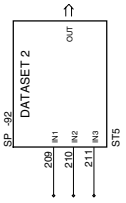

X1 of SDCS-IOE-1
SP -61
DI9
O1 10717
O2 10718
ST20
FREE
X1:1
SP -60
DI10
O1 10719
O2 10720
ST20
FREE
X1:2
SP -59
DI11
O1 10721
O2 10722
ST20
FREE
X1:3
SP -58
DI12
O1 10723
O2 10724
ST20
FREE
X1:4
SP -57
DI13
O1 10725
O2 10726
ST20
FREE
X1:6
SP -56
DI14
O1 10727
O2 10728
ST20
FREE
X1:7
SP -55
DI15
O1 10729
O2 10730
ST20
FREE
X1:8
SP -88
AI3
AI3:OUT+ 10110
AI3:OUT- 10111
AI3:ERR 10112
AI3:CONV MODE
AI3:HIGH VALUE
AI3:LOW VALUE
ST5
110
111
112
P1 0
P2 2000
P3 -2000
FREE
X3:10-9
SDCS-CON-2
SP -87
AI4
AI4:OUT+ 10113
AI4:OUT- 10114
AI4:ERR 10115
AI4:CONV MODE
AI4:HIGH VALUE
AI4:LOW VALUE
ST5
113
114
115
P1 0
P2 2000
P3 -2000
FREE
X4:2-1
SDCS-CON-2
SP -86
AI5
AI5:OUT+ 10116
AI5:OUT- 10117
AI5:ERR 10118
AI5:CONV MODE
AI5:HIGH VALUE
AI5:LOW VALUE
ST5
116
117
118
P1 0
P2 2000
P3 -2000
FREE
X2:2-1
SDCS-IOE-1
SP -85
AI6
AI6:OUT+ 10119
AI6:OUT- 10120
AI6:ERR 10121
AI6:CONV MODE
AI6:HIGH VALUE
AI6:LOW VALUE
ST5
119
120
121
P1 0
P2 2000
P3 -2000
FREE
X2:5-4
SDCS-IOE-1

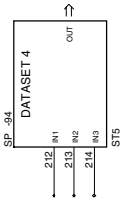
• Extended inputs / outputs

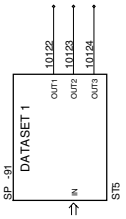
The AI3 and AI4 blocks represent another 2 analog inputs which have as yet not been assigned to any particular functions. The blocks AI5 and AI6 represent another 2 additional inputs which are only active, if the board SDCS-IOE1 is connected. Another 7 digital inputs DI9 … DI15 are available with this additional hardware.

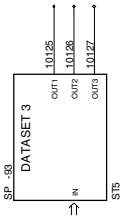
General: please see chapter *General*


FLBSET_2
SP -95
FIELDBUS
FIELDBUS PAR 1
(MODULE TYPE)
ST5
Parameters
depends of
module type
P01 0 4001
P02 0 4002
P03 0 4003
P04 0 4004
P05 0 4005
P06 0 4006
P07 0 4007
P08 0 4008
P09 0 4009
P10 0 4010
P11 0 4011
P12 0 4012
P13 0 4013
P14 0 4014
P15 0 4015


SP -92
DATASET 2
IN1
IN2
IN3
OUT
209
210
211
ST5


SP -94
DATASET 4
IN1
IN2
IN3
OUT
212
213
214
ST5


SP -91
DATASET 1
IN
OUT1
OUT2
OUT3
10122
10123
10124
ST5


SP -93
DATASET 3
IN
OUT1
OUT2
OUT3
10125
10126
10127
ST5

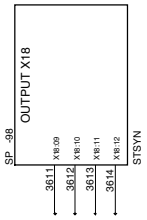
• Serial link via FIELDBUS

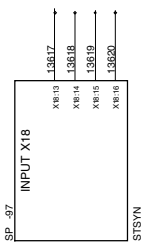
If analog and digital signals are not sufficient for the control or the status of the drive a serial link based on serial communication modules may be a possibility to imcrease the number of information or the accurracy of the signals. The type of module is activated by means of the block FIELDBUS. The data transferred from the control to the converter are stored in the blocks DATASET 1 and 3 as a 16-bit-information. Depending on the application the output pins of these blocks have to be connected to input pins of other blocks in order to transport the message. The same procedure is valid for blocks DATASET 2 and 4, if they are connected. These blocks are transmitting information from the converter to the control system.

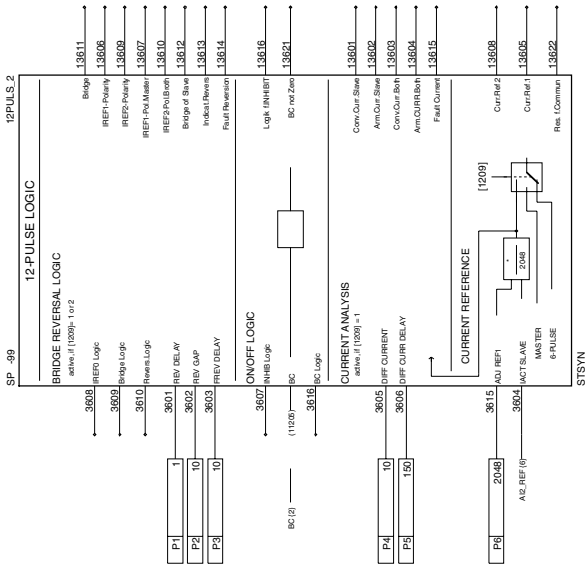
There are several different communication adapter available:
- NPBA-02 for serial links, based on PROFIBUS
- NCSA-01 for serial link to ABB PLC type CS31 / AC31
- NMBA-01 for serial link , based on MODBUS
- NMBP-01 for serial link , based on MODBUS PLUS
- FCI for serial link to ABB PLC via AF100 bus
- no module for serial link to ABB PLC type AC70

General: please refer to the documentation describing the serial link module and the *Description of the drive-specific serial link interconnections*

Some of these modules have been updated in the past. They are available with different software versions. The next table shows the compatibillity (modules marked with ***** should be used together with this converter software):
- NPBA-02; software version 2.1
- NPBA-02; software version 2.2 *****
- NCSA-01; software version 1.5 *****
- NMBA-01; software version 1.5 ***** (supports multilink)
- NMBP-01; software version 1.5 ***** (no parameter exchange)
- FCI; software version 1.3 *****
- AC70; software version 1.1-1 *****


SP -98
OUTPUT X18
3611
3612
3613
3614
X18:09
X18:10
X18:11
X18:12
STSYN


SP -97
INPUT X18
13617
13618
13619
13620
X18:13
X18:14
X18:15
X18:16
STSYN


SP -99
12PULS_2
12-PULSE LOGIC
BRIDGE REVERSAL LOGIC
active, if [1209]= 1 or 2
IREF0 Logic
Bridge Logic
Reverse Logic
REV DELAY
REV GAP
FREV DELAY
ON/OFF LOGIC
INHIB Logic
BC
BC Logic
BC (2)
(11[2:6])
CURRENT ANALYSIS
active, if [1209] = 1
DIFF CURRENT
DIFF CURR DELAY
CURRENT REFERENCE
[1209]
ADJ REF1
ACT SLAVE
MASTER
6-PULSE
2048
A2_REF (6)
Bridge
IREF1-Polarity
IREF0-Polarity
IREF1-Pol.Mastr
IREF2-Pol.Both
Bridge of Slave
Indicat.Revers
Fault Reversion
Logik I.INHIBIT
BC not Zero
Conv.Curr.Slave
Arm.Curr.Slave
Conv.Curr.Both
Arm.CURR.Both
Fault.Current
Curr.Ref.2
Curr.Ref.1
Res. f.Commun
3608
3609
3610
3601
3602
3603
3607
3616
3605
3606
3615
3604
13611
13606
13609
13607
13610
13612
13613
13614
13616
13621
13601
13602
13603
13604
13615
13608
13605
13622
P1
P2
P3
P4
P5
P6
1
10
10
10
150
2048

• 12 pulse configuration

The 12- pulse parallel connection produces the following advantages:

- reduction in power converter´s effects on the mains supply network, like reduced harmonics and different frequencies
- large output DC currents; doubling of the output current due to parallel connection of two 6-pulse standard power converters
- improved current ripple; less amount of current ripple, higher frequency and smaller torque pulsation

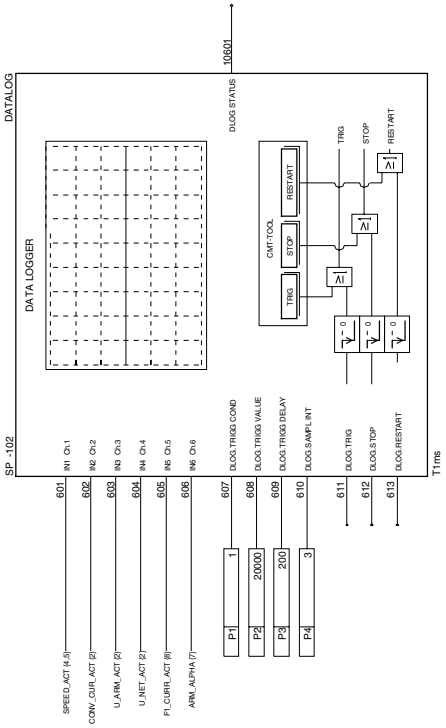
Basically, the 12 –pulse connection is a classical master-slave configuration with a speed controlled 6-pulse master power converter and a current controlled 6-pulse slave power converter. In addition to these 2 identical power converters one field supply unit is needed, which is controlled by the master.

The 12-pulse parallel connection is obtained by feeding the slave with a mains supply offset by 30 degree compared to the master and joining the power converter outputs on one side over a T-reactor (interface choke, 12-pulse choke, …)

The 12-pulse mode has been implemented in the standard software and will not become operative until parameterization is done. After a few signals have been replaced for switch-on and switch-off, and the specific master/slave parameters have been set, the two power converters will work in the usual way. The only distinctive feature compared with the classical 6-pulse version is that the two power converters are synchronized for reversing the bridges.

Depending on the application and the type of converter (2 or 4 quadrant type) the final configuration is different:

- at 2 quadrant systems:
  the 12-pulse function block remains unchanged; the current reference is taken out of the master and feed to the slave via analog output – input;
  see separate documentation MASTER – FOLLOWER 1.1
- at 4 quadrant systems:
  the 12-pulse function block is used; the parameters need to be set and the pins need to be connected;
  see separate documentation DCS 500 Planning and Startup for 12 Pulse Power Converters


DATALOG
DATA LOGGER
SP -102
T1ms
10601
DLOG.STATUS
CMT-TOOL
TRIG
STOP
RESTART
TRIG
STOP
RESTART
IN1 Ch.1
IN2 Ch.2
IN3 Ch.3
IN4 Ch.4
IN5 Ch.5
IN6 Ch.6
601
602
603
604
605
606
SPEED_ACT [4,5]
CONV_CUR_ACT [2]
U_ARM_ACT [2]
U_NET_ACT [2]
FI_CURR_ACT [8]
ARM_ALPHA [7]
DLOG.TRIGG COND
DLOG.TRIGG VALUE
DLOG.TRIGG DELAY
DLOG.SAMPL INT
607
608
609
610
P1
P2
P3
P4
1
20000
200
3
DLOG.TRIG
DLOG.STOP
DLOG.RESTART
611
612
613

• Data Logger

DCS500B also includes a datalogger for measurements. Data logger has six logging channels. The capacity of each channel is 1000 samples.

DATA LOGGER function block

Data logger consists of six logging channels

DLOG1.[IN] (601)
DLOG2.[IN] (602)
DLOG3.[IN] (603)
DLOG4.[IN] (604)
DLOG5.[IN] (605)
DLOG6.[IN] (606)

The capacity of each channel is 1000 samples. These channels can be used to collect fast incidents from the DCS500B within a certain time. The total collection time (1...1000s) can be set with a sampling interval parameter **DLOG.SAMPL INT (610)** (1...1000ms). This collection time is common for all the channels.

Channels can be examined in graph/numeric form with the CMT/DCS500 Tool.

Selection of the parameter/signal index to be sampled in the data logger channels 1...6 is made by setting the index to the desired connection point **DLOG1.[IN] (601) ... DLOG6.[IN] (606).**

Selection of the trigger condition is made by means of the parameter **DLOG.TRIGG COND (607)** as follows:

0 = external triggering
1 = fault + external triggering
2 = triggers when the difference between two successive values of data logger **channel 1** is larger than the value defined in **DLOG TRIGG VALUE (608)**
3 = triggers when the value in data logger **channel 1** exceeds the value which is defined in **DLOG TRIGG VALUE (608)**
4= triggers when the value in data logger **channel 1** falls below the value which is defined in **DLOG TRIGG VALUE (608)**.

Note! Function blocks can be used to generate more complex triggering conditions.

Number of samples **after triggering** can be defined by means of parameter **DLOG.TRIGG DELAY (609),** 0 ... 1000.

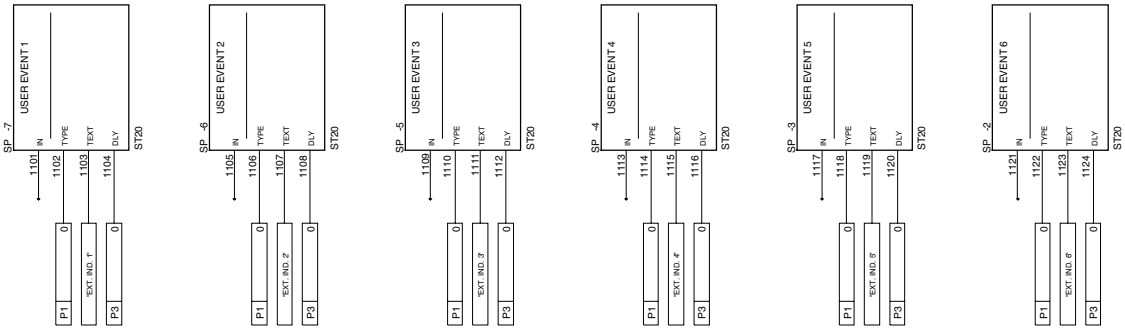
Example:
The data logger is used to monitor the speed difference during a speed response test. The measurement points are **[STEP] (2002)**, **STEP RESP (12003)**. Triggering will take place when **[STEP] (2002)** exceeds the set limit e.g. 10 (given step e.g. 100).

Settings:
DLOG1.[IN] (601) connect to 2002
DLOG2.[IN] (602) connect to 12003
DLOG.TRIGG COND (607) = 2,
triggers when the difference between two successive values of data logger **channel 1** is larger than the value defined in **DLOG.TRIGG VALUE (608).**

DLOG.TRIGG VALUE (608) = 10
DLOG.TRIGG DELAY (609) = 800
200 samples before and 800 samples after the triggering.

DLOG.SAMPL INT (610) = 3ms, samples are taken 0.6 s (200*3ms) before and 2.4 s (800*3ms) after triggering. Resolution must be observed in setting of the sample interval; a too long interval causes losses in the waveform during fast changes of the measured signal.

The status of data logger can be read out from parameter **DLOG STATUS (10601)**.
0 = logger is empty
1 = logger is collecting data
2 = a trigger has occured
3 = logger has stopped after a trigger
4 = logger has stopped after a stop command
5 = logger has stopped after a trigger and stop command


SP -7
USER EVENT 1
IN
1101
1102
TYPE
0
P1
1103
TEXT
'EXT. IND. 1'
1104
DLY
0
P3
ST20
SP -6
USER EVENT 2
IN
1105
1106
TYPE
0
P1
1107
TEXT
'EXT. IND. 2'
1108
DLY
0
P3
ST20
SP -5
USER EVENT 3
IN
1109
1110
TYPE
0
P1
1111
TEXT
'EXT. IND. 3'
1112
DLY
0
P3
ST20
SP -4
USER EVENT 4
IN
1113
1114
TYPE
0
P1
1115
TEXT
'EXT. IND. 4'
1116
DLY
0
P3
ST20
SP -3
USER EVENT 5
IN
1117
1118
TYPE
0
P1
1119
TEXT
'EXT. IND. 5'
1120
DLY
0
P3
ST20
SP -2
USER EVENT 6
IN
1121
1122
TYPE
0
P1
1123
TEXT
'EXT. IND. 6'
1124
DLY
0
P3
ST20

• *User Event*

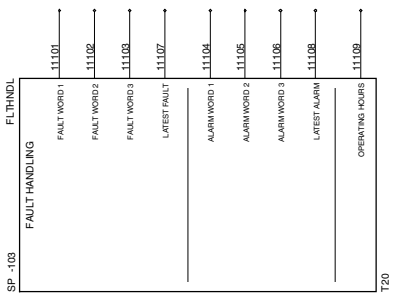
Events can be programmed to DCS 500B software by using USER EVENT function blocks.

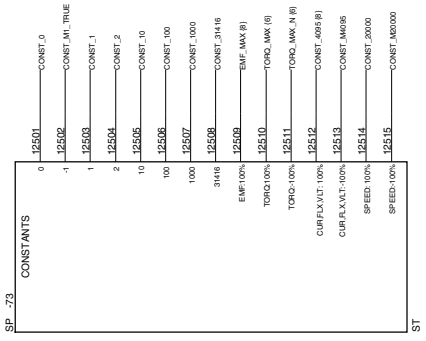
Input **[IN]** activates logging of an external alarm or fault into the Fault Logger when state is 1.

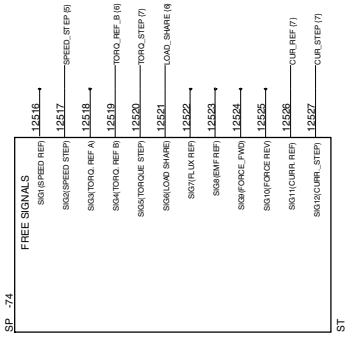
Parameter **TYPE** selects the type of external event:

0 = FAULT: TRIPLEVEL 1 (main, field and fan contactors are opened
1 = FAULT: TRIPLEVEL 2 (main and field contactors are opened
2 = FAULT: TRIPLEVEL 3 (main contactors is opened
3 = ALARM (only alarm indication)
4 = EVENT (only logging to Fault Logger)

Parameter **DLY** (delay) selects the activation delay. External event has to be active for longer than the activation delay time until it is accepted.


FLTHNDL
SP -108
FAULT HANDLING
T20
FAULT WORD 1
FAULT WORD 2
FAULT WORD 3
LATEST FAULT
ALARM WORD 1
ALARM WORD 2
ALARM WORD 3
LATEST ALARM
OPERATING HOURS
11101
11102
11103
11107
11104
11105
11106
11108
11109


SP -73
CONSTANTS
ST
0
-1
1
2
10
100
1000
31416
ELMF:100%
TORQ:100%
TORQ:-100%
CURFLX:VLT:100%
CURFLX:VLT:-100%
SPEED: 100%
SPEED:-100%
CONST_0
CONST_M1_TRUE
CONST_1
CONST_2
CONST_10
CONST_100
CONST_1000
CONST_31416
ELMF_MAX (8)
TORQ_MAX (6)
TORQ_MAX_N (8)
CONST_4095 (8)
CONST_M095
CONST_20000
CONST_M20000
12501
12502
12503
12504
12505
12506
12507
12508
12509
12510
12511
12512
12513
12514
12515


SP -74
FREE SIGNALS
ST
SIG1(SPEED REF)
SIG2(SPEED STEP)
SIG3(TORQ. REF A)
SIG4(TORQ. REF B)
SIG5(TORQUE STEP)
SIG6(LOAD SHARE)
SIG7(FLUX REF)
SIG8(EMF REF)
SIG9(FORCE_FWD)
SIG10(FORCE REV)
SIG11(CURR. REF)
SIG12(CURR._STEP)
SPEED_STEP (5)
TORQ_REF_B (6)
TORQ_STEP (7)
LOAD_SHARE (8
CUR_REF (7)
CUR_STEP (7)
12516
12517
12518
12519
12520
12521
12522
12523
12524
12525
12526
12527

• Diagnostics

If a fault or an alarm has occurred, an error code is generated. These codes are transferred to the fault logger (maximum 100 error codes with occurrence time). This fault logger can be examined for previous fault and alarm codes by means of the control panel or CMT/DCS500 Tool.

In the event of a supply voltage failure, the program stores the data of the fault buffers and data loggers to a protected memory on the Control card **SDCS-CON-2**.

Control card SDCS-CON-2 has a self-diagnostic program. The program indicates the current state of the drive on a seven- segment display. These codes are given in the manual *"OPERATING INSTRUCTION"*.

FAULT HANDLING function block

Each fault and alarm/status is coded as an individual error code to the **LATEST FAULT (11106)** and **LATEST ALARM (11107)**. Fault words **FAULT WORD1 (11101), FAULT WORD2 (11102), FAULT WORD3 (11103)** and alarm words **ALARM WORD1 (11104), ALARM WORD2 (11105), ALARM WORD3 (11106),** contain status bits for all possible DCS500B faults and alarms.

Fault and Alarm signals — see Operating Instruction

Fault Word bits — see Appendix A - Signal list 11101/11102/11103

Alarm Word bits — see Appendix A - Signal list 11104/11105/11106

Fault Logger

The latest fault can be read out from parameter **LATEST FAULT (11107)** and the latest alarm from **LATEST ALARM (11108)**. The parameter is also the basic index for the fault logger which consists of 100 latest events, alarms and faults with occurrence times. The contents of the fault logger can be read out by means of the CMT/DCS500 Tool or panel.

CONSTANTS function block

DCS 500B software consists of certain constant values which can be used in application software or for testing purpose.

Logical constants

Logical constants	Output	Value
CONSTANT 0	(12501)	LOGIC 0 (false)
CONSTANT -1	(12502)	LOGIC 1 (true)

Numerical constants

Numerical constants	Output	Value
CONSTANT 1	(12503)	1
CONSTANT 2	(12504)	2
CONSTANT 10	(12505)	10
CONSTANT 100	(12506)	100
CONSTANT 1000	(12507)	1000
CONSTANT 31416	(12508)	31416 ($\approx \pi * 100$)
EMF 100%	(12509)	3786
TORQ 100%	(12510)	4000
TORQ -100%	(12511)	-4000
CUR,FLX,VLT 100%	(12512)	4095
CUR,FLX,VLT -100%	(12513)	-4095
SPEED 100%	(12514)	20000
SPEED -100%	(12515)	-20000

FREE_SIGNALS function block

These signals can be set by the CMT/DCS500 or control panel. The value can be used to give different references. Before the drive will follow this reference, it has to be connected to the correct input. If BACKUPSTORE MODE is activated, these values will not be stored!

Set constants	Output	Range
SIG1(SPEED REF)	(12516)	-30000...30000
SIG2(SPEED STEP)	(12517)	-30000...30000
SIG3(TORQUE REF A)	(12518)	-30000...30000
SIG4(TORQUE REF B)	(12519)	-30000...30000
SIG5(TORQUE STEP)	(12520)	-30000...30000
SIG6(LOAD SHARE)	(12521)	-30000...30000
SIG7(FLUX REF)	(12522)	-30000...30000
SIG8(EMF REF)	(12523)	-30000...30000
SIG9(FORCE FWD)	(12524)	-30000...30000
SIG10(FORCE REV)	(12525)	-30000...30000
SIG11(CURRENT REF)	(12526)	-30000...30000
SIG12(CURRENT STEP)	(12527)	-30000...30000

Index

S

T

U

W

DCS 500 Thyristor Power converters

Parameter and Signal list

Software Version: 21.233
Diagram: S21V2_0

Appendix A

Contents

Page

General

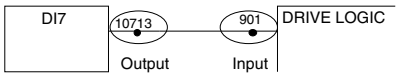
The entire software is made up of connected function blocks. Each of these individual function blocks constitutes a subfunction of the overall functionality.

The function blocks can be subdivided into two categories:

- Function blocks which are permanently active, are almost always in use; these are described on the following pages.
- Function blocks which, although they are available within the software as standard features, have to be expressly activated when they are needed for special requirements. These include, for example: AND gates with 2 or 4 inputs, OR gates with 2 or 4 inputs, adders with 2 or 4 inputs, multipliers/dividers, etc. or closed-control-loop functions, such as integrator, PI controller, D-T1 element, etc.

All function blocks are characterized by input and output lines, equipped with numbers. These inputs/outputs can likewise be subdivided into two categories:

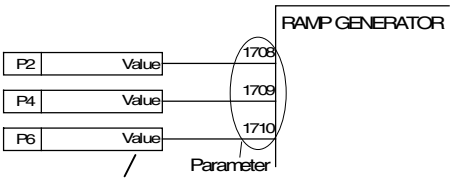
Inputs for designating connections



When you want to alter connections between function blocks, proceed as follows:
- first select the input
- and then connect to output.

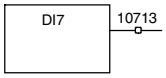
All those connections possessing one dot each at their beginning and end can be altered.

Parameters for setting values
(such as ramp-up time / ramp-down time, controller gain, reference values and others)



Default setting

For input / parameter selection, the following applies:
- Ignore the two right-hand digits; the remaining digits are the group and to be selected
- The two right-hand digits are the element and to be selected



Group **107**
element **13**

The selection can be done with the control panel CDP312, using the (double-up-down) for the group and the (single-up-down) for the element or a PC-based tool program CMT/DCS500B.

Parameters of DCS 500

DCS/DCF 500B parameters consist of two types (parameters and inputs) and divided to several different parameter groups. Parameters / inputs of a certain group belong to the same functional part of the control program. Maximum number in one group is 99.
(within this manual the word *parameter* will be used for both types, parameter and input)

Every parameter is described using the same structure, which is shown by their basics below:

name						
Parameter of {*standard function block*} function block (S11/16).						
Explanation						
index	**data type**	**scal. factor**	**maximum**	**minimum**	**default**	**unit**

Name is given in the same format as it is seen on the panel.

Para mentiones the name of the function block using this parameter; at the end of this line the page of the software diagrams available at the end of the System Description is given; at some parameters the software version is named this parameter is available for the first time

Expl description in verbal form

Index of a parameter contains a group number and an element number. Last two digits are the element number and other numbers before them form the group number:

101 => parameter group = 1, element = 01
1404 => parameter group = 14, element = 04.

Data type is given with a short code:

FB_I:	Input of a function block
FB_P:	Parameter of a function block
P:	Parameter
I2	16-bit signed integer
E2	Selection parameter
PB	packed Boolean value
B	Boolean value
U2	16-bit unsigned integer
C4	connection to function block output (signal) or to some parameter

Scaling factor In this table scaling factors are presented using symbols or constants.

scaling factor (=100%)	calculation: internal to physical value	scaling factor used at (excerpt):
0.001	int.val * 0.001 [unit]	----
0.01	int.val * 0.01 [unit]	5.03, 10.18 and others
0.1	int.val * 0.1 [unit]	4.14, 17.08 and others
1	int.val * 1 [unit]	1.08, 2.02 and others
MCURR (≙ 4095)	int.val * 5.02 [A] / 4095	4.02; 14.06; motor current in A
FCURR (≙ 4095)	int.val * 5.04 [A] / 4095	13.01, 13.05; field current in A
VOLT (≙ 4095)	int.val * 5.07 [V] / 4095	13.11, 15.08; voltage in V
SPEED (≙ 20000)	int.val * 21.03 [RPM] / 20.000	1.02, 17.01; motor speed in RPM
CCURR (≙ 4095)	int.val * 105.09 [A] / 4095	4.09, 3604; converter current in A
TORQ (≙ 4000)	int.val * 100.0 [%] / 4000	4.01, 13.19; motor torque in %
CURR (≙ 4095)	int.val * 100 [%] / 4095	10.13; current in %
FLUX (≙ 4095)	int.val * 100 [%] / 4095	10.02, 10.09; flux in %
EMF (≙ 3786)	int.val * 100 [%] / 3786	10.03, 10.11; motor emf in %
BI (logic input)	not equal to 0 0	= TRUE = FALSE
BO (logic output)	-1 0	= TRUE = FALSE

Maximum	HL = high level; is given as internal values
Minimum	LL = low level; is given as internal values
Default	is given as internal values
Unit	either the maximum or the minimum or the default value has to be multiplied by the scaling factor; then the unit has to be added to that number to get the physical value

Example: The parameter which is defining nominal voltage of the motor has following description:

U_MOTN_V						
Parameter of SETTINGS-function block (S2/16 I mod in S21.232)						
The nominal voltage of the motor in volts. (higher HL in S21.232)						
501	FB_P: I2	SC: 1	HL: 1800	LL: 0	D: 0	U: V

Name	U_MOTN_V
Para	will be found at the SETTINGS function block, which is shown on the software diagrams on page 2 out of 16; this parameter has been modified at software version S21.232 and has still this new function
Expl	description in verbal form
Index	parameter group = 5, element = 01
Data type	FB_P: Parameter of a function block I2 16-bit signed integer
Scaling factor	equal 1
Maximum	1800
Minimum	0
Default	0 (at C1, C2, C3: will be set by the converter automatically)
Unit	is Volt; example: HL (= 1800) * SC (= 1) = 1800V

Signals of DCS 500

DCS/DCF500B signals are divided to several different signal groups. Signals of a certain group belong to the same functional part of the control program. Maximum number of signals in one group is 99.

Every signal is described using the same structure, which is shown by their basics below:

Name						
Signal of {*standard function block*} function block (S11/16).						
Explanation						
index	**data type**	**scal. factor**	**maximum**	**minimum**	**default**	**unit**

Name is given in the same format as it is seen on the panel.
Sig mentiones the name of the function block using this signal; at the end of this line the page of the software diagrams available at the end of the System Description is given; at some signals the software version is named this signal is available for the first time
Expl description in verbal form
Index of a signal contains a group number and an element number. Last two digits are the element number and other numbers before them form the group number:
10101 => signal group = 101, element = 01
11401 => signal group = 114, element = 01.
Data type is given with a short code:
FB_O: Output of a function block
S: Signal
I2 16-bit signed integer
E2 Selection signal
PB packed Boolean value
B Boolean value
U2 16-bit unsigned integer
Scaling factor see table for parameters
Maximum values are given as internal values for those signals which can be modified by user.
Minimum values are given as internal values for those signals which can be modified by user.
Default not used for signals
Unit is given for signals which have an unit.

Example: The signal which is giving the actual motor voltage has following description:

U_ARM_ACT						
Signal of SETTINGS-function block. (S2/16)						
Actual voltage of the motor. Scaling based on signal U_NET_DC_NOM						
10505	FB_O: I2	SC: VOLT	HL: -	LL: -	D: -	U: V

Name U_ARM_ACT
Sig will be found at the SETTINGS function block, which is shown on the software diagrams on page 2 out of 16
Expl description in verbal form
Index signal group = 105, element = 05
Data type FB_O: Output of a function block
I2 16-bit signed integer
Scaling factor as for VOLT
Maximum not available
Minimum not available
Default not available
Unit is Volt;

Group 1: ANALOG INPUTS

AITAC_CONV_MODE
Parameter of AITAC-function block (S4/16)
Selector for type of input signal:

0 = DISABLE	channel not in use	
1 = +/-10V OR +/-20 mA	-10...+10V	IOB3
	-20...+20mA	IOB3: S1:1-2 connected
2 = 4...20 mA	4 ... 20mA	IOB3: S1:1-2 connected
3 = TACHO VOLT. +/-10V	90...270V	IOB1, CON-2: X3:1-4:
	30... 90V	IOB1, CON-2: X3:2-4:
	0 ... 30V	IOB1, CON-2: X3:3-4:

101	FB_P: E2	SC: -	HL: 3	LL: 0	D: 0	U: -

AITAC_HIGH_VALUE
Parameter of AITAC-function block (S4/16).
Value that corresponds to upper range input signal (+10V/20mA)

102	FB_P: I2	SC: SPEED	HL: 32767	LL: -32768	D: 30000	U: rpm

AITAC_LOW_VALUE
Parameter of AITAC-function block (S4/16).
Value that corresponds to lower range input signal (-10V/0mA/4mA)

103	FB_P: I2	SC: SPEED	HL: 32767	LL: -32768	D: -30000	U: rpm

AI1_CONV_MODE
Parameter of AI1-function block (S4/16).
Selector for type of input signal:

0 = DISABLE,	channel not in use	
1 = +/-10V OR +/-20 mA	-10...+10V	IOB1, IOB3, CON-2
	-20...+20mA	IOB1, CON-2: 500 ohms between X3:5-6 IOB3: S1:3-4 connected
2 = 4...20 mA	4 ... 20mA	IOB1, CON-2: 500 ohms between X3:5-6 IOB3: S1:3-4 connected

104	FB_P: E2	SC: -	HL: 2	LL: 0	D: 1	U: -

AI1_HIGH_VALUE
Parameter of AI1-function block (S4/16).
Value that corresponds to upper range input signal (+10V/20mA)

105	FB_P: I2	SC: SPEED	HL: 32767	LL: -32768	D: 20000	U: rpm

AI1_LOW_VALUE
Parameter of AI1-function block (S4/16).
Value that corresponds to lower range input signal (-10V/0mA/4mA)

106	FB_P: I2	SC: SPEED	HL: 32767	LL: -32768	D: -20000	U: rpm

AI2_CONV_MODE
Parameter of AI2-function block (S6/16).
Selector for type of input signal:

0 = DISABLE	channel not in use	
1 = +/-10V +/-20 mA	-10...+10V	IOB1, CON-2, IOB3
	-20...+20mA	IOB1, CON-2: 500 ohms between X3:7-8
		IOB3: S1:5-6 connected
2 = 4...20 mA	4 ... 20mA	IOB1, CON-2: 500 ohms between X3:7-8
		IOB3: S1:5-6 connected
3 = 1 x PT100		IOB3: S5:3-4 + S2:1-2, 3-4, 5-6, 7-8
4 = 2 x PT100		IOB3: S5:3-4 + gain = 1
5 = 3 x PT100		IOB3: S5:3-4 + gain = 1
6 = PTC, BOARD IOB3		IOB3: S5:1-2 + gain = 1
7 = PTC, BOARD IOB1		IOB1, CON-2: S1: 23-24 (+10V source)

107	FB_P: E2	SC: -	HL: 7	LL: 0	D: 0	U: -

AI2_HIGH_VALUE
Parameter of AI2-function block (S6/16).
Value that corresponds to upper range input signal (+10V/20mA)

108	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: 2000	U: -

AI2_LOW_VALUE
Parameter of AI2-function block (S6/16).
Value that corresponds to lower range input signal (-10V/0mA/4mA)

109	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: -2000	U: -

AI3_CONV_MODE
Parameter of AI3-function block (S11/16).
Selector for type of input signal:

0 = DISABLE	channel not in use	
1 = +/-10V or +/-20 mA	-10...+10V	IOB1, IOB3, CON-2
	-20...+20mA	IOB1, CON-2: 500 ohms between X3:9-10
		IOB3: S1:7-8 connected
2 = 4...20 mA	4 ... 20mA	IOB1, CON-2: 500 ohms between X3:9-10
		IOB3: S1:7-8 connected
3 = 1 x PT100		IOB3: S5:3-4, + S3:1-2, 3-4, 5-6, 7-8 conn.
4 = 2 x PT100		IOB3: S5:3-4 + gain = 1
5 = 3 x PT100		IOB3: S5:3-4 + gain = 1
6 = PTC, BOARD IOB3		IOB3: S5:1-2 + gain = 1

110	FB_P: E2	SC: -	HL: 6	LL: 0	D: 0	U: -

AI3_HIGH_VALUE
Parameter of AI3-function block (S11/16).
Value that corresponds to upper range input signal (+10V/20mA)

111	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: 2000	U: -

AI3_LOW_VALUE
Parameter of AI3-function block (S11/16).
Value that corresponds to lower range input signal (-10V/0mA/4mA)

112	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: -2000	U: -

AI4_CONV_MODE
Parameter of AI4-function block (S11/16).
Selector for type of input signal:

0 = DISABLE	channel not in use	
1 = +/-10V or +/-20 mA	-10...+10V	IOB1, CON-2 IOB3: S1:11-12, 13-14 not connected.
	-20...+20mA	IOB1, CON-2: 500 ohms between X4:1-2 IOB3: S1:9-10 connected S1:11-12, 13-14 not connected.
2 = 4...20 mA	4 ... 20mA	IOB1, CON-2: 500 ohms between X4:1-2 IOB3: S1:9-10 connected S1:11-12, 13-14 not connected
3 = EARTH FAULT MON.		IOB3: S1:9-10 not connected S1:11-12, 13-14 connected connection terminals: X3:11, 12

113	FB_P: E2	SC: -	HL: 3	LL: 0	D: 0	U: -

AI4_HIGH_VALUE
Parameter of AI4-function block (S11/16).
Value that corresponds to upper range input signal (+10V/20mA)

114	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: 2000	U: -

AI4_LOW_VALUE
Parameter of AI4-function block (S11/16).
Value that corresponds to lower range input signal (-10V/0mA/4mA)

115	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: -2000	U: -

AI5_CONV_MODE
Parameter of AI5-function block (S11/16).
Selector for type of input signal:

0 = DISABLE	channel not in use	
1 = +/-10V or +/-20 mA	-10...+10V	SDCS-IOE-1
	-20...+20mA	SDCS-IOE-1: S1: 3-4 connected
2 = 4...20 mA	4 ... 20mA	SDCS-IOE-1: S1: 3-4 connected

116	FB_P: E2	SC: -	HL: 2	LL: 0	D: 0	U: -

AI5_HIGH_VALUE
Parameter of AI5-function block (S11/16).
Value that corresponds to upper range input signal(+10V/20mA)

117	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: 2000	U: -

AI5_LOW_VALUE
Parameter of AI5-function block (S11/16).
Value that corresponds to lower range input signal (-10V/0mA/4mA)

118	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: -2000	U: -

AI6_CONV_MODE
Parameter of AI6-function block (S11/16).
Selector for type of input signal:

0 = DISABLE	channel not in use	
1 = +/-10V or +/-20 mA	-10...+10V	SDCS-IOE-1
	-20...+20mA	SDCS-IOE-1: S2: 3-4 connected
2 = 4...20 mA	4 ... 20mA	SDCS-IOE-1: S2: 3-4 connected

119	FB_P: E2	SC: -	HL: 2	LL: 0	D: 0	U: -

AI6_HIGH_VALUE
Parameter of AI6-function block (S11/16).
Value that corresponds to upper range input signal (+10V/20mA)

120	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: 2000	U: -

AI6_LOW_VALUE						
Parameter of AI6-function block (S11/16).						
Value that corresponds to lower range input signal (-10V/0mA/4mA)						
121	FB_P: I2	SC: 1	HL: 32767	LL: -32768	D: -2000	U: -

Group 2: ANALOG OUTPUTS

AO1.[IN] Input IN of AO1 function block (S5/16). Connected to signal which is needed in AO1.						
201	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 12102	U: -
AO1_NOMINAL_V Parameter of AO1 function block (S5/16). Output voltage which corresponds to nominal value of selected signal.						
202	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 10000	U: mV
AO1_OFFSET_V Parameter of AO1 function block (S5/16). Offset voltage which is added to the output voltage.						
203	FB_P: I2	SC: 1	HL: 10000	LL: -10000	D: 0	U: mV
AO1_NOMINAL_VAL Parameter of AO1 function block (S5/16). The nominal value of the signal which is connected to the IN-input.						
204	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 20000	U: -
AO2.[IN] Input IN of AO2 function block (S2/16) Connected to signal which is needed in AO2.						
205	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 10505	U: -
AO2_NOMINAL_V Parameter of AO2 function block (S2/16) Output voltage which corresponds to nominal value of selected signal.						
206	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 5000	U: mV
AO2_OFFSET_V Parameter of AO2 function block (S2/16) Offset voltage which is added to the output voltage.						
207	FB_P: I2	SC: 1	HL: 10000	LL: -10000	D: 0	U: mV
AO2_NOMINAL_VAL Parameter of AO2 function block (S2/16) The nominal value of the signal which is connected to the IN-input.						
208	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 4095	U: -
DATASET2.[IN1] Input of DATASET2 function block (S12/16) DATASET 2 is used for data transmission from the drive to the fieldbus master. When a fieldbus communication module is connected the DCS 500 can transmit a 3 word telegram called DATASET2.[IN1]…[IN3] to a fieldbus master. DATASET2.[IN1] selects the address of first word of this telegram.						
209	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
DATASET2.[IN2] Input of DATASET2 function block (S12/16) DATASET2.[IN2] selects the address of second word of this telegram.						
210	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
DATASET2.[IN3] Input of DATASET2 function block (S12/16) DATASET2.[IN3] selects the address of third word of this telegram.						
211	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

DATASET4.[IN1] Input of DATASET4 function block (S12/16) DATASET 4 is used for data transmission from the drive to the fieldbus master. When a fieldbus communication module is connected the DCS 500 can transmit a 3 word telegram called DATASET4.[IN1]…[IN3] to a fieldbus master. DATASET4.[IN1] selects the address of first word of this telegram.						
212	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
DATASET4.[IN2] Input of DATASET4 function block (S12/16) DATASET4.[IN2] selects the address of second word of this telegram.						
213	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
DATASET4.[IN3] Input of DATASET4 function block (S12/16) DATASET4.[IN3] selects the address of third word of this telegram.						
214	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

Group 3: BRAKE CONTROL

[HOLD_REF]
Input of BRAKE CONTROL-function block. (S10/16)
Holding torque used when the drive is running during START_DELAY or STOP_DELAY.

301	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 0	U: -

[BR_RELEASE]
Input of BRAKE CONTROL-function block. (S10/16)
The release command for the mechanical brake.

302	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10715	U: -

[MIN_SP_IND]
Input of BRAKE CONTROL-function block. (S10/16)
Indicating that speed actual is below a minimum speed limit.

303	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 12201	U: -

[ACT_BRAKE]
Input of BRAKE CONTROL-function block. (S10/16)
Acknowledge signal from the brake. This input points to the signal, it is connected to. The logic level on this interconnection is defined as:

0 = (brake is closed)
<> = (brake is open).

If the acknowledge is not used, set [ACT_BRAKE] = 0, otherwise connect it to Digital Input or some other function block. When brake is opened with LIFT_BRAKE (10304) output, [ACT_BRAKE] has to indicate OPEN-status within 5 seconds, if not, the drive will trip.

304	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

START_DELAY
Parameter of BRAKE CONTROL-function block. (S10/16)
When start command is given, speed reference is released after START_DELAY has elapsed.

305	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: ms

STOP_DELAY
Parameter of BRAKE CONTROL-function block. (S10/16)
When stop command is given, current control is blocked when STOP_DELAY has elapsed.

306	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: ms

HOLD_TORQ
Parameter of BRAKE CONTROL-function block. (S10/16)
Torque reference used when the drive is running during START_DELAY or STOP_DELAY if [HOLD_REF] **is not connected**.

307	FB_P: I2	SC: TORQ	HL: 16000	LL: -16000	D: 0	U: %

EMESTOP_BRAKE
Parameter of BRAKE CONTROL-function block. (S10/16)
Selects the function of mechanical brake in emergency stop situation:

0 = DISABLE (brake is activated when speed is zero)
1 = ENABLE (brake is activated immediately).

308	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

Group 4: CURRENT CONTROL

[TORQ_REF] Input of CURRENT CONTROL-function block. (S7/16)						
401	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12402	U: -
[CURR_REF] Input of CURRENT CONTROL-function block. (S7/16) Either current or torque reference is used depending on value of REF_TYPE_SEL-parameter.						
402	FB_I: C4	SC:MCURR	HL: 19999	LL: 0	D: 12526	U: -
[CURR_STEP] Input of CURRENT CONTROL-function block. (S7/16) Additional current/torque reference added to the main reference.						
403	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 12527	U: -
[BLOCK] Input of CURRENT CONTROL-function block. (S7/16) A block-command for the current controller. The controller will try to decrease the armature current to zero as fast as possible.						
404	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
REF_TYPE_SEL Parameter of CURRENT CONTROL-function block. (S7/16) Selector for the main reference: 0 = TORQ_REF 1 = CURR_REF						
405	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -
ARM_CURR_REF_SLOPE Parameter of CURRENT CONTROL-function block. (S7/16) The maximum slope of the current reference (di/dt). Given as largest amount for reference change during 3.3 ms (2.7 ms in 60Hz supply).						
406	FB_P: I2	SC:MCURR	HL: 4100	LL: 0	D: 1366	U: A
ARM_CURR_PI_KP Parameter of CURRENT CONTROL-function block. (S7/16) Proportional gain for PI-type current controller: output = ARM_CURR_PI_KP * error / 256.						
407	FB_P: I2	SC: -	HL: 2977	LL: 3	D: 300	U: -
ARM_CURR_PI_KI Parameter of CURRENT CONTROL-function block. (S7/16) Integration gain for PI-type current controller: Time constant = 16384 * 3,33 / ARM_CURR_PI_KI (50 Hz supply) 16384 * 2,77 / ARM_CURR_PI_KI (60 Hz supply).						
408	FB_P: I2	SC: -	HL: 31968	LL: 0	D: 3200	U: -
ARM_CONT_CURR_LIM Parameter of CURRENT CONTROL-function block. (S7/16) Current level where current changes from discontinous to continous. Value is set by the auto-tuning or manual tuning function of the current controller.						
409	FB_P: I2	SC: CCURR	HL: 4100	LL: 0	D: 2050	U: A

ARM_L
Parameter of CURRENT CONTROL-function block. (S7/16)
Relative inductance of armature circuit. Value is set by the auto-tuning or manual tuning function of the current controller.
ARM_L = L_A [mH] * I_CONV_A * 245 / (U_SUPPLY * 3,33) (50 Hz supply)
L_A [mH] * I_CONV_A * 245 / (U_SUPPLY * 2,77) (60 Hz supply).

410	FB_P: I2	SC: -	HL: 32767	LL: 0	D: 0	U: -

ARM_R
Parameter of CURRENT CONTROL-function block. (S7/16)
Relative resistance of armature circuit. Value is set by the auto-tuning or manual tuning function of the current controller.
ARM_R = 22444 * R_A [ohm] * I_CONV_A / U_SUPPLY.

411	FB_P: I2	SC: -	HL: 32767	LL: 0	D: 0	U: -

ARM_ALPHA_LIM_MAX
Parameter of CURRENT CONTROL-function block. (S7/16)
Max. firing angle in degrees.

412	FB_P: I2	SC: 1	HL: 165	LL: 0	D: 150	U: -

ARM_ALPHA_LIM_MIN
Parameter of CURRENT CONTROL-function block. (S7/16)
Min. firing angle in degrees.

413	FB_P: I2	SC: 1	HL: 165	LL: 0	D: 15	U: -

DXN
Parameter of CURRENT CONTROL-function block. (S7/16)
Additional commutation reserve proportional to the armature current.

414	FB_P: I2	SC: 0.1	HL: 150	LL: 0	D: 0	U: %

[ARM_CURR_LIM_P]
Input of CURRENT CONTROL-function block. (S7/16)
Positive limitation of current control block.

415	FB_I: C4	SC:MCURR	HL: 19999	LL: 0	D: 12307	U: -

[ARM_CURR_LIM_N]
Input of CURRENT CONTROL-function block. (S7/16)
Negative limitation of current control block.

416	FB_I: C4	SC:MCURR	HL: 19999	LL: 0	D: 12308	U: -

ARM_CURR_CLAMP
Parameter of CURRENT CONTROL-function block. (S7/16)
If |ARM_CURR_ACT| < ARM_CURR_CLAMP then ARM_CURR_ACT (10502) = 0.

417	FB_P: I2	SC: CCURR	HL: 40	LL: 0	D: 40	U: A

CURRENT_RISE_MAX
Parameter of the CURRENT CONTROL-function block. (S7/16 | S21.232)
Determines the amount of current the actual current of one after another current bubble may differ. This setting is used to calculate the current rise monitoring function.

418	FB_P: I2	SC:MCURR	HL: 32767	LL: 0	D: 32767	U: A

ZERO_CUR_DETECT
Parameter of the CURRENT CONTROL-function block. (S7/16 | S21.232)
Selector to enable the use of the zero current detection based on the option board SDCS-CZD-1. This board uses the thyristor blocking voltage.
0 = DISABLED (internal zero current detection on SDCS-CON-x in use)
1 = ENABLED (option board SDCS-CZD-1 is used)

419	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

CUR_RIPPLE_MONIT

Parameter of the CURRENT CONTROL-function block. (S7/16 I S21.232)

Selector for the current ripple monitoring function:

0 = METHOD 1 plus ALARM message
1 = METHOD 1 plus ERROR message
2 = METHOD 2 plus ALARM message (recommended for DCF 500B)
3 = METHOD 2 plus ERROR message (recommended for DCF 500B)

420	FB_P: E2	SC: -	HL: 3	LL: 0	D: 0	U: -

CUR_RIPPLE_LIM

Parameter of the CURRENT CONTROL-function block. (S7/16 I S21.232)

Threshold for the current ripple monitor function. Dependent on the method selected current bubbles compared to each other have to be less different to avoid an alarm or error message. If method 2 is selected, set this parameter to a value higher than ARM_CURR_REF_SLOPE otherwise an indication will be displayed all time.

421	FB_P: I2	SC: 0.1	HL: 1500	LL: 0	D: 7	U: %

Group 5: CONVERTER AND MOTOR

U_MOTN_V

Parameter of SETTINGS-function block (S2/16 | mod in S21.232)

The nominal voltage of the motor in volts. (higher HL in S21.232)

501	FB_P: I2	SC: 1	HL: 1800	LL: 0	D: 0	U: V

I_MOTN_A

Parameter of SETTINGS-function block. (S2/16)

The nominal current of the motor in amperes is set by this parameter for 6 pulse drives.

Half of the nominal current of the motor in A is set by this parameter for 12 pulse drives!

Notice that when this value is changed, all motor current parameters and signals will have different values when they are shown in [A] in the panel or in CMT/DCS 500:

ARM_CURR_REF_SLP, CURRENT_RISE_MAX, MODEL1.CURR, MODEL2.CURR, ARM_CURR_LIM_P, ARM_CURR_LIM_N, MAX_CURR_LIM_N1-5, ARM_CURR_REF, ARM_CURR_ACT, REF_DCF, CURR_LIM_P, CURR_LIM_N, Arm.Curr.Slave, Arm.CURR.Both, Curr.-Ref.1, Curr.-Ref.2.

502	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 0	U: A

I_MOT1_FIELDN_A

Parameter of SETTINGS-function block (S2/16 | mod in S21.232)

The nominal field current of motor 1 in 0.01 Amperes. (lower HL in S21.232)

Notice that when this value is changed, all motor 1 field current parameters and signals will have different values when they are shown in [A] in the panel or in CMT/DCS 500:

F1_CURR_GT_MIN_L, F1_OVERCURR_L, F1_RED.REF, OPTI.REF_MIN_L, REV.REV_HYST, F1_CURR_REF, F1_CURR_ACT.

503	FB_P: I2	SC: 0.01	HL: 16380	LL: 0	D: 30	U: A

I_MOT2_FIELDN_A

Parameter of SETTINGS-function block (S2/16 | mod in S21.232)

The nominal field current of motor 2 in 0.01 Amperes. (lower HL in S21.232)

Notice that when this value is changed, all motor 2 field current parameters and signals will have different values when they are shown in [A] in the panel or in CMT/DCS 500:

F2_CURR_GT_MIN_L, F2_OVERCURR_L, F2_RED.REF, F2_CURR_REF, F2_CURR_ACT.

504	FB_P: I2	SC: 0.01	HL: 16380	LL: 0	D: 30	U: A

FEXC_SEL

Parameter of SETTINGS-function block. (S2/16)

Selection for the type of the field exciter or the type of acknowledgement signal from old field exciters:

0 = NO FIELD EXCITER

1 = DIODE FIELD EXC.

2 = FEX2 OR FEX3 HW: only one field exciter (see Technical Data) as Node 1; SW: MOTOR1_FIELD (10ms update time)

3 = FEX3 FOR MOTOR2 HW: only one field exciter (no SDCS-FEX-2) as Node 2; SW: MOTOR2_FIELD (100ms update time)

4 = FEX2/3 + MOT2=FEX3 HW: possibility of 2 and 3; SW: MOTOR1 + 2_FIELD

5 = FIELD ACK VIA DI SW: MOTOR1_FIELD

6 = FIELD ACK VIA AI SW: MOTOR1_FIELD

505	FB_P: E2	SC: -	HL: 6	LL: 0	D: 0	U: -

PHASE_SEQ_CW

Parameter of SETTINGS-function block. (S2/16)

The phase order of converter supply voltage. If measured phase order does not match with this parameter, fault 38 "Phase sequence fault" is generated.

1 = R-T-S

2 = R-S-T

506	FB_P: E2	SC: -	HL: 2	LL: 1	D: 2	U: -

U_SUPPLY

Parameter of SETTINGS-function block (S2/16 | mod in S21.232)

Nominal value of converter supply voltage. (higher HL in S21.232)

507	FB_P: I2	SC: 1	HL: 1400	LL: 0	D: 0	U: V

U_NET_MIN1

Parameter of CONVERTER_PROTECTION-function block. (S9/16)

Upper limit for supply undervoltage monitoring in %. If supply voltage falls below this limit, controllers are blocked. Undervoltage trip is generated if network voltage does not return to a higher value than U_NET_MIN1 during time defined by PWR_DOWN_TIME.

508	FB_P: I2	SC: 1	HL: 130	LL: 0	D: 80	U: %

U_NET_MIN2

Parameter of CONVERTER_PROTECTION-function block. (S9/16)

Lower limit for supply undervoltage monitoring in %. If supply voltage falls below this limit, the drive will trip immediately.

509	FB_P: I2	SC: 1	HL: 130	LL: 0	D: 60	U: %

PWR_DOWN_TIME

Parameter of CONVERTER_PROTECTION-function block. (S9/16)

During this time the supply voltage must return to a value higher than U_NET_MIN1. Otherwise an undervoltage trip will be generated.

510	FB_P: I2	SC: 1	HL: 5000	LL: 0	D: 5000	U: ms

ARM_OVERVOLT_LEV

Parameter of CONVERTER_PROTECTION-function block. (S9/16)

Armature overvoltage tripping level in % of nominal voltage of motor.

511	FB_P: I2	SC: 1	HL: 150	LL: 20	D: 110	U: %

ARM_OVERCURR_LEV

Parameter of CONVERTER_PROTECTION-function block. (S9/16)

Armature overcurrent tripping level in % of converter nominal current.

512	FB_P: I2	SC: 1	HL: 230	LL: 20	D: 230	U: %

EMF_FILT_TC
Parameter of SETTINGS-function block. (S2/16)
Filter time constant for calculated EMF before EMF-controller.

513	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 10	U: ms

EARTH.CURR_SEL
Parameter of CONVERTER_PROTECTION-function block. (S9/16)
Selection for earth fault monitoring:
0 = DISABLE
1 = ENABLE.

514	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

EARTH.FLT_LEV
Parameter of CONVERTER_PROTECTION-function block. (S9/16)
Earth fault current tripping level in amperes.

515	FB_P: I2	SC: 1	HL: 20	LL: 0	D: 4	U: A

EARTH.FLT_DLY
Parameter of CONVERTER_PROTECTION-function block. (S9/16)
The time after the earth fault is activated.

516	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 10	U: ms

SET_I_CONV_A
Parameter of SETTINGS-function block. (S2/16)
The nominal current of the converter.

Note: *This parameter overwrites the nominal current of the converter defined by type code resistors !*
0 = type code resistors are in use
> 0 = value of this parameter is used.

517	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 0	U: A

SET_U_CONV_V
Parameter of SETTINGS-function block. (S2/16)
The nominal voltage of the converter.

Note: *This parameter overwrites the nominal voltage of the converter defined by type code resistors !*
0 = type code resistors are in use
> 0 = value of this parameter is used.

518	FB_P: I2	SC: 1	HL: 2000	LL: 0	D: 0	U: V

SET_MAX_BR_TEMP
Parameter of SETTINGS-function block. (S2/16)
The tripping level for the converter heat sink temperature monitoring.

Note: *This parameter overwrites the max bridge temperature of the converter defined by type code resistors !*
0 = type code resistors are in use
> 0 = value of this parameter is used.

519	FB_P: I2	SC: 1	HL: 150	LL: 0	D: 0	U: C

SET_CONV_TYPE
Parameter of SETTINGS-function block. (S2/16)
The type of the converter.

Note: *This parameter overwrites the type of the converter defined by type code resistors !*
0: (type code resistors are in use)
1: (C1 construction type converter)
2: (C2 construction type converter)
3 (C3 construction type converter)
4: (C4 construction type converter)

520	FB_P: I2	SC: 1	HL: 4	LL: 0	D: 0	U: -

SET_QUADR_TYPE
Parameter of SETTINGS-function block. (S2/16)
The type of the converter.

Note: *This parameter overwrites the type of the converter defined by type code resistors !*
0: (type code resistors are in use)
1: (ONE_QUADRANT type converter DCx 501)
4: (FOUR_QUADRANT type converter DCx 502)

521	FB_P: I2	SC: 1	HL: 4	LL: 0	D: 0	U: -

LANGUAGE
Parameter of SETTINGS-function block. (S2/16)
Selects the language used for alarm/warning texts in the panel / CMT.
0 = ENGLISH
1 = GERMAN
2 = ITALIAN
3 = SPANISH
4 = FRENCH

522	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

CURR_ACT_FILT_TC
Parameter of SETTINGS-function block. (S2/16)
Filter time constant for calculated CONV_CURR_ACT (10501) and ARM_CURR_ACT (10502).

523	FB_P: I2	SC: 1	HL: 100	LL: 0	D: 0	U: ms

PLL_CONTROL
Parameter of SETTINGS-function block. (S2/16 | S21.230)
The network is reproduced by a software PLL system. If the frequency or the phase shift of the network changes in comparison to the PLL, the PLL system has to be corrected. The gain of this correction is set by this parameter.

524	FB_P: I2	SC: 1	HL: 6	LL: 1	D: 4	U: -

UNI_FILT_TC
Parameter of SETTINGS-function block (S2/16 | S21.232)
Filter time constant to smooth the feedforward control of the firing angle based on the line voltage signal. Line voltage variations will be compensated with a time delay.

525	FB_P: I2	SC: 1.0	HL: 10000	LL: 0	D: 10	U: ms

OFFSET_UDC
Parameter of SETTINGS-function block (S2/16 | S21.232)
The calculated EMF signal used for speed control at the SPEED_MEASUREMENT function block can be offset compensated with this parameter.

526	FB_P: I2	SC: 1.0	HL: 81	LL: -80	D: 0	U: -

CONV_TEMP_DELAY

Parameter of CONVERTER_PROTECTION function block (S2/16 | S21.232)

This parameter delays the converter power part overtemperature function, if the option board PW 1002 is used. This board can be used together with DCP type converters or together with DCR kits. In default condition the delay is switched off. If the value is > 0 F03 and A105 are enabled and F04 is disabled.

527	FB_P: I2	SC: 0.01	HL: 10000	LL: 0	D: 0	U: s

PLL_DEV_LIM

Parameter of SETTINGS-function block (S2/16 | S21.232)

At weak networks or high overload of the converter the duration of two successive line periods may differ. In this case the error message “not in synchronism” may be generated. This parameter specifies the threshold for F31.

528	FB_P: I2	SC: 1.0	HL: 2048	LL: 612	D: 1024	U: -

Group 6: DATA LOGGER

DLOG.[IN1] Input of DATA_LOGGER-function block. (S14/16) Selects the signal which is measured in channel 1.						
601	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 12102	U: -
DLOG.[IN2] Input of DATA_LOGGER-function block. (S14/16) Selects the signal which is measured in channel 2.						
602	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 10501	U: -
DLOG.[IN3] Input of DATA_LOGGER-function block. (S14/16) Selects the signal which is measured in channel 3.						
603	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 10505	U: -
DLOG.[IN4] Input of DATA_LOGGER-function block. (S14/16) Selects the signal which is measured in channel 4.						
604	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 10504	U: -
DLOG.[IN5] Input of DATA_LOGGER-function block. (S14/16) Selects the signal which is measured in channel 5.						
605	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 11302	U: -
DLOG.[IN6] Input of DATA_LOGGER-function block. (S14/16) Selects the signal which is measured in channel 6.						
606	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 10401	U: -
DLOG.TRIGG_COND Parameter of DATA_LOGGER-function block. (S14/16) Selects the triggering condition for the data logger: 0 = EXTERNAL 1 = FAULT or EXT 2 = DIFFERENCE 3 = MAX 4 = MIN						
607	FB_P: E2	SC: -	HL: 4	LL: 0	D: 1	U: -
DLOG.TRIGG_VALUE Parameter of DATA_LOGGER-function block. (S14/16) Reference value that will be used if the trigger condition DLOG.TRIGG_CONT is set to DIFFERENCE, MAX or MIN						
608	FB_P: I2	SC: -	HL: 32767	LL: -32768	D: 20000	U: -
DLOG.TRIGG_DELAY Parameter of DATA_LOGGER-function block. (S14/16) Number of samples collected after triggering instant. Length of data logger is 1000 samples in each channel.						
609	FB_P: I2	SC: -	HL: 1000	LL: 0	D: 200	U: -
DLOG.SAMPL_INT Parameter of DATA_LOGGER-function block. (S14/16) Sampling interval defining how often a measurement is made in each channel.						
610	FB_P: I2	SC: 1	HL: 1000	LL: 1	D: 3	U: ms

DLOG.TRIG Input of DATA_LOGGER-function block. (S14/16) Selects the signal which trigger the datalogger						
611	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
DLOG.STOP Input of DATA_LOGGER-function block. (S14/16) Selects the signal which stop the datalogger.						
612	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
DLOG.RESTART Input of DATA_LOGGER-function block. (S14/16) Selects the signal which restart the datalogger.						
613	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

Group 8: DIGITAL OUTPUTS

DO1.[IN] Input of DO1-function block. Normal input.					(S3/16)	
801	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10908	U: -
DO1.[INV_IN] Input of DO1-function block. Inverted input.					(S3/16)	
802	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO2.[IN] Input of DO2-function block. Normal input.					(S3/16)	
803	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10909	U: -
DO2.[INV_IN] Input of DO2-function block. Inverted input.					(S3/16)	
804	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO3.[IN] Input of DO3-function block. Normal input.					(S3/16)	
805	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10910	U: -
DO3.[INV_IN] Input of DO3-function block. Inverted input.					(S3/16)	
806	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO4.[IN] Input of DO4-function block. Normal input.					(S3/16)	
807	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10902	U: -
DO4.[INV_IN] Input of DO4-function block. Inverted input.					(S3/16)	
808	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO5.[IN] Input of DO5-function block. Normal input.					(S3/16)	
809	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10903	U: -
DO5.[INV_IN] Input of DO5-function block. Inverted input.					(S3/16)	
810	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO6.[IN] Input of DO6-function block. Normal input.					(S3/16)	
811	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO6.[INV_IN] Input of DO6-function block. Inverted input.					(S3/16)	
812	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

DO7.[IN] Input of DO7-function block. Normal input.					(S3/16)	
813	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO7.[INV_IN] Input of DO7-function block. Inverted input.					(S3/16)	
814	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
DO8.[IN] Input of DO8-function block. Normal input.					(S3/16)	
815	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10910	U: -
DO8.[INV_IN] Input of DO8-function block. Inverted input.					(S3/16)	
816	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

Group 9: DRIVE LOGIC

[ON/OFF] Input of DRIVE LOGIC-function block. (S3/16) Control of the main contactor.						
901	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10713	U: -
[RUN1] Input of DRIVE LOGIC-function block. (S3/16) One of three RUN-commands. All run commands release controllers of the drive.						
902	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10715	U: -
[RUN2] Input of DRIVE LOGIC-function block. (S3/16) One of three RUN-commands. All run commands release controllers of the drive.						
903	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 11902	U: -
[RUN3] Input of DRIVE LOGIC-function block. (S3/16) One of three RUN-commands. All run commands release controllers of the drive.						
904	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
[COAST_STOP] Input of DRIVE LOGIC-function block. (S3/16) Coast stop-command. This command will stop the drive so that the motor is left running and friction together with the load will decelerate the speed to zero.						
905	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
[EME_STOP] Input of DRIVE LOGIC-function block. (S3/16) Emergency stop-command. This command will stop the drive in a way which is defined with the parameter EME_STOP_MODE (917).						
906	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10709	U: -
[RESET] Input of DRIVE LOGIC-function block. (S3/16) Reset-command. This command will reset all fault memories if corresponding fault indication is not active any more.						
907	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10711	U: -
[START_INHIBIT] Input of DRIVE LOGIC-function block. (S3/16) Start inhibit-command. This command will disable ON- and RUN-commands to the drive. If the drive is running when this command is activated, the current controler tries to decrease the current to zero as fast as possible. If a 12 pulse parallel configuration is in use, please check signal LOGIK_F.INHIBIT (13616).						
908	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
[DISABLE_LOCAL] Input of DRIVE LOGIC-function block. (S3/16) Disable local-command. This command will disable local control of the drive from either a panel or CMT.						
909	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
[ACK_CONV_FAN] Input of DRIVE LOGIC-function block. (S3/16) An acknowledge signal from converter fan contactor. The drive will not start if there is no acknowledge from the converter fan contactor after the FAN_ON (10908)-command.						
910	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10701	U: -

[ACK_MOTOR_FAN]
Input of DRIVE LOGIC-function block. (S3/16)
An acknowledge signal from motor fan contactor. The drive will not start if there is no acknowledge from the motor fan contactor after the FAN_ON (10908)-command.

911	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10703	U: -

[ACK_MAIN_CONT]
Input of DRIVE LOGIC-function block. (S3/16)
An acknowledge signal from main contactor. The drive will not start if there is no acknowledge from the main contactor after the MAIN_CONT_ON (10910)-command.

912	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10705	U: -

[MOTOR 2]
Input of DRIVE LOGIC-function block. (S3/16)
This signal activates the second parameter set. The drive has two parameter sets in the memory. Active parameter set is selected with this signal:
0 = Parameter set nr. 1
<>0 = Parameter set nr. 2

913	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

FIELD_HEAT_SEL
Parameter of DRIVE LOGIC-function block. (S3/16)
Selects if field heating is used when the drive is not running:
0 = DISABLE
1 = ENABLE

914	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

MAIN_CONT_MODE
Parameter of DRIVE LOGIC-function block. (S3/16)
Selects the command used to control the main contactor:
0 = CLOSE WHEN ON + RUN (both ON and RUN needed)
1 = CLOSE WHEN ON

915	FB_P: E2	SC: -	HL: 1	LL: 0	D: 1	U: -

STOP_MODE
Parameter of DRIVE LOGIC-function block. (S3/16)
Selects the operation when RUN-command is removed:
0 = STOP BY RAMP (decelerate with ramp generator)
1 = STOP BY TORQ LIM (decelerate with torque limit)
2 = STOP BY COASTING (make a coast stop)

916	FB_P: E2	SC: -	HL: 2	LL: 0	D: 0	U: -

EME_STOP_MODE
Parameter of DRIVE LOGIC-function block. (S3/16)
Selects the operation when emergency stop-command is activated:
0 = STOP BY RAMP (decelerate with ramp generator)
1 = STOP BY TORQ LIM (decelerate with torque limit)
2 = STOP BY COASTING (make a coast stop)
3 = STOP BY DYN.BRAKE (use dynamic braking)

917	FB_P: E2	SC: -	HL: 3	LL: 0	D: 0	U: -

PANEL_DISC_MODE

Parameter of DRIVE LOGIC-function block. (S3/16)

Selects the operation when the panel or CMT communication is disconnected during local operation:

0 = STOP BY RAMP (decelerate with ramp generator)
1 = STOP BY TORQ LIM (decelerate with torque limit)
2 = STOP BY COASTING (make a coast stop)
3 = STOP BY DYN.BRAKE (use dynamic braking)
4 = CONTINUE REMOTE (change to remote control)

918	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

PWR_LOSS_MODE

Parameter of DRIVE LOGIC-function block. (S3/16)

Selects if the auto-reclosing function is used when the power is disconnected for a short time:

0 = DISABLE
1 = ENABLE

919	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

COMFAULT_MODE

Parameter of DRIVE LOGIC-function block. (S3/16)

Specifies the reaction of the drive after occurrance of a communication fault.
When a fieldbus communication module detects a communication fault these reaction of the DCS 500 can be selected:

0 = STOP BY RAMP (decelerate with ramp generator)
1 = STOP BY TORQ LIM (decelerate with torque limit)
2 = STOP BY COASTING (make a coast stop)
3 = NOTHING (no action)

920	FB_P: E2	SC: -	HL: 3	LL: 0	D: 0	U: -

COMFAULT_TIMEOUT

Parameter of DRIVE LOGIC-function block. (S3/16)

Sets sets the communication timeout counter.
It can be adjusted in 20 ms steps from

0 = disable fieldbus timeout (F60) supervision
1 = 1 * 20 ms to
150 = 150 * 20 ms = 3 sec

921	FB_P: I2	SC: 20	HL: 150	LL: 0	D: 2	U: ms

Group 10: EMF CONTROL

FIELD_MODE
Parameter of EMF CONTROL-function block. (S8/16)
Selects the operating mode of motor field control:

0 = CONSTANT FIELD	No EMF-control (constant field) without field reversal.
1 = EMF, NO FIELD REV	EMF-control without field reversal.
2 = NO EMF, FIELD REV	No EMF-control (constant field) with field reversal.
3 = EMF+FIELD REV	EMF-control with field reversal.
4 = NO EMF, OPTITORQUE	OPTITORQUE without EMF-control.
5 = EMF+OPTITORQUE	OPTITORQUE with EMF-control.

1001	FB_P: E2	SC: -	HL: 5	LL: 0	D: 0	U: -

[FLUX_REF]
Input of EMF CONTROL-function block. (S8/16)
This is an input for flux reference. EMF CONTROL-block is using either flux or EMF reference.

1002	FB_I: C4	SC: FLUX	HL: 19999	LL: 0	D: 12512	U: -

[EMF_REF]
Input of EMF CONTROL-function block. (S8/16)
This is an input for EMF reference. EMF CONTROL-block is using either flux or EMF reference.

1003	FB_I: C4	SC: EMF	HL: 19999	LL: 0	D: 12509	U: -

[FLUX_REF_SEL]
Input of EMF CONTROL-function block. (S8/16)
This is an input for flux reference selection. It will select either [FLUX_REF] input or constant reference of 100%.
0 = internal reference
<>0 = [FLUX_REF] input.

1004	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

[EMF_REF_SEL]
Input of EMF CONTROL-function block. (S8/16)
This is an input for EMF reference selection. It will select either [EMF_REF] input or LOCAL_EMF_REF-parameter.
0 = LOCAL_EMF_REF-parameter
<>0 = [EMF_REF] input.

1005	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

LOCAL_EMF_REF
Parameter of EMF CONTROL-function block. (S8/16)
Sets the value of local EMF reference.

1006	FB_P: I2	SC: 1	HL: 150	LL: 0	D: 100	U: %

EMF_KP
Parameter of EMF CONTROL-function block. (S8/16)
Proportional gain of the EMF controller. Gain is reduced above field weakening point with a factor 1/n to keep the process gain constant. Scaling:
150 = gain is 54 %
277 = gain is 100 %.

1007	FB_P: I2	SC: 1	HL: 999	LL: 1	D: 150	U: -

EMF_KI
Parameter of EMF CONTROL-function block. (S8/16)
Integral action time of the EMF controller. Scaling:
TC = 147200 / EMF_KI;

1008	FB_P: I2	SC: -	HL: 20000	LL: 0	D: 4905	U: ms

EMF_REG_LIM_P
Parameter of EMF CONTROL-function block. (S8/16)
Positive limit for EMF controller output.

1009	FB_P: I2	SC: FLUX	HL: 4095	LL: 0	D: 410	U: %

EMF_REG_LIM_N
Parameter of EMF CONTROL-function block. (S8/16)
Negative limit for EMF controller output.

1010	FB_P: I2	SC: FLUX	HL: 0	LL: -4095	D: -4095	U: %

EMF_REL_LEV
Parameter of EMF CONTROL-function block. (S8/16)
EMF controller blocking level. When measured EMF is below this level, the EMF-controller is blocked.

1011	FB_P: I2	SC: EMF	HL: 1000	LL: 0	D: 50	U: %

FIELD_WEAK_POINT
Parameter of EMF CONTROL-function block. (S8/16)
Speed of the motor where flux reference reduction is started.

1012	FB_P: I2	SC: SPEED	HL: 23000	LL: 4000	D: 20000	U: rpm

FIELD_CONST_1
Parameter of EMF CONTROL-function block. (S8/16)
Field current reference which produces 40% flux in motor
(default: 29% of nominal field current).

1013	FB_P: I2	SC: CURR	HL: 4095	LL: 0	D: 1187	U: %

FIELD_CONST_2
Parameter of EMF CONTROL-function block. (S8/16)
Field current reference which produces 70% flux in motor
(default: 53% of nominal field current).

1014	FB_P: I2	SC: CURR	HL: 4095	LL: 0	D: 2190	U: %

FIELD_CONST_3
Parameter of EMF CONTROL-function block. (S8/16)
Field current reference which produces 90% flux in motor
(default: 79% of nominal field current).

1015	FB_P: I2	SC: CURR	HL: 4095	LL: 0	D: 3255	U: %

GENER.EMF_REF
Parameter of EMF_CONTROL-function block (S8/16 | S21.232)
This parameter has a similar function than LOCAL_EMF_REF. It sets the value of the local EMF reference, if the drive is in regenerative mode. This function becomes active, if the value is lower than the one of LOCAL_EMF_REF.
In case this value is lower than the one of LOCAL_EMF_REF, but GENER.WEAK_POINT is still higher than FIELD_WEAK_POINT the converter will block the other bridge until the motor voltage has dropped below the level set by GENER.WEAK_POINT. The drive is coasting and the speed normally will go down.

1016	FB_P: I2	SC: 1.0	HL: 160	LL: 0	D: 160	U: %

GENER.WEAK_POINT						
Parameter of EMF_CONTROL-function block (S8/16 I S21.232) This parameter has a similar function than FIELD_WEAK_POINT. It specifies the speed of the motor where flux reference reduction is started, if the drive is in regenerative mode. This function becomes active, if the value is lower than the one of FIELD_WEAK_POINT.						
1017	FB_P: I2	SC: SPEED	HL: 23100	LL: 3400	D: 23100	U: rpm
FIELD_WEAK_DELAY						
Parameter of EMF_CONTROL-function block (S8/16 I S21.233) This parameter defines a time delay, which will delay a reduction of the field current in case different field weakening points are set (see GENER.EMF_REF / GENER.WEAK_POINT) and the drive starts field weakening very often because of a high gain at the speed controller. This time delay will give the speed controller a chance to "correct" himself and avoid a bridge reversal.						
1018	FB_P: I2	SC: 0.01	HL: 100	LL: 0	D: 0	U: s

Group 11: FAULTS, ALARMS

USER_EVENT1.[IN]
Input of EVENT1-function block. (S15/16)
Activates logging of an external alarm or fault into the Fault Logger.

1101	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

USER_EVENT1.TYPE
Parameter of EVENT1-function block. (S15/16)
Selects the type of external event:
0 = FAULT:TRIPLEVEL 1 (main, field and fan contactors are opened)
1 = FAULT:TRIPLEVEL 2 (main and field contactors are opened)
2 = FAULT:TRIPLEVEL 3 (main contactor is opened)
3 = ALARM: (only alarm indication)
4 = EVENT: (only logging to Fault Logger).

1102	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

USER_EVENT1.TEXT
Parameter of EVENT1-function block. (S15/16)
This parameter shows the event´s name: EXT. IND. 1

1103	FB_P: -	SC: -	HL: -	LL: -	D: -	U: -

USER_EVENT1.DLY
Parameter of EVENT1-function block. (S15/16)
Selects the activation delay.
External event has to be active for longer than the activation delay until it is accepted.

1104	FB_P: I2	SC: 0.01	HL: 32767	LL: 0	D: 0	U: s

USER_EVENT2.[IN]
Input of EVENT2-function block. (S15/16)
Activates logging of an external alarm or fault into the Fault Logger.

1105	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

USER_EVENT2.TYPE
Parameter of EVENT2-function block. (S15/16)
Selects the type of external event:
(see **USER_EVENT1.TYPE** for available values).

1106	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

USER_EVENT2.TEXT
Parameter of EVENT2-function block. (S15/16)
This parameter shows the event´s name: EXT. IND. 2

1107	FB_P: -	SC: -	HL: -	LL: -	D: -	U: -

USER_EVENT2.DLY
Parameter of EVENT2-function block. (S15/16)
Selects the activation delay.
External event has to be active for longer than the activation delay until it is accepted.

1108	FB_P: I2	SC: 0.01	HL: 32767	LL: 0	D: 0	U: s

USER_EVENT3.[IN]
Input of EVENT3-function block. (S15/16)
Activates logging of an external alarm or fault into the Fault Logger.

1109	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

USER_EVENT3.TYPE
Parameter of EVENT3-function block. (S15/16)
Selects the type of external event:
(see **USER_EVENT1.TYPE** for available values).

1110	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

USER_EVENT3.TEXT
Parameter of EVENT3-function block. (S15/16)
This parameter shows the event´s name: EXT. IND. 3

1111	FB_P: -	SC: -	HL: -	LL: -	D: -	U: -

USER_EVENT3.DLY
Parameter of EVENT3-function block. (S15/16)
Selects the activation delay.
External event has to be active for longer than the activation delay until it is accepted.

1112	FB_P: I2	SC: 0.01	HL: 32767	LL: 0	D: 0	U: s

USER_EVENT4.[IN]
Input of EVENT4-function block. (S15/16)
Activates logging of an external alarm or fault into the Fault Logger.

1113	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

USER_EVENT4.TYPE
Parameter of EVENT4-function block. (S15/16)
Selects the type of external event:
(see **USER_EVENT1.TYPE** for available values).

1114	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

USER_EVENT4.TEXT
Parameter of EVENT4-function block. (S15/16)
This parameter shows the event´s name: EXT. IND. 4

1115	FB_P: -	SC: -	HL: -	LL: -	D: -	U: -

USER_EVENT4.DLY
Parameter of EVENT4-function block. (S15/16)
Selects the activation delay.
External event has to be active for longer than the activation delay until it is accepted.

1116	FB_P: I2	SC: 0.01	HL: 32767	LL: 0	D: 0	U: s

USER_EVENT5.[IN]
Input of EVENT5-function block. (S15/16)
Activates logging of an external alarm or fault into the Fault Logger.

1117	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

USER_EVENT5.TYPE
Parameter of EVENT5-function block. (S15/16)
Selects the type of external event:
(see **USER_EVENT1.TYPE** for available values).

1118	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

USER_EVENT5.TEXT
Parameter of EVENT5-function block. (S15/16)
This parameter shows the event´s name: EXT. IND. 5

1119	FB_P: -	SC: -	HL: -	LL: -	D: -	U: -

USER_EVENT5.DLY
Parameter of EVENT5-function block. (S15/16)
Selects the activation delay.
External event has to be active for longer than the activation delay until it is accepted.

1120	FB_P: I2	SC: 0.01	HL: 32767	LL: 0	D: 0	U: s

USER_EVENT6.[IN]
Input of EVENT6-function block. (S15/16)
Activates logging of an external alarm or fault into the Fault Logger.

1121	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

USER_EVENT6.TYPE Parameter of EVENT6-function block. (S15/16) Selects the type of external event: (see **USER_EVENT1.TYPE** for available values).						
1122	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -
USER_EVENT6.TEXT Parameter of EVENT6-function block. (S15/16) This parameter shows the event´s name: EXT. IND. 6						
1123	FB_P: -	SC: -	HL: -	LL: -	D: -	U: -
USER_EVENT6.DLY Parameter of EVENT6-function block. (S15/16) Selects the activation delay. External event has to be active for longer than the activation delay until it is accepted.						
1124	FB_P: I2	SC: 0.01	HL: 32767	LL: 0	D: 0	U: s

Group 12: MAINTENANCE

DRIVEMODE

Parameter of MAINTENANCE-function block. (S2/16)

This parameter is used to start special drive functions like autotuning for controllers. After the drive function has completed DRIVEMODE changes to value 0. If an error occurs during drive function, DRIVEMODE is set to value 12. The reason for the error can be seen from the signal COMMIS_STAT1 (11201).
Following drive functions are available:

0 = NOT ACTIVATED	(No function is active)
1 = CLEAR FAULT LOGG.	(Clear the contents of Fault Logger)
2 = CALC PROGRAM LOAD	(Calculate the processor load)
3 = ARM. AUTOTUNING	(Autotuning of armature current controller)
4 = ARM. MAN. TUNING	(Manual tuning of armature current controller)
5 = FEX2/3 AUTOTUNING	(Autotuning of the first field exciter
6 = MOT2 FEXC AUTOTUN	(Autotuning of the second field exciter
7 = FEXC2/3 MAN.TUNIN	(Manual tuning of the first field exciter)
8 = MOT2 FEXC MAN.TUN	(Manual tuning of the second field exciter)
9 = SPD LOOP MAN.TUN	(Manual tuning of the speed loop)
10 = EMF CNTR MAN.TUN	(Manual tuning of EMF controller

Following value is shown during PROGRAM_LOAD-function:
11 = WAIT A MOMENT…

Following value is shown if autotuning fails:
12 = FAILED, SEE 112-01

1201	FB_P: E2	SC: -	HL: 10	LL: 0	D: 0	U: -

CMT_DCS500_ADDR

Parameter of MAINTENANCE-function block. (S2/16)
The node address of the drive in the communication link for CMT/DCS 500 PC-tool. The new value is effective only after the power is switched off and on again.

1202	FB_P: I2	SC: -	HL: 250	LL: 1	D: 250	U: -

DRIVE_ID

Parameter of MAINTENANCE-function block. (S2/16)
This parameter is reserved for future extensions. As long as a panel CDP 312 and a DCS 500B converter is connected to each other this parameter has to be kept to default. It will give a "name" to a drive in a multidrive system.

1203	FB_P: I2	SC: -	HL: 31	LL: 1	D: 1	U: -

POT1_VALUE

Parameter of MAINTENANCE-function block. (S2/16)
Constant test reference 1 for the manual tuning function.

1204	FB_P: I2	SC: -	HL: 32767	LL: -32768	D: 1000	U: -

POT2_VALUE

Parameter of MAINTENANCE-function block. (S2/16)
Constant test reference 2 for the manual tuning function.

1205	FB_P: I2	SC: -	HL: 32767	LL: -32768	D: 0	U: -

PERIOD_BTW.POT1/2

Parameter of MAINTENANCE-function block. (S2/16)
The time period of square wave generator for the manual tuning function.

1206	FB_P: I2	SC: 0.01	HL: 30000	LL: 1	D: 100	U: s

WRITE_ENABLE_KEY
Parameter of MAINTENANCE-function block. (S2/16)
Save the parameter access
This is the key number

1207	FB_P: I2	SC: 1	HL: 1000	LL: 1	D: 358	U: -

WRITE_ENABLE_PIN
Parameter of MAINTENANCE-function block. (S2/16)
Save the parameter access
This is the personality identify number. Parameter access is only possible if WRITE_ENABLE_KEY and WRITE_ENABLE_PIN numbers are equal.

1208	FB_P: I2	SC: 1	HL: 1000	LL: 1	D: 358	U: -

SELECT_OPER.SYST.
Parameter of MAINTENANCE-function block. (S2/16)
Select the operation mode of converter:
0 = 6P-SINGLE (6-pulse single mode, default)
1 = 12P-MASTER (12-pulse master mode)
2 = 12P-SLAVE (12-pulse slave mode)

1209	FB_P: E2	SC: -	HL: 2	LL: 0	D: 0	U:-

ACTUAL VALUE 1
Input of MAINTENANCE-function block. (S2/16)
Pointer to actual value 1 on panel.

1210	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 12103	U: -

ACTUAL VALUE 2
Input of MAINTENANCE-function block. (S2/16)
Pointer to actual value 2 on panel.

1211	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 10501	U: -

ACTUAL VALUE 3
Input of MAINTENANCE-function block. (S2/16)
Pointer to actual value 3 on panel.

1212	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 10505	U: -

FIELDBUS NODE ADDR
Parameter of MAINTENANCE-function block. (S2/16)
In case a field bus module Nxxx-0x is used keep this parameter to default. If a serial link has to be established please handle this parameter according to the AC70 documentation.

1213	FB_P: I2	SC: 1	HL: 255	LL:1	D: 1	U: -

MACRO_SELECT
Parameter of MAINTENANCE-function block. (S2/16)
Select the macros:
0 = NONE (no macro selected)
1 = MACRO 1 (macro 1 selected)
2 = MACRO 2 (macro 2 selected)
3 = MACRO 3 (macro 3 selected)
4 = MACRO 4 (fieldbus macro selected)

1214	FB_P: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

DCF MODE

Parameter of DCF_FIELDMODE-function block (S2/16 | S21.232)

Selects the control configuration for the DCF mode used for high inductive loads:

0 = DISABLE	
1 = DCF CURR CONTROL	Current controller adapted for high inductive load
2 = STAND ALONE	functionality of (1) plus monitoring of overvoltage protection DCF 506
3 = Reserved	
4 = FEXLINK NODE 1	functionality of (2) plus reading of references / commands via X16 as first field exciter
5 = FEXLINK NODE 2	functionality of (2) plus reading of references / commands via X16 as second field exciter
6 = MG-SET	functionality of (2) plus transfer of references / commands via X16 to other field exciter(s)

1215	FB_P: E2	SC: -	HL: 6	LL: 0	D: 0	U: -

DI/OVP

Input of DCF_FIELDMODE-function block (S2/16 | S21.232)

Based on the wiring diagram example the relay contact of the overvoltage protection DCF 506 is connected to the digital input 2 of the SDCS-CON-2 board. By default this hardware input is connected to the input of the DCF fieldmode block. In case a different hardware input is used, adapt the interconnection!

1216	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10703	U: -

OVP_SELECT

Parameter of DCF_FIELDMODE-function block (S2/16 | S21.232)

If the overvoltage protection unit DCF 506 has triggered because of an overvoltage condition the reaction of the converter can be selected by this parameter:

0 = OVP ALARM	indication and blocking of current controller; controller is released, when trigger signal goes back to logic “0” level
1 = OVP FAULT	indication, forcing the current to zero and switch off

1217	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

Group 13: MOTOR 1 FIELD

[F1_REF] Input of MOTOR_1_FIELD-function block. (S8/16) Field current reference for motor 1 field exciter.						
1301	FB_I: C4	SC: FCURR	HL: 19999	LL: 0	D: 11003	U: -
[F1_FORCE_FWD] Input of MOTOR_1_FIELD-function block. (S8/16) Command to force motor field in forward direction.						
1302	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
[F1_FORCE_REV] Input of MOTOR_1_FIELD-function block. (S8/16) Command to force motor field in reverse direction.						
1303	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
[F1_ACK] Input of MOTOR_1_FIELD-function block. (S8/16) Input for analog or digital acknowledge signal from external field excitation system.						
1304	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
F1_CURR_GT_MIN_L Parameter of MOTOR_1_FIELD-function block. (S8/16) Tripping level of minimum field current monitoring function. When field weakening function is used, this limit must be low enough to prevent minimum field faults at high speed!						
1305	FB_P: I2	SC: FCURR	HL: 4095	LL: 0	D: 2047	U: A
F1_OVERCURR_L Parameter of MOTOR_1_FIELD-function block. (S8/16) Field overcurrent limit for motor 1. The default limit is 115% of nominal field current.						
1306	FB_P: I2	SC: FCURR	HL: 8191	LL: 0	D: 4710	U: A
F1_CURR_TC Parameter of MOTOR_1_FIELD-function block (S8/16). Filter time constant for actual field current measurement. (lower HL in S21.232)						
1307	FB_P: I2	SC: 0.01	HL: 1000	LL: 0	D: 0	U: s
F1_KP Parameter of MOTOR_1_FIELD-function block. (S8/16) Proportional gain for PI controller in the field excitation unit .						
1308	FB_P: I2	SC: -	HL: 4096	LL: 0	D: 1	U: -
F1_KI Parameter of MOTOR_1_FIELD-function block. (S8/16) Integral action time for PI controller in the field excitation unit .						
1309	FB_P: I2	SC: 0.01	HL: 4096	LL: 0	D: 20	U: s
F1_U_AC_DIFF_MAX Parameter of MOTOR_1_FIELD_OPTIONS-function block (S8/16). Threshold level for free-wheeling function. If two successive AC voltage measurements in field exciter differ more than this then the 2 phase field exciter activates the free-wheeling function. (lower HL in S21.232)						
1310	FB_P: I2	SC: 1.0	HL: 1000	LL: 0	D: 10	U: %

F1_U_LIM_N
Parameter of MOTOR_1_FIELD-function block. (S8/16)
Negative output voltage limitation for current controller in field excitation unit. Minimum output voltage = -4096.

1311	FB_P: I2	SC: VOLT	HL: 0	LL: -4096	D: -4096	U: %

F1_U_LIM_P
Parameter of MOTOR_1_FIELD-function block. (S8/16)
Positive output voltage limitation for current controller in field excitation unit. Maximum output voltage = 4096.

1312	FB_P: I2	SC: VOLT	HL: 4096	LL: 0	D: 4096	U: %

F1_RED.SEL
Parameter of MOTOR_1_FIELD -function block. (S8/16)
Enables field heating function for the motor when RUN-command is not active.
The function is activated 10 s after the RUN-command has been removed.
0 = DISABLE
1 = ENABLE.

1313	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

F1_RED.REF
Parameter of MOTOR_1_FIELD-function block. (S8/16)
Field current reference when field heating function is active or when the motor is at standstill. Default is 30% of nominal value.

1314	FB_P: I2	SC: FCURR	HL: 4095	LL: 0	D: 1228	U: A

OPTI.REF_GAIN
Parameter of MOTOR_1_FIELD_OPTIONS-function block. (S8/16)
Used in OPTI-TORQUE function. Gain factor used to multiply torque reference when field current reference, F1_CURR_REF (11301), is calculated. Field current reference is calculated from torque reference:
Field current reference = OPTI.REF_GAIN * torque reference / 98.

1315	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 100	U: -

OPTI.REF_MIN_L
Parameter of MOTOR_1_FIELD_OPTIONS-function block. (S8/16)
Used in OPTI-TORQUE function. Minimum field level when OPTI_TORQUE function is selected with FIELD_MODE (1001) parameter.
Default value is 15% of nominal field current. See next parameter.

1316	FB_P: I2	SC: FCURR	HL: 4096	LL: 0	D: 614	U: A

OPTI.REF_MIN_TD
Parameter of MOTOR_1_FIELD_OPTIONS-function block. (S8/16)
Used in OPTI-TORQUE function. Time delay for minimum field indication. The field *reference* can't be below the limit **OPTI.REF_MIN_L** longer than this time when OPTI_TORQUE function is active or when field reversal is done

1317	FB_P: I2	SC: 1	HL: 20000	LL: 0	D: 200	U: ms

REV.REV_HYST
Parameter of MOTOR_1_FIELD_OPTIONS-function block. (S8/16)
Used in field reversal function. Hysteresis for actual field current comparator. During field reversal output of the comparator will produce the flag FIELD1_REV_ACK located in FEX_STATUS (11203)). Hysteresis is needed to avoid possible noise and offset of the field current signal to affect the FIELD1_REV_ACK.

1318	FB_P: I2	SC: FCURR	HL: 4095	LL: 0	D: 80	U: A

REV.REF_HYST

Parameter of MOTOR_1_FIELD_OPTIONS-function block. (S8/16)

Used in field reversal function. Hysteresis for torque reference during field reversal. The absolute value of torque reference must be bigger than **REV.REF_HYST** before the field reversal can take place.

1319	FB_P: I2	SC: TORQ	HL: 4000	LL: 0	D: 80	U: %

REV.FLUX_TD

Parameter of MOTOR_1_FIELD_OPTIONS-function block. (S8/16)

Time period during field reversal when field current and internal FLUX of the motor don't correspond to each other. The flag FIELD1_REV_ACK located in FEXC_STATUS (11203) changes state after this time delay.

1320	FB_P: I2	SC: 1	HL: 20000	LL: 0	D: 0	U: ms

F1_CURR_MIN_TD

Parameter of MOTOR_1_FIELD_OPTIONS-function block. (S8/16 | S21.233)

This parameter defines the time the actual field current is allowed to be lower than the threshold F1_CURR_GT_MIN_L (1305) without error signal F39 (NO FIELD ACK). As long as the actual field current is higher than the threshold, the flag FIELD1_CURR_MIN_L located in FEXC_STATUS (11203) is set.

1321	FB_P: I2	SC: 0.01	HL: 1000	LL: 10	D: 200	U: s

Group 14: MOTOR 1 PROTECT.

MOT1.[TEMP_IN] Input of MOTOR_1_PROTECTION-function block. (S9/16) Input where temperature measurement is connected.						
1401	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
MOT1.TEMP_ALARM_L Parameter of MOTOR_1_PROTECTION-function block. (S9/16) Motor overtemperature alarm is activated when measured temperature (PT100) or resistance value (PTC) exceeds this limit.						
1402	FB_P: I2	SC: 1	HL: 4000	LL: -10	D: 0	U: C
MOT1.TEMP_FAULT_L Parameter of MOTOR_1_PROTECTION-function block. (S9/16) Motor overtemperature fault is activated and the drive will trip when measured temperature (PT100) or resistance value (PTC) exceeds this limit.						
1403	FB_P: I2	SC: 1	HL: 4000	LL: -10	D: 0	U: C
[KLIXON_IN] Input of MOTOR_1_PROTECTION-function block. (S9/16) Input where temperature alarm is connected. Drive will tripped when the input value is not zero.						
1404	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
MODEL1.SEL Parameter of MOTOR_1_PROTECTION-function block. (S9/16) Used to activate the temperature model for motor1. The model will estimate the temperature of the motor based on motor current and given model parameters. 0 = DISABLED 1 = ENABLED.						
1405	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -
MODEL1.CURR Parameter of MOTOR_1_PROTECTION-function block. (S9/16) Nominal current parameter for thermal model. When motor current is MODEL1.CURR and after a time of about 5 times MODEL1.TC, the output of thermal model will be 100.						
1406	FB_P: I2	SC:MCURR	HL: 10000	LL: 0	D: 4096	U: A
MODEL1.ALARM_L Parameter of MOTOR_1_PROTECTION-function block. (S9/16) Motor overtemperature alarm is activated when calculated temperature exceeds this limit.						
1407	FB_P: I2	SC: 1	HL: 130	LL: 10	D: 120	U: %
MODEL1.TRIP_L Parameter of MOTOR_1_PROTECTION-function block. (S9/16) Motor overtemperature fault is activated and the drive will trip when calculated temperature exceeds this limit.						
1408	FB_P: I2	SC: 1	HL: 130	LL: 10	D: 130	U: %
MODEL1.TC Parameter of MOTOR_1_PROTECTION-function block. (S9/16) Thermal time constant parameter for thermal model. The time in which the temperature rises to 63% of the nominal value. When motor current is MODEL1.CURR and after a time of about 5 times MODEL1.TC, the output of thermal model will be 100.						
1409	FB_P: I2	SC: 1	HL: 5400	LL: 0	D: 240	U: s

Group 15: MOTOR 2 FIELD

[F2_REF] Input of MOTOR_2_FIELD-function block. (S8/16) Field current reference for motor 2 field exciter.						
1501	FB_I: C4	SC: FCURR	HL: 19999	LL: 0	D: 12512	U: -
F2_CURR_GT_MIN_L Parameter of MOTOR_2_FIELD-function block. (S8/16) Tripping level of minimum field current monitoring function.						
1502	FB_P: I2	SC: FCURR	HL: 4095	LL: 0	D: 2047	U: A
F2_OVERCURR_L Parameter of MOTOR_2_FIELD-function block. (S8/16) Field overcurrent limit for motor 2. The default limit is 115% of nominal field current.						
1503	FB_P: I2	SC: FCURR	HL: 8191	LL: 0	D: 4710	U: A
F2_CURR_TC Parameter of MOTOR_2_FIELD-function block (S8/16). Filter time constant for actual field current measurement. (lower HL in S21.232)						
1504	FB_P: I2	SC: 0.01	HL: 1000	LL: 0	D: 0	U: s
F2_KP Parameter of MOTOR_2_FIELD-function block. (S8/16) Proportional gain for PI controller in the field excitation unit .						
1505	FB_P: I2	SC: -	HL: 4096	LL: 0	D: 1	U: -
F2_KI Parameter of MOTOR_2_FIELD-function block. (S8/16) Integral action time for PI controller in the field excitation unit .						
1506	FB_P: I2	SC: 0.01	HL: 4096	LL: 0	D: 20	U: s
F2_U_AC_DIFF_MAX Parameter of MOTOR_2_FIELD_OPTIONS-function block (S8/16). Threshold level for free-wheeling function. If two successive AC voltage measurements in field exciter differ more than this then the 2 phase field exciter activates the free-wheeling function. (lower HL in S21.232)						
1507	FB_P: I2	SC: 1	HL: 1000	LL: 0	D: 10	U: %
F2_U_LIM_N Parameter of MOTOR_2_FIELD-function block. (S8/16) Negative output voltage limitation for current controller in field excitation unit. Minimum output voltage = -4096.						
1508	FB_P: I2	SC: VOLT	HL: 0	LL: -4096	D: -4096	U: %
F2_U_LIM_P Parameter of MOTOR_2_FIELD-function block. (S8/16) Positive output voltage limitation for current controller in field excitation unit. Maximum output voltage = 4096.						
1509	FB_P: I2	SC: VOLT	HL: 4096	LL: 0	D: 4096	U: %
F2_RED.SEL Parameter of MOTOR_2_FIELD -function block. (S8/16) Enables field heating function for the motor when the RUN-command is not active. The function is activated 10 s after the RUN-command has been removed. 0 = DISABLE 1 = ENABLE						
1510	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

F2_RED.REF

Parameter of MOTOR_2_FIELD -function block. (S8/16)

Field current reference when field heating function is active or when the motor is at standstill. Default is 30% of nominal value

1511	FB_P: I2	SC: FCURR	HL: 4095	LL: 0	D: 1228	U: A

Group 16: MOTOR 2 PROTECT.

MOT2.[TEMP_IN] Input of MOTOR_2_PROTECTION-function block. (S9/16) Input where temperature measurement is connected.						
1601	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -
MOT2.TEMP_ALARM_L Parameter of MOTOR_2_PROTECTION-function block. (S9/16) Motor overtemperature alarm is activated when measured temperature (PT100) or resistance value (PTC) exceeds this limit						
1602	FB_P: I2	SC: 1	HL: 4000	LL: -10	D: 0	U: C
MOT2.TEMP_FAULT_L Parameter of MOTOR_2_PROTECTION-function block. (S9/16) Motor overtemperature fault is activated and the drive will trip when measured temperature (PT100) or resistance value (PTC) exceeds this limit						
1603	FB_P: I2	SC: 1	HL: 4000	LL: -10	D: 0	U: C
MODEL2.SEL Parameter of MOTOR_2_PROTECTION-function block. (S9/16) Used to activate the temperature model for motor 2. The model will estimate the temperature of the motor based on motor current and given model parameters. 0 = DISABLED 1 = ENABLED.						
1604	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -
MODEL2.CURR Parameter of MOTOR_2_PROTECTION-function block. (S9/16) Nominal current parameter for thermal model. When motor current is MODEL2.CURR and after a time of about 5 times MODEL2.TC, the output of thermal model will be 100.						
1605	FB_P: I2	SC: MCURR	HL: 10000	LL: 0	D: 4096	U: A
MODEL2.ALARM_L Parameter of MOTOR_2_PROTECTION-function block. (S9/16) Motor overtemperature alarm is activated when calculated temperature exceeds this limit.						
1606	FB_P: I2	SC: 1	HL: 130	LL: 10	D: 120	U: %
MODEL2.TRIP_L Parameter of MOTOR_2_PROTECTION-function block. (S9/16) Motor overtemperature fault is activated and the drive will trip when calculated temperature exceeds this limit.						
1607	FB_P: I2	SC: 1	HL: 130	LL: 10	D: 130	U: %
MODEL2.TC Parameter of MOTOR_2_PROTECTION-function block. (S9/16) Thermal time constant parameter for thermal model. The time in which the temperature rises to 63% of the nominal value. When motor current is MODEL2.CURR and after a time of about 5 times MODEL2.TC, the output of thermal model will be 100.						
1608	FB_P: I2	SC: 1	HL: 5400	LL: 0	D: 240	U: s

Group 17: RAMP GENERATOR

RAMP.[IN] Input of RAMP GENERATOR-function block. (S4/16) Source for the speed reference.						
1701	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 11903	U: -
RAMP.[RES_IN] Input of RAMP GENERATOR-function block. (S4/16) Used to set ramp input to zero.						
1702	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
RAMP.[HOLD] Input of RAMP GENERATOR-function block. (S4/16) Used to hold the present ramp output value .						
1703	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
RAMP.[FOLLOW_IN] Input of RAMP GENERATOR-function block. (S4/16) Used to make the ramp output to follow the ramp input value.						
1704	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
RAMP.[FOLL_ACT] Input of RAMP GENERATOR-function block. (S4/16) Used to make the ramp output to follow the signal at RAMP.[SPEED_SET], connected to SPEED ACT (12102) by default.						
1705	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
RAMP.[RES_OUT] Input of RAMP GENERATOR-function block. (S4/16) Used to set ramp output to zero.						
1706	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
RAMP.[T1/T2] Input of RAMP GENERATOR-function block. (S4/16) Selects the used set of ramp times: 0 = ACCEL1, DECEL1 and SMOOTH1 are used <> 0 = ACCEL2, DECEL2 and SMOOTH2 are used.						
1707	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
ACCEL1 Parameter of RAMP GENERATOR-function block. (S4/16) The time in which the drive will accelerate from zero speed to nominal speed.						
1708	FB_P: I2	SC: 0.1	HL: 30000	LL: 1	D: 200	U: s
DECEL1 Parameter of RAMP GENERATOR-function block. (S4/16) The time in which the drive will decelerate from nominal speed to zero speed.						
1709	FB_P: I2	SC: 0.1	HL: 30000	LL: 1	D: 200	U: s
SMOOTH1 Parameter of RAMP GENERATOR-function block. (S4/16) The speed ramp output softening time (S-RAMP function). The total time how long the softening function will last.						
1710	FB_P: I2	SC: 1	HL: 20000	LL: 0	D: 0	U: ms
ACCEL2 Parameter of RAMP GENERATOR-function block. (S4/16) The time in which the drive will accelerate from zero speed to nominal speed.						
1711	FB_P: I2	SC: 0.1	HL: 30000	LL: 1	D: 100	U: s

DECEL2
Parameter of RAMP GENERATOR-function block. (S4/16)
The time in which the drive will decelerate from nominal speed to zero speed.

1712	FB_P: I2	SC: 0.1	HL: 30000	LL: 1	D: 100	U: s

SMOOTH2
Parameter of RAMP GENERATOR-function block. (S4/16)
The speed ramp output softening time (S-RAMP function).
The total time how long the softening function will last.

1713	FB_P: I2	SC: 1	HL: 20000	LL: 0	D: 0	U: ms

EMESTOP_RAMP
Parameter of RAMP GENERATOR-function block. (S4/16)
The time in which the drive will decelerate from nominal speed to zero speed in emergency stop situation.

1714	FB_P: I2	SC: 0.1	HL: 30000	LL: 1	D: 200	U: s

SPEEDMAX
Parameter of RAMP GENERATOR-function block. (S4/16)
Positive limit for speed reference.

1715	FB_P: I2	SC: SPEED	HL: 30000	LL: 0	D: 20000	U: rpm

SPEEDMIN
Parameter of RAMP GENERATOR-function block. (S4/16)
Negative limit for speed reference.

1716	FB_P: I2	SC: SPEED	HL: 0	LL: -30000	D: -20000	U: rpm

STARTSEL
Parameter of RAMP GENERATOR-function block. (S4/16)
Start-function when the motor is rotating
0 = START_FROM_0 (ramp output = 0 at start)
1 = FLYING_START (ramp output = actual speed at start.)

1717	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

ACC_COMP.MODE
Parameter of RAMP GENERATOR-function block. (S4/16)
Acceleration compensation function
0 = DISABLED
1 = ENABLED.

1718	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

ACC_COMP.TRMIN
Parameter of RAMP GENERATOR-function block. (S4/16)
The time in which the drive will accelerate from zero speed to the maximum speed using nominal torque (T_N) of the motor.

1719	FB_P: I2	SC: 0.1	HL: 32767	LL: 0	D: 0	U: s

RAMP.[SPEED_SET]
Input of RAMP GENERATOR-function block. (S4/16)
Set ramp output to this input with signal RAMP.[FOLL_ACT] (1705)

1720	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 12102	U: -

Group 18: REFERENCE CHAIN

REF_SUM.[IN1] Input of REF_SUM-function block. Summation point before Speed Contoller.					(S5/16)	
1801	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 11701	U: -
REF_SUM.[IN2] Input of REF_SUM-function block. Summation point before Speed Contoller.					(S5/16)	
1802	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 0	U: -

Group 19: REFERENCE SOURCES

CONST_REF.[ACT1] Input of CONST_REF-function block. (S4/16) Selects the constant reference REF1 to block output. ACT1 overrides other ACT-inputs.						
1901	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
CONST_REF.[ACT2] Input of CONST_REF-function block. (S4/16) Selects the constant reference REF2 to block output. ACT2 overrides ACT3- and ACT4-inputs.						
1902	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
CONST_REF.[ACT3] Input of CONST_REF-function block. (S4/16) Selects the constant reference REF3 to block output. ACT3 overrides ACT4-input.						
1903	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
CONST_REF.[ACT4] Input of CONST_REF-function block. (S4/16) Selects the constant reference REF4 to block output.						
1904	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
CONST_REF.DEF Parameter of CONST_REF-function block. (S4/16) This value is selected when none of four ACT-inputs is active.						
1905	FB_P: I2	SC: SPEED	HL: 32767	LL: -32767	D: 1000	U: rpm
CONST_REF.REF1 Parameter of CONST_REF-function block. (S4/16) This speed reference is selected when ACT1-input is active.						
1906	FB_P: I2	SC: SPEED	HL: 32767	LL: -32767	D: 1500	U: rpm
CONST_REF.REF2 Parameter of CONST_REF-function block. (S4/16) This speed reference is selected when ACT2-input is active.						
1907	FB_P: I2	SC: SPEED	HL: 32767	LL: -32767	D: 0	U: rpm
CONST_REF.REF3 Parameter of CONST_REF-function block. (S4/16) This speed reference is selected when ACT3-input is active.						
1908	FB_P: I2	SC: SPEED	HL: 32767	LL: -32767	D: 0	U: rpm
CONST_REF.REF4 Parameter of CONST_REF-function block. (S4/16) This speed reference is selected when ACT4-input is active.						
1909	FB_P: I2	SC: SPEED	HL: 32767	LL: -32767	D: 0	U: rpm
REFSEL.[IN1] Input of REF_SEL-function block. (S4/16) Speed reference input which is selected with SEL1-input.						
1910	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 10104	U: -
REFSEL.[SEL1] Input of REF_SEL-function block. (S4/16) Selects the speed reference input IN1 to the output.						
1911	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10715	U: -

REFSEL.[IN2]						
Input of REF_SEL-function block. (S4/16)						
Speed reference input which is selected with SEL2-input.						
1912	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 11901	U: -
REFSEL.[SEL2]						
Input of REF_SEL-function block. (S4/16)						
Selects the speed reference input IN2 to the output.						
1913	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 11902	U: -
REFSEL.[IN3]						
Input of REF_SEL-function block. (S4/16)						
Speed reference input which is selected with SEL3-input.						
1914	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 0	U: -
REFSEL.[SEL3]						
Input of REF_SEL-function block. (S4/16)						
Selects the speed reference input IN3 to the output.						
1915	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
REFSEL.[ADD]						
Input of REF_SEL-function block. (S4/16)						
Additional speed reference which is added to the output.						
1916	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 11904	U: -
REFSEL.[REV]						
Input of REF_SEL-function block. (S4/16)						
Command which changes the sign of the block output.						
1917	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
SOFTPOT.[INCR]						
Input of SOFT_POT-function block. (S4/16)						
Used to activate incrementing of output value.						
1918	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
SOFTPOT.[DECR]						
Input of SOFT_POT-function block. (S4/16)						
Used to activate decrementing of output value.						
1919	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
SOFTPOT.[FOLLOW]						
Input of SOFT_POT-function block. (S4/16)						
Used to make the output to follow actual motor speed.						
1920	FB_I: C4	SC: BI	HL: 19999	LL:0	D: 0	U: -
SOFTPOT.OHL						
Parameter of SOFT_POT-function block. (S4/16)						
Positive limit of the output						
1921	FB_P: I2	SC: SPEED	HL: 23000	LL: -23000	D: 5000	U: rpm
SOFTPOT.OLL						
Parameter of SOFT_POT-function block. (S4/16)						
Negative limit of the output.						
1922	FB_P: I2	SC: SPEED	HL: 23000	LL: -23000	D: -5000	U: rpm

SOFTPOT.[ENABLE]

Input of SOFT_POT-function block. (S4/16 | S21.233)

In default condition the output of the SOFT_POT function block is reset to zero, if the drive is stopped by removing the RUN command from the binary input. In case this behaviour is not useful change the interconnection to a different signal. Definition of this input:

The output SOFT_POT:OUT (11904) is kept to logic level = 0 as long as this input is not connected or the connected signal (default: RUNNING (10903)) has logic level = 0. If the connected signal is set to logic level = -1 the function is enabled.

1923	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 10903	U: -

Group 20: SPEED CONTROLLER

ERR.[IN]
Input of SPEED_ERROR-function block. (S5/16)
Speed reference value for speed error calculation.

2001	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 11802	U: -

ERR.[STEP]
Input of SPEED_ERROR-function block. (S5/16)
Speed step value which is added to speed error.

2002	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 12517	U: -

ERR.[WIN_MODE]
Input of SPEED_ERROR-function block. (S5/16)
Selection for window control mode.

2003	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

ERR.WIN_SIZE
Parameter of SPEED_ERROR-function block. (S5/16)
Size of the speed error window in window control mode.

2004	FB_P: I2	SC: SPEED	HL: 20000	LL: 0	D: 0	U: rpm

ERR.FRS
Parameter of SPEED_ERROR-function block. (S5/16)
The time constant of speed difference filter.

2005	FB_P: I2	SC: 1	HL: 1000	LL: 0	D: 0	U: ms

SPC.[IN]
Input of SPEED_CONTROL-function block. (S5/16)
Speed error input.

2006	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 12001	U: -

SPC.[RINT]
Input of SPEED_CONTROL-function block. (S5/16)
Command to reset the integral part of speed controller.

2007	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

SPC.[BAL]
Input of SPEED_CONTROL-function block. (S5/16)
Command to set the integral part of the speed controller to the value at SPC.[BALREF].

2008	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

SPC.[BALREF]
Input of SPEED_CONTROL-function block. (S5/16)
External value for the integral part of the speed controller when external setting is used via SPC.[BAL].

2009	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 0	U: -

SPC.[BAL2]
Input of SPEED_CONTROL-function block. (S5/16)
Command to set the integral part of the speed controller to the value at SPC.[BAL2REF].

2010	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 12403	U: -

SPC.[BAL2REF]
Input of SPEED_CONTROL-function block. (S5/16)
External value for the integral part of the speed controller when external setting is used via SPC.[BAL2].

2011	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12402	U: -

SPC.[HOLD]						
Input of SPEED_CONTROL-function block. (S5/16)						
Command to keep present value of the integral part of speed controller.						
2012	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -
SPC.DROOPING						
Parameter of SPEED_CONTROL-function block. (S5/16)						
A decrease in speed when the motor has a nominal load (T_N).						
2013	FB_P: I2	SC: 0.1	HL: 4000	LL: 0	D: 0	U: %
SPC.KP						
Parameter of SPEED_CONTROL-function block. (S5/16)						
The proportional gain of the speed controller. SPC.KP = 100 => gain = 1.						
2014	FB_P: I2	SC: 1	HL: 32000	LL: 0	D: 500	U: %
SPC.KPSMIN						
Parameter of SPEED_CONTROL-function block. (S5/16)						
The proportional gain of the speed controller when output of the speed controller is 0.						
Used to have lower gain when torque is small. SPC.KPSMIN = 100 => gain = 1						
2015	FB_P: I2	SC: 1	HL: 32000	LL: 0	D: 0	U: %
SPC.KPSPOINT						
Parameter of SPEED_CONTROL-function block. (S5/16)						
Used to have lower gain when torque is small. The value of the speed controller output where the gain is SPC.KP. Between controller output values 0...SPC.KPSPOINT the proportional gain will increase from SPC.KPSMIN to SPC.KP.						
2016	FB_P: I2	SC: TORQ	HL: 16000	LL: 0	D: 0	U: %
SPC.KPSWEAKFILT						
Parameter of SPEED_CONTROL-function block. (S5/16)						
Used to have lower gain when torque is small.						
The time constant of a filter that smoothens the changes of the proportional gain.						
2017	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 500	U: ms
SPC.KI						
Parameter of SPEED_CONTROL-function block. (S5/16)						
Integral action time of the controller.						
2018	FB_P: I2	SC: 1	HL: 32000	LL: 0	D: 5000	U: ms
SPC.TD						
Parameter of SPEED_CONTROL-function block. (S5/16)						
Time constant for the derivative part of the controller.						
2019	FB_P: I2	SC: 1	HL: 32000	LL: 0	D: 0	U: ms
SPC.TF						
Parameter of SPEED_CONTROL-function block. (S5/16)						
The filter time constant for the derivative part of the controller.						
2020	FB_P: I2	SC: 1	HL: 32000	LL: 5	D: 50	U: ms
ERR. [SPEED_ACT]						
Input of SPEED_ERROR-function block. (S5/16)						
Actuel speed value for speed error calculation.						
2021	FB_I: C4	SC: SPEED	HL: 19999	LL: 0	D: 12102	U: -

Group 21: SPEED MEASUREMENT

TACHOPULS_NR
Parameter of SPEED_MEASUREMENT-function block. (S4/16)
Number of pulses from the tacho when it rotates one turn.

2101	FB_P: I2	SC: 1	HL: 10000	LL: 125	D: 2048	U: -

SPEED_MEAS_MODE
Parameter of SPEED_MEASUREMENT-function block. (S4/16)
Selects the type of speed measurement used:

0 = ENCODER A+, B dir	(ch. A: pos. edges for speed; ch B: direction)
1 = ENCODER A+-	(ch. A: pos. and neg. edges for speed; ch. B: not used)
2 = ENCODER A+-, B dir	(ch. A: pos. and neg. edges for speed; ch. B: direction)
3 = ENCODER A+-, B +-	(all edges of the channels A and B are used)
4 = ANALOG TACHO	(AI channel AITAC is used for analog tacho input)
5 = EMF SPEED ACT	(speed actual is calculated from EMF of motor)

2102	FB_P: E2	SC: -	HL: 5	LL: 0	D: 5	U: -

SPEED_SCALING
Parameter of SPEED_MEASUREMENT-function block. (S4/16)
Speed reference of the motor in 0.1 rpm, when speed reference is 20000.
Notice that when this value is changed, all speed related parameters and signals will have different values when they are shown in [rpm] in the panel or in CMT/DCS 500:

AITAC_HIGH_VALUE,	AITAC_LOW_VALUE,	AI1_HIGH_VALUE,
AI1_LOW_VALUE,	FIELD_WEAK_POINT,	GENER.WEAK_POINT,
SPEEDMAX,	SPEEDMIN,	CONST_REF.DEF,
CONST_REF.REF1-4,	SOFTPOT.OHL,	SOFTPOT.OLL,
ERR.WIN_SIZE,	MIN_SPEED_L,	SPEED_L1,
SPEED_L2,	OVERSPEEDLIMIT,	STALL.SPEED,
MON.MEAS_LEV,	MAX_CURR_LIM_SPD,	
AITAC:OUT+,	AITAC:OUT-,	AI1:OUT+,
AI1:OUT-,	RAMP:OUT,	SPEED REFERENCE,
REF_SUM:OUT,	LOCAL_SPEED_REF,	CONST_REF:OUT,
REF_SEL.OUT,	SOFTPOT:OUT,	ERR:OUT,
ERR:STEP_RESP,	SPEED_ACT_EMF,	SPEED_ACT,
SPEED_ACT_FILT.		

2103	FB_P: I2	SC: 0.1	HL: 65000	LL: 1000	D: 15000	U: rpm

SPEED_ACT_FTR
Parameter of SPEED_MEASUREMENT-function block. (S4/16)
Filter time constant for the speed actual filter.
Output of the filter is the signal SPEED_ACT (12102).

2104	FB_P: I2	SC: 1	HL: 1000	LL: 0	D: 0	U: ms

SPEED_ACT_FLT_FTR
Parameter of SPEED_MEASUREMENT-function block. (S4/16)
Filter time constant for the signal SPEED_ACT_FILT (12103).
This speed actual is intended for display on panel or CMT.

2105	FB_P: I2	SC: 1	HL: 20000	LL: 0	D: 500	U: ms

Group 22: SPEED MONITOR

MIN_SPEED_L
Parameter of SPEED_MONITOR-function block. (S5/16)
Limit value for minimum speed detection.
When speed is below this limit MIN_SPEED (12201) output of the function block is set.

2201	FB_P: I2	SC: SPEED	HL: 30000	LL: 0	D: 50	U: rpm

SPEED_L1
Parameter of SPEED_MONITOR-function block. (S5/16)
Limit value for speed level detection. When speed is above this limit SPEED_GT_L1 (12202) output of the function block is set.

2202	FB_P: I2	SC: SPEED	HL: 30000	LL: 0	D: 5000	U: rpm

SPEED_L2
Parameter of SPEED_MONITOR-function block. (S5/16)
Limit value for speed level detection. When speed is above this limit SPEED_GT_L2 (12203) output of the function block is set.

2203	FB_P: I2	SC: SPEED	HL: 30000	LL: 0	D: 10000	U: rpm

OVERSPEEDLIMIT
Parameter of SPEED_MONITOR-function block. (S5/16)
Limit value for overspeed detection. When speed is above this limit OVERSPEED (12204) output of the function block is set an the drive will trip.

2204	FB_P: I2	SC: SPEED	HL: 30000	LL: 0	D: 23000	U: rpm

STALL.SEL
Parameter of SPEED_MONITOR-function block. (S5/16)
Selection parameter for stall protection:
0 = DISABLED
1 = ENABLED.

2205	FB_P: E2	SC: -	HL: 1	LL: 0	D: 0	U: -

STALL.SPEED
Parameter of SPEED_MONITOR-function block. (S5/16)
Speed limit value for stall detection.
When speed is below this limit and torque is higher than STALL.TORQUE for a time longer than STALL.TIME, the drive will trip.

2206	FB_P: I2	SC: SPEED	HL: 20000	LL: 0	D: 50	U: rpm

STALL.TORQUE
Parameter of SPEED_MONITOR-function block. (S5/16)
Torque limit value for stall detection. Description see STALL.SPEED (2206).

2207	FB_P: I2	SC: TORQ	HL: 16000	LL: 0	D: 3000	U: %

STALL.TIME
Parameter of SPEED_MONITOR-function block. (S5/16)
Time delay for stall detection. Description see STALL.SPEED (2206).

2208	FB_P: I2	SC: 1	HL: 180	LL: 1	D: 10	U: s

MON.MEAS_LEV
Parameter of SPEED_MONITOR-function block. (S5/16)
This function is comparing speed actual from pulse or analog tacho and the calculated EMF_ACT (10506) of the motor. If speed measurement fails the speed is zero, but the EMF_ACT (10506) will increase when the drive is started.
MON.MEAS_LEV is the minimum absolute value the measured speed must have when EMF_ACT (10506) is over the limit MON.EMF_V. Otherwise the drive trips to the speed measurement fault.

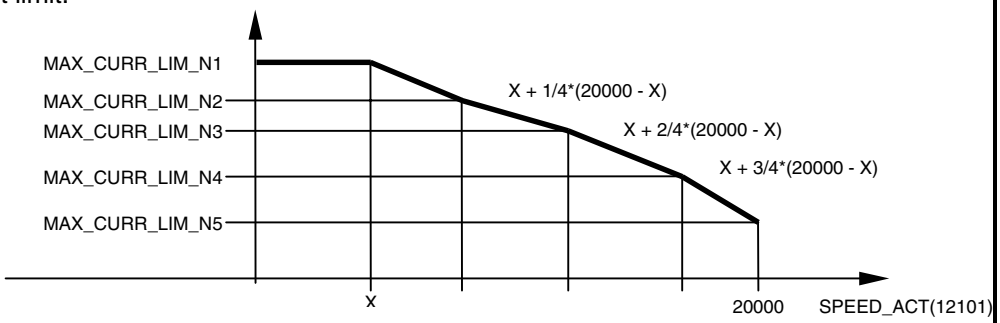
2209	FB_P: I2	SC: SPEED	HL: 20000	LL: 0	D: 200	U: rpm

MON.EMF_V						
Parameter of SPEED_MONITOR-function block. (S5/16) Description see MON.MEAS_LEV (2209).						
2210	FB_P: I2	SC: 1	HL: 1500	LL: 0	D: 50	U: V

Group 23: TORQUE and CURRENT LIMITS

[SPC_TORQ_MAX] Input of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Maximum torque limit for the speed controller. Can be connected to analog input or function block output.						
2301	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12510	U: -
[SPC_TORQ_MIN] Input of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Minimum torque limit for the speed controller. Can be connected to analog input or function block output.						
2302	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12511	U: -
[TREF_TORQ_MAX] Input of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Maximum torque limit for the torque reference chain. Can be connected to analog input or function block output.						
2303	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12510	U: -
[TREF_TORQ_MIN] Input of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Minimum torque limit for the torque reference chain. Can be connected to analog input or function block output.						
2304	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12511	U: -
TORQ_MAX Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Maximum torque limit for the drive.						
2305	FB_P: I2	SC: TORQ	HL: 16000	LL: 20	D: 4000	U: %
TORQ_MIN Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Minimum torque limit for the drive.						
2306	FB_P: I2	SC: TORQ	HL: -20	LL: -16000	D: -4000	U: %
ARM_CURR_LIM_P Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Maximum current of the motor bridge.						
2307	FB_P: I2	SC: MCURR	HL: 16383	LL: 0	D: 4095	U: A
ARM_CURR_LIM_N Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16) Maximum current of the generator bridge.						
2308	FB_P: I2	SC: MCURR	HL: 0	LL: -16383	D: -4095	U: A

MAX_CURR_LIM_SPD
Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
Speed dependent current limitation.
The speed limit named with x where armature current limitation starts to decrease the current limit.



2309	FB_P: I2	SC: SPEED	HL: 20000	LL: 0	D: 20000	U: rpm

MAX_CURR_LIM_N1
Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
Speed dependent current limitation.
Armature current limit at speed MAX_CURR_LIM_SPD (2309).

2310	FB_P: I2	SC: MCURR	HL: 16383	LL: 0	D: 16383	U: A

MAX_CURR_LIM_N2
Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
Speed dependent current limitation.
Armature current limit at speed:
MAX_CURR_LIM_SPD + 1/4*(20000 - MAX_CURR_LIM_SPD).

2311	FB_P: I2	SC: MCURR	HL: 16383	LL: 0	D: 16383	U: A

MAX_CURR_LIM_N3
Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
Speed dependent current limitation.
Armature current limit at speed:
MAX_CURR_LIM_SPD + 2/4*(20000 - MAX_CURR_LIM_SPD).

2312	FB_P: I2	SC: MCURR	HL: 16383	LL: 0	D: 16383	U: A

MAX_CURR_LIM_N4
Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
Speed dependent current limitation.
Armature current limit at speed:
MAX_CURR_LIM_SPD + 3/4*(20000 - MAX_CURR_LIM_SPD).

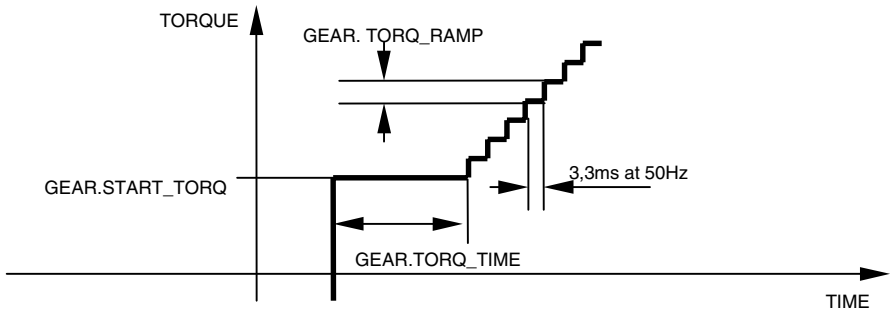
2313	FB_P: I2	SC: MCURR	HL: 16383	LL: 0	D: 16383	U: A

MAX_CURR_LIM_N5
Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
Speed dependent current limitation.
Armature current limit at speed:
20000 (nominal speed of the drive).

2314	FB_P: I2	SC: MCURR	HL: 16383	LL: 0	D: 16383	U: A

GEAR.START_TORQ

Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
Gear backlash compensation function.
When the torque is changing direction, the torque limit is reduced for a while.
GEAR.START_TORQ is the torque limit right after the direction change.



2315	FB_P: I2	SC: TORQ	HL: 16000	LL: 0	D: 16000	U: %

GEAR.TORQ_TIME

Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
GEAR.TORQ_TIME is the time period after the direction change when GEAR.START_TORQ torque is used. (see 2315)

2316	FB_P: I2	SC: 1	HL: 1000	LL: 0	D: 100	U: ms

GEAR.TORQ_RAMP

Parameter of TORQUE/CURRENT_LIMITATION-function block. (S6/16)
GEAR.TORQ_RAMP defines the rate of change for the torque limit when GEAR.TORQ_TIME has elapsed. GEAR.TORQ_RAMP is given as the maximum change of torque limit in 3.3 ms (50 Hz). (see 2315)

2317	FB_P: I2	SC: TORQ	HL: 16000	LL: 0	D: 200	U: %

Group 24: TORQUE REFERENCE CHAIN

SEL1.[TREF_A]
Input of TORQ_REF_SELECTION-function block. (S6/16)
Torque reference A is connected to this input.

2401	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 10107	U: -

SEL1.TREF_A_FTC
Parameter of TORQ_REF_SELECTION-function block. (S6/16)
Filter time constant for torque reference A.

2402	FB_P: I2	SC: 1	HL: 1000	LL: 0	D: 0	U: ms

SEL1.[LOAD_SHARE]
Input of TORQ_REF_SELECTION-function block. (S6/16)
Load share is connected to this input.
Load share is used to scale the torque reference A.
SEL1:OUT = SEL1.[LOAD_SHARE] * SEL1.TREF_A_FTC / 4000

2403	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 12521	U: -

SEL1.[TREF_B]
Input of TORQ_REF_SELECTION-function block. (S6/16)
Torque reference B is connected to this input.

2404	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12519	U: -

SEL1.TREF_B_SLOPE
Parameter of TORQ_REF_SELECTION-function block. (S6/16)
The slope of the ramp for torque reference B.
Given as the time from 0 to 100 % torque.

2405	FB_P: I2	SC: 1	HL: 10000	LL: 0	D: 0	U: ms

SEL2.TREF_SEL
Parameter of TORQ_REF_HANDLING-function block. (S7/16)
Selection for the source of torque reference:
0 = NONE
1 = SPEED_CONTROLLED (from TREF_SPC)
2 = EXT.TORQUE REF (from TREF_EXT)
3 = MIN (minimum logic with speed error comparison)
4 = MAX (maximum logic with speed error comparison)
5 = WINDOW (window control mode)

2406	FB_P: E2	SC: -	HL: 5	LL: 0	D: 1	U: -

SEL2.[TREF_SPC]
Input of TORQ_REF_HANDLING-function block. (S7/16)
Torque reference from speed controller is connected to this input.

2407	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12004	U: -

SEL2.[TREF_EXT]
Input of TORQ_REF_HANDLING-function block. (S7/16)
External torque reference is connected to this input.

2408	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12401	U: -

SEL2.[TORQ_STEP]
Input of TORQ_REF_HANDLING-function block. (S7/16)
Torque step is connected to this input.

2409	FB_I: C4	SC: TORQ	HL: 19999	LL: 0	D: 12520	U: -

Group 25: FB EXECUTION

TASK1_EXEC_ORDER Execution order of function blocks of task 1, which is executed at 5 ms interval.						
2501	P: AI2	SC: -	HL: 10000	LL: 0	D: 0	U: -
TASK2_EXEC_ORDER Execution order of function blocks of task 2, which is executed at 20 ms interval.						
2502	P: AI2	SC: -	HL: 10000	LL: 0	D: 0	U: -
TASK3_EXEC_ORDER Execution order of function blocks of task 3, which is executed at 200 ms interval.						
2503	P: AI2	SC: -	HL: 10000	LL: 0	D: 0	U: -
FB_APPL_ENABLE Selection parameter for the execution of function block application: 0: (disabled; application blocks are not executed) 1: (enabled; application blocks are executed).						
2504	FB_P: I2	SC: 1	HL: 1	LL: 0	D: 0	U: -
FB_TASK_LOCK Interlocking flag for function block programming via panel CDP 312 or PC tool CMT. If function block programming is started via one tool, this one will set this flag to prevent similar actions taking place via the other tool. This flag can be actively set by using one of the tools to define this one being the preferred for function block programming. 0: (disabled; locking flag is not set) 1: (enabled; locking flag is set).						
2505	FB_P: I2	SC: 1	HL: 1	LL: 0	D: 0	U: -

Group 26: FUNCTION BLOCKS 1

2601-2699: Parameters for application function blocks
See application function block data sheets.

Group 27: FUNCTION BLOCKS 2

2701-2799: Parameters for application function blocks
See application function block data sheets.

Group 28: FUNCTION BLOCKS 3

2801-2899: Parameters for application function blocks
See application function block data sheets.

Group 29: FUNCTION BLOCKS 4

2901-2999: Parameters for application function blocks
See application function block data sheets.

Group 30: FUNCTION BLOCKS 5

3001-3099: Parameters for application function blocks
See application function block data sheets.

Group 31: FUNCTION BLOCKS 6

3101-3199: Parameters for application function blocks
See application function block data sheets.

Group 32: FUNCTION BLOCKS 7

3201-3299: Parameters for application function blocks
See application function block data sheets.

Group 33: FUNCTION BLOCKS 8

3301-3399: Parameters for application function blocks
See application function block data sheets.

Group 34: FUNCTION BLOCKS 9

3401-3403: Parameters for application function blocks
See application function block data sheets.

Group 36: 12-PULSE OPERATING

REV_DELAY

Parameter of 12-PULSE LOGIC-function block (S13/16).
A bridge reversal takes place in several steps. When the current has reached very low values this delay time is started to make sure, the current will become zero and then the bridges will be swapped and the current controller will be released. The delay time is defined in multiples of cycles (cycle = 3.3 ms at 50 Hz / 2.78ms at 60 Hz). The function is independent of the control mode (6- or 12-pulse or DCF mode). If used in 12 pulse mode Master and Follower drive must have the same setting! (higher HL in S21.232)

3601	FB_P: I2	SC: 1	HL: 500	LL: 0	D: 1	U: -

REV_GAP

Parameter of 12-PULSE LOGIC-function block (S13/16).
If the actual current doesn´t go down in parallel and as expected in both converters this delay time is started when the time of REV_DELAY has elapsed to enable the system to correct itself. During this time the reversal is blocked. The delay time is defined in multiples of cycles (see REV_DELAY). The bridge reversal will be performed independent of the actual current signal of the other converter, if the time has elapsed. The function is independent of the control mode (6- or 12-pulse or DCF mode). This parameter must have the same setting at the Master and the Follower. (higher HL in S21.232)

3602	FB_P: I2	SC: 1	HL: 5000	LL: 0	D: 10	U: -

FREV_DELAY

Parameter of 12-PULSE LOGIC-function block (S13/16).
This delay time is started when the polarity of the current reference is inverted. In case the bridge reversal is successful this delay time is reset. In case the bridge reversal failed the fault message F65 is displayed when the time is elapsed. A reversal may fail because only one converter swapped the bridge or the converters swapped bridges crosswise or something else. At the end the current is not increased at both converters with the same bridge. This delay time is defined in multiples of cycles (see REV_DELAY).). The function is independent of the control mode (6- or 12-pulse or DCF mode). This parameter must have the same setting at the Master and the Follower and must be greater than the sum of REV_DELAY and REV_GAP plus a safety margin. (higher HL in S21.232)

3603	FB_P: I2	SC: 1	HL: 5000	LL: 1	D: 10	U: -

IACT_SLAVE

Input of 12-PULSE LOGIC-function block (S13/16).
Pointer to an analog hardware input. In default condition the analog input 2 is connected.
At converters working as a 12 pulse MASTER the actual current signal taken out of the SLAVE has to be connected to the hardware and transferred to this input.
At converters working as a 12 pulse SLAVE the actual current signal taken out of the MASTER has to be connected to the hardware and transferred to this input.

3604	FB_I: C4	SC: CCURR	HL: 19999	LL: 0	D: 10107	U: -

DIFF_CURRENT

Parameter of 12-PULSE LOGIC-function block (S13/16).
Permitted difference of the currents (Master/Slave)
Operative only at the Master drive.

3605	FB_P: I2	SC: 1	HL: 50	LL: 5	D: 10	U: %

DIFF_CURR_DELAY
Parameter of 12-PULSE LOGIC-function block (S13/16).
Number of cycles in which the currents are allowed to differ (DIFF_CURRENT) without triggering Error 66
Operative only at the Master drive.

3606	FB_P: I2	SC: 1	HL: 16383	LL: 3	D: 150	U: -

INHIB_Logic
Input of 12-PULSE LOGIC-function block (S13/16).
This input controls the reaction of this converter, if an error is active at the other converter.
Interconnection:
- At systems, running in 12 pulse mode all time (no redundancy; Master or Follower never will be used as single 6 pulse drive), connect this input to the output INPUT_X18:15 (13619) at both converters, the Master and the Follower.

3607	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

IREF0_Logic
Input of 12-PULSE LOGIC-function block (S13/16).
This input is used to monitor and control the bridge changeover. The Follower is reading the polarity of the signal CURR.-REF.1 (13605), generated by the Master.
Interconnection:
- Keep this input unconnected, if this converter is used as a Master.
- Connect this input to INPUT_X18:13 (13617), if this converter is used as a Follower.

3608	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

Bridge_Logic
Input of 12-PULSE LOGIC-function block (S13/16).
This input is used to read, which bridge is active at the Follower.
Interconnection:
- Connect this input to INPUT_X18:13 (13617), if this converter is used as a Master.
- Keep this input unconnected, if this converter is used as a Follower.

3609	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

Reverse.Logic
Input of 12-PULSE LOGIC-function block (S13/16).
This input is used to monitor and control the bridge changeover. Both converters are reading the polarity of the signal CURR.-REF2 (13608), generated by it´s partner.
Interconnection:
- Connect this input to INPUT_X18:14 (13618) at both converters, the Master and the Follower.

3610	FB_I: C4	SC: BI	HL: 19999	LL: 0	D: 0	U: -

[X18:09]
Input of OUTPUT X18-function block (S13/16).
The signal passed to this pointer is outputted at Plug Connector X18:09. It is operative in all modes.
Based on the connection diagram this interconnection should be done:
- Connect this input to IREF1-POLARITY (13606), if this converter is used as a Master.
- Connect this input to BRIDGE (13611), if this converter is used as a Follower.

3611	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

[X18:10]
Input of OUTPUT X18-function block (S13/16).
The signal passed to this pointer is outputted at Plug Connector X18:10. It is operative in all modes.
Based on the connection diagram this interconnection should be done:
- Connect this input to IREF2-POLARITY (13609) at both converters, the Master and the Follower.

3612	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

[X18:11]
Input of OUTPUT X18-function block (S13/16).
The signal passed to this pointer is outputted at Plug Connector X18:11. The logic level of the signal transferred via the cable is inverted compared the one connected to. This interconnection can be used for a fail-safe circuit. It is operative in all modes.
Based on the connection diagram this interconnection should be done:
- in case a 12 pulse system without redundancy is in use (see INHIB_LOGIC):
  - connect this input to RDY_ON (10901) at both converters, the Master and the Follower
- in case a 12 pulse system with redundancy is in use (see BC-LOGIC):
  - connect this input to BC_NOT_ZERO (13621) at both converters, the Master and the Follower

3613	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

[X18:12]
Input of OUTPUT X18-function block (S13/16).
The signal passed to this pointer is outputted at Plug Connector X18:12. It is operative in all modes.
Based on the connection diagram this interconnection should be done:
- in case a 12 pulse system without redundancy is in use (see INHIB_LOGIC):
  - connect this input to RUNNING (10903), if this converter is used as a Master
  - keep this input unconnected, if this converter is used as a Follower
- in case a 12 pulse system with redundancy is in use (see BC_LOGIC):
  - keep this input unconnected at both converters, the Master and the Follower

3614	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

ADJ_REF1
Parameter of 12-PULSE LOGIC-function block (S13/16).
The current reference exchanged between the two converters via analog data can be scaled with this parameter. Higher values will increase the reference at that converter this parameter is set, lower values will reduce the reference. In case the DC current of the two converters involved is different, this parameter can serve for correction, if the error is caused by the analog data exchange.

3615	FB_P: I2	SC: 1	HL: 16384	LL: 1	D: 2048	U: -

BC-Logic
Input of 12-PULSE LOGIC-function block (S13/16).
In conjunction to input INHIB_LOGIC the converters now exchange the logic level of bit 5 of the signal BC (11209). This bit blocks or releases the current controler. Using this input for the data exchange gives the fastest reaction available. The use of bit 5 of the signal BC is recommended, if the 12 pulse system needs redundancy. In this case, the ON/OFF and the RUN command has to be given to each of the converters via digital inputs depending on the converter needed. This enables the user to use both converters in a 12 pulse mode or having the Master or the Follower running as a stand alone drive.
Interconnection:
- At systems, running in 6 or 12 pulse mode (redundancy; Master and Follower used in 12 pulse mode or only the Master is used in single 6 pulse mode or only the Follower is used in single 6 pulse mode), connect this input to the output INPUT_X18:15 (13619) at both converters, the Master and the Follower.

3616	FB_I: C4	SC: -	HL: 19999	LL: 0	D: 0	U: -

Group 37: WINDER PARAMETER

3701-3726: Parameters for application winder blocks
See application function block data sheets.

Group 38: FUNCTION BLOCKS WINDER

3801-3867: Function for application winder
See application function block data sheets.

Group 39: FUNCTION BLOCKS 10

3901-3988: Parameter for application function blocks
See application function block data sheets.

Group 40: FIELDBUS

FIELDBUS_PAR.1

Parameter of FIELDBUS-function block. (S12/16).

Selects the fieldbus-adapter.

0 = DISABLE
1 = Fieldbus
2 = Advant / DDCS
3 = MODBUS INTERNAL
4 = RESET fieldb. par.

If **Fieldbus** is selected the following fieldbus adapters are supported:

PROFIBUS	adapter NPBA-02
PROFIBUS	adapter NPBA-12
AC31(CS31)	adapter NCSA-01
MODBUS	adapter NMBA-01
MODBUS+	adapter NMBP-01
CANopen	adapter NCAN-02
DeviceNet	adapter NDNA-02

4001	FB_P: E2	SC: 1	HL: 4	LL: 0	D: 0	U: -

FIELDBUS_PAR.2

Parameter of FIELDBUS-function block. (S12/16).

	4002	4003	4004	4005	4006	4007	4008	4009	4010	4011	4012	4013	4014	4015
PROFIBUS (NPBA-02)	1	2	6	1	0	30	0	0						
PROFIBUS (NPBA-12)	0	0	2	1	0	30	0	0						
AC31 (CS31)	r.o.	0	1	0	1	1	1	1	1					
MODBUS	0	1	3	2	r.o.	r.o.	0							
MODBUS+	0	64	r.o.	r.o.	4	5	6	0	0	0	0	0	0	
CANopen	1	1	3	1	10	r.o.	0	1						
DeviceNet	63	0	r.o.	0	0	0	0	0	0	1500	1500	0	1000	1

Table shows the default values set by the adapter (r.o. :read only)

Fieldbus parameter with adapter specific function :

PROFIBUS (NPBA-02)	PROFIBUS MODE	(0) FMS (1) DP-PPO1 (2) DP-PPO2 (3) DP-PPO3 (4) DP-PPO4 (5) DP-PPO5
PROFIBUS (NPBA-12)	PROTOCOL	(0) DP (1) DPV1
AC31	PROTOCOL	Read-only
MODBUS	MODBUS MODE	(0) RTUv wdg:flt (1) RTU wdg:rst
MODBUS+	PROTOCOL	(0) MODBUS PLUS (1) MBP FAST
CANopen	WD MODE	(0) FAULT (1) AUTO RESET
DeviceNet	MAC I D	0 … 63

4002	FB_P: I2	SC: 1	HL: 255	LL: 0	D: 0	U: -

FIELDBUS_PAR.3

Parameter of FIELDBUS-function block. (S12/16).

Fieldbus parameter with adapter specific function

PROFIBUS (NPBA-02):	STATION NUMBER	2 to 126
PROFIBUS (NPBA-12):	PPO TYPE	(0) PPO 1 (1) PPO 2 (2) PPO 3 (3) PPO 4 (4) PPO 5
AC31	MODULE ID	(0) WORD (1) BINARY
MODBUS	STATION NUMBER	1 – 247
MODBUS+	Station	1 ... 64
CANopen	NODE ID	1 to 127
DeviceNet	BAUD RATE	(0) 125 kBit/s (1) 250 kBit/s (2) 500 kBit/s

4003	FB_P: I2	SC: 1	HL: 255	LL: 0	D: 0	U: -

FIELDBUS_PAR.4

Parameter of FIELDBUS-function block. (S12/16).

Fieldbus parameter with adapter specific function

PROFIBUS (NPBA-02)	BIT RATE SELECT	(0) 9.6KBIT (1) 19.2KBIT (2) 93.75KBIT (3) 187.5KBIT (4) 500KBIT (5) 1.5MBIT (6) AUTO
PROFIBUS (NPBA-12)	NODE NUMBER	2 to 126
AC31	STATION NUMBER	0 … 5 (Word Mode) 0 … 57 (Binary Mode)
MODBUS	BAUD RATE	(0) 1200 (1) 2400 (2) 4800 (3) 9600 (4) 19200
MODBUS+	Good Msg	read only
CANopen	BAUD RATE	(0) 1 Mbit/s (1) 500 kbit/s (2) 250 kbit/s (3) 125 kbit/s (4) 100 kbit/s (5) 50 kbit/s (6) 20 kbit/s (7) 10 kbit/s
DeviceNet	STATUS	read only (0) SELF TEST (1) NO CONNECT (2) CONNECTED (3) TIMEOUT (4) DUP. MAC ERR (5) BUS_OFF (6) COM. ERROR (7) WRONG ASMBLY

4004	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.5

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS (NPBA-02)	NO. OF DATA SETS	1 to 4
PROFIBUS (NPBA-12)	NO. OF DATA SETS	1 to 4
AC31	ADDR INDEX	(0) LOWER (1) UPPER
MODBUS	PARITY	(0) EVEN (1) ODD (2) NONE 2 STOP BIT; (3) NONE 1 STOP BIT
MODBUS+	Bad Msg	read only
CANopen	COMM PROFILE	(0) CSA 2.8/3.0 (1) ABB DRIVES (2) TRANSPARENT
DeviceNet	PROFILE SELECTION	(0) ABB DRIVES (1) CSA 2.8/3.0

4005	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.6

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS (NPBA-02)	DATA SET OFFSET	0 to 255
PROFIBUS (NPBA-12)	DATA SET INDEX	(0) FBA DSET 1 (1) FBA DSET 10
AC31	DATA SETS	1; 2; 3
MODBUS	GOOD MESSAGES	read only
MODBUS+	GD Out 1	0 ... 96
CANopen	CUT-OFF TIMEOUT	0 to 255
DeviceNet	POLL OUTPUT SELECT	(0) BASIC SPEED (1) TRANSPARENT (2) PARAMETERS (3) MUL. DATASETS

4006	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.7

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS (NPBA-02)	CUT-OFF TIMEOUT	0 to 255
PROFIBUS (NPBA-12)	CUT-OFF TIMEOUT	0 to 255
AC31	DATA SET1 CONST	0 … 32767 (1 = 6ms)
MODBUS	BAD MESSAGES	read only
MODBUS+	GD Out 2	0 ... 96
CANopen	STATUS	read only (0) SELF TEST (1) RX Q OVERRUN (2) CAN OVERRUN (3) BUS OFF (4) ERROR SET (5) ERROR RESET (6) TX Q OVERRUN (7) DISCONNECTED (8) STARTED (9) STOPPED (10) G FAILS (11) PRE-OPERAT (12) RESET COMM. (13) RESET NODE
DeviceNet	POLL/COS INPUT SEL	(0) BASIC SPEED (1) TRANSPARENT (2) PARAMETERS (3) MUL. DATASETS

4007	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.8

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS (NPBA-02)	COMM PROFILE	(0) ABB DRIVES (1) CSA 2.8/3.0
PROFIBUS (NPBA-12)	COMM PROFILE	(0) ABB DRIVES (1) CSA 2.8/3.0
AC31	DATA SET2 CONST	0 … 32767 (1 = 6ms)
MODBUS	DDCS CHANNEL	(0) CH0' (1) CH3
MODBUS+	GD Out 3	0 ... 96
CANopen	DATA SET INDEX	(0) FBA D SET 1 (1) FBA D SET 10
DeviceNet	COS DATA OUTPUT	(0) BASIC SPEED (1) TRANSPARENT (2) PARAMETERS (3) MUL. DATASETS

4008	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.9

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS (NPBA-02)		
Software > V2.3	CONTROL ZERO MODE	(0) STOP (1) FREEZE
PROFIBUS (NPBA-12)	CONTROL ZERO MODE	(0) STOP (1) FREEZE
AC31	DATA SET3 CONST	0 … 32767 (1 = 6ms)
MODBUS	not used	
MODBUS+	GD In 1 Stn	0 ... 64
CANopen	NO. OF D SETS	1 or 2
DeviceNet	BIT STROBE OUTPUT	(0) BASIC SPEED (1) TRANSPARENT (2) PARAMETERS

4009	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.10

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS	not used	
AC31	DATA SET OFFSET	1 … 255
MODBUS	not used	
MODBUS+	GD In 1 Wrd	0 ... 31
CANopen	not used	
DeviceNet	DATASET INDEXES	(0) FBA DSET 1 (1) FBA DSET 10

4010	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.11

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS	not used	
AC31	not used	
MODBUS	not used	
MODBUS+	GD In2 Stn	0 ... 64
CANopen	not used	
DeviceNet	SPEED REF. SCALE	0 … 32767

4011	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.12

Parameter of FIELDBUS-function block. (S12/16).
Fieldbus parameter with adapter specific function

PROFIBUS	not used	
AC31	not used	
MODBUS	not used	
MODBUS+	GD In2 Wrd	0 ... 31
CANopen	not used	
DeviceNet	SPEED ACT. SCALE	0 … 32767

4012	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.13

Parameter of FIELDBUS-function block. (S12/16).

Fieldbus parameter with adapter specific function

PROFIBUS	not used	
AC31	not used	
MODBUS	not used	
MODBUS+	GD In3 Stn	0 ... 64
CANopen	not used	
DeviceNet	ABB DRIVES STOP M	(0) COAST STOP (1) RAMP STOP

4013	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.14

Parameter of FIELDBUS-function block. (S12/16).

Fieldbus parameter with adapter specific function

PROFIBUS	not used	
AC31	not used	
MODBUS	not used	
MODBUS+	GD In3 Wrd	0 ... 31
CANopen	not used	
DeviceNet	RAMP STOP LEVEL	0 … 20000

4014	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

FIELDBUS_PAR.15

Parameter of FIELDBUS-function block. (S12/16).

Fieldbus parameter with adapter specific function

PROFIBUS	not used	
AC31	not used	
MODBUS	not used	
MODBUS+	not used	
CANopen	not used	
DeviceNet	NO. OF DATASETS	1 … 20

4015	FB_P: I2	SC: 1	HL: 32767	LL: 0	D: 0	U: -

Group 101: ANALOG INPUTS

AITAC:OUT+
Signal of AITAC-function block. (S4/16)
Usually used for speed feedback when analog tacho is utilized.

10101	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm

AITAC:OUT-
Signal of AITAC-function block. (S4/16)
Usually used for speed feedback when analog tacho is utilized. Negated output.

10102	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm

AITAC:ERR
Signal of AITAC-function block. (S4/16)
Status of AITAC-function block:

0 = NO FAULT	No fault
1 = I < 4 mA	AITAC_CONV_MODE = 2 and I < 4 mA, current signal out of range
2 = NO IOB1/IOB2/IOB3	No IOB3-board connected
3 = WRONG IOB	Only IOB2 connected or AITAC CONV_MODE = 1...2 and IOB3 not connected
4 = LOW VAL>HIGH VALAITAC_LOW_VALUE > AITAC_HIGH_VALUE.	

10103	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

AI1:OUT+
Signal of AI1-function block. (S4/16)
Usually used for speed reference input when analog reference is used.

10104	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm

AI1:OUT-
Signal of AI1-function block. (S4/16)
Usually used for speed reference input when analog reference is used. Negated output.

10105	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm

AI1:ERR
Signal of AI1-function block. (S4/16)
Status of AI1-function block:

0 = NO FAULT	No fault
1 = I < 4 mA	AI1_CONV_MODE = 2 and I < 4 mA, current signal out of range
2 = NO IOB1/IOB2/IOB3	No IOB3-board connected
3 = WRONG IOB	Only IOB2 connected or AI1_CONV_MODE = 3...6 and IOB3 not connected
4 = LOW VAL>HIGH VALAI1_LOW_VALUE > AI1_HIGH_VALUE.	

10106	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

AI2:OUT+
Signal of AI2-function block. (S6/16)
Value read from Analog Input 2.

10107	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI2:OUT-
Signal of AI2-function block. (S6/16)
Value read from Analog Input 2. Negated output.

10108	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI2:ERR
Signal of AI2-function block. (S6/16)
Status of AI2-function block:

0 = NO FAULT	No fault
1 = I < 4 mA	AI2_CONV_MODE = 2 and I < 4 mA, current signal out of range
2 = NO IOB1/IOB2/IOB3	No IOB3-board connected
3 = WRONG IOB	Only IOB2 connected or AI2_CONV_MODE=3...6 and IOB3 not connected
4 = LOW VAL>HIGH VAL	AI2_LOW_VALUE > AI2_HIGH_VALUE.

10109	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

AI3:OUT+
Signal of AI3-function block. (S11/16)
Value read from Analog Input 3.

10110	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI3:OUT-
Signal of AI3-function block. (S11/16)
Value read from Analog Input 3. Negated output.

10111	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI3:ERR
Signal of AI3-function block. (S11/16)
Status of AI3-function block:

0 = NO FAULT	No fault
1 = I < 4 mA	AI3_CONV_MODE = 2 and I < 4 mA, current signal out of range
2 = NO IOB1/IOB2/IOB3	No IOB3-board connected
3 = WRONG IOB	Only IOB2 connected or AI3_CONV_MODE=3...6 and IOB3 not connected
4 = LOW VAL>HIGH VAL	AI3_LOW VALUE > AI3_HIGH VALUE.

10112	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

AI4:OUT+
Signal of AI4-function block. (S11/16)
Value read from Analog Input 4.

10113	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI4:OUT-
Signal of AI4-function block. (S11/16)
Value read from Analog Input 4. Negated output.

10114	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI4:ERR
Signal of AI4-function block. (S11/16)
Status of AI4-function block:

0 = NO FAULT	No fault
1 = I < 4 mA	AI4_CONV_MODE = 2 and I < 4 mA, current signal out of range
2 = NO IOB1/IOB2/IOB3	No IOB3-board connected
3 = WRONG IOB	Only IOB2 connected or AI4_CONV_MODE=3 and IOB3 not connected
4 = LOW VAL>HIGH VAL	AI4_LOW_VALUE > AI4_HIGH_VALUE.

10115	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

AI5:OUT+
Signal of AI5-function block. (S11/16)
Value read from Analog Input 5.

10116	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI5:OUT-
Signal of AI5-function block. (S11/16)
Value read from Analog Input 5. Negated output.

10117	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI5:ERR
Signal of AI5-function block. (S11/16)
Status of AI5-function block:

0 = NO FAULT	No fault
1 = I < 4 mA	AI5_CONV_MODE = 2 and I < 4 mA, current signal out of range
4 = LOW VAL>HIGH VAL	AI5_LOW_VALUE > AI5_HIGH_VALUE
5 = NO IOE1	No IOE1-board connected.

10118	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

AI6:OUT+
Signal of AI6-function block. (S11/16)
Value read from Analog Input 6.

10119	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI6:OUT-
Signal of AI6-function block. (S11/16)
Value read from Analog Input 6. Negated output.

10120	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

AI6:ERR
Signal of AI6-function block. (S11/16)
Status of AI6-function block:

0 = NO FAULT	No fault
1 = I < 4 mA	AI6_CONV_MODE = 2 and I < 4 mA, current signal out of range
4 = LOW VAL>HIGH VAL	AI6_LOW_VALUE > AI6_HIGH_VALUE
5 = NO IOE1	No IOE1-board connected.

10121	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

DATASET1:OUT1
Signal of DATASET1-function block (S12/16)
DATASET 1 is used for data transmission from the fieldbus master to the drive.
When a fieldbus communication module is connected the DCS 500 can receive a 3 word telegram called DATASET1:OUT1…OUT3 from a fieldbus master.
DATASET1:OUT1 is the first word of this telegram.

10122	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

DATASET1:OUT2 Signal of DATASET1-function block (S12/16) DATASET1:OUT2 is the first word of this telegram.						
10123	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -
DATASET1:OUT3 Signal of DATASET1-function block (S12/16) DATASET1:OUT3 is the first word of this telegram.						
10124	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -
DATASET3:OUT1 Signal of DATASET3-function block (S12/16) DATASET 3 is used for data transmission from the fieldbus master to the drive. When a fieldbus communication module is connected the DCS 500 can receive a 3 word telegram called DATASET3:OUT1...OUT3 from a fieldbus master. DATASET3:OUT1 is the first word of this telegram.						
10125	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -
DATASET3:OUT2 Signal of DATASET3-function block (S12/16) DATASET3:OUT2 is the first word of this telegram.						
10126	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -
DATASET3:OUT3 Signal of DATASET3-function block (S12/16) DATASET3:OUT3 is the first word of this telegram.						
10127	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

Group 103: BRAKE CONTROL

TREF_OUT
Signal of BRAKE_CONTROL-function block (S10/16)
Output for torque reference which is used when the brake is opened or closed.
Usually connected to input SPC.[BALREF] (2009) or SPC.[BAL2REF] (2011) of SPEED_CONTROL-block.

10301	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %

TREF_ENABLE
Signal of BRAKE_CONTROL-function block (S10/16)
Output which is active when the brake is opened or closed.
Usually connected to input SPC.[BAL] (2008) or SPC.[BAL2] (2010) of SPEED_CONTROL-block:
0 = TREF_OUT = 0
-1 = TREF_OUT is set by BRAKE_CONTROL-block.

10302	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

DECEL_CMND
Signal of BRAKE_CONTROL-function block (S10/16)
Output which is active before the brake is closed:
0 = normal speed reference from application
-1 = command to set the speed reference to zero to stop the drive.

10303	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

LIFT_BRAKE
Signal of BRAKE_CONTROL-function block (S10/16)
Output which is used to open the brake when the motor is able to produce torque:
0 = brake is closed
-1 = lift the brake.

10304	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

BRAKE_RUN
Signal of BRAKE_CONTROL-function block (S10/16)
Output which is used to give a run-command to DRIVE LOGIC and reference selectors:
0 = no run-command
-1 = run-command active.

10305	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Group 104: CURRENT CONTROL

ARM_ALPHA
Signal of CURRENT CONTROL-function block (S7/16).
Firing angle.

10401	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: -.

ARM_DIR
Signal of CURRENT CONTROL-function block (S7/16).
Identification of the bridge currently in use:
0 = NO BRIDGE
1 = MOTOR BRIDGE
2 = GENERATOR BRIDGE

10402	FB_O: E2	SC: -	HL: -	LL: -	D: -	U: -

CURR_REF_IN_LIM
Signal of CURRENT CONTROL-function block (S7/16).
Status signal indicating that the current reference is in limit:
0 = current reference is not in limit
-1 = current reference is in limit.

10403	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

CURR_DER_IN_LIM
Signal of CURRENT CONTROL-function block (S7/16).
Status signal indicating that the rate of change of the current reference is too high:
0 = current reference is not in limit
-1 = rate of change of current reference is in limit.

10404	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

ARM_CURR_REF
Signal of CURRENT CONTROL-function block (S7/16).
Either current or torque reference is use depending on value of REF_TYPE_SEL (405).

10405	FB_O: I2	SC: MCURR	HL: -	LL: -	D: -	U: A

Group 105: CONVERTER, MOTOR

CONV_CURR_ACT
Signal of SETTINGS-function block. (S2/16)
Actual current of the converter. Scaling based on signal I_CONV_A

10501	FB_O: I2	SC: CCURR	HL: -	LL: -	D: -	U: A

ARM_CURR_ACT
Signal of SETTINGS-function block. (S2/16)
Actual current of the motor. Scaling based on parameter I_MOTN_A (502)

10502	FB_O: I2	SC:MCURR	HL: -	LL: -	D: -	U: A

TORQUE_ACT
Signal of SETTINGS-function block. (S2/16)
Actual torque of the motor. 100 % = nominal torque of motor.

10503	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %

U_NET_ACT
Signal of SETTINGS-function block. (S2/16)
Actual voltage of the net supply. Scaling based on parameter U_SUPPLY (507)

10504	FB_O: I2	SC: VOLT	HL: -	LL: -	D: -	U: V

U_ARM_ACT
Signal of SETTINGS-function block. (S2/16)
Actual voltage of the motor. Scaling based on signal U_NET_DC_NOM

10505	FB_O: I2	SC: VOLT	HL: -	LL: -	D: -	U: V

EMF_ACT
Signal of SETTINGS-function block. (S2/16)
Actual internal voltage (emf) of the motor. Scaling based on signal U_NET_DC_NOM

10506	FB_O: I2	SC: EMF	HL: -	LL: -	D: -	U: V

BRIDGE_TEMP
Signal of SETTINGS-function block. (S2/16)
Actual temperature of the heat sink.

10507	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: C

U_NET_DC_NOM_V
Signal of SETTINGS-function block. (S2/16)
Nominal value of full-rectified supply voltage. Scaling:
U_NET_DC_NOM_V = 1,35 * U_SUPPLY (507).
Notice that when P507 is changed, the internal values of the following net voltage signals will have different values, but the physical values shown in [V] on the panel or CMT/DCS 500 will keep its values:
U_ARM_ACT, EMF_ACT.

10508	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: V

I_CONV_A
Signal of SETTINGS-function block. (S2/16)
Converter rating plate value. Nominal current of the converter. At C1, C2 and C3 type converters this value is coded via resistors on the power interface board and will be read and then set by the system itself. At C4 type converters it has to be set via settings parameters (group 5) during commissioning.
Notice that when the value of the settings parameters is changed, all converter current parameters and signals will have different values when they are shown in [A] in the panel or in CMT/DCS 500:
ARM_CONT_CURR_LIM, ARM_CURR_CLAMP, CONV_CURR_ACT, I_TRIP_A, Conv.Curr.Slave, Conv.Curr.both.

10509	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: A

I_TRIP_A
Signal of SETTINGS-function block. (S2/16)
Converter rating plate value. Overcurrent tripping limit of the converter. (see additional information at I_CONV_A)

10510	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: A

U_CONV_V
Signal of SETTINGS-function block. (S2/16)
Converter rating plate value. Nominal voltage of the converter. (see additional information at I_CONV_A)

10511	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: V

MAX_BR_TEMP
Signal of SETTINGS-function block. (S2/16)
Converter rating plate value.Tripping limit for converter heatsink overtemperature monitoring. (see additional information at I_CONV_A)

10512	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: C

CONV_TYPE
Signal of SETTINGS-function block. (S2/16)
Converter rating plate value (type of the converter):
1 = (C1)
2 = (C2)
3 = (C3)
4 = (C4)
(see additional information at I_CONV_A)

10513	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

QUADR_TYPE
Signal of SETTINGS-function block. (S2/16)
Converter rating plate value (number of quadrants):
1 = (one quadrant)
4 = (four quadrant)
(see additional information at I_CONV_A)

10514	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

LINE_FREQUENCY
Signal of SETTINGS-function block. (S2/16)
Actual line frequency.

10515	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: 1/s

Group 106: DATA LOGGER

DLOG_STATUS
Signal of DATA_LOGGER-function block (S14/16)
Status of Data Logger:

0 =	(logger is empty)
1 =	(logger is collecting data)
2 =	(a trigger has occurred)
3 =	(logger has stopped after a trigger)
4 =	(logger has stopped after a stop command)
5 =	(logger has stopped after a trigger and a stop command)

10601	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

Group 107: DIGITAL INPUTS

DI1:O1 Signal of DI1-function block (S3/16) State of Digital Input 1: 0 = input voltage is zero -1 = input voltage is nominal.						
10701	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI1:O2 Signal of DI1-function block (S3/16) Inverted state of Digital Input 1: 0 = input voltage is nominal -1 = input voltage is zero.						
10702	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI2:O1 Signal of DI2-function block (S3/16) State of Digital Input 2. See 10701.						
10703	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI2:O2 Signal of DI2-function block (S3/16) Inverted state of Digital Input 2. See 10702.						
10704	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI3:O1 Signal of DI3-function block (S3/16) State of Digital Input 3. See 10701.						
10705	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI3:O2 Signal of DI3-function block (S3/16) Inverted state of Digital Input 3. See 10702.						
10706	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI4:O1 Signal of DI4-function block (S3/16) State of Digital Input 4. See 10701.						
10707	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI4:O2 Signal of DI4-function block (S3/16) Inverted state of Digital Input 4. See 10702.						
10708	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI5:O1 Signal of DI5-function block (S3/16) State of Digital Input 5. See 10701.						
10709	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI5:O2 Signal of DI5-function block (S3/16) Inverted state of Digital Input 5. See 10702.						
10710	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI6:O1 Signal of DI6-function block (S3/16) State of Digital Input 6. See 10701.						
10711	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

DI6:O2						
Signal of DI6-function block (S3/16)						
Inverted state of Digital Input 6. See 10702.						
10712	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI7:O1						
Signal of DI7-function block (S3/16)						
State of Digital Input 7. See 10701.						
10713	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI7:O2						
Signal of DI7-function block. Inverted state of Digital Input 7. See 10702.						
10714	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI8:O1						
Signal of DI8-function block (S3/16)						
State of Digital Input 8. See 10701.						
10715	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI8:O2						
Signal of DI8-function block (S3/16)						
Inverted state of Digital Input 8. See 10702.						
10716	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI9:O1						
Signal of DI9-function block (S11/16)						
State of Digital Input 9. See 10701.						
10717	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI9:O2						
Signal of DI9-function block (S11/16)						
Inverted state of Digital Input 9. See 10702.						
10718	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI10:O1						
Signal of DI10-function block (S11/16)						
State of Digital Input 10. See 10701.						
10719	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI10:O2						
Signal of DI10-function block (S11/16)						
Inverted state of Digital Input 10. See 10702.						
10720	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI11:O1						
Signal of DI11-function block (S11/16)						
State of Digital Input 11. See 10701.						
10721	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI11:O2						
Signal of DI11-function block (S11/16)						
Inverted state of Digital Input 11. See 10702.						
10722	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI12:O1						
Signal of DI12-function block (S11/16)						
State of Digital Input 12. See 10701.						
10723	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI12:O2						
Signal of DI12-function block (S11/16)						
Inverted state of Digital Input 12. See 10702.						
10724	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

DI13:O1 Signal of DI13-function block (S11/16) State of Digital Input 13. See 10701.						
10725	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI13:O2 Signal of DI13-function block (S11/16) Inverted state of Digital Input 13. See 10702.						
10726	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI14:O1 Signal of DI14-function block (S11/16) State of Digital Input 14. See 10701.						
10727	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI14:O2 Signal of DI14-function block (S11/16) Inverted state of Digital Input 14. See 10702.						
10728	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI15:O1 Signal of DI15-function block (S11/16) State of Digital Input 15. See 10701.						
10729	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
DI15:O2 Signal of DI15-function block (S11/16) Inverted state of Digital Input 15. See 10702.						
10730	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Group 109: DRIVE LOGIC

RDY_ON Signal of DRIVE LOGIC-function block (S3/16) 0 = drive is not ready for ON-command -1 = drive is ready for ON-command.						
10901	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
RDY_RUNNING Signal of DRIVE LOGIC-function block. (S3/16) 0 = drive is not ready for RUN-command -1 = drive is ready for RUN-command.						
10902	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
RUNNING Signal of DRIVE LOGIC-function block (S3/16) 0 = drive is not running -1 = drive is running.						
10903	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
FAULT Signal of DRIVE LOGIC-function block (S3/16) 0 = there is no active fault in the drive -1 = there is an active fault in the drive.						
10904	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
ALARM Signal of DRIVE LOGIC-function block (S3/16). 0 = there is no active alarm in the drive -1 = there is an active alarm in the drive.						
10905	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
LOCAL Signal of DRIVE LOGIC-function block (S3/16) 0 = the drive is in remote control (control from I/O or via communication) -1 = the drive is in local control (control from panel or CMT/DCS500).						
10906	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
EMESTOP_ACT Signal of DRIVE LOGIC-function block (S3/16) 0 = emergency stop function is not active -1 = emergency stop function is active.						
10907	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
FAN_ON Signal of DRIVE LOGIC-function block (S3/16) 0 = command to put all fans in off-state -1 = command to put all fans in on-state.						
10908	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
FIELD_ON Signal of DRIVE LOGIC-function block (S3/16) 0 = command to put external field exciter in off-state -1 = command to put external field exciter in on-state.						
10909	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

MAIN_CONT_ON
Signal of DRIVE LOGIC-function block (S3/16)
0 = command to put main contactor in off-state
-1 = command to put main contactor in on-state.

10910	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

TRIP_DC_BREAKER
Signal of DRIVE LOGIC-function block (S3/16)
0 = no command to a dc breaker
-1 = command to open the dc breaker.

10911	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

DYN_BRAKE_ON
Signal of DRIVE LOGIC-function block (S3/16)
0 = no command to a dynamic brake
-1 = command to close the dynamic brake.

10912	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

MOTOR_ACT
Signal of DRIVE LOGIC-function block (S3/16)
0 = parameter set for motor 1 is active
-1 = parameter set for motor 2 is active.

10913	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

AUTO-RECLOSING
Signal of DRIVE LOGIC-function block (S3/16)
0 = Auto-reclosing function is not active
-1 = Auto-reclosing function is active.

10914	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

COMM_FAULT
Signal of DRIVE LOGIC-function block (S3/16)
0 = there is no active communication fault in the drive
-1 = there is an active communication fault in the drive.

10915	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

RUN_DCF
Signal of DCF FIELDMODE-function block (S2/16 | S21.232)
Only active if DCF MODE = FEXLINK NODE1 or FEXLINK NODE2. Can be used to start and stop a DCF 500B, if this converter is connected via FEX-LINK (X16: to X16: connection) to a DCS 500B and no external start / stop command should be used to control the field exciter. In this case connect this signal to input ON/OFF (901) and RUN1 (902) of the DRIVE LOGIC. The signal definition is:
0 = command to put DCF500B field exciter in off-state
-1 = command to put DCF500B field exciter in on-state

10916	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

RESET_DCF
Signal of DCF FIELDMODE-function block (S2/16 | S21.232)
Only active if DCF MODE = FEXLINK NODE1 or FEXLINK NODE2. Can be used to reset faults at a DCF 500B, if this converter is connected via FEX-LINK (X16: to X16: connection) to a DCS 500B and no external RESET command should be used to reset faults at the field exciter. In this case connect this signal to input RESET (907) of the DRIVE LOGIC. The signal definition is:
0 = no command to DCF500B field exciter
-1 = command to reset DCF500B field exciter faults

10917	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Group 110: EMF CONTROL

FLUX_REF1 Signal of EMF CONTROL-function block (S8/16) Flux reference after field weakening function.						
11001	FB_O: I2	SC: FLUX	HL: -	LL: -	D: -	U: %
FLUX_REF_SUM Signal of EMF CONTROL-function block (S8/16) Final flux reference.						
11002	FB_O: I2	SC: FLUX	HL: -	LL: -	D: -	U: %
F_CURR_REF Signal of EMF CONTROL-function block (S8/16) Field current reference.						
11003	FB_O: I2	SC: FLUX	HL: -	LL: -	D: -	U: %

Group 111: FAULTS, ALARMS

FAULT_WORD_1

Signal of FAULT HANDLING function block (S16/16)

Fault status word where each bit represents one fault status.

If fault is active, corresponding bit is set.

B0	Auxil. undervoltage
B1	Overcurrent
B2	Armature overvoltage
B3	Converter overtemp.
B4	Earth fault
B5	Motor 1 overtemp.
B6	Motor 1 overload
B7	I/O-Board not found
B8	Motor 2 overtemp
B9	Motor 2 overload
B10	No BRAKE ack
B11	Mains undervoltage
B12	Mains overvoltage
B13	Not in synchronism
B14	Field ex.1 overcurr
B15	Field ex.1 comerror

11101	S: PB	SC: -	HL: -	LL: -	D: -	U: -

FAULT_WORD_2

Signal of FAULT HANDLING function block (S16/16)

Fault status word where each bit represents one fault status.

If fault is active, corresponding bit is set.

B0	Arm. current ripple
B1	Field ex.2 overcurr
B2	Field ex.2 comerror
B3	Phase sequence fault
B4	No field ack.
B5	Speed meas. fault
B6	No ext. FAN ack.
B7	No main cont. ack.
B8	Type coding fault
B9	Backup read fault
B10	No C FAN ack
B11	Local & disconnected
B12	Field ex.1 not OK
B13	Field ex.2 not OK
B14	Motor stalled
B15	Motor overspeed.

11102	S: PB	SC: -	HL: -	LL: -	D: -	U: -

FAULT_WORD_3

Signal of FAULT HANDLING function block (S16/16)

Fault status word where each bit represents one fault status.

If fault is active, corresponding bit is set.

B0	reserved
B1	reserved
B2	reserved
B3	reserved
B4	reserved
B5	reserved
B6	reserved
B7	reserved
B8	reserved
B9	reserved
B10	Current rise fault
B11	Conv.fan curr.fault
B12	Ext.Overvolt.Fault
B13	Fieldbus Timeout
B14	Current Difference
B15	Reversal Fault.

11103	S: PB	SC: -	HL: -	LL: -	D: -	U: -

ALARM_WORD_1

Signal of FAULT HANDLING function block (S16/16)

Alarm status word where each bit represents one alarm status.

If alarm is active, corresponding bit is set.

B0	Start inhibition	
B1	Emergency stop	
B2	Motor 1 temp. alarm	
B3	Motor 1 overl.alarm	
B4	Conv.overtemp alarm	
B5	Current reg blocked	(used from S21.233 on)
B6	reserved	
B7	RAM-backup failed	
B8	Motor 2 temp. alarm	
B9	Motor 2 overl alarm	
B10	Mains underv.alarm	
B11	reserved	
B12	Conv.FAN ack.alarm	
B13	Arm.curr.dev.alarm	
B14	reserved	
B15	Ext. FAN ack.larm	

11104	S: PB	SC: -	HL: -	LL: -	D: -	U: -

ALARM_WORD_2

Signal of FAULT HANDLING function block (S16/16)

Alarm status word where each bit represents one alarm status.

If alarm is active, corresponding bit is set.

B0	Panel disconnected
B1	Type code changed
B2	Init values read,S2
B3	Param set 2 missing
B4	Backup not allowed
B5	Write backup alarm
B6	Ext.Overvolt.Alarm
B7	Macro change failed
B8	Auto-reclosing
B9	Arm. current ripple
B10	reserved
B11	reserved
B12	reserved
B13	reserved
B14	reserved
B15	reserved

11105	S: PB	SC: -	HL: -	LL: -	D: -	U: -

ALARM_WORD_3

Signal of FAULT HANDLING function block (S16/16)

Alarm status word where each bit represents one alarm status.

If alarm is active, corresponding bit is set.

B0	reserved
B1	reserved
B2	reserved
B3	reserved
B4	reserved
B5	reserved
B6	reserved
B7	reserved
B8	reserved
B9	reserved
B10	reserved
B11	reserved
B12	reserved
B13	reserved
B14	reserved
B15	reserved

11106	S: PB	SC: -	HL: -	LL: -	D: -	U: -

LATEST_FAULT

Signal of FAULT HANDLING function block (S16/16)

Error code of the latest fault.

11107	S: I2	SC: -	HL: -	LL: -	D: -	U: -

LATEST_ALARM

Signal of FAULT HANDLING function block (S16/16)

Error code of the latest alarm.

11108	S: I2	SC: -	HL: -	LL: -	D: -	U: -

OPERATING_HOURS						
Signal of FAULT HANDLING function block (S16/16) Operating hours in 0.1 h resolution. Counter is usually reset if auxiliary power of the control board is switched off for more than 8 hours and the contents of non-volatile memory is lost.						
11109	S: U4	SC: 0.1	HL: -	LL: -	D: -	U: -

Group 112: MAINTENANCE

COMMIS_STAT

Signal of MAINTENANCE function.
Result from a drive function.
Gives feedback status information when the DRIVEMODE parameter was used to start a drive function.
COMMIS_STAT will tell if the function was successful:

0 = NOT ACTIVATED	selected function successfully worked out
1 = RUN COMMAND ?	see code 53
2 = FEXC SEL ?	wrong FEX selection
3 = FEXC RDY OPER=0	FEX1 / 2 or DCF 503/4 not ready for operation
4 = FEXC OK=0	field supply not o.k.; see error message on the display of the converter
5 = FIELD ON=0	FEX1 / 2 or DCF 503/4 not switched on
6 = IF NOT IN 95–105%	field current not within 95% 105%
7 = NOT O.K.AFTER 20s	drive was not released by hardware within 20s
8…34 = reserved	
35 = CANNOT AUTOTUNE	cannot autotune the armature current controller
36...48 = reserved	
49 = IF AT START ?	Field current does not reach reference within 10s, when the selftuning is started

DRIVE_MODE (12.01) = 3, 5 or 6 (autotuning):

50 = OHMIC LOAD ?	Ohmic load not determined.
51 = IACT FEEDBACK ?	Current feedback is less than current reference during measurement of armature resistance. Current limits are lower than the limit for continous current flow or lower than 20%.
52 = CURRENT CURVE ?	Bad current curve. Fuse blown,thyristor not firing or no motor load.
53 = RUN COMMAND ?	Wrong starting conditions. The drive is running when the autotuning is started or run command is not given within 20 s after start of autotuning.
54 = TOO HIGH SPEED ?	Too high speed during autotuning .Speed greater than 1% or EMF greater than 15%.
55 = INDUCTANCE ?	Inductance cannot be determined. Fuse blown, thyristor not firing or no motor load.
56 = CONT CURR LIM ?	Limit for continous current flow cannot be determined.
57 = FIELD REMOVAL ?	The field removal takes longer time than 10 s.
58 = STOP COMMAND ?	Current contoller blocking or stop command appears during autotuning.
59 = MUST BE LOCAL	Drive is not in local mode
60 = CANNOT AUTOTUNE	cannot autotune the field current controller
61 = ILL START COND.	illegal start condition for field autotuning

11201	S: E2	SC: -	HL: -	LL: -	D: -	U: -

BACKUPSTOREMODE

Signal of MAINTENANCE function.

BACKUPSTOREMODE is used to give commands to parameter handling function in the drive:

0 = NONE	
1 = SAVE MOT1 SET	Save motor set 1
2 = SAVE MOT2 SET	Save motor set 2
3 = FACTORY SET VAL.	Load factory values
4 = SELECT MOT1 SET	Load motor set 1
5 = SELECT MOT2 SET	Load motor set 2
6 = READ APPL BLOCKS	Load application; if additional function blocks are activated and saved via SAVE MOTx SET and modified afterwards without saving the configuration before the last modification (the one directly after the last SAVE action) can be activated

While the command is executing the value of BACKUPSTOREMODE will show what is happening or the reason for error if the command fails:

7 = ERASE ERROR	Error during erasing of parameter flash
8 = ERASING…	Erasing the parameter flash
9 = PROGRAM ERROR	Error during programing of parameter flash
10 = PROGRAMMING…	Programing the parameter flash
11 = WRONG FLASH TYPE	Verification error
12 = READING…	Reading the parameter flash
13 = READ ERROR	Error during reading of parameter flash
14 = reserved	
15 = VERSION ERROR	Bad type of parameter flash
16 = reserved	
17 = SIZE ERROR	Bad size of parameter flash

11202	S: E2	SC: -	HL: 5	LL: 1	D: -	U: -

FEXC_STATUS

Signal of MAINTENANCE function.

Status of the field exciters 1 and 2:

(internal signal; not shown on the panel; definition)

B0	(FEXC1_RDY_OPER	0 = not ready for operation; AC-voltage missing)
B1	(FEXC1_OK	0 = self diagnostic failed or power failure in fex 1)
B2	(EXC2_RDY_OPER	0 = not ready for operation; AC-voltage missing)
B3	(EXC2_OK	0 = self diagnostic failed or power failure in fex 2)
B4	(ACK_FEXC1_ON	1 = motor 1 field OK)
B5	(ACK_FEXC2_ON	1 = motor 2 field OK)
B6	(FIELD_HEAT_ON	1 = motor heating function active)
B7	(FIELD1_REV_ACK	direction of the field 0 = forward, 1 = reverse)
B8	(ACK_CSC_ON	1 = on-command accepted by sequence control)
B9	(ACK_FEXC_ON	1 = motor field OK)
B10	(FIELD_REF_ON)	1 = field current reference released
B11	(FIELD1_CURR_MIN_L)	1 = motor 1 field current above min level
B12	(FIELD2_CURR_MIN_L)	1 = motor 2 field current above min level

11203	S: PB	SC: -	HL: -	LL: -	D: -	U: -

TC_STATUS

Signal of MAINTENANCE function.

Status of the torque control sequencing:

(internal signal; not shown on the panel; definition)

B0	(RDY ON	1 = ready for closing contractor)
B1	(MAIN CONT ON	1 = command to close contractor)
B2	(RDY RUNNING	1 = ready for run command)
B3	(RUNNING	1 = command to release controllers)
B4	(TC_RDY_REF	1 = ready for reference)
B5	(TC_FIELD_CHANGE	1 = field revelsal is active)
B6	(CONTINUOUS_CURR	1 = armature current is discontinuous)

11204	S: PB	SC: -	HL: -	LL: -	D: -	U: -

BC

Signal of MAINTENANCE function.

Status of the current contoller. If the value of BC is zero, everything is OK. Otherwise different bits of BC will indicate the reason for blocking the current contoller:

(internal signal; not shown on the panel; definition)

B0	(	overcurrent)
B1	(	Freewheeling unit was fired)
B2	(	field reversal)
B3	(	supply system undervoltage)
B4	(	12Puls only: fault 65 and 66 occurred)
B5	(	12Puls only: signal via cable X18)
B6	(	supply system overvoltage)
B7	(	type code error)
B8	(	suppression of controller at contoller change-over)
B9	(	processor overload)
B10	(	thyristor diagnostic running)
B12	(	primary (AC) or secondary (48Vac) power failure)
B13	(	synchronization signal missing)
B14	(	pulse firing section not in synchronism)
B15	(	not released)

11205	S: PB	SC: -	HL: -	LL: -	D: -	U: -

SQUARE_WAVE

Signal of MAINTENANCE function.

Output of square wave generator. Used for tuning of controllers.

11206	S: I2	SC: -	HL: -	LL: -	D: -	U: -

TEST_REF

Signal of MAINTENANCE function.

Test reference input for different drive functions which are activated with DRIVE_MODE parameter.

11207	S: I2	SC: 1	HL: 32767	LL: -32768	D: 0	U: -

TEST_RELEASE

Signal of MAINTENANCE function..

Release-command for a controller in manual tuning of current or EMF controller. In manual tuning first the reference is selected with the signal TEST_REF_SEL and then the controller is released by setting TEST_RELEASE to a value different than zero.

11208	S: I2	SC: 1	HL: 1	LL: 0	D: 0	U: -

TEST_REF_SEL
Signal of MAINTENANCE function.
Test reference selection. In manual tuning the reference is selected with the signal TEST_REF_SEL:

0 = ZERO	reference is zero
1 = POT1	reference is POT1_VALUE, 1204
2 = POT2	reference is POT2_VALUE, 1205
3 = SQRW	reference is SQUARE_WAVE, 11206
4 = TEST	reference is TEST_REF, 11207.

11209	S: E2	SC: -	HL: 4	LL: 0	D: 0	U: -

FEXC1_CODE
Signal of MAINTENANCE function.
Type code from field exciter no. 1

0000...0307	FEX-2, half-controlled, single
0308...0819	FEX-31, full-controlled, double
0820...1023	FEX-32, half-controlled, single
10000	DCF501, DCF501B, DCF502B

11210	S: I2	SC: -	HL: -	LL: -	D: -	U: -

FEXC1_COM_STATUS
Signal of MAINTENANCE function.
Communication link timeout-status for field exciter no. 1.
FEXC1_COM_STATUS = 0 = no time-out indication:

B0	timeout when write parameter, no echo for address
B1	timeout when write parameter, no values received
B2	timeout when read parameter, no echo for address
B3	timeout when read parameter, no values received
B4	timeout when read actual values, no values received.

11211	S: PB	SC: -	HL: -	LL: -	D: -	U: -

FEXC1_COM_ERRORS
Signal of MAINTENANCE function.
Number of transmission errors in FEXC-communication link for field exciter no. 1.

11212	S: I2	SC: -	HL: -	LL: -	D: -	U: -

FEXC2_CODE
Signal of MAINTENANCE function.
Type code from field exciter no. 2

0308...0819	FEX-31, full-controlled, double
0820...1023	FEX-32, half-controlled, single
10000	DCF501, DCF501B, DCF502B

11213	S: I2	SC: -	HL: -	LL: -	D: -	U: -

FEXC2_COM_STATUS
Signal of MAINTENANCE function.
Communication link timeout-status for field exciter no. 2.
FEXC2_COM_STATUS = 0 = no time-out indication:

B0	timeout when write parameter, no echo for address
B1	timeout when write parameter, no values received
B2	timeout when read parameter, no echo for address
B3	timeout when read parameter, no values received
B4	timeout when read actual values, no values received.

11214	S: PB	SC: -	HL: -	LL: -	D: -	U: -

FEXC2_COM_ERRORS Signal of MAINTENANCE function. Number of transmission errors in FEXC-communication link for field exciter no. 2.						
11215	S: I2	SC: -	HL: -	LL: -	D: -	U: -
CMT_COM_ERRORS Signal of MAINTENANCE function. Number of transmission errors in DDCTool communication link.						
11216	S: I2	SC: -	HL: -	LL: -	D: -	U: -
CDI300_BAD_CHAR Signal of MAINTENANCE function. Number of transmission errors in panel communication link.						
11217	S: I2	SC: -	HL: -	LL: -	D: -	U: -
CNT_SW_VERSION Signal of MAINTENANCE function. DCS 500 converter firmware revision.						
11218	S: I2	SC: -	HL: -	LL: -	D: -	U: -
CNT_BOOT_SW_VERSION Signal of MAINTENANCE function. DCS 500 converter boot firmware revision.						
11219	S: I2	SC: -	HL: -	LL: -	D: -	U: -
FEXC1_SW_VERSION Signal of MAINTENANCE function. Field exciter no. 1 firmware revision.						
11220	S: I2	SC: -	HL: -	LL: -	D: -	U: -
FEXC2_SW_VERSION Signal of MAINTENANCE function. Field exciter no. 2 firmware revision.						
11221	S: I2	SC: -	HL: -	LL: -	D: -	U: -
PROGRAM_LOAD Signal of MAINTENANCE function. Calculated load of DCS 500 control program. Calculation is started by setting DRIVE_MODE, 1201 = PROGRAM_LOAD. The calculation will take about 20 seconds.						
11222	S: I2	SC: -	HL: -	LL: -	D: -	U: %

Group 113: MOTOR 1 FIELD

F1_CURR_REF Signal of MOTOR_1_FIELD- function block. (S8/16) Field current reference for field exciter no. 1.						
11301	FB_O: I2	SC: FCURR	HL: -	LL: -	D: -	U: A
F1_CURR_ACT Signal of MOTOR_1_FIELD- function block. (S8/16) Actual field current from field exciter no. 1.						
11302	FB_O: I2	SC: FCURR	HL: -	LL: -	D: -	U: A
REF_DCF Signal of DCF FIELDMODE function block. (S2/16 ǀ S21.232) Only activ if DCF MODE (1215) = FEXLINK NODE1 or FEXLINK NODE2 Field current reference via FEXLINK for DCF500 as field exciter no. 1 or no. 2						
11303	FB_O: I2	SC:MCURR	HL: -	LL: -	D: -	U: A

Group 114: MOTOR 1 PROTECT.

MOT1_MEAS_TEMP Signal of MOTOR_1_PROTECTION- function block. (S9/16) Measured temperature of motor 1. The unit of the value depends on the selection of AI_CONV_MODE (107, 110): 0 = not selected 1, 2 = value scaled by AI_HIGH_VALUE (108,111) and AI_LOW_VALUE (109,112) 3..5 = unit = degrees 6, 7 = resistance value is ohms **(but displayed in °C)**						
11401	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: C
MOT1_CALC_TEMP Signal of MOTOR_1_PROTECTION- function block. (S9/16) Output from thermal model for motor 1.						
11402	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: %

Group 115: MOTOR 2 FIELD

F2_CURR_REF Signal of MOTOR_2_FIELD- function block. (S8/16) Field current reference for field exciter no. 2.						
11501	FB_O: I2	SC: FCURR	HL: -	LL: -	D: -	U: A
F2_CURR_ACT Signal of MOTOR_2_FIELD- function block. (S8/16) Actual field current from field exciter no. 2.						
11502	FB_O: I2	SC: FCURR	HL: -	LL: -	D: -	U: A

Group 116: MOTOR 2 PROTECTION

MOT2_MEAS_TEMP

Signal of MOTOR_2_PROTECTION- function block. (S9/16)
Measured temperature of motor 2.
The unit of the value depends on the selection of AI_CONV_MODE (107, 110):
0 = not selected
1, 2 = value scaled by AI_HIGH_VALUE (108,111) and AI_LOW_VALUE (109,112)
3..5 = unit = degrees
6, 7 = resistance value is ohms **(but displayed in °C)**

11601	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: C

MOT2_CALC_TEMP

Signal of MOTOR_2_PROTECTION- function block. (S9/16)
Output from thermal model for motor 2.

11602	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: %

Group 117: RAMP GENERATOR

RAMP:OUT Signal of RAMP GENERATOR- function block. (S4/16) Speed reference after ramp function.						
11701	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
ACCELCOMP:OUT Signal of RAMP GENERATOR- function block. (S4/16) Acceleration compensation. Additional torque reference output calculated from the ACC_COMP.TRMIN (1719) parameter.						
11702	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
RAMP:SIGN Signal of RAMP GENERATOR- function block. (S4/16) Sign of speed reference after ramp function.						
11703	FB_O: I2	SC: -	HL: -	LL: -	D: -	U: -

Group 118: REFERENCE CHAIN

SPEED_REFERENCE Signal of the RAMP GENERATOR-function block. Speed reference after RAMP.[RES_IN] (1702) and before RAMP.[FOLLOW_IN] (1704) controlled switches. Both limits SPEEDMAX (1715) and SPEEDMIN (1716) are effective.						
11801	S: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
REF_SUM:OUT Signal of REFSUM_2-function block. (S5/16) Speed reference which is connected to SPEED_ERROR-function block.						
11802	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
LOCAL_SPEED_REF Signal of RAMP GENERATOR-function block.. Local mode: Input value used as speed reference set by either panel or CMT-tool. Remote mode: Output used to display the speed reference after the LOCAL controlled switch.						
11803	S: I2	SC: SPEED	HL: 23000	LL: -23000	D: 0	U: rpm

Group 119: REFERENCE SOURCES

CONST_REF:OUT Signal of CONST_REF-function block (S4/16) Selected constant speed reference.						
11901	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
CONST_REF:ACT Signal of CONST_REF-function block (S4/16) Signal which is set to TRUE when one of the ACT-inputs is active.						
11902	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
REF_SEL:OUT Signal of REF_SEL-function block (S4/16) Selected speed reference which is usually connected to the ramp generator input.						
11903	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
SOFT_POT:OUT Signal of SOFT_POT-function block (S4/16) Speed reference from the software potentiometer.						
11904	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
SOFT_POT:ACT Signal of SOFT_POT-function block (S4/16) Signal which is set to TRUE if either input SOFTPOT.[INCR] (1918) or SOFTPOT.[DECR] (1919) is active.						
11905	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Group 120: SPEED CONTROLLER

ERR:OUT Signal of SPEED_ERROR-function block (S5/16) Speed error which is usually connected to the speed controller input.						
12001	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
ERR:OUT_OF_WIN Signal of SPEED_ERROR-function block (S5/16) Indication which is active when speed error is out of error window ERR.WIN_SIZE (2004).						
12002	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
ERR:STEP_RESP Signal of SPEED_ERROR-function block (S5/16) Speed error output which is used to show the behaviour of speed controller in step response test.						
12003	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
SPC:OUT Signal of SPEED_CONTROL-function block (S5/16) Torque reference output from speed controller.						
12004	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
SPC:IN_LIM Signal of SPEED_CONTROL-function block (S5/16) Indication from speed controller showing that output is in limit.						
12005	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Group 121: SPEED MEASUREMENT

SPEED_ACT_EMF Signal of SPEED_MEASUREMENT-function block (S4/16) Actual speed calculated from armature voltage and motor parameters.						
12101	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
SPEED_ACT Signal of SPEED_MEASUREMENT-function block (S4/16) Actual speed after filtering which is connected to the SPEED_ERROR-function block..						
12102	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
SPEED_ACT_FILT Signal of SPEED_MEASUREMENT-function block (S4/16) Actual speed after second filtering stage. Usually used for display purposes.						
12103	FB_O: I2	SC: SPEED	HL: -	LL: -	D: -	U: rpm
TACHO_PULSES Signal of SPEED_MEASUREMENT-function block (S4/16) Counter which is counting tacho pulses.						
12104	FB_O: U2	SC: -	HL: -	LL: -	D: -	U: -

Group 122: SPEED MONITOR

MIN_SPEED Signal of SPEED_MONITOR-function block (S4/16) Indication which is active when actual speed is below minimum speed limit MIN_SPEED_L (2201).						
12201	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
SPEED_GT_L1 Signal of SPEED_MONITOR-function block (S4/16) Indication which is active when actual speed is above speed level SPEED_L1 (2202).						
12202	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
SPEED_GT_L2 Signal of SPEED_MONITOR-function block (S4/16) Indication which is active when actual speed is above speed level SPEED_L2 (2203).						
12203	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
OVERSPEED Signal of SPEED_MONITOR-function block (S4/16) Indication which is active when actual speed is above speed limit OVERSPEEDLIMIT (2204).						
12204	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Group 123: TORQUE and CURRENT LIMITS

SPC_TORQMAX1 Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Positive torque limit for speed controller.						
12301	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
SPC_TORQMIN1 Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Negative torque limit for speed controller.						
12302	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
TREF_TORQMAX1 Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Positive torque limit for torque reference chain.						
12303	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
TREF_TORQMIN1 Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Negative torque limit for torque reference chain.						
12304	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
TORQMAX2 Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Positive torque limit before external torque limitation.						
12305	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
TORQMIN2 Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Negative torque limit before external torque limitation.						
12306	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
CURR_LIM_P Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Positive current limit for current contoller.						
12307	FB_O: I2	SC:MCURR	HL: -	LL: -	D: -	U: A
CURR_LIM_N Signal of TORQUE/CURRENT LIMITATION-function block. (S6/16) Negative current limit for current contoller.						
12308	FB_O: I2	SC:MCURR	HL: -	LL: -	D: -	U: A

Group 124: TORQUE REFERENCE CHAIN

SEL1:OUT Signal of TORQ_REF_SELECTION-function block (S6/16) Torque reference from torque reference chain .						
12401	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
SEL2:OUT Signal of TORQ_REF_HANDLING-function block (S7/16) Torque reference after torque reference selector .						
12402	FB_O: I2	SC: TORQ	HL: -	LL: -	D: -	U: %
SEL2:TORQ/SPEED Signal of TORQ_REF_HANDLING-function block (S7/16) An output indicating which control mode is active: 0 = speed control is active -1 = torque control is active.						
12403	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -
SEL2:IN_LIM Signal of TORQ_REF_HANDLING-function block (S7/16) An output indicating that torque reference is in limit: 0 = reference between limits -1 = reference has reached limit / is limited						
12404	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Group 125: TASKS, CONSTANTS

CONSTANT 0 Signal of CONSTANTS-function block (S2,S16/16) Value which is always zero (FALSE).						
12501	FB_O: I2	SC: -	HL: 0	LL: 0	D: 0	U: -
CONSTANT -1 Signal of CONSTANTS-function block (S2,S16/16) Value which is always -1 (TRUE). Can be connected to function block inputs (FB_I: B) which use BI scaling.						
12502	FB_O: I2	SC: -	HL: -1	LL: -1	D: -1	U: -
CONSTANT 1 Signal of CONSTANTS-function block (S2,S16/16) Value which is always 1.						
12503	FB_O: I2	SC: -	HL: 1	LL: 1	D: 1	U: -
CONSTANT 2 Signal of CONSTANTS-function block (S2,S16/16) Value which is always 2.						
12504	FB_O: I2	SC: -	HL: 2	LL: 2	D: 2	U: -
CONSTANT 10 Signal of CONSTANTS-function block (S2,S16/16) Value which is always 10.						
12505	FB_O: I2	SC: -	HL: 10	LL: 10	D: 10	U: -
CONSTANT 100 Signal of CONSTANTS-function block (S2;S16/16) Value which is always 100.						
12506	FB_O: I2	SC: -	HL: 100	LL: 100	D: 100	U: -
CONSTANT 1000 Signal of CONSTANTS-function block (S2,S16/16) Value which is always 1000.						
12507	FB_O: I2	SC: -	HL: 1000	LL: 1000	D: 1000	U: -
CONSTANT 31416 Signal of CONSTANTS-function block (S2,S16/16) Value which is always 31416.						
12508	FB_O: I2	SC: -	HL: 31416	LL: 31416	D: 31416	U: -
EMF: 100% Signal of CONSTANTS-function block (S2,S16/16) Value which corresponds to nominal EMF = 3786.						
12509	FB_O: I2	SC: -	HL: 3786	LL: 3786	D: 3786	U: -
TORQ: 100% Signal of CONSTANTS-function block (S2,S16/16) Value which corresponds to nominal positive torque = 4000.						
12510	FB_O: I2	SC: -	HL: 4000	LL: 4000	D: 4000	U: -
TORQ -100% Signal of CONSTANTS-function block (S2,S16/16) Value which corresponds to nominal negative torque = -4000.						
12511	FB_O: I2	SC: -	HL: -4000	LL: -4000	D: -4000	U: -

CUR,FLX,VLT 100%
Signal of CONSTANTS-function block (S2,S16/16)
Value which corresponds to nominal positive current, flux and voltage = 4095.

12512	FB_O: I2	SC: -	HL: 4095	LL: 4095	D: 4095	U: -

CUR,FLX,VLT -100%
Signal of CONSTANTS-function block (S2,S16/16)
Value which corresponds to nominal negative current, flux and voltage = -4096.

12513	FB_O: I2	SC: -	HL: -4095	LL: -4095	D: -4096	U: -

SPEED: 100%
Signal of CONSTANTS-function block (S2,S16/16)
Value which corresponds to nominal positive speed = 20000.

12514	FB_O: I2	SC: -	HL: 20000	LL: 20000	D: 20000	U: -

SPEED: -100%
Signal of CONSTANTS-function block (S2,S16/16)
Value which corresponds to nominal negative speed = -20000.

12515	FB_O: I2	SC: -	HL: -20000	LL: -20000	D: -20000	U: -

SIG1(SPEED REF)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **speed reference**. Before the drive will follow this reference, it has to be connected to the speed reference input ERR.[IN] (2001).

12516	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG2(SPEED STEP)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **speed step**. Before the drive will follow this step, it has to be connected to the speed step input ERR.[STEP] (2002).

12517	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG3(TORQ. REF A)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **torque reference**. Before the drive will follow this reference, it has to be connected to the torque reference input SEL1.[TREF_A] (2401).

12518	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG4(TORQ. REF B)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **torque reference**. Before the drive will follow this reference, it has to be connected to the torque reference input SEL1.[TREF_B] (2404).

12519	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG5(TORQUE STEP)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **torque step**. Before the drive will follow this step, it has to be connected to the torque step input SEL2.[TORQ_STEP] (2409).

12520	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG6(LOAD SHARE)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give control **load sharing** in master/follower drives. Before the drive will use this value, it has to be connected to the load sharing input SEL1.[LOAD_SHARE] (2403).

12521	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 4000	U: -

SIG7(FLUX REF)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **flux reference**. Before the drive will follow this reference, it has to be connected to the flux reference input [FLUX_REF] (1002).

12522	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 4095	U: -

SIG8(EMF REF)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give an **emf reference**. Before the drive will follow this reference, it has to be connected to the emf reference input [EMF_REF] (1003).

12523	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 3786	U: -

SIG9(FORCE FWD)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a force command to **field logic**. Before the drive will follow this command, it has to be connected to the force forward-input [F1_FORCE_FWD] (1302).

12524	FB_O: B	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG10(FORCE REV)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a force command to **field logic**. Before the drive will follow this command, it has to be connected to the force reverse-input [F1_FORCE_REV] (1303).

12525	FB_O: B	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG11(CURR. REF)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **current reference**. Before the drive will follow this reference, it has to be connected to the current contoller input [CURR_REF] (402).

12526	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 0	U: -

SIG12(CURR. STEP)
Signal of FREE_SIGNALS-function block (S2,S16/16)
This block is containing signals which can be set by the CMT or panel.
Value which can be used to give a **current step**. Before the drive will follow this step, it has to be connected to the current contoller step input [CURR_STEP] (403).

12527	FB_O: I2	SC: -	HL: 30000	LL: -30000	D: 0	U: -

Group 126: FUNCTION BLOCKS 1

12601-12699: Signals for application function blocks
See application function block data sheets.

Group 127: FUNCTION BLOCKS 2

12701-12799: Signals for application function blocks
See application function block data sheets.

Group 128: FUNCTION BLOCKS 3

12801-12899: Signals for application function blocks
See application function block data sheets.

Group 129: FUNCTION BLOCKS 4

12901-12999: Signals for application function blocks
See application function block data sheets.

Group 130: FUNCTION BLOCKS 5

13001-13013: Signals for application function blocks
See application function block data sheets.

Group 135: DDCTool

STATUS_WORD

Signal of DDCTool interface. DCS 500 drive status word:

B0	reserved	
B1	RDY ON	1=ready to close the contactor
B2	RDY RUN	1=ready to generate torque
B3	RUNNING	1=speed/torque control operating
B4	Auto-reclosing	1=A140 is activ
B5	FAULT	1=indication of a fault in DCS500
B6	ALARM	1=indication of an alarm in DCS500
B7	reserved	
B8	reserved	
B9	reserved	
B10	reserved	
B11	reserved	
B12	reserved	
B13	reserved	
B14	Emergency stop	1=A102 is not activ, [EME_STOP](906)="0"
B15	Start inhibition	1=A101 is activ, [START_INHIBIT](908)="1"

13501	S: PB	SC: -	HL: -	LL: -	D: -	U: -

LTIME

Signal of DDCTool interface.
DCS 500 time counter.

13502	S: I4	SC: -	HL: -	LL: -	D: -	U: -

LDATE

Signal of DDCTool interface.
DCS 500 date counter.

13503	S: I4	SC: -	HL: -	LL: -	D: -	U: -

Group 136: 12-PULSE-OPERATING

Conv.Curr.Slave
Signal of 12-PULSE_LOGIC-function block (S13/16)
Converter current of the Slave; evaluated signal from input IACT_SLAVE (3604); scaling as with the CONV_CUR_ACT (10501); operative only at that converter, which has got Master functionallity

13601	FB_O: I2	SC: CCURR	HL: -	LL: -	D: -	U: A

Arm.Curr.Slave
Signal of 12-PULSE_LOGIC-function block (S13/16)
Motor current of the Slave; evaluated signal from input IACT_SLAVE (3604); scaling as with the CONV_CUR_ACT_A (10502); operative only at that converter, which has got Master functionallity

13602	FB_O: I2	SC: MCURR	HL: -	LL: -	D: -	U: A

Conv.Curr.Both
Signal of 12-PULSE_LOGIC-function block (S13/16)
Sum of converter currents (current of the Master and the Slave are added); evaluated signal from input IACT_SLAVE (3604) and CONV_CUR_ACT (10501); scaling: half of each current is added together, so that 100 % corresponds to twice of the single converter current; operative only at Master

13603	FB_O: I2	SC: CCURR	HL: -	LL: -	D: -	U: A

Arm.CURR.Both
Signal of 12-PULSE_LOGIC-function block (S13/16)
Sum of motor currents (current of the Master and the Slave are added); evaluated signal from inputs IACT_SLAVE (3604) and CONV_CUR_ACT_A (10502); scaling: half of each current is added together, so that 100 % corresponds to the real motor current; operative only at Master.

13604	FB_O: I2	SC: MCURR	HL: -	LL: -	D: -	U: A

Curr.-Ref.1
Signal of 12-PULSE_LOGIC-function block (S13/16)
The current reference in front of the current limiting block (ARM_CURR_LIM_P (415), ARM_CURR_LIM_N (416)) at the CURRENT_CONTROL function block is outputted via this signal. This signal is calculated at the MASTER and the SLAVE.

13605	FB_O: I2	SC: MCURR	HL: -	LL: -	D: -	U: A

IREF1-Polarity
Signal of 12-PULSE_LOGIC-function block (S13/16)
The sign of the current reference in front of the current limiting block (ARM_CURR_LIM_P (415), ARM_CURR_LIM_N (416)) at the CURRENT_CONTROL function block is outputted via this signal. This signal is calculated at the MASTER and the SLAVE.
Logic level: “0” = positive current / forward bridge.

13606	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

IREF1-Pol.Master
Signal of 12-PULSE_LOGIC-function block (S13/16)
The sign of the current reference in front of the current limiting block (ARM_CURR_LIM_P (415), ARM_CURR_LIM_N (416)) at the CURRENT_CONTROL function block of the MASTER is outputted via this signal at the converter having SLAVE functionallity. Logic level as before.

13607	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Curr.-Ref.2
Signal of 12-PULSE_LOGIC-function block (S13/16)
The current reference at the output of the current limiting block (ARM_CURR_LIM_P (415), ARM_CURR_LIM_N (416)) at the CURRENT_CONTROL function block is outputted via this signal. This signal is calculated at the MASTER and the SLAVE.

13608	FB_O: I2	SC: MCURR	HL: -	LL: -	D: -	U: A

IREF2-Polarity
Signal of 12-PULSE_LOGIC-function block (S13/16)
The sign of the current reference at the output of the current limiting block (ARM_CURR_LIM_P (415), ARM_CURR_LIM_N (416)) at the CURRENT_CONTROL function block is outputted via this signal. This signal is calculated at the MASTER and the SLAVE.
Logic level: “0” = positive current / forward bridge.

13609	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

IREF2-Pol.Broth.
Signal of 12-PULSE_LOGIC-function block (S13/16)
This signal is taken from the same point as signal IREF2-POLARITY and has therefor the same definition. Before it is available as a signal, it is transferred to the other unit and displayed there. So the converter with the MASTER function shows the logic level actually used at the converter with the SLAVE function and vice versa.

13610	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Bridge
Signal of 12-PULSE_LOGIC-function block (S13/16)
This signal is a picture of signal 10402. It is calculated at the MASTER and the SLAVE.
With logic level 0 = Bridge 1 is active.

13611	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Bridge of Slave
Signal of 12-PULSE_LOGIC-function block (S13/16)
This signal is operative only in the MASTER and indicates which bridge is used by the Slave.
Logic level: 0 = Bridge 1 active

13612	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Indicat.Revers.
Signal of 12-PULSE_LOGIC-function block (S13/16)
This signal indicates, if a bridge reversal takes place.
Logic level: -1 = bridge reversal running.

13613	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Fault Reversion
Signal of 12-PULSE_LOGIC-function block (S13/16)
This signal triggers Error 65.

13614	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Fault Current
Signal of 12-PULSE_LOGIC-function block (S13/16)
This signal triggers Error 66.

13615	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Logik f.INHIBIT

Signal of 12-PULSE_LOGIC-function block (S13/16)

This signal is generated by the 12 pulse switch-off logic. In case this signal is used at the 12 pulse data exchange the converters will try to switch off each other in the event of an error.

Based on the connection diagram this interconnection should be done:

- in case a 12 pulse system without redundancy is in use (see INHIBIT_LOGIC (3607)):
  - connect this output to input START_INHIBIT (908) at both converters, Master and Follower
- in case a 12 pulse system with redundancy is in use (see BC_LOGIC (3616)):
  - don´t use this signal at both of the converters and keep START_INHIBIT (908) to default or application dependent

13616	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Input X18:13

Signal of INPUT X18-function block (S13/16)

The signal passed to this pointer is outputted at Plug Connector X18:13. It is operative in all modes. The interconnections recommended for the different 12 pulse modes are listed at groupe 36.

13617	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Input X18:14

Signal of INPUT X18-function block (S13/16)

The signal passed to this pointer is outputted at Plug Connector X18:14. It is operative in all modes. The interconnections recommended for the different 12 pulse modes are listed at groupe 36.

13618	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Input X18:15

Signal of INPUT X18-function block (S13/16)

The signal passed to this pointer is outputted at Plug Connector X18:15. It is operative in all modes. The interconnections recommended for the different 12 pulse modes are listed at groupe 36.

13619	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Input X18:16

Signal of INPUT X18-function block (S13/16)

The signal passed to this pointer is outputted at Plug Connector X18:16. It is operative in all modes. The interconnections recommended for the different 12 pulse modes are listed at groupe 36.

13620	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

BC not Zero

Signal of 12-PULSE_LOGIC-function block (S13/16)

Signal is set when signal BC (112-05) is different to 0 (Bit 5 of BC is not taken into account!).

13621	FB_O: B	SC: BO	HL: -	LL: -	D: -	U: -

Reserved f.Commun

Signal of 12-PULSE_LOGIC-function block (S13/16)

This signal is already defined and used for future extensions.

13622	FB_O: I2	SC: 1	HL: -	LL: -	D: -	U: -

Group 138: FUNCTION WINDER BLOCKS

13801-13819: Function for application winder
See winder data sheets.

Group 139: FUNCTION BLOCKS 10

13901-13912: Parameter for application function blocks
See application function block data sheets.

E

F

G

H

I

K

L

M

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P

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R

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T

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W

X

Z

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Ident. No.: 3ADW 000 078 R0301 Rev C
08_01

078R0301A1310000