ACS 600
ACS800

Firmware Manual

Multi Block Programming Application 7.x

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Firmware Manual

ACS 600/ACS800

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Table of Contents

Chapter 1 – Introduction to This Manual

Overview

This chapter describes the contents of the manual. In addition it contains information about the compatibility, safety and intended audience.

Compatibility

The manual is compatible with ACS 600 / ACS800 Multi Block Programming Application 7.1x.

Safety Instructions

Follow all safety instructions delivered with the drive.

- Read the complete safety instructions before you install, commission, or use the drive. For single drive the complete safety instructions are given at the beginning of the hardware manual. For multidrive safety instructions, see ACS600 Multidrive Safety and Product Information [3AFE63982229 (English)].
- Read the software function specific warnings and notes before changing the default settings of the function. For each function, the warnings and notes are given in this manual in the section describing the related user-adjustable parameters.

Before You Start

The purpose of this manual is to provide you with the information necessary to control and program the drive.

Read through this manual before commencing start-up.

The installation and commissioning instructions given in the Hardware Manual (the appropriate manual is delivered with the unit) must also be read before proceeding.

Study carefully the Safety Instructions before attempting any work on, or with, the unit.

What This Manual Contains

Chapter 1 – Introduction to This Manual, the chapter you are reading now, introduces you to this manual.

Chapter 2 – Start-Up, explains the Start-up procedure.

Chapter 3 – Control Panel, describes the operation of the CDP 312 control panel used for controlling and programming.

Chapter 4 – Software Description, explains the operation of the System Application Program.

Chapter 5 – Signals, introduces you to the measured or calculated signals.

Chapter 6 – Parameters, lists the System Application Program parameters and explains their functions.

Chapter 7 – *Application Blocks,* describes the function blocks.

Chapter 8 – Fault Tracing, lists the warning and fault messages with the possible causes and remedies.

Chapter 9 – Terms, gives complete listing of the terms used in this manual.

Related Publications

AIMA-01 I/O Module Adapter User's Manual (3AFE 64661442, English.)

RAIO-01 Analogue I/O Extension User's Manual (3AFE 64484567, English.)

RDIO-01 Digital I/O Extension User's Manual (3AFE 64485733, English.)

RTAC-01 Pulse Encoder Interface User's Manual (3AFE 64486853, English.)

NTAC-XX Installation and Start-up Guide (3AFE 58919730, English.)

Fieldbus Adapters, I/O Extension Modules User's Manuals etc.

DriveAP User's Manual (3AFE 64540998, English.)

DriveWindow 2.x User's Manual (CD-ROM includes extensive User's Manual.)

Chapter 2 – Start-up

Overview

This chapter describes the basic start-up procedure of the drive. The instructions are given as a step-by-step table. A more detailed description of the parameters involved in the procedure is presented in the *Chapter 6 Parameters*.

General Start-up Instructions

The drive can be operated:

- locally from its Control Panel or the DriveWindow PC tool.
- externally via the I/O connections on the RMIO board or fieldbus connection to the RMIO board.

The start-up procedure presented uses the DriveWindow program. Drive references can be monitored with DriveWindow with data loggers or with an oscilloscope (connect analogue output signals to an oscilloscope and check the scaling of the signals). For instruction on how to use the DriveWindow PC tool, see DriveWindow Online Help.

The start-up procedure includes actions which need to be performed only when the drive is powered up for the first time (e.g. entering the motor data). After the first start-up, the drive can be powered up without using these start-up functions again. The start-up procedure can be repeated later if the start-up data needs to be changed.

If an alarm or a fault is generated during the start-up, see *Chapter 8 Fault Tracing* for the possible causes and remedies.
If problems continue, disconnect the main power and wait for 5 minutes before attempting any work on the unit, the motor, or the motor cable.

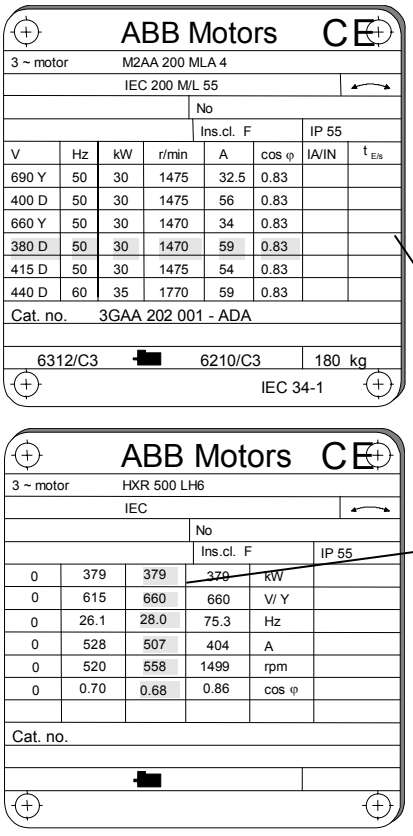
START-UP PROCEDURE

⚠	**Follow the safety instructions during the start-up procedure.** The start-up procedure should only be carried out by a qualified electrician.
☐	Check the mechanical and electrical installation and the commissioning of the drive section from the ACS 600 XXX Hardware Manual *(Code 3AFY63700118).*
☐	Connect optical cables temporarily between the RMIO board channel CH3 and the DDCS communication (NISA) card or PCMCIA card in the PC. When using a PCMCIA card, follow the instructions included in the DriveWindow kit.
☐	Disconnect the overriding system link from channel CH0 of the RDCO-0x module or from the fieldbus adapter module type Rxxx connected to Slot1 of the RMIO board.
1.	***POWER-UP***
☐	Apply mains power.
☐	Start the DriveWindow program.
☐	Select the DDCS protocol.
☐	Switch the DriveWindow program into Local control mode.

START-UP PROCEDURE

2. START-UP DATA

2.1 Entering and Checking Data

☐	Upload the parameter and signal list.	
☐	Select the language (if available). Reload the parameter and signal list from the Drive menu.	99.01 LANGUAGE _____
☐	Enter the motor data from the motor nameplate into the following parameters (parameter group 99): Set all motor data exactly as indicated on the motor nameplate. (For example, if the motor nominal speed is given as 1440 rpm on the nameplate, setting the value of parameter 99.05 MOTOR NOM SPEED to 1500 rpm would result in the wrong operation of the drive.)  	**99.02 MOTOR NOM VOLTAGE** _____ **99.03 MOTOR NOM CURRENT** _____ **99.04 MOTOR NOM FREQ** _____ **99.05 MOTOR NOM SPEED** _____ **99.06 MOTOR NOM POWER** _____ **99.12 MOTOR NOM COSFII** _____ If the nominal COS φ of the motor is unknown, set parameter 99.13 POWER IS GIVEN to POWER. Field Weakening Point Values!
☐	Check that the motors have the same relative slip, nominal voltage and number of poles. If the manufacturer motor data is insufficient, use the following formulas to calculate the slip and the number of poles:	

START-UP PROCEDURE

	$p = Int\left(\frac{f_N \cdot 60}{n_N}\right)$ * *Round to the nearest integer value. $n_S = \frac{f_N \cdot 60}{p}$ $s = \frac{n_S - n_N}{n_S} \cdot 100\%$ Where p = number of pole pairs (= motor pole number / 2) f_N = motor nominal frequency [Hz] n_N = motor nominal speed [rpm] s = motor slip [%] n_S = motor synchronous speed [rpm].	
☐	Download the parameters.	The Alarm Message **"ID MAGN REQ"** is displayed.
2.2	***Activating the Optional Modules***	
☐	Activate all installed optional modules connected to Slot1, Slot2, DDCS channel CH1 and CH2 of the RDCO-0x DDCS Option Module. Check the location, node addresses and HW mode for the modules.	Parameter group 98 OPTION MODULES Parameter groups 13…15
☐	After the fault reset no I/O COMM ERR. All I/O modules have been identified and activated.	Parameter group 98 OPTION MODULES
2.3	***Checking the I/O***	
☐	Check the I/O signal connection between the HW and SW.	**Signal groups 5, 6 and 8**

START-UP PROCEDURE

2.4.	***Checking the Prevention of Unexpected Start-up and Emergency Stop Circuit.***	
☐	Check that the *prevention of unexpected start-up circuit* works. 1 = Active (AGPS /NGPS power supply 230/115 VAC circuit is open) 0 = Normal State (circuit is closed)	**Signal 8.02 AUX STATUS** **AUX STATUS WORD bit B8 START_INHIBITION.** **8.21 START INHIBI WORD**
☐	Set the mask for Prevention of Unexpected Start-up alarm for ALARM /FAULT logger, if the AGPS / NGPS power supply is often de-energised. Otherwise the alarm / fault logger will be filled with START INHIBIT alarms.	**31.02 START INHIBIT ALM**
☐	Check that the *emergency stop circuit* is functioning correctly (DI and DO), if programmed to application.	Signal **8.01 MAIN STATUS WORD** bits B5 OFF_3_STA and bit B4 OFF_2_STA
2.5.	***Checking the Inverter Fan Speed Control***	
☐	With ACS800 R8i module equipped with speed controlled fan, check the fan speed control mode setting.	16.08 FAN SPD CTRL MODE
2.5.	***Checking the Motor Fan Circuit (if exists).***	
☐	Check the possible fan control circuit, if programmed to application.	
2.6.	***Checking the DC switch option in multidrive.***	
☐	If ACS800 multidrive HW includes DC switch at the input of R7i and R8i inverter unit, activate fuse switch control.	98.14 FUSE SWITCH CNTR
☐	If ACS800 multidrive HW includes R2i…R5i modules, check following: HW: Feedback signal from auxiliary contact of DC switch to selected digital input. SW: Check the connection from selected digital input to **DC SWITCH** block with DriveAP 2.	
2.7.	***Checking the Auxiliary Power Supply for control board (RMIO).***	
☐	Check the source of auxiliary power supply.	**16.07 CTRL BOARD SUPPLY**

START-UP PROCEDURE

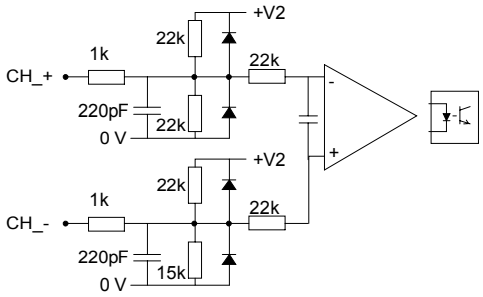
3. MOTOR ID RUN = MOTOR IDENTIFICATION RUN

3.1 Checking the Speed Measurement and Rotation Direction

With a pulse encoder (Encoder 1)

↓	**Without a pulse encoder**		
☐	☐	Check the rated speed value of the motor (e.g. 1485 rpm).	**50.01 SPEED SCALING**
☐		Set parameter 50.03 **SPEED FB SEL** to INTERNAL (default value).	**50.03 SPEED FB SEL**
☐		Set the number of pulses per revolution for the encoder.	**50.04 ENCODER PULSE NR.**
☐		Check the other Encoder 1 parameter settings in parameter group 50.	**Parameters 50.01…50.14 SPEED MEASUREMENT**
☐	☐	Reset and start the motor. The stator resistance and other electrical losses are identified and stored into FPROM memory. The motor shaft is not rotating during the FIRST START.	**DriveWindow Drives Panel** The Alarm Message "**ID MAGN REQ"** is displayed.
☐	☐	The motor stops after the FIRST START has been performed.	The Alarm Message **"ID DONE"** is displayed.
☐	☐	Start the motor again.	**DriveWindow Drives Panel**
☐	☐	Enter a small (e.g. 50 rpm) value for the speed reference.	**DriveWindow Drives Panel**
☐		Check that the motor shaft actually turns to the correct direction and the polarity of the speed measurement is correct.	

START-UP PROCEDURE

☐		When the motor is rotating in the correct direction and the speed reference is positive, then the actual speed in Signal 1.03 **SPEED MEASURED 1** must be positive as well and equal to Signal 1.02 **SPEED ESTIMATED**. If this is not the case, the incorrect connection can be located as follows: • If the direction of rotation is correct and signal 1.03 SPEED MEASURED 1 is negative, the phasing of the pulse encoder channel wires is reversed. • If the direction of rotation is incorrect and signal 1.03 SPEED MEASURED 1 is negative, the motor cables are connected incorrectly. • If the direction of rotation is incorrect and signal 1.03 SPEED MEASURED 1 is positive, both the motor and the pulse encoder are connected incorrectly. Changing the direction: • Disconnect mains power from the drive, and wait about 5 minutes for the intermediate circuit capacitors to discharge! • Do the necessary changes and verify by applying mains power and starting the motor again. Check that the speed actual value is positive.  *An input channel connection of the NTAC-02.*	
☐	☐	Stop the motor.	
☐		Set parameter 50.03 **SPEED FB SEL** to 2 = ENCODER.	50.03 SPEED FB SEL
☐		Start the motor.	
☐		Check that the signals SPEED ESTIMATED and SPEED MEASURED 1 are the same.	**1.02 SPEED ESTIMATED** **1.03 SPEED MEASURED 1**
☐		Stop the motor.	

START-UP PROCEDURE

3.2 Selecting the Motor ID Run Mode

Warning!
The motor will run at up to approximately 50%…80% of nominal speed during the Motor ID Run. BE SURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE MOTOR ID RUN!

☐ Select the Motor ID Run.

During the Motor ID Run, the drive will identify the characteristics of the motor for optimum motor control. The ID Run may take a few minutes, depending on motor size.

Select the *STANDARD OR REDUCE*D ID Run if
- operation point is near zero speed,
- maximum dynamic torque performance is required (motor model optimisation) and operation without a pulse encoder is required.

Select the *ID MAGN* Run if
- it is a pump or fan application,
- there are drive sections in which more than one motor is connected to one inverter. See section *3.3 Multi-Motor Drives*.

Note: The Motor ID Run cannot be performed if scalar control mode is selected for motor control (parameter 99.08 MOTOR CTRL MODE is set to SCALAR).

The Standard Motor ID run can also be performed if the machinery is coupled and there is only inertia but no continuous load. In this case the ID Run may take much longer than without any load.

WARNING! If the Standard ID run is to be performed with the machinery coupled to the motor, make sure the machinery is able to with stand the fast speed changes during the ID Run. Otherwise select the Reduced ID Run.

99.07 MOTOR ID RUN

1= NO (ID MAGN)
The Motor ID Run is not performed. If the start command has been given, the motor model is calculated by the drive by magnetising the motor for 20 to 60 s at zero speed.

2 = STANDARD
Performing the Standard Motor ID Run guarantees the best possible control accuracy. The motor and the driven equipment must be uncoupled for the Standard ID Run.

3 = REDUCED
The Reduced ID Run should be selected (instead of Standard) if mechanical losses are higher than 20% (i.e. the motor cannot be uncoupled from the driven equipment), or flux reduction is not allowed when the motor is running (e.g. a braking motor in which the brake switches on when the flux falls below a certain level).

If you select the Standard ID Run, uncouple the driven equipment from the motor!

99.07 MOTOR ID RUN

Check that starting of the motor does not cause any danger!

☐ Start the motor.

☐ **The motor stops after the ID Run has been performed.**

When the ID Run has been successfully performed, **AUX STATUS WORD** signal 8.02 B7 IDENTIF_RUN_DONE is set to 1. Parameter 99.07 **MOTOR ID RUN** also changes back to NO.

START-UP PROCEDURE

⚠	**Note***:* If the Motor ID Run has not been successfully performed (for example it does not finish), see *Chapter 8 Fault Tracing.*	**FAULT MESSAGE "ID RUN FLT"**
3.3	***Multi-Motor Drives***	
	These are drive sections in which more than one motor is connected to one inverter. The motors must have the same relative slip, nominal voltage and number of poles. **Note:** If scalar control is used, then these limitations are not effective.	
☐	Set the sum of motor nominal currents.	**99.03 MOTOR NOM CURRENT**
☐	Set the sum of motor nominal powers.	**99.06 MOTOR NOM POWER**
☐	If the powers of the motors are close to each other or the same, but nominal speeds vary a little, parameter 99.05 MOTOR NOM SPEED can be set to an average value of the motor speeds.	**99.05 MOTOR NOM SPEED**
	If the powers of the motors vary a great deal, then use of scalar control is recommended. **Note:** If scalar control is used then these limitations are not effective.	
☐	Set the frequency of the motors (must be same).	**99.04 MOTOR NOM FREQ**
☐	The Motor ID Run can be performed with all the motors connected or without load.	**99.07 MOTOR ID RUN**

3.4	***Settings of Second Pulse Encoder on DDCS Channel CH2***	
☐	Activate the second pulse encoder module.	**98.15 ENCODER 2 MODULE**
☐	Select the channel for encoder 2. **Note:** The I/O configuration rules (see *Chapter 4 Software Description* section *I/O Configurations*).	**50.19 ENC2 CHANNEL**
☐	Set the number of pulses per revolution for the encoder.	**50.15 ENCODER2 PULSE NR**
☐	Set the speed measurement mode.	**50.16 SP MEAS MODE ENC2**
☐	Set the diagnostics, if communication break is detected between the encoder module 2 and RMIO board.	**50.17 ENCODER2 ALM/FLT**
☐	Set the filter time.	**50.18 ENC2 FILT TIME**
☐	Speed signal polarity is correct for application. If not, change the cable connections between the channel A and B.	**1.28 SPEED MEASURED 2**

START-UP PROCEDURE

4.	***OPTIMISING THE STARTING TIME AND TORQUE***	
☐	Select the start function. *The fastest starting is achieved when parameter 21.01* ***START FUNCTION*** *is set to 1 (AUTO, flying start).* *The highest possible starting torque is achieved when parameter 21.01* ***START FUNCTION*** *is set to 2 = DC magnetising or 3 = constant DC magnetising.* ***Note:*** *No support for flying start function.*	**21.01 START FUNCTION**
☐	Set the limit parameters according to process requirements.	**Parameter group 20 LIMITS**

START-UP PROCEDURE

5. MOTOR PROTECTIONS

5.1 Motor Thermal Model Protection

☐	Select the motor thermal model protection mode. **Note*:*** DTC mode is used for ABB motors with I_N up to 800 A. Above that USER MODE is the only valid selection.		**30.01 MOTOR THERM PMODE**
With USER MODE set according to motor manufacturer data.			
↓	**With DTC mode**		
☐		Select the protection function for the motor thermal model protection. FAULT / WARNING / NO.	**30.02 MOTOR THERM PROT**
☐		Set the time for 63% temperature rise	**30.09 MOTOR THERM TIME**
☐	☐	Set the motor load curve current.	**30.10 MOTOR LOAD CURVE**
☐	☐	Set the zero speed load. Especially with forced cooling of the motor.	**30.11 ZERO SPEED LOAD**
☐	☐	Set the break point value for motor load curve.	**30.12 BREAK POINT**
☐	☐	Set the temperature alarm limit of the motor thermal model.	**30.28 THERM MOD ALM L**
☐	☐	Set the temperature trip limit of the motor thermal model.	**30.29 THERM MOD FLT L**
☐	☐	Set the motor nominal temperature rise. If ABB motor specifies MNTRC value on the rating plate, multiply value by 80 °C and enter the result here.	**30.30 MOT NOM TEMP RISE**
☐	☐	Set the typical ambient temperature of motor.	**30.31 AMBIENT TEMP**

START-UP PROCEDURE

5.2 Motor Protection with Temperature Measurement (if implemented in application)

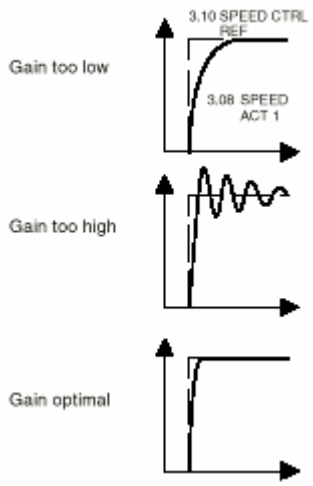
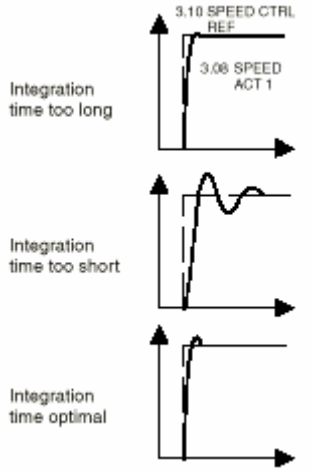
Sensor Type	Unit / Symbol	**Scaling**
PT100	Celsius / °C	
PTC	Ohm / Ω	Normal 0…1,5 kΩ Overtemperature ≥ 4 kΩ
KTY 84-1xx Silicon temperature sensor	Ohm / Ω	90°C == 939 Ω 110°C == 1063 Ω 130°C == 1197 Ω 150°C == 1340 Ω

☐	Programme the motor temperature measurement function for MOTOR 1 with application blocks.	
☐	Programme the temperature alarm limit for MOTOR 1 (EVENT block).	
☐	Programme the temperature trip limit for MOTOR 1 (EVENT block).	
☐	Test trip and alarm functions.	

START-UP PROCEDURE

6.	***TUNING THE SPEED CONTROLLER***	
	When tuning the drive, change one parameter at a time, then monitor the response to a speed reference step possible oscillations. To achieve the best possible result, the step response tests should be carried out at different speeds, from minimum speed up to maximum speed.	
	The speed control values obtained depend mainly on: • Flux reference **27.03 FLUX REF**. • The relationship between the motor power and the rotating mass. • Backlashes in the drive's mechanical structure (filtering).	
	Note*:* The Thyristor Supply Unit TSU may have to be set to normal operation mode for step response tests (signal 10407=0). If the TSU is in the diode bridge mode, an overvoltage alarm may trip the drive section when a stepped change down is given. Extra "jumps" may also appear in the step when the DC voltage rises, because no braking occurs.	
6.1.	***Step Response Test***	
	Manual Tuning	
☐	Select, for example, the following signals on the DriveWindow Monitoring Tool: • **1.07 MOTOR TORQUE FILT2**, actual torque • **1.03 SPEED MEASURED 1**, actual speed • **2.03 SPEED ERROR NEG**, filtered speed difference	
☐	Start the motor. Increase the speed slightly. Give a speed reference step and monitor the response. Repeat at a few test values across the whole speed range.	**DriveWindow Drives Panel**
☐	Set step changes of 1% or 2% from the maximum speed of the drive for DriveWindow.	**23.10 SPEED STEP**
☐	Optimise the P part of the speed controller: Set integration time to the maximum value. This turns the PI controller into a P controller.	**24.09 TIS**
☐	Give a step change up, e.g. 20 rpm. When the speed is stabilised, give a step change down e.g. 20 rpm.	23.10 SPEED STEP

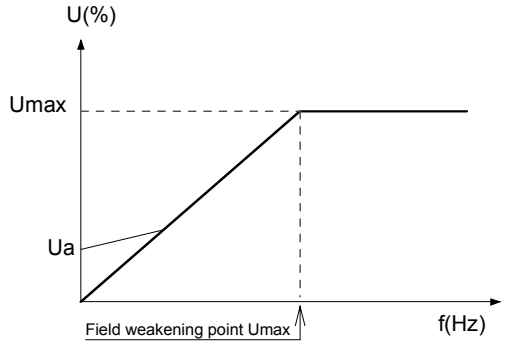
START-UP PROCEDURE

☐	Increase the relative gain until the response is sufficient. **Note:** Parameter 24.16 KPS LOC/EMSTOP is used only with Local and emergency stop situation. After the tuning procedure, type same value to parameter 24.03 KPS. See also limit parameters: 20.19 SPC TORQMAX LOC/EMS and 20.20 SPC TORQMIN LOC/EMS.	**24.16 KPS LOC/EMSTOP** **24.03 KPS** 
☐	Reduce the integral time constant until overshoot is observed in the response. The integral time constant is then adjusted such that there is no overshoot or only a slight overshoot (depending on the drive application). The function of the integral part is to remove the difference caused by the proportional control between the reference and the actual value as quickly as possible.	**24.09 TIS** 
	If the drive is stable and allows a high proportional gain, the integral time constant can be set short and an overcompensated step response is obtained.	

START-UP PROCEDURE

6.2	***Low Speed Fine Tuning***	
	In order to eliminate potentially harmful oscillations at low speeds (for example, during start), parameters 50.13 ZERO DETECT DELAY and 50.14 SPEED HOLD TIME should be adjusted at this point. The larger the mass of the driven equipment, the higher the value of 50.13 should be. As a rule of thumb, 50.14 should be set to approx. 60% of 50.13. For example, typical values for a drive rotating a dryer section of a paper machine would be 50 ms and 30 ms respectively.	**50.13 ZERO DETECT DELAY** **50.14 SPEED HOLD TIME**
6.3	***Suppression of Oscillations***	
	The measured speed always has a small ripple because of gear play and flexible couplings. However, a small ripple is acceptable as long as it does not affect the control loops. Reduction of this ripple with filters may cause tuning problems later on. A long filter time constant and a fast acceleration time contradict each other.	
☐	If the speed measurement shows rapid oscillation, filter it by means of speed error filter and setting the time constant of the first order actual speed filter. With the combination “no gear box” and “pulse encoder feedback”, decrease SP ACT FILT TIME to a minimum if fast oscillation is observed.	**23.06 SPEED ERROR FILT** **50.06 SP ACT FILT TIME**
☐	If there is substantial backlash in the drive, and if the drive oscillates at low torque due to the mechanism, the situation can be remedied by means of the adaptive control parameters. If the adaptivity has to be made abrupt (24.03 **KPS** high and 24.04 **KPS MIN** low), the drive may start to oscillate as the load varies. Use a step to test the functioning of the adaptivity. The step can be higher than 20 rpm (e.g. 50 rpm).	**24.04 KPSMIN** **24.05 KPS WEAKPOINT** **24.06 KPS WP FILT TIME**

START-UP PROCEDURE

7.	***SCALAR CONTROL***	
7.1	***Selecting the Scalar Control***	
	The scalar control mode is recommended for multimotor drives when the number of motors connected to drive is variable. Scalar control is also recommended when the nominal current of the motor is less than 1/6 of the nominal current of the inverter, or the inverter is used for test purposes with no motor connected.	
☐	Start the drive with DTC mode (FIRST START) before selecting the scalar control mode.	**99.07 MOTOR ID RUN**
☐	Select the scalar control mode. Parameter group 29 becomes visible after selection of scalar control. Parameters 29.02 **FREQUENCY MAX** and 29.03 **FREQUENCY MIN** are updated by software according to parameters 20.02 **MAXIMUM SPEED** and 20.01 **MINIMUM SPEED**.	**99.08 MOTOR CTRL MODE**
7.2	***IR Compensation***	
	IR compensation, or boosting the inverter output voltage, is often necessary to obtain an optimal start torque, or when the motor must rotate slowly, i.e. at a low frequency. Due to the stator winding resistance an additional voltage will be needed when even a slight load torque exists.	
☐	Set the operating range for the IR compensation. Starting voltage Ua (at zero frequency), can be set to 0% to 30% of motor nominal voltage. Select a combination at which the motor is able to start and run at a constant speed over the whole speed range.	**29.04 IR_COMPENSATION**
	 *U/F characteristic*	

START-UP PROCEDURE

	Always supervise the temperature rise in motors running at low speeds with IR compensation, particularly if no separate fan or temperature monitoring is included.
	The adequacy of IR compensation must be checked under actual load conditions.

8.	*CONTROLLING THE DRIVE USING AN ABB OVERRIDING SYSTEM*	
	The drive can be controlled from an overriding system by using fieldbus modules (see section 11 *FIELDBUS ADAPTERS*) and ABB (DDCS, DriveBus) communication protocols.	
☐	Select the control mode.	**98.02 COMM MODULE**
☐	Connect the overriding system optic fibres to the channel CH0 of the RDCO-0x DDCS option module.	
☐	Set the overriding node address for the fieldbus module, if connected to channel CH0.	**70.01 CH0 NODE ADDR**
☐	Select the communication mode for channel CH0. See the table above. **Note*:*** This parameter is valid after the next power-up.	**71.01 CH0 DRIVEBUS MODE**
☐	Check that the communication is working.	
☐	Set the delay time before a communication break fault is indicated.	**70.04 CH0 TIMEOUT**
☐	Select the action upon a communication fault on channel CH0.	**70.05 CH0 COM LOSS CTRL**
☐	Select RING, if the CH0 channels on the RMIO have been connected to ring. (Default is STAR that is typically used with the branching units NDBU-95 / -85).	**70.19 CH0 HW CONNECTION**

Controller	Node Addr. DDCS	Node Addresses DriveBus	Node Addresses ModuleBus	Par. 71.01 CH0 DRIVEBUS MODE
APC2	1	-	-	NO
AC70	-	-	17-125	NO
AC80/AC800M DriveBus	-	1-12		YES
AC80 ModuleBus	-		17-125	NO
FCI (CI810A)	-	-	17-125	NO

START-UP PROCEDURE

9.	*PC TOOL INTERFACE*	
☐	Set the node address for channel CH3. This are used for DriveWindow and DriveAP. Use addresses 1…75 and 124…254. Rest of the addresses have been reserved for branching units (NDBU-95 or NDBU-85). If the CH3 channels of several drives have been connected in a ring or star (using a branching unit configuration), each one must be given a unique node address. The new node address becomes valid only on the next RMIO power-on.	**70.15 CH3 NODE ADDR**
☐	Select RING, if the CH3 channels on the RMIO boards have been connected to ring. (Default is STAR that is typically used with the branching units NDBU-95 or NDBU-85).	**70.20 CH3 HW CONNECTION**
☐	Test the functions with received and transmitted data.	

10.	*CONTROLLING THE DRIVE USING THE I/O SIGNALS*	
	The drive can be controlled, instead of an overriding system, by using I/O signals.	
☐	Select the I/O control mode (1=NO), if no fieldbus control required.	**98.02 COMM MODULE**
☐	Controlling of Control Word can also be mixed between the overriding system and I/O by using function blocks and mask word.	**7.05 MAIN CONTROL W MASK** **98.02 COMM MODULE**

11.	*FIELDBUS ADAPTERS*	
☐	See the appropriate *Installation and Start-up Guide.* The fieldbus communication is set up with parameter group 51.	**98.02 COMM MODULE** **Parameter group 51**
☐	Set the delay time before a communication break fault is indicated.	**70.04 CH0 TIMEOUT**
☐	3rd data word of R-type of fieldbus module can be routed faster to the torque reference chain. Condition: M/F function is not activated.	**51.0x** (assignment of 3rd data word) = 3

START-UP PROCEDURE

13.	***CHECKING THE MASTER/FOLLOWER COMMUNICATION***	
13.1	***Checking the Mode and Signals***	
	Required only if the application includes master/follower drives.	
☐	Select the Master/Follower mode.	**70.08 M/F MODE**
☐	In the Master: A packed Boolean word can be sent to followers (e.g. start/stop control with application blocks). In the follower: See parameter 70.09 MASTER SIGNAL 1 description.	70.09 MASTER SIGNAL 1
☐	In the Master: A speed reference is sent from the master drive to the follower drive. Select a signal to be sent as a speed reference (from the master drive to the follower). In the follower: See parameter 70.10 MASTER SIGNAL 2 description.	70.10 MASTER SIGNAL 2
☐	In the Master: A torque reference is sent from the master drive to the follower drive. Select a signal to be sent as a torque reference (from the master drive to the follower). In the follower: See parameter 70.11 MASTER SIGNAL 3 description. The MASTER SIGNAL 3 can be scaled before sent to CH2 by parameter 70.30 MASTER SGN3 SCALE in the master drive and rescaled back by parameter 70.31 FOLL SGN3 SCALE.	70.11 MASTER SIGNAL 3 **70.30 MASTER SGN3 SCALE** **70.31 MASTER SGN3 SCALE**
☐	Enter the node address for used Follower channel CH2 or CH0.	70.01 CH0 NODE ADDR or 70.07 CH2 NODE ADDR
☐	In the Follower: If the speed reference is read from the master drive, set parameter 70.17 SPEED REF SEL to 1 = SPEED REF 1 in the follower.	**70.17 SPEED REF SEL**
☐	Speed Follower with load share. A follower drive load can be shared also with speed control mode. Activate this function by parameter 23.18 FOLL SPD CTRL COR. Typical value is 1…3%.	**23.18 FOLL SPD CTRL COR**

START-UP PROCEDURE

	Note: With this function, parameter. 24.02 DROOP RATE must be set to zero.	
☐	In the Follower: If the torque reference is read from the master drive, set parameter 70.18 TORQ REF SEL to 1 = DS TORQ REF A in the follower.	**70.18 TORQ REF SEL**
☐	Test the load sharing in practice. Also test the function with an emergency stop.	**25.03 LOAD SHARE**
13.2	***Checking the Point-To-Point Communication on CH2***	
☐	Activate the M/F link. Define the master and the followers if not already done in section 13.1.	70.08 M/F MODE or blocks REC1 M/F 1,REC1 M/F 2
☐	Activate the communication between the node 1 (Master) and node 2 (Follower 1) in both drives	**94.01 ENABLE FOLLOWER 1**
☐	Activate the communication between the node 1 (Master) and node 3 (Follower 2) in both drives	**94.05 ENABLE FOLLOWER 2**
☐	No other special options connected in CH2.	**98.15 ENCODER 2 MODULE** **94.16 FAST AI**
14	***SPECIAL TUNING***	
14.1	***Flying start function and flux correction***	
☐	If flying start fails (21.01 START FUNCTION = AUTO), adjust the flying start tuning parameters.	**28.12 FLYSTART CUR REF %** **28.13 FLYSTART INIT DLY**
☐	If required start torque is not achieved, i.e. motor will not start to rotate, decrease the stator resistance of the motor model.	**28.15 RS20 [mOhm]**

Chapter 3 – Control Panel

Overview

This chapter describes how to use the control panel CDP 312R.

The user can change the configuration of the drive to meet the needs of the requirements by programming. The drive is programmable through a set of parameters. This chapter describes the operation of the CDP 312R control panel and how to use it to modify the parameters, to measure the actual values and to control the drive(s).

Panel Link

The CDP 312R control panel is connected to the drive through a Modbus-protocol communication bus. Modbus is a common bus protocol for ABB Drives products. The communication speed of the bus is 9600 bit/s. 31 drives and one panel can be connected to the bus. Each station must have a unique ID number.

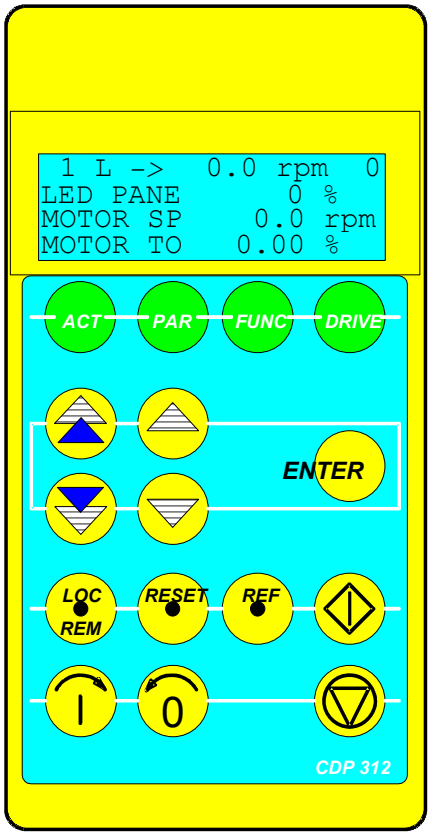


Figure 3 - 1 CDP 312R control panel

Display

The LCD type display has 4 lines of 20 characters.

The language is selected at start-up (parameter 99.01 LANGUAGE). Depending on the customers selection, a set of four languages is loaded into the memory of the drive at the factory.

Keys

The control panel keys are flat, labelled, push-button keys that allow you to monitor drive functions, select drive parameters, and change settings.

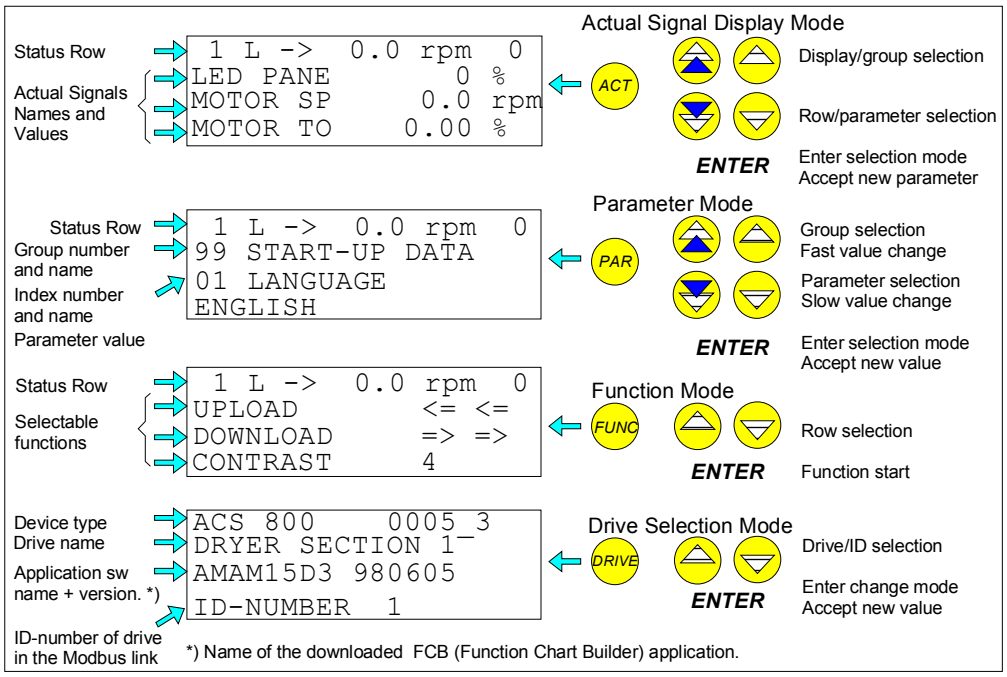


Figure 3 - 2 Control Panel Display Indications and Functions of the Control Panel Keys

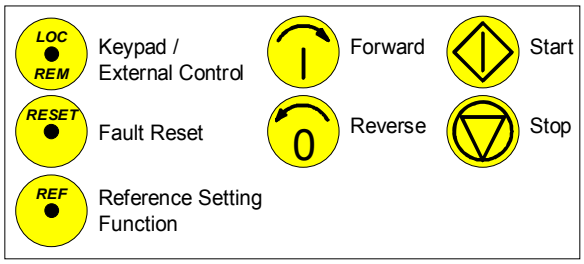


Figure 3 - 3 Operational Commands of the Control Panel Keys

Panel Operation

The following is a description of the operation of the CDP 312R control panel.

Keypad Modes

The CDP 312R control panel has four different keypad modes: Actual Signal Display Mode, Parameter Mode, Function Mode, and Drive Selection Mode. In addition, there is a special Identification Display, which is displayed after connecting the panel to the link. The Identification Display and the keypad modes are described briefly below.

Identification Display

When the panel is connected for the first time, or the power is applied to the drive, the Identification Display appears, showing the panel type and the number of drives connected to the Panel Link.

Note: The panel can be connected to the drive while power is applied to the drive.

```
ACS 800   0005_3


ID NUMBER 1
```

After two seconds, the display will clear, and the Actual Signals of the drive will appear.

Actual Signal Display Mode

This mode includes two displays, the Actual Signal Display and the Fault History Display. The Actual Signal Display is displayed first when the Actual Signal Display mode is entered. If the drive is in a fault condition, the Fault Display will be shown first.

The panel will automatically return to Actual Signal Display Mode from other modes if no keys are pressed within one minute (exceptions: Status Display in Drive Selection Mode and Fault Display Mode).

In the Actual Signal Display Mode you can monitor three Actual Signals at a time.

The Fault History includes information on the 16 most recent faults that have occurred in your drive. The name of the fault and the total power-on time are displayed. If the APC2 overriding system has been connected to the drive (DDCS channel 0), this time can be seen in the date format instead of power-on time.

The following table shows the events that are stored in the Fault History. For each event it is described what information is included.

Event	Information	Display
A fault is detected by Drive.	Sequential number of the event. Name of the fault and a "+" sign in front of the name. Total power on time or date and time updated by overriding system.	1 L -> 0.0 rpm 2 LAST FAULT + OVERCURRENT 12 H 49 MIN 10 S
A fault is reset by user.	Sequential number of the event. -RESET FAULT text. Total power on time or date and time updated by the overriding system.	1 L -> 0.0 rpm 1 LAST FAULT -RESET FAULT 12 H 50 MIN 10 S
A warning is activated by Drive.	Sequential number of the event. Name of the warning and a "+" sign in front of the name. Total power on time or date and time updated by the overriding system.	1 L -> 0.0 rpm 1 LAST WARNING +EMESTOP 12 H 50 MIN 10 S
A warning is deactivated by Drive.	Sequential number of the event. Name of the warning and a "-" sign in front of the name. Total power on time or date and time updated by the overriding system.	1 L -> 0.0 rpm 1 LAST WARNING +EMESTOP 12 H 50 MIN 35 S

When a fault or warning occurs in the drive, the message will be displayed immediately, except in the Drive Selection Mode. From the fault display, it is possible to change to other displays without resetting the fault. If no keys are pressed the fault or warning text is displayed as long as the fault exists.

Table 3 - 1 How to Display the Full Name of the three Actual Signals

Step	Function	Press key	Display after key is pressed
1.	To display the full name of the three actual signals	**Hold** ACT	1 L -> 0.0 rpm 0 LED PANEL OUTP MOTOR SPEED FILT MOTOR TORQUE FILT
2.	To return to the Actual Signal Display Mode.	**Release** ACT	1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %

Table 3 - 2 How to Select Actual Signals to the Display

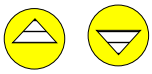
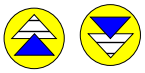
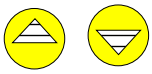
Step	Function	Press key	Display after key is pressed
1.	To enter the Actual Signal Display Mode	ACT	1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %
2.	To select the desired row.		1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %
3.	To enter the Actual Signal Selection Mode.	ENTER	1 L -> 0.0 rpm 0 1 ACTUAL SIGNALS 01 MOTOR SPEED FILT 0.0 rpm
4.	To select a different group.		1 L -> 0.0 rpm 0 2 ACTUAL SIGNALS 01 SPEED REF 2 0 rpm
5.	To select a index.		1 L -> 0.0 rpm 0 2 ACTUAL SIGNALS 02 SPEED REF 3 0 rpm
6.	To accept the selection and to return to the Actual Signal Display Mode.	ENTER	1 L -> 0.0 rpm 0 LED PANE 0 % SPEED RE 0.0 rpm MOTOR TO 0.00 %

Table 3 - 3 How to Display a Fault and Reset the Fault History

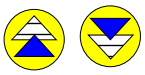
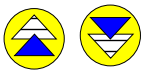
Step	Function	Press key	Display after key is pressed
1.	To enter the Actual Signal Display Mode	ACT	1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %
2.	To enter the Fault History Display. The time of occurrence can be seen either as total power-on time or in the date format if an overriding system (e.g. AC80) has been connected to control the drive.		1 L -> 0.0 rpm 2 LAST FAULT + PANEL LOST 20 H 49 MIN 56 S 1 L -> 0.0 rpm 1 LAST FAULT + PANEL LOST 980621 10:26:19.3043 s = fault or alarm logged into the fault logger r = fault or alarm reset
3.	To clear all the faults from the Fault History Buffer. A view of cleared fault logger.	RESET	1 L -> 0.0 rpm 2 LAST FAULT + OVERCURRENT 12 H 49 MIN 10 S 1 L -> 0.0 rpm 0 2 LAST FAULT H MIN S
4.	To return to the Actual Signal Display Mode.		1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %

Table 3 - 4 How to Display and Reset an Active Fault

Step	Function	Press key	Display after key is pressed
1.	To display an active fault..	ACT	1 L -> 0.0 rpm 0 ACS 800 75 kW *** FAULT *** PANEL LOST
2.	To reset the fault. The Reset button functions also in the REMOTE mode.	RESET	1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %

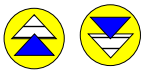
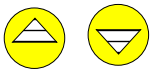
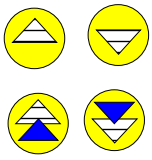
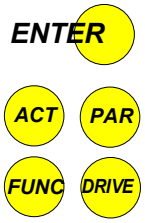
Parameter Mode

The Parameter Mode is used for making changes to the drive parameters. When this mode is entered for the first time after power up, the display will show the first parameter of the first group. The next time, the Parameter Mode is entered, the previously selected parameter is shown.

Note: If you try to write to a write-protected parameter, the following warning will be displayed.

```
**WARNING**
WRITE ACCESS DENIED
PARAMETER SETTING
NOT POSSIBLE
```

Table 3 - 5 How to Select a Parameter and Change the Value

Step	Function	Press key	Display after key is pressed
1.	To enter the Parameter Mode.		1 L -> 0.0 rpm 0 13 ANALOGUE INPUTS 01 AI1 HIGH VALUE 10000
2.	To select another parameter group. When the arrow button is pressed down, only the parameter group name is displayed. When the button is released also the first parameter of the group is displayed.		1 L -> 0.0 rpm 0 14 DIGITAL INPUTS 1 L -> 0.0 rpm 0 14 DIGITAL OUTPUTS 01 DO1 CONTROL OFF
3.	To select a parameter within a group. When the arrow button is pressed down, only the parameter name is displayed. When the button is released also the parameter value is displayed..		1 L -> 0.0 rpm 0 14 DIGITAL OUTPUTS 01 DO1 GROUP+INDEX 1 L -> 0.0 rpm 0 14 DIGITAL OUTPUTS 02 DO1 GROUP+INDEX 801
4.	To enter the parameter setting function..		1 L -> 0.0 rpm 0 14 DIGITAL OUTPUTS 02 DO1 GROUP+INDEX [801]
5.	To change the parameter value. (slow change for numbers and text) (fast change for numbers only)		1 L -> 0.0 rpm 0 14 DIGITAL OUTPUTS 02 DO1 GROUP+INDEX [901]
6a. 6b.	To send a new value to the drive. To cancel the new setting and keep the original value. The selected mode is entered.		1 L -> 0.0 rpm 0 14 DIGITAL OUTPUTS 02 DO1 GROUP+INDEX [901] 1 L -> 0.0 rpm 0 14 DIGITAL OUTPUTS 02 DO1 GROUP+INDEX 801

Function Table 3 - 6 How to Set the Contrast of the Panel Display.

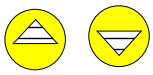
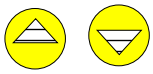
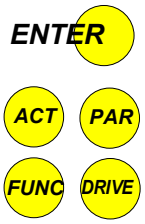
Step	Function	Press key	Display after key is pressed
1.	To enter the Function Mode.		1 L -> 0.0 rpm 0 UPLOAD <= <= DOWNLOAD => => CONTRAST 0
2.	To select a function.		1 L -> 0.0 rpm 0 UPLOAD <= <= DOWNLOAD => => CONTRAST 0
3.	To enter the contrast setting function.		1 L -> 0.0 rpm 0 CONTRAST [0]
4.	To enter the contrast setting function.		1 L -> 0.0 rpm 0 CONTRAST [7]
5a.	To accept the selected value. To cancel the new setting and keep the original value, press any of the mode selection keys. The selected mode is entered.		1 L -> 0.0 rpm 0 UPLOAD <= <= DOWNLOAD => => CONTRAST 7 1 L -> 0.0 rpm 0 UPLOAD <= <= DOWNLOAD => => CONTRAST 0

Table 3 - 7 How to Select a Drive

Step	Function	Press key	Display after key is pressed
1.	To enter the Drive Selection Mode.	DRIVE	ACS 800 0005_3 DRIVE NAME AMAM1050 980612 ID NUMBER 1
2.	To select the next drive/view. The drive connected to the panel is selected with the arrow buttons. Selected ID number is shown on the bottom row in the display. The Status Display of all devices connected to the Panel Link is shown after the last individual station. If all stations do not fit on the display at once, press to view the rest of them.		ACS 800 0005_3 DRIVE NAME AMAM1050 980612 ID NUMBER 1 1O-> 2I<- 3O<- 4I-> 5I-> 6O-> 7F 8I-> 9I-> 10I->
3.	To connect to the last displayed drive and to enter another mode, press one of the mode selection keys. The selected mode is entered.	ACT PAR FUNC	1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %

Table 3 - 8 How to Change ID Number of the Drive

Step	Function	Press key	Display after key is pressed
1.	To enter the Drive Selection Mode	DRIVE	ACS 800 0005_3 DRIVE NAME AMAM1050 980612 ID NUMBER 1
2.	To select the next drive/view. The ID number of the station is changed by first pressing ***ENTER*** (the brackets round the ID number appear) and then adjusting the value with arrow buttons. The new value is accepted with ***ENTER***. The power of the drive must be switched off to validate its new ID number setting (the new value is not displayed until the power is switched off and on). The Status Display of all devices connected to the Panel Link is shown after the last individual station. If all stations do not fit on the display at once, press to view the rest of them.		ACS 800 0005_3 DRIVE NAME AMAM1050 980612 ID NUMBER 1 1O-> 2I<- 3O<- 4I-> 5I-> 6O-> 7F 8I-> 9I-> 10I-> O = Drive stopped I = Drive running -> = Direction forward <- = Direction reverse F Drive has tripped on a fault
3.	To connect to the last displayed drive and to enter another mode, press one of the Mode keys. The selected mode is entered.	ACT PAR FUNC	1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %

Operational Commands

Operational commands control the operation of the drive. They include starting and stopping the drive, changing the direction of rotation and adjusting the reference. The reference value is used for controlling motor speed (Local Reference 1), motor torque (Local Reference 2) or frequency in scalar control (Local Reference 3).

Operational commands can be given from the CDP 312R control panel always when the status row is displayed and the control location is the panel. This is indicated by L (Local Control) on the display. See the following figure.

```
1 L ->    0.0 rpm 0
```

Remote Control (control from the overriding system or I/O is indicated by an empty field).

```
1   ->    0.0 rpm 0
```

Operational commands cannot be given from this panel when in Remote Control. Only monitoring actual signals, setting parameters, uploading and changing ID numbers is possible.

The control is changed between Local and External control locations by pressing the ***LOC / REM*** key. Only one of the Local Control devices (CDP 312R or DriveWindow) can be used as the local control location at a time.

Direction of actual rotation is indicated by an arrow.

Forward

```
1   ->    0.0 rpm 0
```

Reverse

```
1   <-    0.0 rpm 0
```

Start, Stop, Direction and Reference

Start, Stop and Direction commands are given from the panel by pressing the keys

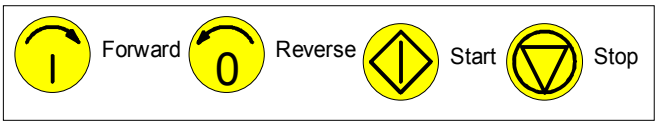
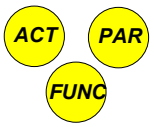
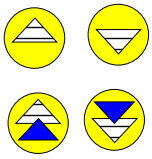


Table 3 - 9 How to Set the Reference

Step	Function	Press key	Display after key is pressed
1.	To display enter a Keypad Mode displaying the status row.		1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %
2.	To enter the Reference Setting Mode		1 L ->[0.0 rpm]0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %
3.	To change the reference. (slow change) (fast change)		1 L ->[1030.0 rpm]0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %
4.	To escape the Reference Setting Mode. The selected Keypad Mode is entered.		1 L -> 0.0 rpm 0 LED PANE 0 % MOTOR SP 0.0 rpm MOTOR TO 0.00 %

Chapter 4 – Software Description

Drive Functions

This chapter describes the typical functions of the drive.

General

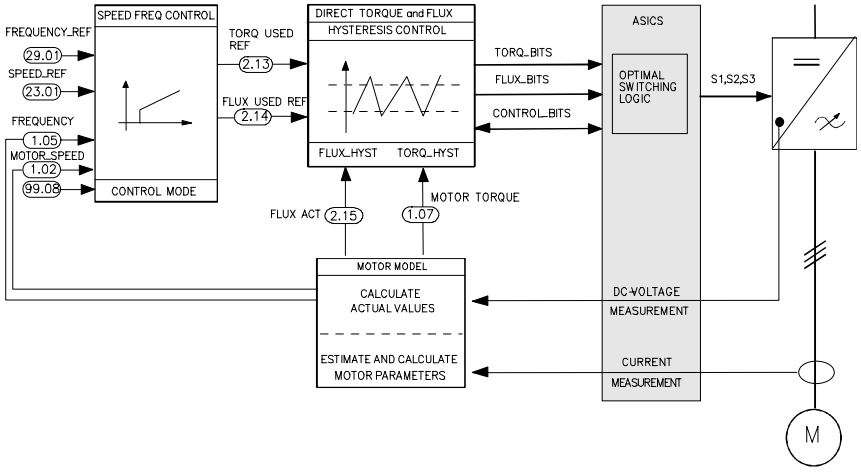


Figure 4 - 1 Block Diagram of the Direct Torque Control Method

The motor control of the frequency converter is based on the direct control of motor torque (DTC) by means of the stator flux. The inverter power semiconductors (switch) are regulated to achieve the required stator flux and torque of the motor. The power module “switching reference” is changed only if the values of the actual torque and the stator flux differ from their reference values more than the allowed hysteresis. The reference value for the torque controller comes either from the speed controller or directly from an external source.

The motor control requires measurements of the intermediate circuit voltage and two phase currents of the motor. The stator flux is calculated by integrating the motor voltage in vector space. The torque of the motor is calculated as a cross product of the stator flux and rotor current. By utilising the identified motor model, the stator flux estimate is improved. The measurement of the shaft speed is not needed for motor control. Good dynamic control performance is achieved providing the identification run is done during the commissioning.

The main difference between traditional control and DTC is that the torque control is made at the same time level as the control of the power switches (25 μs). There is no separate voltage and frequency controlled PWM modulator. All selections of the switches are based on the electromagnetic state of the motor.

DTC can only be applied by using high speed signal processing technology. Digital signal processors (MOTOROLA 560xx) are used in ACS 600 and ACS800 products to achieve this performance.

Application Program Identification

Each drive SW product has a product specific loading package, which contains all necessary software files to be downloaded to the RMIO board. The loading packages define, for example the inverter ratings. A Multi Block Programming Application type information is **ABXR7xxx** and it can be identified from the signal **4.01 SW PACKAGE VER** (xxx means SW revision number).

Program Boot

The application program on the RMIO board is saved into FPROM memory. After switching on the auxiliary power, the program starts routines for initialisation and loading of all tasks, parameters and application program from FPROM to RAM memory. This takes about 6 seconds. A reset is given at the end of the boot procedure, and the control mode of the drive is changed to REMOTE.

Control Diagrams

The speed control routine is executed once per millisecond in the fixed part of the program (speed ramp every 2 ms). The following Control Block diagram figures show the speed and torque control chains. Application blocks are executed at 20 ms (default) or 10 ms, 100 ms and 500 ms intervals.

Control Block Diagrams

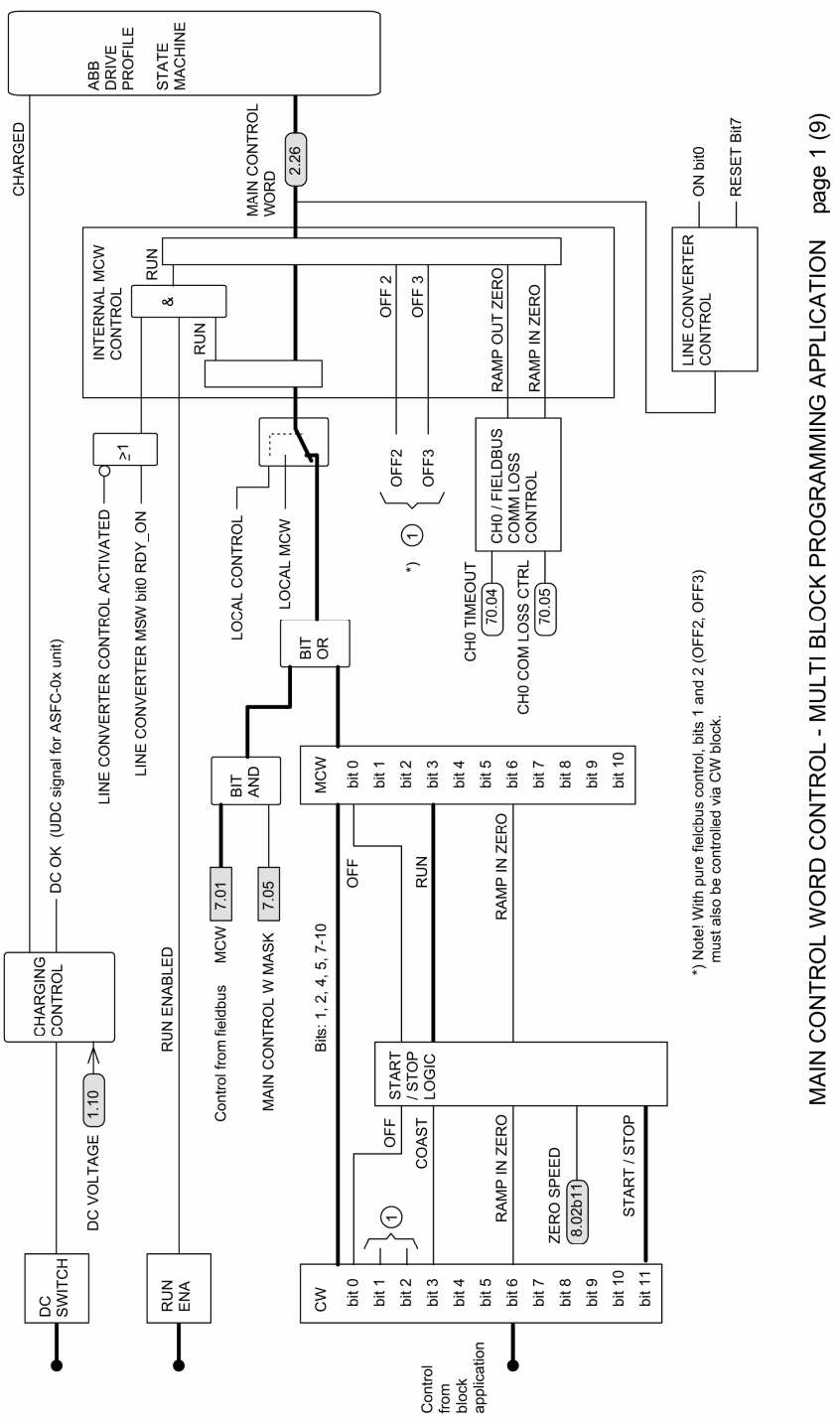


Figure 4 - 2 Main control word control

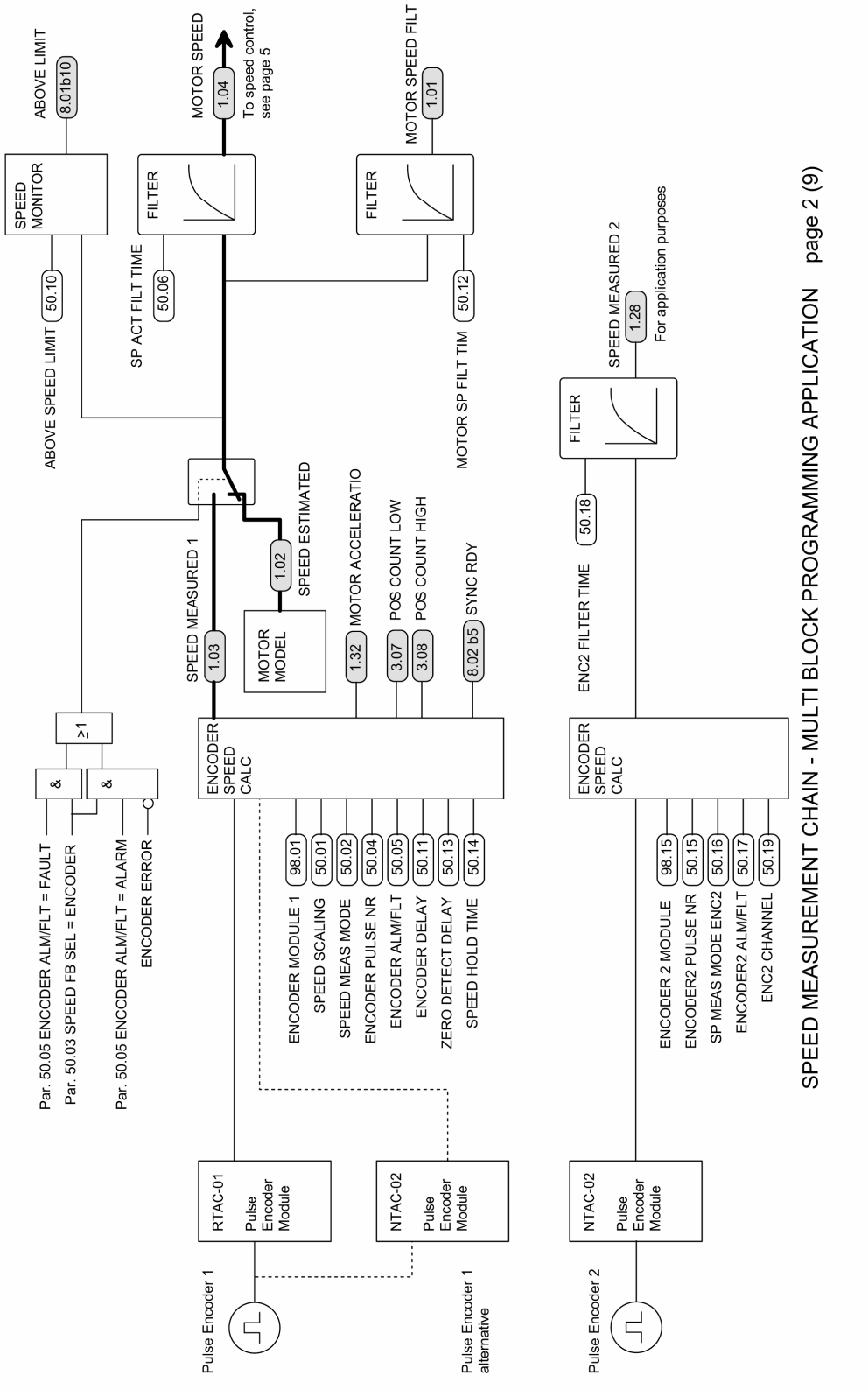


Figure 4 - 3 Speed measurement chain

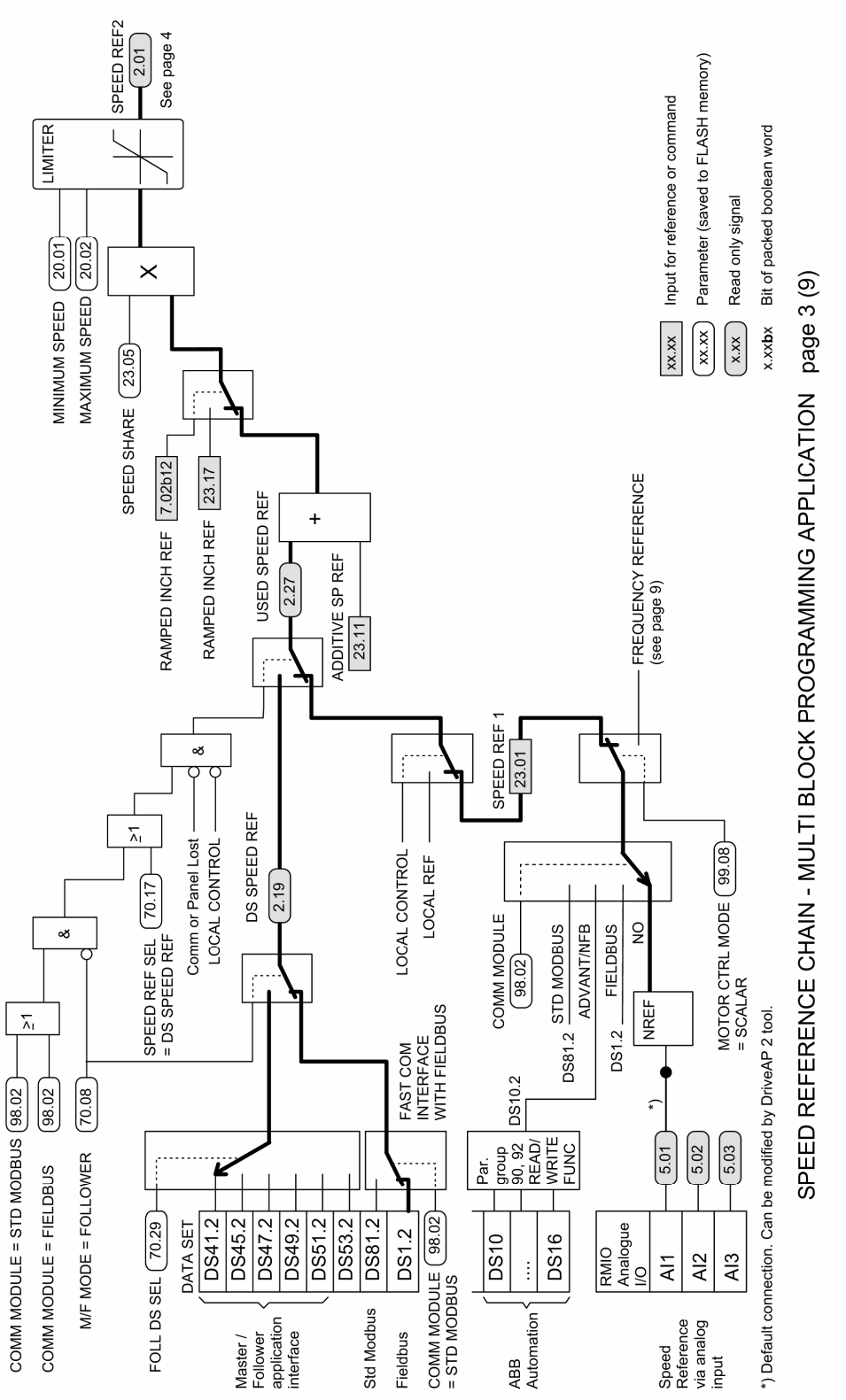


Figure 4 - 4 Speed reference chain

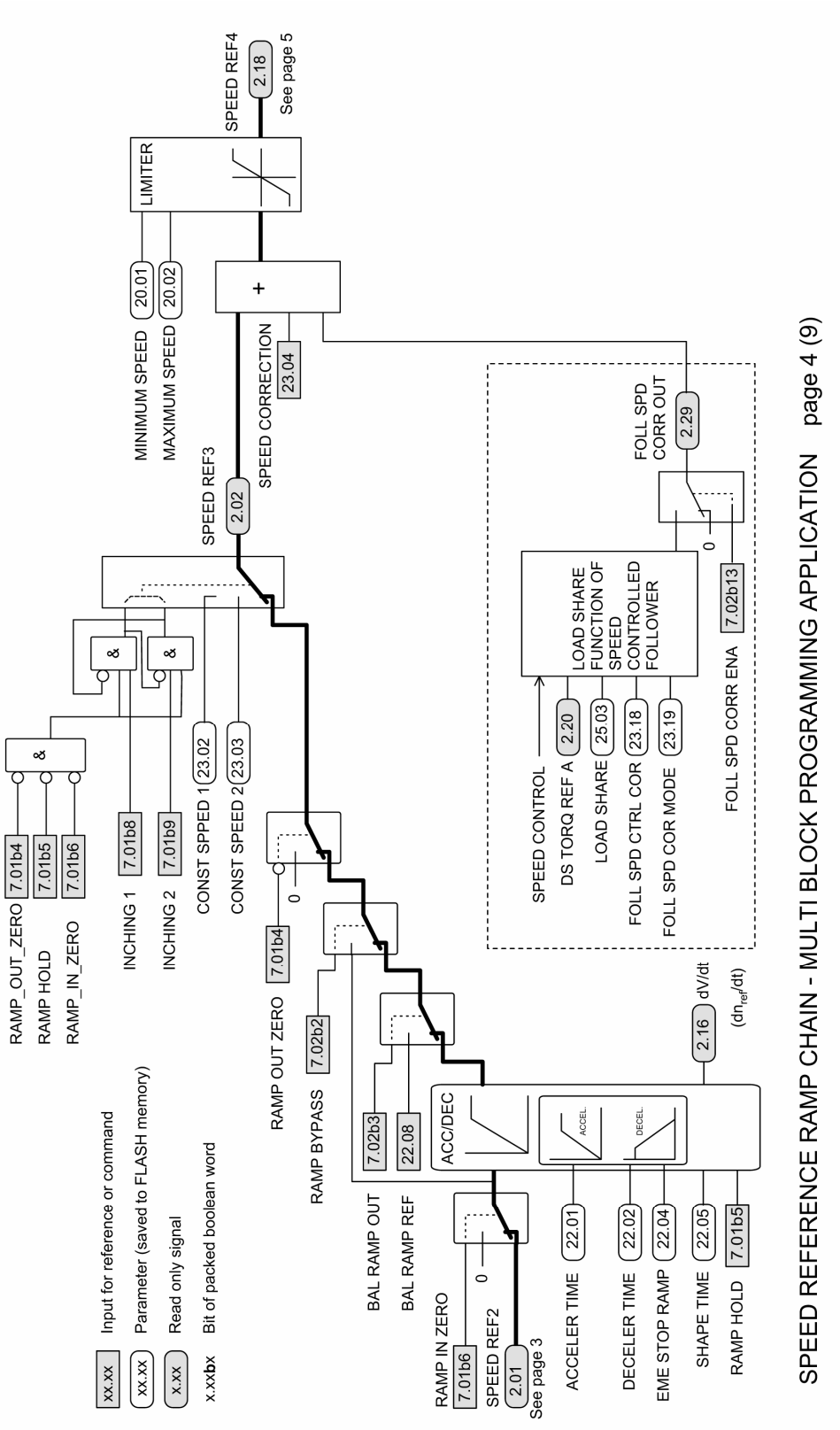


Figure 4 - 5 Speed reference ramp chain

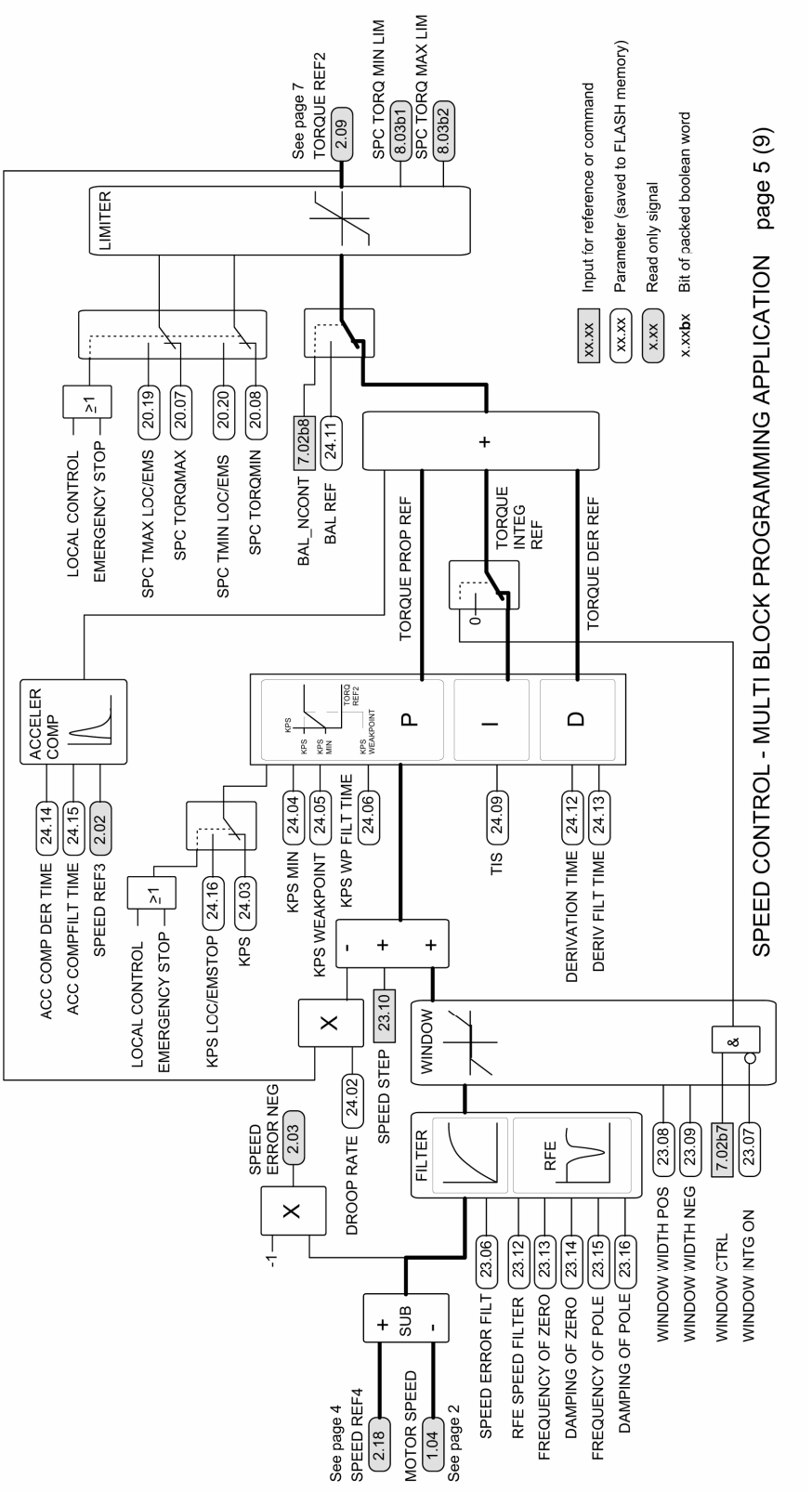


Figure 4 - 6 Speed control

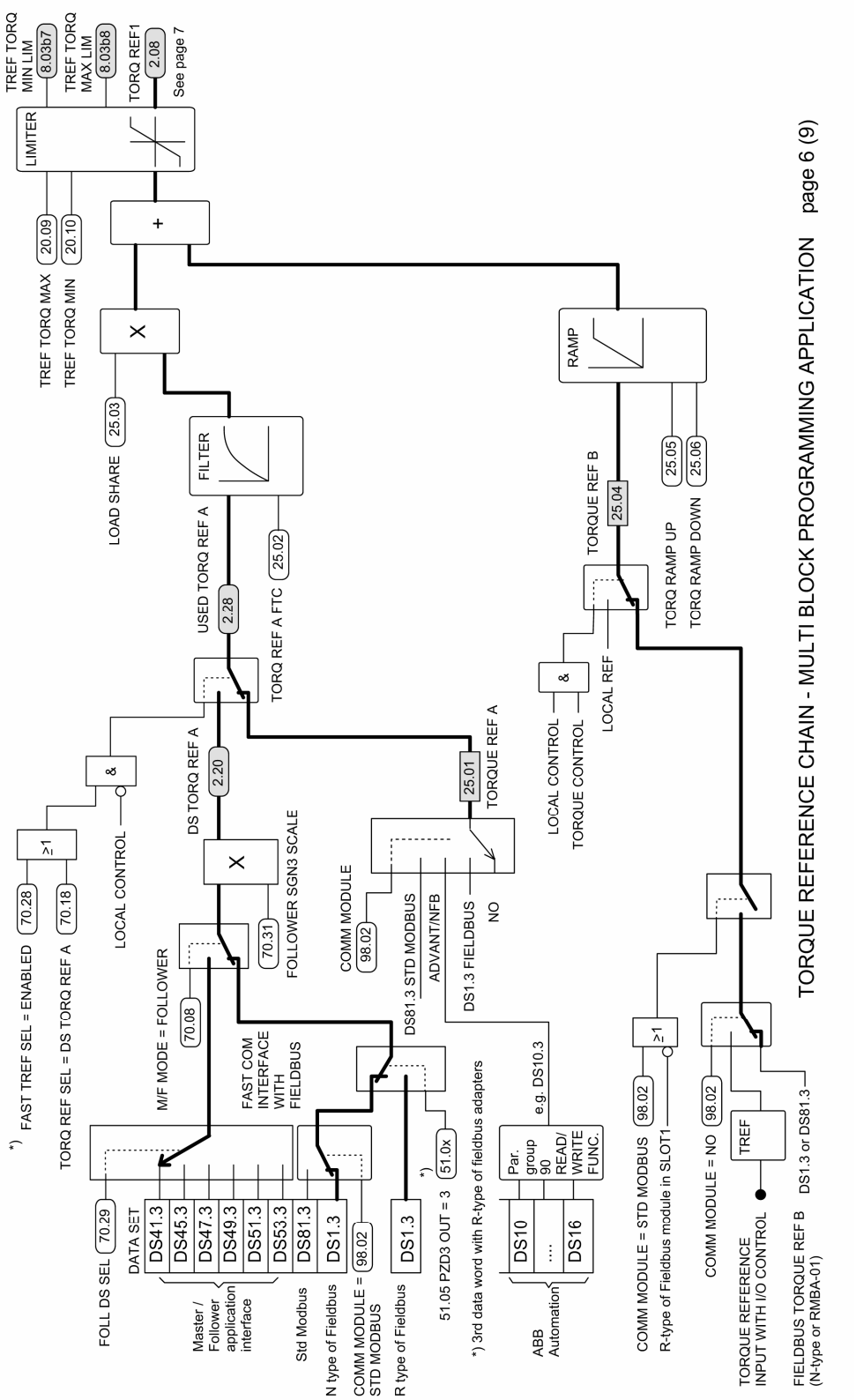


Figure 4 - 7 Torque reference chain

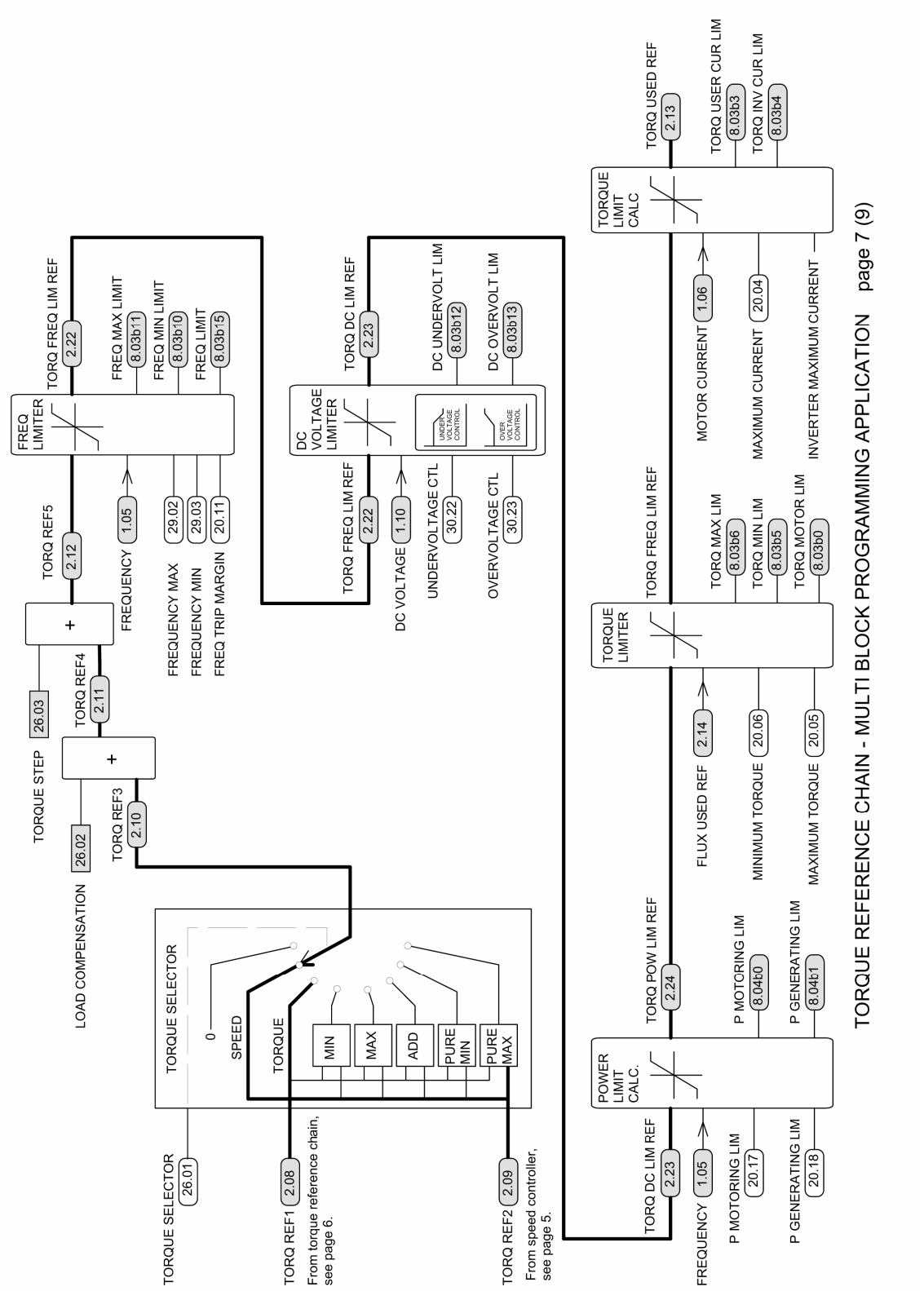


Figure 4 - 8 Torque reference chain

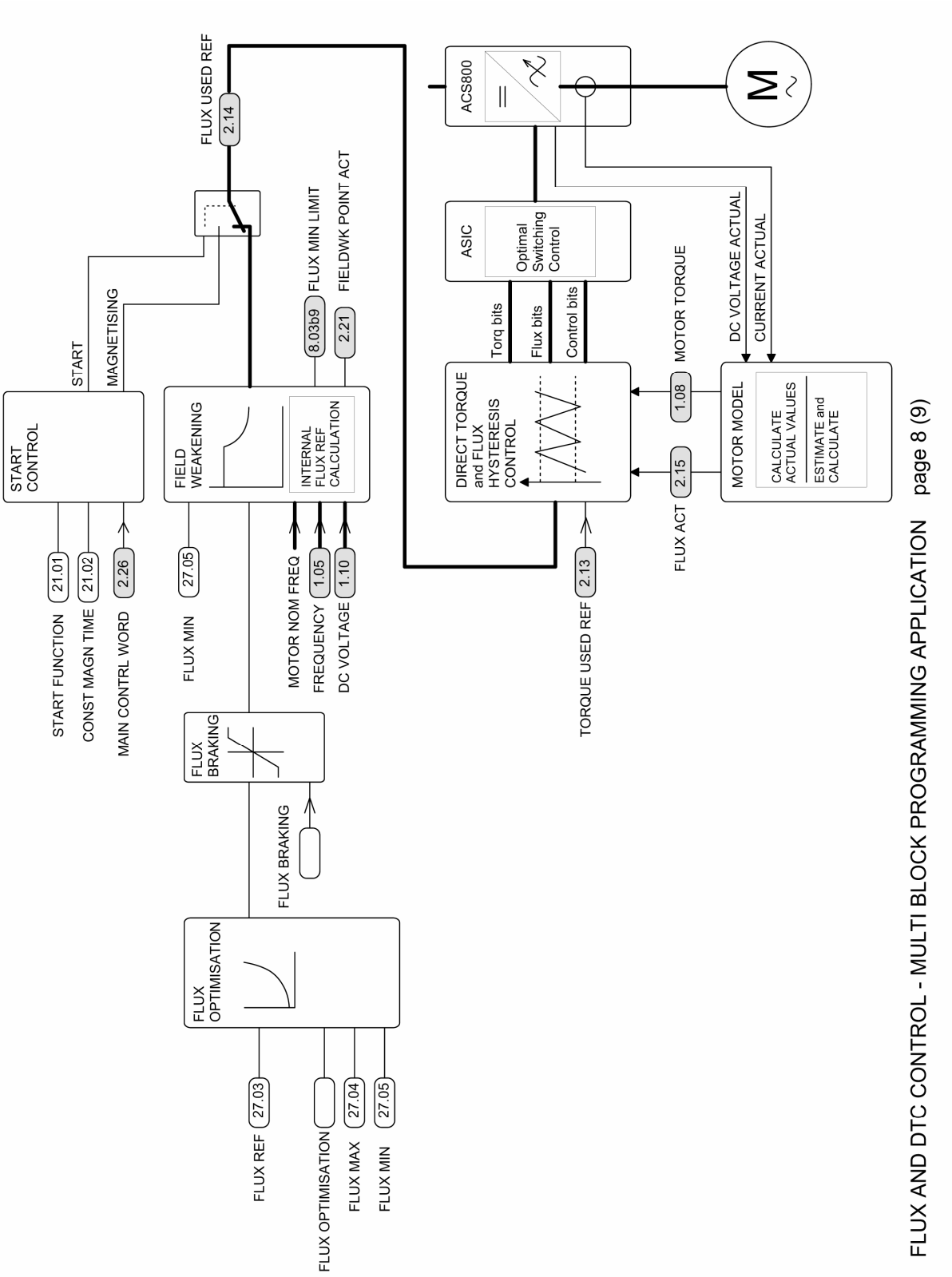


Figure 4 - 9 Flux and DTC control

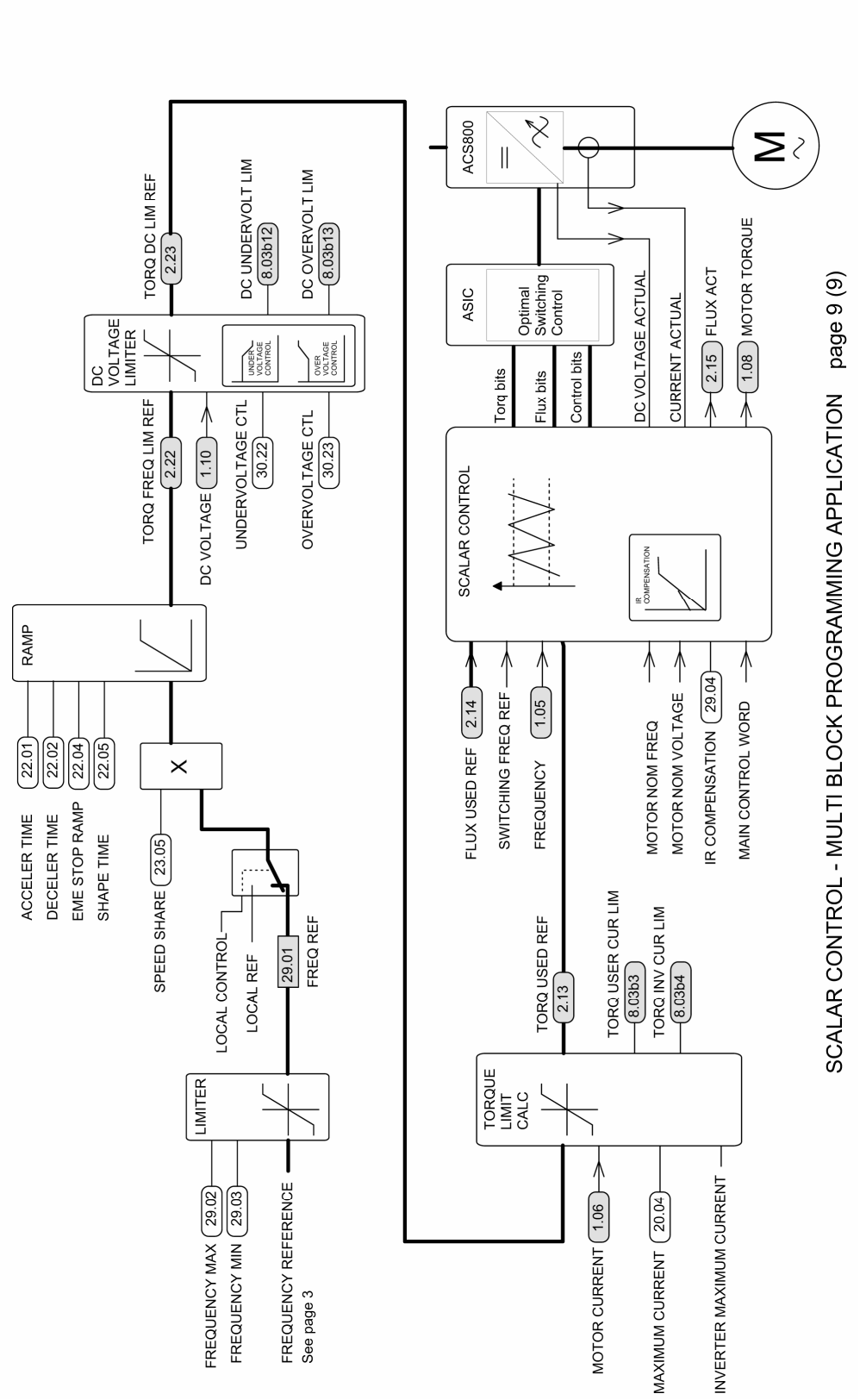


Figure 4 - 10 Scalar control

Control Modes

The Block Programming Application Program has two main control modes: **REMOTE** and **LOCAL**. The mode is selected by the LOC/REM key of the CDP312R control panel or the DriveWindow tool.

REMOTE Mode

The drive is controlled either through a fieldbus by an overriding system or by the drive I/O. The desired alternative is selected by parameter **98.02 COMM MODULE**. A digital input or fieldbus signal can also be used for changing the control location with Multi Block Programming Application.

LOCAL Mode

The local control mode is mainly used during commissioning and servicing. Local control is selected with the LOC/REM key on either the CDP312R control panel or DriveWindow. The controls from the overriding system have no effect in this mode. Parameter values can always be monitored and changed regardless of the selected control mode.

Emergency Stop

Emergency Stop Hardware

An Emergency stop function can be built by using block programming. See Main Control Word (MCW) bits 1 and 2. The Emergency stop mode is activated by controlling application programmed digital input to state FALSE. This input must command either bit 1 (coast stop) or 2 (ramp stop) to FALSE. See MCW description.

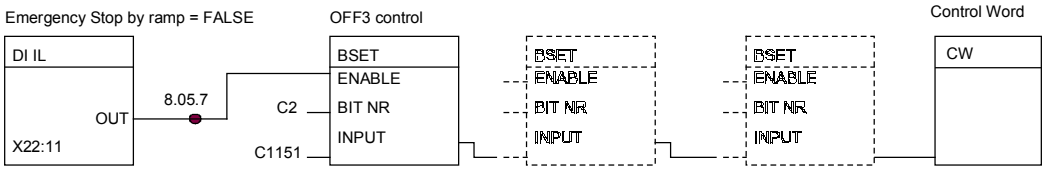


Figure 4 - 11 Programming principle of emergency stop OFF3.

The emergency stop feedback signal can be programmed by using application blocks to be sent through a relay output. The purpose of the feedback signal is to acknowledge that the emergency stop function has been received and the drive program is running. If no feedback is received, the main AC supply will be switched off by hardware after the short delay defined by the ACU (Auxiliary Control Unit) adjustable relays (MultiDrive systems).

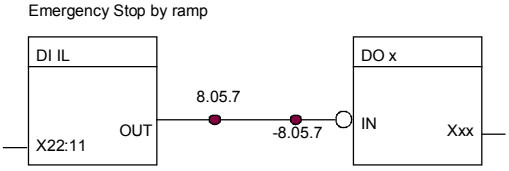


Figure 4 - 12 Example Programming principle of emergency stop feedback signal

Note: When an emergency stop signal is detected, the emergency stop cannot be cancelled even though the signal is cancelled (emergency stop push button is released).

Emergency Stop Modes

If the motor is already at zero speed when the drive receives an emergency stop signal (MCW bits 1 and 2) the following actions are taken:

- Running and magnetising of the motor is prevented
- Bit 5 of the **MAIN STATUS WORD (MCW)** is set to 0
- Bit 1 of **ALARM WORD 1 (9.04) is set to 1**
- An alarm "**EME STOP**" is indicated in the fault logger.

Action if the Motor Is Running

It the motor is running when the drive receives an emergency stop signal, the following actions are taken:

- The drive is stopped according to the application.
- The application program locks the emergency stop procedure until the motor has reached zero speed and the **(MCW) MAIN CTRL WORD (7.01)** bit 0 is set to "0" state
- An alarm "**EME STOP**" is indicated in the fault logger.

Prevention of Unexpected Start

The Prevention of Unexpected Start function disables the control voltage of the power semiconductors, thus preventing the inverter from generating the AC voltage required to rotate the motor. By using this function, short-time operations (like cleaning) and/or maintenance work on non-electrical parts of the machinery can be performed without switching off the AC power supply to the drive.

The drive and machinery must be stopped using the appropriate stopping mode before using the Prevention of Unexpected Start function. The function must not be used for stopping the drive when the drive is running.

WARNING! The Prevention of Unexpected Start function does not disconnect the voltage of the main and auxiliary circuits from the drive. Therefore maintenance work on electrical parts of the drive or the motor can only be carried out after isolating the drive system from the main supply.

The prevention of Unexpected function operates as follows:
The operator activates the Prevention of Unexpected Start function by opening a switch on a control desk. The drive application program diagnostics routine receives an internal signal from the AINT/NINT board that a prevention of Unexpected Start input has been detected. Then the voltage supply of the AGPS/NGPS-0x board is disconnected.

Drive is Stopped

The program performs the following actions:

- Activates the alarm "**START INHIBI**" (start inhibition).
- Sets **ALARM WORD_1 (9.04)** bit 0 to 1.
- Sets **AUXILIARY STATUS WORD (8.02)** bit 8 to 1.
- Sets **START INHIBI WORD (8.21)**.

If a start command is given while the Prevention of the Unexpected Start function is active, the fault "**START INHIBI**" is activated (start inhibition).

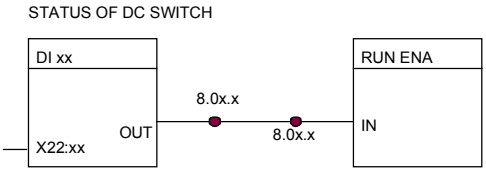
Drive is Running

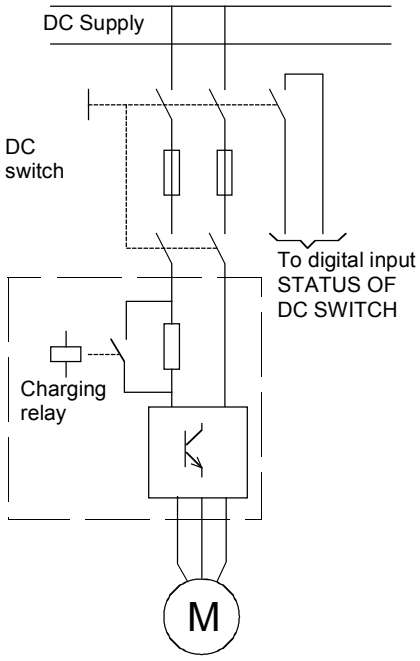
Drive is stopped by coasting, if the function has been activated during run. This is at first hardware-controlled; the program only provides diagnostics at this point.

- Activates a fault "**START INHIBI**" (start inhibition).
- Sets **START INHIBI WORD (8.21).**

Charging Logic of Inverter

If the multidrive drive section includes optional DC switch with R2i…R7i inverter modules, a position of the DC switch must be wired to charging logic software via digital input. Then this signal must be programmed using function blocks with DriveAP 2 program. See next diagram.





Three conditions must be fulfilled before the charging relay can be energised: DC voltage level or DC voltage, derivative = 0, feedback digital input = 1.

When the DC switch is opened, control pulses of the inverter must be blocked by means of the digital input and DC SWITCH function block in Multi Block Programming Application software to open the charging relay. In case of undervoltage in the supply, the charging relay opens after the undervoltage trip.

Communication

DDCS Channels in RMIO Controllers

In the following table it is described how the DDCS channels on the RMIO board are used by means of the RDCO option (**D**DCS **C**ommunication **O**ption module).

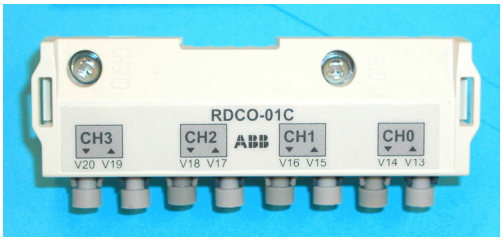


Figure 4 - 13 DDCS communication option module RDCO-01.

The types of the optic components are also given (5 MBd or 10 MBd). Always use the same type at both ends of an optic fibre.

Table 4 - 1 Usage and Type of DDCS Channels in RMIO Controller

CH No	STANDARD USAGE	RMIO		
		DDCS Communication Option Module		
	ACS 600/ACS800	RDCO-01	RDCO-02	RDCO-03
CH0	- Applic.Controller - Fieldbus Interface - Follower	10 MBd DDCS/ DriveBus	5 MBd	5 MBd
CH1	- Optional I/O - Encoder 2	5 MBd	5 MBd	5 MBd
CH2	- Master / Follower - Encoder 2 - Fast AI	10 MBd	10 MBd	5 MBd
CH3	- DriveWindow, DriveAp, *NETA-01* (PC, 1 Mbit/s)	10 MBd	10 MBd	5 MBd

Several communication protocols are supported by Nxxx-type of fieldbus adapters connected to DDCS channel 0 (CH0) on the RMIO board. The communication protocol of channels CH0...CH3 is DDCS (Distributed Drives Communication System). The channel CH0 supports Drivebus and DDCS protocols. The Drivebus master can send one message that contains 1 data set for 10 s during a 1 ms. The DDCS link between the overriding system and the drive uses data sets for the information exchange. Each data set includes three 16-bit data words. The link sends the information of a transmitted data set to the data set table in the drive program and returns the content of the next data set to the overriding system as a “return message”. The data received from the overriding system affects only the RAM (not FPROM) memory on the RMIO board.

N-type Fieldbus Communication Adapter Modules

(Type Nxxx) fieldbus communication adapters mainly use data sets 1 and 2 between the fieldbus adapter module and the RMIO board. Some of the adapters can transfer more data. For that purpose there is an offset parameter for the first transmitted data set in parameter group 51. For example, with NPBA-12, by setting the parameter **51.06 DATA SET INDEX** to FBA DSET 10, the first data set can be written to data set 10. In this case, select **98.02 COMM MODULE** = ADVANT/N-FB. Set also parameter **71.01 CH0 DRIVEBUS MODE** off and reconnect the auxiliary power to the RMIO board.

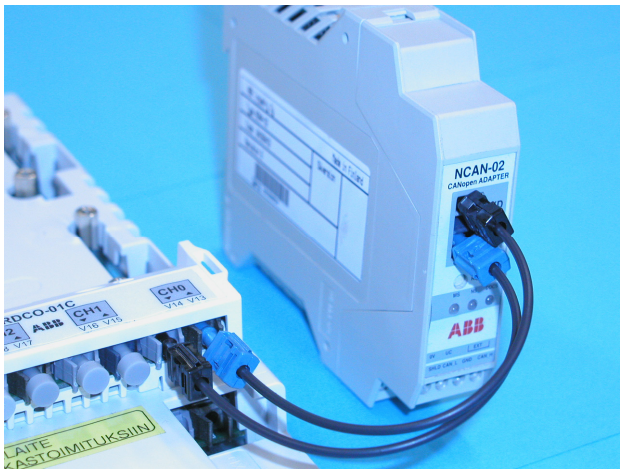


Figure 4 - 14 NCAN-02 fieldbus module installed on CH0 of RDCO-01C option.

R-type Fieldbus Communication Adapter Modules

Type Rxxx fieldbus modules are installed in Slot1 of RMIO board and activated by setting parameter **98.02 COMM MODULE** to FIELDBUS (except with an RMBA-01 Modbus adapter).

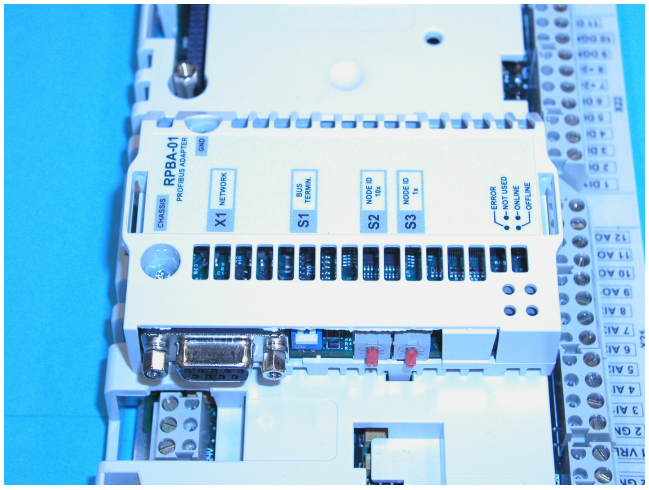
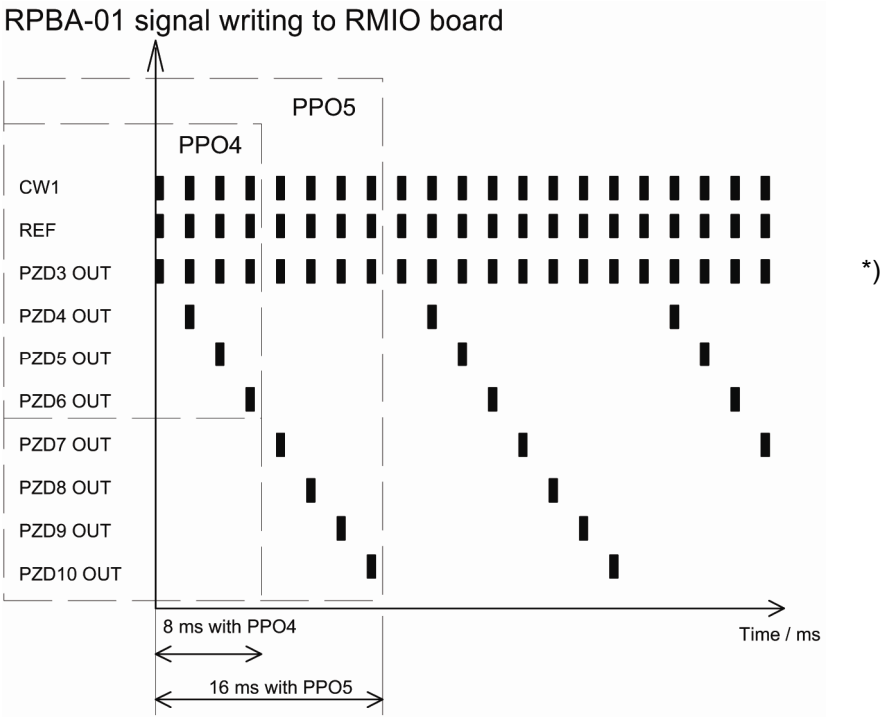


Figure 4 - 15 RPBA-01 fieldbus module installed in Slot 1 on to the RMIO board.



*) With RPBA-01 revision J

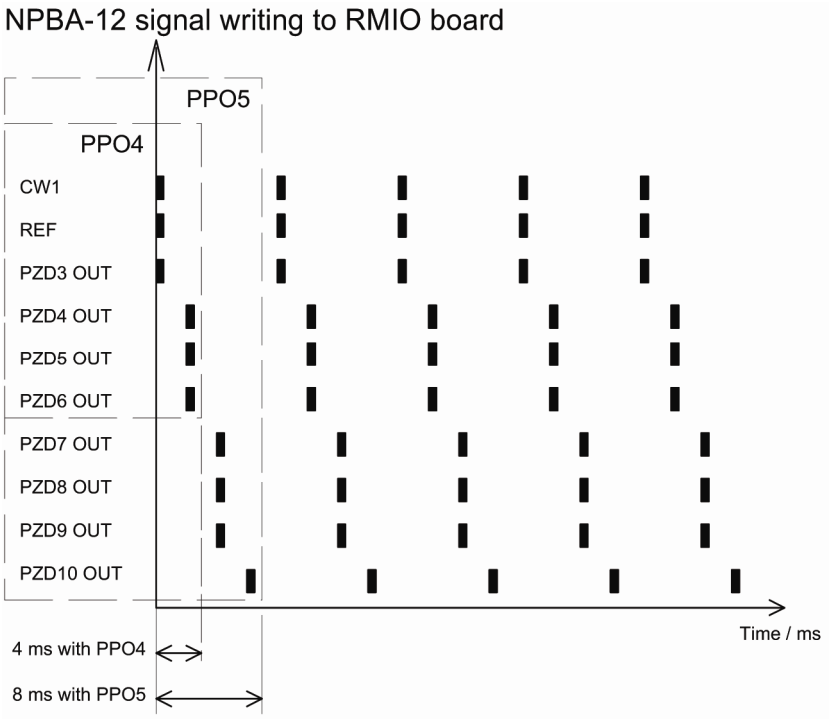


Figure 4 - 16 Timing diagram for sent and received messages between the fieldbus module and the RMIO board. The interval between the two messages is 2 ms. Sent (e.g. PZD3 OUT) and received message (PZD3 IN) have a 1 ms time difference.

Fieldbus Adapter Selections and Signals

The signal sources and targets have been fixed as shown in the table below. This mode is applied with selection **FIELDBUS** at parameter **98.02 COMM MODULE**.

1 = **NO**	I/O control
2 = **FIELDBUS**	Type Rxxx and Nxxx fieldbus adapter
3 = **ADVANT/N-FB**	for ABB controllers and type Nxxx fieldbus adapters with dataset offset function
4 = **STD MODBUS**	Type RMBA-0x fieldbus adapter

Table 4 - 2 Fixed fieldbus signals with selection FIELDBUS and Nxxx or RMBA-0x type of module.

Data Set	Index	Signal	Source or Target	
1	index 1	MCW	7.01	MAIN CTRL WORD
	index 2	REF1	23.01	SPEED REF in DTC or
			29.01	FREQ REF in Scalar control
	index 3	REF2	25.04	TORQUE REF B
2	index 1	MSW	8.01	MAIN STATUS WORD
	index 2	ACT1	1.01	MOTOR SPEED FILT
	index 3	ACT2	1.08	MOTOR TORQUE

Register Addresses with Modbus Link

With RMBA-01 Modbus module, the rest of signals and parameters are accessed by using the register read and write function in the Modbus master. See the *RMBA-01 Modbus Adapter User's Manual* (3AFE 64488851, English).

Modbus is designed for integration with Modicon PLCs or other automation devices, and the services closely correspond to the PLC architecture. The drive looks like a Modicon PLC on the network. See parameter group 52 for configuration of the link.

Register Read and Write

The drive parameter and data set information is mapped into the 4xxxx register area. This holding register area can be read from an external device, which can modify the register values by writing to them.

There are no setup parameters for mapping the data to the 4xxxx registers. The mapping is pre-defined and corresponds directly to the drive parameter grouping, which is being used by the local drive panel.

All parameters are available for both reading and writing. The parameter writes are verified for correct value and for valid register addresses. Some parameters, such as actual values, never allow write access, some parameters, such as setup variables allow write access only when the drive is stopped, and some parameters, such as reference values, can be modified at any time.

Register Mapping

The drive parameters are mapped to the 4xxxx area so that:
40101…40999 registers are reserved for the signal values
41000…49999 registers are reserved for the parameter data

In this mapping, the thousands and hundreds correspond to the group number, while the tens and ones correspond to the parameter number within a group.

Other Rxxx type of Fieldbus Modules

Table 4 - 3 Fixed fieldbus signals with selection FIELDBUS when type Rxxx modules are used (e.g. RPBA-0x, RDNA-0x…)

Data Set	Index	Signal	Source or Target	
1	index 1	MCW	7.01	MAIN CTRL WORD
	index 2	REF1	23.01	SPEED REF in DTC or
			29.01	FREQ REF in Scalar control
2	index 1	MSW	8.01	MAIN STATUS WORD
	index 2	ACT1	1.01	MOTOR SPEED FILT

With type Rxxx modules, other signals in and out are accessed by assigning data words in parameter group 51. For details on the parameters, refer to the manual (chapter Programming) of the fieldbus module.

Block Programming with Profibus Signals

PZD3 IN…PZD10 IN and PZD3 OUT…PZD10 OUT signals can be visualised with RPBA-01 by means of application blocks if signals are needed in the block programming application. However, if there is a need to assign process data (PZD) directly to the speed or torque control chain, it can be defined directly without function blocks by group 51 parameters.

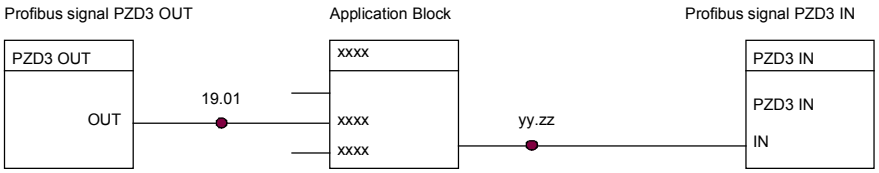
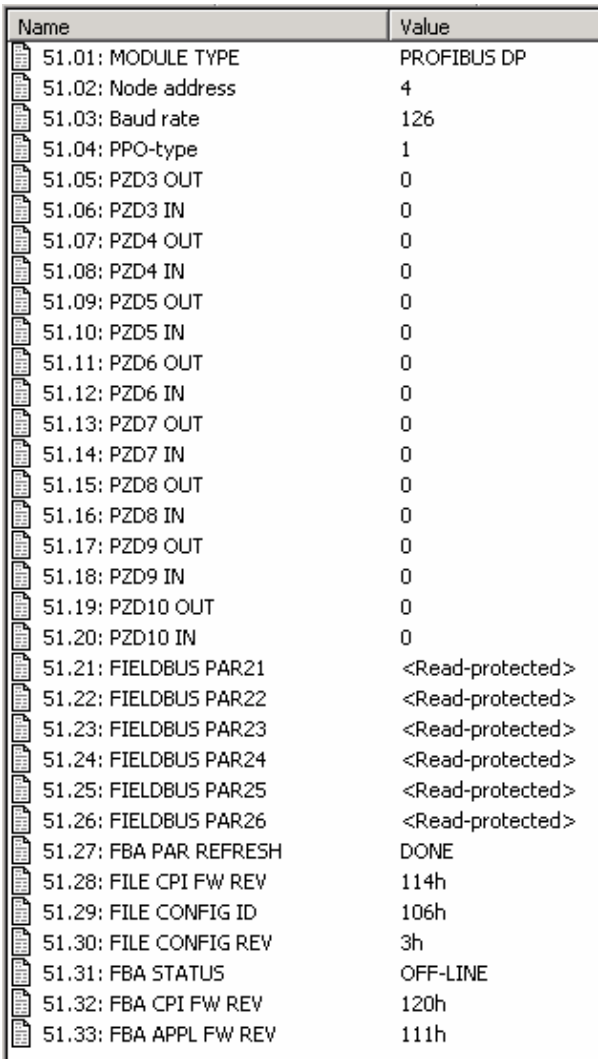


Figure 4 - 17 Profibus PZD3 OUT block is connected to the block programming application via parameter 19.01 DATA1. Output of the application block can be read directly for fieldbus.

Using Templates in DriveAP Programming

DriveAP 2.0 includes two templates; one with Profibus blocks, another without them. Select the right one before you start application programming in off-line mode.
Note: Before downloading of the application to the drive with Profibus blocks, there must be an RPBA-01 module installed in Slot1 of the RMIO.



Name	Value
51.01: MODULE TYPE	PROFIBUS DP
51.02: Node address	4
51.03: Baud rate	126
51.04: PPO-type	1
51.05: PZD3 OUT	0
51.06: PZD3 IN	0
51.07: PZD4 OUT	0
51.08: PZD4 IN	0
51.09: PZD5 OUT	0
51.10: PZD5 IN	0
51.11: PZD6 OUT	0
51.12: PZD6 IN	0
51.13: PZD7 OUT	0
51.14: PZD7 IN	0
51.15: PZD8 OUT	0
51.16: PZD8 IN	0
51.17: PZD9 OUT	0
51.18: PZD9 IN	0
51.19: PZD10 OUT	0
51.20: PZD10 IN	0
51.21: FIELDBUS PAR21	<Read-protected>
51.22: FIELDBUS PAR22	<Read-protected>
51.23: FIELDBUS PAR23	<Read-protected>
51.24: FIELDBUS PAR24	<Read-protected>
51.25: FIELDBUS PAR25	<Read-protected>
51.26: FIELDBUS PAR26	<Read-protected>
51.27: FBA PAR REFRESH	DONE
51.28: FILE CPI FW REV	114h
51.29: FILE CONFIG ID	106h
51.30: FILE CONFIG REV	3h
51.31: FBA STATUS	OFF-LINE
51.32: FBA CPI FW REV	120h
51.33: FBA APPL FW REV	111h

Figure 4 - 18 Example view of fieldbus parameters with an RPBA-XX Profibus module.

Note: Parameter groups 90…93 have no function with type Rxxx fieldbus modules and therefore are not visible.

Addressing of Data Using Data Sets 10…17

This mode is typically used when the overriding system is able to communicate by using the DDCS protocol and there is a need to transfer several control signals and actual values cyclically. The mode is selected by setting parameter **98.02 COMM MODULE** to **ADVANT/N-FB**. Every data set has a specified read and write task interval in the drive program. See the sections ”*Received Data Set Table*” and ”*Transmitted Data Set Table*”. Addresses are assigned in the drive according to parameter groups 90...93, which are not sent through the link.

Integer Scaling on the DDCS Link

Due to the effectiveness of the communication method, the data is transferred as integer values through the link. Therefore the actual and reference values have to be scaled to 16-bit integers for the DDCS link. The integer scaling factor is mentioned in the AMC table parameter list in the column Integer scaling.

05	(161.3)	CURRENT		
Index	Description:	Measured motor current absolute value.		
unit: A	type: R	Min: 0	Max:	Integer scaling: 10 == 1A

Each parameter has two different gateways to write the value: integer format or decimal. Finally, the result is exactly the same in the RMIO program. This relationship is always shown in the signal and parameter table as shown above.

Received Data Set Table

Data set target addresses are assigned, using the CDP 312R control panel or DriveWindow, in parameter group 90 and valid when par. 98.02 COMM MODULE is set to (=) **ADVANT/N-FB**.

Addresses for Data Received from the Overriding System

Data Set Number	Data Set Index	Interval RMIO	Default Address	Parameter Name (default values)	Address Set Parameter
10 [1]	1	**2 ms**	701	MAIN CTRL WORD	90.01
	2	**2 ms**	2301	SPEED REF	90.02
	3	**2 ms**	2501	TORQ REF A	90.03
12 [1]	1	**4 ms**	702	AUX CTRL WORD	90.04
	2	**4 ms**			90.05
	3	**4 ms**			90.06
14	1	**20 ms**			90.07
	2	**20 ms**			90.08
	3	**20 ms**			90.09
16	1	**20 ms**			90.10
	2	**20 ms**			90.11
	3	**20 ms**			90.12

[1] Boolean data type parameters are not supported. If boolean data type parameters need to be set from external control system, use data sets 14…24.

Transmitted Data Set Table

Data se source addresses are set by the CDP 312R control panel or DriveWindow, in parameter group 92 and valid when par. 98.02 COMM MODULE is set to (=) **ADVANT/N-FB**.

Signal Addresses for the Data Transmitted to the Overriding System

Data Set Number	Data Set Index	Interval RMIO	Default Address	Parameter Name (default values)	Address Set Parameter
11 [1)]	1	**2 ms**	801	MAIN STATUS WORD	92.01
	2	**2 ms**	102	SPEED MEASURED 1	92.02
	3	**2 ms**	209	TORQUE REF 2	92.03
13 [1)]	1	**4 ms**	802	AUX STATUS WORD	92.04
	2	**4 ms**	101	MOTOR SPEED	92.05
	3	**4 ms**	108	TORQUE	92.06
15	1	**20 ms**	901	FAULT WORD 1	92.07
	2	**20 ms**	902	FAULT WORD 2	92.08
	3	**20 ms**	906	FAULT WORD 3	92.09
17	1	**20 ms**	904	ALARM WORD 1	92.10
	2	**20 ms**	905	ALARM WORD 2	92.11
	3	**20 ms**			92.12

[1)] Boolean data type parameters are not supported. If boolean data type parameters need to be set to the external control system, use data sets 15…25.

I/O Extension Devices on Channel CH1

All of the drive I/O extension devices outside of the RMIO board are connected in a ring to channel 1 (CH1) on the RMIO board. The RMIO is the master in the communication link. Each device has a unique address when connected to CH1. The address is set with rotary switches on the device. Before use, each I/O device must be activated from parameter Group 98. A second encoder (Encoder 2) can also be connected to CH1 (selected by parameter 50.19 ENC2 CHANNEL).

Master/Follower Link on Channel CH2

A Master/Follower link can be formed by connecting the CH2 channels of two or more drives in a ring. CH0 can be also used in the follower drives, if available in the configuration. Parameters 70.07 to 70.14 define the mode and the references. The message type is broadcast. In the same link it is possible to use point-to-point communication between the master and two follower drives (nodes 2 and 3). See parameter group 94.

FAST AI and Encoder 2 on Channel CH2

A second pulse encoder module (ENCODER 2) or FAST AI can be connected to CH2. Only one module at a time can be used.

Commissioning and Programming Tools on Channel CH3

The DriveWindow commissioning and DriveAP 2.*x* programming tools can be connected to channel CH3 on the RMIO board of each drive, either in a ring, or a star connection using NDBU-xx branching units. CH3 Node numbers must be set for each drive unit before starting the communication through the connection: see parameter **70.15 CH3 NODE ADDR**. This setting can be made by a point-to-point connection with either the control panel CDP 312R or DriveWindow. The new node address becomes valid after cycling the auxiliary power of the RMIO board. RMIO board channel 3 (CH3) has been configured to Follower from the communication point of view.

DriveWindow and DriveAP2.0 tools can be used simultaneously in the PC. See the *DriveWindow 2 User's Manual,* section *Several Clients* in chapter *Advanced Information.*

Ethernet Adapter Module

NETA-01 Ethernet Adapter module instead of DriveWindow and DriveAP can be connected to CH3 for remote diagnostics purposes.

Modbus Panel Link

The CDP 312R Control Panel, NLMD-01 LED Monitoring Display panel or DriveWindow *Light* can be connected to the drive through an internal Modbus link. The default communication speed is 9600 bit/s (8 data bits, 1 stop bit, odd parity). The connected device is the master of the communication link. NBCI-01 bus connection units must be used if the distance between the panel and drive is over three metres.

Application Control Word CW

The block CW (Control Word) has mainly the same function as ABB Drives profile, except bit 11 controls start/stop by normal ramp and bit 3 RUN ENABLE is used to coast the drive. By means of these features, the block CW simplifies normal ramp stop control.

ABB Drive States

The ABB Drive Profile is a PROFIBUS-based model describing the drive interface between the state transitions under control of an overriding control system. In order to achieve this, the ABB Drive Profile defines general states. A control word generally commands the transitions between these states. The table below defines the most important states and the ABB Drive Profile names for these states.

Table 4 - 4 ABB Drive Profile States, see Chapter 5 – Signals for more Information on Status and Commands.

Action	Name of state	Explanation
Switch on inhibit	**ON_INHIBIT**	The drive is moved to this state after the EMERGENCY OFF/STOP or TRIPPED state. The main idea is to guarantee that the ON command is removed. Drive is moved to an OFF state after the ON command has been removed.
Not ready for switch on	**OFF**	The drive stays in this state as long as the EMERGENCY OFF/STOP commands are active. After these commands have been deactivated and the command “Control from the automation unit” is activated, the drive is moved to the RDYON state.
Ready to switch on	**RDY_ON**	After an “ON” command the drive is allowed to perform equipment specific actions. For drives these are: - Flux ON - Stator pulses inhibited
Ready	**RDY_RUN**	After a “RUN” command the drive performs - enabling internal controllers, when all internal controllers are ready, the drive is moved to RDYREF state.
Enable operation	**RDY_REF**	The drive is following the given references.
RFG: enable output		This is actually the speed ramp control, all drive controllers are activated but the output of the speed ramp is clamped to zero. This causes the drive to decelerate to zero speed and regulate zero speed.
RFG: Acceleration enabled		This is also the speed ramp control, the ramping can be started or stopped (HOLD).
Operating status		This is also the speed ramp control, the input of ramp is released.
OFF 1 active		The ON command is removed. The drive deactivates all of its functions which were commanded by the ON command e.g. Drive is first decelerated to the zero speed by deceleration stop ramp. - Stator and flux current to zero. After this the drive is shifted to the OFF state.
OFF 2 active	**OFF_2_STA** EMERGENCY OFF	The voltage of the drive is immediately removed (coast stop), all functions created by the ON command are removed and after that the drive is shifted to ON INHIBIT state.
OFF 3 active	**OFF_3_STA** EMERGENCY STOP	The drive is decelerated to zero speed according to parameter 21.04 EME STOP MODE, all of the functions created by the ON command are removed and after that the drive is shifted to the ON INHIBIT state.
Fault	**TRIPPED**	After tripping, the drive remains in this state as long as the rising edge of the RESET signal is sent to the drive. The drive is shifted to the ON INHIBIT state, so the ON command must first be turned OFF before the sequence is allowed to continue.

Main Control Word (MCW)

The table below defines the use of the ABB Drive Profile command word for drives application.

Table 4 - 5 Main Control Word Bits 0…10, see Chapter 5 – Signals for more Information on Status and Commands.

Bit	Name	Value	Description
0	**ON**	1	Command to "**RDYRUN**" state.
	OFF1	0	Command to "**OFF**" state. (Can go immediately to "RDYON" state if there are no other interlocking (OFF 2 / OFF 3). Drive stops down to the zero speed by ramp. Ramp time is defined by parameter 22.02 DECELER TIME. All pulses are removed, when in zero speed. Restart is not possible before zero speed.
1	**OFF 2**	1	No OFF 2 (Emergency OFF)
		0	Command to "**ON INHIBIT**" state. Inhibit pulses and drive coasts down. Sequence control handles: - Stator and flux current to zero - All pulses are removed
2	**OFF 3**	1	No OFF 3 (Emergency STOP)
		0	Command to "**ON INHIBIT**" state. Digital input 1 in the hardware operates parallel with this bit. Drive decelerates to zero speed using deceleration value of parameter 22.04 EME STOP RAMP. After zero speed the sequence control handles: - Stator and flux current to zero - All pulses are removed
3	**RUN**	1	**Enable Operation** Command to **RDYREF** states. Enable stator/armature pulses. Raise flux to the nominal reference if not already in that value. Then accelerate via speed ramp to the given speed reference setpoint.
		0	**Inhibit Operation**. Inhibit inverter pulses and the drive coasts, and goes into the "READY" status (refer to control word bit 0)
4	**RAMP-OUT-ZERO**	1	Operating condition.
		0	Ramp-function generator output is set to zero. Drive ramps down along the current limit or at the DC link voltage limit.
5	**RAMP-HOLD**	1	Enable ramp-function generator.
		0	Speed ramping stopped. Freeze the actual setpoint from the ramp-function generator.
6	**RAMP-IN-ZERO**	1	Enable setpoint
		0	Inhibit setpoint. Speed ramp input is forced to zero.

7	**RESET**	1	Fault resetting with a positive edge.
		0	No significance
8	**INCHING_1**	1	Drive accelerates as fast as possible to inching setpoint 1, if following conditions are fulfilled: - bit **RAMP-OUT-ZERO** = 0 - bit **RAMP-HOLD** = 0 - bit **RAMP-IN-ZERO** = 0
		0	Drive brakes as fast as possible if INCHING_1 was previously ON
9	**INCHING_2**	1	Drive accelerates as fast as possible to inching setpoint 2, if following conditions are fulfilled: - bit **RAMP-OUT-ZERO** = 0 - bit **RAMP-HOLD** = 0 - bit **RAMP-IN-ZERO** = 0
		0	Drive brakes as fast as possible if INCHING_1 was previously ON
10	**REMOTE_CMD**	1	Overriding computer is requesting to control the drive
		0	No control from the overriding system, except OFF1, OFF2 and OFF3 commands.

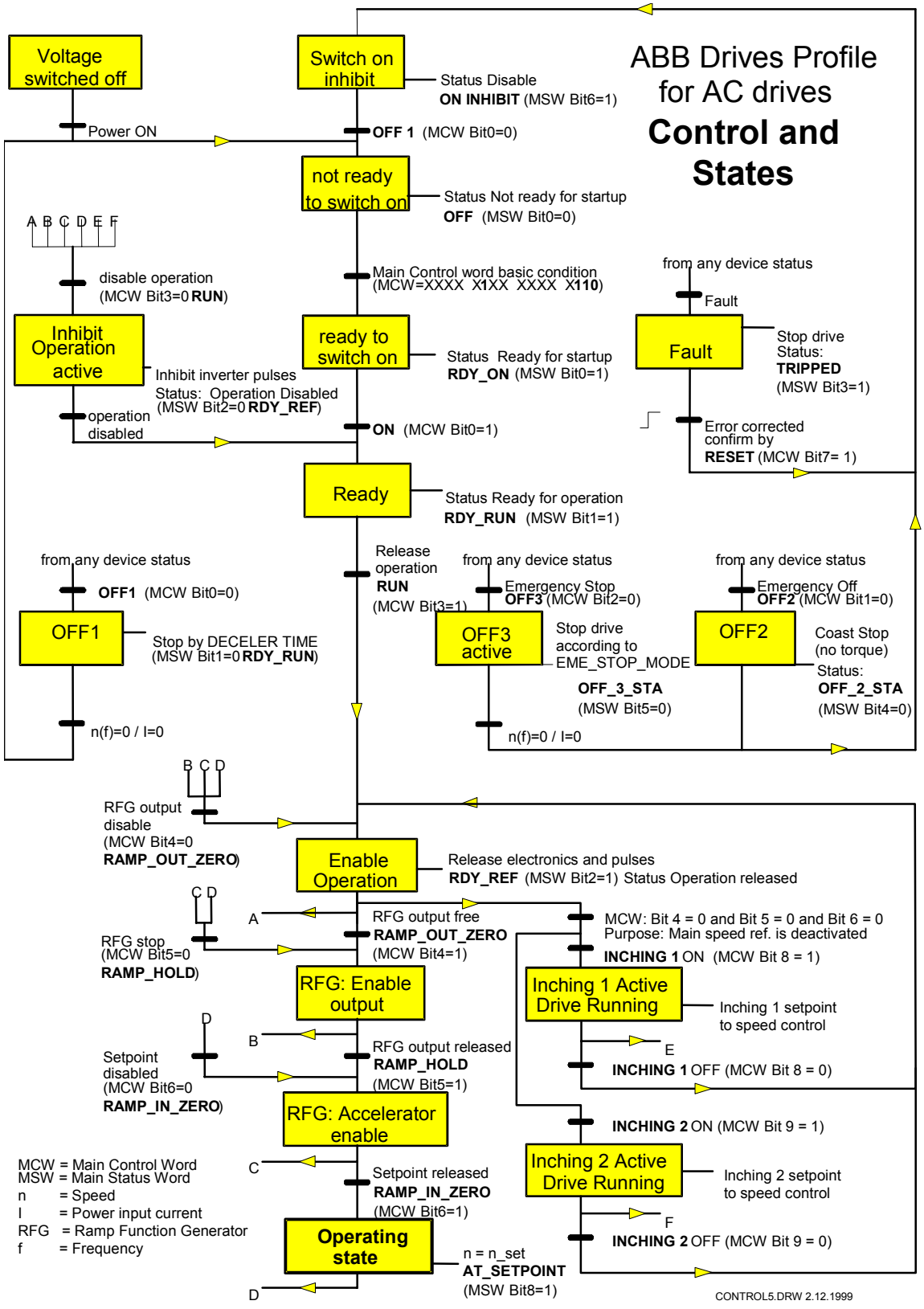


Figure 4 - 19 Control and State Diagram, see Chapter 5 - Signals for more information on Status and Commands.

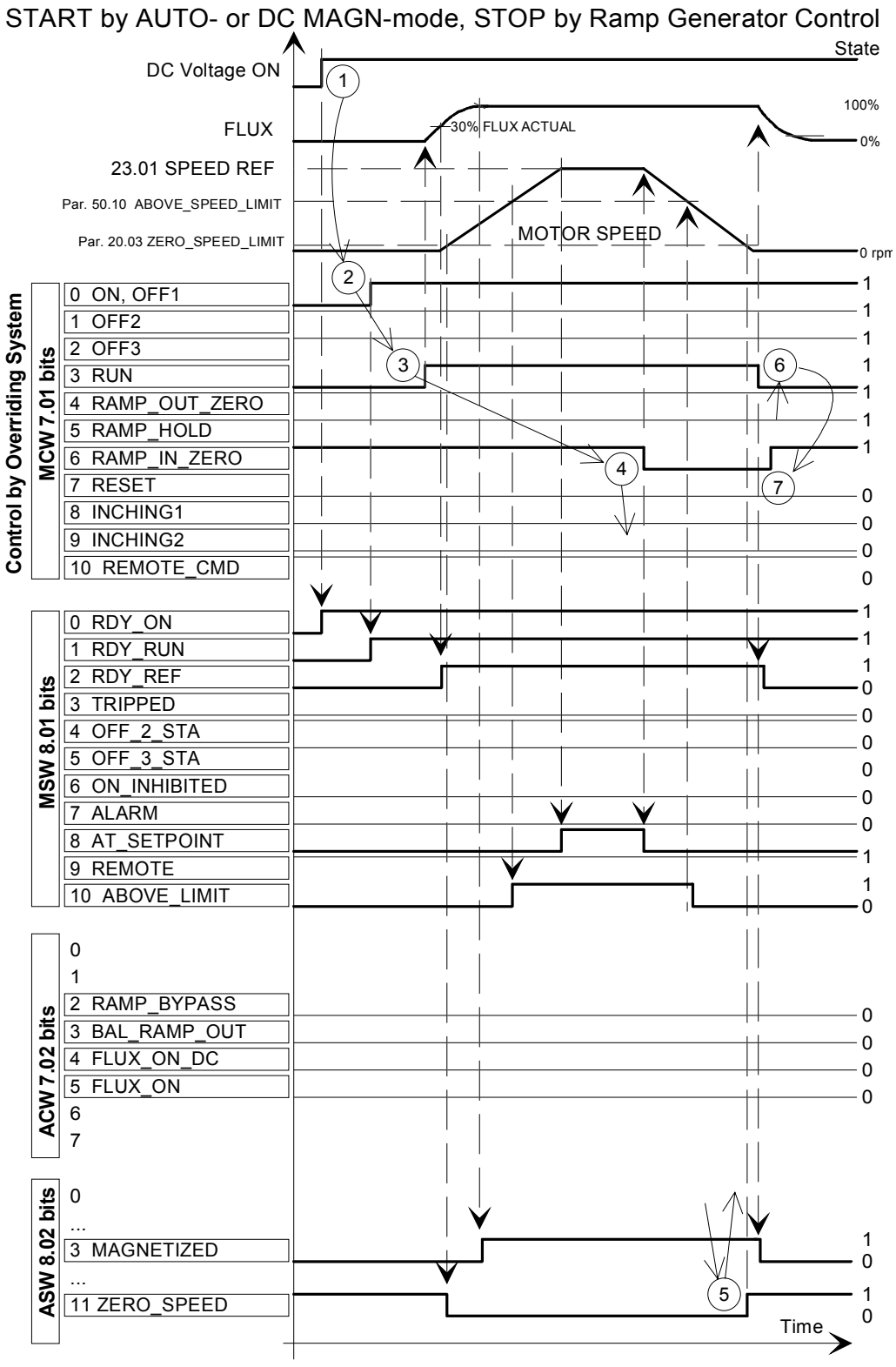


Figure 4 - 20 Control example: Start by AUTO or DC MAGN Mode, Stop by Ramp Generator, see Chapter 5 – Signals for more information on Status and Commands.

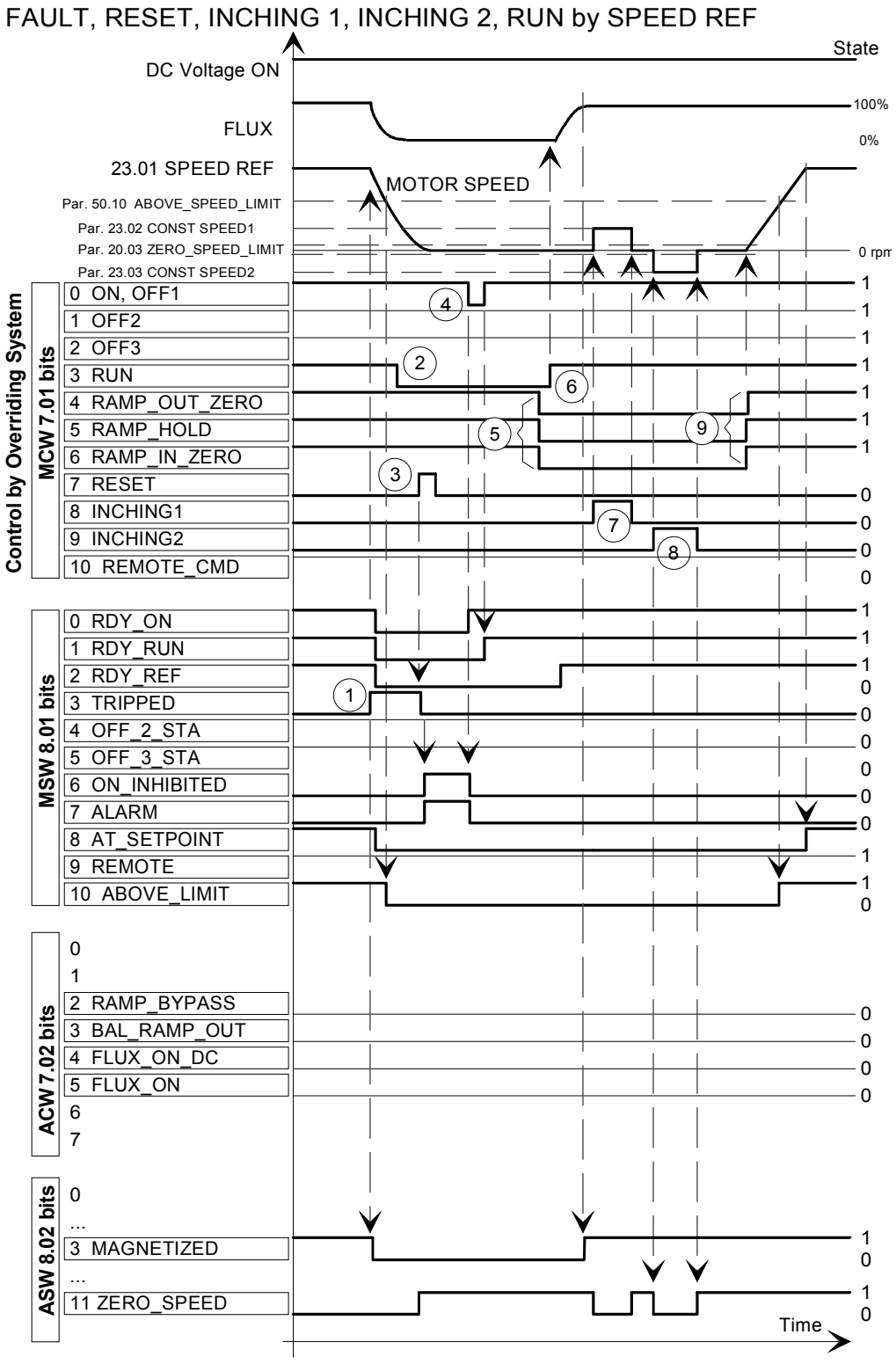


Figure 4 - 21 Control example: Fault Reset, Run by CONST SPEED 1 (Inching 1), CONST SPEED 2 (Inching 2) and SPEED REF, see Chapter 5 - Signals for more information on Status and Commands.

I/O Configurations

Basic and Extension I/O

The basic inputs and outputs are located on the RMIO board. The number of inputs and outputs can be extended with RDIO-01 and RAIO-01 I/O extension modules by means of an AIMA-01 I/O Module Adapter if free Slots are not available on the RMIO board. See parameters 98.04…98.13.

Table 4 - 6 Number of I/Os and execution interval as milliseconds in brackets.

I/O Device	Digital Inputs	Digital Outputs	Analogue Inputs	Analogue Outputs	Fast Analogue Inputs	Pulse Encoders
RMIO Basic I/O	7 (20/10ms)	3 (20 ms)	3 (20/10ms)	2 (20 ms)		
RDIO DI/O EXT1	3 (40ms)	2 (40ms)				
RDIO DI/O EXT2	3 (40ms)	2 (40ms)				
RDIO DI/O EXT3	3 (40ms)	2 (40ms)				
RDIO DI/O EXT4	3 (40ms)	2 (40ms)				
RDIO DI/O EXT5	3 (40ms)	2 (40ms)				
RAIO AI/O EXT1			2 (40ms)	2 (40ms)		
RAIO AI/O EXT2			2 (40ms)	2 (40ms)		
RAIO AI/O EXT3			2 (40ms)	2 (40ms)		
RAIO AI/O EXT4			2 (40ms)	2 (40ms)		
RAIO AI/O EXT5			2 (40ms)	2 (40ms)		
NAIO-03F FAST AI					2 (2ms) *)	
RTAC Pulse Encoder						ENCODER 1 (2ms)
NTAC-02 Pulse Encoder						ENCODER 1 ENCODER 2 *) (2 ms)
Totally:	22	13	13	12	2 Fast AIs	2 Encoders

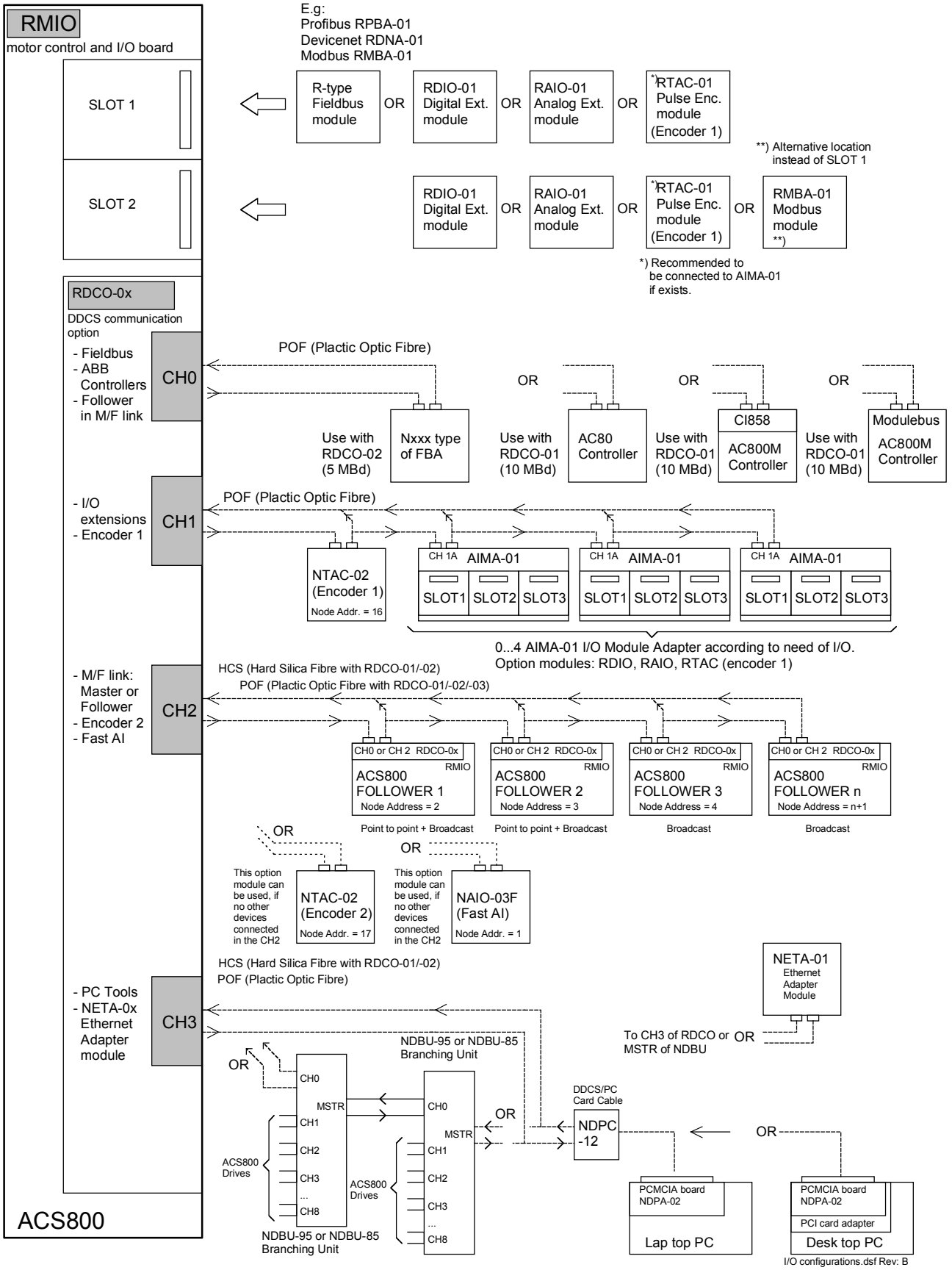
*) Reserves DDCS channel CH2

Note: Also NDIO I/O Extension modules (ACS 600) can be used as DI/O EXT1…5.

Diagnostics of extension I/O modules is collected to IO FAULT WORD (9.09).

For extension module connection with AIMA-01, see *AIMA-01 I/O Module Adapter User's Manual (3AFE 64661442, English).*

Option I/O, Fieldbus and PC tool configurations



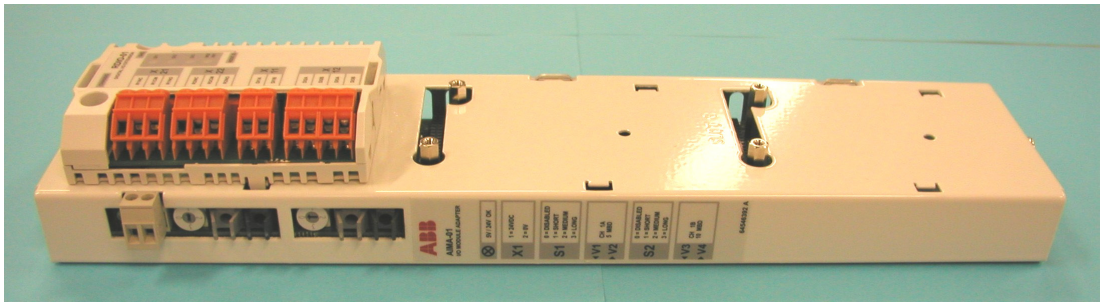


Figure 4 - 22 AIMA-01 I/O Module Adapter for 3 I/O option modules. With an RDIO-01 installed

Digital Inputs

All inputs can be read by the block programming application and overriding controller. The status of digital inputs can be read from the signals **8.05 DI STATUS WORD** and **8.06 EXTENSION DI STATUS WORD**. Each input is represented by a function block in the DriveAP 2 PC tool. HW terminal information is also given, e.g. X22:1.

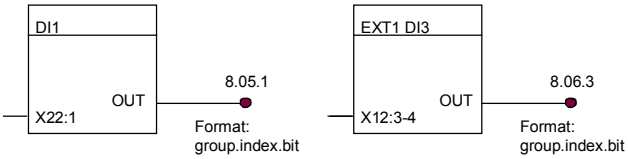


Figure 4 - 23 Digital input blocks. The Output format is group.index.bit number

Digital Outputs

The digital outputs can be controlled either by an overriding controller or block program. The RMIO and extension digital outputs can be controlled with function blocks as shown by following figure. Control of each extension DO needs a BITSET function block.

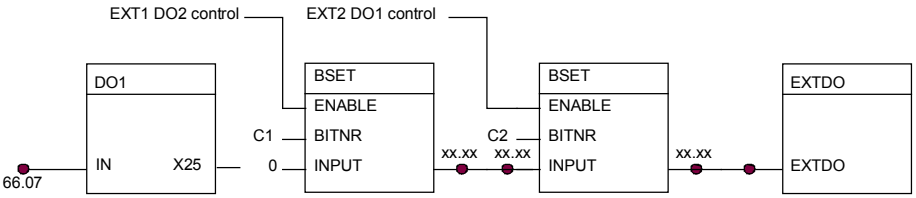


Figure 4 - 24 Controlling of extension digital outputs.

Analogue I/O

Analogue inputs can be used for temperature measurement. I/O speed / torque references and signals can be read by the overriding system.

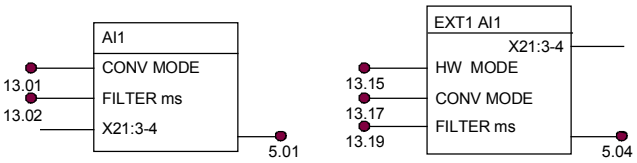


Figure 4 - 25 Analogue input blocks. The Output has a fixed scaling according to selected conversion mode.

Basic I/O of RMIO board

Three differential, non-galvanically isolated analogue inputs (11 bits + sign with AI1, accuracy +/- 0.5%) and two non-galvanically isolated analogue outputs AO1 and AO2 (10 bits, accuracy +/- 1%) are available on the RMIO board.

RAIO Analogue I/O Extension Module

The RAIO Analogue I/O Extension Module has analogue inputs AI1 and AI2. The resolution of the RAIO is 12 bits with a unipolar signal and 11 bits + sign with bipolar. The input range is selectable by DIP switches and the maximum voltage or milliampere value corresponds to an integer value in the program. HW filtering for analogue inputs is approx 2 ms. The RAIO-01 extension module also has two analogue outputs with a resolution of 12 bits.

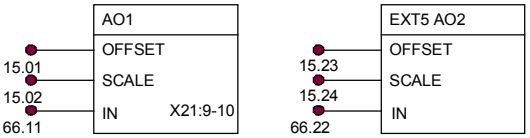


Figure 4 - 26 View of the analogue output blocks.

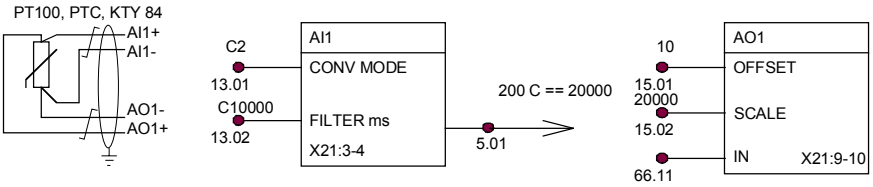
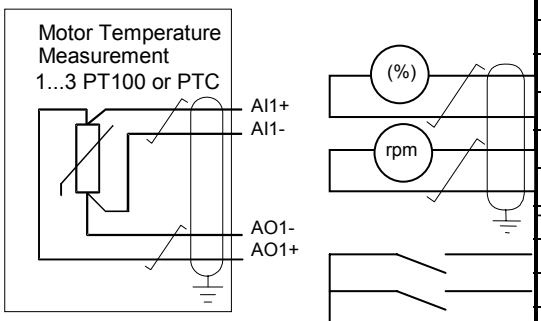


Figure 4 - 27 Example of temperature measurement with 1 x PT100 according to parameter 13.01 AI1 CONV MODE.
Note *the 10 mA offset at AO1.*

Note: Set RAIO input signal type selection to ±0…2 V range with PT100 temperature measurement and ±0…10 V range with KTY84-1xx sensor.



Use an external power
if the total current consumption
exceeds 250 mA

Terminal Block **X16**		**RMIO board**
1	-VREF	Negative reference voltage –10 V, max 10 mA
2	AI GND	
Terminal Block **X21**		***Analogue signals***
1	VREF	Positive reference voltage +10 V, max 10 mA
2	AI GND	
3	AI1+	Speed Reference (default) (Range for AI1: voltage –10 V…0…+10 V)
4	AI1-	
5	AI2+	
6	AI2-	
7	AI3+	
8	AI3-	
9	AO1+	Motor Torque
10	AO1-	0…20 mA == 0…Motor Nominal Torque
11	AO2+	Motor Speed
12	AO2-	0…20 mA == 0…Motor Nominal Speed
Terminal Block **X22**		
1	DI1	START/STOP (default)
2	DI2	RESET (default)
3	DI3	
4	DI4	
5	DI5	
6	DI6	
7	+24 VDC	+24 VDC max. 100 mA
8	+24 VDC	
9	DGND	Digital ground
10	DGND	Digital ground
11	DI7 (DIIL)	
Terminal Block **X23**		
1	+24 V DC	Aux. voltage output 24V 250 mA or 130 mA,
2	GND	if NLMD-01 panel included
Terminal Block **X25**		
1	RO1	***Relay Output 1***
2	RO1	**READY** (default)
3	RO1	
Terminal Block **X26**		
5	RO2	***Relay Output 2***
6	RO2	**RUN** (default)
7	RO2	
Terminal Block **X27**		
5	RO3	***Relay Output 3***
6	RO3	**NO FAULT** (default)
7	RO3	

Figure 4 - 28 RMIO Board Signals

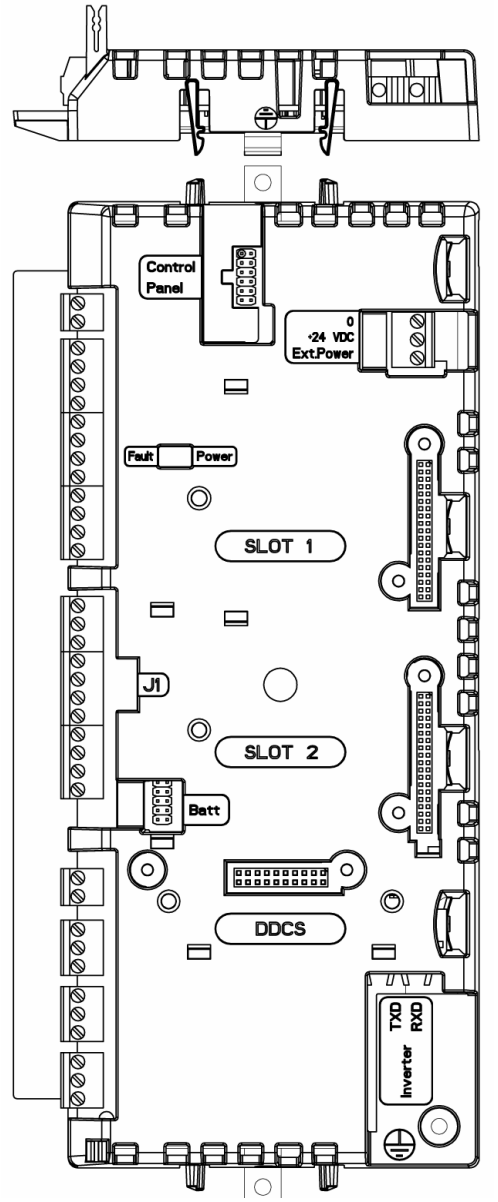


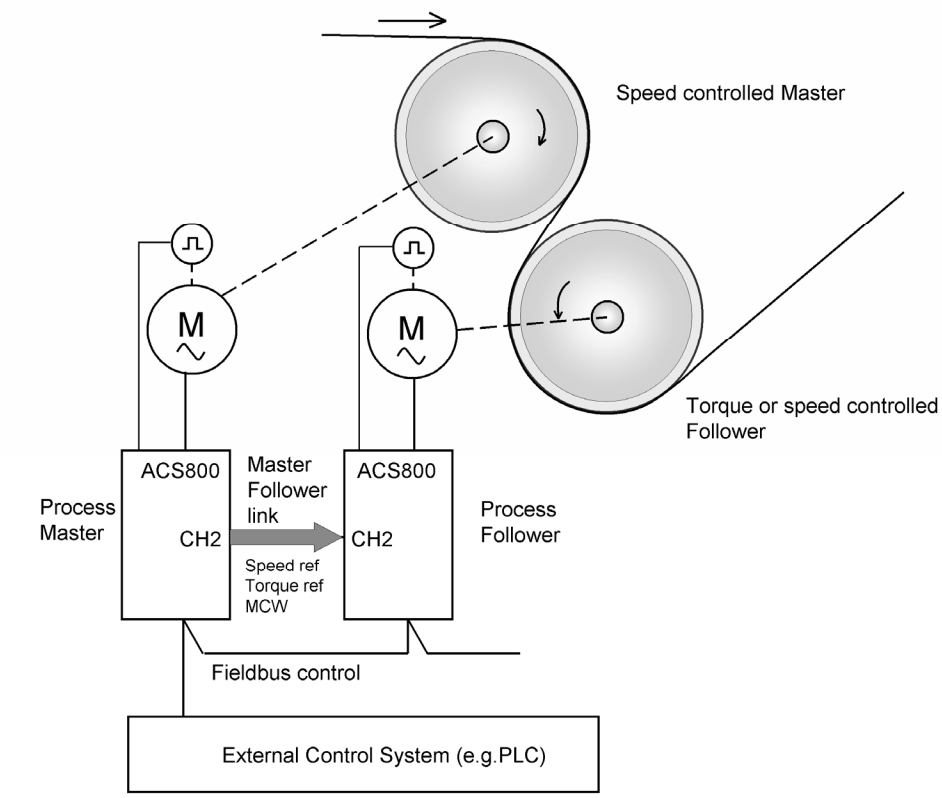
Figure 4 - 29 RDCU-02 Drive Controller Unit, containing the RMIO board.

Pulse Encoder 1 Interface RTAC

The pulse encoder module 1 (RTAC-01) is connected to Slot1, Slot2 on the RMIO board, or by means of an AIMA-01 I/O extension unit in channel CH1. It is activated by parameter **98.01 ENCODER MODULE**. The feedback used is indicated in the **AUXILIARY STATUS WORD (8.02)** bit 12.

B12: 0 = External pulse encoder
1 = Internal speed

The Master / Follower Link



General

The Master/Follower application is designed for applications in which the system is operated by several drives and the shafts are coupled to each other via gearing, chain, belt etc. The Master controls the Followers via a fibre optic serial communication link. The pulse encoder is recommended to use in both with the torque controlled followers.

The Master drive is typically speed controlled and the other drives follow its torque or speed reference. In general, Torque control of the Follower should be used when the motor shafts of the Master and Follower drives are coupled fixedly to each other via gearing, a chain etc. and no speed difference between the drives is possible.

Link Configuration

Channel 2 (CH2) on the RMIO board is used for the Master/Follower link between the drives. The drive is programmable to be either the master or a follower in the communication by parameter **70.08 M/F MODE**. Typically, the speed controlled process master drive is configured also as the communication master. In addition to broadcast messaging, the Multi Block Programming Application also supports point-to-point communication between the master and two followers. See parameter group 94. A follower channel can be either CH2 or CH0.

Broadcasting messages from the Master Drive

Packed Boolean type signals, e.g. CW (Control Word), can be sent on the link. This is configured by parameter **70.09 MASTER REF1** by selecting the source signal of the CW block. By parameters **70.10 MASTER REF2** and **70.11 MASTER REF3**, two other signals can be transmitted through the link. Typical parameter addresses are:

MASTER REF1 (70.09)	Application	e.g. Control Word (CW)
MASTER REF2 (70.10)	23.01	SPEED REF
MASTER REF3 (70.11)	2.10	TORQ REF 3

The parameters above have also another meaning in the follower drives with multi master connection.

MASTER REF 3 signal can be scaled before sending to CH2 by parameter **70.30 MASTER SGN3 SCALE**. This is useful for example, if torque reference to be sent to follower is unit of Nm. Rescaling back to the correct % of motor nominal torque in the follower drive is scaled by parameter **70.31 FOLLOW SGN3 SCALE** based on the power of the motor in follower.

The Master Drive cyclically sends Master References 1…3 in one DDCS message, a broadcast every 2 milliseconds.

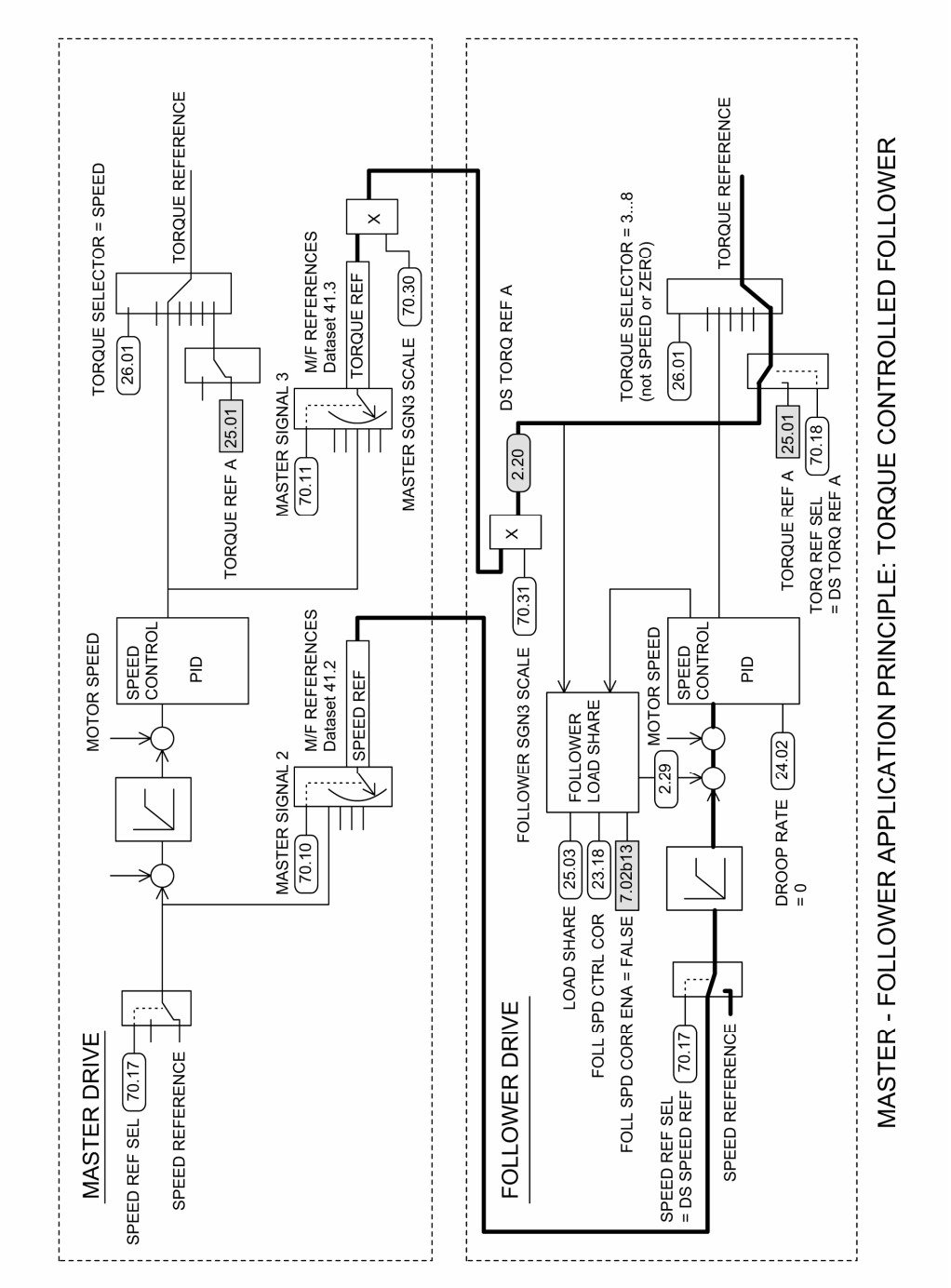


Figure 4 - 30 Control principle of torque controlled master follower configuration.

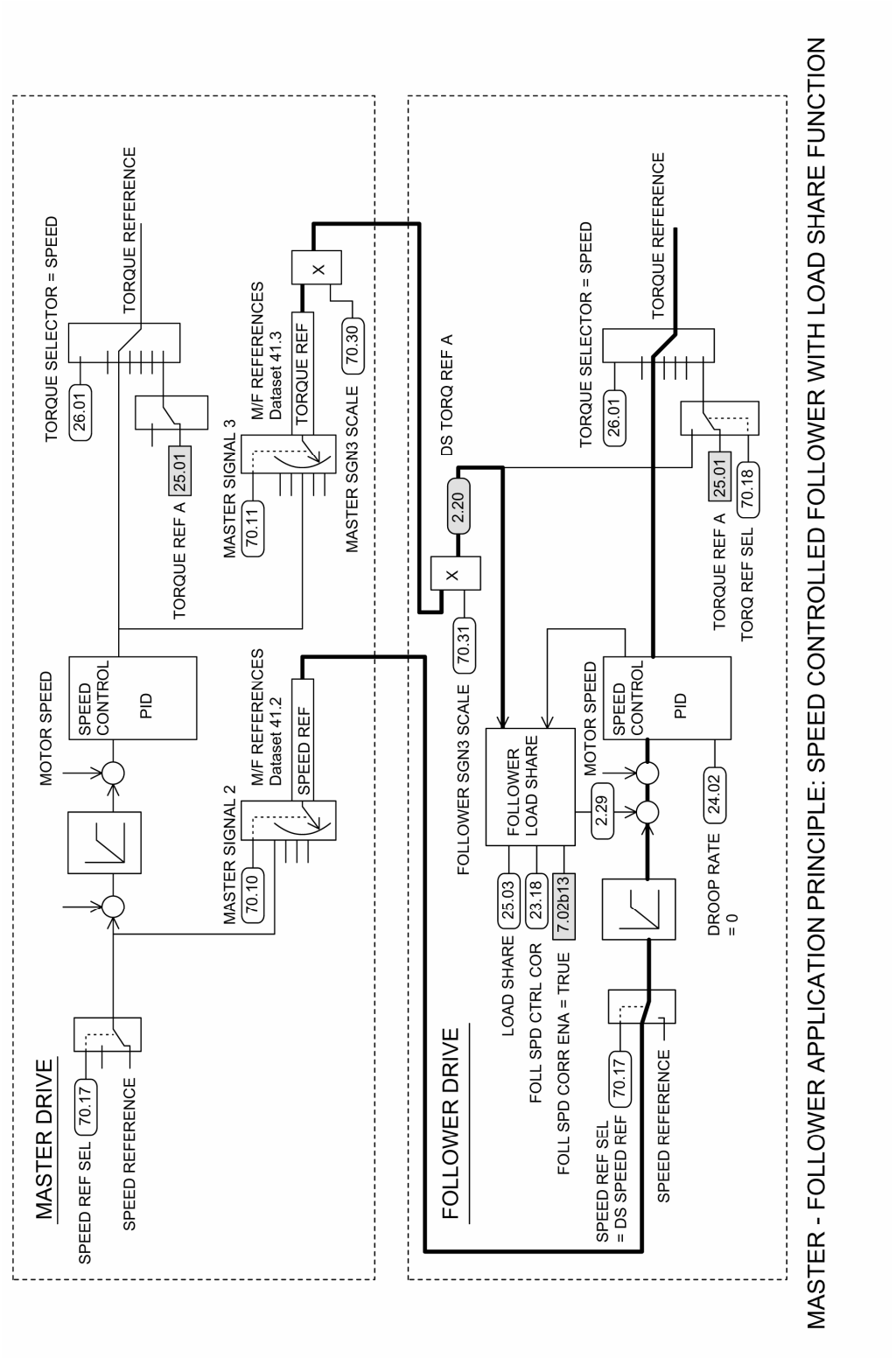


Figure 4 - 31 Control principle of speed controlled follower with load share function.

Follower Drive(s)

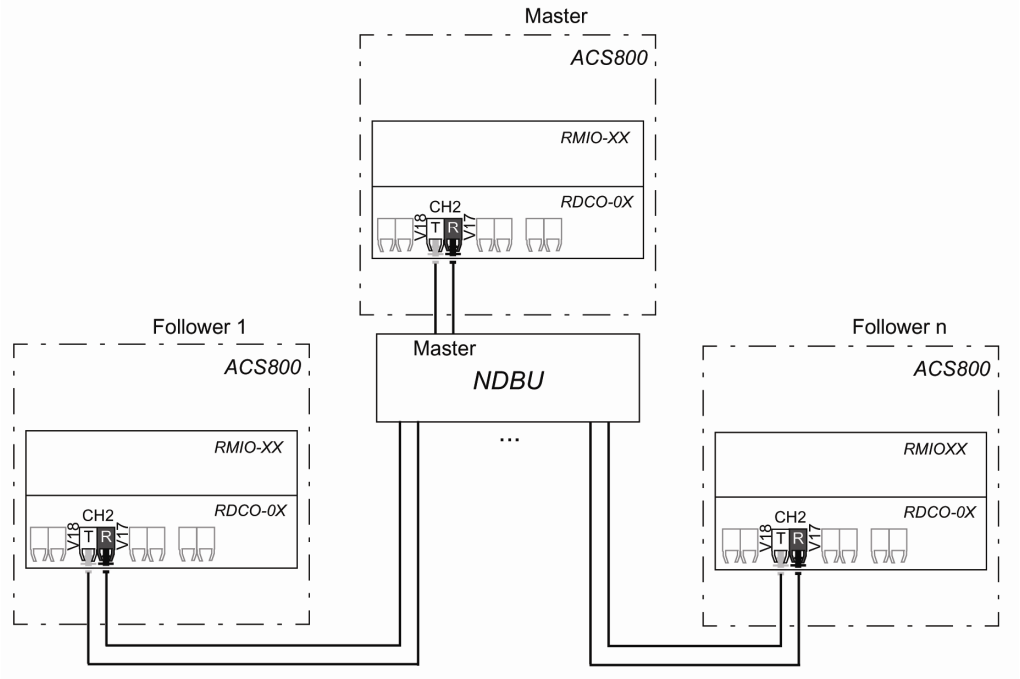
The Follower mode for CH2 is selected by parameter **70.08 M/F MODE.** The signals can be read either directly into the speed and torque control chain or into the block programming application. When point-to-point communication is also activated, the updating interval is 4 ms.

Direct assigning of M/F broadcast message in the Follower Drive					
Selection Parameter	**Dataset Index**	**Interval**	**Address**	**Parameter Name**	**Signal**
70.17	2	2 / 4 ms	23.01	SPEED REF	2.19 DS SPEED
70.18	3	2 / 4 ms	25.01	TORQ REF A	2.20 DS TORQ REF

Star Configuration

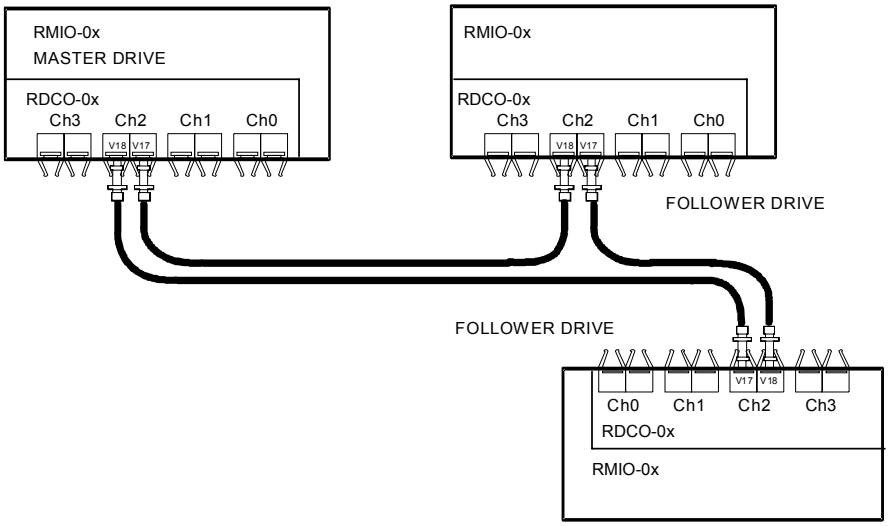
T = Transmitter; R = Receiver; RMIO = I/O and Control Board

Please note that channels CH0/CH2/CH3 are located on the optional RDCO-0x module.



A Master/Follower link is formed by connecting the DDCS CH2 channels of two or more drives in a ring or star configuration (NDBU branching unit is required with star configuration).

Ring Configuration



An alternative connection using CH0 in the Follower drives.

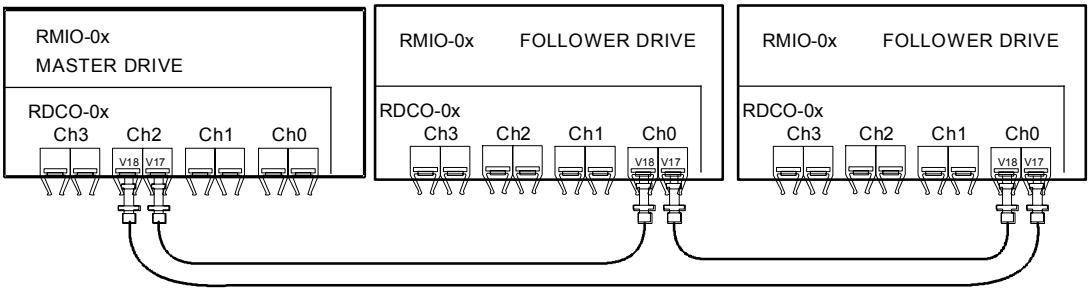


Figure 4 - 32 Master/Follower Fibre Optic Cable Connections

On-the-fly switching between Speed and Torque Control

In some applications, both speed and torque control of the followers are required. This is the case e.g. when it is necessary to accelerate all drives along the same speed ramp up to a certain speed before torque control can be started. On-the-fly switching between speed and torque control is controlled for the parameter **26.01 TORQ REF SEL** by means of WR-I function block in the application. WR-I and WR-PB are general-purpose write blocks for changing parameter values. If window control is requested, also control **ACW_1 (7.02)** bit 7.

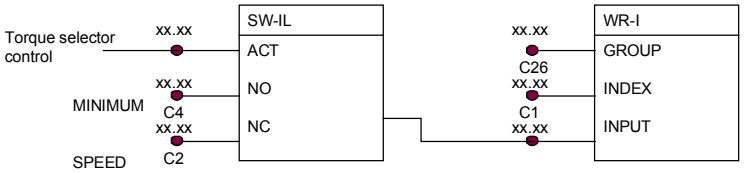


Figure 4 - 33 Example of torque selector switching control between the SPEED and MINIMUM selections.

Follower Diagnostics

All Followers receive the torque reference through the DS TORQUE REF A signal. The follower drive is able to detect a communication break, the action upon which is defined by parameter **70.13 M/F TIMEOUT** and **70.14 M/F COM LOSS CTRL**.

Master/Follower Link Specification

Size of the Link: One Master and maximum of 10 Follower drives. If more than 10 Followers are required, an ABB representative should be consulted. There is also a glass fibre alternative for longer distances between the master and follower (pair of NOCR-01 units).

With RDCO-01 or RDCO-02:
- POF (Plastic Optic Fibre): Maximum cable length is 30 m.
- HCS (Hard-Clad Silica Fibre): Maximum cable length is 200 m.

For distances up to 1000 m: Use two of Optical Converter/Repeater boards (NOCR-01) with glass optic cable (GOF, 6.25 um, Multi-Mode).

With RDCO-03:
- POF (Plastic Optic Fibre): Maximum cable length is 10 m.
- HCS (Hard-Clad Silica Fibre): Not supported.

Transmission Rate: 4 Mbit/s

Total Performance of Link: < 5 ms to transfer references as broadcast between the Master and Follower drives without point-to-point communication.

Protocol: DDCS (Distributed Drives Communication System).

Point to point Communication between the Master and two Follower drives

This application also supports point-to-point communication between the Master and two Followers at 100 ms time intervals. Three 16 bits data words can be sent to Followers and three data words can be received from the Followers.

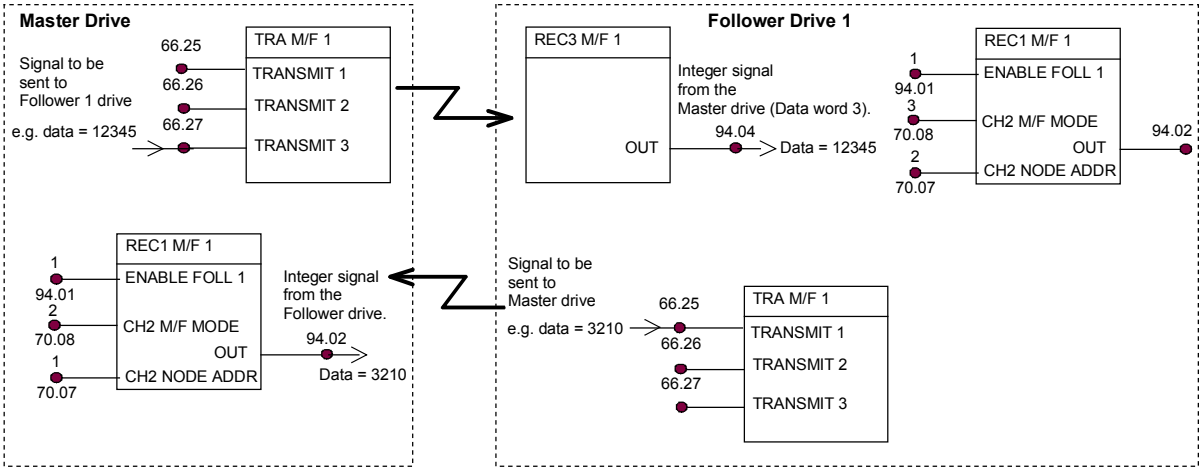


Figure 4 - 34 Example of point-to-point communication between the master and follower drive 1.

Speed controlled Follower with load share

Speed controlled follower(s) can be used in several applications where load sharing is also needed between the master and follower(s). This is implemented in practice by using additional term for speed reference based on the torque reference of master drive. Master and follower drive should be similar with same speed control tuning values. Drooping function must not be used at all by parameter **24.02 DROOP RATE**. A load share is adjusted with same parameter as with TORQUE REF A by parameter **25.03 LOAD SHARE**. A load share function is activated by **ACW 7.02 bit 13**. A gain for load share function is set by parameter **23.18 FOLL SPD CTRL COR**. A value of load share correction is added to the speed reference between the SPEED REF3 and SPEED REF 4 and can be monitored from the signal **2.29 FOLL SPD CORR OUT**. See figures in section *Control Block Diagrams*.

Diagnostics

General

A common method of drive diagnostics is to provide the user with information on previous conditions. Signals, data loggers and fault loggers are commonly implemented in most modern drives.

The following is a description of the data and fault loggers available in the Multi Block Programming Application program.

Alarm and Fault Logger

The fault logger collects 64 of the most recent faults into the fault buffer in the RAM memory. The latest 16 faults are stored into the FLASH memory at the beginning of an auxiliary power loss, when an internal +24 V power supply is used. With an external +24 V power supply, RAPI-01C Auxiliary Power interface unit must be used for successful power fail function. It concerns also parameters 19.11…19.14. The fault logger records all available information from the drive including faults, alarms, reset and system messages. See the chapter Fault Tracing to see diagnostics messages.

AMC Time Format and Counting

The Time for the logger fault is taken from the power-on counter, whose format is 9999 hr, xx min, yy.yyyy s. However, the counter can be updated cyclically from the overriding system if the system includes an overriding controller with clock master (for example AC800M and AC80). Then DriveWindow and the CDP 312R Control Panel will show the real date and time.

Data Loggers 1 and 2

The purpose of the Data Logger is to collect the history of signals related to an incident and store them for later retrieval and analysis. The contents of the Data Loggers are stored to the RAM memory. There are two Data Loggers on the RMIO board.

Both of the Data Loggers consist of 1...4 channels and the total memory size is 1024 bytes. The maximum number of samples depends on the data type:

- Integer type signal or parameters reserve 1 byte
- Real-type values reserve 2 bytes

Example: Four real-type signals are measured by Data Logger 1. The maximum number of sample is 1024/(2 bytes x 4 channels) = 128.

The Data Loggers store the selected signals to the RAM memory every 1 milliseconds.

By default, the following signals and parameters are monitored by Data Logger 1:

1.01 MOTOR SPEED FILT
1.07 MOTOR TORQUE FILT
23.01 SPEED REF
25.01 TORQUE REF A

By default, the following signals are monitored by Data Logger 2:

1.02 SPEED ESTIMATED
1.10 DC VOLTAGE
1.12 PP TEMP
2.15 FLUX ACT

The signals to be monitored can be selected from DriveWindow. The default trigger mode is Fault.

Positioning Counter with Pulse Encoder 1

The number of pulses from Encoder 1 can be counted and set by using **7.02 ACW** bits B9...11.

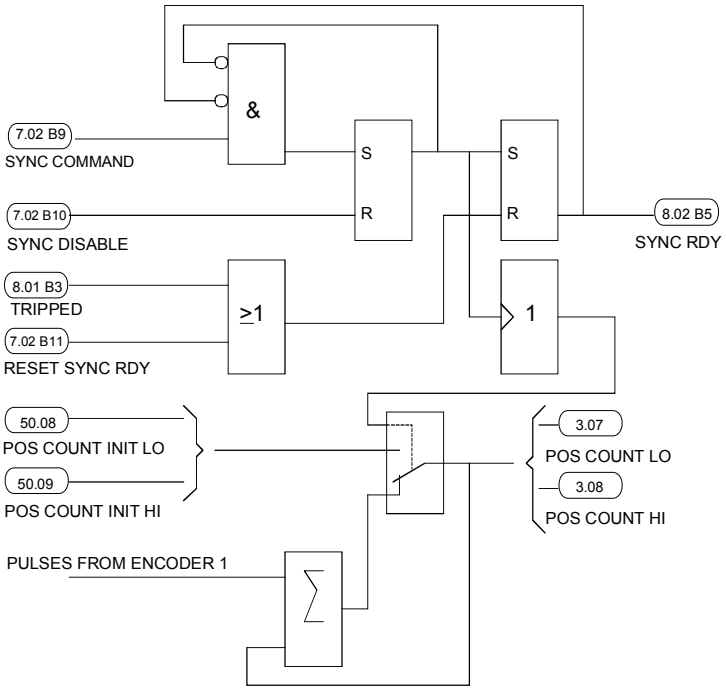


Figure 4 - 35 Positioning counting logic.

Positioning Counting Function

The basic function can be seen in the following diagram. Synchronisation is enabled when SYNC_DISABLE = 0, no fault and RESET SYNC RDY = 0. When the next rising edge of the SYNC_COMMAND is encountered, the initial values of POS COUNT INIT LOW and POS COUNT INIT HIGH are loaded into the counter and the counting continues. The Status signal SYNC_RDY is set to indicate controlled SYNC_COMMAND. When the positioning has been completed by the application or overriding system (i.e. the motor can be stopped or another sequence started), the signal SYNC_RDY is reset by RESET_SYNC_RDY. Before the next synchronisation, both SR flip-flops must be reset. See the logic diagram above.

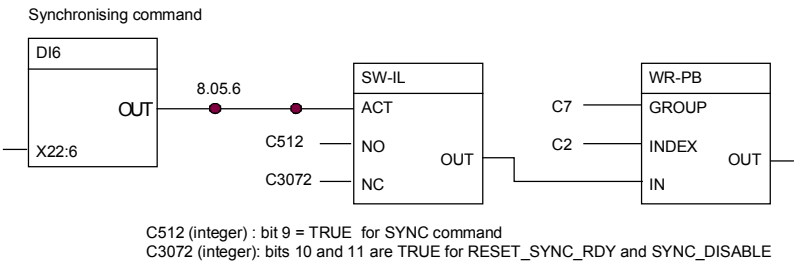


Figure 4 - 36 Simple initialisation example of positioning counter.

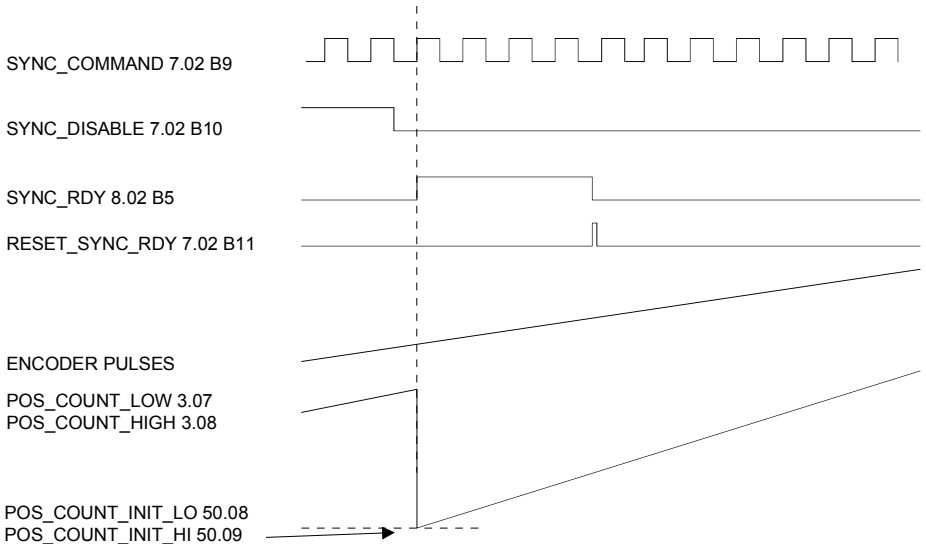


Figure 4 - 37 Example of the Positioning counting function

Back-Up of Parameters or Software

At the end of the commissioning of the drive, backing up the (RMIO board) parameters is recommended. The results of the Motor ID Run should also be backed up. If necessary, the data can be restored later on (e.g. downloaded to a spare board of the same type). The back-up can be done by the DriveWindow PC Tool.

Spare RMIO Boards

One spare RDCU-02C unit (includes RMIO board) covers the whole ACS600 or ACS800 drive power range, loaded with the same firmware as in the drives. See signal 4.01 in the drive for firmware version.

The inverter ratings can be NONE (no ratings entered) or any inverter type for a spare part RMIO board.

Drive*Window* *Back-Up Function*

Introduce to *DriveWindow 2 User's Manual*. Back-up file (*.BPG) is normally downloaded in case of RMIO board replacement. **Note:** Cannot be performed in Local mode. Remember to save it after back upping.
Note: When the backup is restored to e.g. spare part board, restore it twice, if there is a problem (e.g. with ID run results).

Version Update Back-Up Function

A version update means here restoring of parameters from the old drive firmware version to newer one without a need of new ID-RUN. All the blocks and their connections are also restored. For parameter file saving, select from DW2.1x File menu → Parameters → Save as (parameter file *.dwp). Next step is to save block application file (*.ap) to PC in DriveAP; File menu -> Save As.

Restoring of Parameters in Version Update

DriveWindow *2.x* file. Select *File* menu → *Parameters* → *Open* → Select (*.dwp) file → *Open*. Select drive from upper left window and select from *File* menu → *Parameters* → *Download* → Version conflicts → Yes → Restore User data and ID run results → Yes → Yes.

Download DriveAP application to RMIO board from *File* menu → *Open* block application file (*.ap). Perform *Download* from Drive menu. Start the used time levels by DriveAP.

Reduced Run Function

Reduced run function is available for parallel connected R8 inverters, 2…12 × R8i. Reduced run function makes it possible to continue the operation with limited current if an inverter module(s) is out of order. If one of the modules is broken, it must be removed from the cabinet. Parameter change is needed to continue the run with reduced current.

Removing a broken Inverter Module

- The safety instructions must be followed. See the safety instructions on the first pages of the appropriate hardware manual or the safety manual.
- Disconnect the supply voltage and all auxiliary voltages from the drive.
- Remove the broken inverter module from the cabinet. See appropriate hardware manual.

- Fasten the air baffle provided with the unit to the top module guide to block airflow through the empty module space.
- Disable the charging monitoring of the isolated module, i.e. set switch S1…S3 of the ASFC-01 board to DIS (=disabled).
- Switch on the supply voltage. INT CONFIG fault (09.06 Fault Word 3 bit 7 value is 1) now indicates that the number of the connected inverter modules has changed.
- If the operation is continued with limited current, number of existing inverter modules must be set by parameter 16.10 INT CONFIG USER.
- Reset the fault and start the drive. PPCS link is reconfigured automatically and the maximum current is limited (20.04 MAXIMUM CURRENT) in relation to the new inverter configuration and inverter nominal current.

Note: If INT CONFIG fault reappears, the number of parallel connected inverters defined by parameter 16.10 INT CONFIG USER is incorrect. See signal 08.22 INT CONFIG WORD.

Note: When the isolated module is reconnected, set switch S1/S2/S3 of the ASFC-01 board back to the enabled position.

Note: If all switches S1, S2 and S3 of the ASFC-01 board are set to DIS (=disabled), the main contactors of the DC switches will not close.

When inverter hardware configuration is changed back to the original, parameter 16.10 INT CONFIG USER value automatically restores back to the original value.

Settings

Parameter	Additional information
16.10 INT CONFIG USER	Number of parallel connected inverter modules (R8i) in the drive.
20.04 MAXIMUM CURRENT	Maximum motor current

Diagnostics

Actual value	Additional information
08.22 INT CONFIG WORD	Inverters recognized by the application program.
09.06 FAULT WORD 3	Number of recognized inverters.

Chapter 5 –Signals

Overview

This chapter describes the measured and calculated actual signals, and the content of the control, status, limit, fault, and alarm words of the drive.

How to Read the Signal Table

Before you start to read the signal table, we first recommend you read this description.

Signals

Group + Index	Description	Quantity
1.1…1.14, 1.18, 1.26…1.28, 1.31…1.32	Actual Signals	21
2.1…2.3, 2.8…2.16, 2.18…2.29	Actual Signals	24
3.7...3.8, 3.16, 3.31…3.32	Actual Signals	5
4.1…4.2, 4.4	Information	3
5.1...5.13	(reserved for the application)	13
6.1...6.12	(reserved for the application)	12
7.1...7.2, 7.5	Control Words	3
8.1...8.7, 8.20…8.23	Status Words, Limit Words	11
9.1...9.2, 9.4…9.6, 9.8…9.9, 9.13…9.19, 9.30…9.39	Fault Words, Alarm Words	23
	Total	**115**

05	(161.3)	**CURRENT**		
Index	Description:	Measured motor current absolute value.		
unit: A	type: R	Min: 0	Max:	Integer Scaling 10 == 1A

Figure 5 - 1 Sample of an Actual Signal table

- All signals are read-only. However the overriding system can write to the control words, but it only affects the RAM memory.
- If the overriding control system reads or writes individual bits of a word with an Advant CONV_IB element, (for example AUX CONTROL WORD 7.02) the bit B15 corresponds to the SIGN outputs of the element.
- If signal type is R (real value), it also has an integer scaling relation mentioned in the column Integer scaling. For example, if the CURRENT signal is read to the overriding system, an integer value of 10 corresponds to 1 Ampere. All the read and sent values are limited to 16 bits (-32768...32767).

- The unit of the signal value can be seen on the lower left-hand corner of the signal description.
- Minimum and maximum values are shown in decimal format.
- Data type is given with a short code:
  I = 16-bit signed integer B = Boolean value
  PB = Packed Boolean value R = Real value

AMC Table Signals

Group 1 Actual Signal

1	Group name:	*ACTUAL SIGNALS*		
	Description:	Measured or calculated values		
01 Index		**MOTOR SPEED FILT**		
	Description:	Filtered actual speed according to the speed feedback selection. Filter time constant is adjustable by parameter. 50.12 MOTOR SP FILT TIME. Default filter time constant is 500 ms + parameter 50.06 SP ACT FILT TIME with pulse encoder. See also parameter 50.03.		
unit: rpm	type: R	Min:	Max:	Integer scaling: See parameter 50.01
02 Index		**SPEED ESTIMATED**		
	Description:	Internally calculated actual speed.		
unit: rpm	type: R	Min:	Max:	Integer scaling: See parameter 50.01
03 Index		**SPEED MEASURED 1**		
	Description:	Measured actual speed from the pulse encoder 1. This actual value can be used for speed control.		
unit: rpm	type: R	Min:	Max:	Integer scaling: See parameter 50.01
04 Index		**MOTOR SPEED**		
	Description:	Actual speed to the speed error calculation of the speed controller.		
unit: rpm	type: R	Min:	Max:	Integer scaling: See parameter 50.01
05 Index		**FREQUENCY**		
	Description:	Calculated frequency of the motor.		
unit: Hz	type: R	Min:	Max:	Integer scaling: 100 == 1Hz
06 Index		**MOTOR CURRENT**		
	Description:	Measured motor current (absolute value).		
unit: A	type: R	Min:	Max:	Integer scaling: 10 == 1A
07 Index		**MOTOR TORQ FILT2**		
	Description:	Filtered motor torque in percent of the rated motor torque. See also parameter 25.07.		
unit: %	type: R	Min:	Max:	Integer scaling: 100 == 1%
08 Index		**MOTOR TORQUE**		
	Description:	Motor torque in percent of the rated motor torque.		
unit: %	type: R	Min:	Max:	Integer scaling: 100 == 1%
09 Index		**POWER**		
	Description:	Motor power in percent of the rated motor power.		
unit: %	type: R	Min:	Max:	Integer scaling: 10 == 1%
10 Index		**DC VOLTAGE**		
	Description:	Measured dc bus voltage as percents of nominal DC voltage (1.35 x U_{max}(AC)). See section *DC Overvoltage* in *Chapter 8 – Fault Tracing*.		
unit: %	type: R	Min:	Max:	Integer scaling: 10 == 1%
11 Index		**MOTOR VOLTAGE**		
	Description:	Calculated motor output voltage.		
unit: V	type: R	Min:	Max:	Integer scaling: 1 == 1 V
12 Index		**ACS800 TEMP**		
	Description:	Temperature indication of the IGBT heat sink plate. This is indicated in degrees centigrade with ACS600 and percents with ACS800.		
unit: °C / %	type: R	Min:	Max:	Integer scaling: 1 == 1°, 1 == 1%
13 Index		**TIME OF USAGE**		
	Description:	This actual signal is an elapsed mains-on time indicator.		
unit: h	type: R	Min:	Max:	Integer scaling: 1 == 1 h

1	Group name:	*ACTUAL SIGNALS*		
14		**KILOWATT HOURS**		
Index	Description:	KWh counter.		
unit: kWh	type: R	Min:	Max:	Integer scaling: 1 == 1 kWh
18		**MOTOR TEMP EST**		
Index	Description:	Calculated motor temperature when thermal model (DTC or USER MODE) is used for motor overtemperature protection. See parameter 30.01 MOT THERM P MODE.		
unit: °C	type: R	Min:	Max:	Integer scaling: 1 == 1 kWh
26	Interval: 100 ms	**LED PANEL OUTPUT**		
Index	Description:	Output monitoring of the NLMD-01 LED panel. See parameter group 18.		
unit: %	type: R	Min:	Max:	Integer scaling: 1 == 1
27		**CABLE TEMPERATURE**		
Index	Description:	Output monitoring of the motor cable thermal model. An alarm limit is 100%, trip limit 103%.		
unit: %	type: R	Min: 0%	Max: 110%	Integer scaling: 1 == 1
28		**SPEED MEASURED 2**		
Index	Description:	Measured actual speed from the pulse encoder 2 (NTAC-02).		
unit: rpm	type: R	Min:	Max:	Integer scaling: See parameter 50.01
29		**MOTOR RUN-TIME**		
Index	Description:	Motor run rime counter. The counter runs when the inverter modulates. Counter can be reset by parameter 16.09 RESET RUN-TIME.		
unit: h	type: R	Min: 0 h	Max: 139810 h	Integer scaling: 1 == 1
31		**FAN ON-TIME**		
Index	Description:	Running time of the drive cooling fan. **Note:** The counter can be reset by means of application blocks or DriveAP 2. Resetting is recommended when the fan is replaced.		
unit: h	type: R	Min: 0 h	Max: 139810 h	Integer scaling: 1 == 1
32		**MOTOR ACCELERATIO**		
Index	Description:	Motor speed change in rpm/s.		
unit: rpm/s	type: R	Min:	Max:	Integer scaling: 1rpm/s == 1

Group 2 Actual Signals

2	Group name:	*ACTUAL SIGNALS*		
	Description:	Measured or calculated values in the speed and torque reference chain.		
01		**SPEED REF2**		
Index	Description:	Limited speed reference.		
unit: rpm	type: R	Min: -18000 rpm	Max: 18000rpm	Integer scaling: See parameter 50.01
02		**SPEED REF3**		
Index	Description:	Speed reference after the speed ramp.		
unit: rpm	type: R	Min: -18000 rpm	Max: 18000rpm	Integer scaling: See parameter 50.01
03		**SPEED ERROR NEG**		
Index	Description:	Difference between reference and the actual value. If parameter WINDOW_SEL_ON is enabled, SPEED_ERROR_NEG is filtered through the window function.		
unit: %	type: R	Min:	Max:	Integer scaling: See parameter 50.01
08		**TORQUE REF 1**		
Index	Description:	Limited torque reference value in the torque reference chain.		
unit: %	type: R	Min:	Max:	Integer scaling: 100 == 1%

2	Group name:	*ACTUAL SIGNALS*			
09		**TORQUE REF 2**			
Index	Description:	Final torque reference from the speed control chain.			
unit: %	type: R	Min:	Max:	Integer scaling:	100 == 1%
10		**TORQUE REF 3**			
Index	Description:	Torque reference after the torque selector block.			
unit: %	type: R	Min:	Max:	Integer scaling:	100 == 1%
11		**TORQUE REF 4**			
Index	Description:	Sum of TORQUE REF 3 and LOAD COMPENSATION.			
unit: %	type: R	Min:	Max:	Integer scaling:	100 == 1%
12		**TORQUE REF 5**			
Index	Description:	Sum of TORQUE REF 4 and TORQUE STEP.			
unit: %	type: R	Min:	Max:	Integer scaling:	100 == 1%
13		**TORQ USED REF**			
Index	Description:	Limited torque reference. This is the final torque input for the internal torque controller.			
unit: %	type: R	Min:	Max:	Integer scaling:	100 == 1%
14		**FLUX USED REF**			
Index	Description:	Flux reference used.			
unit: %	type: R	Min:	Max:	Integer scaling:	10 == 1%
15		**FLUX ACT**			
Index	Description:	Flux actual value.			
unit: %	type: R	Min:	Max:	Integer scaling:	10 == 1%
16		**dV/dt**			
Index	Description:	Speed reference change in rpm/s at the output of the speed ramp generator.			
unit: rpm/s	type: R	Min:	Max:	Integer scaling:	See parameter 50.01
18		**SPEED REF4**			
Index	Description:	Speed reference before speed error calculation.			
unit: rpm	type: R	Min: -18000 rpm	Max: 18000rpm	Integer scaling:	See parameter 50.01
19		**DS SPEED REF**			
Index	Description:	For example speed reference from the Master Follower link to be used in the Follower drive.			
unit: rpm	type: R	Min: -18000 rpm	Max: 18000rpm	Integer scaling:	See parameter 50.01
20		**DS TORQ REF A**			
Index	Description:	For example torque reference from the Master Follower link to be used in the Follower drive.			
unit: %	type: R	Min: -300%	Max: 300%	Integer scaling:	100 == 1%
21		**FIELDWK POINT ACT**			
Index	Description:	Actual field weakening point.			
unit: Hz	type: R	Min:	Max:	Integer scaling:	100 == 1Hz
22		**TORQ FREQ LIM REF**			
Index	Description:	Torque reference after frequency limiter block.			
unit: %	type: R	Min:	Max:	Integer scaling:	100 == 1%
23		**TORQ DC LIM REF**			
Index	Description:	Torque reference after DC-voltage limiter block.			
unit: %	type: R	Min:	Max:	Integer scaling:	100 == 1%
24		**TORQ POW LIM REF**			
Index	Description:	Torque reference after power limiter block			
unit: %	type: R	Min: -600.00	Max: 600.00	Integer scaling:	10 == 1%
25		**DS MCV**			
Index	Description:	Packed boolean word from the Master Follower link to be used in block application of the Follower drive.			
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:	

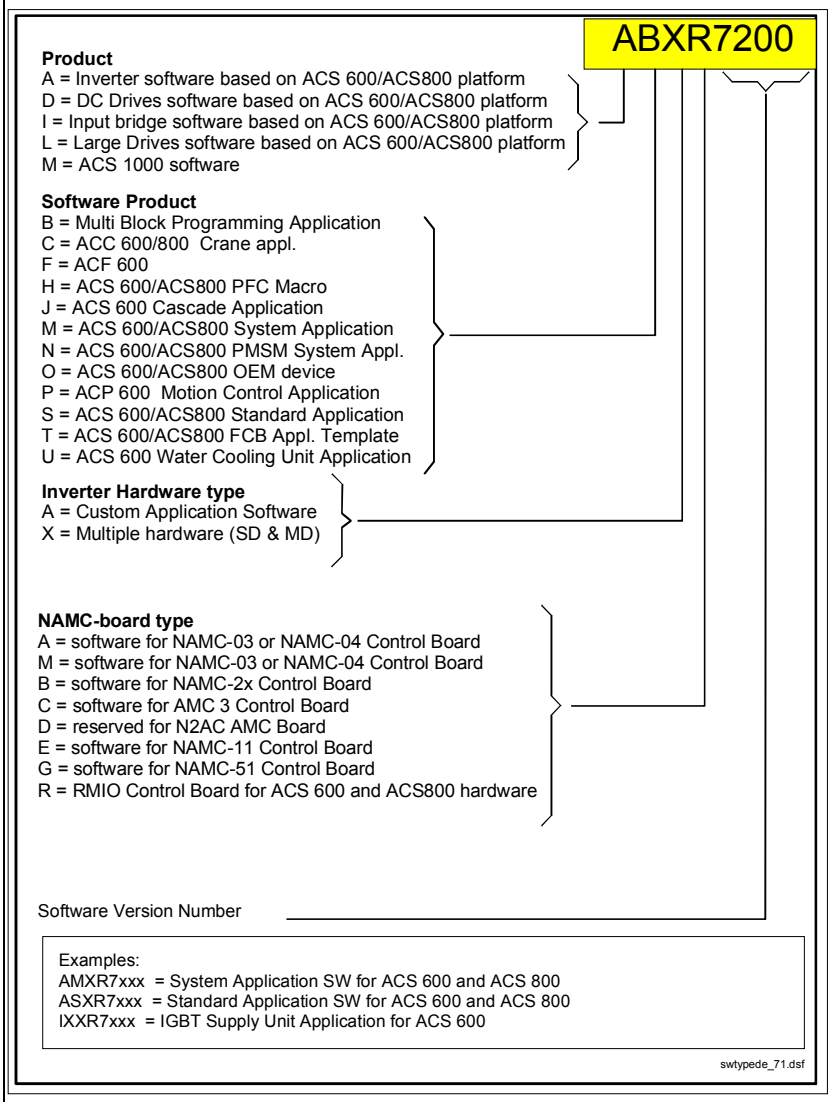
2	Group name:	*ACTUAL SIGNALS*		
26 Index		**MAIN CONTROL WORD**		
	Description:	The status of final main control word into the state machine.		
unit:	type: Pb	Min: 0	Max: 65535	Integer scaling:
27 Index		**USED SPEED REF**		
	Description:	Speed reference before the summing of ADDITIVE SP REF in the speed reference chain.		
unit: rpm	type: R	Min: -18000	Max: 18000	Integer scaling: See parameter 50.01
28 Index		**USED TORQ REF A**		
	Description:	Torque reference A before filter (TORQ REF A FTC) in the torque reference chain.		
unit: %	type: R	Min:	Max:	Integer scaling: 100 == 1%
29 Index		**FOLL SPD CORR OUT**		
	Description:	Output of speed follower load share function.		
unit: rpm	type: R	Min: -18000	Max: 18000	Integer scaling: See parameter 50.01

Group 3 Actual Signals

3	Group name:	*ACTUAL SIGNALS*		
	Description:	Data values.		
07 Index		**POS COUNT LOW**		
	Description:	Position counter value in pulses (low word).		
unit:	type: I	Min: 0	Max: 65536	Integer scaling: 1 == 1
08 Index		**POS COUNT HIGH**		
	Description:	Position counter value in pulses (high word).		
unit:	type: I	Min: 0	Max: 65536	Integer scaling: 1 == 1
16 Index		**CTRL BOARD TEMP**		
	Description:	Control board (RMIO) temperature.		
unit: °C	type: I	Min:	Max:	Integer scaling: 1 == 1 °C
31		**LCU ACT SIGNAL 1**		
	Description:	Signal from active supply unit. Signal is selected with parameter 95.03 LCU PAR1 SEL. See parameter group 95.		
unit:	type:	Min:	Max:	Integer scaling: See IGBT Supply Control Manual
32		**LCU ACT SIGNAL 2**		
	Description:	Signal from active supply unit. Signal is selected with parameter 95.04 LCU PAR2 SEL. See parameter group 95.		
unit:	type:	Min:	Max:	Integer scaling: See IGBT Supply Control Manual

Group 4 Information

4	Group name:	*INFORMATION*
	Description:	This signal group consists of information about the downloaded software on the RMIO board.
01 Index		**SOFTWARE VERSION**
	Description:	This signal gives information on the downloaded loading package information. This information must be mentioned when spare part board is ordered.



unit:	type: C	Min:	Max:	

4	Group name:	*INFORMATION*		
02 Index		**APPLICATION OVERL**		
	Description:	Possible overload of each application task can be detected by means of this signal in the Packed Boolean format. The status is cleared with RESET command. To eliminate detected possible overload, move functions from the fastest task to slower one. **Bit** B0 Application Task 1 overload B1 Application Task 2 overload B2 Application Task 3 overload B3 Application Task 4 overload B4 Application Task 5 overload B5 Application Task 6 overload		
unit:	type: PB	Min: 0	Max:	Integer scaling: 1 == 1
04		*APBU EPLD VERSION*		
	Description:	This signal indicates APBU logic software version with parallel connected ACS800 inverters. This signal is read only when PPCC link has been successfully established.		
unit:	type: C	Min:	Max:	Integer scaling:

Group 5 Analogue Inputs

5	Group name:	*ANALOGUE INPUTS*		
	Description:			
01		**BASIC AI1**		
Index	Description:	Basic board analogue input AI1.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
02		**BASIC AI2**		
Index	Description:	Basic board analogue input AI2.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
03		**BASIC AI3**		
Index	Description:	Basic board analogue input AI3.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
04		**EXT1 AI1**		
Index	Description:	Extension board 1 analogue input AI1.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
05		**EXT1 AI2**		
Index	Description:	Extension board 1 analogue input AI2.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
06		**EXT2 AI1**		
Index	Description:	Extension board 2 analogue input AI1.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
07		**EXT2 AI2**		
Index	Description:	Extension board 2 analogue input AI2.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
08		**EXT3 AI1**		
Index	Description:	Extension board 3 analogue input AI1.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
09		**EXT3 AI2**		
Index	Description:	Extension board 3 analogue input AI2.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
10		**EXT4 AI1**		
Index	Description:	Extension board 4 analogue input AI1.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
11		**EXT4 AI2**		
Index	Description:	Extension board 4 analogue input AI2.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
12		**EXT5 AI1**		
Index	Description:	Extension board 5 analogue input AI1.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:
13		**EXT5 AI2**		
Index	Description:	Extension board 5 analogue input AI2.		
unit:	type: I	Min: -20000	Max: 20000	Integer scaling:

Group 6 Analogue Outputs

6	Group name:	*ANALOGUE OUTPUTS*		
	Description:			
01 Index		**BASIC AO1**		
	Description:	Basic board analogue input AO1.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
02 Index		**BASIC AO2**		
	Description:	Basic board analogue input AO2.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
03 Index		**EXT1 AO1**		
	Description:	Extension board 1 analogue input AO1.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
04 Index		**EXT1 AO2**		
	Description:	Extension board 1 analogue input AO2.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
05 Index		**EXT2 AO1**		
	Description:	Extension board 2 analogue input AO1.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
06 Index		**EXT2 AO2**		
	Description:	Extension board 2 analogue input AO2.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
07 Index		**EXT3 AO1**		
	Description:	Extension board 3 analogue input AO1.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
08 Index		**EXT3 AO2**		
	Description:	Extension board 3 analogue input AO2.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
09 Index		**EXT4 AO1**		
	Description:	Extension board 4 analogue input AO1.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
10 Index		**EXT4 AO2**		
	Description:	Extension board 4 analogue input AO2.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
11 Index		**EXT5 AO1**		
	Description:	Extension board 5 analogue input AO1.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483
12 Index		**EXT5 AO2**		
	Description:	Extension board 5 analogue input AO2.		
unit: mA	type: R	Min: 0	Max: 22	Integer scaling: 1==1483

Group 7 Control Words

7	Group name:	*CONTROL WORDS*		
	Description:	ABB Drive Profile Control Word for fieldbus control.		
01	Interval: 20 ms	*MAIN CTRL WORD (MCW)*		
Index		**Bit**	**Name**	**Value Meaning**
		B0	ON	1 Command to "**RDYRUN**" state 0 Command to "**OFF**" state
		B1	OFF 2	1 No OFF2 (Emergency OFF or Coast Stop) 0 Command to "**ON INHIBIT**" state
		B2	OFF 3	1 No OFF 3 (Emergency STOP) 0 Command to "**ON INHIBIT**" state
		B3	RUN	1 Command to "RDYREF" states 0 Stop by coasting
		B4	RAMP_OUT_ZERO	1 No other activities 0 Speed ramp output is forced to zero
		B5	RAMP_HOLD	1 No other activities 0 Speed ramping stopped
		B6	RAMP_IN_ZERO	1 No other activities 0 Speed ramp input is forced to zero
		B7	RESET	1 Fault resetting with a positive edge 0
		B8	INCHING1	1 Constant speed 1 defined by a parameter 0
		B9	INCHING2	1 Constant speed 2 defined by a parameter 0
		B10	REMOTE_CMD	1 Overriding computer is req. to control the drive 0 Only OFF commands are valid
		B11	reserved	1 (reserved) 0
		B12	reserved	1 (reserved) 0
		B13	reserved	1 (reserved) 0
		B14	reserved	1 (reserved) 0
		B15	reserved	1 (reserved) 0
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:

02	Interval: 20 ms	*AUX CONTROL WORD 1 (ACW_1)*	
Index	**Description:**	**Bit**	**Drive-specific auxiliary control word**
		B0 RESTART_DLOG	Restart data logger (rising edge).
		B1 TRIGG_LOGGER	Data logger triggering (rising edge)
		B2 RAMP_BYPASS	Bypass Speed ramp.
		B3 BAL_RAMP_OUT	Force ramp output.
		B4 FLUX ON DC	Flux on DC. (Flux off: set this bit and MCW bit 3 to 0).
		B5 FLUX ON	Flux on (zero torque).
		B6 HOLD_NCONT	Hold the integral part in the speed controller.
		B7 WINDOW_CTRL	FALSE = ADD CONTROL, TRUE = Window Control.
		B8 BAL_NCONT	Force speed controller output.
		B9 SYNC_COMMAND	Position counting: synchronise command.
		B10 SYNC_DISABLE	Position counting: disable synchronise command.
		B11 RESET_SYNC_RDY	Position counting: reset synchronous ready command.
		B12 RAMPED INCH REF	Activates 23.17 RAMPED INCH REF to speed ref chain.
		B13 FOLL SPD CORR ENA	Enables speed follower load share function.
		B14	
		B15	
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:

7	Group name:	*CONTROL WORDS*			
05	Interval: 20 ms	*MAIN CONTROL W MASK*			
	Description:	Mask word for control word 7.01. If a mask is used, set FFFF (65535 int) for the mask. If e.g. bit 0 is masked, set FFFE (65534 int) for the mask. Several bits can be masked at the same time. A mask function is needed if there is a need to share the control of bits between the fieldbus and block programming application. See Figure 4-6 in section *Control Block Diagrams.*			
Index:	Description:	**Bit** B0 0 = mask, 1 = no mask B1 0 = mask, 1 = no mask B2 0 = mask, 1 = no mask B3 0 = mask, 1 = no mask B4 0 = mask, 1 = no mask B5 0 = mask, 1 = no mask B6 0 = mask, 1 = no mask B7 0 = mask, 1 = no mask B8 0 = mask, 1 = no mask B9 0 = mask, 1 = no mask B10 0 = mask, 1 = no mask B11 0 = mask, 1 = no mask B12 0 = mask, 1 = no mask B13 0 = mask, 1 = no mask B14 0 = mask, 1 = no mask B15 0 = mask, 1 = no mask			
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:	

Group 8 Status Words

8	Group name:	*STATUS WORDS*			
	Description:	Status signals of the drive according to the ABB Drive Profile.			
01	Interval: 20 ms	*MAIN STATUS WORD (MSW)*			*INPUT*
Index		**Bit**	**Name**	**Value**	**Meaning**
		B0	RDYON	1 0	Ready to switch on Not ready to switch on
		B1	RDYRUN	1 0	Ready Not ready
		B2	RDYREF	1 0	Operation enabled (RUNNING) Operation inhibited
		B3	TRIPPED	1 0	Fault
		B4	OFF_2_STA	1 0	No OFF 2 OFF 2
		B5	OFF_3_STA	1 0	No OFF 3 OFF3
		B6	SWC ON INHIB	1 0	Switch on inhibit
		B7	ALARM	1 0	Alarm
		B8	AT_SETPOINT	1 0	Setpoint/act. value monitoring in the tolerance
		B9	REMOTE	1 0	Remote control Local control
		B10	ABOVE_LIMIT	1 0	frequency or speed > par. 50.10 Speed Above Limit
		B11	...		(reserved)
		B12	INTERNAL_INTERLOCK	1 0	Motor par. typed and no prev. of unexpected start-up
		B13			(reserved)
		B14			(reserved)
		B15			(reserved)
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:	

8	Group name:	*STATUS WORDS*			
02	Interval: 20 ms	*AP STATUS WORD (APSW)*			
	Description:	Bolded status bits are especially recommended to use with block programming application.			
Index	Description:	**Bit**		**Drive specific auxiliary status word**	
		B0			
		B1	**READY FOR START**	A drive is ready for immediate start.	
		B2	**RUNNING**	A drive is running.	
		B3	**MAGNETIZED**	A flux has been formed in the motor.	
		B4	**MODULATING**	IGBTs are switching voltage to the motor.	
		B5	SYNC_RDY	Position counter synchronous ready status.	
		B6	1_START_NOT_DONE	Not started after the setting of Group 99.	
		B7	IDENTIF_RUN_DONE	Motor Identification run has been completed.	
		B8	START_INHIBITION	Prevention of unexpected start-up is active.	
		B9	**LIMITING**	Control at a limit. (See signals 8.03…8.04).	
		B10	TORQUE CONTROL	A drive is torque controlled.	
		B11	ZERO_SPEED	Motor actual speed is below the zero speed limit.	
		B12	INTERNAL_SPEED_FB	Internal speed feedback selected for speed control.	
		B13	**ALARMING**	An alarm is active.	
		B14	**FAULTED**	A drive is tripped.	
		B15			
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:	
03	Interval: 2 ms	*LIMIT WORD 1*			
Index	Description:	**Bit**			
		B0	TORQ_MOTOR_LIM		
		B1	SPC_TORQ_MIN_LIM		
		B2	SPC_TORQ_MAX_LIM		
		B3	TORQ_USER_CUR_LIM		
		B4	TORQ_INV_CUR_LIM		
		B5	TORQ_MIN_LIM		
		B6	TORQ_MAX_LIM		
		B7	TREF_TORQ_MIN_LIM		
		B8	TREF_TORQ_MAX_LIM		
		B9	FLUX_MIN_LIMIT		
		B10	FREQ_MIN_LIMIT		
		B11	FREQ_MAX_LIMIT		
		B12	DC_UNDERVOLT_LIM		
		B13	DC_OVERVOLT_LIM		
		B14	TORQUE_LIMIT		
		B15	FREQ_LIMIT		
unit:	type: I	Min: 0	Max: 65535	Integer scaling:	
04	Interval: 20 ms	*LIMIT WORD 2*			
Index	Description:	**Bit**			
		B0	P MOT LIM	POWER MOTORING LIMIT is active.	
		B1	P GEN LIM	POWER GENERATING LIMIT is active.	
		B2…15		(reserved)	
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:	

8	Group name:	*STATUS WORDS*		
05	Interval: 20 ms	*DI STATUS WORD*		
Index	Description:	**Bit**		**Digital input status word**
		B0		
		B1	DI1	RMIO board digital input DI1 status
		B2	DI2	RMIO board digital input DI2 status
		B3	DI3	RMIO board digital input DI3 status
		B4	DI4	RMIO board digital input DI4 status
		B5	DI5	RMIO board digital input DI5 status
		B6	DI6	RMIO board digital input DI6 status
		B7	DI7 (DIIL)	RMIO board digital input DI7 status
		B8		
		B9		
		B10		
		B11		If RDIO Extension Modules are installed, see also parameters
		B12		98.04…98.08 and *Chapter 4 - I/O Configuration, Digital Inputs.*
		B13		
		B14		
		B15		
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:

06	Interval: 20 ms	*EXT DI STATUS WORD*		
Index	Description:	**Bit**		**Extension digital input status word**
		B0		
		B1	EXT1_DI1	RDIO Extension Module 1 DI1 status
		B2	EXT1_DI2	RDIO Extension Module 1 DI2 status
		B3	EXT1_DI3	RDIO Extension Module 1 DI3 status
		B4	EXT2_DI1	RDIO Extension Module 2 DI1 status
		B5	EXT2_DI2	RDIO Extension Module 2 DI2 status
		B6	EXT2_DI3	RDIO Extension Module 2 DI3 status
		B7	EXT3_DI1	RDIO Extension Module 3 DI1 status
		B8	EXT3_DI2	RDIO Extension Module 3 DI2 status
		B9	EXT3_DI3	RDIO Extension Module 3 DI3 status
		B10	EXT4_DI1	RDIO Extension Module 4 DI1 status
		B11	EXT4_DI2	RDIO Extension Module 4 DI2 status
		B12	EXT4_DI3	RDIO Extension Module 4 DI3 status
		B13	EXT5_DI1	RDIO Extension Module 5 DI1 status
		B14	EXT5_DI2	RDIO Extension Module 5 DI2 status
		B15	EXT5_DI3	RDIO Extension Module 5 DI3 status
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:

8	Group name:	*STATUS WORDS*
07		*LIMIT WORD INV*
	Description:	Following bits are included to bit 4 TORQ INV CUR LIM in 8.03 LIMIT WORD 1:
Index	Description:	**Bit** B0 Current integrator 200% (Function is active only in ACS 600) B1 Current integrator 150% B2 High IGBT temperature in low frequency with current integrators B3 High IGBT temperature with current integrators B4 IGBT overtemperature with temperature model B5 IGBT overload with temperature model B6 Inverter maximum power limit (internal limit is INV POWER LIM). If line converter is not included and brake chopper is configured, power limit in generator side is calculated directly according to internal parameter MAX BRAKING POWER B7 Inverter trip current (internal limit is INV TRIP CURRENT%) B8 Inverter maximum current limit (internal limit is OVERLOAD CURR LIM) B9 Continuous power limit i.e. dc-current B10 Continuous output current limit B11 Maximum continuous output current limited due to Reduced Run function B12 Maximum output current limited due to Reduced Run function B13 B14 B15

unit:	type: PB	Min: 0	Max: 65535	Integer scaling:

20		*INV ENABLED WORD*
Index:	Description:	These bits are indicating state TRUE when the parameter **98.12 FUSE SWITCH CTRL** has been activated, a DC switch of each ACS800 R8i inverter module is closed, intermediate circuit has been charged and inverter module is allowed to start modulating. **Bit** B0 INV1 ENABLED Inverter module 1 ready for operation B1 INV2 ENABLED Inverter module 2 ready for operation B2 INV3 ENABLED Inverter module 3 ready for operation B3 INV4 ENABLED Inverter module 4 ready for operation B4 INV5 ENABLED Inverter module 5 ready for operation B5 INV6 ENABLED Inverter module 6 ready for operation B6 INV7 ENABLED Inverter module 7 ready for operation B7 INV8 ENABLED Inverter module 8 ready for operation B8 INV9 ENABLED Inverter module 9 ready for operation B9 INV10 ENABLED Inverter module 10 ready for operation B10 INV11 ENABLED Inverter module 11 ready for operation B11 INV12 ENABLED Inverter module 12 ready for operation B12 B13 B14 B15

unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling: 1 == 1

8	Group name:	*STATUS WORDS*				
21		*START INHIBI WORD*				
Index:	Description:	**Bit** These bits are indicate the status of unexpected start-up circuit B0 INV1 START INHIB Inverter module 1 start inhibited B1 INV2 START INHIB Inverter module 2 start inhibited B2 INV3 START INHIB Inverter module 3 start inhibited B3 INV4 START INHIB Inverter module 4 start inhibited B4 INV5 START INHIB Inverter module 5 start inhibited B5 INV6 START INHIB Inverter module 6 start inhibited B6 INV7 START INHIB Inverter module 7 start inhibited B7 INV8 START INHIB Inverter module 8 start inhibited B8 INV9 START INHIB Inverter module 9 start inhibited B9 INV10 START INHIB Inverter module 10 start inhibited B10 INV11 START INHIB Inverter module 11 start inhibited B11 INV12 START INHIB Inverter module 12 start inhibited B12 B13 B14 B15				
unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling:	1 == 1
22		*INT CONFIG WORD*				
Index:	Description:	**Bit** Found inverter units by APBU 44 branching unit. B0 INV1 found B1 INV2 found B2 INV3 found B3 INV4 found B4 INV5 found B5 INV6 found B6 INV7 found B7 INV8 found B8 INV9 found B9 INV10 found B10 INV11 found B11 INV12 found B12 B13 B14 B15				
unit:	type: Pb	Min: 0	Max: 65535	Def:	Integer scaling:	1 == 1

8	Group name:	*STATUS WORDS*					
23		*LCU STATUS WORD*					
Index:	Description:	**Bit**	Line converter status word.				
		B0	RDY_ON	1 = ready to switch on (no fault)			
		B1	RDY_RUN	1 = ready to operate			
		B2	RDY_REF	1 = operation enabled			
		B3	TRIPPED	1 = fault			
		B4					
		B5					
		B6					
		B7	ALARM	1 = warning			
		B8	MODULATING	1 = line converter modulates			
		B9	REMOTE	1 = drive control: remote			
		B10	NET OK	1 = network voltage is OK.			
		B11					
		B12					
		B13					
		B14	CHARGING	1 = charging contactor is closed			
		B15					
unit:	type: Pb	Min: 0		Max: 65535	Def:	Integer scaling:	1 == 1

Group 9 Fault Words

9	Group name:	*FAULT WORDS*		
	Description:	Fault signals of the drive.		
01	Interval: 500 ms	*FAULT WORD 1*		
Index	Description:	**Bit**		
		B0	SHORT CIRC	Short circuit in the main circuit.
		B1	OVERCURRENT	Overcurrent.
		B2	DC OVERVOLT	Intermediate circuit DC overvoltage.
		B3	ACS 800 TEMP	Power plate overtemperature.
		B4	EARTH FAULT	Earth (ground) fault or excessive output current unbalance in inverter unit of several parallel connected inverter modules.
		B5		
		B6	MOTOR TEMP	Motor overtemperature (calculated).
		B7	SYSTEM_FAULT	A fault is indicated by the System Fault Word 9.03.
		B8	UNDERLOAD	Underload fault. See parameter 30.16.
		B9	OVERFREQ	Overspeed fault.
		B10		(reserved)
		B11	CH2 COM LOS	Channel CH2 (Master/Follower link) communication error
		B12	SC (INU1)	Short circuit in parallel connected INU 1.
		B13	SC (INU2)	Short circuit in parallel connected INU 2.
		B14	SC (INU3)	Short circuit in parallel connected INU 3.
		B15	SC (INU4)	Short circuit in parallel connected INU 4.
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:
02	Interval: 500 ms	*FAULT WORD 2*		
Index	Description:	**Bit**		
		B0	SUPPLY PHASE	DC voltage ripple in intermediate circuit is too high.
		B1	NO MOTOR DATA	No motor data entered in Group 99.
		B2	DC UNDERVOLT	Intermediate circuit DC undervoltage
		B3	CABLE TEMP	Motor cable overtemperature
		B4	INV DISABLED	DC supply switch of inverter module is opened.
		B5	ENCODER 1 ERR	Speed measurement 1 fault on pulse encoder module 1.
		B6	I/O COMM ERR	I/O device fault on DDCS channel CH1.
		B7	CONTROL B TEMP	Drive cabinet overtemperature (meas. by RMIO board)
		B8		
		B9	OVER SWFREQ	Switching frequency is too high.
		B10	ENCODER 2 ERR	Communication break on pulse encoder module 2.
		B11	PPCC LINK	NINT board current measurement or communication error.
		B12	COMM MODULE	Fieldbus communication break.
		B13	PANEL LOST	Local control lost.
		B14	MOTOR STALL	Motor stall
		B15	MOTOR PHASE	Motor circuit fault.
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:

9	Group name:	*FAULT WORDS*		
04 Index	Interval: 500 ms	*ALARM WORD 1*		
	Description:	**Bit**		
		B0	START INHIBIT	Preventation of Unexpected Start-up
		B1	EM STOP	Emergency stop function has been activated DI1=0.
		B2		
		B3	MOTOR TEMP	Overtemperature alarm of the thermal model.
		B4	ACS 800 TEMP	Power plate overtemperature.
		B5	ENCODER 1 ERR	Pulse encoder 1 error. See parameter 50.05.
		B6	ENCODER 2 ERR	Pulse encoder 2 error. See parameter 50.17.
		B7	DIGITAL IO	Basic digital I/O alarm (RMIO).
		B8	ANALOG IO	Basic analogue I/O alarm (RMIO).
		B9	EXT DIGITAL IO	External digital I/O alarm (RDIO).
		B10	EXT ANALOG IO	External analogue I/O alarm (RAIO).
		B11	CH2 COM LOS	CH2 Master/Follower link communication error.
		B12		
		B13		
		B14	EARTH FAULT	Earth (ground) fault / current unbalance with parallel connected drives
		B15		
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:
05 Index	Interval: 500 ms	*ALARM WORD 2*		
	Description:	**Bit**		
		B0		
		B1		
		B2	INV OVERLOAD	Internal current limitation is active.
		B3	CABLE TEMP	Motor cable overtemperature.
		B4	ENCODER A<>B	Pulse encoder output phasing is wrong (polarity).
		B5		
		B6		
		B7	POWFAIL FILE	Error in restoring powerfail.ddf file
		B8	POWDOWN FILE	Error in restoring powerdown.ddf file
		B9	MOTOR STALL	Motor stall
		B10		
		B11	COMM MODULE	Fieldbus communication break.
		B12	BATT FAILURE	APBU 44 branching unit memory backup battery error
		B13	PANEL LOST	Local control lost.
		B14	RUN DISABLED	Input of the block RUN ENA is in state FALSE.
		B15		
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:
06 Index	Interval: 500 ms	*FAULT WORD 3*		
	Description:	**Bit**		
		B0	FAST EXT AI	Extension analogue I/O alarm (NAIO-02F on CH2)
		B1		
		B2		
		B3	LINE CONV ERR	Line converter fault. Used in 2Q and 4Q single drives.
		B4		
		B5		
		B6		
		B7	INT CONFIG	Found R8i inverter modules does not match with configuration
		B8		
		B9		
		B10	ENCODER A<>B	Pulse encoder output phasing is wrong (polarity).
		B11	DC HIGH RISE	Too high change in the DC voltage level.
		B12		
		B13	MOD CHOKE T	Overtemperature in choke of liquid cooled R8i inverter module.
		B14	MOD BOARD T	Overtemperature in AINT board of inverter module
		B15	TEMP DIFF	Temperature difference. See 09.17 TEMP DIF FLT WORD.
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:

9	Group name:	*FAULT WORDS*		
08	Interval: 500 ms	*ALARM WORD 3*		
Index	Description:	**Bit**		
		B0	APPL OVERLOAD	Application software overload
		B1	APPLIC 1 FAULT	Application task program 1 fault
		B2	APPLIC 2 FAULT	Application task program 2 fault
		B3	APPLIC 3 FAULT	Application task program 3 fault
		B4		
		B5	NODE2 ERR	Node 2 communication error on channel CH2
		B6	NODE3 ERR	Node 3 communication error on channel CH2
		B7		
		B8		
		B9		
		B10		
		B11		
		B12		
		B13	MOD CHOKE T	Overtemperature in choke of liquid cooled R8i inverter module.
		B14	MOD BOARD T	Overtemperature in AINT board of inverter module
		B15	TEMP DIFF	Temperature difference. See 09.18 TEMP DIF ALM WORD.
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:
09	Interval: 500 ms	*I/O FAULT WORD*		
Index	Description:	**Bit**		
		B0	DIO EXT1 ERROR	Error detected in the digital extension module 1
		B1	DIO EXT2 ERROR	Error detected in the digital extension module 2
		B2	DIO EXT3 ERROR	Error detected in the digital extension module 3
		B3	DIO EXT4 ERROR	Error detected in the digital extension module 4
		B4	DIO EXT5 ERROR	Error detected in the digital extension module 5
		B5	RMIO DI ERROR	Error detected in the digital I/O of RMIO control board
		B6		
		B7		
		B8		
		B9		
		B10	AIO EXT1 ERROR	Error detected in the analogue extension module 1
		B11	AIO EXT2 ERROR	Error detected in the analogue extension module 2
		B12	AIO EXT3 ERROR	Error detected in the analogue extension module 3
		B13	AIO EXT4 ERROR	Error detected in the analogue extension module 4
		B14	AIO EXT5 ERROR	Error detected in the analogue extension module 5
		B15	RMIO AIO ERROR	Error detected in the analogue I/O of RMIO control board
unit:	type: PB	Min: 0	Max: 65535	Integer scaling:
13	Interval: 2 ms	*CURRENT UNBALANCE*		
Index:	Description:	B0	CUR UNBAL 1	Current unbalance fault detected in inverter module 1
		B1	CUR UNBAL 2	Current unbalance fault detected in inverter module 2
		B2	CUR UNBAL 3	Current unbalance fault detected in inverter module 3
		B3	CUR UNBAL 4	Current unbalance fault detected in inverter module 4
		B4	CUR UNBAL 5	Current unbalance fault detected in inverter module 5
		B5	CUR UNBAL 6	Current unbalance fault detected in inverter module 6
		B6	CUR UNBAL 7	Current unbalance fault detected in inverter module 7
		B7	CUR UNBAL 8	Current unbalance fault detected in inverter module 8
		B8	CUR UNBAL 9	Current unbalance fault detected in inverter module 9
		B9	CUR UNBAL 10	Current unbalance fault detected in inverter module 10
		B10	CUR UNBAL 11	Current unbalance fault detected in inverter module 11
		B11	CUR UNBAL 12	Current unbalance fault detected in inverter module 12
		B12		
		B13		
		B14		
		B15		
unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling:

9	Group name:	*FAULT WORDS*		
14	Interval: 2 ms	*OVERCURRENT FAULT*		
Index:	Description:	B0	OVERCURR 1	Overcurrent fault detected in inverter module 1
		B1	OVERCURR 2	Overcurrent fault detected in inverter module 2
		B2	OVERCURR 3	Overcurrent fault detected in inverter module 3
		B3	OVERCURR 4	Overcurrent fault detected in inverter module 4
		B4	OVERCURR 5	Overcurrent fault detected in inverter module 5
		B5	OVERCURR 6	Overcurrent fault detected in inverter module 6
		B6	OVERCURR 7	Overcurrent fault detected in inverter module 7
		B7	OVERCURR 8	Overcurrent fault detected in inverter module 8
		B8	OVERCURR 9	Overcurrent fault detected in inverter module 9
		B9	OVERCURR 10	Overcurrent fault detected in inverter module 10
		B10	OVERCURR 11	Overcurrent fault detected in inverter module 11
		B11	OVERCURR 12	Overcurrent fault detected in inverter module 12
		B12		
		B13		
		B14		
		B15		

unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling: 1 == 1

15	Interval: 2 ms	*OVERCURRENT FAULT*		
Index:	Description:	B0	SC INV 1 U 1	Short circuit detected in inverter module 1
		B1	SC INV 1 U 2	Short circuit detected in inverter module 2
		B2	SC INV 1 U 3	Short circuit detected in inverter module 3
		B3	SC INV 1 U 4	Short circuit detected in inverter module 4
		B4	SC INV 1 U 5	Short circuit detected in inverter module 5
		B5	SC INV 1 U 6	Short circuit detected in inverter module 6
		B6	SC INV 1 U 7	Short circuit detected in inverter module 7
		B7	SC INV 1 U 8	Short circuit detected in inverter module 8
		B8	SC INV 1 U 9	Short circuit detected in inverter module 9
		B9	SC INV 1 U 10	Short circuit detected in inverter module 10
		B10	SC INV 1 U 11	Short circuit detected in inverter module 11
		B11	SC INV 1 U 12	Short circuit detected in inverter module 12
		B12	SC PHASE U	Short circuit detected in phase U of inverter module
		B13	SC PHASE V	Short circuit detected in phase V of inverter module
		B14	SC PHASE W	Short circuit detected in phase W of inverter module
		B15		

unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling: 1 == 1

16	Interval: 2 ms	*OVERTEMP WORD*		
Index:	Description:	B0	ACS TEMP INV1	Overtemperature in inverter module 1
		B1	ACS TEMP INV2	Overtemperature in inverter module 2
		B2	ACS TEMP INV3	Overtemperature in inverter module 3
		B3	ACS TEMP INV4	Overtemperature in inverter module 4
		B4	ACS TEMP INV5	Overtemperature in inverter module 5
		B5	ACS TEMP INV6	Overtemperature in inverter module 6
		B6	ACS TEMP INV7	Overtemperature in inverter module 7
		B7	ACS TEMP INV8	Overtemperature in inverter module 8
		B8	ACS TEMP INV9	Overtemperature in inverter module 9
		B9	ACS TEMP INV10	Overtemperature in inverter module 10
		B10	ACS TEMP INV11	Overtemperature in inverter module 12
		B11	ACS TEMP INV12	Overtemperature in inverter module 12
		B12	OVERTEMP PHASE U	Overtemperature in phase U
		B13	OVERTEMP PHASE V	Overtemperature in phase V
		B14	OVERTEMP PHASE W	Overtemperature in phase W
		B15		

unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling: 1 == 1

9	Group name:	*FAULT WORDS*		
17	Interval: 2 ms	*TEMP DIF FLT WORD*		
		B0	TEMPD INV1	Temperature difference fault detected in inv. module 1
		B1	TEMPD INV2	Temperature difference fault detected in inv. module 2
		B2	TEMPD INV3	Temperature difference fault detected in inv. module 3
		B3	TEMPD INV4	Temperature difference fault detected in inv. module 4
		B4	TEMPD INV5	Temperature difference fault detected in inv. module 5
		B5	TEMPD INV6	Temperature difference fault detected in inv. module 6
		B6	TEMPD INV7	Temperature difference fault detected in inv. module 7
		B7	TEMPD INV8	Temperature difference fault detected in inv. module 8
		B8	TEMPD INV9	Temperature difference fault detected in inv. module 9
		B9	TEMPD INV10	Temperature difference fault detected in inv. module 10
		B10	TEMPD INV11	Temperature difference fault detected in inv. module 11
		B11	TEMPD INV12	Temperature difference fault detected in inv. module 12
		B12	TEMPD PHASE U	Temperature difference is too high in phase U
		B13	TEMPD PHASE V	Temperature difference is too high in phase V
		B14	TEMPD PHASE W	Temperature difference is too high in phase W
		B15		

unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling: 1 == 1

18	Interval: 2 ms	*TEMP DIF ALM WORD*		
Index:	Description:	B0	TEMPD INV1	Temperature difference fault detected in inv. module 1
		B1	TEMPD INV2	Temperature difference fault detected in inv. module 2
		B2	TEMPD INV3	Temperature difference fault detected in inv. module 3
		B3	TEMPD INV4	Temperature difference fault detected in inv. module 4
		B4	TEMPD INV5	Temperature difference fault detected in inv. module 5
		B5	TEMPD INV6	Temperature difference fault detected in inv. module 6
		B6	TEMPD INV7	Temperature difference fault detected in inv. module 7
		B7	TEMPD INV8	Temperature difference fault detected in inv. module 8
		B8	TEMPD INV9:	Temperature difference fault detected in inv. module 9
		B9	TEMPD INV10:	Temperature difference fault detected in inv. module 10
		B10	TEMPD INV11	Temperature difference fault detected in inv. module 11
		B11	TEMPD INV12:	Temperature difference fault detected in inv. module 12
		B12	TEMPD PHASE U	Temperature difference is too high in phase U
		B13	TEMPD PHASE V	Temperature difference is too high in phase V
		B14	TEMPD PHASE W	Temperature difference is too high in phase W
		B15		

unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling: 1 == 1

19	Interval: 20 ms	*AP ALARM and FAULT WORD (AP AFW)*
Index:	Description:	Alarm and Fault word for user's events. This word can be used for Block Programming purposes typically for fieldbus information. Use function block A/F WORD in application program.
		B0
		B1
		B2
		B3
		B4
		B5
		B6
		B7
		B8
		B9
		B10
		B11
		B12
		B13
		B14
		B15

unit:	type: PB	Min: 0	Max: 65535	Def:	Integer scaling: 1 == 1

9	Group name:	*FAULT WORDS*		
30 Index		**FAULT CODE 1 LAST**		
	Description:	Fieldbus code of the latest fault. This code is also displayed in fault logger. See *Chapter 8 - Fault Tracing* for the codes.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
31 Index		**FAULT CODE 2 LAST**		
	Description:	Fieldbus code of the 2nd latest fault.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
32 Index		**FAULT CODE 3 LAST**		
	Description:	Fieldbus code of the 3rd latest fault.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
33 Index		**FAULT CODE 4 LAST**		
	Description:	Fieldbus code of the 4th latest fault.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
34 Index		**FAULT CODE 5 LAST**		
	Description:	Fieldbus code of the 5th latest fault.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
35 Index		**WARN CODE 1 LAST**		
	Description:	Fieldbus code of the latest warning. This code is also displayed in fault logger. See *Chapter 8 - Fault Tracing* for the codes.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
36 Index		**WARN CODE 2 LAST**		
	Description:	Fieldbus code of the 2nd latest warning.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
37 Index		**WARN CODE 3 LAST**		
	Description:	Fieldbus code of the 3rd latest warning.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
38 Index		**WARN CODE 4 LAST**		
	Description:	Fieldbus code of the 4th latest warning.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1
39 Index		**WARN CODE 5 LAST**		
	Description:	Fieldbus code of the 5th latest warning.		
unit:	type: I	Min: 0	Max: FFFF	Integer scaling: 1 == 1

Chapter 6 – Parameters

Overview

This chapter explains the function of, and valid selections for, each parameter.

Parameter Groups

The parameters are arranged into groups by their function. The figure below illustrates the organisation of the parameter groups.

Drive Parameters		
Group + Index	**Description**	**Quantity**
13.01…13.06, 13.15…13.44	Analogue Input	36
14.02…14.07	Fast Inputs	7
15.01…15.24	Analogue Outputs	24
16.02…16.04, 16.07…16.10	System Control Inputs	7
18.01…18.02	LED Panel Control	2
19.01…19.14	Data Storage	14
20.01…20.11, 20.17…20.20	Limits	15
21.01…21.02	Start/Stop Functions	2
22.01…22.02, 22.04…22.05, 22.08	Accel/Decel	5
23.01...23.19	Speed Reference	19
24.02…24.03, 24.04…24.06, 24.09, 24.11…24.16	Speed Control	12
25.01…25.07	Torque Reference	7
26.01…26.03	Torque Reference Handling	3
27.03…27.05	Flux Control	3
28.07…28.08, 28.12…28.15	Motor Model	5
29.01…29.04	Scalar Control	4
30.01…30.02, 30.09…30.25, 30.28…30.32	Fault Functions	24
31.02	Fault Functions	1
34.01…34.05	Brake Chopper	5
37.01, 37.03…37.13	Function Generator	12
50.01…50.06, 50.08…50.19	Speed Measurement	18
51.01…51.33	Master Adapter	33
53.01…53.24	User Parameters	24
55.01…55.02, 55.05…55.154	Appl Prog1	152
56.01…56.05	Appl Task 1 Ctrl	5
57.01…57.02, 57.05…57.249	Appl Prog2	247
58.01…58.05	Appl Task 2 Ctrl	5
59.01…59.02, 59.05…59.254	Appl Prog3	251
60.01…60.254	Appl Task 3 Ctrl	254
66.02, 66.04, 66.06…66.30	Applic Connect	27
70.01…70.20, 70.28…70.30	DDCS Control	23
71.01	DriveBus Communication	1
90.01…90.12	Data Set Receive Addresses	12
92.01…92.12	Data Set Transmit Addresses	12
94.01…94.08	P2P Connection	8
95.01…95.04	LCU	4
97.01	Drive	1
98.01…98.02, 98.04…98.16	Option Modules	15
99.01…99.13	Start-Up Data	13
	Total	**1312**

How to Read the Parameter Table

Before you start to read the parameter table, we first recommend you read this description.

- Parameter change by DriveWindow or the CDP 312 R is stored to FPROM memory; changes made by the overriding system are only stored to RAM.
- If the overriding control system reads or writes individual bits of a word with an Advant CONV_IB element, (for example 7.02 AUX CONTROL WORD) the bit B15 corresponds to the SIGN outputs of the element.
- From DriveWindow and the control panel, parameter values are set in decimal.
- Unit of the parameter value can be seen on the lower left-hand corner of the parameter description.
- Minimum, maximum and default values are shown in decimal format.
- Data type is given with a short code:
  I = 16-bit signed integer value B = Boolean value
  PB = Packed Boolean value R = Real value
  P = Pointer
- Communication between the overriding system and the drive uses 16 bit integer values (-32768...32767). To change a parameter value from the overriding system, an integer value for the parameter must be calculated using the information given in the **Integer scaling** column.

Example 1: If TREF TORQMAX (real) is set from the overriding system, an integer value of 100 corresponds to 1% (see below).

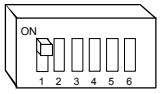
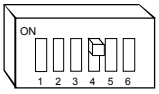
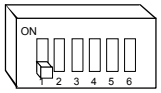
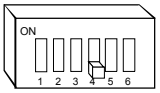
09		**TREF TORQMAX**			
Index	Description:	Maximum torque reference as a percentage of the motor nominal torque.			
unit: %	type: R	Min: 0 %	Max: 300 %	Def: 300 %	Integer scaling: 100 == 1%

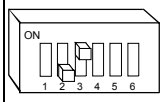
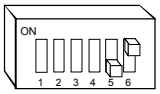
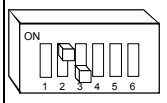
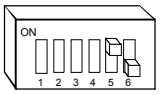
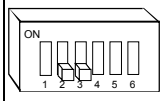
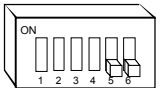
Figure 6 - 1 Sample of the Parameter Table

Example 2: Speed reference from the overriding system.

- Speed reference input is given by parameter 23.01 SPEED REF. The Integer scaling box reads “see parameter. 50.01”. Parameter 50.01 defines the motor speed (in rpm) at maximum reference (20000 for the overriding system). Thus, sending a value of 20000 from the overriding system into parameter 23.01 sets the speed reference to the rpm value given with parameter 50.01.

Group 13 Analogue Inputs

13	Group name:	*ANALOGUE INPUTS*			
01		**AI1 CONV MODE**			
Index:	Description:	The conversion mode for the analogue input AI1. Different modes are: 1 = **NORMAL** scaling: –10 V…0…10 V = -20000…0…20000 2 = PT 100: supply from any AO, scale 200˚C = 20000 **1xPT 100:** = 10 mA **2xPT 100:** = 5 mA **3Xpt 100:** = 3.3 mA 3 = **KTY84** = supply from any AO, supply 2 mA; scale 100˚C = 10000			
unit:	type: I	Min: 1	Max: 3	Def: 1 (normal)	Integer scaling:
02		**AI1 FILTER ms**			
Index:	Description:	The filtering time constant for AI1.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
03		**AI2 CONV MODE**			
Index:	Description:	The conversion mode for the analogue input AI2. Different modes: 1 = **NORMAL** scaling: –20 mA…0…20 mA = 20000…0…20000 2 = **4 mA** scaling: 4 mA…20 mA = 0…20000			
unit:	type: I	Min: 1	Max: 2	Def: 1 (normal)	Integer scaling:
04		**AI2 FILTER ms**			
Index:	Description:	The filtering time constant for AI2.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
05		**AI3 CONV MODE**			
Index:	Description:	The conversion mode for the analogue input AI3. Different modes are: 1 = **NORMAL** scaling: –20 mA…0…20 mA = 20000…0…20000 2 = **4 mA** scaling: 4 mA…20 mA = 0…20000			
unit:	type: I	Min: 1	Max: 2	Def: 1 (normal)	Integer scaling:
06		**AI3 FILTER ms**			
Index:	Description:	The filtering time constant for AI3.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
15		**EXT1 AI1 HW MODE**			
Index	Description:	This parameter configures the inputs and outputs of an RAIO analogue I/O extension module. The operating mode of the analogue inputs can be selected by using the configuration DIP switch (S2) on the circuit board of the module. The drive parameters must be set accordingly. Each input can be used with a current or voltage signal. The selection is made with the configuration DIP switch (S2) on the circuit board of the module. 1 = **UNIPOLAR** unipolar input mode (default) 2 = **BIPOLAR** bipolar input mode **RAIO-01** Switch S2 (Operating mode): **Analogue input AI1** **Analogue input AI2** **Input signal type**   ± 0(4)…20 mA ± 0(2)…10 V ± 0…2 V   0(4)…20 mA 0(2)…10 V 0…2 V (Default)			

13	Group name:	*ANALOGUE INPUTS*			
		Switch S2 (Current or voltage signal): **Analogue input AI1** **Analogue input AI2**   Current signal ±0(4)…20 mA (Default)   Voltage signal ±0(2)…10 V   Voltage signal ±0…2 V			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
16		**EXT1 AI2 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
17		**EXT1 AI1 CONV MODE**			
Index:	Description:	The conversion mode for the external 1 analogue input AI1. The scaling is the same in both hw modes (unipolar, bipolar). Different modes: 1 = **NORMAL** scaling: –20 mA / -2 V / -10 V…0…20 mA / 2 V / 10 V = -20000…20000 2 = **4 mA** scaling: 4…20 mA = 0…20000 3 = PT 100 supply from any AO, scale 200˚C = 20000 **1XPT 100:** = 10 mA **2XPT 100:** = 5 mA **3XPT 100:** = 3.3 mA 4 = **KTY84** = supply from any AO, supply 2 mA; scale 200˚C = 20000			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
18		**EXT1 AI2 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
19		**EXT1 AI1 FILTER ms**			
Index:	Description:	The filtering time constant for external module 1 AI1.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
20		**EXT1 AI2 FILTER ms**			
Index:	Description:	The filtering time constant for external module 1 AI2.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
21		**EXT2 AI1 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
22		**EXT2 AI2 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:

13	Group name:	*ANALOGUE INPUTS*			
23		**EXT2 AI1 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
24		**EXT2 AI2 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
25		**EXT2 AI1 FILTER ms**			
Index:	Description:	The filtering time constant for external module 2 AI1.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
26		**EXT2 AI2 FILTER ms**			
Index:	Description:	The filtering time constant for external module 2 AI2.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
27		**EXT3 AI1 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
28		**EXT3 AI2 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
29		**EXT3 AI1 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
30		**EXT3 AI2 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
31		**EXT3 AI1 FILTER ms**			
Index:	Description:	The filtering time constant for external module 3 AI1.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
32		**EXT3 AI2 FILTER ms**			
Index:	Description:	The filtering time constant for external module 3 AI2.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
33		**EXT4 AI1 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
34		**EXT4 AI2 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
35		**EXT4 AI1 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
36		**EXT4 AI2 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
37		**EXT4 AI1 FILTER ms**			
Index:	Description:	The filtering time constant for external module 4 AI1.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
38		**EXT4 AI2 FILTER ms**			
Index:	Description:	The filtering time constant for external module 4 AI2.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms

13	Group name:	*ANALOGUE INPUTS*			
39		**EXT5 AI1 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
40		**EXT5 AI2 HW MODE**			
Index:	Description:	See index 15.			
unit:	type: I	Min: 1	Max: 2	Def: 1 (unipolar)	Integer scaling:
41		**EXT5 AI1 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
42		**EXT5 AI2 CONV MODE**			
Index:	Description:	See index 17.			
unit:	type: I	Min: 1	Max: 4	Def: 1 (normal)	Integer scaling:
43		**EXT5 AI1 FILTER ms**			
Index:	Description:	The filtering time constant for external module 5 AI1.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms
44		**EXT5 AI2 FILTER ms**			
Index:	Description:	The filtering time constant for external module 5 AI2.			
unit: ms	type: I	Min: 0	Max: 30000	Def: 1000 (ms)	Integer scaling: 1 = 1 ms

Group 14 Fast Inputs

14	Group name:	*FAST INPUTS*			
	Description:	Fast analogue input signals of NAIO-03F can be directly switched into the speed and torque control chain. This mode is activated with parameter 98.16 FAST AI. No other devices allowed to connect simultaneously on DDCS communication channel CH2.			
02 Index		**NAIO AI1 REF SEL**			
	Description:	Analogue input AI1 connection point in the speed and torque reference chain. 0 = **NO AI REF** No connections for AI1 of fast NAIO-03F 1 = **ADD SPEED** AI1 of NAIO-03F is connected internally to input ADDITIVE SPEED reference. 2 = **SPEED COR** AI1 of NAIO-03F is connected internally to input SPEED CORRECTION. 3 = **TORQ REF A** AI1 of NAIO-03F is connected internally to input TORQUE REFERENCE A. 4 = **TORQ REF B** AI1 of NAIO-03F is connected internally to input TORQUE REFERENCE B. 5 = **TORQ STEP** AI1 of NAIO-03F is connected internally to input TORQUE STEP.			
unit:	type: I	Min: 0	Max: 5	Def: 0	Integer scaling:
03 Index		**NAIO AI2 REF SEL**			
	Description:	Analogue input AI2 connection point in the speed and torque reference chain. 0 = **NO AI REF** No connections for AI2 of fast NAIO-03F 1 = **ADD SPEED** AI2 of NAIO-03F is connected internally to input ADDITIVE SPEED reference. 2 = **SPEED COR** AI2 of NAIO-03F is connected internally to input SPEED CORRECTION. 3 = **TORQ REF A** AI2 of NAIO-03F is connected internally to input TORQUE REFERENCE A. 4 = **TORQ REF B** AI2 of NAIO-03F is connected internally to input TORQUE REFERENCE B. 5 = **TORQ STEP** AI2 of NAIO-03F is connected internally to input TORQUE STEP.			
unit:	type: I	Min: 0	Max: 5	Def: 0	Integer scaling:
04 Index		**AI1 SPEED SCALE**			
	Description:	A scaling of NAIO-03F analogue input AI1 signal in the speed reference chain. The value of this parameter corresponds the nominal signal level of NAIO-03F (+2 V, +10 V or 20 mA).			
unit: rpm	type: I	Min: -9000	Max: 9000	Def: 0	Integer scaling:
05 Index		**AI2 SPEED SCALE**			
	Description:	A scaling of NAIO-03F analogue input AI2 signal in the speed reference chain. The value of this parameter corresponds the nominal signal level of NAIO-03F (+2 V, +10 V or 20 mA).			
unit: rpm	type: I	Min: -9000	Max: 9000	Def: 0	Integer scaling:
06 Index		**AI1 TORQUE SCALE**			
	Description:	A scaling of NAIO-03F analogue input AI1 signal in the torque reference chain. The value of this parameter corresponds the nominal signal level of NAIO-03F (+2V, +10 V or 20 mA).			
unit: %	type: R	Min: -2844	Max: 2844	Def: 0	Integer scaling:
07 Index		**AI2 TORQUE SCALE**			
	Description:	A scaling of NAIO-03F analogue input AI2 signal in the torque reference chain. The value of this parameter corresponds the nominal signal level of NAIO-03F (+2V, +10 V or 20 mA).			
unit: %	type: R	Min: -2844	Max: 2844	Def: 0	Integer scaling:

Group 15 Analogue Outputs

15	Group name:	*ANALOGUE OUTPUTS*			
	Description:	It is possible to select a signal or parameter to control the analogue outputs. The outputs can also be controlled from the overriding system.			
01 Index		**AO1 OFFSET**			
	Description:	Analogue output AO1 signal offset in milliamperes.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
02 Index		**AO1 SCALE**			
	Description:	The scaling of analogue output AO1 signal. The value of this parameter corresponds the maximum output current (20 mA). E.g. 20000 (default) = 20 mA.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
03 Index		**AO2 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
04 Index		**AO2 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
05 Index		**EXT1 AO1 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
06 Index		**EXT1 AO1 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
07 Index		**EXT1 AO2 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
08 Index		**EXT1 AO2 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
09 Index		**EXT2 AO1 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
10 Index		**EXT2 AO1 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
11 Index		**EXT2 AO2 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
12 Index		**EXT2 AO2 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
13 Index		**EXT3 AO1 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000

15	Group name:	*ANALOGUE OUTPUTS*			
14 Index		**EXT3 AO1 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
15 Index		**EXT3 AO2 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
16 Index		**EXT3 AO2 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
17 Index		**EXT4 AO1 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
18 Index		**EXT4 AO1 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
19 Index		**EXT4 AO2 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
20 Index		**EXT4 AO2 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
21 Index		**EXT5 AO1 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
22 Index		**EXT5 AO1 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:
23 Index		**EXT5 AO2 OFFSET**			
	Description:	See index 01.			
unit: mA	type: R	Min: 0 mA	Max: 20 mA	Def: 0 mA	Integer scaling: 1 mA == 1000
24 Index		**EXT5 AO2 SCALE**			
	Description:	See index 02.			
unit:	type: I	Min: 0	Max: 30000	Def: 20000	Integer scaling:

Group 16 System Control Inputs

16	Group name:	SYSTEM CTR INPUTS			
	Description:				
02 Index		**PARAMETER LOCK**			
	Description:	This parameter selects the state of the parameter lock. With the parameter lock you can prevent unauthorised changes by CDP 312R or the DriveWindow Tool for parameter groups 0…99. 1 = **LOCKED** Parameter changes are disabled. 0 = **OPEN** Parameter changes are enabled.			
unit:	type: B	Min:	Max:	Def: OPEN	Integer scaling: 1 == 1
03 Index		**PASS CODE**			
	Description:	This parameter enters the pass code for the Parameter Lock. The default value of this parameter is 0. In order to open the Parameter Lock, change the value to 358. After the Parameter Lock is opened, the value is automatically changed back to 0.			
unit:	type: I	Min: 0	Max: 30000	Def: 0	Integer scaling:
04 Index		**LOCAL LOCK**			
	Description:	Control place change of the drive from remote to local can be disabled by setting this parameter to TRUE. If LOCAL LOCK is activated during local control, it takes effect only after the control place is changed back to remote. 0 = **FALSE** No locking for control place change. 1 = **TRUE** Local control is disabled.			
unit:	type: B	Min:	Max:	Def: FALSE	Integer scaling: 1 == 1
07 Index	Description:	**CNTR BOARD SUPPLY**			
		Selection value of this parameter must be matched with the power supply source of RMIO board or RDCU-02C unit. 0 = **INTERNAL +24 V** RMIO board is supplied using internal power supply from the inverter module. After power fail saving function RMIO board is booted. In normal cases RMIO loses power supply before waking up from boot state. 1 = **EXTERNAL +24 V** The RMIO board is powered from an external supply. Power fail saving is done without boot in background.			
unit:	type: B	Min: 0	Max: 1	Def: 1	Integer scaling: 1 == 1
08 Index		**FAN SPD CNTR MODE**			
	Description:	ACS800 inverter modules 1…12 x R8i equipped with optional fan inverter have adjustable speed control as a function of IGBT temperature. However fan speed can also be set to constant. There are following control mode selections: 0 = **CONST 50 HZ** Fan is running always at constant frequency 50 Hz when powered. 1 = **RUN/STOP** Drive stopped: Fan is running at constant frequency 10 Hz Drive started: Fan is running at constant frequency 50 Hz. 2 = **CONTROLLED** Fan speed is determined from IGBT temperature vs. fan speed curve.			
unit:	type: I	Min: 0	Max: 2	Def: 0	Integer scaling:
09 Index		**RESET RUN-TIME**			
	Description:	A run time counter can be reset by means of this parameter. See signal 1.29 MOTOR RUN-TIME. 0 = **NO** No reset for run time counter. 1 = **YES** Reset the run time counter.			
unit:	type: B	Min: 0	Max: 1	Def: 0	Integer scaling: 1 == 1
10 Index		**INT CONFIG USER**			
	Description:	Adjustable number of parallel connected ACS800 inverter modules for user. Changing of this parameter is user acceptance for Reduced Run function. It must be corresponded with active (found) R8i inverter module configuration when inverter module(s) disconnected from the main circuit. If active INU configuration is the same as the original configuration (8.22 INT CONFIG WORD), this parameter has no meaning and will be updated automatically to same value as the original INT configuration.			
unit:	type: I	Min: 1	Max: int config	Def: int config	Integer scaling:

Group 18 LED Panel Control

18	Group name:	*LED PANEL CTRL*				

	Description:	The NLMD-01 Monitoring Display has a 0…150% LED bar to show an absolute real type value. The source and the scale of this display signal is defined by this parameter group. **Note:** If NLMD -01 and CDP 312 control panel are used together, the first signal selected in the Actual Signal Display Mode of CDP 312 must be the default value **1.26 LED PANEL OUTP**. Otherwise the NLMD-01 LED bar display will not show the correct value.
		
		`1 L ->     0.0 rpm 0`
		`LED PANEL OUTP`
		`MOTOR SPEED FILT`
		`MOTOR TORQUE FILT`				

01 Index	Interval 100 ms	**LED PANEL OUTPUT**				
	Description:	Signal group and index for the LED monitor display. The default value for this signal is 1.07 **MOTOR TORQUE FILT**.				
unit:	type: I	Min: 0	Max: 30000	Def: 107	Integer scaling:	
02 Index		**SCALE PANEL**				
	Description:	The signal value (defined in parameter 18.01) which corresponds to 100% on the LED bar display.				
unit:	type: R	Min: 0	Max: 65536	Def: 100	Integer scaling: 1 == 1	

Group 19 Data Storage

19	Group name:	DATA STORAGE		
	This parameter group consists of unconnected parameters for linking, testing and commissioning purposes. Fieldbus signals with RPBA-01 module are linked to inputs of blocks via parameters 19.01…19.08.			
01 Index		**DATA 1**		
	Description:	A storage parameter for receiving from or sending to the overriding system. For example, if the signal from data set 10 word 3 (DW 10.3) is required for monitoring by DriveWindow, first set parameter 90.03 DATA SET 10 VAL 3 to 1901 (denoting parameter 19.01), then select parameter 19.01 DATA1 for the desired DriveWindow monitoring channel.		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
02 Index		**DATA 2**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
03 Index		**DATA 3**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
04 Index		**DATA 4**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
05 Index		**DATA 5**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
06 Index		**DATA 6**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
07 Index		**DATA 7**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
08 Index		**DATA 8**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
09 Index		**DATA 9**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
10 Index		**DATA 10**		
	Description:	See 19.01 DATA 1		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
11 Index		**NV STORE1**		
	Description:	The non-volatile storage 1 for any data in power shutdown. The data is written to this index and after power up it can ONCE be read from the index 13. Note! RAPI-01C Auxiliary Power Interface module is needed with the external +24 V power supply circuit for RMIO to guarantee this power fail function.		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:
12 Index		**NV STORE2**		
	Description:	The non-volatile storage 2 for any data in power shutdown. The data is written to this index and after power up it can ONCE be read from the index 14. Note! RAPI-01C Auxiliary Power Interface module is needed with the external +24 V power supply circuit for RMIO to guarantee this power fail function.		
unit:	type: I	Min: -32768	Max: 32767	Integer scaling:

19	Group name:	*DATA STORAGE*			
13 Index		**STORED DATA1**			
	Description:	The non-volatile storage 1 for any data in power shutdown. Data type is unsigned integer. The stored data 1 (index 11) can ONCE be read after power up from this index. Note! RAPI-01C Auxiliary Power Interface module is needed with the external +24 V power supply circuit for RMIO to guarantee this power fail function.			
unit:	type: UI	Min: 0	Max: 65535	Integer scaling:	
14 Index		**STORED DATA2**			
	Description:	The non-volatile storage 2 for any data in power shutdown. Data type is unsigned integer. The stored data 1 (index 12) can ONCE be read after power up from this index. Note! RAPI-01C Auxiliary Power Interface module is needed with the external +24 V power supply circuit for RMIO to guarantee this power fail function.			
unit:	type: UI	Min: 0	Max: 65535	Integer scaling:	

Group 20 Limits

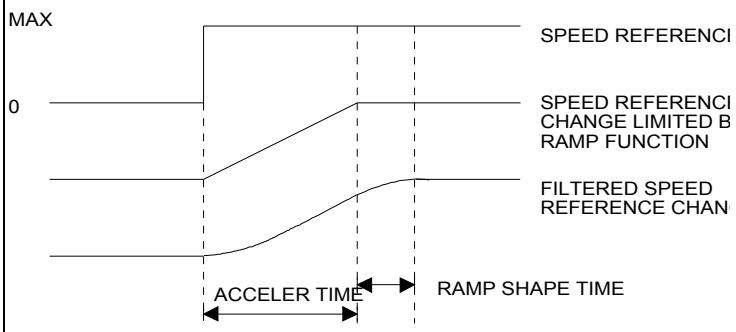
20	Group name:	*LIMITS*			
	Description:	This parameter group defines the maximum and minimum limits for the speed, frequency, current and torque algorithms. **Note:** The absolute nominal torque is calculated in the application program from the motor parameters (see parameter group 99).			
01 Index		**MINIMUM SPEED**			
	Description:	Negative speed reference limit in rpm.			
unit: rpm	type: R	Min: -18000 rpm	Max: 18000rpm	Def: See 99.05	Integer scaling: See 50.01
02 Index		**MAXIMUM SPEED**			
	Description:	Positive speed reference limit in rpm.			
unit: rpm	type: R	Min: -18000 rpm	Max: 18000rpm	Def: See 99.05	Integer scaling: See 50.01
03 Index		**ZERO SPEED LIMIT**			
	Description:	The absolute speed value at which the drive coasts after a stop command.			
unit: rpm	type: R	Min: 0 rpm	Max: 15000rpm	Def: 60 rpm	Integer scaling: See 50.01
04 Index		**MAXIMUM CURRENT**			
	Description:	Maximum output current I2max as a percentage of the drive. The maximum values are limited according to the duty cycle tables. There are two loading cycles defined: 10 s / 60 s and 1 min / 4 min. See the MultiDrive catalogue.			
unit: %I2ma	type: R	Min: 0%	Max: 200%	Def: 170%	Integer scaling: 100 == 1%
05 Index		**MAXIMUM TORQUE**			
	Description:	Maximum positive output torque as a percentage of the motor nominal torque.			
unit: %	type: R	Min: 0%	Max: 300%	Def: 300%	Integer scaling: 100 == 1%
06 Index		**MINIMUM TORQUE**			
	Description:	Minimum negative output torque as a percentage of the motor nominal torque.			
unit: %	type: R	Min: -300%	Max: 0%	Def: -300%	Integer scaling: 100 == 1%
07 Index		**SPC TORQMAX**			
	Description:	Maximum speed controller output limit as a percentage of the motor nominal torque in remote and I/O control mode.			
unit: %	type: R	Min: 0%	Max: 600%	Def: 300%	Integer scaling: 100 == 1%
08 Index		**SPC TORQMIN**			
	Description:	Minimum speed controller output limit as a percentage of the motor nominal torque in remote and I/O control mode.			
unit: %	type: R	Min: -600%	Max: 0%	Def: -300%	Integer scaling: 100 == 1%
09 Index		**TREF TORQMAX**			
	Description:	Maximum torque reference as a percentage of the motor nominal torque.			
unit: %	type: R	Min: 0%	Max: 300%	Def: 300%	Integer scaling: 100 == 1%

20	Group name:	*LIMITS*			
10 Index		**TREF TORQMIN**			
	Description:	Minimum torque reference as a percentage of the motor nominal torque.			
unit: %	type: R	Min: -300%	Max: 0%	Def: -300%	Integer scaling: 100 == 1%
11 Index		**FREQ TRIP MARGIN**			
	Description:	The purpose of this parameter is to protect the process against an over speed condition. This parameter defines, together with parameters SPEEDMAX and SPEEDMIN (FREQ MAX and FREQ MIN in scalar control mode) the maximum allowed frequency of the drive. If this frequency is reached, an OVER SPEED FAULT is activated. Example: If the maximum process speed is 1420 rpm (Parameter 20.01 SPEED MAX = 1420 rpm == 50 Hz) and this parameter (20.11) is 10 Hz, the drive trips at 60 Hz.			
unit: Hz	type: R	Min: 0 Hz	Max: 500 Hz	Def: 50 Hz	Integer scaling: 100 == 1 Hz
17 Index		**P MOTORING LIM**			
	Description:	Maximum motoring power. 100% == motor nominal power.			
unit: %	type: R	Min: 0%	Max: 600%	Def: 300%	Integer scaling: 100 == 1%
18 Index		**P GENERATING LIM**			
	Description:	Maximum generating power. 100% == motor nominal power.			
unit: %	type: R	Min: -600%	Max: 0%	Def: -300%	Integer scaling: 100 == 1%
19 Index		**SPC TORQMIN LOC/EMS**			
	Description:	Maximum speed controller output limit as a percentage of the motor nominal torque in local control and emergency stop situation.			
unit: %	type: R	Min: 0%	Max: 600%	Def: 300%	Integer scaling: 100 == 1%
20 Index		**SPC TORQMIN LOC/EMS**			
	Description:	Minimum speed controller output limit as a percentage of the motor nominal torque in local control and emergency stop situation.			
unit: %	type: R	Min: -600%	Max: 0%	Def: -300%	Integer scaling: 100 == 1%

Group 21 Start/Stop Functions

21	Group name:	*START/STOP FUNC*				
	Description:	Start and stop modes of the motor. **Note:** Coast stop is always the stop mode in a fault situation.				
01 Index		**START FUNCTION**				
	Description:	1 = **AUTO**	This setting is selected when starting to a rotating machine (Flying Start).			
		2 = **DC MAGN**	If this setting is selected, a higher starting torque can be achieved. The optimal magnetising current is calculated on the basis of the motor parameters. The pre-magnetising time is calculated using the motor information.			
		3 = **CNST DCMAGN**	Selects the constant magnetising mode. This is the fastest starting method if the motor is at a standstill. The optimal magnetising current is calculated on the basis of the motor parameters. The pre-magnetising time is defined by parameter 21.02 CONST MAGN TIME. To ensure full magnetising, set the value the same as or higher than the rotor time constant. If not known, use the rule-of-thumb value given below.			
			This mode remembers last position of the motor shaft until next auxiliary voltage break of the RMIO board. This minimises possible shaft movement during the next start. See also parameter **21.11 START JERK COMP**.			
			MOTOR RATED POWER	**Constant Magnetising Time**		
			<10 kW	> 100 to 200 ms		
			10 to 200 kW	> 200 to 1000 ms		
			200 to 1000 kW	> 1000 to 2000 ms		
			Note: The starting to a rotating machine is not possible when DC magnetising is selected.			
			Note: DC magnetising cannot be selected if parameter 99.08 MOTOR CTRL MODE = SCALAR			
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:	
02 Index		**CONST MAGN TIME**				
	Description:	Defines the magnetising time for the constant magnetising mode.				
unit: ms	type: R	Min: 30 ms	Max: 10000 ms	Def: 300 ms	Integer scaling: 1 == 1 ms	

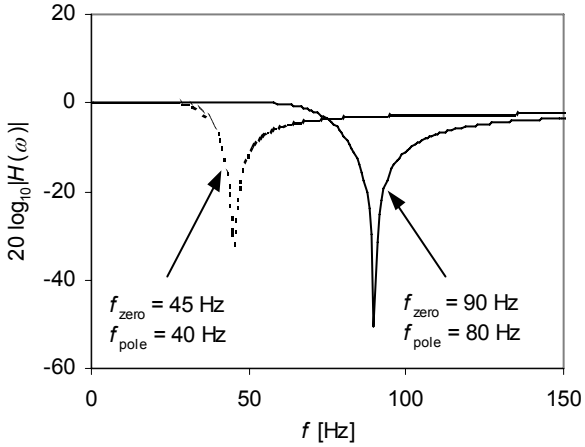
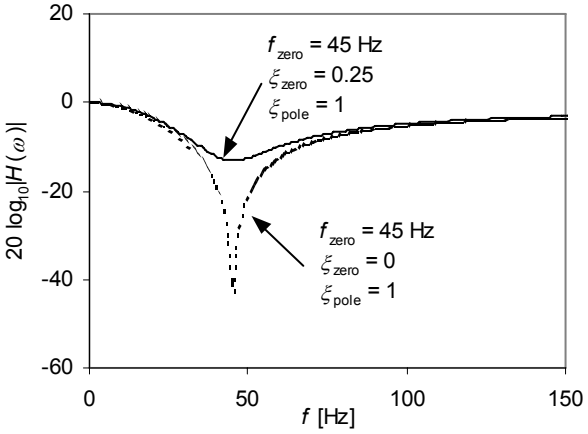
Group 22 Ramp Functions

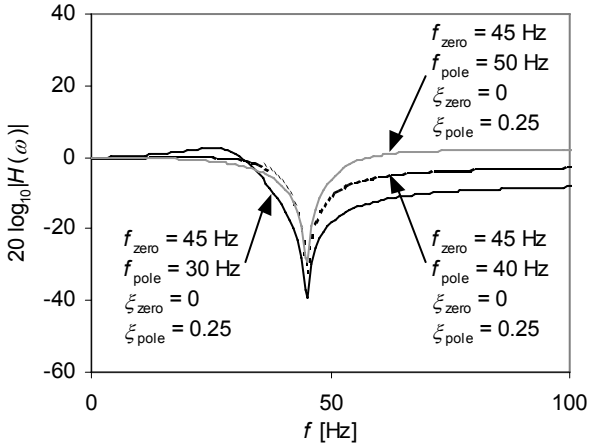
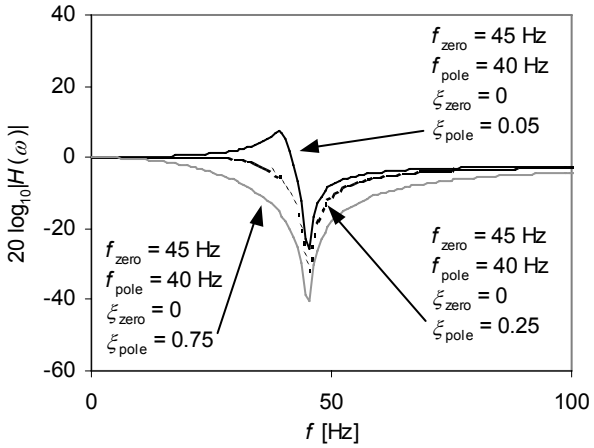
22	Group name:	RAMP FUNCTIONS			
	Description:	Speed reference ramp functions.			
01 Index		**ACCELER TIME**			
	Description:	The time within the drive accelerates from zero speed to the speed defined by parameter **50.01 SPEED SCALING**.			
unit: s	type: R	Min: 0 s	Max: 1000 s	Def: 20 s	Integer scaling: 100 == 1s
02 Index		**DECELER TIME**			
	Description:	The time within the drive decelerates from the speed defined by parameter **50.01 SPEED SCALING** to zero speed.			
unit: s	type: R	Min: 0 s	Max: 1000 s	Def: 20 s	Integer scaling: 100 == 1s
04 Index		**EME STOP RAMP**			
	Description:	If an emergency stop by ramp is activated (OFF3), the drive will decelerate according to this parameter to zero speed.			
unit: s	type: R	Min: 0 s	Max: 3000 s	Def: 20 s	Integer scaling: 10 == 1s
05 Index		**SHAPE TIME**			
	Description:	Speed reference softening time. This function is deactivated during an emergency stop condition.  			
unit: s	type: R	Min: 0 s	Max: 1000 s	Def: 0 s	Integer scaling: 100 == 1s
08 Index		**BAL RAMP REF**			
	Description:	The output of the speed ramp can be forced to the value defined by this parameter. This function is activated by setting 7.02 AUX CONTROL WORD bit 3 to 1.			
unit: rpm	type: R	Min: See 20.01	Max: See 20.02	Def: 0 rpm	Integer scaling: See Par 50.01

Group 23 Speed Reference

23	Group name:	*SPEED REF*			
01 Index		**SPEED REF**			***INPUT***
	Description:	Main speed reference input for the speed control of the drive.			
unit: rpm	type: R	Min: See 20.01	Max: See 20.02	Def: 0 rpm	Integer scaling: See par. 50.01
02 Index:		**CONST SPEED 1**			
	Description:	Constant speed reference is activated from 7.01 MAIN CTRL WORD bit 8. See also MCW bits 4...6.			
unit:	type: I	Min: -18000 rpm	Max: 18000 rpm	Def: 0	Integer scaling: See par. 50.01
03 Index:		**CONST SPEED 2**			
	Description:	Constant speed reference is activated from 7.01 MAIN CTRL WORD bit 9. See also MCW bits 4...6.			
unit:	type: I	Min: -18000 rpm	Max: 18000 rpm	Def: 0	Integer scaling: See par. 50.01
04 Index		**SPEED CORRECTION**			***INPUT***
	Description:	This parameter value can be added to the filtered reference value. **Note:** If the overriding system or RMIO application itself sends a reference value into this parameter, it must be set to zero before a stop command of the drive.			
unit: rpm	type: R	Min: See 99.05	Max: See 99.05	Def: 0 rpm	Integer scaling: See par. 50.01
05 Index		**SPEED SHARE**			
	Description:	Speed reference share coefficient.			
unit: %	type: R	Min: 0%	Max: 400%	Def: 100%	Integer scaling: 10 == 1%
06 Index		**SPEED ERROR FILT**			
	Description:	Speed reference and actual error filter time.			
unit: ms	type: R	Min: 0 ms	Max: 999999 ms	Def: 0 ms	Integer scaling: 1 == 1 ms
07 Index		**WINDOW INTG ON**			
	Description:	1 = **ON** Integrator of the speed controller is released when window control is on. 0 = **OFF** Integrator of the speed controller is blocked when window control is on. **The Idea of Window Control** The idea of Window Control is to deactivate speed control as long as the speed deviation remains within the window set by parameters 23.08 WINDOW WIDTH POS and 23.09 WINDOW WIDTH NEG. This allows the external torque reference to affect the process directly. For example, in Master/Follower drives, where the follower is torque controlled, window control is used to keep the speed deviation of the follower under control. The speed error output to the speed controller is zero, when speed error is within the window. If the load of the follower disappears due to a disturbance in the process, the speed error will be outside the window. The speed controller reacts and its output is added to the torque reference. Speed control (only with P-control) brings the speed to the value SPEED REF4 + WINDOW WIDTH, if not integrator used. **Note** the permanent error of the P-control. This function could be called over speed or under speed protection in the torque control mode. To activate the window control it must be set 26.01 TORQUE SELECTOR to value ADD and set ACW1 (7.02) bit 7 WINDOW CTRL to 1.			
unit:	type: B	Min: 0	Max: 1	Def: OFF	Integer scaling: 1 == 1

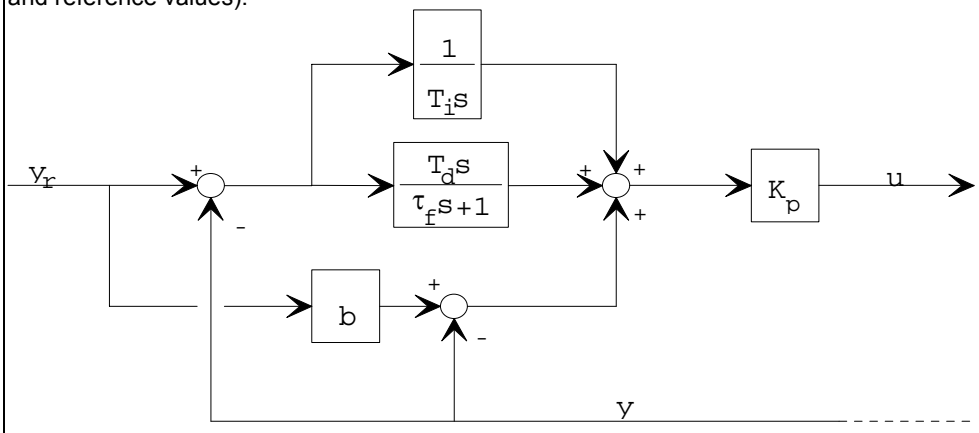
23	Group name:	*SPEED REF*			
08 Index		**WINDOW WIDTH POS**			
	Description:	Positive speed limit for the window control, when the calculated speed error is positive. Speed error = speed reference – speed actual. **Note:** Window width positive and negative is forced to zero, if SPEED REF4 + WINDOW WIDTH POS is > MAXIMUM SPEED or < MINIMUM SPEED.			
unit: rpm	type: R	Min: 0 rpm	Max: See 99.05	Def: 0 rpm	Integer scaling: See par 50.01
09 Index		**WINDOW WIDTH NEG**			
	Description:	Negative speed limit for the window control, when the calculated speed error is negative. The maximum limit is the absolute value of parameter 23.08 WINDOW WIDTH POS. **Note:** Window width positive and negative is forced to zero, if SPEED REF4 + WINDOW WIDTH NEG is > MAXIMUM SPEED or < MINIMUM SPEED.			
unit: rpm	type: R	Min: 0	Max: See 99.05	Def: 0 rpm	Integer scaling: See par 50.01
10 Index		**SPEED STEP**			***INPUT***
	Description:	An additional speed step can be given to the speed controller directly as an additive error input. **Note:** If the overriding system or RMIO application itself sends a reference value into this parameter, it must be set to zero before a stop command of the drive.			
unit: rpm	type: R	Min: See 20.01	Max: See 20.02	Def: 0 rpm	Integer scaling: See par 50.01
11 Index		**ADDITIVE SP REF**			***INPUT***
	Description:	Additive speed reference. Can be used as an additional speed reference with Multi Block Programming application.			
unit: rpm	type: R	Min: -18000 rpm	Max: 18000rpm	Integer scaling:	See parameter 50.01
12 Index		**RFE SPEED FILTER**			
	Description:	Resonance frequency elimination function. The actual speed of the speed controller is filtered by a common 2^{nd} order filter to eliminate amplification of mechanical resonance frequencies by the speed controller. The filter is configured using parameters 129.02 FREQUENCY OF ZERO, 129.03 DAMPING OF ZERO, 129.04 FREQUENCY OF POLE and 129.05 DAMPING OF POLE. 0 = **OFF** 1 = **ON** **Warning!** When tuning the filter, the user should have basic understanding of frequency filters. Unqualified tuning of the parameters may amplify mechanical oscillations and cause damage to the drive hardware. When significant changes in the filter configuration parameters are done, it is recommended that the inverter is either in stopped state or that the filter is switched off to ensure stability of the speed controller.			
unit:	type: B	Min: 0	Max: 1	Def: OFF	Integer scaling: 1 == 1

23	Group name:	*SPEED REF*			
13 Index		**FREQUENCY OF ZERO**			
	Description:	RFE speed filter zero frequency is set near to the resonance frequency which is desired to be filtered out before the speed controller block (see the magnitude of frequency response below).  			
unit: Hz	type: R	Min: 0.5 Hz	Max: 500 Hz	Def: 45 Hz	Integer scaling: 10 == 1 Hz
14 Index		**DAMPING OF ZERO**			
	Description:	RFE speed filter damping of zero. Value 0 corresponds to maximum rejection of resonance frequency 23.13 FREQUENCY OF ZERO.  **Warning!** Damping of zero should always be smaller than **23.16 DAMPING OF POLE** to ensure that resonance frequency band is rejected, not amplified, by the RFE filter.			
unit:	type: R	Min: -1	Max: 1	Def: 0	Integer scaling: 100 == 1.0

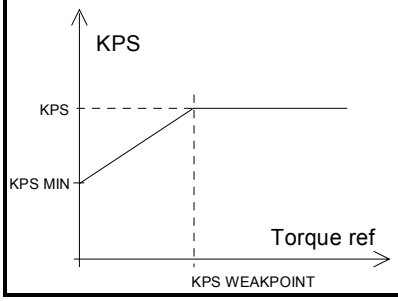
23	Group name:	*SPEED REF*			
15		**FREQUENCY OF POLE**			
Index	Description:	RFE speed filter pole frequency is used to shape frequency response e.g. to have more narrow bandwidth and thus to have better dynamic properties.  **Warning!** Moving the frequency of pole far from **23.13 FREQUENCY OF ZERO** amplifies frequencies near the frequency of pole and may cause damage to the drive hardware.			
unit: Hz	type: R	Min: 0.5 Hz	Max: 500 Hz	Def: 40 Hz	Integer scaling: 10 == 1 Hz
16		**DAMPING OF POLE**			
Index	Description:	RFE speed filter damping of pole is used to shape frequency response. Value 1 eliminates the effect of the pole.  **Warning!** Damping of pole should always be higher than **23.14 DAMPING OF ZERO** to ensure that resonance frequency band is rejected, not amplified, by the RFE filter.			
unit:	type: R	Min: -1	Max: 1	Def: 0.25	Integer scaling: 100 == 1.0
17		**RAMPED INCH REF**			***INPUT***
Index	Description:	Additional speed reference before speed share function.			
unit: rpm	type: R	Min: See 20.01	Max: See 20.02	Def: 0 rpm	Integer scaling: See par. 50.01
18		**FOLL SPD CTRL COR** (valid: ABXR7120)			
Index	Description:	A correction term used typically with speed controlled follower drive using load share function. Keep value 0% in the parameter 24.02 DROOP RATE. See section *Control Block Diagrams* in chapter *Software Description*.			
unit: %	type: R	Min: 0%	Max: 100%	Def: 0%	Integer scaling: 10 == 1%

23	Group name:	*SPEED REF*			
19 Index		**FOLL SPD COR MODE** (valid: ABXR7120)			
	Description:	Control mode selection with speed controlled torque follower. 1 = **FAST** Fast torque follower mode. This mode is used, when fast torque following is needed in follower drive during the dynamic change of load. 2 = **SLOW** Torque in the follower drive is balanced slowly after the dynamic torque change in master drive.			
unit:	type: I	Min: 1	Max: 2	Def: 1	Integer scaling:

Group 24 Speed Control

24	Group name:	SPEED CONTROL				
	Description:	The speed controller is based on PID algorithm, which continuous time is presented as follows: $u(s) = KPS\left[(bY_r(s) - Y(s)) + (\frac{1}{sTIS} + \frac{T_d s}{T_f s + 1})e(s)\right]$ Variable u is the output of the controller, e is the speed error (difference between the actual and reference values).  The PID controller also has set point weighting. y is the output; y_r is the set point; u is the controller's output.				
02 Index	Description:	**DROOP RATE** The amount of speed decrease caused by the load is determined by means of this parameter. A setting of 1% causes (with nominal torque reference) a 1% decrease in speed from the rated speed. **Note:** When speed follower load share function is used, keep value 0%.				
unit: %	type: R	Min: 0%	Max: 100%	Def: 0%	Integer scaling: 10 == 1%	
03 Index	Description:	**KPS** Relative gain for the speed controller in remote and I/O control. If you select a value of 1, a 10% change in the error value (e.g. reference - actual value) causes also the speed controller output to change by 10%. Set also parameter 24.16 KPS LOCAL/EMSTOP.				
unit:	type: R	Min: 0	Max: 250	Def: 10	Integer scaling: 100 ==1	

The Adaptive Speed Control as a Function of the Torque Reference



The adaptive gain of the speed controller is used to smooth out disturbances, which are caused, by low load and backlash. Moderate filtering of the speed error (parameter 23.04) is typically not enough to tune the drive.
+

24	Group name:	*SPEED CONTROL*			
04 Index		**KPS MIN**			
	Description:	KPS MIN determines the proportional gain when the speed controller output is zero.			
unit:	type: R	Min: 0	Max: 150	Def: 10	Integer scaling: 100 == 1
05 Index		**KPS WEAKPOINT**			
	Description:	The value of the speed controller output where the gain is KPS			
unit: %	type: R	Min: 0%	Max: see 20.05	Def: 0%	Integer scaling: 100 == 1%
06 Index		**KPS WP FILT TIME**			
	Description:	The rate of change for the proportional gain can be softened by this parameter.			
unit: ms	type: R	Min: 0 ms	Max: 999999 ms	Def: 100 ms	Integer scaling: 1 == 1 ms

Integration Time Parameters of the Speed Controller

09 Index		**TIS**			
	Description:	Integration time for the speed controller. This defines the time within which the maximum output is achieved if a constant error value exists and the relative gain of the speed controller is 1.			
unit: s	type: R	Min: 0.01 s	Max: 1000 s	Def: 2.5 s	Integer scaling: 1000 == 1s
11 Index		**BAL REF**			
	Description:	External value to be forced to the output of the speed controller when 7.02 AUX CONTROL WORD bit 8 BAL_NCONT is 1.			
unit: %	type: R	Min: see 20.06	Max: see 20.05	Def: 0%	Integer scaling: 100 == 1%

Derivation Parameters of the Speed Controller

12 Index		**DERIVATION TIME**			
	Description:	Derivation time for speed controller. Defines the time within which he speed controller derives the error value before the output of the speed controller is changed. If this is set to zero, the controller works as a PI controller, otherwise as a PID controller.			
unit: ms	type: R	Min: 0 ms	Max: 10000 ms	Def: 0 ms	Integer scaling: 1 == 1 ms
13 Index		**DERIV FILT TIME**			
	Description:	The derivation filter time constant.			
unit: ms	type: R	Min: 0 ms	Max: 100000 ms	Def: 8 ms	Integer scaling: 1 == 1 ms

Acceleration Compensation Parameters

14 Index		**ACC COMP DER TIME**			
	Description:	Derivation time used during compensation of acceleration. In order to compensate inertia during acceleration, the derivative of the reference is added to the output of the speed controller. This function is deactivated by setting the parameter to 0.			
unit: s	type: R	Min: 0 s	Max: 1000 s	Def: 0 s	Integer scaling: 10 == 1s
15 Index		**ACC COMPFILT TIME**			
	Description:	Acceleration compensation term filter coefficient.			
unit: ms	type: R	Min: 0 ms	Max: 999999 ms	Def: 8 ms	Integer scaling: 1 == 1 ms
16 Index		**KPS LOC/EMSTOP**			
	Description:	Relative gain for the speed controller in local control and emergency stop situation. If you select a value of 1, a 10% change in the error value (e.g. reference - actual value) causes also the speed controller output to change by 10%. Set also parameter 24.03 KPS.			
unit:	type: R	Min: 0	Max: 250	Def: 10	Integer scaling: 100 == 1

Group 25 Torque Reference

25	Group name:	*TORQUE REF*			
	Description:	Torque reference chain.			
01 Index		**TORQUE REF A**			***INPUT***
	Description:	Torque reference. TORQUE REF A can be scaled by the parameter LOAD SHARE.			
unit: %	type: R	Min: see 20.06	Max: see 20.05	Def: 0%	Integer scaling: 100 == 1%
02 Index		**TORQ REF A FTC**			
	Description:	TORQUE REF A low pass filter time constant.			
unit: ms	type: R	Min: 0 ms	Max: 60000 ms	Def: 0 ms	Integer scaling: 1 == 1 ms
03 Index		**LOAD SHARE**			
	Description:	TORQ REF A scaling factor which scales the external torque reference to a required level.			
unit: %	type: R	Min: -400%	Max: 400%	Def: 100%	Integer scaling: 10 == 1%
04 Index		**TORQUE REF B**			***INPUT***
	Description:	Torque reference. Torque reference B is ramped by the parameters TORQ RAMP UP TIME and TORQ RAMP DN TIME.			
unit: %	type: R	Min: see 20.06	Max: see 20.05	Def: 0%	Integer scaling: 100 == 1%
05 Index		**TORQ RAMP UP**			
	Description:	Torque reference B ramp time from 0% to 100%.			
unit: s	type: R	Min: 0 s	Max: 120 s	Def: 0 s	Integer scaling: 100 == 1s
06 Index		**TORQ RAMP DOWN**			
	Description:	Torque reference B ramp time from 100% to 0%.			
unit: s	type: R	Min: 0 s	Max: 120 s	Def: 0 s	Integer scaling: 100 == 1s
07 Index		**TORQ ACT FILT TIME**			
	Description:	Filter time constant for signal **1.07 MOTOR TORQFILT2** used for torque actual monitoring purposes.			
unit: ms	type: R	Min: 2 ms	Max: 20000 ms	Def: 100 ms	Integer scaling: 1 == 1 ms

Group 26 Torque Reference Handling

26	Group name:	*TORQ REF HANDLING*				
	Description:	The torque reference can be given from the speed reference chain (TORQ REF2) or from the torque reference chain (TORQ REF1) depending on the control mode. This group defines how to handle the reference after the torque selector block.				
01 Index		**TORQUE SELECTOR**				
	Description:	The torque reference selector includes. 1 = **ZERO** This selection forces the output of the torque selector to zero. 2 = **SPEED** Speed control 3 = **TORQUE** Torque control **Note:** To prevent the torque limitation in the generating mode, keep the minimum torque limits < 0 (zero) e.g. during fast deceleration in the positive speed direction. 4 = **MINIMUM** Minimum control. The drive follows smaller value of the TORQ REF1 and TORQ REF2. However, if the speed error becomes negative the drive follows TORQ REF2 until the speed error becomes positive again (latch function). Thus the drive never accelerates uncontrolled if the load is lost in the torque control. 5 = **MAXIMUM** Maximum control. The drive follows bigger value of the TORQ REF1 and TORQ REF2. However if the speed error becomes positive the drive follows TORQ REF2 until the speed error becomes negative again (latch function). Thus the drive never accelerates uncontrolled if the load is lost in the torque control. 6 = **ADD** Add control. The output of the torque selector is a sum of the TORQ REF1 and TORQ REF2. When the Window Control is required, a bit 7 WINDOW_CTRL must be activated in the ACW2 (7.02). See also parameter 23.07 WINDOW INTG ON. 7 = **PURE MINIMUM** Pure minimum control without checking of speed error sign. The most negative value of torque references is selected. 8 = **PURE MAXIMUM** Pure maximum control without checking of speed error sign. The most positive value of torque references is selected.				
unit:	type: I	Min: 1	Max: 8	Def: 2 SPEED	Integer scaling:	
02 Index		**LOAD COMPENSATION**				***INPUT***
	Description:	Load compensation added to TORQ REF3. **Note:** If the overriding system or the RMIO application itself sends a reference value into this parameter, it must be set to zero before the stop command of the drive.				
unit: %	type: R	Min: See 20.06	Max: See 20.05	Def: 0%	Integer scaling:	100 == 1%
03 Index		**TORQUE STEP**				***INPUT***
	Description:	Additional torque step added to TORQ REF4. **Note:** If the overriding system or the RMIO application itself sends a reference value into this parameter, it must be set to zero before the stop command of the drive.				
unit: %	type: R	Min: See 20.06	Max: See 20.05	Def: 0%	Integer scaling:	100 == 1%

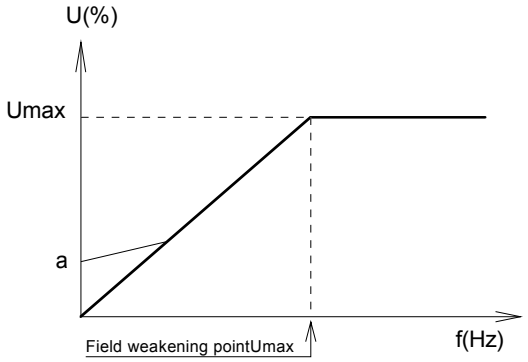
Group 27 Flux Control

27	Group name:	*FLUX CONTROL*				
03 Index		**FLUX REF**				
	Description:	Flux reference value in percentage. This value is stored to FPROM memory when set by CDP 312 or DriveWindow.				
unit: %	type: R	Min: see 27.05	Max: see 27.04	Def: 100%	Integer scaling:	10 == 1%
04 Index		**FLUX MAX**				
	Description:	Maximum limit of the flux percentage.				
unit: %	type: R	Min: 100%	Max: 140%	Def: 140%	Integer scaling:	10 == 1%
05 Index		**FLUX MIN**				
	Description:	Minimum limit of the flux percentage.				
unit: %	type: R	Min: 0%	Max: 100%	Def: 25%	Integer scaling:	10 == 1%

Group 28 Motor Model

28	Group name:	*MOTOR MODEL*			
07 Index		**LONG DISTANCE MOD**			
	Description:	Long Distance Mode. This function is used to limit maximum voltage peaks in the motor circuit and to reduce the switching frequency of the inverter. This parameter is used only with ACS600 inverter units; it can also be used when the motor cables are long. 1 = **ON** Long distance mode enabled. 0 = **OFF** Long distance mode disabled.			
unit:	type: B	Min:	Max:	Def: ON	Integer scaling: 1 == 1
08 Index		**TR TUNE**			
	Description:	This coefficient affects the calculated rotor time constant according to the motor rating plate values. It is used if the nominal speed value of the motor rating plate does not correspond to the real speed. For example, if the real slip speed is 10% higher than the calculated slip speed stated on the motor rating plate, a coefficient value of 10% is set into this parameter. See also signal 3.06 TR. **Note:** This parameter is effective only if a pulse encoder is used.			
unit: %	type: R	Min: -60%	Max: 200%	Def: 0%	Integer scaling: 1 == 1
12 Index		**FLYSTART CUR REF [%]**			
	Description:	Defines the current reference used with flying start (start to a rotating motor) when no pulse encoder is used. If flying start fails (i.e. drive is unable to detect motor speed 01.02 SPEED ESTIMATED): Monitor signals 01.02 SPEED ESTIMATED and 01.06 MOTOR CURRENT with DriveWindow PC tool and increase the reference in steps of 5% until the flying start function is successfully performed (i.e. drive is able to detect 01.02 SPEED ESTIMATED). See also parameter 28.13 FLYSTART INIT DLY.			
unit: %	type: R	Min: 0	Max: 100%	Def: 60%	Integer scaling: 1 == 1
13 Index		**FLYSTART INIT DLY**			
	Description:	Defines together with the motor characteristics the delay before the speed value estimated at the beginning of flying start is connected to the speed reference ramp output. Increase the delay, if the motor starts to rotate in the wrong direction or if the motor starts to rotate with the wrong speed reference. See also parameter 28.12 FLYSTART CUR REF [%].			
unit: %	type: R	Min: -60%	Max: 60%	Def: 25%	Integer scaling: 1 == 1
14 Index		**PQ METHOD**			
	Description:	Activates the flux correction at low frequencies, <3 Hz, when the torque exceeds 30%. Effective in the motoring and generating modes. 1 = ON Active 0 = OFF Inactive			
unit: %	type: B	Min: 0	Max: 1	Def: ON	Integer scaling: 1 == 1
15 Index		**RS20 [mOhm]**			
	Description:	Defines the stator resistance of the motor model at 20˚C. By increasing the default value defined during ID run (does not include the temperature dependence of the resistance), the motor model can be fine tuned especially in applications where the motor or ambient temperature is not measured. **Note:** If stator resistance value is too high, the desired starting torque cannot be achieved. *) The maximum value depends on the defined motor parameters (99 START-UP DATA).			
unit: mOhm	type: R	Min: 0	Max: ‘) mOhm	Def: Set during ID run	Integer scaling: 28676 = 1 Ohm

Group 29 Scalar Control

29	Group name:	*SCALAR CONTROL*			
	Description:	Scalar control is activated by setting parameter 99.08 MOTOR CTRL MODE to SCALAR. This parameter group is not visible when DTC control mode is selected. **Note:** The following start-up parameters have no effect in scalar control: 99.03 MOTOR NOM CURRENT 99.05 MOTOR NOM SPEED 99.06 MOTOR NOM POWER **Note:** Parameter 50.01 SPEED SCALING has only affect for scaling of the actual speed in the Scalar motor control mode. Scalar control parameters can be seen in the Control Diagram (chapter 5). The scalar control mode is recommended for multimotor drives when the number of motors connected to the drive is variable. Scalar control is also recommended when the nominal current of the motor is less than 1/6 of the nominal current of the inverter, or the inverter is used for test purposes with no motor connected. The motor identification Run, flying start, torque control, DC HOLD, motor phase loss check, and stall functions are disabled in the scalar control mode.				
01		**FREQUENCY REF**			***INPUT***
Index	Description:	This is an input for the frequency reference.			
unit: Hz	type: R	Min: See 29.03	Max: See 29.02	Def: 0	Integer scaling: 100 == 1 Hz
02		**FREQUENCY MAX**			
Index	Description:	Operating range maximum frequency. This parameter has an internal link to the parameter SPEED MAX; if SPEED MAX is changed, this parameter is changed accordingly by the application program.			
unit: Hz	type: R	Min: See 29.03	Max: 300 Hz	Def: See 20.01	Integer scaling: 100 == 1 Hz
03		**FREQUENCY MIN**			
Index	Description:	Operating range maximum frequency. This parameter has an internal link to the parameter SPEED MIN; if SPEED MIN is changed, this parameter is changed accordingly by the application program.			
unit: Hz	type: R	Min: -300 Hz	Max: See 29.02	Def: See 20.02	Integer scaling: 100 == 1 Hz
04		**IR COMPENSATION**			
Index	Description:	This parameter sets the extra relative voltage that is fed to the motor at zero frequency. The range is 0…30% of motor nominal voltage.  			
unit: %	type: R	Min: 0%	Max: 30%	Def: 0	Integer scaling: 100 == 1

Group 30 Fault Functions

30	Group name:	FAULT FUNCTIONS			
	Description:				
01 Index		**MOT THERM P MODE**			
	Description:	Motor thermal protection mode selection. The selections are based on the thermal model defined by the drive (DTC) or the user (USER MODE). Motor heat-up is calculated assuming a load curve. The motor is at the estimated temperature (value of 01.18 MOTOR TEMP EST saved at power switch off) when the power is switched on. With the first power switch on, the motor is at the ambient temperature (30˚C). **Note:** The motor thermal model can be used when only one motor is connected to the inverter. 1 = **DTC** The drive defines the thermal model values during the Motor Identification Run. (See parameter 99.06.) **Note:** This mode can be used for ABB motors up to 800 A of IN. Above that, USER MODE is the only valid selection. 2 = **USER MODE** The user can define the thermal model values using parameters 30.09…30.12 and 30.28…30.31.			
unit:	type: I	Min: 1	Max: 2	Def: 1	Integer scaling: 1 == 1
02 Index		**MOTOR THERM PROT**			
	Description:	Operation in case of an overload based on the motor thermal model protection (parameter 30.01 MOT THERM P MODE). 1 = **FAULT** 2 = **WARNING** 3 = **NO** Inactive			
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:

Motor Thermal Model User Mode

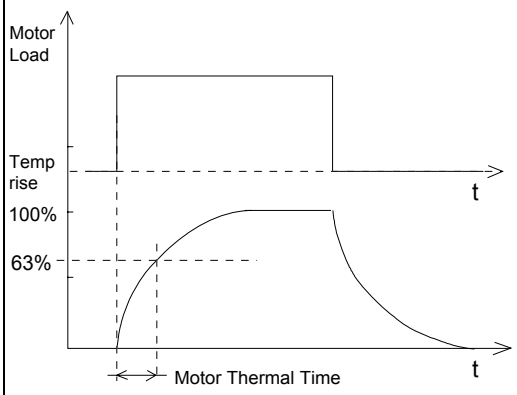
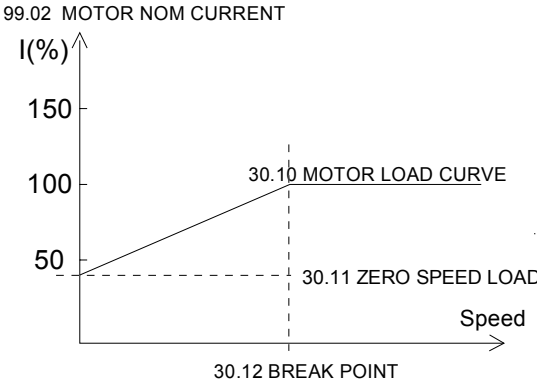
09 Index		**MOTOR THERM TIME**			
	Description:	Time for 63% temperature rise. Used with the motor thermal model when parameter 30.01 MOT THERM P MODE is set to USER MODE. For monitoring of the calculated temperature, see signal 1.18 MOTOR TEMP EST. The USER MODE is only used when motor nominal current is >800 A.  If thermal protection according to UL requirements for NEMA class motors is desired, the thermal time for a Class 10 trip curve is 350 s, for Class 20 trip curve 700 s and for a Class 30 trip curve 1050 s.			
unit: s	type: R	Min: 256 s	Max: 9999 s	Def: s	Integer scaling: 1 == 1s

Table 6 - 1 Motor Thermal Times for ABB HXR and AMA Motors.

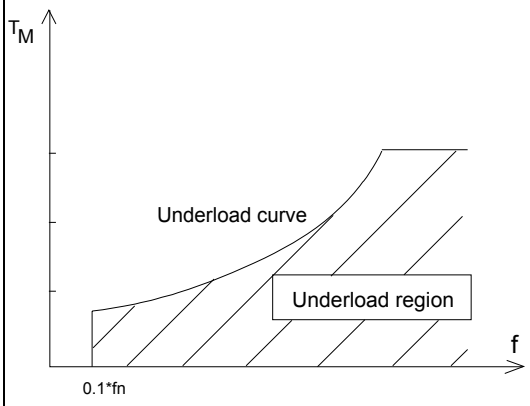
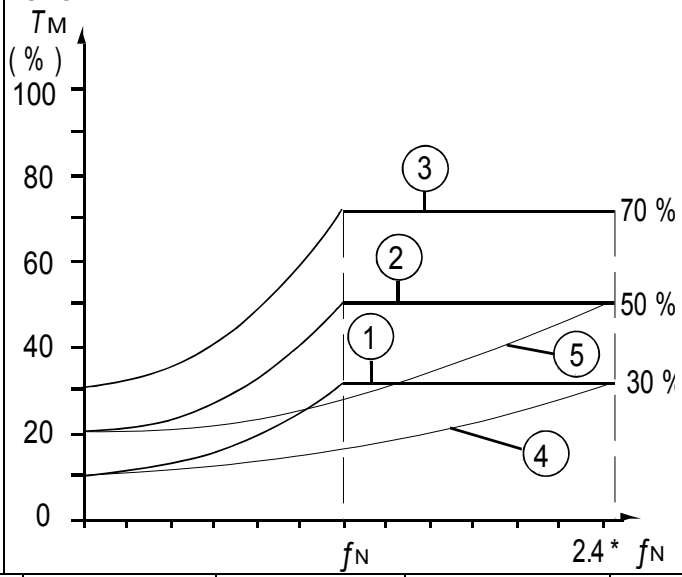
HXR motor type	Temp. rise time
400S	2700 s
400L	3600 s
450L	4200 s
500L	4800 s
560L	6000 s
AMA motor type	
all types	1500 s

30	Group name:	*FAULT FUNCTIONS*			
10 Index		**MOTOR LOAD CURVE**			
	Description:	The motor load curve sets the maximum allowable operating load of the motor. It is active when USER MODE is selected in parameter 30.01 MOT THERM P MODE. When set to 100%, the maximum allowable load is equal to the value of Start-up Data parameter 99.03 MOTOR NOM CURRENT. The load curve level should be adjusted if the ambient temperature differs from the nominal value.  			
unit: %	type: R	Min: 50%	Max: 150%	Def: 100%	Integer scaling: 1 == 1%
11 Index		**ZERO SPEED LOAD**			
	Description:	The maximum motor load at zero speed for the load curve. A higher value can be used if the motor has an external fan motor to boost the cooling when running the drive at a low frequency. See the motor manufacturer's recommendations. This parameter is used when USER MODE is selected in parameter 30.01 MOT THERM P MODE.			
unit: %	type: R	Min: 25%	Max: 150%	Def: 74%	Integer scaling: 1 == 1%
12 Index		**BREAK POINT**			
	Description:	The break point frequency for the load curve. This parameter defines the point at which the motor load curve begins to decrease from the maximum value set by parameter 30.10 MOTOR LOAD CURVE to the value of parameter 30.11 ZERO SPEED LOAD. Used when the USER MODE is selected in parameter 30.01 MOT THERM P MODE.			
unit: Hz	type: R	Min: 1 Hz	Max: 300 Hz	Def: 45 Hz	Integer scaling: 100 == 1 Hz

Stall Protection

30	Group name:	*FAULT FUNCTIONS*			
13 Index		**STALL FUNCTION**			
	Description:	This parameter defines the operation of the stall protection. The protection is activated if the following conditions are valid for a time longer than the period set by parameter 30.15 STALL TIME LIM. 1. The output frequency is below the level set by parameter 30.14. STALL FREQ HI. 2. The application is at stall limit set by the user (defined by parameters 20.04…20.10). Operation in case of a motor stall condition. 1 = **NO** No action 2 = **WARNING** A warning is produced**.** 3 = **FAULT** A fault is produced.			
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:
14 Index		**STALL FREQ HI**			
	Description:	Defines the frequency limit for the stall protection. See parameter 30.13 STALL FUNCTION.			
unit: Hz	type: R	Min: 0.5 Hz	Max: 50 Hz	Def: 20 Hz	Integer scaling: 100 == 1 Hz
15 Index		**STALL TIME**			
	Description:	Time value for the stall protection. See parameter 30.13 STALL FUNCTION.			
unit: s	type: R	Min: 10 s	Max: 400 s	Def: 20 s	Integer scaling: 1 == 1 s

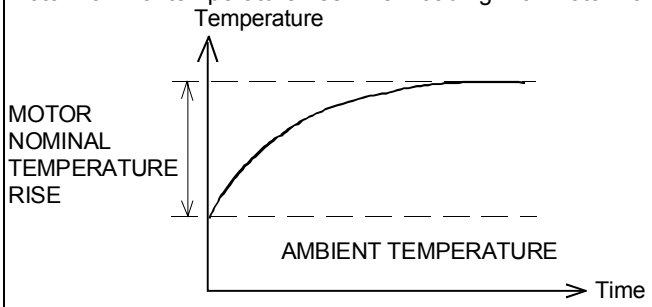
Underload Protection

30	Group name:	*FAULT FUNCTIONS*			
16 Index		**UNDERLOAD FUNC**			
	Description:		The absence of motor load may indicate a process malfunction. The protection wakes up if 1. The motor torque falls below the load curve selected by parameter 30.18 UNDERLOAD CURVE 2. The above conditions have been valid longer than the time set by parameter 30.17 UNDERLOAD TIME 3. Output frequency is higher than 10% of the nominal motor frequency. The protection function assumes that the drive is equipped with a motor of the rated power. Operation in case of the underload fault. 1 = **NO** Protection is inactive. 2 = **WARNING** A warning is produced 3 = **FAULT** A fault is produced		
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:
17 Index		**UNDERLOAD TIME**			
	Description:	Time limit for underload logic.			
unit: s	type: R	Min: 0 s	Max: 600 s	Def: 600 s	Integer scaling: 1 == 1
18 Index		**UNDERLOAD CURVE**			
	Description:	Selects the load curve for the underload function. See parameter 30.16 UNDERLOAD FUNC. 			
unit:	type: I	Min: 1	Max: 5	Def: 1	Integer scaling:
19 Index		**MOTOR PHASE LOSS**			
	Description:	Operation in case a motor phase is lost. 1 = **FAULT** Enabled. 0 = **NO** Disabled.			
unit:	type: B	Min:	Max:	Def: NO	Integer scaling: 1 == 1

30	Group name:	*FAULT FUNCTIONS*			
20 Index	Description:	**EARTH FAULT** Operation in case of an earth fault condition. **Note:** A warning cannot be selected with parallel connected inverters. 1 = **FAULT** A fault is produced and the drive is tripped. 0 = **WARNING** A warning is produced and the drive continues running.			
unit:	type: B	Min: 0	Max: 1	Def: FAULT	Integer scaling: 1 == 1
21 Index		**PANEL LOSS**			
	Description:	Operation in case local control (control panel or DriveWindow) is lost. 1 = **FAULT** A fault is produced. 0 = **LAST SPEED** A warning is produced.			
unit:	type: B	Min: 0	Max: 1	Def: FAULT	Integer scaling: 1 == 1
22 Index		**UNDERVOLTAGE CTL**			
	Description:	Activates the undervoltage control of the intermediate DC link. If the DC voltage drops due to input power cut off, the undervoltage controller will automatically decrease the motor torque in order to keep the voltage above the lower limit. By decreasing the motor torque, the inertia of the load will cause and preventing an undervoltage trip until the motor coasts to stop. This will act as a power-loss ride-through functionality in systems with high inertia, such as a centrifuge or a fan. 1 = **ON** Active 0 = **OFF** Inactive			
unit:	type: B	Min: 0	Max: 1	Def: OFF	Integer scaling: 1 == 1
23 Index		**OVERVOLTAGE CTL**			
	Description:	Activates the overvoltage control of the intermediate DC link. Fast breaking of a high inertia load causes the voltage to rise to the overvoltage control limit. To prevent the DC voltage from exceeding the limit, the overvoltage controller automatically decreases the braking torque. **Note:** If a brake chopper and resistor or a regenerative supply section are included in the drive, the controller must be OFF. 1 = **ON** Active 0 = **OFF** Inactive (This is the normal mode with regenerative supply sections.)			
unit:	type: B	Min: 0	Max: 1	Def: ON	Integer scaling: 1 == 1
24 Index		**PPCC FAULT MASK**			
	Description:	Activates the fault mask. Unwanted AINT / NINT board current measurement or communication faults can be masked in situations where the DC intermediate circuit voltage has been disconnected but the RMIO board has an external power supply and fault indication is not needed. A fault is produced only when the motor is started. See also parameter **31.02 START INHIBIT ALM**. 0 = **NO** Fault mask is inactive. 1 = **YES** Fault mask is active.			
unit:	type: B	Min: 0	Max: 1	Def: NO	Integer scaling: 1 == 1

30	Group name:	*FAULT FUNCTIONS*			
25 Index		**EARTH FAULT LEVEL**			
	Description:	The earth fault trip level is set through the PPCC link by means of this parameter (non parallel connected ACS600 inverters R8i, R9i, R10i, R11i and R12i only and R8i inverter module with ACS800). For the parallel connected inverters this function is the current unbalance protection of the inverter output (e.g. short circuit). ACS800 **Note:** DO NOT change earth fault level with parallel connected inverter modules. With parallel connected inverters, the fault is CUR UNBAL x instead of EARTH FAULT. ACS 600:(*) Default value: 4 for non-parallel connected and 5 for parallel connected inverter. ACS800: type specific The earth fault level is given in percent of the current measurement range. **0** = Disabled **1** = 1% unbalance in the sum current **2** = 3% unbalance in the sum current **3** = 8% unbalance in the sum current **4** = 13% unbalance in the sum current **5** = 18% unbalance in the sum current **6** = 28% unbalance in the sum current **7** = 39% unbalance in the sum current **8** = 62% unbalance in the sum current			
unit:	type: R	Min: 0	Max: 8	Def: (*)	Integer scaling: 1 == 1

Motor Thermal Model User Mode Alarm and Fault Limits

30	Group name:	*FAULT FUNCTIONS*			
28 Index		**THERM MOD ALM LIM**			
	Description:	An alarm temperature limit for the thermal model protection of the motor. The thermal model of the motor is activated by parameter **30.01 MOTOR THERM PMODE** and calculated temperature is shown by the signal **1.18 MOTOR TEMP EST**.			
unit: °C	type: I	Min: 0°C	Max: 300°C	Def: 90°C	Integer scaling:
29 Index		**THERM MOD FLT LIM**			
	Description:	A trip temperature limit for the thermal model protection of the motor.			
unit: °C	type: I	Min: 0°C	Max: 300°C	Def: 110°C	Integer scaling:
30 Index		**MOT NOM TEMP RISE**			
	Description:	Motor nominal temperature rise when loading with motor nominal current.  **Note:** If ABB motor rating plate has coefficient **MNTRC**, multiply it by 80°C to get the motor nominal temperature rise. With non-ABB motors, contact motor manufacturer.			
unit: °C	type: R	Min: 0°C	Max: 300°C	Def: 80°C	Integer scaling: 1 == 1°C
31 Index		**AMBIENT TEMP**			
	Description:	Typical motor ambient temperature. Used only with motor thermal protection model.			
unit: °C	type: R	Min: -40°C	Max: 100°C	Def: 30°C	Integer scaling: 1 == 1°C

Motor Temperature Feedback to the Motor Model

32 Index		**RS TEMP SCALE**			
	Description:	Tuning coefficient for temperature dependence of stator resistance R_s based on the measured temperature with PT100 sensors or internal motor thermal protection model. The measured total resistance includes motor cable and stator resistance. With pulse encoder feedback, 100% compensation can often be used. Undercompensation decreases the starting torque at high motor temperatures.			
unit: %	type: R	Min: 0%	Max: 200%	Def: 40%	Integer scaling: 1 == 1%

Group 31 Fault Functions

31	Group name:	*FAULT FUNCTIONS*			
02 Index		**START INHIBIT ALM**			
	Description:	Logging of the Prevention of Unexpected Start-up alarm “START INHIBI” (9.04 AW_1 bit 0) to the fault/alarm logger can be prevented using this parameter. This function has no effect on status or alarm words. 0 = **OFF** Logging disabled 1 = **ON** Logging enabled			
unit:	type: B	Min: 0	Max: 1	Def: 1	Integer scaling: 1 == 1

Group 34 Brake Chopper

34	Group name:	*BRAKE CHOPPER*			
01 Index		**BRAKE CHOPPER CTL**			
	Description:	Activates the optional brake chopper control with ACS800 inverter modules R2…R6. 0 = **OFF** Inactive 1 = **ON** Active			
unit:	type: B	Min:	Max:	Def: OFF	Integer scaling:
02 Index		**BR OVERLOAD FUNC**			
	Description:	Activates the overload protection of the brake resistor. The user-adjustable variables are parameters 34.03, 34.04 and 34.05. 0 = **NO** Inactive 1 = **WARNING** Active. If the drive detects an overload, it generates a warning. 2 = **FAULT** Active. If the drive detects an overload, it trips on a fault.			
unit:	type:	Min:	Max:	Def: NO	Integer scaling: 1==1
03 Index		**BR RESISTANCE**			
	Description:	Defines the resistance value of the brake resistor. The value is used for brake chopper protection. See parameter 34.02. 0…100 ohm Resistance value			
unit: ohm	type: R	Min: 0	Max: 10000	Def: 0.000	Integer scaling: 1==1
04 Index		**BR THERM TCONST**			
	Description:	Defines the thermal time constant of the brake resistor. The value is used in the overload protection. See parameter 34.02. 0…10000 s Time constant.			
unit: s	type: R	Min: 0.000	Max: 9999.998	Def: 0.000	Integer scaling: 1==1

34	Group name:	*BRAKE CHOPPER*			
05 Index		**MAX CONT BR POWER**			
	Description:	Defines the maximum continuous braking power witch will raise the resistor temperature to the maximum allowed value. The value is used in the overload protection. See parameter 34.02 BR OVERLOAD FUN. 0.01…10000 kW Power			
unit: kW	type: R	Min: 0.000	Max: 9999.998	Def: 0	Integer scaling: 1==1

Group 37 Function Generator

37	Group name:	*FUNCTION GENERATOR*			
	Description:	The five point (x1,y1), (x2,y2), (x3,y3), (x4,y4), (x5,y5) function curve. This function is executed on 100 ms time level.			
01 Index		**ENABLE**			
	Description:	Activates function. 0 = **OFF** Inactive 1 = **ON** Active			
unit:	type: B	Min:	Max:	Def: OFF	Integer scaling:
03 Index		**OUT**			
	Description:	The output of the function curve.			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
04 Index		**X1**			
	Description:	The value for the x-axis 1. point. (x1, y1).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
05 Index		**Y1**			
	Description:	The value for the y-axis 1. point. (x1, y1).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
06 Index		**X2**			
	Description:	The value for the x-axis 2. point. (x2, y2).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
07 Index		**Y2**			
	Description:	The value for the y-axis 2. point. (x2, y2).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
08 Index		**X3**			
	Description:	The value for the x-axis 3. point. (x3, y3).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
09 Index		**Y3**			
	Description:	The value for the y-axis 3. point. (x3, y3).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
10 Index		**X4**			
	Description:	The value for the x-axis 4. point. (x4, y4).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
11 Index		**Y4**			
	Description:	The value for the y-axis 4. point. (x4, y4).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1
12 Index		**X5**			
	Description:	The value for the x-axis 5. point. (x5, y5).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1

37	Group name:	FUNCTION GENERATOR			
13 Index		**Y5**			
	Description:	The value for the y-axis 5. point. (x5, y5).			
unit:	type: R	Min: -32768	Max: 32767	Def: 0	Integer scaling: 1==1

Group 50 Speed Measurement

50	Group name:	SPEED MEASUREMENT			
01 Index		**SPEED SCALING**			
	Description:	This parameter defines the speed reference (in rpm) that corresponds to the value of 20000 from the overriding system or I/O. This parameter has only scaling effect to speed actual signals in the scalar control mode.			
unit: rpm	type: R	Min: 0 rpm	Max: 100000 rpm	Def: 1500 rpm	Integer scaling: 15000 = 1500 rpm
02 Index		**SPEED MEAS MODE**			
	Description:	Selects the measurement type for the pulse encoder mode. 0 = **A_-B DIR** Channel A: positive edges calculated for speed. Channel B: direction. 1 = **A_-_** Channel A: positive and negative edges calculated for speed. Channel B: not used 2 = **A_-_B DIR** Channel A: positive and negative edges are calculated for speed. Channel B: direction. 3 = **A_-_B_-_** All edges of the signals are calculated.			
unit:	type: I	Min: 0	Max: 3	Def: 3	Integer scaling: 1 == 1
03 Index		**SPEED FB SEL**			
	Description:	Source of the speed feedback to the speed controller. 1 = **INTERNAL** Calculated speed estimate 2 = **ENCODER** Pulse encoder module 1 (see also parameter 98.01 ENCODER MODULE).			
unit:	type: I	Min: 0	Max: 2	Def: 1	Integer scaling: 1 == 1
04 Index		**ENCODER PULSE NR**			
	Description:	Number of pulse encoder 1 pulses per revolution.			
unit:	type: R	Min: 1	Max: 30000	Def: 2048	Integer scaling: 1 == 1
05 Index		**ENCODER ALM/FLT**			
	Description:	Determines if speed measurement 1 error causes a warning or a fault. 1 = **FAULT** The drive trips on fault ENCODER ERR. 0 = **ALARM** The drive generates alarm ENCODER ERR.			
unit:	type: B	Min:	Max:	Def: ALARM	Integer scaling: 1 == 1
06 Index		**SP ACT FILT TIME**			
	Description:	The time constant of the first order actual speed filter.			
unit: ms	type: R	Min: 0 ms	Max: 999999 ms	Def: 4 ms	Integer scaling: 1 == 1 ms
08 Index		**POS COUNT INIT LO**			
	Description:	Position counter initial low word value when the mode is PULSE EDGES.			
unit:	type: PB	Min: 0	Max: 65536	Def: 0	Integer scaling: 1 == 1
09 Index		**POS COUNT INIT HI**			
	Description:	Position counter initial high word value when the mode is PULSE EDGES.			
unit:	type: PB	Min: 0	Max: 65536	Def: 0	Integer scaling: 1 == 1
10 Index		**ABOVE SPEED LIMIT**			
	Description:	When the actual speed has reached the value of this parameter, 8.01 MAIN STATUS WORD bit 10 is set to 1.			
unit: rpm	type: R	Min: See 20.01	Max: See 20.02	Def: 0	Integer scaling: See 50.01

50	Group name:	*SPEED MEASUREMENT*			
11 Index		**ENCODER DELAY**			
	Description:	Time of no encoder 1 pulses received, and the drive being at the torque or current limit simultaneously, before an alarm or a fault is produced. Setting this parameter to 0 disables the function at the torque or current limit.			
unit: ms	type: R	Min: 0	Max: 50000	Def: 1000	Integer scaling: 1 == 1 ms
12 Index		**MOTOR SP FILT TIME** (available in sw ver 5.2x)			
	Description:	Filter time constant for monitoring signal **1.01 MOTOR SPEED FILT**.			
unit: ms	type: R	Min: 2 ms	Max: 20000 ms	Def: 500 ms	Integer scaling: 1 == 1 ms

13 Index:

Description:

ZERO DETECT DELAY

This parameter can be adjusted for the best possible performance at the low speeds when a pulse encoder is used and pulses are not received during the 1 ms measurement cycle.

The definition of low speeds depends on the type of the used encoder. If the encoder pulse number is 2048 and both edges of both of the channels (A and B) are counted, the number of pulses per revolution is 8192. This means that at least one pulse per millisecond is received at 7.3 rpm (1 pulse/ms ⇒ 1000 pulses/s ⇒ 1000/8192 rev/s = 7.3 rpm). Thus 4 ms between pulses corresponds to 1.8 rpm and 80 ms to 0.09 rpm.

See the following example with parameter settings:
50.13 = 250 ms, 50.14 = 4 ms, constant speed reference.

After receiving a pulse, measured speed is calculated and speed control P-part is set to a value related to speed error. When no new pulses are received within 1 ms, the measured speed and P-part (due to the constant speed reference) are held. After the **SPEED HOLD TIME**, the P-part is forced to zero so that speed control will not be based on an absolute speed measurement value. After **ZERO DETECT DELAY,** it is assumed that speed is zero, causing clearing of measured speed and allowing use of P-part.

After the next pulse, some measured speed is calculated again and P-part accordingly. P-part is cleared again after **SPEED HOLD TIME**. The measured speed is not set to zero anymore, because a new pulse comes before **ZERO DETECT DELAY**.

The time between pulses 3 and 4 is still longer than **SPEED HOLD TIME** and P-part is forced to zero.

The time between pulses 4 and 5 is already so short that neither P-part nor the measured speed is forced to zero.

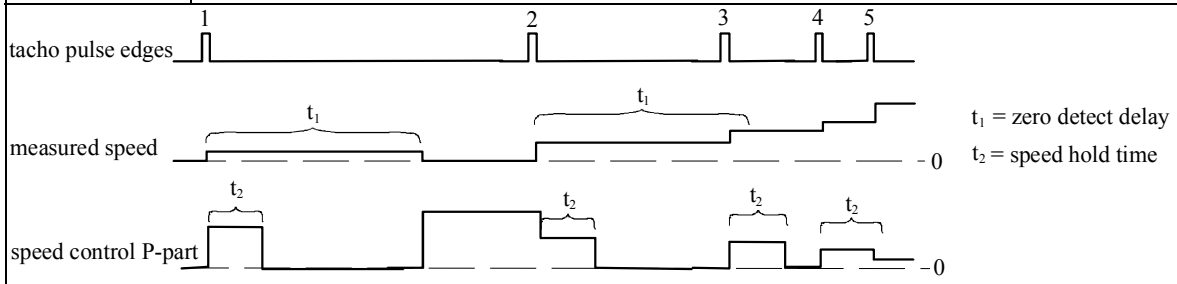


Figure 6 - 2 ZERO DETECT DELAY = 250ms (t_1) and SPEED HOLD TIME = 4ms (t_2).

With the configuration of figure 6 -3 there is a long ZERO DETECT DELAY that gives accurate speed measurement. The short **SPEED HOLD TIME** keeps the speed control stable in many cases, because speed control output is not influenced by the earlier speed measurement sample. On the other hand, if P-part is very large, forcing it to zero causes undesirable torque steps.
The tuning values depends on the clearances of mechanics. Therefore after increasing these parameter values, check that the torque actual value is still smooth.

unit: ms	type: I	Min: 1 ms	Max: 2000 ms	Def: 4 ms	Integer scaling:

50	Group name:	*SPEED MEASUREMENT*			
14 Index:		**SPEED HOLD TIME**			
	Description:	The time after the P-part of speed control is forced to zero, if the time has been elapsed and no new pulses have been received after the last sample. By increasing the value, it amplifies the effect of P-part at the low speeds due to the longer effect time of P-part. Oscillation can occur, if the time is too long. See description of parameter 50.13 ZERO DETECT DELAY above. **Note:** The value of SPEED HOLD TIME <= ZERO DETECT DELAY.			
unit: ms	type: I	Min: See 50.13	Max: 2000 ms	Def: 4 ms	Integer scaling:
15 Index		**ENCODER2 PULSE NR**			
	Description:	Number of encoder 2 pulses per revolution.			
unit:	type: R	Min: 1	Max: 30000	Def: 2048	Integer scaling: 1 == 1
16 Index		**SP MEAS MODE ENC2**			
	Description:	Selects the measurement type for the pulse encoder 2 mode. 0 = **A_-B DIR** Channel A: positive edges calculated for speed. Channel B: direction. 1 = **A_-_** Channel A: positive and negative edges calculated for speed. Channel B: not used 2 = **A_-_B DIR** Channel A: positive and negative edges are calculated for speed. Channel B: direction. 3 = **A_-_B_-_** All edges of the signals are calculated.			
unit:	type: I	Min: 0	Max: 3	Def: 3	Integer scaling: 1 == 1
17 Index		**ENCODER 2 ALM/FLT**			
	Description:	Determines if encoder module NTAC-02 communication error on DDCS channel CH2 causes a warning or a fault. 1 = **FAULT** A drive is tripped 0 = **ALARM** A warning is generated.			
unit:	type: B	Min:	Max:	Def: ALARM	Integer scaling: 1 == 1
18 Index		**ENC2 FILTER TIME**			
	Description:	The time constant of the first order actual speed filter for encoder 2.			
unit: ms	type: R	Min: 0 ms	Max: 10000 ms	Def: 2 ms	Integer scaling: 1 == 1 ms
19 Index		**ENC2 CHANNEL**			
	Description:	DDCS Channel for encoder 2 module. 1 = **CH1** DDCS channel 1 2 = **CH2** DDCS channel 2			
unit:	type: S/I	Min: 1	Max: 2	Def: 2	Integer scaling: 1 == 1

Group 51 Master Adapter (Field Bus Adapter)

51	Group name:	*MASTER ADAPTER*			
	Description:	This group defines the communication parameters for a fieldbus adapter module. The parameter names are copied from the module when its connection to the drive is activated using parameter 98.02 COMM MODULE. For details on the parameters, refer to the manual of the fieldbus module and chapter *Fieldbus control*. **Note:** Any changes in these parameters take effect only upon the next power-up of the adapter module or refreshing by parameter **FBA PAR REFRESH**. **Note:** With NMBA-0x module, choose parameter 70.19 CH0 HW CONNECTION to value RING to enable regeneration of received messages in the DDCS link.			
01 Index		**FIELDBUS PAR1** (Module type and software version)			
	Description:				
unit:	type: R	Min:	Max:	Def:	Integer scaling:

51	Group name:	*MASTER ADAPTER*			
02...33		**FIELDBUS PAR2...33** (According to module type)			
Index	Description:				
unit:	type: R	Min:	Max:	Def:	Integer scaling:

Group 52 Standard Modbus

52	Group name:	*STANDARD MODBUS*			
	Description:	These settings for the Standard Modbus Link are only visible, when the **STANDARD MODBUS** has been selected by parameter 98.02 **COMM MODULE**. See chapter *Fieldbus control* and *RMBA-01 Modbus Adapter User's Manual* [3AFE64498851(English)].			
01		**STATION NUMBER**			
Index	Description:	Defines the address of the device. Two units with the same address are not allowed on-line.			
unit:	type: I	Min: 1	Max: 247	Def: 1	Integer scaling:
02		**BAUDRATE**			
Index	Description:	Defines the transfer rate of the link. 1 = **600** 600 bits/s 2 = **1200** 1200 bits/s 3 = **2400** 2400 bits(s 4 = **4800** 4800 bits/s 5 = **9600** 9600 bits/s 6 = **19200** 19200 bits/s			
unit:	type: I	Min: 1	Max: 6	Def: 5	Integer scaling:
03		**PARITY**			
Index	Description:	Defines the use of parity and stop bit(s). The same setting must be used in all on-line stations. 1 = **NONE1STOPBIT** No parity bit, one stop bit 2 = **NONE2STOPBIT** No parity, 2 stop bits 3 = **ODD** Odd parity indication bit, one stop bit 4 = **EVEN** Even parity indication bit, one stop bit			
unit:	type: I	Min: 1	Max: 4	Def: 3	Integer scaling:

Group 53 User Parameters

53	Group name:	*USER PARAMETERS*		
	This parameter group consists of unconnected parameters to be used with application blocks.			
01		**NUMERIC 1**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
02		**NUMERIC 2**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
03		**NUMERIC 3**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
04		**NUMERIC 4**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
05		**NUMERIC 5**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:

53	Group name:	*USER PARAMETERS*		
06		**NUMERIC 6**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
07		**NUMERIC 7**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
08		**NUMERIC 8**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
09		**NUMERIC 9**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
10		**NUMERIC 10**		
Index	Description:	User's numeric parameter for Multi Block Programming purposes.		
unit:	type: I	Min: -8388608	Max: 8388607	Integer scaling:
11		**STRING 1**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
12		**STRING 2**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
13		**STRING 3**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
14		**STRING 4**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
15		**STRING 5**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
16		**STRING 6**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
17		**STRING 7**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
18		**STRING 8**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
19		**STRING 9**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
20		**STRING 10**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
21		**STRING 11**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -

53	Group name:	*USER PARAMETERS*		
22		**STRING 12**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
23		**STRING 13**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -
24		**STRING 14**		
Index	Description:	User's ASCII string type of parameter for the alarm or fault text definition of EVENT block.		
unit:	type: S	Min: 0 chars	Max: 9 chars	Integer scaling: -

Group 55 Appl Prog1

55	Group name:	APPL PROG1			
01 Index		**STATUS**			
	Description:	Shows the value of the application task 1 status word. The table below shows the alternative bit states and the corresponding values on the panel display. STOPPED if all bits are false. This signal is mainly used by DriveAP PC tool.			
Index	Description:	**Bit** **CDP312R Panel display indicates:** B0 RUNNING 1 B1 EDITING 2 B2 CHECKING 4 B3 FAULTED 8			
unit:	type: I	Min: 0	Max: 8	Def:	Integer scaling:
02 Index		**FAULTED PAR**			
	Description:	Points out the faulted parameter in the application task 1. This signal is mainly used by DriveAP PC tool.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
05 Index		**BLOCK 1**			
	Description:	Selects the function block type for block 1 in the application task 1. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
06 Index		**INPUT 1**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
07 Index		**INPUT 2**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
08 Index		**INPUT 3**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
09 Index		**OUTPUT**			
	Description:	Stores and displays the output of block 1. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
10 Index		**BLOCK 2**			
	Description:	Selects the function block type for block 2 in the application task 1. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
11 Index		**INPUT 1**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -

55	Group name:	*APPL PROG1*			
12 Index		**INPUT 2**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
13 Index		**INPUT 3**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
14 Index		**OUTPUT**			
	Description:	Stores and displays the output of block 2. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
From block 55.05 to the last block 155.54 has same parameter order structure.					

Group 56 Appl Task 1 Cntr

56	Group name:	*APPL TASK 1 CTRL*			
	This parameter group consists of execution control for the fast application task.				
01 Index		**APPL TASK1 CNTR**			
	Description:	Selects the operation mode for the fastest application task program.			
		1 = **STOP** Stop. The program can be edited. 2 = **START** Run. The program cannot be edited. 3 = **EDIT** Stop to edit mode. The program can be edited.			
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:
02 Index		**EDIT COMMAND**			
	Description:	Selects the command for the block placed in the location defined by parameter 56.03. This parameter is used by DriveAP PC tool.			
		1 = **NO** Home value. The value automatically restores to NO after an editing command has been executed. 2 = **PUSH** Shifts the block in the location defined by parameter 56.03 and the subsequent blocks one location up. A new block can be placed in the emptied location. 3 = **DELETE** Deletes the block in the location defined by parameter 56.03 and shifts the subsequent blocks one step down. 4 = **PROTECT** Read protects input connections of the blocks. 5 = **UNPROTECT** Unprotects read protection of input connections.			
unit:	type: I	Min: 1	Max: 5	Def: 1	Integer scaling:
03 Index		**EDIT BLOCK**			
	Description:	Defines the block location number for the command selected by parameter 56.02. This parameter is used by DriveAP PC tool.			
unit:	type: I	Min: 1	Max: 15	Def: 0	Integer scaling:

56	Group name:	*APPL TASK 1 CTRL*			
04 Index		**TIMELEVEL_SEL**			
	Description:	Selection of the execution cycle time for application task 1.			
		1 = **10 ms** Application task 1 is running on 10 ms interval. Also digital and analogue inputs of RMIO are read on this time level. **Note:** Only limited number of blocks can be used on 10 ms level. An alarm APPL SW OVERLOAD is indicated and application task execution is delayed. 2 = **20 ms** Application task 1 is running on 20 ms interval. This is normally used task interval.			
unit:	type: I	Min: 1	Max: 2	Def: 2	Integer scaling:
05 Index		**PASS CODE**			
	Description:	Pass code to deactivate protection of input pin connections.			
unit: hex	type: I	Min: 0 h	Max: FFFFFF h	Def: 0	Integer scaling:

Group 57 Appl Prog2

57	Group name:	*APPL PROG2*			
01 Index		**STATUS**			
	Description:	Shows the value of the application task 2 status word. The table below shows the alternative bit states and the corresponding values on the panel display. STOPPED if all bits are false. This signal is mainly used by DriveAP PC tool.			
		Bit **CDP312R Panel display indicates:** B0 RUNNING 1 B1 EDITING 2 B2 CHECKING 4 B3 FAULTED 8			
unit:	type: I	Min: 0	Max: 8	Def:	Integer scaling:
02 Index		**FAULTED PAR**			
	Description:	Points out the faulted parameter in the application task 2. This signal is mainly used by DriveAP PC tool.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
05 Index		**BLOCK 1**			
	Description:	Selects the function block type for block 1 in the application task 2. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
06 Index		**INPUT 1**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
07 Index		**INPUT 2**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
08 Index		**INPUT 3**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -

57	Group name:	*APPL PROG2*				
09 Index		**OUTPUT**				
	Description:	Stores and displays the output of block 1. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.				
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:	
10 Index		**BLOCK 2**				
	Description:	Selects the function block type for block 2 in the application task 2. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.				
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:	
11 Index		**INPUT 1**				
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
12 Index		**INPUT 2**				
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
13 Index		**INPUT 3**				
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
14 Index		**OUTPUT**				
	Description:	Stores and displays the output of block 2. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.				
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:	
From block 57.05 to last block 57.254 has same parameter order structure.						

Group 58 Appl Task 2 Cntr

58	Group name:	*APPL TASK 2 CTRL*			
	This parameter group consists of execution control for the medium fast application task.				
01 Index		**APPL TASK 2 CNTR**			
	Description:	Selects the operation mode for the medium fast application task program. 1 = **STOP** Stop. The program can be edited. 2 = **START** Run. The program cannot be edited. 3 = **EDIT** Stop to edit mode. The program can be edited.			
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:

58	Group name:	*APPL TASK 2 CTRL*			
02 Index		**EDIT COMMAND**			
	Description:	Selects the command for the block placed in the location defined by parameter 58.03. This parameter is used by DriveAP PC tool. 1 = **NO** Home value. The value automatically restores to NO after an editing command has been executed. 2 = **PUSH** Shifts the block in the location defined by parameter 58.03 and the subsequent blocks one location up. A new block can be placed in the emptied location. 3 = **DELETE** Deletes the block in the location defined by parameter 58.03 and shifts the subsequent blocks one step down. 4 = **PROTECT** Read protects input connections of the blocks. 5 = **UNPROTECT** Unprotect read protection of input connections.			
unit:	type: I	Min: 1	Max: 5	Def: 1	Integer scaling:
03 Index		**EDIT BLOCK**			
	Description:	Defines the block location number for the command selected by parameter 58.02. This parameter is used by DriveAP PC tool.			
unit:	type: I	Min: 1	Max: 15	Def: 0	Integer scaling:
04 Index		**TIME LEVEL SEL**			
	Description:	Indicates the fixed execution cycle time for application task 2.			
unit:	type: I	Min: 1	Max: 1	Def: 1	Integer scaling:
05 Index		**PASS CODE**			
	Description:	Pass code to deactivate protection of input pin connections.			
unit: hex	type: I	Min: 0 h	Max: FFFFFF h	Def: 0	Integer scaling:

Group 59 Appl Prog3

59	Group name:	*APPL PROG3*			
01 Index		**STATUS**			
	Description:	Shows the value of the application task 3 status word. The table below shows the alternative bit states and the corresponding values on the panel display. STOPPED if all bits are false. This signal is mainly used by DriveAP PC tool.			
Index	Description:	**Bit** **CDP312R Panel display indicates:** B0 RUNNING 1 B1 EDITING 2 B2 CHECKING 4 B3 FAULTED 8			
unit:	type: I	Min: 0	Max: 8	Def:	Integer scaling:
02 Index		**FAULTED PAR**			
	Description:	Points out the faulted parameter in the application task 3. This signal is mainly used by DriveAP PC tool.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
05 Index		**BLOCK 1**			
	Description:	Selects the function block type for block 1 in the application task 3. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
06 Index		**INPUT 1**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
07 Index		**INPUT 2**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
08 Index		**INPUT 3**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
09 Index		**OUTPUT**			
	Description:	Stores and displays the output of block 1. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
10 Index		**BLOCK 2**			
	Description:	Selects the function block type for block 2 in the application task 3. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
11 Index		**INPUT 1**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -

59	Group name:	*APPL PROG3*			
12 Index		**INPUT 2**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
13 Index		**INPUT 3**			
	Description:	An input for parameter or constant value. This parameter is mainly used by DriveAP PC tool. See the corresponding function block description. Format for input is [Group.Index.bit].			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
14 Index		**OUTPUT**			
	Description:	Stores and displays the output of block 2. This parameter is mainly used by DriveAP PC tool. See the section Function blocks.			
unit:	type: I	Min: 0	Max: 32768	Def:	Integer scaling:
From block 59.03 to last block 59.254 has same parameter order structure.					

Group 60 Appl Task3 Ctrl

60	Group name:	*APPL TASK3 CTRL*			
	This parameter group consists of execution control for slow application task.				
01 Index		**APPL TASK 3 CNTR**			
	Description:	Selects the operation mode for the slow application task program.			
		1 = **STOP** Stop. The program can be edited. 2 = **START** Run. The program cannot be edited. 3 = **EDIT** Stop to edit mode. The program can be edited.			
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:
02 Index		**EDIT COMMAND**			
	Description:	Selects the command for the block placed in the location defined by parameter 60.03. This parameter is used by DriveAP PC tool.			
		1 = **NO** Home value. The value automatically restores to NO after an editing command has been executed. 2 = **PUSH** Shifts the block in the location defined by parameter 60.03 and the subsequent blocks one location up. A new block can be placed in the emptied location. 3 = **DELETE** Deletes the block in the location defined by parameter 60.03 and shifts the subsequent blocks one step down. 4 = **PROTECT** Read protects input connections of the blocks. 5 = **UNPROTECT** Unprotects read protection of input connections.			
unit:	type: I	Min: 1	Max: 5	Def: 1	Integer scaling:
03 Index		**EDIT BLOCK**			
	Description:	Defines the block location number for the command selected by parameter 60.02. This parameter is used by DriveAP PC tool.			
unit:	type: I	Min: 1	Max: 15	Def: 0	Integer scaling:
04 Index		**TIME LEVEL SEL**			
	Description:	Indicates the fixed execution cycle time for application task 2.			
unit:	type: I	Min: 1	Max: 1	Def: 1	Integer scaling:

60	Group name:	*APPL TASK3 CTRL*			
05 Index		**PASS CODE**			
	Description:	Pass code to deactivate protection of input pin connections.			
unit: hex	type: I	Min: 0 h	Max: FFFFFF h	Def: 0	Integer scaling:

Group 66 Applic Connect

66	Group name:	*APPLIC CONNECT*			
	This group consists of input type parameters for block programming application. **Note:** It is recommended that these parameter values are set with the DriveAP 2.x PC tool.				
02 Index		**N REF**			
	Description:	Speed reference input for function block. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
04 Index		**T REF**			
	Description:	Torque reference input for function block. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
06 Index	Interval: 20 ms	*CW (Control Word)*			
	Description:	Control Word reference input for function block. This signal is mainly used by DriveAP PC tool. Start and stop by speed ramp is controlled by bit 11. A bit 3 must be normally at state TRUE and FALSE only when a coast stop is needed.			
		Bit		**Drive-specific control word**	
		B0	ON	1 = Normal, 0 = EMERGENCY STOP by RAMP	
		B1	OFF2	see bit 1 of 7.01 MAIN CTRL WORD	
		B2	OFF3	see bit 2 of 7.01 MAIN CTRL WORD	
		B3	**COAST STOP**	1 = Enable run, 0 = Drive stops modulation (Coast stop)	
		B4	RAMP_OUT_ZERO	see bit 4 of 7.01 MAIN CTRL WORD	
		B5	RAMP_HOLD	see bit 5 of 7.01 MAIN CTRL WORD	
		B6	RAMP_IN_ZERO	see bit 6 of 7.01 MAIN CTRL WORD	
		B7	**RESET**	see bit 7 of 7.01 MAIN CTRL WORD	
		B8	INCHING1	see bit 8 of 7.01 MAIN CTRL WORD	
		B9	INCHING2	see bit 9 of 7.01 MAIN CTRL WORD	
		B10	REMOTE_CMD	see bit 10 of 7.01 MAIN CTRL WORD	
		B11	**START**	1 = Normal start, 0 = Stop with ramp	
		B12			
		B13			
		B14			
		B15			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
07 Index		**DO1**			
	Description:	An input for Relay Output 1 control on RMIO board. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -

66	Group name:	*APPLIC CONNECT*				
08 Index		**DO2**				
	Description:	An input for Relay Output 2 control on RMIO board. This signal is mainly used by DriveAP PC tool.				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
09 Index		**DO3**				
	Description:	An input for Relay Output 3 control on RMIO board. This signal is mainly used by DriveAP PC tool.				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
10 Index	Interval: 20 ms	*EXT DO*				
	Description:	An input to control extension digital outputs (EXT DO word). This signal is mainly used by DriveAP PC tool. See function block EXT DO.				
		Bit	**Extension digital input status word**			
		B0	EXT1_DO1 Digital output 1 control on RDIO Ext. Module 1.			
		B1	EXT1_DO2 Digital output 2 control on RDIO Ext. Module 1.			
		B2	EXT2_DO1 Digital output 1 control on RDIO Ext. Module 2.			
		B3	EXT2_DO2 Digital output 2 control on RDIO Ext. Module 2.			
		B4	EXT3_DO1 Digital output 1 control on RDIO Ext. Module 3.			
		B5	EXT3_DO2 Digital output 2 control on RDIO Ext. Module 3.			
		B6	EXT4_DO1 Digital output 1 control on RDIO Ext. Module 4.			
		B7	EXT4_DO2 Digital output 2 control on RDIO Ext. Module 4.			
		B8	EXT5_DO1 Digital output 1 control on RDIO Ext. Module 5.			
		B9	EXT5_DO2 Digital output 2 control on RDIO Ext. Module 5.			
		B10				
		B11				
		B12				
		B13				
		B14				
		B15				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
11 Index		**AO1**				
	Description:	An input for analogue output 1 on RMIO board. This signal is mainly used by DriveAP PC tool.				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
12 Index		**AO2**				
	Description:	An input for analogue output 2 on RMIO board. This signal is mainly used by DriveAP PC tool.				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
13 Index		**EXT1 AO1**				
	Description:	An input for extension AI/O module 1 analogue output 1. This signal is mainly used by DriveAP PC tool.				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	
14 Index		**EXT1 AO2**				
	Description:	An input for extension AI/O module 1 analogue output 2. This signal is mainly used by DriveAP PC tool.				
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -	

66	Group name:	*APPLIC CONNECT*			
15 Index		**EXT2 AO1**			
	Description:	An input for extension AI/O module 2 analogue output 1. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
16 Index		**EXT2 AO2**			
	Description:	An input for extension AI/O module 2 analogue output 2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
17 Index		**EXT3 AO1**			
	Description:	An input for extension AI/O module 3 analogue output 1. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
18 Index		**EXT3 AO2**			
	Description:	An input for extension AI/O module 3 analogue output 2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
19 Index		**EXT4 AO1**			
	Description:	An input for extension AI/O module 4 analogue output 1. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
20 Index		**EXT4 AO2**			
	Description:	An input for extension AI/O module 4 analogue output 2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
21 Index		**EXT5 AO1**			
	Description:	An input for extension AI/O module 5 analogue output 1. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
22 Index		**EXT5 AO2**			
	Description:	An input for extension AI/O module 5 analogue output 2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
23 Index		**DC SWITCH STATE**			
	Description:	An input for DC switch control / monitoring. This is used only with ACS800 MultiDrive with optional DC switch. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
24 Index		**FUNC GEN**			
	Description:	An input for function generator input. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -

66	Group name:	*APPLIC CONNECT*			
25 Index		**TRA1 NODE2**			
	Description:	A transmit input 1 for point to point communication to node 2 on DDCS channel CH2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
26 Index		**TRA2 NODE2**			
	Description:	A transmit input 2 for point to point communication to node 2 on DDCS channel CH2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
27 Index		**TRA3 NODE2**			
	Description:	A transmit input 3 for point to point communication to node 2 on DDCS channel CH2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
28 Index		**TRA1 NODE3**			
	Description:	A transmit input 1 for point to point communication to node 3 on DDCS channel CH2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
29 Index		**TRA2 NODE3**			
	Description:	A transmit input 2 for point to point communication to node 3 on DDCS channel CH2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
30 Index		**TRA3 NODE3**			
	Description:	A transmit input 3 for point to point communication to node 3 on DDCS channel CH2. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
31 Index		**AP AFW**			
	Description:	An alarm and fault word for user's application. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -
32 Index		**RUN ENA**			
	Description:	A run enable interlocking for start command. This signal is mainly used by DriveAP PC tool.			
unit:	type: P	Min: -255.255.31 C –32768	Max: -255.255.31 C 32768	Def:	Integer scaling: -

Group 70 DDCS Control

70	Group name:	*DDCS CONTROL*			
	Description:	Parameter settings of the DDCS communication channels.			
01 Index		**CH0 NODE ADDR**			
	Description:	Node address for channel CH0. In an AC800M with CI858 and AC80 DriveBus connection, the drives are addressed 1 to 12. The drive address is related to the value of the DRNR terminal of the ACSRX PC element. When using the APC2 system, the address must be 1. With optical ModuleBus connection CH0 node address is calculated with the following steps: 1. Multiply the hundreds of the position value by 16. 2. Add the tens and ones of the position value to the result. For example, if the position value is 101, parameter 70.01 must be set 16 x 1 + 1 = 17.			
unit:	type: R	Min: 0	Max: 254	Def: 1	Integer scaling: 1 == 1
02 Index		**CH0 LINK CONTROL**			
	Description:	DDCS channel 0 intensity control for transmission LEDs. This parameter can be used in special cases to optimise the communication performance of the link.			
unit:	type: R	Min: 1	Max: 15	Def: 10	Integer scaling: 1 == 1
03 Index		**CH0 BAUD RATE-**			
	Description:	Channel CH0 communication speed. This must be set to 4 Mbits/s, when FCI or FBA communication modules are used. Otherwise, the overriding system automatically sets the communication speed. 0 = **8 Mbit/s** 1 = **4 Mbit/s** 2 = **2 Mbit/s** 3 = **1 Mbit/s**			
unit: Mbit/s	type: I	Min: 1 Mbit/s	Max: 8 Mbit/s	Def: 4 Mbit/s	Integer scaling: 1 == 1
04 Index		**CH0 TIMEOUT**			
	Description:	The delay time before a communication break fault is declared. The time count starts when the link fails update the message. Setting this parameter to 0 disables the function.			
unit: ms	type: R	Min: 0 ms	Max: 60000 ms	Def: 100 ms	Integer scaling: 1 == 1 ms
05 Index		**CH0 COM LOSS CTRL**			
	Description:	This parameter defines the action after a communication fault on channel CH0. 1 = **STOP RAMPNG** The drive is stopped by ramping. The deceleration time is defined by parameter 22.02 DECELER TIME. 2 = **STOP TORQ** The drive is stopped by torque limit. 3 = **COAST STOP** The drive is stopped by coasting. 4 = **LAST SPEED** The drive continues running on the last reference, the warning CH0 TIME OUT is activated, and 9.05 ALARM WORD 2 bit 11 is set to 1. 5 = **CNST SPEED1** The drive continues running at the speed reference defined by parameters 23.02 CONST SPEED 1, the warning CH0 TIME OUT is activated and 9.05 ALARM WORD 2 bit 11 is set to 1.			
unit:	type: I	Min: 1	Max: 5	Def: 1	Integer scaling:
06 Index		**CH1 LINK CONTROL**			
	Description:	DDCS channel CH1 intensity control for transmission LEDs. This value is adjusted through the link including each device on the link. This parameter can be used in special cases to optimise the communication performance of the link.			
unit:	type: R	Min: 1	Max: 15	Def: 10	Integer scaling: 1 == 1

70	Group name:	*DDCS CONTROL*			
07 Index		**CH2 NODE ADDR**			
	Description:	Defines the node address for channel CH2. This is used only in applications, with one or several point to point communications connections between the RMIO boards.			
unit:	type: R	Min: 1	Max: 125	Def: 1	Integer scaling: 1 == 1
08 Index		**M/F MODE**			
	Description:	Channel CH2 can be used to send the torque reference from the Master Drive to one or several Followers. Master/Follower is an application in which the machinery is run by several drives and the motor shafts are coupled to each other by gearing, a chain, a belt etc. 1 = **NOT IN USE** Channel CH2 not used for M/F communication. 2 = **MASTER** The drive is the master on the M/F link and broadcasts via CH2 the contents of data set 41 (defined by parameters 70.09…70.11). 3 = **FOLLOWER** The drive is a follower on the M/F link.			
unit:	type: I	Min: 1	Max: 3	Def: 1	Integer scaling:
09 Index		**MASTER SIGNAL 1**			
	Description:	When parameter **70.08 M/F MODE = MASTER**, this parameter defines a group + Index of the signal to be sent as a broadcast message in the selected data set (see parameter 70.29 FOLL DS SEL) index 1 to the follower drives. Example: the setting 701 broadcasts 7.01 MAIN CTRL WORD. When parameter **70.08 M/F MODE = FOLLOWER**, the data value of selected signal is written to dataset n-1 according to the parameter **70.07 CH2 NODE ADDRESS**. See parameter 70.29 FOLL DS SEL. This function is used with special M/F configuration where master and follower configuration can be changed on-line.			
unit:	type: PB	Min: 0	Max: 20000	Def: 0	Integer scaling: 1 == 1
10 Index		**MASTER SIGNAL 2**			
	Description:	When parameter **70.08 M/F MODE = MASTER**, this parameter defines a group + Index of the signal to be sent as a broadcast message in the selected data set (see parameter 70.29 FOLL DS SEL) index 2 to the follower drives. Example: the setting 2301 broadcasts 23.01 SPEED REF. When parameter **70.08 M/F MODE = FOLLOWER**, the data value of selected signal is written to dataset n-1 according to the parameter **70.07 CH2 NODE ADDRESS**. See parameter 70.29 FOLL DS SEL. This function is used with special M/F configuration where master and follower configuration can be changed on-line.			
unit:	type: R	Min: 0	Max: 20000	Def: 0	Integer scaling: 1 == 1
11 Index		**MASTER SIGNAL 3**			
	Description:	When parameter **70.08 M/F MODE = MASTER**, this parameter defines a group + Index of the signal to be sent as a broadcast message in the selected data set (see parameter 70.29) index 3 to the follower drives. Example: **2.10 TORQ REF3** is typically used to send as torque reference to the **25.01 TORQUE REF A** in the follower drives. Parameter 70.11 value is then 210. When parameter **70.08 M/F MODE = FOLLOWER**, the data value of selected signal is written to dataset n-1 according to the parameter **70.07 CH2 NODE ADDRESS** excluding dataset 41. See parameter 70.29. This function is used with special M/F configuration where master and follower configuration can be changed on-line. This signal can be scaled before broadcasting on the DDCS channel CH2 by parameter **70.30 MASTER SGN3 SCALE**.			
unit:	type: R	Min: 0	Max: 20000	Def: 0	Integer scaling: 1 == 1
12 Index		**CH2 LINK CONTROL**			
	Description:	DDCS channel CH2 intensity control for transmission LEDs. This parameter can be used in special cases to optimise the communication performance of the link.			
unit:	type: R	Min: 1	Max: 15	Def: 10	Integer scaling: 1 == 1

70	Group name:	*DDCS CONTROL*			
13 Index		**M/F TIME OUT**			
	Description:	The delay time before a communication break fault is declared. The time count starts when the link fails update the message. During the time elapsing, the warning M/F TIMEOUT is activated and **9.04 ALARM WORD 1** bit 6 is set to 1.			
unit: ms	type: R	Min: 0 ms	Max: 60000 ms	Def: 100 ms	Integer scaling: 1 == 1
14 Index		**M/F COM LOSS CTRL**			
	Description:	This parameter defines the action upon a communication fault on CH2 of the RMIO board. 1 = **FAULT** Drive is tripped, fault M/F LINK FAULT activated and 9.01 FAULT WORD 1 bit 11 is set to 1. 2 = **ALARM** The warning M/F LINK ALARM is generated and 9.04 ALARM WORD 1 bit 11 is set to 1.			
unit:	type: I	Min: 1	Max: 2	Def: 1	Integer scaling:
15 Index		**CH3 NODE ADDR**			
	Description:	Node address for channel CH3. This channel is normally used with the start-up and maintenance tools. If the CH3 channels of several drives have been connected in a ring or star (using a branching unit), each one must be given unique node address. **The new node address becomes valid only on the next RMIO board power-on**. The address range is 1…75 and 125…254. Addresses 75…124 are reserved for branching units.			
unit:	type: R	Min: 1	Max: 254	Def: 1	Integer scaling: 1 == 1
16 Index		**CH3 LINK CONTROL**			
	Description:	DDCS channel CH3 intensity control for transmission LEDs. This value is adjusted through the link including each device on the link. This parameter can be used in special cases to optimise the communication performance of the link.			
unit:	type: R	Min: 1	Max: 15	Def: 15	Integer scaling: 1 == 1
17 Index		**SPEED REF SEL**			
	Description:	This parameter defines the source for the speed reference in the Master/Follower mode. 0 = **SPEED REF 1** Speed reference is read either datasets 1, 10...24 or I/O. 1 = **DS SPEED REF** Speed reference is read from M/F link or fast com interface with fieldbus. See control block diagrams.			
unit:	type: B	Min:	Max:	Def: SPEED REF 1	Integer scaling: 1 == 1
18 Index		**TORQ REF SEL**			
	Description:	This parameter defines the source for the torque reference in the Master / Follower mode. 0 = **TORQUE REF A** Torque reference is read either datasets 1, 81 or 10...24. 1 = **DS TORQ REF A** Torque reference is read from M/F link or fast com interface with fieldbus. See control block diagrams.			
unit:	type: B	Min:	Max:	Def: DS TORQ REF A	Integer scaling: 1 == 1

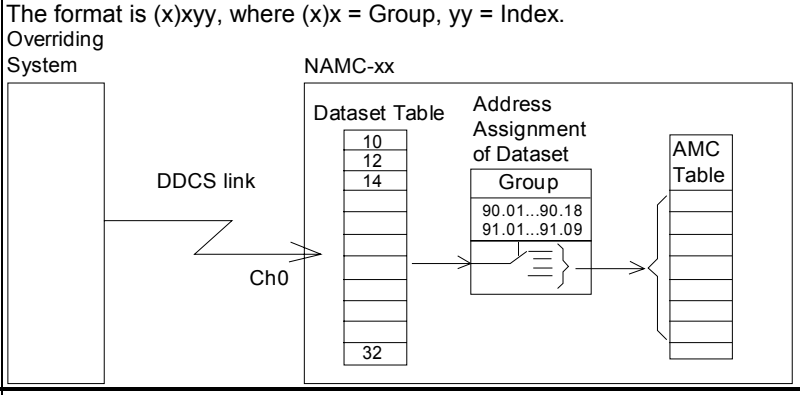
70	Group name:	*DDCS CONTROL*				
19		**CH0 HW CONNECTION**				
Index:	Description:	This parameter is used to enable or disable the regeneration of CH0 transmitter in DDCS mode (parameter 71.01 DRIVEBUS MODE = OFF). Regeneration means that the drive echoes all messages back. DDCS mode is typically used with APC2, AC70, module bus of AC800M and AC450 controllers. 0 = **RING** Regeneration is enabled. Used with ring-type bus topology. 1 = **STAR** Regeneration disabled. Used with star-type bus topology. Typically with configurations: AC80 or NDBU-95 branching unit(s) – ACS800. **Note:** This parameter has no effect in DriveBus mode. Select RING, if the CH0 channels on the RMIO boards have been connected to ring. **Note:** Select RING with NMBA-01 field bus module.				
unit:	type: B	Min: 0	Max: 1	Def: 1 = STAR	Integer scaling: 1 == 1	
20		**CH3 HW CONNECTION**				
Index:	Description:	This parameter is used to enable or disable the regeneration of CH3 transmitter. Regeneration means that the drive echoes all messages back. 0 = **RING** Regeneration is enabled. Used with ring-type bus topology. 1 = **STAR** Regeneration disabled. Used with star-type bus topology. Typically with configurations: DriveWindow (PC) – NDBU-95 branching unit(s) – ACS800. Select RING, if the CH3 channels on the RMIO boards have been connected to ring.				
unit:	type: B	Min: 0	Max: 1	Def: 1 = STAR	Integer scaling: 1 == 1	
28		**FAST TREF SEL**				
Index:	Description:	This parameter is used to enable or disable fast update of third data word via R-type of fieldbus module on the same way as with MCW and REF1. To activate this function: Enable this parameter and set value 3 for assigning of third data word in the group 51. E.g. with Profibus module parameter PZD3OUT = 3 0 = **DISABLED** Fast mode is disabled. 1 = **ENABLED** Fast mode is enabled. This function is enabled typically, when two fast references (speed and torque) are needed through the field bus.				
unit:	type: B	Min: 0	Max: 1	Def: 0 = DISABLED	Integer scaling: 1 == 1	
29		**FOLL DS SEL**				
Index:	Description:	This parameter is used to select desired data set package in the follower drive. Each data set package contains 3 data words. This function is needed in the application, where the process master drive is changed on-line.				
	Description:	**Bit** **Digital input status word** B0 DS41 Data set 41. This is used normally with basic master- follower connection. B1 DS45 Data set 45 is read to the speed and torque ref. chain. Source: CH2 node 2 B2 DS47 Data set 47 is read to the speed and torque ref. chain. Source: CH2 node 3 B3 DS49 Data set 49 is read to the speed and torque ref. chain. Source: CH2 node 4 B4 DS51 Data set 51 is read to the speed and torque ref. chain. Source: CH2 node 5 B5 DS53 Data set 43 is read to the speed and torque ref. chain. Source: CH2 node 6 B6 B7 B8 . B9 B10 B11 B12 B13 B14 B15				
unit:	type: PB	Min: 0	Max: 65535	Def: B0 = DS41	Integer scaling:	

70	Group name:	*DDCS CONTROL*			
30 Index		**MASTER SGN3 SCALE**			
	Description:	A signal selected by parameter **70.11 MASTER SIGNAL 3** can be rescaled before sending to the follower drive. Thus it is possible to send higher data values than with the normal integer scaling 10 == 1%.			
unit: %	type: R	Min: 0%	Max: 1000%	Def: 100%	Integer scaling: 10 == 1%
31 Index		**FOLLOW SGN3 SCALE**			
	Description:	Scaling of torque reference received from master follower link (MASTER SIGNAL 3).			
unit: %	type: R	Min: 0	Max: 1000	Def: 100%	Integer scaling: 10 == 1%
32 Index:		**CH2 HW CONNECTION**			
	Description:	This parameter is used to enable or disable the regeneration of CH2 transmitter. Regeneration means that the drive echoes all messages back. 0 = **RING** Regeneration is enabled. Used with ring-type topology. 1 = **STAR** Regeneration disabled. Used with star-type bus topology. Can be used with master follower application. Select RING, if the CH3 channels on the RMIO boards have been connected to ring.			
unit:	type: B	Min: 0	Max: 1	Def: 0 = RING	Integer scaling: 1 == 1

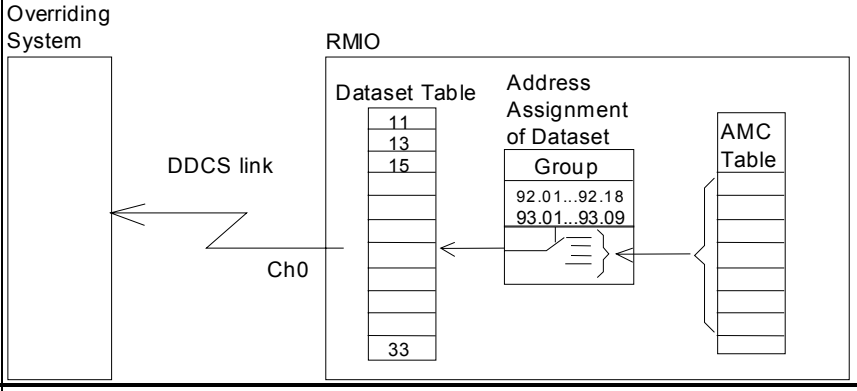
Group 71 DriveBus Communication

71	Group name:	*DRIVEBUS COMM*			
	Description:	Parameter settings of DriveBus communication on channel CH0.			
01 Index		**CH0 DRIVEBUS MODE**			
	Description:	Communication mode selection for channel CH0. The DriveBus mode is used with the ABB's AC800M or AC80 controller. The performance is four times better with DriveBus mode than ordinary DDCS module bus. **The new mode becomes valid only on the next RMIO board power-on**. 0 = **NO** DDCS mode 1 = **YES** DriveBus mode			
unit:	type: B	Min: 0	Max: 1	Def: 0 NO	Integer scaling: 1 == 1

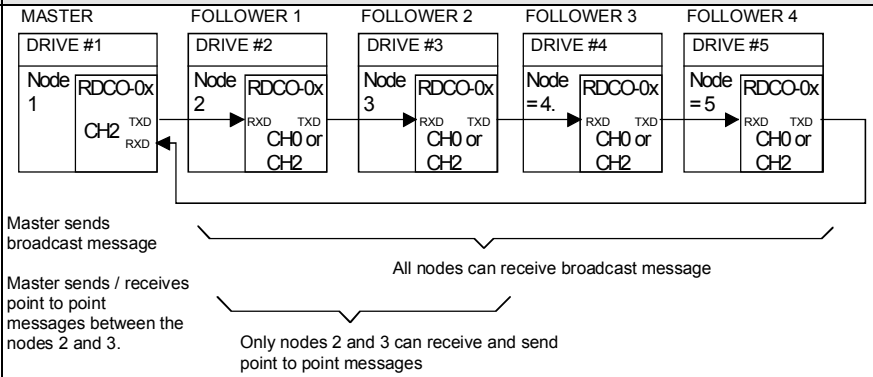
Group 90 Data Set Receive Addresses

90	Group name:	*D SET REC ADDR*			
	Description:	This group is only visible when parameter 98.02 **COMM MODULE** = **ADVANT/N-FB**. Addresses for Received Data from the Overriding System. The format is (x)xyy, where (x)x = Group, yy = Index.  			
01		**D SET 10 VAL 1**			
Index	Description:	Data set 10 value 1 receive address (Interval: 2 ms).			
unit:	type: I	Min: 0	Max: 9999	Def: 701	Integer scaling:
02		**D SET 10 VAL 2**	See 90.01	Interval: 2 ms	
03		**D SET 10 VAL 3**	See 90.01	Interval: 2 ms	
04		**D SET 12 VAL 1**	See 90.01	Interval: 4 ms	
05		**D SET 12 VAL 2**	See 90.01	Interval: 4 ms	
06		**D SET 12 VAL 3**	See 90.01	Interval: 4 ms	
07		**D SET 14 VAL 1**	See 90.01	Interval: 20 ms	
08		**D SET 14 VAL 2**	See 90.01	Interval: 20 ms	
09		**D SET 14 VAL 3**	See 90.01	Interval: 20 ms	
10		**D SET 16 VAL 1**	See 90.01	Interval: 20 ms	
11		**D SET 16 VAL 2**	See 90.01	Interval: 20 ms	
12		**D SET 16 VAL 3**	See 90.01	Interval: 20 ms	

Group 92 Data Set Transmit Addresses

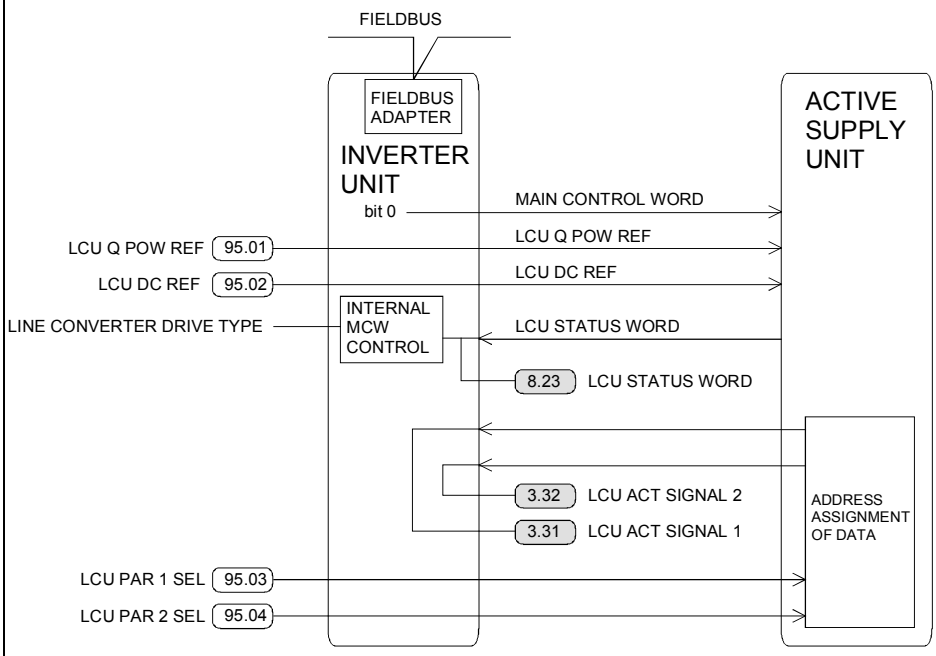
92	Group name:	*D SET TR ADDR*			
	Description:	The parameters are visible only when a fieldbus communication is activated by setting parameter 98.02 COMM MODULE to FIELDBUS or ADVANT/N-FB. Signal addresses for the transmitted data to the overriding system. The format is (x)xyy, where (x)x = Group, yy = Index.  			
01		**D SET 11 VAL 1**			
Index	Description:	Data set 11 value 1 transmit address (Interval: 2 ms).			
unit:	type: I	Min: 0	Max: 9999	Def: 801	Integer scaling:
02		**D SET 11 VAL 2** See 92.01		Interval: 2 ms	
03		**D SET 11 VAL 3** See 92.01		Interval: 2 ms	
04		**D SET 13 VAL 1** See 92.01		Interval: 4 ms	
05		**D SET 13 VAL 2** See 92.01		Interval: 4 ms	
06		**D SET 13 VAL 3** See 92.01		Interval: 4 ms	
07		**D SET 15 VAL 1** See 92.01		Interval: 20 ms	
08		**D SET 15 VAL 2** See 92.01		Interval: 20 ms	
09		**D SET 15 VAL 3** See 92.01		Interval: 20 ms	
10		**D SET 17 VAL 1** See 92.01		Interval: 20 ms	
11		**D SET 17 VAL 2** See 92.01		Interval: 20 ms	
12		**D SET 17 VAL 3** See 92.01		Interval: 20 ms	

Group 94 Point to Point Communication

94	Group name:	*P2P CONNECTION*			
	Description:	 The master drive on DDCS channel CH2 can also communicate with two other follower drives via point to point communication service. When this is activated, a broadcast transmission is still active on 4 ms time interval. Without point-to-point communication it is 2 ms. The communication must be enabled in both ends and the node number of the follower(s) must be set to 2 and / or 3. The node number must be different between the followers. The transmitting / receiving time interval is 100 ms.			
01 Index		**ENABLE FOLLOWER 1**			
	Description:	Activates the point-to-point communication between the master and follower node 2. This parameter must be activated in both ends: Master and Follower 2. 0 = **OFF** Inactive 1 = **ON** Active			
unit:	type: B	Min:	Max:	Def: OFF	Integer scaling:
02 Index		**REC2 DW1**			
	Description:	Received 16-bit data word 1 to / from the node 2. This signal is read on 100 ms time level.			
unit:	type: I	Min: -32768	Max: 32767	Def: 0	Integer scaling:
03 Index		**REC2 DW2**			
	Description:	Received 16-bit data word 2 to / from the node 2. This signal is read on 100 ms time level.			
unit:	type: I	Min: -32768	Max: 32767	Def: 0	Integer scaling:
04 Index		**REC2 DW3**			
	Description:	Received 16-bit data word 3 to / from the node 2. This signal is read on 100 ms time level.			
unit:	type: I	Min: -32768	Max: 32767	Def: 0	Integer scaling:
05 Index		**ENABLE FOLLOWER 2**			
	Description:	Activates the point-to-point communication between the master and follower node 3. This parameter must be activated in both ends: Master and Follower 3. 0 = **OFF** Inactive 1 = **ON** Active			
unit:	type: B	Min:	Max:	Def: OFF	Integer scaling:
06 Index		**REC3 DW1**			
	Description:	Received 16-bit data word 1 to / from the node 3. This signal is read on 100 ms time level.			
unit:	type: I	Min: -32768	Max: 32767	Def: 0	Integer scaling:
07 Index		**REC3 DW2**			
	Description:	Received 16-bit data word 2 to / from the node 3. This signal is read on 100 ms time level.			
unit:	type: I	Min: -32768	Max: 32767	Def: 0	Integer scaling:
08 Index		**REC3 DW3**			
	Description:	Received 16-bit data word 3 to / from the node 3. This signal is read on 100 ms time level.			
unit:	type: I	Min: -32768	Max: 32767	Def: 0	Integer scaling:

Group 95 LCU

95	Group name:	*LCU*
	Description:	Active Supply Unit parameters. This internal interface is used with ACS800 4Q drives. Main control word bit 0 control starts active supply unit. DC voltage reference and reactive power reference can be sent via inverter unit. With 4Q single drives parameter 98.02 COMM MODULE is set automatically to position INVERTER in active supply unit.



01 Index		**LCU Q POW REF**			
	Description:	Reactive power reference as percents of nominal power in active supply unit, sent every 10 ms.			
unit: %	type: I	Min: -10000	Max: 10000	Def: 0	Integer scaling: 100 = 1%

02 Index		**LCU DC REF**			
	Description:	DC voltage reference for the line-side converter, sent from inverter unit every 10 ms to active supply unit.			
unit: V	type: I	Min: 0	Max: 1100	Def: 0	Integer scaling: 1 == 1 V

03 Index		**LCU PAR1 SEL**			
	Description:	Address for LCU ACT SIGNAL 1 from the active supply unit. This parameter is used to select monitored signal from active supply unit. A selected actual value is monitored in signal 3.31 LCU ACT SIGNAL 1. The format is (x)xyy, where (x)x = Group, yy = Index.			
unit:	type: I	Min: 0	Max: 10000	Def: 0	Integer scaling:

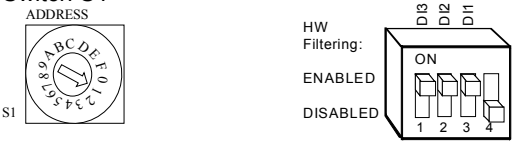
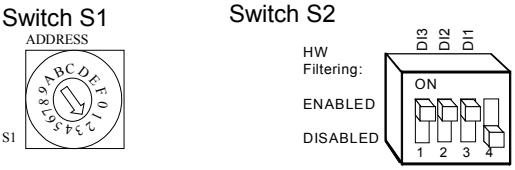
04 Index		**LCU PAR2 SEL**			
	Description:	Address for LCU ACT SIGNAL 2 from the active supply unit. This parameter is used to select monitored signal from active supply unit. A selected actual value is monitored in signal 3.32 LCU ACT SIGNAL 2. The format is (x)xyy, where (x)x = Group, yy = Index.			
unit:	type: I	Min: 0	Max: 10000	Def: 0	Integer scaling:

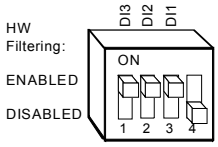
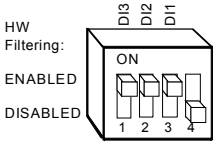
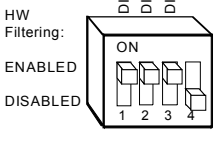
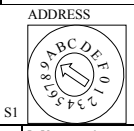
Group 97 Drive

97	Group name:	DRIVE			
	Description:				
01		**DEVICE NAME**			
Index	Description:	The name of the drive section can be typed here by the DriveWindow PC tool. This name is shown in the DriveWindow. The maximum number of characters is 32.			
unit:	type: String	Min: 0 char	Max: 32 char	Def: 0	Integer scaling: no

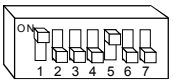
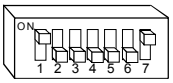
Group 98 Option Modules

98	Group name:	OPTION MODULES			
	Description:	The optional RTAC, RAIO and RDIO modules are connected to Slot 1 or Slot 2 of the RMIO board or via optional AIMA-01 I/O Module Adapter in a ring on channel CH1. Each of these modules is given an address using the DIP switches on them. ACS 600 fieldbus adapter modules are connected to channel CH0. ACS800 fieldbus adapter modules are connected only to the Slot 1.			
01		**ENCODER MODULE 1**			
Index	Description:	Pulse encoder module 1 interface selection. The module is connected into the position marked Slot 1 or Slot 2 on the RMIO board or alternatively onto external I/O Module Adapter (AIMA-01) with DDCS communication module. The module is given the address 0 by setting the switch as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board. 0 = **NTAC** NTAC-02 pulse encoder module interface activated. 1 = **NO** No pulse encoder modules. 2 = **RTAC-SLOT1** Pulse encoder module connected into Slot 1 on the RMIO board. 3 = **RTAC-SLOT2** Pulse encoder module connected into Slot 2 on the RMIO board. 4 = **RTAC-DDCS** Pulse encoder module connected with DDCS communication module onto external I/O Module Adapter. **RDIO** Switch S1  **Note:** See the parameter settings in group 50.			
unit:	type: I	Min: 0	Max: 4	Def: 1	Integer scaling:

98	Group name:	*OPTION MODULES*			
02		**COMM MODULE**			
Index	Description:	This parameter defines the control mode and place in the REMOTE mode. 1 = **NO** The drive is controlled using the I/O. 2 = **FIELDBUS** The drive is controlled through the fieldbus adapter or communication link (channel CH0) using data sets 1 and 2. This is a typical setting for use with Rxxx type of fieldbus adapter module. 3 = **ADVANT/N-FB** The drive is controlled through the Nxxx type of fieldbus adapter or communication link (channel CH0) using data sets 10 to 33 (for example AC800M, AC80, APC2, AC 70: also NPBA-02, NCSA-01). 4 = **STD MODBUS** RMBA-0x Modbus interface module is used. See Modbus parameter settings in the group 52.			
unit:	type: I	Min: 1	Max: 4	Def: 3	Integer scaling:
04		**DI/O EXT1 LOCATION**			
Index	Description:	RDIO-01 Extension module 1 interfaces selection. The module is connected into the position marked Slot 1 or Slot 2 on the RMIO board or alternatively onto external I/O Module Adapter (AIMA-01) with DDCS communication module. The module is given the address 1 by setting the switch (S1) as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board. For faster input signal detection with a DC signal, the hardware filter of the digital input in question can be disabled using the configuration DIP switch (S2) on the circuit board of the module. **Note:** Always have the hardware filtering enabled with an AC input signal.			
		1 = **NDIO** NDIO-02 module connected to DDCS channel CH1 of RDCO module. 2 = **NOT IN USE** No extension DIO board used. 3 = **RDIO-SLOT1** RDIO-01 is connected into Slot 1. 4 = **RDIO-SLOT2** RDIO-01 is connected into Slot 2. 5 = **RDIO-DDCS** RDIO-01 is connected onto external I/O Module Adapter with DDCS communication module. **RDIO** Switch S1 Switch S2  DI/O EXT1 address: 1 **Note**: Actuator no.4 is unused.			
unit:	type: I	Min: 1	Max: 4	Def: 1	Integer scaling:
05		**DI/O EXT2 LOCATION**			
Index:	Description:	RDIO-01 Extension module 2 interfaces selection. See index 4. The module is given the address 2 by setting the switch (S1) as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board. **Note:** Always have the hardware filtering enabled with an AC input signal. **RDIO** Switch S1 Switch S2  DI/O EXT1 address: 2 **Note**: Actuator no.4 is unused.			
unit:	type: I	Min: 1	Max: 4	Def: 1	Integer scaling:

98	Group name:	*OPTION MODULES*			
06		**DI/O EXT3 LOCATION**			
Index:	Description:	RDIO-01 Extension module 3 interfaces selection. See index 4. The module is given the address 3 by setting the switch (S1). Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board. **Note:** Always have the hardware filtering enabled with an AC input signal. **RDIO** Switch S1  Switch S2  DI/O EXT1 address: 3 **Note:** Actuator no.4 is unused.			
unit:	type: I	Min: 1	Max: 4	Def: 1	Integer scaling:
07		**DI/O EXT4 LOCATION**			
Index:	Description:	RDIO-01 Extension module 4 interfaces selection. See index 4. The module is given the address 4 by setting the switch (S1). Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board. **Note:** Always have the hardware filtering enabled with an AC input signal. **RDIO** Switch S1  Switch S2  DI/O EXT1 address: 4 **Note:** Actuator no.4 is unused.			
unit:	type: I	Min: 1	Max: 4	Def: 1	Integer scaling:
08		**DI/O EXT5 LOCATION**			
Index:	Description:	RDIO-01 Extension module 5 interfaces selection. See index 4. The module is given the address 5 by setting the switch (S1). Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board. **Note:** Always have the hardware filtering enabled with an AC input signal. **RDIO** Switch S1  Switch S2  DI/O EXT1 address: 5 **Note:** Actuator no.4 is unused.			
unit:	type: I	Min: 1	Max: 4	Def: 1	Integer scaling:
09		**AI/O EXT1 LOCATION**			
Index	Description:	RAIO-01 Extension module interface selection. The module is connected into the position marked Slot 1 or Slot 2 on the RMIO board or alternatively onto external I/O Module Adapter (AIMA-01) with DDCS communication module, channel CH1. The module is given the address A by setting the switch (S1) as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board. 1 = **NAIO-DDCS** NAIO module connected to DDCS channel CH1 RDCO module. 2 = **NOT IN USE** No extension AIO board used. 3 = **RAIO-SLOT1** RAIO-01 is connected into Slot 1. 4 = **RAIO-SLOT2** RAIO-01 is connected into Slot 2. 5 = **RAIO-DDCS** RAIO-01 is connected onto external I/O Module Adapter with DDCS communication module.			
	RAIO Node ID selection, Switch S1	 AI/O EXT1 address: **A**			
unit:	type: I	Min: 1	Max: 5	Def: 2	Integer scaling:

98	Group name:	*OPTION MODULES*			
10 Index:		**AI/O EXT2 LOCATION**			
	Description:	See index 9. The module is given the address B by setting the switch (S1) as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board.			
	RAIO Node ID selection, Switch S1	 AI/O EXT2 address: **B**			
unit:	type: I	Min: 1	Max: 5	Def: 2	Integer scaling:
11 Index:		**AI/O EXT3 LOCATION**			
	Description:	See index 9. The module is given the address C by setting the switch (S1) as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board.			
	RAIO Node ID selection, Switch S1	 AI/O EXT2 address: **C**			
unit:	type: I	Min: 1	Max: 5	Def: 2	Integer scaling:
12 Index:		**AI/O EXT4 LOCATION**			
	Description:	See index 9. The module is given the address D by setting the switch (S1) as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board.			
	RAIO Node ID selection, Switch S1	 AI/O EXT2 address: **D**			
unit:	type: I	Min: 1	Max: 5	Def: 2	Integer scaling:
13 Index:		**AI/O EXT5 LOCATION**			
	Description:	See index 9. The module is given the address E by setting the switch (S1) as shown below. Setting the node ID is not required when the module is mounted into Slot 1 or Slot 2 on the RMIO board.			
	RAIO Node ID selection, Switch S1	 AI/O EXT2 address: **E**			
unit:	type: I	Min: 1	Max: 5	Def: 2	Integer scaling:
14		**FUSE SWITCH CNTR**			
Index	Description:	ACS800 / ACS 600 MultiDrive section can be equipped with DC switch, which disconnects inverter from the common DC supply. Disabled check function is used with ACS800 1…12 x R8i inverter modules equipped with optional DC switches. A fuse switch controller AFSC-01 is used together with DC switch. A status of DC switch position and charging can be seen from the signal 8.20 **INV ENABLED WORD**. An alarm is indicated, if DC switch is opened at stop state of the drive and fault during the run. Fault / alarm text is **INV DISABLED**. ACS800 IGBT pulses are always blocked, when auxiliary contact of DC switch is opened. Thus this function guarantees no load situation for DC contacts of switch during switch off. 0 = **OFF**DC switch is not used in the drive section. 1 = **ON** DC switch is included in the drive section. See ACS800 MD HW drawings.			
unit:	type: B	Min: 0	Max: 1	Def: 1	Integer scaling: 1 == 1

98	Group name:	*OPTION MODULES*			
15		**ENCODER 2 MODULE**			
Index	Description:	Second pulse encoder module interface selection. The NTAC-02 module can be used with Multi Block Programming Application as a second speed measurement unit and it is connected to channel CH2 on the RDCO DDCS communication option module. The NTAC-02 module is given the address 17 by setting the DIP switches as shown below. RTAC type of pulse encoder module cannot be used as ENCODER 2 MODULE. See parameters 50.15…50.19. Measured speed is shown at the signal 1.28 **SPEED MEASURED 2**. **Note:** No other modules are allowed to use on CH2, if this module is enabled. 0 = **NTAC** Second pulse encoder module interface activated. 1 = **NO** Second pulse encoder module interface **not** activated.  NTAC-02 DIP switch settings **Note:** See the parameter settings in group 50.			
unit:	type: B	Min: 0	Max: 1	Def: NO	Integer scaling: 1 == 1
16		**FAST AI**			
Index	Description:	An interface activation for fast analogue input module. The NAIO-03F module can be used with Multi Block Programming Application as fast analogue inputs. It is connected to channel CH2 on the RDCO DDCS communication option module. The NAIO-03F module is given the address 1. Also bipolar mode must be used (S7 = ON). **Note:** No other modules are allowed to use on CH2, if FAST AI module is enabled. 0 = **OFF** Not activated 1 = **ON** Fast analogue module interface is activated.  NAIO-03F DIP switch settings **Note:** See the parameter settings in group 14.			
unit:	type: B	Min: 0	Max: 1	Def: NO	Integer scaling: 1 == 1

Group 99 Start Up Data

Note: The drive will not start if the Start-up Data parameters have not been changed from the factory settings, or the nominal current of the motor is too small compared to the nominal current of the inverter.

WARNING! Running the motor and the driven equipment with incorrect start-up data can result in improper operation, reduction in control accuracy and damage to equipment.

If several motors are connected to the drive, some additional instructions must be considered when setting the Start-up Data parameters. Please contact your local ABB representative for more information.

Note: Changing any of the motor parameters in group 99, causes the cancellation of all existing Motor ID Run results!

99	Group name:	*START UP-DATA*			
	Description:	Parameters for setting up the motor information.			
01 Index		**LANGUAGE**			
	Description:	If English (Am) is selected, the unit of power used is HP instead of kW. 0 = **ENGLISH** 1 = **ENGLISH AM** not available 2 = **DEUTSCH** not available 3 = **ITALIANO** not available 4 = **ESPAÑOL** not available 5 = **PORTUGUÊS** not available 6 = **NETHERLANDS** not available 7 = **FRANÇAIS** not available 8 = **DANSK** not available 9 = **SUOMI** not available 10 = **SVENSKA** not available 11 = **CESKY** not available 12 = **POLSKI** not available 13 = **PO-RUSSKI** not available			
unit:	type: I	Min: 0	Max: 13	Def: 0	Integer scaling:
02 Index		**MOTOR NOM VOLTAGE**			
	Description:	Nominal voltage from the motor rating plate. It is not possible to start the drive without setting this parameter. **Note*:*** It is not allowed to connect a motor with nominal voltage less than 1/2 * UN or more than 2 * UN of the drive.			
unit: V	type: R	Min: 207 V	Max: 830 V	Def: 0 V	Integer scaling: 1 == 1V
03 Index		**MOTOR NOM CURRENT**			
	Description:	Rated motor current. If several motors are connected to the inverter, enter the total current of the motors.			
unit: A	type: R	Min: 0 A	Max:	Def: 0 A	Integer scaling: 10 == 1A
04 Index		**MOTOR NOM FREQ**			
	Description:	Nominal frequency from the motor rating plate. **Note*:*** If the nominal frequency of the motor is higher than 50 Hz, speed limits in DTC mode or frequency limits in scalar control mode must be set before an ID Run command. See parameter group 20 DTC mode or group 29 (SCALAR control mode).			
unit: Hz	type: R	Min: 8 Hz	Max: 300 Hz	Def: 50 Hz	Integer scaling: 100 == 1 Hz

99	Group name:	*START UP-DATA*			
05		**MOTOR NOM SPEED**			
Index	Description:	Nominal speed from the motor rating plate.			
unit: rpm	type: R	Min: 1 rpm	Max: 18000 rpm	Def: 1 rpm	Integer scaling: 1 == 1 rpm
06		**MOTOR NOM POWER**			
Index	Description:	Nominal power from the motor rating plate. If several motors are connected to the inverter, enter the total power of the motors. Set also parameter 99.12 MOTOR NOM COS FII.			
unit: kW	type: R	Min: 0 kW	Max: 9000 kW	Def: 0 kW	Integer scaling: 10 == 1 kW
07		**MOTOR ID RUN**			
Index	Description:	This parameter is used to initiate the Motor Identification Run. During the run, the drive will identify the characteristics of the motor for optimum motor control. The ID Run takes about one minute. The ID Run cannot be performed if scalar control is selected (parameter 99.08 is set to SCALAR). **Note:** The ID Run (STANDARD or REDUCED) should be selected if: • the operation point is near zero speed, and/or • operation at torque range above the motor nominal torque within a wide speed range and without a pulse encoder is required. **Note:** Check the rotation direction of the motor by first start before starting the Motor ID Run. During the run the motor will rotate in the forward direction. **Warning!** The motor will run at up to approximately 50%…80% of the nominal speed during the Motor ID Run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE MOTOR ID RUN. 1 = **NO** The Motor ID Run is not performed. If an ID Run has not been done yet, or any of the motor parameters have been changed, the motor will start the mode **FIRST START** after the start command has been given. The DC-magnetising phase lasts much longer than the normal start because the stator resistance and other electrical losses are first identified and stored into the FPROM memory. 2 = **STANDARD** Performing the Standard Motor ID Run guarantees the best possible control accuracy. The motor must be decoupled from the driven equipment before performing the Standard ID Run. 3 = **REDUCED** Only to be selected if the motor cannot be decoupled from the driven equipment. The Reduced Motor ID Run should be selected in applications where mechanical losses are higher than 20% (i.e. the load cannot be disconnected) or where flux reduction is not allowed (i.e. there are auxiliary devices connected in parallel with the motor) while the motor is running. 4 = **CURRENT CAL** Current offset and gain measurement calibration. Calibration is performed on next start.			
unit:	type: I	Min: 1	Max: 4	Def: 1	Integer scaling:
08		**MOTOR CTRL MODE**			
Index	Description:	Motor control mode selection. 1 = **SCALAR** Scalar control mode. 0 = **DTC** Direct Torque Control mode. If several motors are connected to the inverter, there are certain restrictions on the usage of DTC. Please contact your local ABB representative for more information.			
unit:	type: B	Min:	Max:	Def: DTC	Integer scaling: 1 == 1
09		**APPLIC RESTORE**			
Index	Description:	Restores either USER MACRO 1, USER MACRO 2 or FACTORY parameter values depending on the selection in parameter 99.11 APPLICATION MACRO except parameter group 99. 1 = **YES** Restoring 0 = **NO** No restoring			
unit:	type: B	Min: 0	Max: 1	Def: 0	Integer scaling: 1 == 1

99	Group name:	*START UP-DATA*			
10 Index		**DRIVE ID NUMBER**			
	Description:	This parameter can be used by the overriding system to check the correct connections of the optical cables to the drive type. This parameter requires support from the overriding system.			
unit:	type: I	Min: 0	Max: 32767	Def: 0	Integer scaling:
11 Index		**APPLICATION MACRO**			
	Description:	This parameter selects the application macro to be used. In addition to the default settings (FACTORY), two user-definable parameter sets (USER) are available. In addition to the FACTORY setting there is a selection for saving the current settings as a User Macro (USER 1 SAVE or USER 2 SAVE), and recalling these settings (USER 1 LOAD or USER 2 LOAD). If User Macro 1 or 2 is in use, the parameter values are restored to the last saved values. In addition, the last saved results of the motor identification are restored. Exception: Settings of parameters 99.11 remain unchanged. **Note:** When user macros are saved to the PC with DrivwWindow, both macros must be saved separately. See section *User macro save with DriveWindow* on page 108. **Note:** Restoring of the DriveWindow backup file (.BPG) restores both macros. See section *Backup and restore function with DriveWindow* on page 107. 1 = **FACTORY** Factory parameters (default values) are recalled and stored to the FPROM memory. 2 = **USER 1 LOAD** Parameter set 1 (User Macro 1) is loaded to the RAM memory. 3 = **USER 1 SAVE** Parameter set 1 (User Macro 1) is saved to the FPROM memory. 4 = **USER 2 LOAD** Parameter set 2 (User Macro 2) is loaded to the RAM memory. 5 = **USER 2 SAVE** Parameter set 2 (User Macro 2) is saved to the FPROM memory.			
unit:	type: I	Min: 1	Max: 5	Def: 1	Integer scaling:
12 Index		**MOTOR NOM COS FII**			
	Description:	Cos φ from the motor rating plate.			
unit:	type: R	Min: 0	Max: 1	Def: 0.7	Integer scaling: 100 == Cos φ 1
13 Index		**POWER IS GIVEN**			
	Description:	Selects whether the first start or ID run is be performed by using power or Cosφ of the motor. Cosφ is recommended. Use power selection if Cosφ is unknown. 0 = **COSFII** 1 = **POWER**			
unit:	type: B	Min: 0	Max: 1	Def: 0	Integer scaling: 1 == 1

Chapter 7 - Application Blocks

Overview

The chapter describes the function blocks.

Safety Instruction with Function Blocks

ABB Drives is not responsible for the operation of the custom-made function block program nor any damage or injury caused by the use of it.

General Rules

The use of first input is compulsory (it must not be left unconnected). Use of second and third input is voluntary for most blocks. As a rule of thumb, an unconnected input does not affect the output of the blocks.

Block Inputs

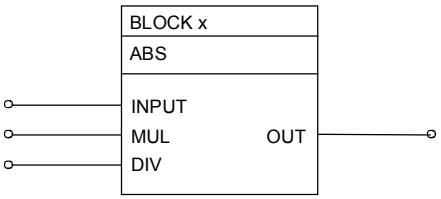
The blocks use three input formats:

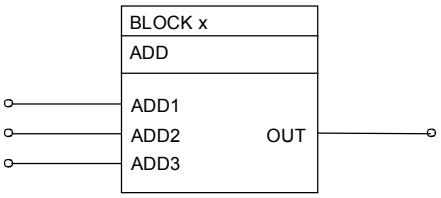
- integer
- Boolean
- text string

The used format varies depending on the block. For example, the ADD block uses integer inputs and the OR block Boolean inputs. Text string format is used only by EVENT blocks.

Note: The inputs of the blocks are read when the execution of the block starts, not simultaneously for all blocks.

Function Blocks

ABS		
	Type **Summary**	Arithmetic function ABS (**ABS**olute value) is used to obtain the absolute value of an integer number.
	Illustration	
	Operation	The output is the absolute value of INPUT multiplied by input MUL and divided by input DIV. OUT = | INPUT | · MUL / DIV
	Connections	Inputs INPUT, MUL and DIV: 24 bit integer values (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

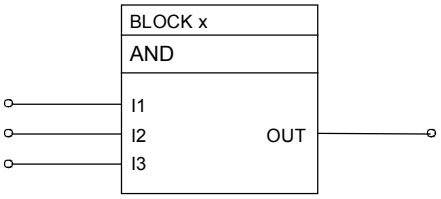
ADD		
	Type **Summary**	Arithmetic function **ADD**er is used to calculate the sum of integers.
	Illustration	
	Operation	The output is the sum of the inputs. OUT = ADD1 + ADD2 + ADD3 This block is also used for subtraction. See SUB function.
	Connections	Input ADD1, ADD2 and ADD3: 24 bit integer values (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

AND

Type Summary

Logical function.
AND is used to form a logical AND-function of Boolean input variables.

Illustration



Operation

The output is true if all connected inputs are true. Otherwise the output is false. Truth table:

I1	**I2**	**I3**	**OUT** (binary)	**OUT** (value on display)
0	0	0	False (All bits 0)	0
0	0	1	False (All bits 0)	0
0	1	0	False (All bits 0)	0
0	1	1	False (All bits 0)	0
1	0	0	False (All bits 0)	0
1	0	1	False (All bits 0)	0
1	1	0	False (All bits 0)	0
1	1	1	True (All bits 1)	-1

Connections

Input I1, I2 and I3: Boolean values

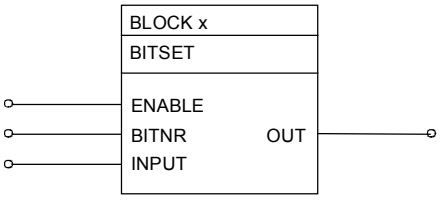
Output (OUT): 24 bit integer value (packed boolean)

BSET

Type Summary

A bit setting of an integer word.
Bit **SET** is used to change the state of one selected bit of an integer value. The integer usually contains packed Boolean data.

Illustration



Operation

If the input I1 is active (=1), the function sets the bit defined by the input I2 (0 = bit 0, 1 = bit 1, …), and if not active (=0), the function resets the bit defined by the input I2.
VALUE: Boolean value, set bit = 1, reset bit = 0
BITNR: Bit number (0 = bit nr 0…15 = bit nr 15)
INPUT: Input word for chaining several blocks or for masking bit pattern

Connections

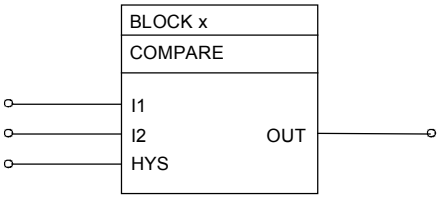
Input ENABLE: Boolean value
Inputs BITNR and INPUT: 24 bit integer values (23 bits + sign)
Output (OUT): 24 bit integer (23 bits + sign)

COMPARE

Type Summary

Comparative function.
Comparator is used to **COMPARE** two integers.

Illustration



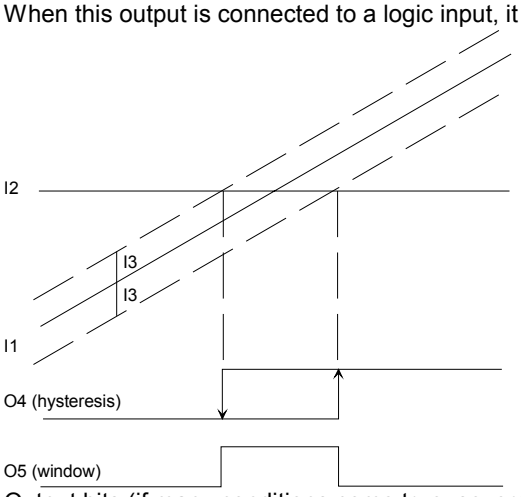
Operation

Output bits 0, 1 and 2:
If I1 > I2, O = … 001 (Output bit 0 is set.), If I1 = I2, O = … 010 (Output bit 1 is set.), If I1 < I2, O = … 100 (Output bit 2 is set.)

Output bit 3:
If I1 > I2, O = … 1xxx (Output bit 3 is set and remains set until I1 < I2 - I3, after which bit 3 is reset.)

Output bit 4:
If I1 - I2 - I3 ≥ 0 ⇒ O4 = 1, If I1 - I2 + I3 < 0 ⇒ O4 = 0

Output bit 5:
If I3 ≥ |I1 - I2| ⇒ O5 = 1, NB! I3 must be ≥ 0, If I3 < |I1 - I2| ⇒ O5 = 0
When this output is connected to a logic input, it is true if any bit is true.



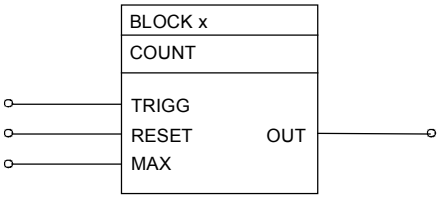
Output bits (if many conditions come true, several bits are set):

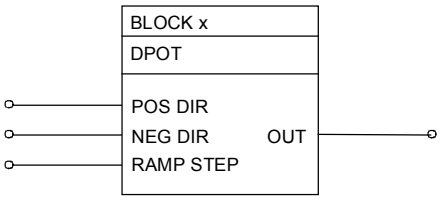
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	OUT (value on display)
0	0	0	0	0	0	0
1	0	0	0	0	1	1
0	1	0	0	0	0	2
0	0	1	0	0	0	4
0	0	0	0	0	0	8
0	0	0	0	1	0	16
0	0	0	0	0	1	32

Connections

Input I1, I2 and HYS: 24 bit integer values (23 bits + sign)

Output (OUT): 24 bit integer (packed boolean)

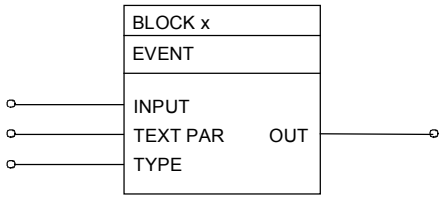
COUNT		
	Type **Summary**	Counter function. **COUNT**er is reset counter with maximum value limit.
	Illustration	
	Operation	The counter function counts rising edges of the input TRIGG. The counter is reset by the input RESET and limited to the value set with the input MAX. **TRIGG:** Trigger input **RESET:** Resets output **MAX:** Maximum limit of output **Note:** If pin 3 is left unconnected, the maximum count value is zero.
	Connections	Input TRIGG and RESET: Boolean values Input MAX: 24 bit integer value (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

DPOT		
	Type **Summary**	Up / down counter **D**igitally controlled **POT**entiometer function.
	Illustration	
	Operation	The digitally controlled ramp function increments or decrements the output according to control inputs POS DIR and NEG DIR. The input POS DIR ramps the output to positive direction and NEG DIR to negative direction. If both inputs are active, nothing happens. The step is defined by the input RAMP STEP. **POS DIR:** Control to positive direction **NEG DIR:** Control to negative direction **RAMP STEP:** Ramp step on program cycle
	Connections	Input POS DIR and NEG DIR: Boolean values Input RAMP STEP: 24 bit integer value (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

EVENT

Type Summary
Event function.
Application based alarm or fault **EVENT**.

Illustration



Operation

The EVENT block is used to write an event to the alarm or fault logger. A fault event will trig a drive fault and trip the drive. Alarm events are reflected in the drive status word alarm bit.
INPUT triggers the event. Input TEXT PAR selects the parameter index from which the event message (text string) is read. Selects the parameter index from which the event message (text string) is read. Use text parameters 53.11...53.24 for user's application specific texts. Type the respective text by clicking the pin with shift pressed. Input TYPE selects the type of the event (warning or fault)

INPUT	TEXT PAR	TYPE	Cause
0->1			block activates the event
0			block deactivates the event
	TEXT PAR		contents of the event message
		0	type of event: warning
		1	type of event: fault

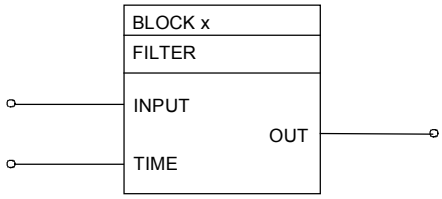
Connections

Inputs INPUT, TEXT PAR: 24 bit integer values (23 bits + sign)
Input TYPE: String (compulsory)

FILTER

Type Summary
Filtering function.
The **FILTER** block is used as a first order low pass filter for integer values.

Illustration

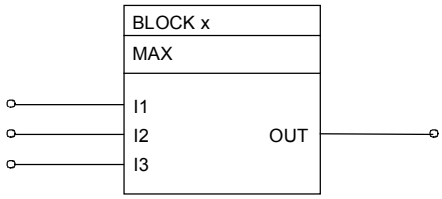


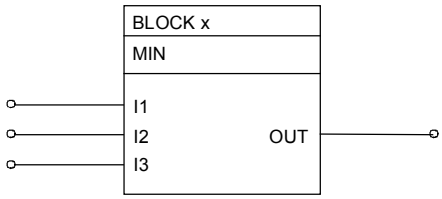
Operation

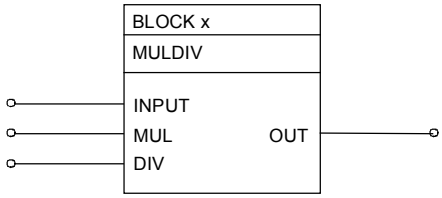
The output is the filtered value of INPUT. Input TIME is the filtering time constant.
OUT = INPUT * (1 - $e^{-t/TIME}$)
Note: The internal calculation uses 48 bits accuracy to avoid offset errors.

Connections

INPUT: 24 bit integer value (23 bits + sign)
TIME: 24 bit integer value (23 bits + sign). One corresponds to 1 ms.
Output (OUT): 24 bit integer (23 bits + sign)

MAX		
	Type **Summary**	Comparative function: maximum selector MAX (**MAX**imum selector) is used to select the highest value of inputs to the output.
	Illustration	
	Operation	The values at the inputs **I1**, **I2** and **I3** are compared and the highest value is written to the output OUT. OUT = MAX (I1, I2, I3)
	Connections	Input I1, I2 and I3: 24 bit integer values (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

MIN		
	Type **Summary**	Comparative function: minimum selector MIN (**MIN**imum selector) is used to select the lowest value of inputs to the output.
	Illustration	
	Operation	The values at the inputs **I1**, **I2** and **I3** are compared and the lowest value is written to the output OUT. OUT = MIN (I1, I2, I3)
	Connections	Input I1, I2 and I3: 24 bit integer values (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

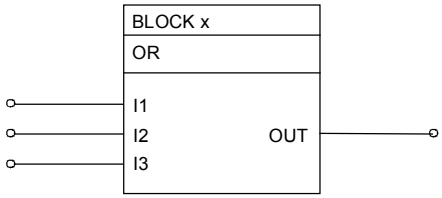
MULDIV		
	Type **Summary**	Arithmetic function **MUL**tiplayer **DIV**ider element is used to scale an integer value by dividing the product of two integers with third value.
	Illustration	
	Operation	The output is the product of **INPUT** multiplied by **MUL** and divided by **DIV**. OUT = (INPUT * MUL) / DIV
	Connections	Inputs INPUT, MUL and DIV: 24 bit integer values (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

OR

Type Logical function

Summary **OR** is used to form general combinatory expressions with Boolean variables.

Illustration

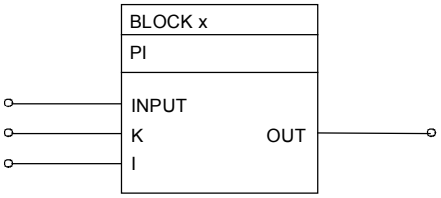


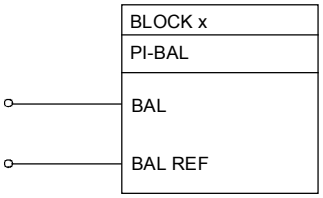
Operation The output is true if any of the inputs is true.
Truth table:

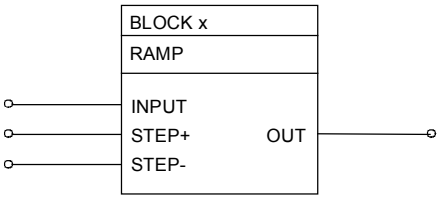
I1	**I2**	**I3**	**OUT** (binary)	**OUT** (value on display)
0	0	0	False (All bits 0)	0
0	0	1	True (All bits 1)	-1
0	1	0	True (All bits 1)	-1
0	1	1	True (All bits 1)	-1
1	0	0	True (All bits 1)	-1
1	1	0	True (All bits 1)	-1
1	1	1	True (All bits 1)	-1

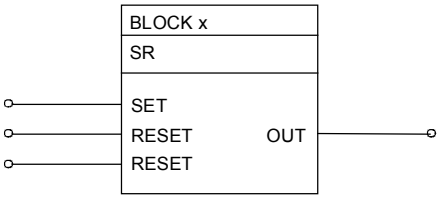
Connections Input I1, I2 and I3: Boolean values

Output (OUT): 24 bit integer value (packed Boolean)

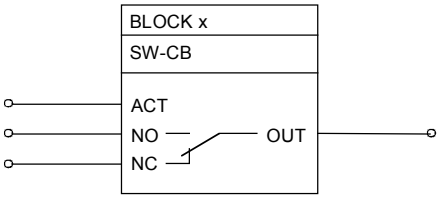
PI	**Type**	PI controller
	Summary	**P**roportional **I**ntegrating block is used as a standard PI-regulator for serial compensation in closed loop systems.
	Illustration	
	Operation	The output is INPUT multiplied by input K/100 plus integrated INPUT multiplied by input I/100. **OUT** = **INPUT** * **K** / 100 + (**I** / 100) * $\int$ INPUT **Note:** The internal calculation uses 48 bits accuracy to avoid offset errors.
	Connections	INPUT: 24 bit integer value (23 bit + sign) Input **K**: -24 bit integer value (23 bit + sign) - Gain factor 100 correspond to 1. 10 000 corresponds to 100. Input **I**: - Integrator coefficient. 100 correspond to 1. 10 000 corresponds to 100. Output (OUT): 24 bit integer (23 bits + sign). The range is limited to –10000…10000.

PI-BAL	**Type**	Initialisation block for the PI controller.
	Illustration	
	Operation	The block initialises the PI block first. When input **BAL** is true, the block writes the value of **BAL REF** to the output of the PI block. When input BAL becomes false, the block releases the output of the PI controller block which continues normal operation from the set output. **Note:** The block may be used only with the PI block. The execution of block must be after the PI block.
	Connections	Input BAL: Boolean value Input BAL REF: 24 bit integer value (23 bits + sign)

RAMP		
	Type **Summary**	Ramp function The ramp (**RAMP** generator) function is used to limit the rate of change of a signal.
	Illustration	
	Operation	The step value is added every program cycle to the OUT value as long as: INPUT - OUT >= STEP+ (positive direction) INPUT - OUT <= -STEP- (negative direction) The ramp step is defined: Input STEP+: positive direction (INPUT + STEP+) Input STEP-: negative direction (INPUT – STEP-)
	Connections	Inputs INPUT, STEP+ and STEP-: 24 bit integer value (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

SR		
	Type **Summary**	Logical function The memory block SR (**S**et **R**eset memory) is used as a memory for Boolean variables.
	Illustration	
	Operation	Input **SET** sets and **RESET** inputs reset the output. If input SET and both RESET inputs are false, the current value remains at the output. If input SET is true and both RESET inputs are false, the output is true. If one or both of the RESET inputs is true, the output is false.
	Connections	Inputs SET and both RESET: Boolean values Output (OUT): 24 bit integer value (23 bits + sign)

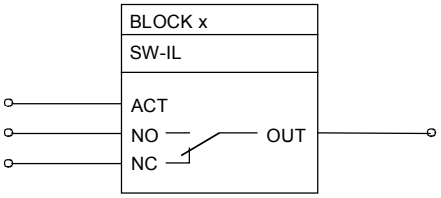
SET	**RESET**	**RESET**	**OUT** (binary)	**OUT** (value on display)
0	0	0	Output	Output
0	0	1	False (All bits 0)	0
0	1	0	False (All bits 0	0
0	1	1	False (All bits 0)	0
1	0	0	True (All bits 1)	-1
1	0	1	False (All bits 0	0
1	1	0	False (All bits 0)	0
1	1	1	False (All bits 0)	0

SWITCH-B	**Type** **Summary**	Logical function Changeover **SWITCH** for **B**oolean type of data.
	Illustration	
	Operation	The **OUT** is equal to input **NO** (**N**ormally **O**pen) if input **ACT** is true and equal to input **NC** (**N**ormally **C**losed) if input ACT is false.

ACT	**NO**	**NC**	**OUT**	**OUT** (value on display)
0	I2	I3	I3	True = -1
1	I2	I3	I2	False = 0

NO = normally open, NC = normally closed

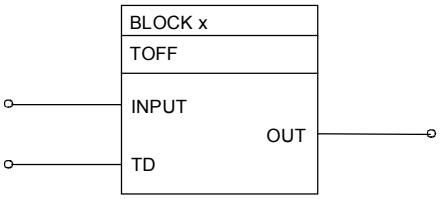
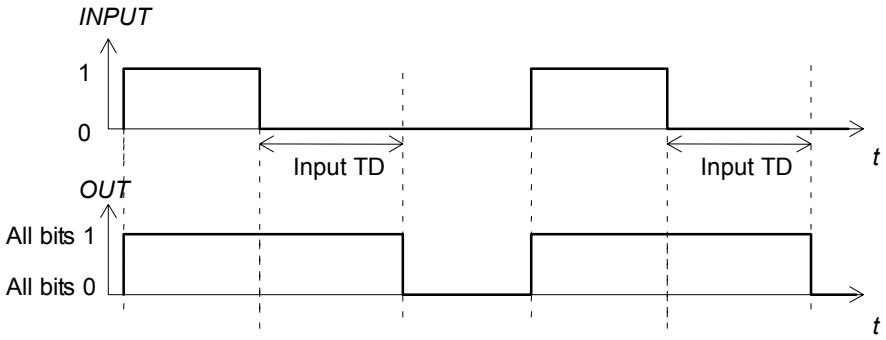
	Connections	Input ACT, NO and NC: Boolean values Output (OUT): 24 bit integer value (packed Boolean)

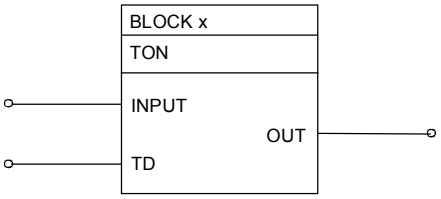
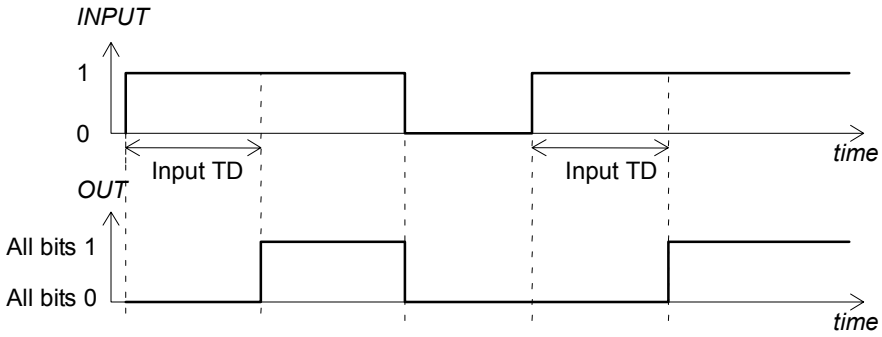
SWITCH-I	**Type** **Summary**	Logical function Changeover **SWITCH** for **I**nteger type of data.
	Illustration	
	Operation	The **OUT** is equal to input **NO** if input **ACT** is true and equal to input **NC** if input **ACT** is false.

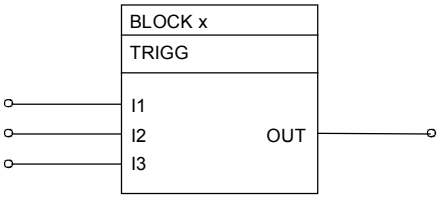
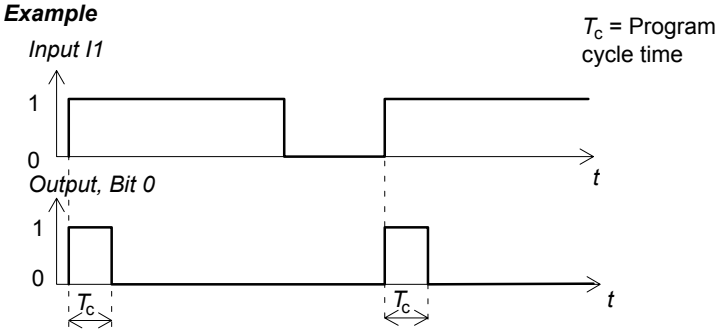
ACT	**NO**	**NC**	**OUT**
0	NO	NC	NC
1	NO	NC	NO

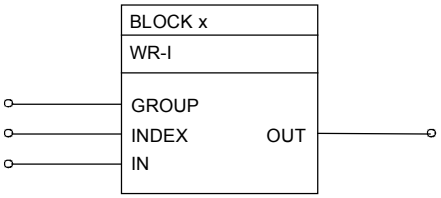
NO = normally open, NC = normally closed

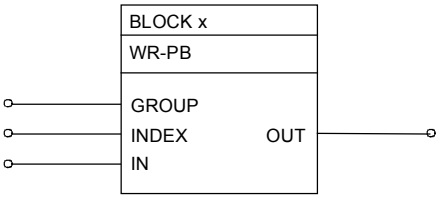
	Connections	Input ACT: Boolean value Input NO and NC: 24 bit integer values (23 bits + sign) Output (OUT): 24 bit integer value (23 bits + sign)

TOFF		
	Type **Summary**	Timing function **T**ime delay **OFF** (TOFF) is used for Boolean off state delay.
	Illustration	
	Operation	The output **OUT** is true when **INPUT** is true. The output is false when INPUT has been false for a time equal or longer than input **TD**.  Values on display: True = -1, false = 0
	Connections	INPUT: Boolean value Input TD: 24 bit integer value (23 bits + sign). One corresponds to 1 ms. Output (OUT): 24 bit integer value (packed Boolean)

TON	**Type** **Summary**	Timing function **T**ime delay **ON** (TON) is used for Boolean on state delay.
	Illustration	
	Operation	The output **OUT** is true when **INPUT** has been true for a time equal or longer than input **TD**. The output is false when the **INPUT** is false.  Values on display: True = -1, false = 0.
	Connections	INPUT: Boolean value Input TD: 24 bit integer value (23 bits + sign). 1 corresponds to 1 ms. Output (OUT): 24 bit integer value (packed Boolean)

TRIGG		
	Type **Summary**	Timing function This block is used for reducing impulse times at the start of automatic procedures and for calculating functions.
	Illustration	
	Operation	The rising edge of input **I1** sets the output bit 0 for one program cycle. The rising edge of input **I2** sets the output bit 1 for one program cycle. The rising edge of input **I3** sets the output bit 2 for one program cycle. ***Example*** 
	Connections	Input I1, I2 and I3: Boolean values Output (OUT): 24 bit integer value (23 bits + sign)

WR-I	**Type**	Write integer value to the parameter in the RAM memory of the control board.
	Illustration	
	Operation	This function writes an integer value to the integer type of AMC-table index. **Note:** The function does not take care if another device e.g. field bus is writing to the same place. This causes oscillation of signal. It is not possible to write into the middle of the reference chain. Check the parameter type (I or PB) from the Firmware manual
	Connections	Inputs GROUP, INDEX and IN: 24 bit integer value (23 bits + sign) Input **GROUP:** Parameter group number Input **INDEX:** Parameter index number Input **IN:** Data input pin to read new value for the parameter Output (OUT): Error code (24 bit integer value) Error codes: 0 Successful write 131073 Group protected 131074 Index protected 131075 Illegal group 131076 Undefined group 131077 Illegal index 131078 Undefined index 131079 Illegal format 131080 Min max limitation 131088 Illegal selection For example parameter 20.05 MAXIMUM CURRENT - group is 20 - index is 05

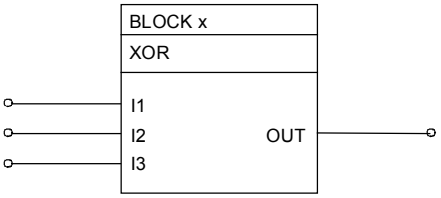
WR-PB	**Type**	Write packed Boolean value to the parameter in the RAM memory of the control board.
	Illustration	
	Operation	Writes a packed Boolean value to the packed Boolean type of AMC-table index e.g. command word. **Note:** The function does not take care if another device e.g. field bus is writing to the same place. This causes oscillation of signal. Check the parameter type (I or PB) from the Firmware manual.
	Connections	Inputs GROUP, INDEX and IN: 24 bit integer value (23 bits + sign) Input **GROUP:** Parameter group number Input **INDEX:** Parameter index number Input **IN:** Data input pin to read new value for the parameter Output (OUT): Error code (24 bit integer value) Error codes: 0 Successful write 131073 Group protected 131074 Index protected 131075 Illegal group 131076 Undefined group 131077 Illegal index 131078 Undefined index 131079 Illegal format 131080 Min max limitation 131088 Illegal selection For example parameter 7.01 MCW - group is 7 - index is 01

XOR

Type
Logical function.

Summary
XOR (e**X**clusive **OR)** is used to generate combinatory expressions with Boolean variables.

Illustration



Operation

The output is true if only one or all connected inputs are true. Otherwise the output is false.
Truth table:

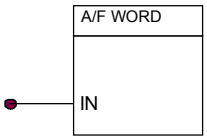
I1	**I2**	**I3**	**OUT** (binary)	**OUT** (value on display)
0	0	0	False (All bits 0)	0
0	0	1	True (All bits 1)	-1
0	1	0	True (All bits 1)	-1
0	1	1	False (All bits 0)	0
1	0	0	True (All bits 1)	-1
1	0	1	False (All bits 0)	0
1	1	0	False (All bits 0)	0
1	1	1	True (All bits 1)	-1

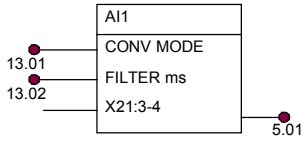
Connections

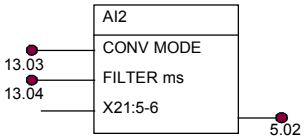
Input I1, I2 and I3: Boolean values
Output (OUT): 24 bit integer value (packed Boolean)

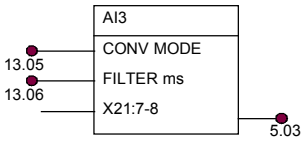
I/O and Communication Blocks

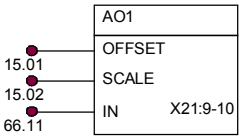
Execution time interval of these blocks has not relation with execution time of Function blocks. See section *The Master / Follower Link* in chapter *Software Description.*

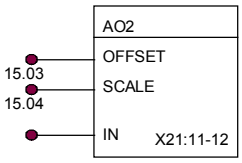
A/F WORD		
	Type **Summary**	A/F WORD Application based alarm and fault word. Execution interval is 560 ms.
	Illustration	
	Operation	This block is used to collect application specific alarms and faults to packed boolean type of word A/F WORD further to be read e.g. by overriding system from the signal 9.19 AP AFW. Use e.g. BSET function blocks to set desired bits of A/F WORD according to application needs.
	Connections	IN: 24 bit integer value (23 bits + sign)

AI1		
	Type **Summary**	Analogue input 1 This block is used to read analogue input 1 (AI1) of RMIO motor control- and I/O board. Resolution is 10 bits + sign, voltage type of input. Updating interval is 10 ms or 20 ms according to Parameter 56.04 TIME LEVEL SEL.
	Illustration	
	Operation	**CONV MODE**: See parameter 13.01 AI1 CONV MODE. The conversion mode for the analogue input AI1. Different modes are: 1 = NORMAL scale –10 V…0…+10V = -20000…0…+20000 2 = Pt-100: supply from any AO, scale 200 C = 20000 1xPt-100: supply 10 mA 2xPt-100: supply 5 mA 3xPt-100: supply 3.3 mA 3 = KTY84 supply 2 mA from any AO; scale 100 C = 10000 Set these values to AO according to number of sensors connected to series. **FILTER ms:** See parameter 13.02 AI1 FILTER ms. A filtering time constant for AI1. **OUT:** See signal 5.01 BASIC AI1
	Connections	Input CONV MODE: Integer value 1…3 Input FILTER ms: Integer value 0…30000 Output (OUT): Integer value on range –20000…20000

AI2	**Type Summary**	Analogue input AI2. This block is used to read analogue input 2 (AI2) of RMIO motor control- and I/O board. Resolution is 10 bits + sign, current type of input 0(4)…20 mA.
	Illustration	
	Operation	**CONV MODE**: See parameter 13.03 AI2 CONV MODE. The conversion mode for the analogue input AI2. Different modes are: 1 = NORMAL scale -20 mA.…0…+20mA = -20000…0…+20000 2 = 4 mA scale 4…20 mA = 0…20000 **FILTER ms:** See parameter 13.04 AI2 FILTER ms. A filtering time constant for AI2. **OUT:** See signal 5.02 BASIC AI2
	Connections	Input CONV MODE: Integer value 1…2 Input FILTER ms: Integer value 0…30000 Output (OUT): Integer value on range –20000…20000

AI3	**Type Summary**	Analogue input AI3. This block is used to read analogue input 3 (AI3) of RMIO motor control- and I/O board. Resolution is 10 bits + sign, current type of input 0(4)…20 mA.
	Illustration	
	Operation	**CONV MODE**: See parameter 13.05 AI3 CONV MODE. The conversion mode for the analogue input AI2. Different modes are: 1 = NORMAL scale -20 mA…0…+20mA = -20000…0…+20000 2 = 4 mA scale 4…20 mA = 0…20000 **FILTER ms:** See parameter 13.06 AI3 FILTER ms. A filtering time constant for AI3. **OUT:** See signal 5.03 BASIC AI3
	Connections	Input CONV MODE: Integer value 1…2 Input FILTER ms: Integer value 0…30000 Output (OUT): Integer value on range –20000…20000

AO1		
	Type **Summary**	Analogue output This block is used to write data to the analogue output 1 (AO1) of RMIO motor control- and I/O board. Execution interval is 20 ms.
	Illustration	
	Operation	**OFFSET:** See parameter 15.01 AO1 OFFSET in the Firmware manual of Multi Block Programming Application. Analogue ouput offset in milliamperes. **SCALE:** See parameter 15.02 AO1 SCALE, the scaling of analogue output AO1 signal. The value of this signal corresponds the maximum output current 20 mA at the HW. **IN:** Input pin to control analogue output AO1.
	Connections	Input OFFSET: Integer value 0…20000 = 0…20 mA Input SCALE: Integer value 0…30000 IN: 24 bit integer value (23 bits + sign) HW settings See the *Analogue I/O Extension User's Manual RAIO-01* (3AFE 64484567 English).

AO2		
	Type **Summary**	Analogue output This block is used to write data to the analogue output 2 (AO2) of RMIO motor control- and I/O board. Execution interval is 20 ms.
	Illustration	
	Operation	**OFFSET:** See parameter 15.03 AO2 OFFSET in the Firmware manual of Multi Block Programming Application. Analogue ouput offset in milliamperes. **SCALE:** See parameter 15.04 AO2 SCALE The scaling of analogue output AO2 signal. The value of this signal corresponds the maximum output current 20 mA at the HW. **IN:** Input pin to control analogue output AO2.
	Connections	Input OFFSET: Integer value 0…20000 = 0…20 mA Input SCALE: Integer value 0…30000 IN: 24 bit integer value (23 bits + sign) HW settings See the *Analogue I/O Extension User's Manual RAIO-01* (3AFE64484567 English).

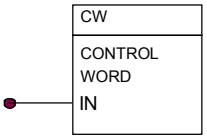
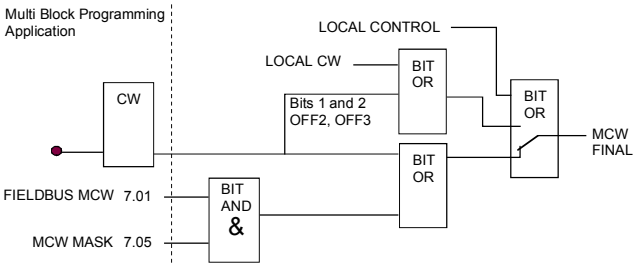
CW		
	Type **Summary**	Control Word in block application. This block is used to control the drive from the application. See also parameter 7.05 MAIN CONTROL W MASK, if there is a need to share control bits between the fieldbus control word 7.01 MAIN CTRL WORD and CW. Execution interval is 20 ms.
	Illustration	
	Operation	See the *Chapter 6 - Parameters* **66.06 CW** (Control Word) bits: Bit – Signal name – Function 0 – ON – 1= normal, 0 = Emergency stop by ramp 1 – OFF2 – 1= normal, 0 = Emergency Coast Stop 2 – OFF3 – 1= normal, 0 = Emergency Ramp Stop 3 – COAST – 1= normal, 0 = coast stop 4 – RAMP OUT ZERO – 1= normal, 0 = output of speed ref. ramp is forced to zero 5 – RAMP HOLD – 1= normal, 0 = output of speed ref. ramp is frozen 6 – RAMP IN ZERO – 1= normal, 0 = input of speed ref. ramp is forced to zero 7 – RESET – 1= reset, 0 = reset of fault 8 – INCHING 1 – 1= acceleration to CONST SPEED 1, 1->0 = deceleration to zero speed **Note:** bits 4,5 and 6 must be 0 before inching control 9 – INCHING 2 – 1= acceleration to CONST SPEED 2, 1->0 deceleration to zero speed **Note:** bits 4,5 and 6 must be 0 before inching control 10 – REMOTE CMD – 1= Overriding computer is requesting to control the drive. 0= No control from the overriding system, except OFF1, OFF2 and OFF3. 11 – START – 1= Normal start, 0 = Stop by ramp Operation, use e.g. BSET function blocks to set needed bits of A/F WORD according to the requirements of the application.
	Connections	IN: 24 bit integer value (23 bits + sign)

Figure below is an example, how to use 7.05 MAIN CONTROL W MASK.

- Emergency stop OFF3 is programmed to work either through the fieldbus or from the I/O.
- **Note:** Also in LOCAL control OFF2 and OFF3 bits must be set using CW block.
- OFF3 from the digital input is also active with LOCAL control in this example.



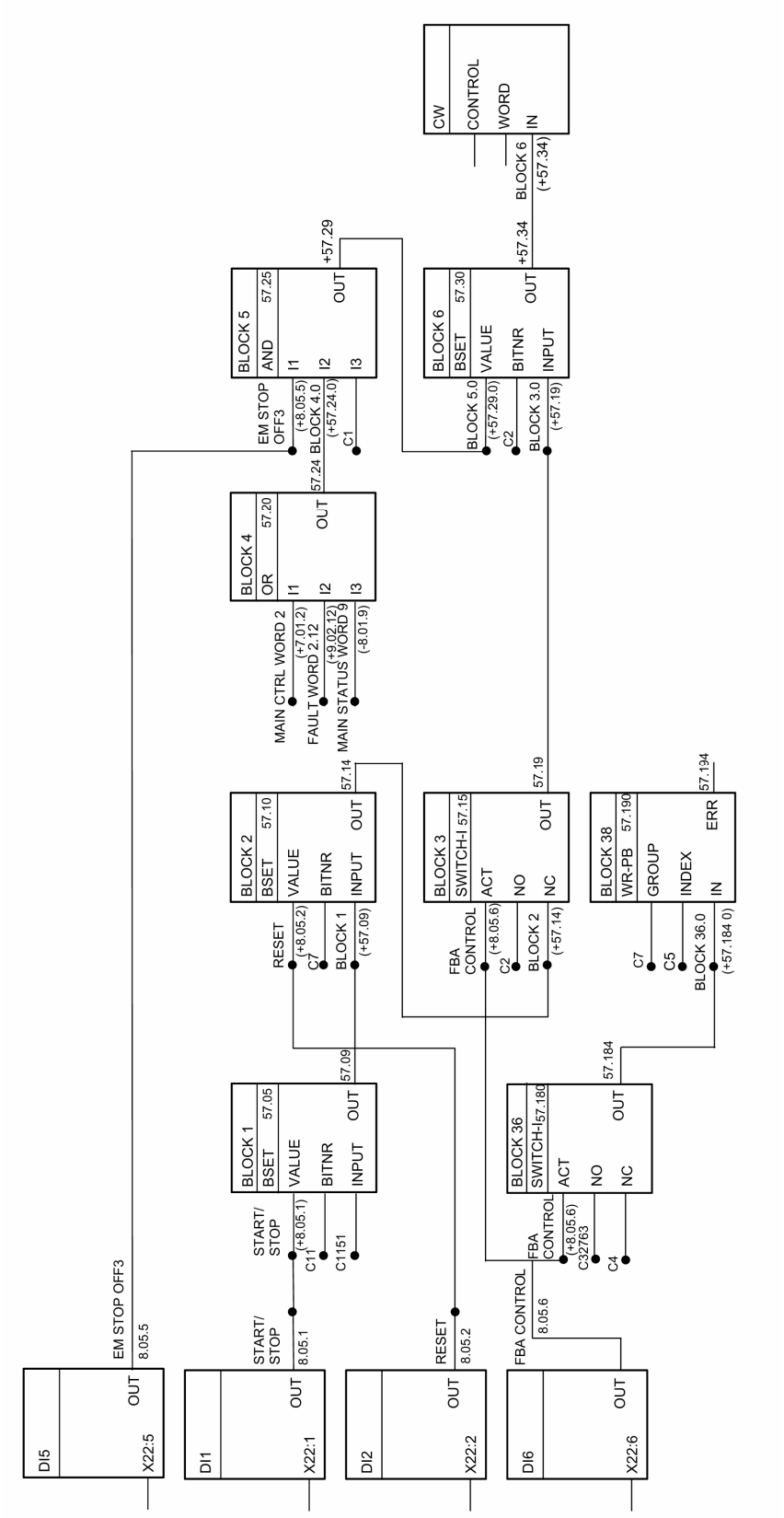
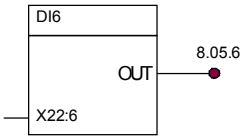
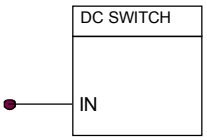
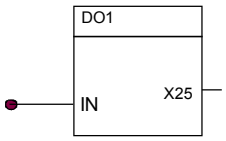
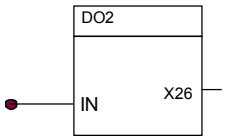


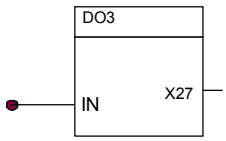
Figure 7 - 1 Block Diagram.

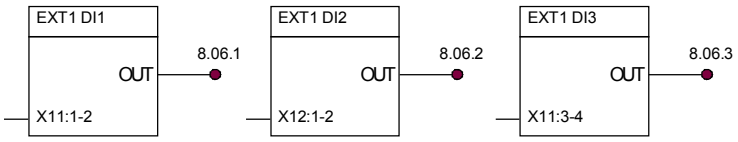
DI1…DI6, DI IL		
	Type **Summary**	Digital input These blocks are used to read the status of the digital input DI1…DI6 and DI IL (DI7) of RMIO motor control- and I/O board. Execution interval is 10 ms or 20 ms according to parameter 56.04 TIME LEVEL SEL.
	Illustration	 Example: View of DI6
	Operation	Output of the blocks corresponds 8.01 DI STATUS WORD. bit 0 = not in use- bit 1 = Status of DI1 bit 2 = Status of DI2 bit 3 = Status of DI3 bit 4 = Status of DI4 bit 5 = Status of DI5 bit 6 = Status of DI6 bit 7 = Status of DI IL
	Connections	OUT: 16 bit packed boolean value.

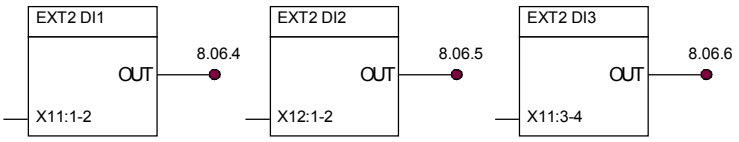
DC SWITCH		
	Type **Summary**	Charging control of DC circuit This block is used to control DC charging software with DC switch option in the multidrive systems. Execution interval is 20 ms.
	Illustration	
	Operation	Following is valid with ACS 600 R2i…R7i and ACS800 R2i…R7i inverter modules. This block must be used, if DC switch exists at the DC input of the inverter unit. A feedback signal of DC switch must be wired to one of the digital input (e.g. DI IL) on the RMIO board. DC switch open -> digital input state is FALSE DC switch closed -> digital input state is TRUE The output of the digital input is connected to the input of this block in the software. When this connection has been performed in HW and SW, the DC switch can be opened.
	Connections	IN: 24 bit integer value (23 bits + sign)

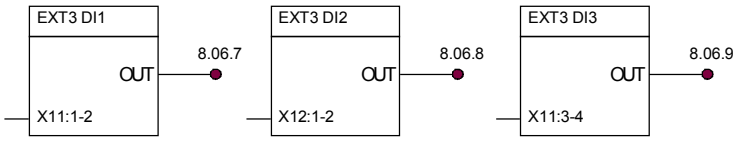
DO1	**Type** **Summary**	Digital output DO1 This block is used to control relay output RO1 of RMIO motor control and I/O board. Execution interval is 20 ms.
	Illustration	
	Operation	INPUT: State TRUE energises relay output RO1 and state FALSE de-energises the relay.
	Connections	INPUT: 24 bit integer value (23 bits + sign).

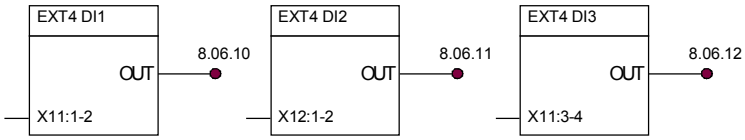
DO2	**Type** **Summary**	Digital output This block is used to control relay output RO2 of RMIO motor control and I/O board. Execution interval is 20 ms.
	Illustration	
	Operation	INPUT: State TRUE energises relay output RO2 and state FALSE de-energises the relay.
	Connections	INPUT: 24 bit integer value (23 bits + sign).

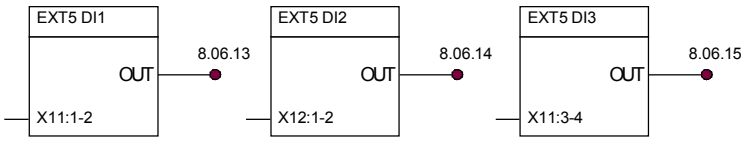
DO3	**Type** **Summary**	Digital output DO3 This block is used to control relay output RO3 of RMIO motor control- and I/O board. Execution interval is 20 ms.
	Illustration	
	Operation	INPUT: State TRUE energises relay output RO3 and state FALSE de-energise the relay.
	Connections	INPUT: 24 bit integer value (23 bits + sign).

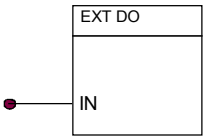
EXT1 DI…DI3		
	Type Summary	Extension module 1 digital inputs. This block is used to read status of the digital inputs DI1…DI3 of digital extension module 1 (DI/O EXT1). Execution interval is 40 ms.
	Illustration	
	Operation	Output is same as 8.06 EXT DI STATUS WORD bits 1…3. bit 0 = not in use- bit 1 = Status of EXT1 DI/O DI1 bit 2 = Status of EXT1 DI/O DI2 bit 3 = Status of EXT1 DI/O DI3 …
	Connections	OUT: 16 bit packed boolean value.

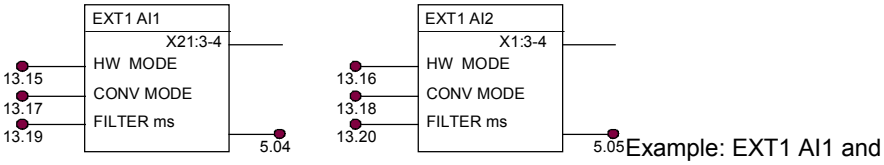
EXT2 DI…DI3		
	Type Summary	Extension module 2 digital inputs: EXT2 DI1, EXT2 DI2 and EXT2 DI3. This block is used to read status of the digital inputs DI1…DI3 of digital extension module 2 (DI/O EXT2). Execution interval is 40 ms.
	Illustration	
	Operation	Output is same as 8.06 EXT DI STATUS WORD bits 4…6. … bit 4 = Status of EXT2 DI/O DI1 bit 5 = Status of EXT2 DI/O DI2 bit 6 = Status of EXT2 DI/O DI3 …
	Connections	OUT: 16 bit packed boolean value.

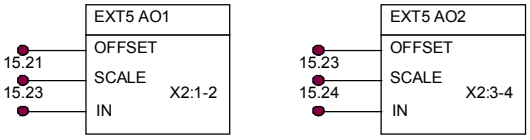
EXT3 DI…DI3		
	Type Summary	Extension module 3 digital inputs: EXT3 DI1, EXT3 DI2 and EXT3 DI3. This block is used to read status of the digital inputs DI1…DI3 of digital extension module 3 (DI/O EXT3). Execution interval is 40 ms.
	Illustration	
	Operation	Output is the same as 8.06 EXT DI STATUS WORD bits 6…8. … bit 6 = Status of EXT3 DI/O DI1 bit 7 = Status of EXT3 DI/O DI2 bit 8 = Status of EXT3 DI/O DI3 …
	Connections	OUT: 16 bit packed boolean value.

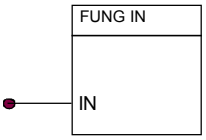
EXT4 DI…DI3		
	Type Summary	Extension module 4 digital inputs: EXT4 DI1, EXT4 DI2 and EXT4 DI3. This block is used to read status of the digital inputs DI1…DI3 of digital extension module 4 (DI/O EXT4). Execution interval is 40 ms.
	Illustration	
	Operation	Output is the same as 8.06 EXT DI STATUS WORD bits 9…11. … bit 9 = Status of EXT4 DI/O DI1 bit 10 = Status of EXT4 DI/O DI2 bit 11 = Status of EXT4 DI/O DI3 …
	Connections	OUT: 16 bit packed boolean value.

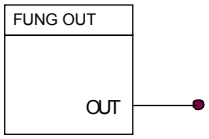
EXT5 DI…DI3		
	Type Summary	Extension module 5 digital inputs: EXT5 DI1, EXT5 DI2 and EXT5 DI3. This block is used to read status of the digital inputs DI1…DI3 of digital extension module 5 (DI/O EXT5). Execution interval is 40 ms.
	Illustration	
	Operation	Output is the same as 8.06 EXT DI STATUS WORD bits 12…14. … bit 12 = Status of EXT5 DI/O DI1 bit 13 = Status of EXT5 DI/O DI2 bit 14 = Status of EXT5 DI/O DI3 …
	Connections	OUT: 16 bit packed boolean value.

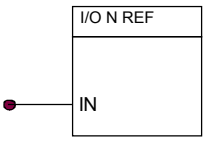
EXT DO		
	Type Summary	Extension Digital Output control This block is used to control relay outputs of RDIO digital extension modules 1…5. Execution interval is 20 ms.
	Illustration	
	Operation	This block writes packed boolean value to parameter 66.10 EXT DO. State TRUE of each bit energises relay output and state FALSE de-energises the relay. Bit 0: EXT1 DO1 control Bit 1: EXT1 DO2 control Bit 2: EXT2 DO1 control Bit 3: EXT2 DO2 control Bit 4: EXT3 DO1 control Bit 5: EXT3 DO2 control Bit 6: EXT4 DO1 control Bit 7: EXT4 DO2 control Bit 8: EXT5 DO1 control Bit 9: EXT5 DO2 control Use BSET blocks connected to series to set each bit of the EXT DO word.
	Connections	INPUT: 16 bit packed boolean value.

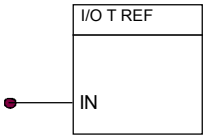
EXT1…5 AI1…AI2	**Type** **Summary**	Extension analogue inputs This block is used to read analogue input 1 and 2 (AI1, AI2) of analogue extension module (AI/O EXT1…AI/O EXT5). Execution interval is 40 ms.
	Illustration	 Example: EXT1 AI1 and EXT1 AI2
	Operation	**HW MODE:** See parameters 13.xx EXTx AIx HW MODE in chapter Parameters. 1 = UNIPOLAR unipolar input mode 2 = BIPOLAR bipolar input mode **CONV MODE:** See parameters 13.xx EXTx AIx CONV MODE in chapter Parameters. The modes are: 1 = NORMAL Scale –20 mA, -2 V, -10 V…0…+10 V, +2 V, -20 mA = -20000…+20000 2 = 4 mA Scale 4…20 mA = 0…20000 3 = PT 100 Supply from any AO, scale 200 C = 20000 1XPT 100: supply 10 mA 2XPT 100: supply 5 mA 3xPT 100: supply 3.3 mA 4 = KTY84 Supply 2 mA from any AO; scale 200 C = 20000 **FILTER ms**: See parameter 13.xx EXTx AI1 FILTER ms. A filtering time constant for AIx. **OUT:** See signal 5.xx EXTx AIx
	Connections	Input HW MODE: Integer value 1…2 Input CONV MODE: Integer value 1…4 Input FILTER ms: Integer value 0…30000 Output (OUT): Integer value on range –20000…20000 HW settings See *Analogue I/O Extension User's Manual RAIO-01* (3AFE 64484567 English).

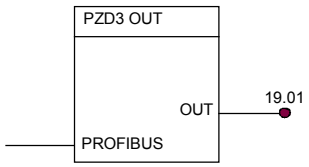
EXT1…5 AO1…AO2		
	Type Summary	Extension analogue outputs EXT1…5 AO1, AO2 (AI/O EXT1…AI/O EXT5). This block is used to write data to the analogue output 1 and 2 (AO1, AO2) of analogue extension module. Execution interval is 40 ms.
	Illustration	 Example: EXT5 AO1 and EXT5 AO2
	Operation	**OFFSET:** See parameter 15.xx EXTx AOx OFFSET Analogue output offset in milliamperes. **SCALE:** See parameters 15.xx EXTx AOx SCALE in chapter Parameters. The scaling of analogue output AOx signal. The value of this signal corresponds the maximum output current 20 mA at the HW. **IN:** Input pin to control analogue output AO1.
	Connections	Input OFFSET: integer value 0…20000 = 0…20 mA Input SCALE: integer value 0…30000 IN: 24 bit integer value (23 bits + sign) HW settings: See the *Analogue I/O Extension User's Manual RAIO-01* (3AFE64484567 English).

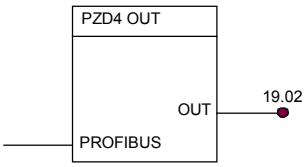
FUNG IN		
	Type Summary	Function generator input This block is a part of an internally built 5-step function generation and executed every 100 ms.
	Illustration	
	Operation	Input for function generator. See parameter group 37 FUNCTION GENERATOR. Function generator is enabled by parameter 37.01 ENABLE and it includes: IN: Function block FUNG IN A function curve is set by parameters: 37.04 X1 37.05 Y1 37.06 X2 37.07 Y2 37.08 X3 37.09 Y3 37.10 X4 37.11 Y4 37.12 X5 37.13 Y5 OUT: Function block FUNG OUT
	Connections	IN: 24 bit integer value (23 bits + sign)

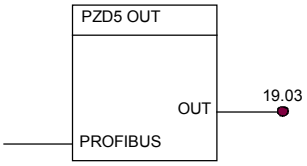
FUNG OUT	**Type** **Summary**	Function generator output This block is a part of internally built 5 step function generation and executed every 100 ms.
	Illustration	
	Operation	Output of the function generator. See parameter group 37 FUNCTION GENERATOR. Function generator is enabled by parameter 37.01 ENABLE and it includes: IN: Function block FUNG IN A function curve is set by parameters: 37.04 X1 37.05 Y1 37.06 X2 37.07 Y2 37.08 X3 37.09 Y3 37.10 X4 37.11 Y4 37.12 X5 37.13 Y5 OUT: Function block FUNG OUT
	Connections	OUT: 24 bit integer value (23 bits + sign)

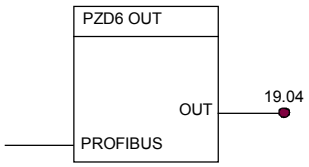
I/O N REF	**Type** **Summary**	I/O speed reference block This block is used to write I/O speed or frequency (scalar) reference to input 66.02 N REF and executed only in I/O mode (parameter 98.02 COMM MODULE = NO). Execution interval is 20 ms.
	Illustration	
	Operation	Speed reference from the application is connected to input IN (66.02 N REF). **Note:** With fieldbus the speed reference is written directly to 23.01 SPEED REF without this block when 98.02 COMM MODULE has selection FIELDBUS or ADVANT/N-FB.
	Connections	IN: 24 bit integer value (23 bits + sign)

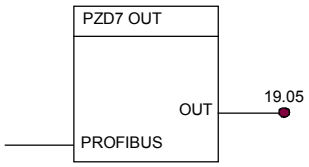
I/O T REF	**Type** **Summary**	I/O torque reference block This block is used to write I/O torque reference to input 66.04 T REF and executed only in I/O mode (parameter 98.02 COMM MODULE = NO). Execution interval is 20 ms.
	Illustration	
	Operation	Torque reference from the application is connected to input IN (66.04 T REF).
	Connections	IN: 24 bit integer value (23 bits + sign)

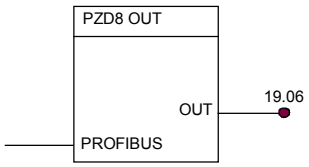
PZD3 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD3 OUT Profibus data word for block application program. Execution interval: see Figure *Timing diagrams* in Chapter *Software Description.*
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1901 to field bus parameter 51.05 PZD3 OUT. A sent data (PZD3 OUT) from the master device is readable at the output pin of block (19.01). When this block is deleted, it automatically writes the value of zero to parameter 19.01 once. If this block is not activated, parameter 19.01 can be used for other purposes. In On-line mode PZD3 OUT…PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

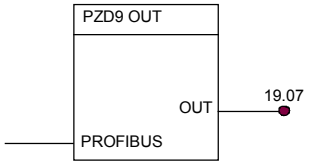
PZD4 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD4 OUT Profibus data word for block application program. Execution interval: see *Chapter 4 Figure 4–9 Timing diagrams*.
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1902 to field bus parameter 51.07 PZD4 OUT. A sent data (PZD4 OUT) from the master device is readable at the output pin of block (19.02). When this block is deleted, it automatically writes the value zero to parameter 19.02 once. If this block is not activated, parameter 19.02 can be used for other purposes. In On-line mode PZD3 OUT…PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

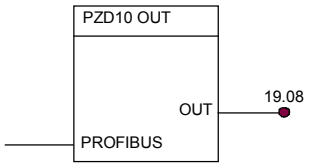
PZD5 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD5 OUT Profibus data word for block application program. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1903 to field bus parameter 51.09 PZD5 OUT. A sent data (PZD5 OUT) from the master device is readable at the output pin of block (19.03). When this block is deleted, it automatically writes the value zero to parameter 19.03 once. If this block is not activated, parameter 19.03 can be used for other purposes. In On-line mode PZD3 OUT…PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

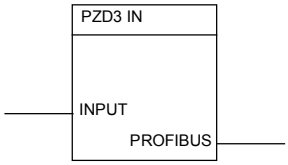
PZD6 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD6 OUT Profibus data word for block application program. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1904 to field bus parameter 51.11 PZD6 OUT. A sent data (PZD6 OUT) from the master device is readable at the output pin of block (19.04). When this block is deleted, it automatically writes the value zero to parameter 19.04 once. If this block is not activated, parameter 19.04 can be used for other purposes. In On-line mode PZD3 OUT…PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

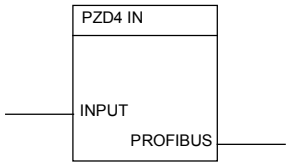
PZD7 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD7 OUT Profibus data word for block application program. Execution interval: see Figure *Timing diagrams* in chapter Software *Description.*
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1905 to field bus parameter 51.13 PZD7 OUT. A sent data (PZD7 OUT) from the master device is readable at the output pin of block (19.05). When this block is deleted, it automatically writes the value zero to parameter 19.05 once. If this block is not activated, parameter 19.05 can be used for other purposes. In On-line mode PZD3 OUT...PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

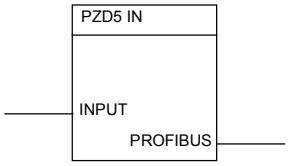
PZD8 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD8 OUT Profibus data word for block application program. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1906 to field bus parameter 51.15 PZD8 OUT. A sent data (PZD8 OUT) from the master device is readable at the output pin of block (19.06). When this block is deleted, it automatically writes the value zero to parameter 19.06 once. If this block is not activated, parameter 19.06 can be used for other purposes. In On-line mode PZD3 OUT…PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

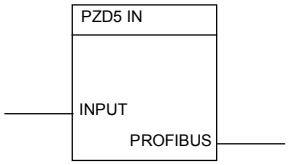
PZD9 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD9 OUT Profibus data word for block application program. Execution interval is 20 ms.
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1907 to field bus parameter 51.17 PZD9 OUT. A sent data (PZD9 OUT) from the master device is readable at the output pin of block (19.07). When this block is deleted, it automatically writes the value zero to parameter 19.07 once. If this block is not activated, parameter 19.07 can be used for other purposes. In On-line mode PZD3 OUT…PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

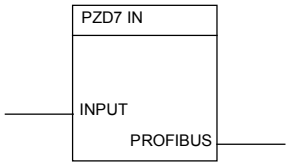
PZD10 OUT	**Type** **Summary**	Communication input block This block is used with RPBA type of field bus module to read PZD10 OUT Profibus data word for block application program. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	When this block is inserted, it automatically writes data value 1908 to field bus parameter 51.19 PZD10 OUT. A sent data (PZD10 OUT) from the master device is readable at the output pin of block (19.08). When this block is deleted, it automatically writes the value zero to parameter 19.08 once. If this block is not activated, parameter 19.08 can be used for other purposes. In On-line mode PZD3 OUT…PZD10 OUT blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	Output (OUT): 16 bit integer value (15 bits + sign)

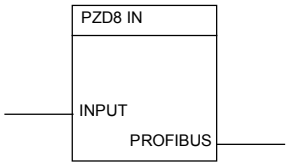
PZD3 IN	**Type** **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD3 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.06 PZD3 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1…19 as a source from the block application to the Profibus. **Note:** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN…PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

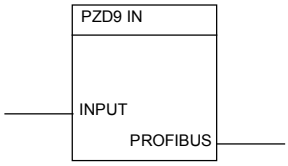
PZD4 IN	**Type** **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD4 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.08 PZD4 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1…19 as a source from the block application to the Profibus. **Note** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN...PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

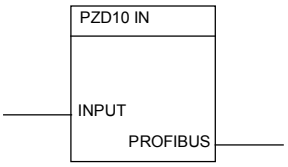
PZD5 IN	**Type** **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD5 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.10 PZD5 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1...19 as a source from the block application to the Profibus. **Note** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN…PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

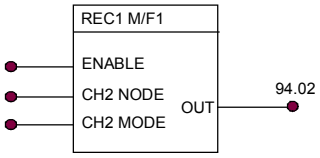
PZD6 IN	**Type** **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD6 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.12 PZD6 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1…19 as a source from the block application to the Profibus. **Note** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN…PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

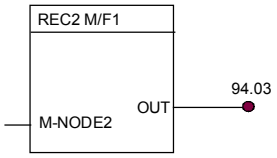
PZD7 IN	**Type** **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD7 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.14 PZD7 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1…19 as a source from the block application to the Profibus. **Note** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN...PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

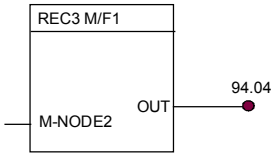
PZD8 IN	**Type** **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD8 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.16 PZD8 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1…19 as a source from the block application to the Profibus. **Note** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN…PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

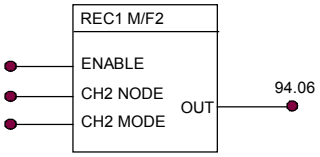
PZD9 IN	**Type** **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD9 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.18 PZD9 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1…19 as a source from the block application to the Profibus. **Note** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN…PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

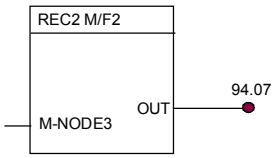
PZD10 IN		
	Type **Summary**	Communication output block from the drive. This block is used with RPBA type of field bus module to write data value of PZD10 OUT to the Profibus master device. Execution interval: see Figure *Timing diagrams* in chapter *Software Description.*
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the Profibus master. Assignment of source signal is written automatically to parameter 51.20 PZD10 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Use blocks 1…19 as a source from the block application to the Profibus. **Note** the difference between the function block outputs (24 bit) and Profibus (16 bit). In On-line mode PZD3 IN…PZD10 IN blocks are available only if RPBA module is connected to SLOT1. In Off-line mode, use the Profibus template file.
	Connections	INPUT: 16 bit integer value (15 bits + sign)

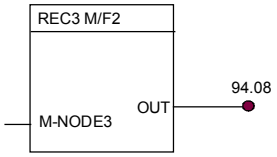
REC1 M/F1		
	Type **Summary**	Communication receive block This block is used to receive data of REC2 DW1 between the master and follower drive via optic fibre link. Execution interval is 200 ms.
	Illustration	
	Operation	**ENABLE:** Communication is enabled (parameter 94.01 FOLLOWER 1) **CH2 NODE:** Node address of follower drive 1 must be 2 on DDCS channel CH2 (parameter 70.07 CH2 NODE ADDR) **Note:** Master's node address is always 1. **M/F MODE:** Communication configuration of DDCS channel CH2. See parameter 70.08 M/F MODE. 1 = NOT IN USE 2 = MASTER 3 = FOLLOWER Received data is readable at the pin OUT 94.02.
	Connections	ENABLE: Boolean type of parameter (0 = false, 1 = true) CH2 NODE: Integer value 1…125 M/F MODE: Integer value 1…3 OUT: 16 bit integer value (15 bits + sign)

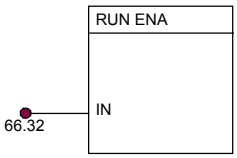
REC2 M/F1	**Type**	Communication receive block
	Summary	This block is used to receive data of REC2 DW2 between the master and follower drive via optic fibre link. Execution interval is 200 ms.
	Illustration	
	Operation	Received data is readable at the pin OUT 94.03. **Note:** Communication is enabled by parameter 94.01 FOLLOWER 1.
	Connections	OUT: 16 bit integer value (15 bits + sign)

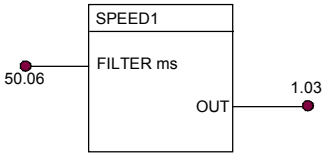
REC3 M/F1	**Type**	Communication receive block
	Summary	This block is used to receive data of REC2 DW2 between the master and follower drive via optic fibre link. Execution interval is 200 ms.
	Illustration	
	Operation	This block is used to receive data of REC2 DW3 between the master and follower drive via optic fibre link. Received data is readable at the pin OUT 94.04. **Note:** Communication is enabled by parameter 94.01 FOLLOWER 1.
	Connections	OUT: 16 bit integer value (15 bits + sign)

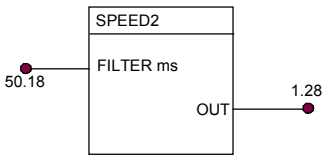
REC1 M/F2	**Type**	Communication receive block
	Summary	This block is used to receive data of REC3 DW1 between the master and follower drive via optic fibre link. Execution interval is 200 ms.
	Illustration	
	Operation	**ENABLE:** Communication is enabled (parameter 94.05 FOLLOWER 2) **CH2 NODE:** Node address of follower drive 2 must be 3 on DDCS channel CH2. See parameter 70.07 CH2 NODE ADDR. **Note:** Master's node address is always 1. **M/F MODE:** Communication configuration of DDCS channel CH2. See parameter 70.08 M/F MODE. 1 = NOT IN USE 2 = MASTER 3 = FOLLOWER Received data is readable at the pin OUT 94.06.
	Connections	ENABLE: Boolean type of parameter (0 = false, 1 = true) CH2 NODE: Integer value 1…125 M/F MODE: Integer value 1…3 OUT: 16 bit integer value (15 bits + sign)

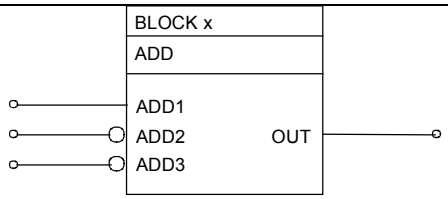
REC2 M/F2	**Type**	Communication receive block
	Summary	This block is used to receive data of REC3 DW2 between the master and follower drive via optic fibre link. Execution interval is 200 ms.
	Illustration	
	Operation	Received data is readable at the pin OUT 94.07. **Note:** Communication is enabled by parameter 94.05 FOLLOWER 2.
	Connections	OUT: 16 bit integer value (15 bits + sign)

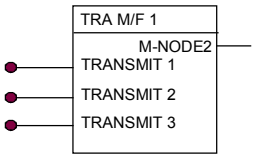
REC3 M/F2	**Type** **Summary**	Communication receive block This block is used to receive data of REC3 DW3 between the master and follower drive via optic fibre link. Execution interval is 200 ms.
	Illustration	
	Operation	Received data is readable at the pin OUT 94.08. **Note:** Communication is enabled by parameter 94.05 FOLLOWER 2.
	Connections	OUT: 16 bit integer value (15 bits + sign)

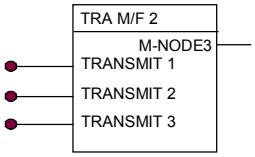
RUN ENA	**Type** **Summary**	RUN ENABLED block This block is used to interlock run command. Execution interval is 500 ms.
	Illustration	
	Operation	Input state: FALSE — RUN is disabled with coast stop and an alarm "RUN DISABLED (FF54)" is indicated in the alarm and fault logger. A bit 14 of 9.05 Alarm Word 2 is set. Input state: TRUE — RUN is enabled. A drive is started immediately, if start command is active. **Note:** Activation of run disabled do not reset start command.
	Connections	Input IN 24 bit integer value (23 bits + sign)

SPEED 1	**Type**	Speed measurement block
	Summary	This block is used to read signal SPEED MEASURED 1. Execution interval is 2 ms.
	Illustration	
	Operation	Measured speed is readable at the output pin OUT 1.03. FILTER ms: See parameter 50.06 SP ACT FILT TIME.
	Connections	FILTER ms: integer value 1…999999 OUT: 24 bit integer value (23 bits + sign)

SPEED 2	**Type**	Speed measurement block
	Summary	This block is used to read signal SPEED MEASURED 2. Execution interval is 2 ms.
	Illustration	
	Operation	Measured speed is readable at the output pin OUT 1.28. **FILTER ms**: See parameter 50.18 ENC2 FILTER TIME.
	Connections	FILTER ms: Integer value 1…999999 OUT: 24 bit integer value (23 bits + sign)

SUB		
	Type Summary	Arithmetic subtraction function.
	Illustration	
	Operation	Subtraction can be implemented by using ADD block in which the subtracter input is inverted (multiplied by -1). OUT = ADD1 + (-ADD2) + (-ADD3) Example ADD1 = 3000 ADD2 = 1000 (inverted in Connect Pin window of DriveAP) ADD3 = 0 (inverted in Connect Pin window of DriveAP) OUT = ADD1 + (-ADD2) + (-ADD3) 2000 = 3000 + (-1000) + (-0)
	Connections	Input ADD1, ADD2 and ADD3: 24 bit integer values (23 bits + sign) Output (OUT): 24 bit integer (23 bits + sign)

TRA M/F1		
	Type Summary	Communication block Communication is enabled in both end by parameter 94.01 FOLLOWER 1. See block REC1M/F 1. Execution interval is 100 ms.
	Illustration	
	Operation	Communication is enabled in both end by parameter 94.01 FOLLOWER 1. See block REC1M/F 1 TRANSMIT 1: Input for transferred data word 1 TRANSMIT 2: Input for transferred data word 2 TRANSMIT 3: Input for transferred data word 3 Parameter 70.07 CH2 NODE ADDR must be 2 in the follower 1. See block REC1M/F 1.
	Connections	TRANSMIT 1…3: 16 bit integer value (15 bits + sign)

TRA M/F2	**Type** **Summary**	Communication block Communication is enabled in both end by parameter 94.05 FOLLOWER 2. See block REC1M/F 2. Execution interval is 100 ms.
	Illustration	
	Operation	Communication is enabled in both end by parameter 94.05 FOLLOWER 2. See block REC1M/F 1 TRANSMIT 1: Input for transferred data word 1 TRANSMIT 2: Input for transferred data word 2 TRANSMIT 3: Input for transferred data word 3 Parameter 70.07 CH2 NODE ADDR must be 3 in the follower 2. See block REC1M/F 2.
	Connections	TRANSMIT 1…3: 16 bit integer value (15 bits + sign)

Factory Connections of Blocks

Multi Block Programming Application is always delivered with factory settings. It includes speed reference from the analogue input 1 (AI1) connected to I/O N REF block.

On 100 ms time level:

DI1 START=1, STOP = 0

DI2 RESET 0->1

Drive will restart automatically after power reconnection, if digital input START is already active. This must be noticed in the application in safety point of view.

This connection can be further modified or disconnected and application engineer can design his or her own one.

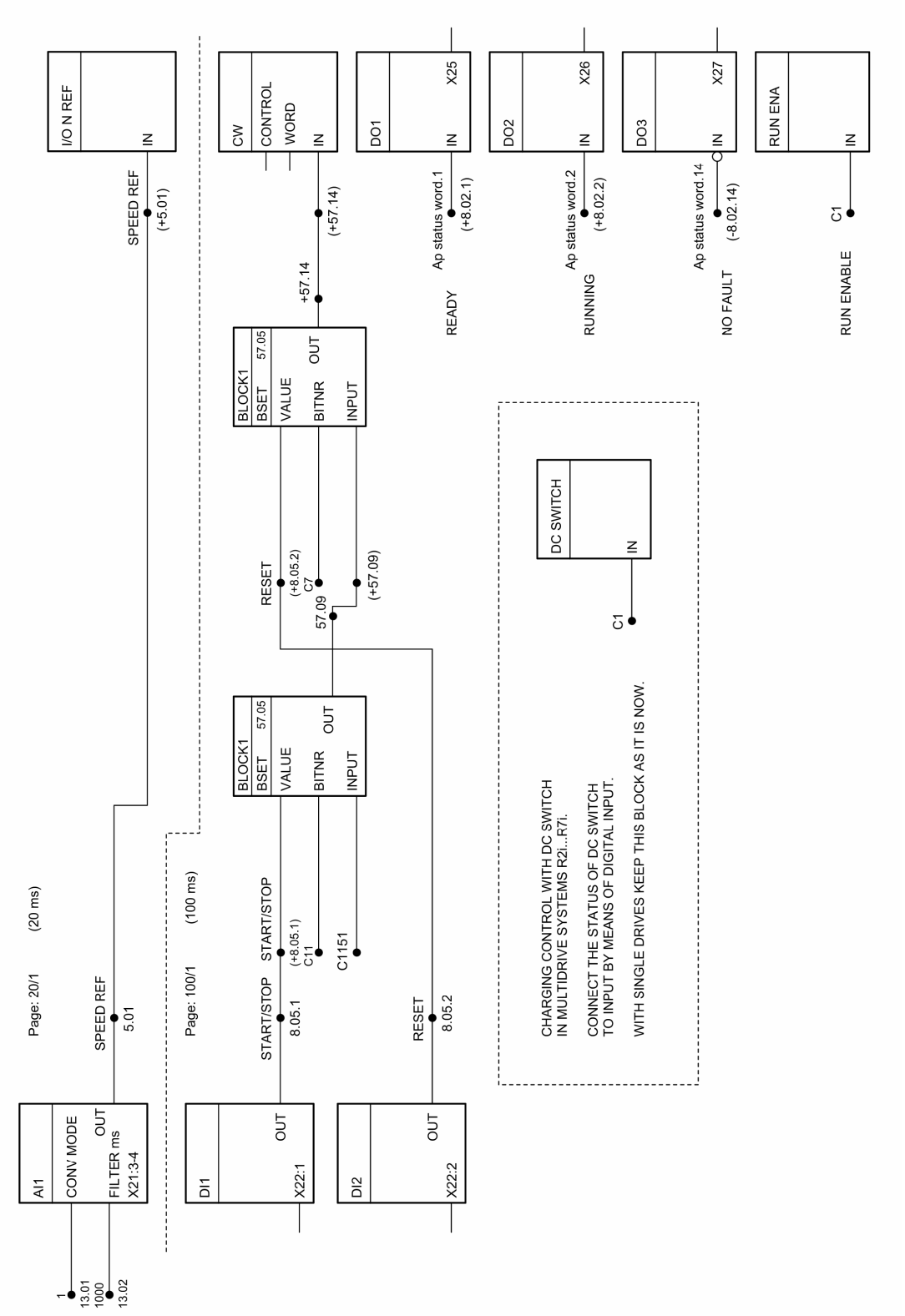


Figure 7 - 2 Factory connection

Chapter 8 – Fault Tracing

This chapter describes the protections and fault tracing of drive.

Protections

I/O- Monitoring

If the RMIO board cannot read its I/O, or with an I/O Extension Module connected to the Slot 1, Slot 2 or I/O Extension Link, the following alarms are given:

DIGITAL IO	bit 7 in ALARM WORD_1 (9.04)
ANALOG IO	bit 8 in ALARM WORD_1 (9.04)
EXT DIGITAL IO	bit 9 in ALARM WORD_1 (9.04)
EXT ANALOG IO	bit 10 in ALARM WORD_1 (9.04)

I/O COMM ERR fault is indicated, if SW selections do not match with HW configuration.

I/O COMM ERR	bit 6 in FAULT WORD_2 (9.02)

Communication Monitoring

Messages received from the overriding system are monitored in the RMIO diagnostics program. The monitoring function is activated by parameter **70.4 CH0 TIME OUT**. This parameter defines the delay before the communication fault is indicated. By entering the value zero, this function is disabled. In case of a communication fault the action is defined in the parameter **70.05 CH0 COM LOSS CTRL**. In a communication fault, bit 12 (fault **"COMM MODULE"**) in **9.02 FAULT WORD 2,** is set to 1. This parameter is also in use with Rxxx type of fieldbus modules.

ACS 600/ACS800 Inverter

The drive supervises the inverter power plate module temperature. If a temperature exceeds an alarm limit, a warning "**ACS 800 TEMP**" is given and **9.04 ALARM WORD 1** bit 4 is set to 1. ACS800: Alarm temperatures are type-specific.

Overtemperature Fault

If the power plate module temperature exceeds a trip limit, a fault "**ACS 800 TEMP**" is given and **09.01 FAULT WORD 1** bit 3 is set to 1. Trip temperatures are type-specific.

Ambient Temperature

The drive measures the ambient temperature on the surface of the RMIO board. The drive will not start if the temperature is below -5°C or above 73 to 82°C (depending on the converter type). Also a fault "**CONTROL B TEMP**" is given and **9.02 FAULT WORD 2** bit 7 is set to1.

ACS 600/ ACS800 Overcurrent

The overcurrent trip limit is 3.5 * I_{hd} (nominal motor current for heavy duty use). There are several sources of overcurrent trip:

- Software trip (time level 100 μs, level = 97% of measurement scale)
- Hardware level trip (97% of measurement scale for 35 μs)

- Hardware derivative trip (12.5% of measurement scale for 75 μs)
- Hardware level trip in parallel connected units by xPBU logic (94% of measurement scale for 75 μs)

A fault "**OVERCURRENT**" is given and **09.01 FAULT WORD 1** bit 1 is set to 1.

The current measurement is calibrated automatically during the start procedure. With parallel connected inverters the overcurrent fault indication is "**OVERCURR x**".

DC Overvoltage

The DC Overvoltage trip limit is 1.3 * 1.35 * U_{1max}, where U_{1max} is the maximum value of the mains voltage range.

Nominal Voltage of Inverter Unit	U_{1max}(AC)	U_{DC} Overvoltage Trip Limit
400 V	415 V	730 V
500 V	500 V	880 V
690 V	690 V	1210 V

A fault **"DC OVERVOLT"** is given and **09.01 FAULT WORD 1** bit 2 is set to 1.

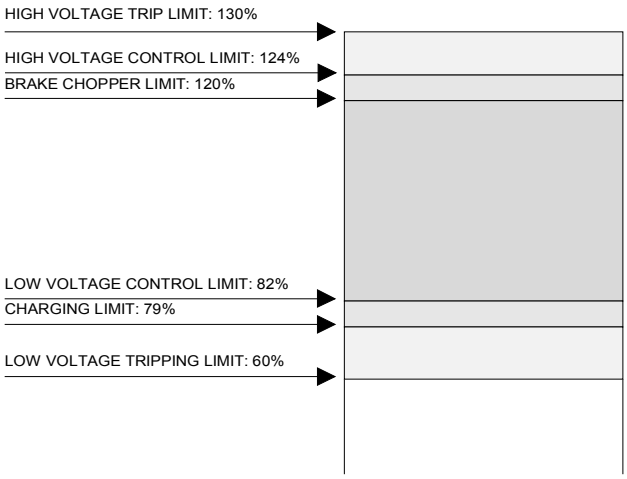


Figure 8 - 1 DC Voltage Control and Tripping Limits

DC Undervoltage

The DC Undervoltage trip limit is 0.60 * 1.35 * U_{1min}, where U_{1min} is the minimum value of the mains voltage range.

Nominal Voltage of Inverter Unit	U_{1min} (AC)	U_{DC} Undervoltage Trip Limit
400 V	380 V	307 V
500 V	380 V	307 V
690 V	525 V	425 V

A fault "**DC UNDERVOLT**" is given and **09.02 FAULT WORD 2** bit 2 is set to 1.

PPCC Link Diagnostics

PPCC link is 8 Mbit/s communication link between the RMIO control board and xINT Main Circuit Interface board. A fault indication in case of error is "**PPCC LINK**" and **9.02 FAULT WORD 2** bit 11 is 1 with non-parallel connected drive and also with parallel connected drive, if the communication fault exists between the RMIO and APBU-44 (NPBU-42) branching unit.

Fault is indication is "**PPCC x**" with parallel connected drives, where x means the inverter module number.

The status of the found ACS800 modules is indicated in signal **8.22 INT CONFIG WORD**.

Panel loss Function

Panel loss function defines the operation of the drive if the control panel or DriveWindow selected as control location for the drive stops communication (toggle bit). Settings: Par. 30.21 PANEL LOSS. Panel loss is indicated in **9.05 ALARM WORD 2** bit 13 and **9.02 FAULT WORD 2** bit 13.

Short Circuit

There are separate protection circuits for supervising the motor cable and the short circuits at the inverter output. If a short circuit occurs, the drive will not start, a fault "**SHORT CIRC**" is given and **09.01 FAULT WORD1** bit 0 is set to "1". See also **9.15 SHORT CIRC FAULT** for parallel connected inverter modules, where a fault text is "**SC INV xy**".

Intermediate DC Link Current Ripple Fault

Input phase loss protection circuits supervise the status of the mains in the supply section by detecting the intermediate current ripple. If an input phase is lost, the intermediate circuit current ripple increases. If the ripple exceeds 13% the drive is stopped and a fault "**SUPPLY PHASE**" is given. **09.02 FAULT WORD 2** bit 0 is set to 1.

Overspeed Fault

If the drive output frequency exceeds the pre-set level (e.g. in the case of overshooting in speed control), the drive is stopped and a fault "**OVER FREQ**" is given. **09.01 FAULT WORD 1** bit 9 is set to 1. The trip level frequency margin is adjustable by Parameter **20.11 FREQ TRIP MARGIN**

Earth Fault

The earth fault protection detects faults in the motor, motor cable or at the output circuit of inverter. The protection is based on the sum current measurement on 100 us time level.

A fault function can be selected with non-parallel connected drive by Par. **30.20 EARTH FAULT**. In case of fault, "**EARTH FAULT**" is indicated and **09.01 FAULT WORD 1** bit 4 is set to 1. If NO is selected, an alarm "**EARTH FAULT**" is given and **09.04 ALARM WORD 1** bit 14 is set to 1.

For parallel connected ACS800 inverter modules each module monitors current unbalance at the output and the fault indication is "**CUR UNBAL x**", where x is the inverter number.

ACS 600 Earth Fault level set

The tripping level of inverter sizes R10i…R12i can be selected by parameter **30.25 EARTH FAULT LEVEL**. The parameter defines the unbalance trip level of sum current measured by the NINT board.

ACS 600 Earth/ Fault Logics

This section describes how to track the cause of earth fault in ACS 600 MultiDrive R2i-R12i, 2xR11i/R12i and 4xR11i/R12i modules.

Earth fault notification of **inverter module** does not always indicate actual earth fault. Failure can sometimes be in IGBTs or NGDRs.

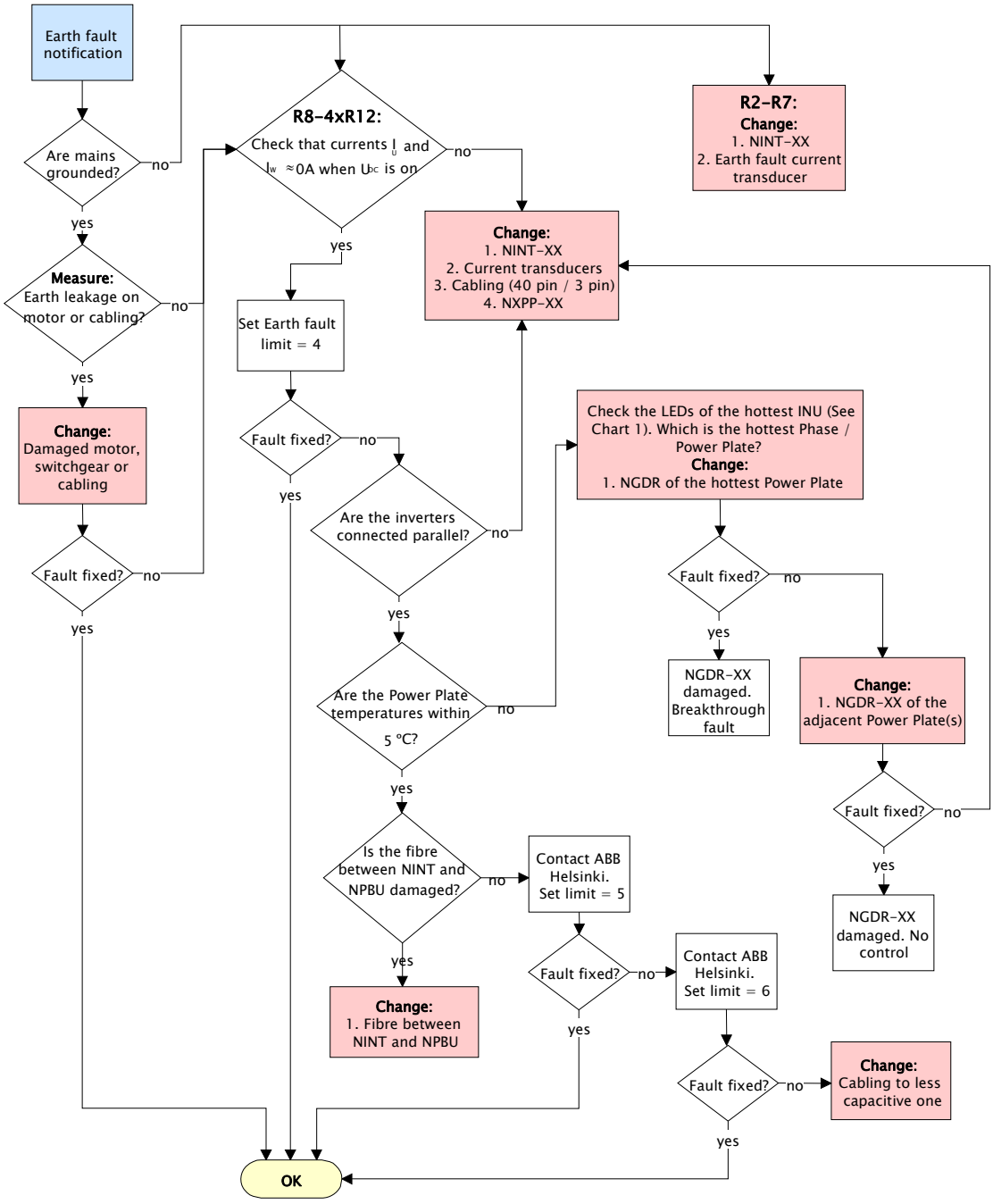


Figure 8 - 2 This Flowchart can be used to Trace the Cause of Earth Fault and to Find Faulty Parts.

ACS 600 Indicator LEDs in the NINT Board

Following figure describes how to find the hottest phase or power plate by checking the LEDs of NINT-XX and NXPP-0X boards. This applies only to parallel connected phase modules and power plates of R8i…R12i modules.

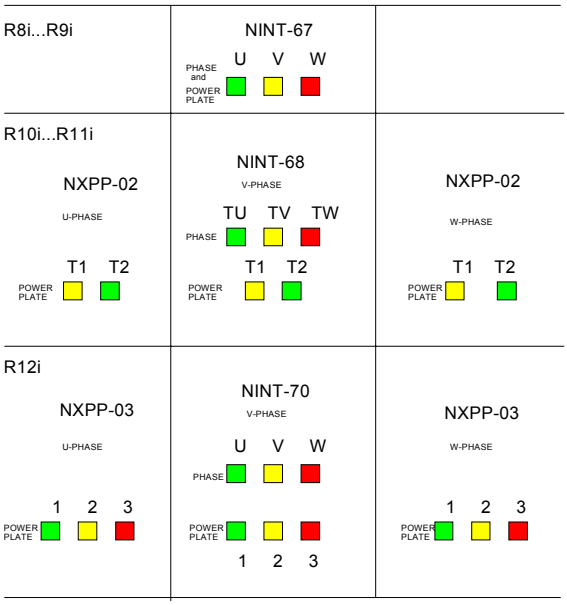


Figure 8 - 3 LED Indicators of NINT Boards.

Interpretation of the LEDs in ACS 600

All LEDs are unlit on NINT-XX or NXPP-0X board:

- No DC-voltage connected.
- Possibly burned fuse on the NPOW-62 board.
- Connection between NRED-61 and NPOW-62 is faulty.
- Connection between NPOW-62 (X32) and NINT-XX (X42) is faulty.

Only one LED is lit on NINT-XX or NXPP-0X board: That phase or power plate is hotter than the other ones.

One LED is brighter than other ones on NINT-XX or NXPP-0X board: That phase or power plate is hotter than the other ones.

All LEDs are lit on NINT-XX or NXPP-0X board: That phase or power plate is hotter than the other ones.

R8i…R9i modules: The *three LEDs of NINT-XX* tell the hottest *phase* and also the hottest *power plate*, because on each phase there is only one power plate.

R10i…R11i modules: The *upper three LEDs of NINT-XX* board show, which *phase* is the hottest. The *lower two LEDs of NINT-XX* indicate the hottest *power plate on V-phase* and the *two LEDs of NXPP-0X* indicate the hottest *power plate on U-phase* (left NXPP-0X) and *W-phase* (right NXPP-0X). Two power plates are connected parallel in each phase module.

R12i module: The *upper three LEDs of NINT-XX* board show, which *phase* is the hottest. The *lower three LEDs of NINT-XX* tell the hottest *power plate on V-phase* and the *three LEDs of NXPP-0X* tell the hottest *power plate on U-phase* (left NXPP-0X) and *W-phase* (right NXPP-0X). Three parallel connected power plates are placed in each phase module.

The causes of overheated power plate are usually faulty NGDR-XX boards, damaged power plates or badly installed power plates (greasing or quality of the surface).

The colours of the three LEDs and the matching phases or power plates are:

U-phase / power plate 1	Green (left)
V-phase / power plate 2	Yellow (middle)
W-phase / power plate 3	Red (right)

For two power plates per phase (R10i…R11i):

Power plate T1	Yellow (left)
Power plate T2	Green (right)

Speed Measurement Fault of Encoder 1

Speed measurement 1 Fault is activated, if

- No pulses are received within the time of Parameter **50.11 ENCODER DELAY** and the drive is simultaneously at the current or torque limit.
- There is a 20% difference between the estimated and measured speed received from the pulse encoder (parameter 50.03 = SPEED FB SEL = ENCODER).
- There is no communication between the pulse encoder module and RMIO board.
- The pulse frequency of the pulse encoder changes considerably during a time interval of 1 ms.

The Fault/Alarm function is activated by Parameter **50.05 ENCODER ALM/FLT**. In case of a fault, **09.02 FAULT WORD 2** bit 5 is set to 1 and a fault "**ENCODER ERR1**" is given.

Speed Measurement Fault of Encoder 2

Speed Measurement 2 Fault is activated, if

- There is no communication between the pulse encoder module and RMIO board.

The Fault/Alarm function is activated by parameter **50.17 ENCODER 2 ALM/FLT**. In case of a fault, **09.02 FAULT WORD 2** bit 10 is set to 1 and a fault "**ENCODER2 ERR**" is given. If an alarm function has been selected, **9.04 ALARM WORD 1** bit 6 is set.

Switching from Measured Speed to Estimated Speed

In case of an alarm, **9.04 ALARM WORD 1** bit 5 is set to 1 and an alarm "**ENCODER ERR1**" is given. If an alarm function has been selected and the speed measurement error is detected based on derivation term of speed the drive automatically starts to use estimated speed. Drive uses estimated speed as long as the difference between estimated and measured speed is bigger than 1%. The difference is checked every five seconds. When the difference is smaller than 1% drive turns back to use measured speed. The status of the used actual speed can be seen from the **8.02 AP STATUS WORD** bit 12.

Overswitching Frequency Fault

If the inner control loop exceeds the maximum switching frequency, a fault "**OVER SWFREQ**" is given and **9.02 FAULT WORD 2** bit 9 is set to 1.

System Fault

If the program on the RMIO board has failed and causes an interruption, **09.01 FAULT WORD 1** bit 7 (SYSTEM_FAULT) is set to 1.

ACS800 Short Time Overloading

See ACS800 catalogue for light-overload and heavy-duty use ratings.

ACS 600 Short Time Overloading

The inverter section of the ACS 600 MultiDrive incorporates an IGBT-transistor power stage. Duty Cycles A and B are presented for each inverter type in the ACS 600 MultiDrive catalogue (code 3BFE63981915). See also the environmental limits.

$I_{AC\_NOMINAL}$ = nominal current (continuous)

$I_{AC\_4/5\ min}$ = I_2 base current for Duty Cycle A

$I_{AC\_1/5\ min}$ = I_2 max current for Duty Cycle A (150% of the base current $I_{AC\_4/5\ min}$)

$I_{AC\_50/60\ s}$ = I_2 base current for Duty Cycle B

$I_{AC\_10/60\ s}$ = I_2 max current for Duty Cycle B (200% of the base current $I_{AC\_50/60\ s}$)

If the overload cycle is longer than described for Duty Cycle A or B, the inverter section is protected against the overload with a temperature measurement sensor and a software algorithm.

Overloading between $I_{AC\_Nominal}$ and $I_{AC\_1/5\ min}$

If the load current is continuously between $I_{AC\_Nominal}$ and $I_{AC\_1/5\ min}$, the temperature of the IGBT power plate(s) and the heat sink will increase further. The overloading time is limited by means of the temperature sensor.

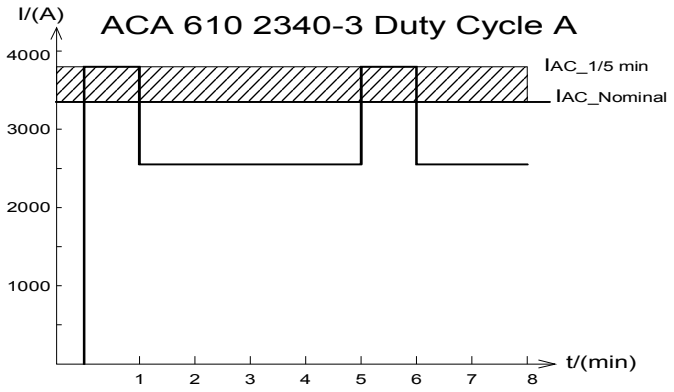


Figure 8 - 4 Overloading Range between I $_{AC\_Nominal}$ and I $_{AC\_1/5\ min}$ in ACA 6102340-3

If the measured temperature exceeds 115°C, a warning "**ACS 800 TEMP**" is given and **9.04 ALARM WORD 1** bit 4 is set to 1.

If the power plate module temperature exceeds 125°C, a fault "**ACS 800 TEMP**" is given and **9.01 FAULT WORD 1** bit 3 is set 1. The inverter pulses are blocked and the drive stops by coasting (zero torque).

Overloading between the I $_{AC\_1/5\ min}$ and Maximum Current

The maximum current is limited by parameter **20.04 MAXIMUM CURRENT**. If the actual current exceeds the **I $_{AC\_1/5\ min}$** level, a software algorithm is also activated. The load cycle between **I $_{AC\_1/5\ min}$** and the maximum current is time-limited as a function of current by means of a software integrator and thus the areas of the A1, A2 and A3 are equal.

A1 = 10 s * (**I $_{AC\_10/60s}$ - $_{AC\_1/5\ min}$**.).

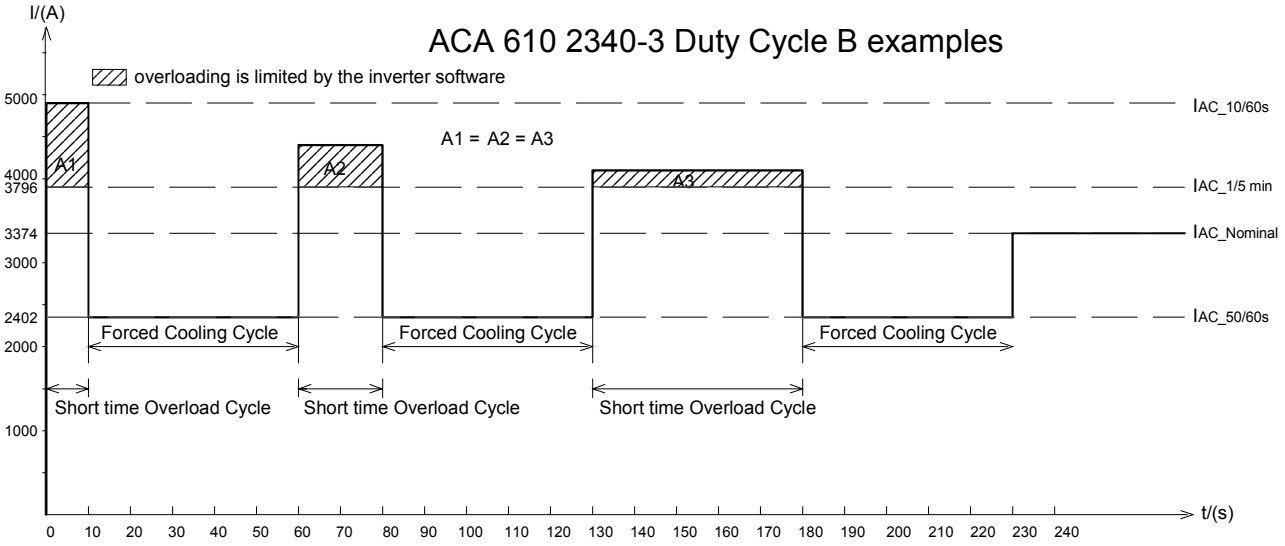


Figure 8 - 5 Overloading example when the Load Current is > I $_{AC\_1/5\ min}$

At the beginning of a forced cooling cycle, **9.05 ALARM WORD 2** bit 2 is set to 1 and an alarm "**INV OVERLOAD**" is given.

Motor Protections

Motor Thermal Protection Functions

The motor can be protected against overheating by:

- activating the DTC motor thermal model or User Mode
- measuring motor temperature by PT 100, PTC or KTY84-1xx sensors by block programming.

The motor thermal model can be used parallel with other temperature protections (PTC, PT100, KTY84-1xx, KLIXON).

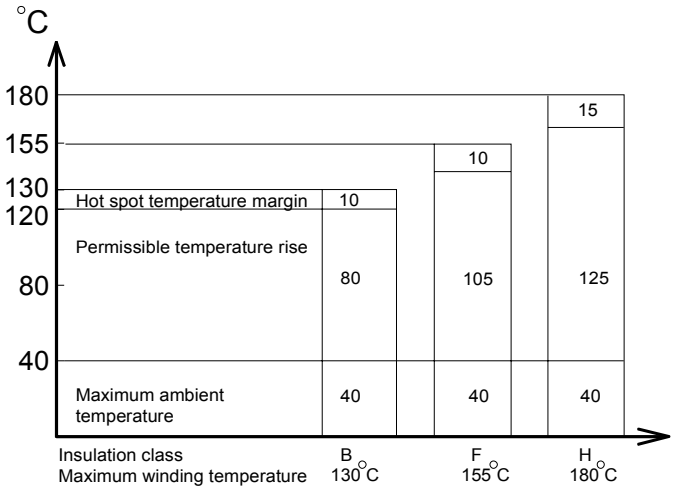


Figure 8 - 6 Motor Insulation Classes According to IEC 85

Motor Thermal Model

The drive calculates the temperature of the motor based on the following assumptions:

1. By default the motor ambient temperature is 30°C (see parameter **30.31 AMBIENT TEMP**).
2. Motor temperature is calculated using either the user-adjustable or automatically calculated Motor Thermal Time and Motor Load Curve. The load curve should be adjusted in case the ambient temperature is higher than 30 °C. See parameters 30.01…30.12.

The thermal model provides protection equivalent to standard class 10, 20, or 30 overload relays by setting the Motor Thermal Time to 350, 700, or 1050 seconds respectively and parameter **30.29 THERM MOD FLT L** to value 110°C.

There are two levels of temperature monitoring:

- alarm "**MOTOR TEMP**" is activated when the alarm temperature limit defined by Parameter **30.28 THERM MOD ALM L** is reached and **09.04 ALARM WORD 1** bit 3 is set to 1.

- fault "**MOTOR TEMP**" is activated when the trip temperature limit defined by Parameter **30.29 THERM MOD FLT L** is reached, **09.01 FAULT WORD 1** bit 6 is set to 1.

Usage of PT100, PTC or KTY84-1xx Temperature Sensors

Motor temperature can be measured by using the analogue inputs and outputs of the drive.

WARNING! According to IEC 664, the connection of the thermistor to the analogue I/O (RMIO or RAIO) or to digital input DI6 of the RMIO requires double or reinforced insulation between motor live parts and the thermistor. Reinforced insulation entails a clearance and creepage of 8 mm (400/500 VAC equipment). If the thermistor assembly does not fulfil the requirement, the other I/O terminals of drive must be protected against contact, or a thermistor relay must be used to isolate the thermistor from the digital input.

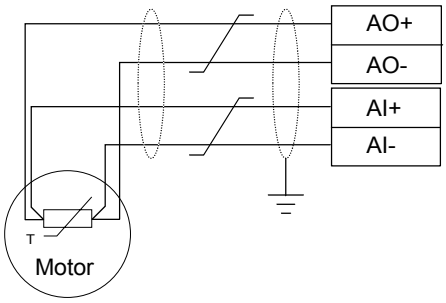
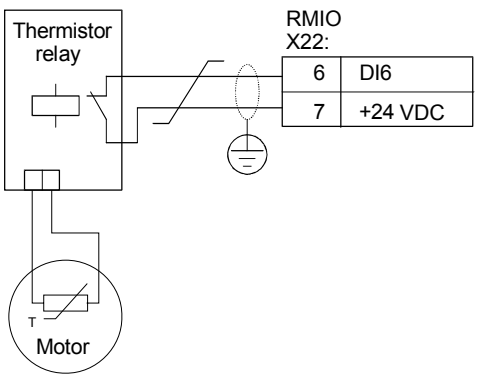


Figure 8 - 7 Thermistor connection example using Analogue I/O.

Motor overtemperature can be detected by connecting 1...3 PTC thermistors, 1...3 PT100 elements or silicon temperature sensor (KTY84-1xx).

- **Note:** The thermistor can also be connected to digital input DI6 on the RMIO board according to the following figure. If direct thermistor connection is used, digital input DI6 goes to 0 false when resistance rises higher than 4 kΩ. By means of block programme it is possible to cause trip (EVENT block).



Stall Function

The drive protects the motor in a stall situation. It is possible to adjust the supervision limits (torque, frequency, time) and choose how the drive reacts to a motor stall condition (warning indication fault indication & stop; no reaction).

The protection is activated if all the following conditions are fulfilled at the same time:

1. The drive output frequency is below the Stall Frequency limit set by the user.
2. The application is at a stall limit set by user (defined by parameters 20.04…20.10)
3. Conditions 1 and 2 have been fulfilled longer than the period set by the user (Stall Time Limit).

An alarm or fault function can be selected by Parameter **30.13 STALL FUNCTION**. If FAULT is selected, a stall situation produces a fault **"MOTOR STALL"** and sets **9.02 FAULT WORD 2** bit 14 to 1. If WARNING is selected, a stall situation produces a warning **"MOTOR STALL"** and sets **9.05 ALARM WORD 2** bit 9 to 1.

Underload Function

The loss of motor load may indicate a process malfunction. The drive drive provides an Underload Function to protect the machinery and process in such a fault condition. The supervision limits (Underload Curve and Underload Time) can be chosen as well as the drive operation in an underload condition (warning indication; fault indication & stop; no reaction).

The protection is activated if all the following conditions are fulfilled at the same time:

1. The motor load is below the Underload Curve selected by the user.
2. The motor load has been below the selected Underload Curve longer than the time set by the user (Underload Time).
3. The drive output frequency is more than 10% of the motor nominal frequency.

An alarm or fault function can be selected by Parameter **30.16 UNDERLOAD FUNC**. If FAULT is selected, an underload situation produces a fault **"UNDERLOAD"** and sets **9.01 FAULT WORD 1** bit 8 to 1. If WARNING is selected, an underload situation produces a warning **"UNDERLOAD"** and sets **9.05 ALARM WORD 2** bit 1 to 1.

Motor Phase Loss Function

The Motor Phase Loss function monitors the status of the motor cable connections. The function is most useful during motor start. The drive detects if any of the motor phases have not been connected and refuses to start. The Phase Loss function also supervises the motor connection status during normal operation.

The user can define the operation upon motor phase loss. The alternatives are either a fault indication and Stop, or no reaction.

The fault indication is “**MOTOR PHASE**”. **09.02 FAULT WORD 2** bit 15 is simultaneously set to a 1.

Fault Message Table

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
ACS 800 TEMP 9.01 FW_1, bit 3 Fault code: 4210	The drive internal temperature is excessive. A fault is given if inverter module temperature exceeds the trip level.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
ACS TEMP x y 9.13 OVERTEMP WORD Fault code: 4210	The drive internal temperature is excessive in inverter module x phase y. This diagnostics is valid with parallel connected inverters. (x = 1…12, y = U, V and W)	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
BACKUP ERROR Fault code: FFA2	Failure when restoring PC-stored backup of drive parameters.	Retry. Check connections. Check that parameters are compatible with drive.
BC OVERHEAT Fault code: 7114	Brake chopper overload.	Stop drive. Let chopper cool down. Check parameter settings of resistor overload protection function (see parameter group 34 BRAKE CHOPPER). Check that braking cycle meets allowed limits. Check that the supply AC voltage of the drive is not excessive.
BR BROKEN Fault code: 7110	Brake resistor is not connected or it is damaged. The resistance rating of the brake resistor is too high.	Check the resistor and the resistor connection. Check that the resistance rating meets the specification. See *the Brake Chopper User's Manual* (code: 3AFE64273507 [English]).
BR OVERHEAT Fault code: 7112	Overload of the brake resistor.	Stop drive. Let the resistor cool down. Check parameter settings of the resistor overload protection function (see parameter group 34 BRAKE CHOPPER). Check that braking cycle meets the allowed limits. Check that the supply AC voltage of the drive is not excessive.
BC SHORT CIR Fault code: 7113	Short circuit in brake chopper IGBT(s).	Replace brake chopper. Ensure brake resistor is connected and not damaged.
BR WIRING Fault code: 7111	Wrong connection of brake resistor.	Check resistor connection. Ensure brake resistor is not damaged.
CONTROL B TEMP Fault code: 4110 9.02 FW_2, bit 7	Cabinet over- or undertemperature detected on the RMIO board (thermistor). Environment temperature is too high (>80°C).	Boost the cooling of air.
CABLE TEMP Fault code: 4080 9.02 FW_2 bit 3	Motor cable overtemperature trip. Thermal model of cable has reached 100% temperature level.	Check the motor load. Check the motor cable and its type. Verify with the cable thermal model parameters in parameter group 36.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
COMM MODULE Fault code: 7510 9.02 FW_2, bit 12	Fieldbus communication break detected on fieldbus module or on communication channel CH0 receive. (Programmable fault, see parameter 70.04)	Check the connections of fieldbus adapter module. With an ABB Advant overriding system check channel CH0 optical fibres between the RMIO board and overriding system (or Nxxx type of fieldbus adapter). Test with new optical fibres. Check the earthings of fieldbus cables. Check that the node address is correct in the drive. Check the status of the fieldbus adapter. See appropriate fieldbus adapter manual. Check parameter settings of Group 51, if a fieldbus adapter is present. Check the connections between the fieldbus and the adapter. Check that the bus master is communicating and correctly configured.
M/F COM LOSS Fault code: 7520 9.01 FW_1, bit 11	Communication break detected on follower drive. (Programmable fault or alarm, see parameter 70.14)	Check the optical fibres between the RMIO boards. Check that the optical fibre loop is closed. Test with new optical fibres.
CTRL B TEMP Fault code: 4110	Control board temperature is lower than –5 … 0 °C or exceeds +73 …82 °C.	Check air flow and fan operation.
CURR MEAS Fault code: 2211	Current transformer failure in output current measurement circuit.	Check current transformer connections to Main Circuit Interface Board, INT.
CUR UNBAL x Fault code: 2330 9.10 CURRENT UNBALANCE	The current unbalance detected at the output of inverter module x. Tripping level setting is too sensitive in the non parallel connected ACS600 R10i…R12i inverters. Check Parameter 30.25.	Check motor. Check motor cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable.
DC HIGH RUSH Fault code: FF80 9.06 FW_3, bit 11	Drive supply voltage is excessive. DC voltage rises too fast for overvoltage controller (if used) to react. When supply voltage is over 124% of unit voltage rating (415, 500 or 690 V), motor speed rushes to trip level (40% of nominal speed)	Check supply voltage level, rated voltage of the drive and allowed voltage range of the drive.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
DC OVERVOLT Fault code: 3210 9.01 FW_1, bit 2	Intermediate circuit DC voltage is excessive. This can be caused by 1. Static or transient overvoltages in the mains. 2. Faulty braking chopper or resistor (if used). 3. Deceleration time being too short, if there is no braking chopper or regenerative incoming section. 4. Internal fault in the inverter unit.	Check the functioning of the braking chopper. If using a regenerative incoming section check that the diode mode is not forced during deceleration. Check the level of DC voltage and inverter nominal voltage. Replace the NINT-xx board (its voltage measurement circuit is faulty).
DC UNDERVOLT Fault code: 3220 9.02 FW_2, bit 2	Intermediate circuit DC voltage is not sufficient. This can be caused by a missing mains phase in the diode rectifying bridge.	Checks mains supply and inverter fuses. With MultiDrive HW and DC switch option, check the feedback circuit to the input of DC switch block.
DDF FORMAT 9.03 SFW, bit 3	File error in FLASH memory.	Replace the RMIO board.
EARTH FAULT Fault code: 2330 9.01 FW_1, bit 4	The load on the incoming mains system is out of balance. This can be caused by a fault in the motor, motor cable or an internal malfunction. (Programmable fault, see parameter 30.20) Tripping level setting is too sensitive in the non parallel connected R10i…R12i inverters. Check Parameter 30.25.	Check motor. Check motor cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable.
ENCODER A<>B Fault code: 7302 9.06 FW_3 bit 10	Pulse encoder 1 phasing is wrong: Phase A is connected to the terminal of phase B and vice versa.	Interchange the connection of pulse encoder phases A and B.
ENCODER1 ERR Fault code: 7301 9.02 FW_2 bit 5	Speed measurement 1 fault detected. This can be caused by loose cable connection, communication time-out, faulty pulse encoder, or too great a difference between the internal and measured actual speeds. (Programmable fault or alarm, see parameter 50.05)	Check parameter group 50 SPEED MEASUREMENT settings. Check pulse encoder and its cabling including Ch A and Ch B phasing. Sign of signal **1.03 SPEED MEASURED 1** must be same as internal actual speed **1.02 MOTOR SPEED** when rotating the motor. If not, exchange channels A and B. Check the installation between the RMIO and RDCU DDCS option board. Check fibre optic connection between the RMIO board and the RTAC pulse encoder module. Check the proper earthing of equipment. Check for highly emissive components nearby.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
ENCODER2 ERR Fault code: 7301 9.02 FW_2 bit 10	Communication break detected between the encoder module 2 and RMIO. This can be caused by a loose cable connection or faulty pulse encoder. (Programmable fault or alarm, see parameter 50.17)	Check the configuration. Check the pulse encoder module. Check the pulse encoder 2 and its cabling. Check optic fibre connection between the RMIO board and the NTAC-02 pulse encoder module. Check the proper earthing of equipment. Check the auxiliary power supply of pulse encoder module.
FACTORY FILE 9.03 SFW bit 0	Factory macro parameter file error.	Replace the RMIO board.
FLT (xx) 8.01 MSW bit 3	There is an internal fault in the drive.	Check for loose connections inside of frequency converter cabinet. Write down the Fault code (in brackets). Contact ABB Service.
ID RUN FAIL Fault code: FF84 8.01 MSW bit 3	Motor ID Run not possible due to the limits or locked rotor.	Check that no overriding system is connected to the drive. Switch off the auxiliary voltage supply from the RMIO board and power up again. Check the parameter values in Group 20. - Check that no limits prevent the ID Run. Restore factory settings and try again. Check that the motor shaft is not locked.
INT CONFIG Fault code: 5410 9.06 FW_3 bit 7	Number of found ACS800 R8i inverter modules is not equal with original configuration.	Check the status of not found inverter modules. See signals 8.20 INV ENABLED WORD. Check the fibre optic connections between the APBU and R8i inverter modules. In case of Reduced Run function, isolate faulted inverter module from the main circuit and type the number of existing inverter modules to parameter 16.10 INT CONFIG USER. Reset the drive.
INV DISABLED Fault code: 3200 9.02 FW_1 bit 4 Status: 8.20 INV ENABLED WORD	DC switch has been opened during running or start command has been given, when DC switch is open. This diagnostics is valid in ACS800 R8i modules with AFSC-0x Fuse Switch Controller unit.	Close the DC switch before attempting a start between the inverter DC supply terminals and common DC busbars. A DC switch status of each parallel connected inverter module can be seen from the signal 8.20 **INV ENABLED WORD**. If a DC switch is not included to the HW configuration, deactivate this function by Parameter 98.12 **FUSE SWITCH CNTR**.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
IO COMM ERR Fault code: 7000 9.02 FW_2 bit 6	I/O communication fault or error detected. This can be caused by a fault in the I/O unit, a fibre optic cable connection problem or incorrect module identification number (if I/O extension modules are present via optic link).	**Option slot installation** RAIO, RDIO, RTAC: Check the status LED (WD/INIT, yellow) in the extension module. The LED is lit when the drive is configuring the module at power-up. If the LED does not go out after one second, the configuration has failed. - Cycle the power supply of the drive - Change the option module. - Check for loose connections between the extension module and RMIO board. **I/O Module Adapter installation** Test with new optic fibre cables. Check the module node IDs of extension I/O modules with AIMA-01I/O adapter module. Check the intensity level of optic transmitters with AIMA-01. See rotary HEX switch, setting. If the fault is still active, replace the I/O board/extension unit(s).
LINE CONV Fault code: FF51 9.06 FW 3 bit 3	Fault on the line side converter.	Shift panel from motor-side converter control board to line-side converter control board. See line side converter manual for fault description.
MOD BOARD T Fault code: FF88 9.06 FW_3 bit 14	Overtemperature in AINT board of inverter module.	Check inverter fan. Check ambient temperature.
MOD CHOKE T Fault code: FF89 9.06 FW_3 bit 13	Overtemperature in choke of liquid cooled R8i inverter module.	Check inverter fan. Check ambient temperature. Check liquid cooling system.
MOTOR PHASE Fault code: FF56 9.02 FW_2 bit 15	Fault in the motor circuit. One of the motor phases is lost. This can be caused by a fault in the motor, the motor cable, a thermal relay (if used), or an internal fault. (Programmable fault or alarm, see parameter 30.19).	Check motor and motor cable. If the motor is disconnected, this fault is activated. Check thermal relay (if used). Check MOTOR PHASE Fault Function parameters. Disable this protection. If the cable and motor is ok, this fault can appear with small motors (<30 kW) in low speed. Deactivate protection in this case.
MOTOR STALL Fault code: 7121 9.02 FW_2 bit 14	Motor or process stall. Motor is operating in the stall region. This can be caused by excessive load or insufficient motor power. (Programmable fault or alarm, see parameter 30.13)	Check motor load and the inverter ratings. Check MOTOR STALL Fault Function parameters (30.13 ... 30.15).
MOTOR TEMP Fault code: 4310 9.01 FW_1 bit 6	Overtemperature fault (thermal model). Temperature has exceeded the tripping level of the thermal model. (Programmable fault or alarm, see parameter 30.02)	Check motor ratings, load and cooling. Check start-up data. Check MOTOR TEMP Fault Function parameters.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
NO MOTOR DATA Fault code: FF52 9.02 FW_2 bit 1	Motor data is not given or motor data does not match with inverter data.	Check the motor data given by Parameters 99.02...99.06.
NVOS ERROR 9.03 SFW bit 2	Non-volatile operating system error.	Replace the RMIO board.
OVER SWFREQ Fault code: FF55 9.02 FW_2 bit 9	Over switching frequency fault. This may be due to a hardware fault in the electronics boards.	Replace the RMIO board. Replace the NINT / AINT / RINT board. On units with parallel connected inverters, replace the branching unit board.
OVERCURRENT Fault code: 2310 9.01 FW_1 bit 1	Overcurrent has been detected.	If the drive tripped during flying start, check that Parameter **21.01 START FUNCTION** is set to AUTO. (Other modes do not support flying start). Check motor load. Check acceleration time. Check motor and motor cable (including phasing). Check pulse encoder and pulse encoder cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable. Check the nominal motor values from Group 99 to confirm that the motor model is correct.
OVERCURR x Fault code: 2310 9.01 FW_1 bit 1 9.11 OVERCURRENT WORD	Overcurrent has been detected in the inverter module x. This diagnostics is valid with parallel connected inverters. (x = 1…12)	If the drive tripped during flying start, check that Parameter **21.01 START FUNCTION** is set to AUTO. (Other modes do not support flying start). Check motor load. Check acceleration time. Check motor and motor cable (including phasing). Check pulse encoder and pulse encoder cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable. Check the nominal motor values from group 99 to confirm that the motor model is correct.
OVERFREQ Fault code: 7123 9.01 FW_1 bit 9	Motor is turning faster than the highest allowed speed. This can be caused by an incorrect setting of parameters, insufficient braking torque or changes in the load when using torque reference.	Check the minimum and maximum speed settings. Check the adequacy of motor braking torque. Check the applicability of torque control. Check the need for a Braking Chopper and Braking Resistor if the drive has a Diode Supply Unit. Check Parameter **20.11 FREQ TRIP MARGIN**.

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
PANEL LOSS Fault code: 5300 9.02 FW_2 bit 13	A Local Control device (CDP312R or DriveWindow) has ceased communicating. This can be caused by the disconnection of the selected local control device during local control or an internal fault in the local controlling device. (Programmable fault or alarm, see parameter 30.21)	Check Control Panel connector. Replace Control Panel in the mounting platform. Check PANEL LOST Fault Function parameters.
POWER FAIL x Fault code:	Power failure detected in the auxiliary supply circuits of APBU or ACS800 R8i modules (AINT-1x) This diagnostics is valid with parallel connected inverters. (x = 1…12)	Check the auxiliary power supply circuits.
PPCC LINK Fault code: 5210 9.02 FW_2 bit 11	xINT board current measurement or communication fault between the RMIO and boards. (This fault can be masked, if the DC intermediate circuit voltage has been disconnected, but the RMIO board has an external power supply and fault indication is not needed. The Fault appears only if the motor is start. See Parameter 30.24) (xINT can be NINT, AINT or RINT)	Check the fibre optic cables connected between the RMIO and xINT boards. In parallel connected inverters, also check the cabling on the branching unit. If the fault is still active, replace the branching unit (only with parallel connected inverters), RMIO and xINT board until the fault disappears. Test with new fibre optic cables in the PPCC link. Check that there is no short circuit in the power stage. The short circuit or over current can cause this message due to the possible faulty power plate. It can causes possible overloading for auxiliary power and as a result PPCC link communication failure.
PPCC LINK x Fault code: 5210 9.02 FW_2 bit 11 x = (1…12)	AINT board current measurement or communication fault between the AINT board in inverter module and APBU branching unit. (This fault can be masked, if the DC intermediate circuit voltage has been disconnected, but the RMIO board has an external power supply and fault indication is not needed. The Fault appears only if the motor is start. See Parameter 30.24).	Check the fibre optic cables connected between the inverter module x and APBU branching unit. If the fault is still active, replace the branching unit (only with parallel connected inverters). Check that there is no short circuit in the power stage. The short circuit or over current can cause this message due to the possible faulty power plate. It can causes possible overloading for auxiliary power and as a result PPCC link communication failure. If the fault is still active, replace the inverter module.
PP OVERLOAD Fault code: 5482 8.07 LW_INV bit 5	Excessive IGBT junction to case temperature. This can be caused by excessive load at low frequencies (e.g. fast direction change with excessive load and inertia).	Check cooling. Check inverter dimensioning Increase speed reference ramp time. Reduce load

FAULT MESSAGES (in alphabetical order)		
Alarm / Fault Text	**Cause**	**What to do**
SHORT CIRC Fault code: 2340 9.01 FW_1 bit 0	Short circuit has been detected. The output current is excessive.	Check the motor and motor cable. Measure the resistances of the power plate(s). If a faulty power plate is detected, replace the power plate and the NINT and NGDR boards or the whole inverter phase module. Check that the prevention of unexpected start-up circuit has not opened during the run.
SC INV x y Fault code: 2340 9.01 FW_1 bit 0 9.12 SHORT CIRC FAULT	Short circuit has been detected in the inverter module x phase y. The output current is excessive. This diagnostics is valid with parallel connected inverters. (x = 1…12, y = U, V and W)	Check the motor and motor cable. Measure the resistances of the power plate(s). If a faulty IGBT module is detected in ACS800, replace the inverter module. If a faulty power plate is detected in ACS600, replace the power plate and the NINT and NGDR boards or the whole inverter phase module. Check that the prevention of unexpected start-up circuit has not opened during the run.
START INHIBI Fault code: FF7A	Prevention of unexpected start-up activated during the motor run or motor start command has been given at the prevention of unexpected start-up.	The Operator must close the prevention of unexpected start-up switch before motor start command. If the switch is closed and the alarm is still active, check that the “Power On” LED is lit on the NGPS (ACS600) or AGPS (ACS800) board. If the LED is off but there is a voltage at the input terminals of the NGPS or AGPS, replace the board.
SUPPLY PHASE Fault code: 3130 9.02 FW_2 bit 0	Ripple voltage in the DC link is too high. This can be caused by a missing mains phase in the diode rectifier bridge, or DC voltage oscillation by a thyristor rectifying bridge (if used in the incoming section).	Check for mains supply imbalance. Check the mains fuses.
TEMP DIF x y Fault code: 4380 9.06 FW_3 bit 15 9.14 TEMP DIF FLT WORD	A temperature difference trip limit of inverter module has been reached in ACS800 R8i inverter module x compared to other parallel connected module(s). (x = 1…12)	Check the cooling fan. Replace fan if out of order. Check the air filters if exists.
UNDERLOAD Fault code: FF6A 9.01 FW_1 bit 8	Process underload situation detected. Motor load is too low. This can be caused by a release mechanism in the driven equipment. (Programmable fault or alarm, see parameter 30.16.)	Check the driven equipment. Check UNDERLOAD Fault Function parameters.
USER MACRO Fault code: FFA1 9.03 SFW bit 1	User Macro parameter file error. There is no User Macro saved or the file is defective.	Create the User Macro again.

Alarm Message Table

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
ACS 800 TEMP Warning code: 4210 9.04 AW_1 bit 4	Drive IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
ANALOG IO Warning: 5441 9.04 AW_1 bit 8	Analogue I/O error detected on the Standard I/O board RMIO.	Replace the RMIO board. Test with new fibre optic cables on CH1, if AIMA-01 I/O Module Adapter is used.
ALM (xx) 8.01 MSW bit 7	There is an internal alarm in the drive.	Check for loose connections inside of frequency converter cabinet. Write down the Alarm code (in brackets). Contact ABB Service.
AP STOPPED	At least one of the tasks is in stop state in drive function block programme.	Start all the time levels (Drive AP or CDP).
APPL PROG1 ERROR 9.07 AW_3 bit 1	Adaptive programme (AP) has detected internal fault on the fastest time level (20 ms).	Replace the RMIO board.
APPL PROG2 ERROR 9.07 AW_3 bit 2	Adaptive programme (AP) has detected internal fault on the time level 100 ms.	Replace the RMIO board.
APPL PROG3 ERROR 9.07 AW_3 bit 3	Adaptive programme (AP) has detected internal fault on the slowest time level (500 ms).	Replace the RMIO board.
APPL SW OVERLOAD 9.07 AW_3 bit 0	Application (AP) software overload. There is no enough processor capacity to execute blocks.	Reduce application software load e.g.:+ - change the fastest time level from 10 ms to 20 ms. - move some blocks to slower time level - disable point to point communication - disable some extension IO modules
BATT FAILURE Fault code: 5581 9.5 AW2 bit 12	An actuator 6 of S3 is off or voltage level of backup battery is low in the APBU-44 branching unit.	Activate actuator 6 of S3. Change battery. **Note:** Actuator 6 is normally activated (ON) during the commissioning. **Note:** Do not keep actuator 6 of S3 ON when stored as spare part.
BR OVERHEAT Warning code: 7112	Brake resistor overload.	Stop drive. Let resistor cool down. Check parameter settings of resistor overload protection function (see parameter group 34 BRAKE CHOPPER). Check that braking cycle meets allowed limits.
CABLE TEMP Fault code: 4080 8.05 AW_2 bit 3	Motor cable overtemperature alarm. Thermal model of the cable has reached 90% temperature level.	Check the motor load. Check the motor cable and its type and verify the cable thermal model parameters from the parameter group 36.

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
CH2 NODE2 ERROR 9.07 AW_3, bit 5	Communication break detected on CH2 node 2 point to point communication.	Check CH2 settings: 70.7 CH2 NODE ADDR = 2 70.8 M/F MODE = MASTER/FOLLOWER Check the optical fibres between the RMIO boards. Check that the optical fibre loop is closed. Test with new optical fibres.
CH2 NODE3 ERROR 9.07 AW_3, bit 6	Communication break detected on CH2 node 3 point to point communication.	Check CH2 settings: 70.7 CH2 NODE ADDR = 3 70.8 M/F MODE = MASTER/FOLLOWER Check the optical fibres between the RMIO boards. Check that the optical fibre loop is closed. Test with new optical fibres.
COMM MODULE Warning code: 7510 9.05 AW_2 bit 11	Fieldbus communication break detected on fieldbus module or on communication channel CH0 receive. (Programmable fault, see parameter 70.04).	Check the connections of fieldbus adapter module. With an ABB Advant overriding system check channel CH0 optical fibres between the RMIO board and overriding system (or Nxxx type of fieldbus adapter). Test with new optical fibres. Check that the node address is correct in the drive. Check the earthings of the fieldbus cables. Check the status of the fieldbus adapter. See appropriate fieldbus adapter manual. Check parameter settings of Group 51 if a fieldbus adapter is present. Check the connections between the fieldbus and the adapter. Check that the bus master is communicating and correctly configured.
M/F COM LOSS Warning code: 7520 9.04 AW_1 bit 11	Communication break detected in Follower drive. (Programmable fault or alarm; see parameter 70.14)	Check the fibre optic cables on CH2 between the RMIO boards. Check that the fibre optic loop is closed. Test with new fibre optic cables on CH2. Check that there is one master drive and the remainder are followers in the M/F link. See parameter **70.08 M/F MODE**.
DC UNDERVOLT Warning code: 3220 9.05 AW_2 bit 14	An undervoltage trip has been detected with the Auto Restart function. This is indicated to the AW2 diagnostics.	n.a. Only indication.
DIGITAL IO 9.04 AW_1 bit 7 Warning code: 5442	Digital input malfunction detected in the RMIO board.	Replace the RMIO board.

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
EARTH FAULT Warning code: 2330 9.04 AW_1 bit 14	The load on the incoming mains system is out of balance. This can be caused by a fault in the motor, motor cable or an internal malfunction. (Programmable fault or alarm; see parameter 30.20) Tripping level setting is too sensitive in the R8i…R12i inverters. See parameter 30.25.	Check motor. Check motor cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable.
EM STOP 9.04 AW_1 bit 1	Emergency Stop has been activated either by digital input (if block programmed) or MAIN CONTROL WORD 7.01 bit 1 or 2 (= 0).	Emergency stop push buttons must be returned to their normal position after the emergency stop situation is over. Check that the overriding system keeps sending the MAIN CONTROL WORD to drive. See bit 1 and 2 of MCW or CW block. To get drive to ready status, the MCW bit 0 must be set to state FALSE and back to TRUE.
ENCODER1 ERR Warning code: 7301 9.04 AW_1 bit 5	Speed measurement 1 alarm detected. This can be caused by a loose cable connection or faulty pulse encoder. (Programmable fault or alarm, see parameter 50.05)	Check settings of parameter group 50. Check the pulse encoder and its cabling (including CH A and CH B phasing). The sign of signal **1.03 SPEED MEASURED 1** must be the same as internal actual speed **1.02 SPEED ESTIMATED**. If it is not, reverse the channels A and B. Check connection between the RMIO board and the RTAC pulse encoder module. Check the proper earthing of equipment. Check for highly emissive components nearby.
ENCODER2 ERR Warning code: 7301 9.04 AW_1 bit 6	Speed measurement 2 alarm detected. This can be caused by a loose cable connection or faulty pulse encoder. (Programmable fault or alarm, see parameter 50.17)	Check settings of parameter group 50. Check the pulse encoder and its cabling (including CH A and CH B phasing). Check connection between the RMIO board and the NTAC-02 pulse encoder module. Check the proper earthing of equipment. Check for highly emissive components nearby.
EXT ANALOG IO 9.04 AW_1 bit 10 Warning code: 7081	Analogue I/O error detected in the RAIO I/O Extension module	If the alarm is continuously active, replace the RAIO module.
EXT DIGITAL IO 9.04 AW_1 bit 9 Warning code 7082	Digital input error detected in the RDIO I/O Extension module.	If the alarm is continuously active, replace the RDIO module.

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
INV DISABLED Warning code: 3200 8.20 INV ENABLED WORD	DC switch has been opened at stop state. This diagnostics is valid only in ACS800 R8i modules with AFSC-0x Fuse Switch Controller unit.	Close the DC switch. A DC switch status of each parallel connected inverter module can be seen from the signal 8.20 INV ENABLED WORD. If a DC switch is not included to the HW configuration, deactivate this function by parameter 98.12 **FUSE SWITCH CNTR**.
INV OVERLOAD Warning code: 5481 9.05 AW2_ bit 2	Forced cooling cycle for ACS800 / ACS600 inverter is active after the overloading cycle.	Load is too high. Check the dimensioning and process.
M/F CONNECT	Incompatible parameter type selected in master drive. (see data type of parameters 70.09…70.11).	Change correct value for parameter 70.09…70.11.
MOD BOARD T Warning code: FF88 9.08 AW_3 bit 14	Overtemperature in AINT board of inverter module.	Check inverter fan. Check ambient temperature.
MOD CHOKE T Warning code: FF89 9.08 AW_3 bit 13	Overtemperature in choke of liquid cooled R8i inverter module.	Check inverter fan. Check ambient temperature. Check liquid cooling system.
MOTOR STALL Warning code: 7121 9.05 AW_2 bit 9	Motor or process stall. Motor operating in the stall region. This can be caused by excessive load or insufficient motor power. (Programmable fault or alarm; see Parameter 30.13)	Check motor load and the drive ratings. Check MOTOR STALL Fault Function parameters.
MOTOR STARTS	Motor ID Run has been selected and the drive started in the Local control mode.	Wait until the Motor ID Run is complete.
MOTOR TEMP Warning code: 4310 9.04 AW_1 bit 3	Overtemperature alarm (thermal model). Temperature has exceeded the alarm level of the thermal model. (Programmable fault or alarm; see Parameter 30.02)	Check motor ratings, load and cooling. Check parameter **30.28 THERM MOD ALM L**. If USER MODE is selected, check that parameters 30.09…30.12 are set correctly.
PANEL LOST 9.05 AW_2 bit 13	A Local Control device (CDP312R or DriveWindow) has ceased communicating. This can be caused by the disconnection of the selected local control device during local control or an internal fault in the local controlling device. (Programmable fault or alarm, see parameter 30.21)	Check Control Panel connector. Replace Control Panel in the mounting platform. Check PANEL LOST Fault Function parameters.
POWDOWN FILE 9.05 AW_2 bit 8	Error in restoring powerdown.ddf file	If the alarm keeps reappearing, replace the RMIO board.
POWFAIL FILE 9.05 AW_2 bit 7	Error in restoring powerfail.ddf file.	If the alarm keeps reappearing, replace the RMIO board.
REPLACE FAN	Running time of the inverter cooling fan has exceeded its estimated life time.	Change the fan. Reset fan run time counter parameter 1.31.

ALARM MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
RUN DISABLED Fault code: FF54 9.05 AW2 bit 14	The drive is not allowed to RUN (Drive AP application block).	Check the interlocking of RUN ENA block in the Drive AP program.
START INHIBI Warning code: FF7A 9.04 AW_1 bit 0	Prevention of unexpected start-up activated from the hardware typically by operator for equipment maintenance.	The Operator must close the prevention of unexpected start-up switch. ACS 600: If the switch is closed and the alarm is still active, check that the "Power On" LED is lit on the NGPS board. If the LED is off but there is a voltage at the input terminals of the NGPS, replace the board.
SYNCRO SPEED	The value of the motor nominal speed set to parameter 99.05 is not correct: The value is too near the synchronous speed of the motor. Tolerance is 0.1%.	Check nominal speed from motor rating plate and set parameter 99.05 exactly accordingly.
TEMPD INV x Warning code: 4314 9.08 AW_3 bit 15 9.15 TEMP DIF ALM WORD	A temperature difference alarm limit of inverter module has been reached in ACS800 R8i inverter module x compared to other parallel connected module(s). (x = 1…12)	Check the cooling fan. Replace fan if out of order. Check the air filters if exists.
UNDERLOAD Warning code: FF6A 9.05 AW_2 bit 1	Process underload situation detected. Motor load is too low. This can be caused by a release mechanism in the driven equipment. (Programmable fault or alarm; see parameter 30.16)	Check for a problem in the driven equipment. Check UNDERLOAD Fault Function parameters.
SYSTEM START	Inverter software has been started. This indicates normally an auxiliary voltage on connection.	If this message appears during the normal operation of drive, check the power supply for RMIO board. Check the connections of +24 VDC supply circuit. Check possible short cuts in the +24 VDC circuit.

Other Messages

OTHER MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
SWC ON INHIB 8.01 MSW bit 6	Drive is in the ON INHIBIT state. See ABB Drive Profile description.	Set MAIN CONTROL WORD bit 0 first to 0, and then back to 1 to proceed into the next state.
ID N CHANGED	Modbus ID number of the drive has been changed from 1 in Drive Selection Mode of CDP312R panel (the change is not shown on the display).	To change the Modbus ID number back to 1 go to Drive Selection Mode by pressing ***DRIVE***. Press ***ENTER***. Set the ID number to 1. Press ***ENTER.***
MACRO CHANGE	A Macro is being restored or a user Macro is being saved.	Please wait.
ID MAGN REG	The drive is ready to start identification magnetisation.	This warning belongs to the normal start-up procedure. Press PAR and check parameter 99.07.
ID MAGN	The drive is performing identification magnetisation.	Please wait 20 to 60 seconds.
ID DONE	The drive has performed the identification magnetisation and is ready to start.	-

Alarm messages generated by the control panel

CONTROL PANEL MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
DOWNLOADING FAILED	Download function of the panel has failed. No data has been copied from panel to drive.	Make sure the panel is in local mode. Retry (there might be interference on the link). Contact ABB representative.
DRIVE INCOMPATIBLE DOWNLOADING NOT POSSIBLE	Program versions in the panel and drive do not match. It is not possible to copy data from panel to drive.	Check program versions (see parameter group 4 INFORMATION).
DRIVE IS RUNNING DOWNLOADING NOT POSSIBLE	Downloading is not possible while the motor is running.	Stop motor. Perform downloading.
NO COMMUNICATION	Control Panel CDP312R message. The selected drive is not present on the link. The link does not work because of a hardware malfunction or problem in the cabling.	Check the fibre optic cable connections in the I/O-link.
	Panel type not compatible with version of the drive application program.	Check panel type and version of the drive application program. The panel type is printed on the cover of the panel. The application program version is stored in parameter 4.03.

CONTROL PANEL MESSAGES (in alphabetical order)		
Alarm Message	***Cause***	***Action***
NO FREE ID NUMBERS ID NUMBER SETTING NOT POSSIBLE	The Panel Link already includes 31 stations.	Disconnect another station from the link to free an ID number.
NOT UPLOADED DOWNLOADING NOT POSSIBLE	No upload function has been performed.	Perform the upload function before downloading. See the Chapter *Control Panel*.
UPLOADING FAILED	Upload function of the panel has failed. No data has been copied from the drive to the panel.	Retry (there might be interference on the link). Contact ABB representative.
WRITE ACCESS DENIED PARAMETER SETTING NOT POSSIBLE	Certain parameters do not allow changes while motor is running. If tried, no change is accepted, and a warning is displayed. Parameter lock is on.	Stop motor, and then change parameter value. Open the parameter lock (see parameter 16.02).

Chapter 9 - Terms

TERM	FULL NAME	DESCRIPTION
ACS	AC Standard	ABB standard frequency converter family. E.g. ACS800 and ACS 600.
ACS 600		ACS 600 frequency converter family.
ACS800		ACS800 frequency converter family.
ACS 600 MultiDrive		System drive; a member of ACS 600 product family.
ACS800 MultiDrive		System drive; a member of ACS800 product family.
ACU	Auxiliary Control Unit	
AI	Analogue Input	Interface for analogue input signal.
AIMA	I/O Module Adapter	Extension unit for mounting of I/O extension modules.
AINT	Main Circuit Interface Board	Interface for RMIO/NAMC and main circuit.
NAMC	Application and Motor Control	E.g. NAMC table. The interface between application SW and motor control SW in ACS 600.
NAMC Control Board	Application and Motor Controller board	Control board for ACS 600 and ACS 600 MultiDrive.
AO	Analogue Output	Interface for analogue output signal.
APC2	Application Program Controller	
AC 80	Advant Controller 80	
AC 800M	Advant Controller 800M	
ASIC	Application Specific Integrated Circuit	Non-standard IC circuits. Allow more compact and cheaper PCB design than using standard circuits.
BJT	Bipolar Junction Transistor	Semiconductor type.
CAD	Computer Aided Design	
CDC	Common Drive Control	APC 2, DDC and optional boards.
CDP 311	Common Drives Panel 311	Control panel is used for setting drive parameters and monitoring the drive. Control panel uses the CDI-protocol.
CDP312R	Common Drives Panel 312	Control panel is used for setting drive parameters and monitoring the drive. Control panel uses the Modbus-protocol.
CE Marking	Communauté Européenne Marking	CE marking: The product complies with the requirements of relevant European Directives.
CMOS	Complementary MOS	Semiconductor type.
DC Busbar		Direct Current supply for inverter units.
DDC	Digital Drive Controller	Standard control functions, torque and speed control loops, internal start/stop logic, internal fault diagnostic, motor and cable protection.

TERM	FULL NAME	DESCRIPTION
DDCC	Distributed Drives Communication Circuit	Communication ASIC
DDCS	Distributed Drives Communication System	Communication protocol used with drive products.
DDCTool	Digital Drive Controller Tool	Windows based PC tool. Optically connected to the DDC, setting/monitoring DDC's parameters local control of DDC, monitoring actual values, testing DDC I/O's.
DI	Digital Input	Interface for a digital input signal.
DO	Digital Output	Interface for a digital output signal.
DriveAP		Windows based tool program for Adaptive Proramming.
DriveSize		Dimensioning PC tool for optional selection of ACS 600 and motors.
DriveWindow		PC tool for operating, controlling, parametrising and monitoring ABB drives.
DSP	Digital Signal Processor	Processor type used in RMIO and NAMC board.
DSU	Diode Supply Unit	Diode rectifying type of incoming supply.
DTC	Direct Torque Control	Revolutionary motor and inverter control method utilised first in ACS 600 product family.
EEPROM	Electrically Erasable Programmable ROM	Non-volatile memory.
EMC	Electromagnetic Compatibility	The ability of electrical equipment to operate problem-free in electromagnetic environment. Likewise, the equipment must not disturb other products/systems.
EMI	Electromagnetic Interference	
EPROM	Erasable Programmable ROM	See: ROM.
ESD	ElectroStatic Discharge	
FET	Field Effect Transistor	Semiconductor type.
Flash EEPROM	Electrically Sector erasable EEPROM memory	Non volatile memory type.
FSR	Full Scale Range	E.g. the error is 0.01% FSR (from maximum value).
GTO	Gate Turn-Off Thyristor	Semiconductor type.
HW	Hardware	Physical device or equipment.
I/O	Input/Output	Control Input/Output signal (E.g. DI, DO, AI, AO).
IC	Integrated Circuit	
IC	International Cooling	International cooling standard.
ICMC	Integrated Control Motor Circuit	Motor and inverter control ASIC used in ACS 600.
ICU	Incoming Unit	Section through which the ACS 600 MultiDrive connects to the mains.
ID	Identification	E.g. ID run of ACS 600 to get initial motor parameters.

TERM	FULL NAME	DESCRIPTION
ID-run	Identification run	Start-up run to identify characteristics of a motor for optimum motor control.
IEC	International Electrotechnical Commission	Organisation for Electrical and Electronic Engineering Standards.
IEEE	Institute of Electrical and Electronic Engineers	US professional society that takes part in standardisation. E.g. IEEE Conference Reviews.
IGBT	Insulated Gate Bipolar Transistor	Power semiconductor used widely in frequency converters.
IM	International Mounting	International mounting standard.
IOCC	Input Output Control Circuit	I/O ASIC used in ACS 600 products.
IP	International Protection	Degree of protection provided by enclosures.
IR	IR stands for voltage. I(Current)x R(Resistance) = U(Voltage))	E.g. IR compensation: An extra voltage (torque) boost for a motor at low speeds.
ISO	International Organisation for Standardisation	E.g. ISO 9000 series quality standards.
KLIXON		Thermal switch
KTY-84-1	Silicon type of temperature sensor.	Temperature dependent silicon temperature sensor used e.g. in AC-motors to indicate motor temperature.
LCD	Liquid Crystal Display	Electronic display type used e.g. in CDP312R control panel.
LCI	Load Commutated Inverter	Some ABB Megadrive products are equipped with LCI (large synchronous motor drives).
LED	Light Emitting Diode	Semiconductor type.
LMD-0X	Led Monitoring Display	Led display for monitoring ACS 600 / ACS800 Drive status and one signal.
Modbus		Fieldbus communication protocol.
MultiDrive		Drive consisting of several inverter modules connected to same DC link.
NAC	Next AC drive	Common platform or basis for drives R&D projects. ACS 600, MultiDrive, XT are based on NAC for example.
NAFA	NAC AF100 Adapter	Fieldbus option module of ACS 600.
NAIO	NAC Analogue Input/Output	Option module for ACS 600 / ACS800 to extend analogue I/O channels.
NAMC	NAC NAMC Board	Motor and inverter control board of ACS 600.
NBRA	NAC Braking Chopper	Option device of ACS 600 for efficient braking with no regenerative input bridge.
NBRC	NAC Braking Chopper Controller Board	Board controlling the operation of braking chopper NBRA.
NCPC	NAC Control Panel Cable	Option cable for remote connection of the CDP312R control panel.
NCSA	NAC CS 31 Adapter	Fieldbus option module of ACS 600 / ACS800.

TERM	FULL NAME	DESCRIPTION
NDIO	NAC Digital Input/Output	Option module for ACS 600 to replace or extend digital I/O channels.
NDNA	NAC DeviceNet Adapter	Fieldbus option module of ACS 600 / ACS800.
NDSC	NAC Diode Supply Unit Controller	Control board for half controlled diode/thyristor input bridge.
NECG	NAC EMC Cable Glands	Optional add-on kit of ACS 601 (R3 to R6) for 360° cable shield earthing.
NGDR	NAC Gate Driver Board	PCB of ACS 600 for controlling the inverter IGBTs.
NIBA	NAC Interbus-S Adapter	Fieldbus option module of ACS 600.
NINP	NAC Input Bridge Board	PCB of ACS 600 for controlling the rectifier.
NINT	NAC Interface Electronics Board	PCB of ACS 600 for interfacing RMIO or NAMC and Main Circuit.
NIOC	NAC Input Output Control Board	PCB of ACS 600 for connecting I/O and CDP312R control panel to the drive.
NISA	NAC ISA/DDCS Adapter	Optional device of ACS 600. Placed to a PC's ISA board slot. Connects via fibres to NAMC.
NLWC	NAC Ligth Wave Cable	Optional add-on kit of ACS 600 (2 additional fibre optic cables).
NMBA	NAC Modbus Adapter	Fieldbus option module of ACS 600 / ACS800.
NMFA	NAC Master Fieldbus Adapter	Fieldbus option module of ACS 600.
NPBA	NAC Profibus Adapter	Fieldbus option module of ACS 600 / ACS800.
NPBU	NAC PPCS Branching Unit	Optical PPCS branching unit used when paralleling inverter modules.
NPMP	NAC Panel Mounting Platform	Optional add-on kit of ACS 600: A base onto which the control panel can be attached.
NPOW	NAC Power Supply Board	PCB of ACS 600 for powering other boards and option modules.
NPSM	NAC Power Supply Option	Option module of ACS 600 to power external devices.
NSNA	NAC SucoNet Adapter	Fieldbus option module of ACS 600.
NTAC	NAC Tacho (Encoder)	Option pulse encoder interface for ACS 600.
NTC	Negative Temperature Coefficient resistor	
NVAR	NAC Varistor Board	PCB of ACS 600 for input bridge protection.
OSI	Open System Interconnection	A standard layer model for open telecommunication systems.
PCB	Printed Circuit Board	Wiring boards used in electronic devices.
PCMCIA	Personal Computer Memory Card International Association	DDCS/PCMCIA interface enables connecting PC and Drives Window tool to ACS 600 series drive.
PE	Protective Earth	Terminal for grounding e.g. ACS 600.
PFC	Pump and Fan Control (Macro)	The macro of ACS 600 for controlling pump or fan sections.

TERM	FULL NAME	DESCRIPTION
PI	Proportional, Integral	Controller type.
PID	Proportional, Integral and Derivate	Controller type which allows to control customer's process'.(e.g. used in ACS 600 speed controller).
PLC	Programmable Logic Controller	
PP	Power Plate	Inverter IGBTs, sensors and control circuits integrated into one component.
PPCC	Power Plate Control Circuit	ASIC of NINT board used for controlling PPs.
PPCS	Power Plate Communication System	Optical serial link for inverter control.
ppm	parts per million	$1/10^{-6}$
ppr	pulses per revolution	Number of pulses given by incremental encoder per one revolution.
PROM	Programmable ROM	See: ROM.
PT100	Platinum Wire Resistance Element 100	Temperature dependent resistor used e.g. in AC-motors to indicate motor temperature. R = 100 ohm at 0°.
PTC	Positive Temperature Coefficient resistor	PTC thermistor is a semi-conductor used to indicate exceeded temperature limit.
PWM	Pulse Width Modulation	The traditional control method of inverter.
R&D	Research and Development	
R2…R9	Frame size 2…9	ACS 600/500 series: Size of the frame inside which the converter unit is assembled.
RAM	Random Access Memory	Volatile memory.
RAIO	Analogue Input/Output	I/O option module for ACS 600 / ACS800 to replace or extend analogue I/O channels.
RDCO	DDCS communication option	I/O option module for DDCS communication for ACS600 / ACS800. Includes CH0…CH3.
RDCU	Drive controller unit	DIN rail installable drive controller unit which include RMIO board, bottom plate and plastic cover.
RDIO	Digital Input/Output	I/O option module for ACS 600/ACS 800 to replace or extend digital I/O channels.
RMIO	RMIO Board	Motor, I/O and Inverter control board of ACS 600/ACS800.
RFI	Radio Frequency Interference	
RMS	Root Mean Square	For sine wave the RMS value is obtained by dividing the maximum by the square root of 2.
RO	Relay Output	Interface for a digital output signal. Implemented with a relay.
ROM	Read Only Memory	Non-volatile memory
RS 232		Standard for data transmission physical interface (signal usage & other electrical parameters).
RS 485		Standard for data transmission physical interface (signal levels & other electrical parameters).

TERM	FULL NAME	DESCRIPTION
RTAC	Tacho (Encoder)	Option pulse encoder interface for ACS 600/ ACS 800.
SCR	Silicon Controlled Rectifier	Semiconductor type similar to thyristor.
SDCS UCM-1	UC-resistor board	Used in TSU.
SDCS-COM-1	Communication board	Used in TSU.
SDCS-CON-1	Control board	Used in TSU.
SDCS-IOB-22	Digital connection card (115V)	Used in TSU.
SDCS-IOB-23	Digital connection card (230V)	Used in TSU.
SDCS-IOE-2	UC-measurement board	Used in TSU.
SDCS-PIN-41	Pulse transformer board	Used in TSU.
SDCS-PIN-51	Measurement board	Used in TSU.
SDCS-POW-1	Power supply board	Used in TSU.
SW	Software	Computer programs.
TSU	Thyristor Supply Unit	Full controlled thyristor input bridge.
UART	Universal Asynchronous Receiver Transmitter	Communication controlled circuit used in asynchronous communication protocols.
UPS	Uninterrupted Power Supply	Power supply equipment with battery to maintain output voltage during power failure.
UR fuse	Ultra Rapid fuse	Fuse type used to protect semiconductors.
VSD	Variable Speed Drives	Speed controlled electrical motor.
XT	Extension	R&E project name. It stands for power range extension of ACS 600 product family by paralleling inverter modules.
YPQ112A/B		DDCS Interface board for CDC system.

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