DCS800

Firmware manual supplement for North America,
Firmware Rev. 2.20

DCS800 Drives (20 to 5200 A)

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Revision Information

This supplement is dedicated to **Revision 2.2** of the DCS800 Firmware. Drives shipped after September, 2007 will most likely have this revision.

What revision do I have?

To determine your firmware revision number, check the value of signal:

FirmwareVer (4.01).

Or check the label on the box:

Indicates Revision 2.2

What's different with this revision

1. Start up assistant: When using a DB contactor, the last step of the start up assistant wizard, step 7 field weakening assistant, faulted out immediately on a "drive in motion" fault. In revision 2.2, if you configure the DC contactor as recommended in this document before commissioning, the drive will not fault.
2. EMF feedback: You might have gotten F532 "Motor Overspeed" faults upon motor-on when using EMF Feedback with a DC contactor. This happened due to long contactor closure time. The new firmware revision now waits for the DC contactor acknowledge signal before enabling the SCR's which eliminates this problem.
3. EMF & Field Heat: You may have seen the motor turn momentarily when the drive was turned on, with EMF feedback, a DC contactor and with field heating on. This has now been corrected.
4. Ethernet: Ethernet can now be configured to transmit up to 10 words. Only 4 words were possible previously.
5. **DC contactor acknowledge: When the drive controls a DC contactor, it is now required to have a "contactor acknowledge" input coming into the drive so it can properly control the motor-on sequence.**
6. DC contactor acknowledge: The contactor acknowledge input configuration is different than in the earlier revision. See page 6 for details.

Introduction

This supplement to the DCS800 Firmware Manual contains information that is especially important to the North American market. Some of the information is not shown in the firmware manual; other information is shown but it deserves to be highlighted. We have also included a list of known issues with the latest firmware release, rev. 2.2.

Macros

Overview

The DCS800 uses macro's differently than the ACS800 and other ABB AC drives. In the DCS800, macro's only define the designation for analog and digital inputs and outputs. Moreover, once a macro has been implemented, these designations are easily changed. For many, a macro is a starting point. it may also be the end point, but it is not necessarily so.

Using DC macros

There are two ways to enable a macro, using the start up wizard in DriveWindow Light (DWL) or using the parameter list either through the control panel or DWL. Using the start up wizard is a bit easier.

To use the wizard, after connecting to the drive with DriveWindow Light (see Quick Guide for details), click on the wizard. Then select the checkbox next to *2. Macro Assistant*. Then select *Next*. At the top of the page is the selection for parameter *Application Macro (9908)*. Choose the desired macro in the drop down box. Then click on *Apply*. The page will then fill in the designations of the analog and digital inputs and outputs according to the macro selected.

For detailed information about the macros, click on *Help*.

To use the parameter list, either through the control panel, DriveWindow, or DriveWindow Light, use the following parameters:

- *ApplMacro (99.08)*
- *Applrestore (99.07)*
- *MacroSel (8.10)*

ApplMacro (99.08) is used to select the desired macro. *Applrestore (99.07)* is used to execute the command. First, change *ApplMacro (99.08)* to the macro of your choice from the drop down box (in DW or DWL) or by using the arrow keys (in the control panel). Then change the selection of *Applrestore (99.07)* from **Done** to **Yes**. When finished executing, the drive will set this value back to Done. If using DWL, you may need to right click and select **upload** to see this change. Verify the macro was loaded by observing the setting of *MacroSel (8.10)*.

		DCS800 - Terminal Allocation - Default Settings (by Macro)							
Terminal #		**Signal**	**Factory**	**Standard**	**Manual / Const Spd**	**Hand / Auto**	**Hand / Motor Pot**	**Motor Pot**	**Torque Control**
X3:	1	90...270 V AITAC-	-	-	-	-	-	-	-
	2	30...90 V AITAC-	-	-	-	-	-	-	-
	3	8...30 V AITAC-	-	-	-	-	-	-	-
	4	AITAC+	-	-	-	-	-	-	-
	5	AI1-	-	Speed Reference	Speed Reference	Speed Reference	Speed Reference	-	Torque Reference
	6	AI1+							
	7	AI2-	-	Torque Limit	-	-	-	-	-
	8	AI2+							
	9	AI3-	-	-	-	-	-	-	-
	10	AI3+							
X4:	1	AI4-	-	-	-	-	-	-	-
	2	AI4+							
	3	0 V	-	-	-	-	-	-	-
	4	+10 V	-	-	-	-	-	-	-
	5	-10 V	-	-	-	-	-	-	-
	6	0 V	-	-	-	-	-	-	-
	7	AO1	-	Motor speed	Motor speed	Motor speed	Motor speed	Motor speed	Motor speed
	8	AO2	-	Actual armat. volt.	Actual motor curr.	Actual motor curr.	Actual motor curr.	Actual armat. volt.	Motor torque
	9	IACT	Actual current	Actual current	Actual current	Actual current	Actual current	Actual current	Actual current
	10	0 V	-	-	-	-	-	-	-
X5:	1-10		-	-	-	-	-	-	-
X6:	1	DI1	Converter fan ack.	Jog1	Jog1	StartStop	Motor pot up	Direction	Off2 (coast stop)
	2	DI2	Motor fan ack.	Jog2	Jog2	HandAuto	Motor pot down	Motor pot up	Torque select
	3	DI3	Main contact. ack.	External fault	Direction	Direction	Direction	Motor pot down	External fault
	4	DI4	Off2 (coast stop)	External alarm	Parameter select	Speed ref. select	Speed ref. select	Motor pot minimum	-
	5	DI5	E-Stop	E-Stop	E-Stop	E-Stop	E-Stop	E-Stop	E-Stop
	6	DI6	Reset	Reset	Reset	Reset	Reset	Reset	Reset
	7	DI7	OnOff1	OnOff1	On Start pulse	OnOff1	On Start pulse	OnOff1	OnOff1
	8	DI8	StartStop	StartStop	Off1 Stop pulse NC	-	Off1 Stop pulse NC	StartStop	StartStop
	9	+24 V	-	-	-	-	-	-	-
	10	0 V	-	-	-	-	-	-	-
X7:	1	DO1	Fans On cmd.	ReadyRun	ReadyOn	ReadyOn	ReadyOn	ReadyRun	ReadyRun
	2	DO2	Field excit. On cmd.	ReadyRef (running)	ReadyRef (running)	ReadyRef (running)	ReadyRef (running)	Above limit	ReadyRef (running)
	3	DO3	Main contact. On cmd.	Fault or alarm	Tripped (fault)	Tripped (fault)	Tripped (fault)	Fault or alarm	Fault or alarm
	4	DO4	-	Zero speed	Zero speed	Zero speed	Zero speed	Zero speed	Zero speed
	5	DO5	-	Above limit	Above limit	Above limit	Above limit	At setpoint	DC-breaker trip cmd.
	6	DO6	-	-	-	-	-	-	-
	7	DO7	-	-	-	-	-	-	-
	8	0 V	-	-	-	-	-	-	-
X96:	1	DO8 Relay	Main Contact. On	Main Contact. On	Main Contact. On	Main Contact. On	Main Contact. On	Main Contact. On	Main Contact. On
	2								
Serial Comm		-	Speed Reference		-	Speed Reference	-		

A special message about Torque Limit in the STANDARD macro

In the standard macro, analog input 2 (AI-2) is assigned to "torque limit." AI-2, therefore, adjusts the maximum amount of torque that the drive can produce. If AI-2 is not connected, and thus is set to zero, the drive will not produce torque and the motor will not turn. If you are not using AI-2, disable it by making the following change:

- *TorqUsedMaxSel (20.18)* = **TorqMax2005**

For additional information

Macros: See the help screen in Drive Window Light. While connected to the drive, it is accessed by clicking on **Help** from any wizard screen. While off line it can be found in the following location on computers that have been loaded with Drive Window Light:

C:\Program Files\DriveWare\DriveWindow Light 2\DCS800\DCS800HelpEnglish.chm

DriveWindow Light: For basic instructions on DriveWindow Light (incl. communication settings), see the **DCS800 Quick Guide** which is included with every drive.

DC contactors with/without dynamic braking

Overview

The type of DC contactor used in North America is not used worldwide. The US typically uses DC contactors with 1 or 2 normally-open (NO) poles and sometimes 1 normally-closed (NC) pole. The NO poles are used to make and break the connection between the drive and the motor. Some contactors also have a NC pole used to connect a resistor across the motor leads to make it stop (dynamic braking). The Europeans use a different technique. In Europe, the dc contactor never breaks the circuit between the drive and the motor. Instead, an AC input contactor is used. A single pole NO DC contactor is used for dynamic braking. When dynamic braking is required, the AC contactor is opened, removing power to the drive, and the DC contactor is closed, connecting the resistor across the motor leads to make it stop. Then the DC contactor is opened again after the motor stops. In revisions 1.7 and 1.8, only the European type was supported by the DCS800. Revisions 2.1 and 2.2 also support the North American type. Revision 2.2, however, supports it differently with improved results.

Contactor acknowledge input

When using the DCS800 to control the DC contactor, firmware 2.2 requires that an auxiliary contact from the DC contactor be connected to a drive input. This is the only sure way for the drive to know that the contactor is closed and current can flow to the motor. To configure this, set the following parameter:

- *MainContactorAck (10.21)* = **DI-1** (or whichever input is chosen)

IMPORTANT: This configuration is different than what was recommended for revision 2.1. In 2.1, parameter 10.22 was used instead, and the input was inverted (using parameter 10.25 for example). This is *not* recommended for revision 2.2.

Using DC contactors with or without dynamic braking

Use digital output 8 (DO-8) to control the DC contactor. DO-8 is the only relay output in the DCS800 drive and is rated at 3 Amps at either 115/230 Vac or 24 Vdc. (Rated at 0.3 Amps at 115-230 Vdc.) Control of DO-8 is configured using parameters *DO8Index (14.15)* and *DO8BitNo (14.16)*.

Parameter *DO8Index (14.15)* is used to select the control word;
Parameter *DO8BitNo (14.16)* is used to select which bit in that word is the switch;

The default setting for *DO8Index (14.15)* is **603**, which refers to *CurCtrlStat1 (6.03)*. Three bits can be used to control the various types of contactors:

7	MainContactorOn	(default – for AC contactors)
8	DynamicBrakingOn	(for European 1-pole DB contactors)
10	US-DynamicBrakingOn	(for North American DC contactors)

For all types of DC contactors that break the circuit between the drive and the motor, set the parameters as follows:

- Parameter *DO8Index (14.15)* = **603** (default)
- Parameter *DO8BitNo (14.16)* = **10**

For revision 2.2, the following parameter must also be set:

- *MainContCtrlMode (21.16)* = **DCcontact** (3)

Configuring the drive for dynamic braking

The drive allows you to select the stopping method under three different situations. Parameters 21.02, 21.03 and 21.04 select the stopping method for loss of the OnOff, run command (StartStop, Jog1, Jog2, etc.), and E-Stop input, respectively. Each can be set to:

- RampStop
- CoastStop
- TorqueLimit
- DynBraking

In order to command the drive to perform a DB stop, one or more of these parameters must be set to DynBraking. Most users will want the drive to ramp stop when OnOff or a run command (StartStop, Jog1, Jog2, etc.) input is cleared, and dynamically brake when the E-Stop input is cleared. In that case, use the following settings:

- Parameter *Off1Mode* *(21.02)* = **RampStop**
- Parameter *StopMode* *(21.03)* = **RampStop**
- Parameter *E StopMode* *(21.04)* = **DynBraking**

However, any case is allowed and the final decision is left to the user.

NOTE: Stopping by way of OnOff takes precedence over stopping by way of StartStop (or Jog1 or Jog2). For example, assume:

Off1Mode (21.02) is set to DynBraking, and
StopMode (21.03) is set to RampStop

If StartStop is cleared, then the drive will begin to ramp stop. If OnOff is then cleared before the motor comes to a stop, then the motor will dynamically brake the rest of the way.

Other parameters control the stopping method during certain fault conditions. See:

- *LocalLossCtrl (30.27)*
- *ComLossCtrl (30.28)*
- *FaultStopMode (30.30)*
- *SpeedFbFltMode (30.36)*

EMF feedback with dynamic braking

If using EMF feedback with dynamic braking (meaning parameter *M1SpeedFbSel (50.03)* is set to EMF and one or more of the above parameters is set to DynBraking), you will also need to set up the *DynBrakeDly (50.11)* parameter. This is necessary, because, when using a DC contactor with EMF feedback, when the contactor opens to dynamically brake, there is no valid information about the motor speed and thus no zero speed information in the drive. To prevent an interlocking of the drive after dynamic braking, the speed is assumed to be zero after *DynBrakeDly (50.11)* time is elapsed. When dynamically braking, the zero speed output will be set after this time expires.

The following parameter must be set:

- Parameter *DynBrakeDly* *(50.11)* = **the time (sec) it normally takes to the motor to stop during dynamic braking**

For additional information

See the DCS800 firmware manual:

- Page 120 group 6 parameters
- Page 168 group 14 parameters
- Pages 180 – 181 group 21 parameters
- Pages 205 - 207 group 30 parameters

AC contactors

The drive's DO-8 output can control an AC contactor instead. For an AC contactor, use these settings:

- Parameter *DO8Index* *(14.15)* = **603** (default)
- Parameter *DO8BitNo* *(14.16)* = **7**
- Parameter *MainContCtrlMode* *(21.16)* = **On** (default)
- Parameter MainContAck *(10.21)* = **the acknowledge input number, if present. It is not necessary to use an acknowledge input with AC contactors.**

Field heating

Overview

Field heating (also referred to as "field warming and field economy") is traditionally been used in the US for a couple reasons. Previous generations of dc drives used voltage-controlled field supplies, meaning that the only thing the field supply could directly control was voltage. For DC motors, maintaining the field's current is what's important to maintaining optimal torque. Ohm's law tells us that current equals voltage multiplied by resistance, so as long as resistance remains constant, current will be proportional to voltage. But field resistance changes with temperature. Therefore, a cold motor would have a different field current than a warm motor, even though voltage remained unchanged. To keep the resistance, and thus the current constant, the field was left on to keep it warm. Then the voltage-controlled field supply would work just fine.

The new generation of drives, including all field supplies used with the DCS800, are current controlled, meaning that the field supply directly regulates field current. This means that field heating may no longer be necessary with this drive.

The other reason field heating is used is to keep moisture out of the motor.

If field heating is still required, the drive does allow for this option.

Two parameters are used to turn on and control field heating:

- *FldHeatSel (21.18*)
- *M1FldHeatRef (44.04)*

Field heat On

When parameter *FldHeatSel (21.18*) = **On**, the feature works as follows:

Condition	OnOff Input (DI-7)	Off2 Input*	Result
Power Up:	Off	On	Field On - reduced**
Start drive:	On	On	Field On
Normal stop:	On → Off	On	Field On, then reduced** after stop
Off2 while running:	On	On → Off	Field turns off safely as motor coasts to stop.

* Parameter *Off2 Emergency Off / Coast Stop (10.08)* must be set to a valid input bit number for this to be valid. Default value is **DI-4**.

** If parameter 44.04 is set below 100%, field will be at this reduced level while motor is stopped.

Field heat OnRun

When *FldHeatSel (21.18*) = **OnRun**, the feature works as follows:

Run (StartStop, Jog1, Jog2, etc.)	OnOff Input (DI-7)	Off2 Input*	Result
Off	On	On	Field On - reduced**
On	On	On	Field On
On or Off	On	On → Off	Field will turn off safely as motor coasts to stop and cannot turn back on again until **Off2** is switched on while **OnOff** and **Run** are off.
All other conditions			Field Off

* Parameter *Off2 Emergency Off / Coast Stop (10.08)* must be set to a valid input bit number for this to be valid. Default value is **DI-4**.

** If parameter 44.04 is set below 100%, field will be at this reduced level while motor is stopped.

For additional information

See the DCS800 firmware manual:

- Page 148 - 152 group 10 parameters
- Pages 180 – 181 group 21 parameters
- Page 222 group 44 parameters

Saving and restoring a parameter set

Overview

There are many ways to save a parameter set in DriveWindow Light and in the control panel. This section describes the best way for each.

Using DriveWindow Light

In DriveWindow Light, there are many ways to save and restore a parameter set. The easiest method is to use Save as and Open in Browser, found under the File menu. This will save and restore the entire parameter set, including motor data and any existing AP programming. Type code parameters will not be affected. This means there is no danger with uploading parameters from a 10 hp drive and downloading them to a 100 hp drive. The drive will not forget that it is a 100 hp drive, but you will need to modify the motor voltage, current, etc. after the download.

Saving with SAVE AS: This function transfers the parameter set from the DCS800 to the PC. It is done as follows:

1. Connect to the DCS800 and go on line by clicking on File, then New Online Drive.
2. Click on File, then Save As…. Enter a file name and select a location.
3. Click SAVE. A file of type .dwp will be created. This will take about a minute so be patient. The process is done when the hourglass stops spinning.

Restoring with OPEN IN BROWSER: This function transfers the parameter set from the PC to the DCS800. It is done as follows:

1. Connect to the DCS800 and go on line by clicking on File, then New Online Drive.
2. Click on File, then Open in Browser. Find the desired .dwp file. Then click OPEN.
3. A message will appear stating, *"You are opening a new file in OnLine Mode. All values from the file will be written to the drive. Do you want to continue?"* Click YES.
4. In some cases, another message will appear stating, *"loaded file and active parameter browser version numbers differ…"* followed by file and parameter browser information. This occurs when the original drive had a different version of either the operating system (OS) or the control module (HW) than the connected drive. In almost all cases, the parameter sets will be compatible, so we recommend answering YES, but if in doubt, click NO. Then back up your current parameter set using the SAVE AS procedure above, before proceeding with this restore. This will allow you to easily recover if there is a compatibility issue.

NOTE 1: FOLLOWING ERRORS OCCURRED or NO WIZARD FILE: If one of these error messages appears after the download, close the error window, close the browser window, then reopen the browser by clicking on File, then New Online Drive.
NOTE 2: In some cases, the AP program will not be downloaded to the drive during a restore. If this happens, close any open parameter browser windows, open the .dwp file (in Offline mode), change 83.01 to EDIT, click SAVE, close the parameter browser, then repeat the restore, starting with step 1 above. After the download, change 83.01 in the drive back to START to enable the AP program.
NOTE 3: If using a tachometer, you will need to perform TACHO FINE TUNING after the download by running Startup Assistant 5 (Speed Feedback Assistant) from the wizard.

Using the control panel

The current version of the control panel only supports one method of upload and download. The function DOWNLOAD APPLICATION is not currently available.

UPLOAD: This function transfers the parameter set from the DCS800 drive to the control panel. It is done as follows:

1. Put the drive in "local mode" by pushing the LOCAL REMOTE button on the control panel.
2. Select PAR BACKUP from the main menu (use the arrow button to find it), then UPLOAD TO PANEL. If the control panel reports an error "Parameter Upload Failed," the you probably did not do step 1.

DOWNLOAD: This function transfers the parameter set from the control panel to the DCS800. It is done as follows:

1. Put the drive in "local mode" by pushing the LOCAL REMOTE button on the control panel.
2. Select PAR BACKUP from the main menu (use the arrow button to find it), then DOWNLOAD FULL SET. If the control panel reports an error "Parameter Download Failed," the you probably did not do step 1.
   NOTES: 1) You must first do an UPLOAD before this function appears. 2) The function DOWNLOAD APPLICATION is currently not available.

For additional information

See the DCS800 firmware manual:

- Page 272 - 280 DCS800 panel operation
- Page 279 Parameter backup mode

Adaptive programming

Overview

This section contains some helpful hints about how to use adaptive programming.

Using spare control bits

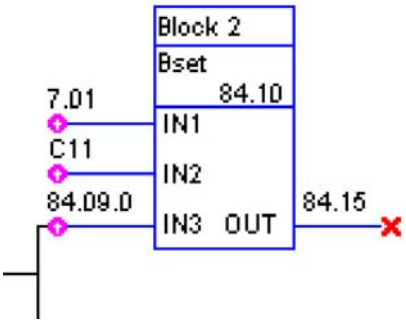
Many times with adaptive programming, a bit in a control word needs to be set. This could be a defined control bit or a spare control bit. The *MainCtrlWord (7.01)* has 11 defined bits, from bit 0 (OnOff1) to bit 10 (RemoteCmd). The last five, B11 through B15 are spare, available for use by the AP program. More often than not, it is better to use a spare control bit than a defined control bit. If you use a defined bit, one never knows whether it will be written over by the firmware, undoing the work of your AP program. Furthermore, most of the start/stop functions in group 10, including direction, reset, handauto, Off2, and E-stop, can be set to switch on one of these spare bits.

The importance of BSet (Bit Set)

Setting and clearing a bit in a control word is done by use of the BSet function block. If BSet is not used, instead of switching just one bit, the AP program will likely switch all the

bits in a word, usually setting them all to 1 (TRUE) or 0 (FALSE). The firmware uses the defined bits in the control words to perform important functions. Undoing the good work of the firmware with your AP program is bound to cause trouble.

This means that, in many cases, the last block you will use in your AP program will be a BSet block. Here is an example:



In this example, the block is toggling bit 11 of the *MainCtrlWord (7.01)* according to the state of 84.09.0, leaving the other MainCtrlWord bits as they were before. The modified copy of the MainCtrlWord is written to parameter 84.15. To complete this process, the output must be set as follows:

Block1 Out	86.01	0
Block1 Out Signal		0

Block2 Out	86.02	701
Block2 Out Signal		0

This will direct the program to write the value of block 2 output (84.15) to parameter 701 *MainCtrlWord (7.01*). This all happens very quickly. The result will be that the value of bit 11 while change, but the other bits will remain intact.

For additional information

See the DCS800 firmware manual:

- Page 67 – 75 Adaptive Program Instructions
- Page 76 – 98 Adaptive Program Function Blocks

Configuring and displaying digital inputs and outputs

Overview

In the keypad, the only way to view the status of digital inputs and outputs is in hexadecimal format (parameters 8.05 and 8.06). Setting them up during commissioning can be a bit complicated. Digital inputs and outputs (analog too) can be configured in a much more user friendly format by using the "I/O assistant" wizard in DriveWindows Light.

Using DriveWindows Light

1. Connect to the DCS800 and go on line by clicking on File, then New Online Drive.
2. Click on Wizard, on the left side of the screen.
3. Click on Advanced.
4. Check the box for "I/O assistant," then click on Next.
5. In the digital input box or digital output box, click on "edit parameters."

In this screen, you can:

- View the status of digital inputs and outputs
- Invert inputs and outputs
- View the current input and output setting
- Change the input and output setting (by clicking on edit for the desired bit)

NOTE: In many cases, the initial input and output configuration will be done by using one of the predefined macros. The "Macro assistant" is almost the same as the I/O assistant. I/O status can be viewed and configuration changed in that assistant in much the same way.

Known Issues with revision 2.20

Overview
Please be aware of the following issues with DCS800 firmware revision 2.20.

Days display in the fault logger
When viewing the fault logger display in the control panel, the number of days since the fault occurred is not shown correctly. This will be corrected with the next revision of the control panel firmware.

Ramp hold
Ramp hold is a function that, when set during ramp up or ramp down, it holds the speed at the current value. The feature is selected by setting bit 5 of the *MainCtrlWord (7.01)*. Although not apparent from the documentation, this feature is currently only available when CommandSel (10.01) is set to MainCtrlWord. It is not available when the drive is controlled via digital inputs and outputs (Local I/O).

As an alternative, a ramp hold function can be created using adaptive programming (AP). Contact ABB for additional information.

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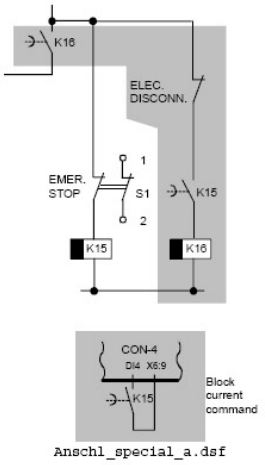
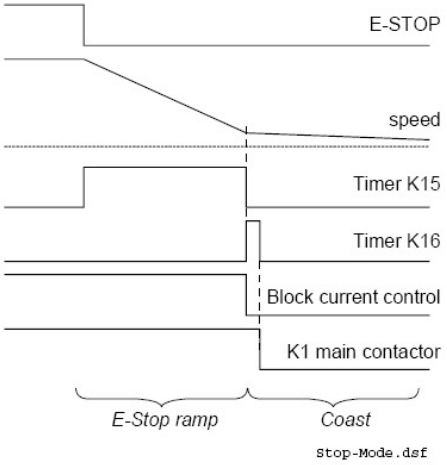
Index	Signal / Parameter name	min.	max.	def.	unit	E/C
21.10	**FlyStart (flying start)** Selection of the desired operating response to a **Run** command [*UsedMCW (7.04)*) bit 3] during braking or coasting: 0 = **StartFrom0** wait until the motor has reached zero speed [see *ZeroSpeedLim (20.03)*], then restart. In case the restart command comes before zero speed is reached **A137 SpeedNotZero** [*AlarmWord3 (9.08)* bit 4] is generated. 1 = **FlyingStart** start motor with its actual speed, when the drive was stopped by **RampStop**, **TorqueLimit** or **CoastStop**. Stop by **DynBraking** is not interrupted, wait until zero speed is reached, default 2 = **FlyStartDyn** reserved **Attention:** When using **FlyStartDyn** make sure, that the hardware (e.g. the switch disconnecting the braking resistor) is able to disconnect the current. **Int. Scaling: 1 == 1 Type: C Volatile: N**	StartFrom0	FlyingStart	FlyingStart		E
21.11	**Unused**					
21.12	**Unused**					
21.13	**Unused**					
21.14	**FanDly (fan delay)** After the drive has been switched off [*UsedMCW (7.04)* bit 0 **On** = 0], both fans (motor and converter) mustn't switched off before *FanDly (21.14)* has elapsed. If motor or converter overtemperature is pending, the delay starts after the temperature has dropped below the overtemperature limit. **Int. Scaling: 1 == 1 s Type: I Volatile: N**	0	300	30	s	E
21.15	**Unused**					
21.16	**MainContCtrlMode (main contactor control mode)** *MainContCtrlMode (21.16)* determines the reaction to **On** and **Run** commands [*UsedMCW (7.04)* bits 0 and 3]: 0 = **On** main contactor closes with **On** = 1, default 1 = **On&Run** main contactor closes with **On** = **Run** = 1 2 = **OnHVCB** for high voltage AC circuit breaker configuration (for more information see chapter XXXX); not implemented yet 3 = **DC Contactor US** clamps EMF speed, EMF voltage, armature voltage to zero until *MainContAck (10.21)* is on **Int. Scaling: 1 = 1 Type: C Volatile: N**	On	OnHVCB	On	-	E
21.17	**Unused**					





E-Stop reaction

d: DC contactor US:

DC contactor US K1.1 is a special designed contactor with 2x NO contacts for C1 and D1 connection and 1x NC contact for connection of Dynamic Brake resistor R_B.

The contactor should be controlled by signal 6.03 Bit 10.

The acknowledge can be connected to parameter:

10.21 MainContAck
10.23 DCBreakAck