# ACS800

## Firmware Manual
## ACC800 CraneDrive application program 7.42 (+N652)

# ACC800 Crane Application Program 7.42
for ACS 800 frequency converters

# Firmware Manual

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# Table of Contents

### *Control Operation*



### *Crane Program Description*

***Parameters***

***Fault Tracing and Maintenance***



***Appendix A - Complete Parameter and Default Settings***

***Appendix B - User I/O Interface diagrams***

# Introduction to the manual

## Overview

The chapter includes a description of the contents of the manual. In addition it contains information about the compatibility, safety, intended audience, and related publications.

## Compatibility

The manual is compatible with ACS800 Standard Application Program version ASXR7310. See parameter 33.01 SOFTWARE VERSION.

## Safety instructions

Follow all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission, or use the drive. The complete safety instructions are given at the beginning of the Hardware Manual.
- 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.

## Reader

The reader of the manual is expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

## Contents

The manual consists of the following chapters:

- The *Start-up* chapter instructs in setting up the application program, and how to start, stop and regulate the speed of the drive.
- The *Control panel* chapter gives instructions for using the panel.
- *Control Operation*
- *Crane Program Description*
- The *Parameters* chapter describes the actual signals and parameters of the drive.
- The *Fault Tracing and Maintenance* chapter lists the warning and fault messages with the possible causes and remedies.
- *Appendix A - Complete Parameter and Default Settings*
- *Appendix B - User I/O Interface diagrams*,

## Related documents

In addition to this manual the CraneDrive user documentation includes the following manuals:

- ACS800-01/U1 Hardware Manual or ACS800-02/U2 Hardware Manual
- ACS800 Multidrive Hardware Manuals
- ACS800 Pulse encoder RTAC-01 and RTAC-03 User's manual (optional)
- ACS800 I/O Extension modules (RDIO-01 & RAIO-01) User's manuals (optional)
- ACS800 Fieldbus adapter module, User's manuals (optional)
- DriveWindow User's Manual (optional)

New manuals will be prepared as more Option Modules and other optional extras become available. Please ask for them from the local ABB distributor.

## Revision history

The table bolow shows updates in the different revisions of this manual.

| Revision | Description | Date/By |
|---|---|---|
| R13 | | |
| R14 | | |
| R15 | Faulty page numbers corrected | 2009-06-29/GW |

# Start-up

## Chapter overview

This chapter lists and explains the Start-up Procedure and the Start-up Data Parameters. The Start-up Data Parameters are a special set of parameters that allow you to set up the CraneDrive and motor information. Start-up Data Parameters should only need to be set during start-up and should not need to be changed afterwards.

## Start-up Procedure

The start-up procedure of CraneDrive frequency converters equipped with Standard or CraneDrive Application Program is described in this chapter.

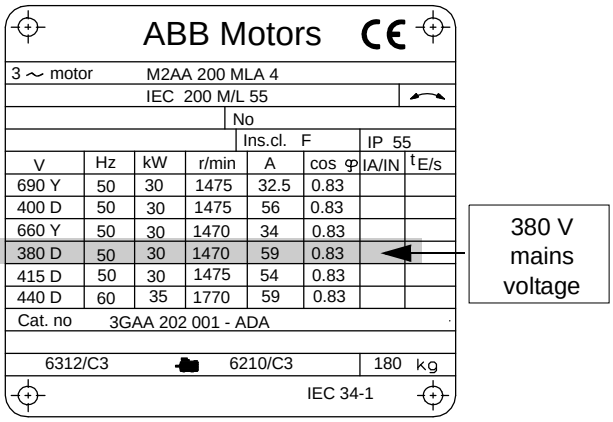
**WARNING!** All electrical installation and maintenance work described in this chapter should only be undertaken by a qualified electrician. The Safety Instructions on the first pages of this manual and appropriate hardware manual must be followed.

| SAFETY | |
|---|---|
|  | The start-up may only be carried out by a qualified electrician.<br>The safety instructions must be followed during the start-up procedure. See the appropriate hardware manual for safety instructions. |
| ☐ | Check the installation. See the installation checklist in the appropriate hardware/installation manual. |
| ☐ | Check that the starting of the motor does not cause any danger.<br>**De-couple the driven machine** if:<br>- there is a risk of damage in case of incorrect direction of rotation, or<br>- a Standard ID Run needs to be performed during the drive start-up. (ID Run is essential only in applications which require the ultimate in motor control accuracy.) |

| | | |
|---|---|---|
| | **1- POWER-UP** | |
| ☐ | **Apply mains power. The ACS800 should not be powered up more than five times in ten minutes to avoid charging resistor overheating** (no limitation for ACS 600 MultiDrive units).<br><br>The Control Panel enters the Identification Display.<br><br>The Control Panel enters the Actual Signal Display Mode automatically in a few seconds. | CDP312 PANEL<br>ID NUMBER 31<br><br>TOTAL 12 DRIVES<br><br>1 L -> 0.0% 0<br>99 START-UP DATA<br>2 APPLICATION<br>MACRO |
| | **2 - START-UP DATA ENTERING** | |
| ☐ | **Select the Application Macro.**<br>Press ***PAR*** key. | 1 L -> 0.0% 0<br>99 START-UP DATA<br>2 APPLICATION<br>MACRO |
| ☐ | Press ***ENTER***. Square brackets appear around the parameter value. Scroll available options with ▲ and ▲ , Accept the selection with ***ENTER***<br><br>A detailed description of the Application Macros is included in *Chapter Crane Program Description*.<br><br>**Select the motor control mode.** DTC is suitable in most cases. | 1 L -> 0.0% 0<br>99 START-UP DATA<br>2 APPLICATION<br>MACRO<br><br>1 L -> 0.0% 0<br>99 START-UP DATA<br>4 MOTOR CTRL MODE<br>[DTC] |

**Enter the motor data from the motor nameplate.**

**Note:** Use the motor´s (continuous duty) data = true electrical data. If nameplate is showing only duty cycle data e.g. S3-60% data, please contact motor manufacturer for S1 data.




Nominal voltage

```
1 L ->      0.0%     0
99 START-UP DATA
5 MOTOR NOM VOLTAGE
```

Press ***PAR*** key. Press ▲ to move to Parameter 99.5.

Press ***ENTER***. Enter the value by ▲ and ▼. Press ***ENTER***. Allowed range: ½ · UN ... 2 · UN of ACS800. ( UN refers to the highest voltage in each of the nominal voltage ranges: 415 VAC for 400 VAC units, 500 VAC for 500 VAC units and 690 VAC for 600 VAC
units.)

```
1 L ->      0.0%     0
99 START-UP DATA
6 MOTOR NOM CURRENT
```

***Note:*** Enter exactly the value given on the nameplate.
Repeat the procedure for the following parameters:

```
1 L ->      0.0%     0
99 START-UP DATA
7 MOTOR NOM FREQ []
```

Nominal current 99.6
Allowed range: 1/6 · Ihd ... 2 · Ihd of ACS800

Nominal frequency 99.7
Range: 8 ... 300 Hz

☐ Nominal speed 99.8

Range: 1 ... 18000 rpm

```
1 L ->     0.0%   0
99 START-UP DATA
8 MOTOR NOM SPEED []
```

**Set the motor data exactly the same as on the motor nameplate (should be the rated *full-load* speed). For example, if the motor nominal speed is 1440 rpm on the nameplate, setting the value of Parameter 99.8 MOTOR NOM SPEED to 1500 rpm (e.g. no-load speed) results in wrong operation of the drive.**

Nominal power 99.9
Range: 0 ... 9000 kW

```
1 L ->     0.0%   0
99 START-UP DATA
9 MOTOR NOM POWER []
```

☐ When the motor data has been entered a warning appears. It indicates that the motor parameters have been set, and the CraneDrive is ready to start the motor identification (ID magnetisation or ID Run). Press PAR to go to the next parameter 99.10 Motor ID Run.

```
1 L ->     0.0%   0
STANDARD DRIVE
** WARNING **
ID MAGN REQ
```

Motor ID Run 99.10

```
1 L ->     0.0%   0
99 START-UP DATA
10 MOTOR ID RUN
[ID MAGN]
```

Selection ID MAGN is sufficient for less demanding travel drives. The next step of this flowchart is performed with Motor ID Run selection ID MAGN. Motor identification magnetisation is performed instead of Motor ID Run.

Motor ID Run is recommended for hoist drives.

Motor Identification Run (ID Run) can be performed to enhance the mathematical model of the motor. This is required e.g. in demanding motor control applications when no pulse encoder feedback is used, as 100 % motor control accuracy is usually only achieved with the ID Run. Refer to section *Start-up Data* for performance procedure of the ID Run.

**3 - IDENTIFICATION MAGNETISATION with Motor ID Run selection ID MAGN**

☐ Press the ⏀ key. The motor is magnetised at zero speed.

Duration approximately 10 to 60 s.

```
1 L ->     0.0%   1
STANDARD DRIVE
** WARNING **
ID MAGN
```

```
1 L ->     0.0%   0
STANDARD DRIVE
** WARNING **
ID DONE
```

## 4 - ROTATION DIRECTION OF THE MOTOR

☐ Increase the speed reference from zero to a small value: Press ACT, PAR or FUNC key to enter Keypad Mode with the status row visible. Change the Speed Reference value by pressing REF and then or . Press (Start) to start the motor. Check that the motor is running in the desired direction. Stop the motor by pressing .

To change the rotation direction of the motor: Disconnect mains power from the CraneDrive, and wait 5 minutes for the intermediate circuit capacitors to discharge. Measure the voltage between each input terminal (U1, V1 and W1) and earth with a multimeter to ensure that the frequency converter is discharged.

2. Exchange the position of two motor cable phase conductors at the motor terminals or at the motor connection box.

3. Verify your work by applying mains power and repeating the check as described above.

```
1 L ->   [xx.x]% 1
SPEED     xxxx rpm
TORQUE      xx %
CURRENT     xx A
```

## 5 - SPEED LIMITS AND ACCELERATION/DECELERATION TIMES

☐ Press **PAR**. Use and to scroll parameters

Minimum speed

```
1 L ->     0.0%   0
20 LIMITS
1 MINIMUM SPEED []
```

Enter the value by ENTER and or . Press ENTER.

Repeat the procedure for the following parameters:

Maximum speed

```
1 L ->     0.0%   0
20 LIMITS
2 MAXIMUM SPEED []
```

Acceleration times

```
1 L ->     0.0%   0
69 REFERENCE HANDLER
2 ACC TIME FORW
```

```
1 L ->     0.0%   0
69 REFERENCE HANDLER
3 ACC TIME REV
```

Deceleration times

```
1 L ->    0.0%    0
69 REFERENCE HANDLER
4 DEC TIME FORW
```

```
1 L ->    0.0%    0
69 REFERENCE HANDLER
5 DEC TIME REV
```

For other parameters see chapter *Parameters*.

## Start-up Data

To access the Start-up Data Parameters you must enter the Parameter Mode. The Start-up Data Parameters appear on the display (Parameter Group 99). After the Start-up parameters for the motor are set, the display shows the last edited Parameter Group when entering Parameter Mode and no longer returns to the Parameter Group 99.

In the Start-up Data group there are parameters for selecting the Application Macro and the Motor Information Parameters containing the basic settings required to match the CraneDrive with your motor.

When changing the value of the Start-up Data Parameters, follow the procedure described in section *Parameter mode* on page *26*. The table on page 13 lists the Start-up Data Parameters. The Range/Unit column shows the parameter values, which are explained in detail below the table.

**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. The following warning will be displayed:

```
**Warning**
NO MOT DATA
```

If the Motor Control Mode (Parameter 99.4) is set to SCALAR, the comparison between the nominal current of the motor and the nominal current of the inverter is not made.

**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.

*Start-up Data parameters*

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 LANGUAGE | Languages | Display language selection. |
| 2 APPLICATION MACRO | Application macros | Application macro selection. |
| 3 APPLIC RESTORE | NO; YES | Restores parameters to factory setting values. |
| 4 MOTOR CTRL MODE | DTC; SCALAR | Motor control mode selection. |
| 5 MOTOR NOM VOLTAGE | ½ * UN of ACS800 ... 2 * UN of ACS800 | Nominal voltage from the motor rating plate. |
| 6 MOTOR NOM CURRENT | 1/6 * Ihd of ACS800 ... 2 * Ihd of ACS800 | Matches the ACS800 to the rated (S1) motor current. |
| 7 MOTOR NOM FREQ | 8 ... 300 Hz | Nominal frequency from the motor rating plate. |
| 8 MOTOR NOM SPEED | 1 ... 18 000 rpm | Nominal speed from the motor rating plate. |
| 9 MOTOR NOM POWER | 0 ... 9000 kW | Nominal (S1) power from the motor rating plate. |
| 10 MOTOR ID RUN? | ID MAGN; STANDARD; REDUCED | Selects the motor ID self-tune run.<br>**NOTE: This will cause the motor to operate after start command.** |
| 11 DEVICE NAME | "free text" | Drive section name, e.g. "Main Hoist". |

## Parameter Selection

The following is a list of the Start-up Data Parameters with a description of each parameter. **The motor data parameters 99.5 ... 99.9 are always to be set at start-up**.

### 1 LANGUAGE

The ACS800 displays all information in the language you select. The 13 alternatives are: English, American English, German, Italian, Spanish, Portugese, Dutch, French, Danish, Finnish, Swedish, Czech and Polish. **Please note that for ACC800 sw version 7.1 only following languages are available: English, German, French, Spanish and Finnish.**

### 2 APPLICATION MACRO

This parameter is used to select between the **CRANE** macro, for crane drive functions but not including Master/Follower bus communication, and the **M/F CTRL** macro with the crane drive functions plus Master/Follower bus communication. Refer to chapter *Crane Program Description*, for a description of the two available macros. There is also a selection for saving the current parameter settings as a User Macro (USER 1 SAVE or USER 2 SAVE), and recalling these settings (USER 1 LOAD or USER 2 LOAD).

Parameter group 99 is not included in CRANE and M/F CTRL macros. The parameter settings will remain the same even though the macro is changed.

---

**NOTE:** User Macro load restores also the motor settings of the Start-up Data group and the results of the Motor ID Run. Check that the settings correspond to the motor used.

---

### 3 APPLIC RESTORE

Selection Yes restores the original settings of an application macro as follows:

- If application macro CRANE or M/F CTRL is selected, the parameter values are restored to the settings loaded at the factory. Exceptions: Parameter setting in groups 50, 51, 98 and 99 remain unchanged.

- If User Macro 1 or 2 is selected, the parameter values are restored to the last saved values. In addition, the results of the motor identification run are restored (see chapter *Crane Program Description*). Exceptions: Parameter setting in groups 50, 51 and 98 remain unchanged.

### 4 MOTOR CTRL MODE

This parameter sets the motor control mode.

*DTC*

The DTC (Direct Torque Control) mode is suitable for most applications. The CraneDrive performs precise speed and torque control of standard squirrel cage motors. Pulse encoder feedback is required on all Crane Hoist Drives.

In multi-motor applications the nominal voltage of each motor has to be equal to the nominal voltage of the inverter and the nominal frequency of each motor must be the same. The sum of the motor nominal currents has to fall within the limits specified at Parameter 99.6 (MOTOR NOMINAL CURRENT).

*SCALAR*

The SCALAR control mode is recommended for multi-motor drives when number of motors connected to the CraneDrive is variable. The 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.

With SCALAR control the drive is not as effective as with DTC control. The differences between the SCALAR and DTC control modes are discussed further in this manual in relevant parameter lists.

The motor identification run, torque control, and motor phase loss check (Parameter 30.10) are disabled in the SCALAR control mode.

**5 MOTOR NOM VOLTAGE**

This parameter matches the CraneDrive with the nominal voltage of the motor as indicated on the motor rating plate. It is not possible to start the CraneDrive without setting this parameter.

---

**Note:** It is not allowed to connect a motor with nominal voltage less than ½ × $U_N$ or more than 2 × $U_N$ where $U_N$ is either 415 V, 500 V or 690 V depending on the voltage rating of the ACS800 used.

---

**6 MOTOR NOM CURRENT**

This parameter matches the ACS800 to the rated motor current. The allowed range 1/6 × $I_{hd}$ of ACS800 … 2 × $I_{hd}$ of ACS800 is valid for DTC motor control mode. In SCALAR mode the allowed range is 0 × $I_{hd}$ of ACS800 … 3 × $I_{hd}$ of ACS800.

Correct motor run requires that the magnetising current of the motor does not exceed 90 per cent of the nominal current of the inverter.

**7 MOTOR NOM FREQUENCY**

This parameter matches the ACS800 to the rated motor frequency, adjustable from 8 Hz to 300 Hz.

**8 MOTOR NOM SPEED**

This parameter matches the ACS800 to the nominal speed as indicated on the motor rating plate.

---

**NOTE:** It is very important to set this parameter in order to achieve the best possible accuracy in speed control.

---

**9 MOTOR NOM POWER**

This parameter matches the ACS800 to the rated power of the motor, adjustable between 0.5 kW and 9000 kW.

**10 MOTOR ID RUN**

This parameter is used to initiate the Motor Identification Run. During the run, the ACS800 will identify the characteristics of the motor for optimum motor control. The ID Run takes about one minute.

**NOTE: Torque monitor and Torque proving is automatically disabled during ID Magn (first start) and ID Run. Other optional crane functions like: Power optimization and Torque memory should also be disabled during ID Run!**

Any change of limitations (Parameter Group 20) should be done after performing the Motor ID Run (use default values). These limits may affect the result of the ID Run.

*ID MAGN*

The Motor ID Run is not performed. This can be selected in most applications. The motor model is calculated at first start by magnetising the motor for 10 to 60 s at zero speed.

**Note:** The ID Run (Standard or Reduced) should be selected if:

- operation point is near zero speed
- operation at torque range above the motor nominal torque within wide speed range and without any pulse encoder (i.e. without any measured speed feedback) is required

*STANDARD*

Performing the Standard Motor ID Run guarantees that the best possible control accuracy is achieved. The motor must be decoupled from the driven equipment before performing the Standard Motor ID Run.

*REDUCED*

The Reduced Motor ID Run should be selected instead of the Standard ID Run:

- if mechanical losses are higher than 20 % (i.e. the motor cannot be de-coupled from the driven equipment)
- if flux reduction is not allowed while the motor is running (i.e. there are auxiliary devices connected in parallel with the motor)

NOTE: Check the rotation direction of the motor 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. BE SURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE MOTOR ID RUN!

**11 DEVICE NAME**

This parameter can be used to set a name, e.g. Main Hoist, on the drive. The parameter can only be set using DriveWindow PC tool (it is not possible to enter text from the CDP312R panel). The name will appear on the DriveWindow configuration picture, and also on the CDP312R panel if pressing DRIVE key.

## ID Run Procedure

To perform the Motor ID Run (Drive must be in LOCAL mode):

---

**Note*:*** If parameter values (Group 10 to 98) are changed before the ID Run, check that the new settings meet the following conditions:

- 20.01 MINIMUM SPEED $\leq$ 0 rpm
- 20.02 MAXIMUM SPEED > 80% of motor rated speed
- 20.03 MAXIMUM CURRENT $\geq$ 100% · $I_{hd}$
- 20.04 MAXIMUM TORQUE > 50%

---

- Ensure that the panel is in the local control mode (L displayed on the status row). Press the ***LOC/REM*** key to switch between modes.
- Change the ID Run selection to STANDARD or REDUCED.

```
1 L -> 0.0 %     O
99 START-UP DATA
10 MOTOR ID RUN
[STANDARD]
```

- Press ***ENTER*** to verify selection. The following message will be displayed:

```
1 L -> 0.0 %     O
ACS 800 75 kW
**WARNING**
ID RUN SEL
```

- To start the ID Run, press the ⏀ key. The Power On Ackn input (e.g. DI2, see parameter 10.5) must be active if used..

| Warning when the ID Run is started | Warning during the ID Run | Warning after a successfully completed ID Run |
|---|---|---|
| 1 L -> 11.3 % I<br>ACS 800 75 kW<br>**WARNING**<br>MOTOR STARTS | 1 L -> 11.3 % I<br>ACS 800 75 kW<br>**WARNING**<br>ID RUN | 1 L -> 11.3 % I<br>ACS 800 75kW<br>**WARNING**<br>ID DONE |

After completing the ID Run, the Actual Signal Display mode is entered by pressing the RESET key.

The Motor ID Run can be stopped at any time by pressing the Control Panel key.

Pressing any other key than **ACT**, **FUNC** or **DRIVE** while the previous warning messages are displayed will clear the display and return the panel to Parameter Mode, Parameter 99.10. Either STANDARD, REDUCED or ID MAGN will be displayed according to whether the ID Run is in progress or not. If no keys are pressed within 60 seconds and the ID Run is still in progress, the warning message is restored.

Actual signal no. 1.16 IDENTIF RUN DONE will be set True when the ID Run has been completed OK.

**NOTE: Any change of the motor data parameters 99.5 … 99.9 after a completed ID Run will delete the ID Run performed. A new ID Run (or First start) has to be performed without load before being able to operate the drive again.**

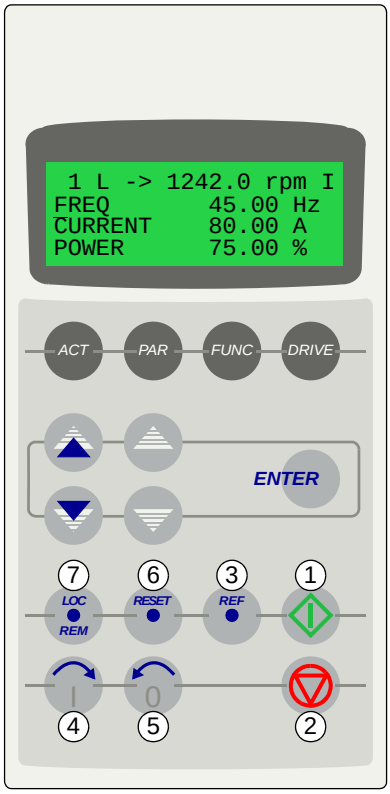
# Control panel

## Chapter overview

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

The same control panel is used with all ACS800 series drives, so the instructions given apply to all ACS800 types. The display examples shown are based on the Standard Application Program; displays produced by other application programs may differ slightly.

## Overview of the panel




The LCD type display has 4 lines of 20 characters.

The language is selected at start-up (parameter 99.01).

The control panel has four operation modes:

- Actual Signal Display Mode (ACT key)
- Parameter Mode (PAR key)
- Function Mode (FUNC key)
- Drive Selection Mode (DRIVE key)

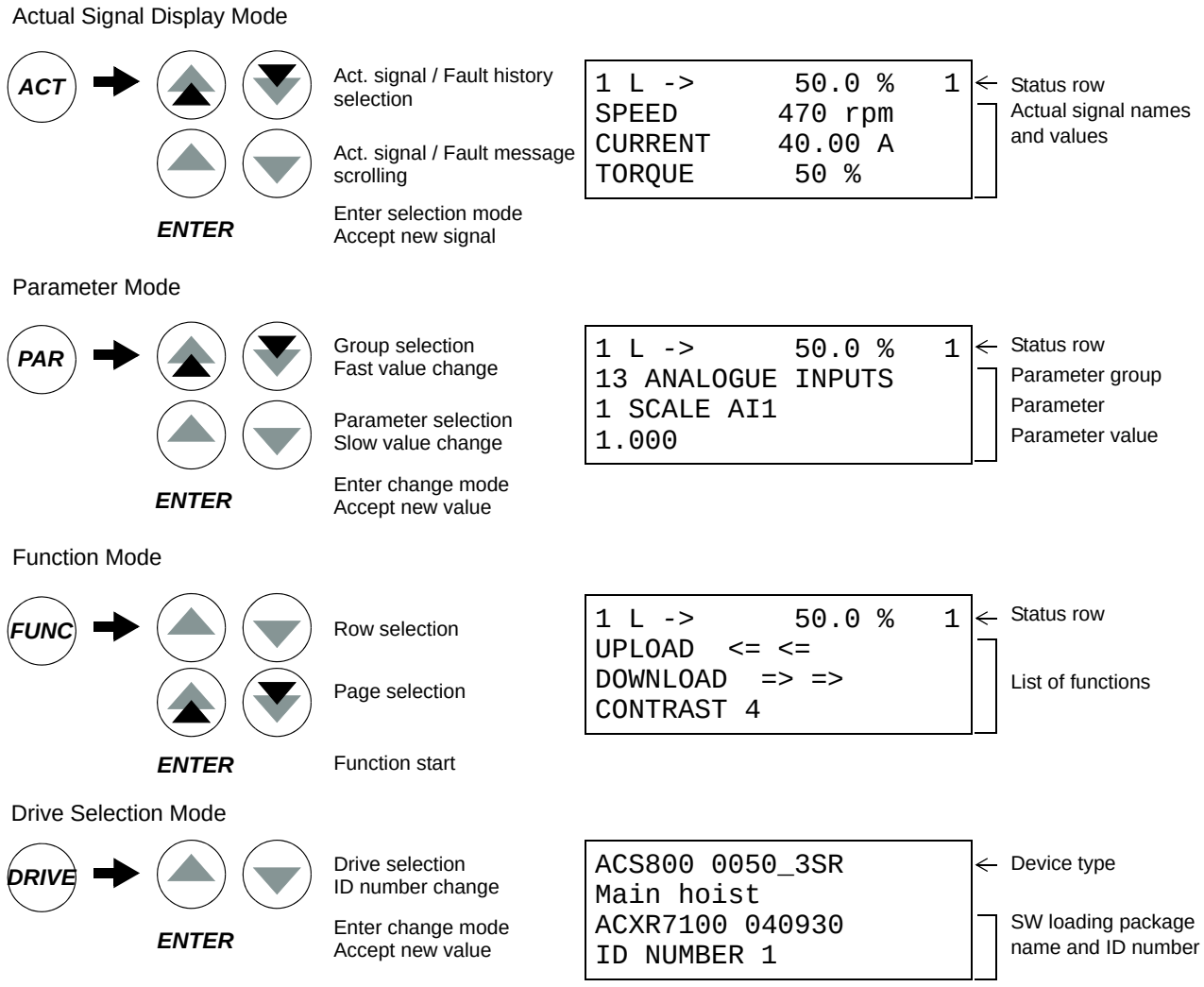
The use of single arrow keys, double arrow keys and ENTER depend on the operation mode of the panel.

The drive control keys are:

| No. | Use |
|---|---|
| 1 | Start |
| 2 | Stop |
| 3 | Activate reference setting |
| 4 | Forward direction of rotation |
| 5 | Reverse direction of rotation |
| 6 | Fault reset |
| 7 | Change between Local / Remote (external) control |

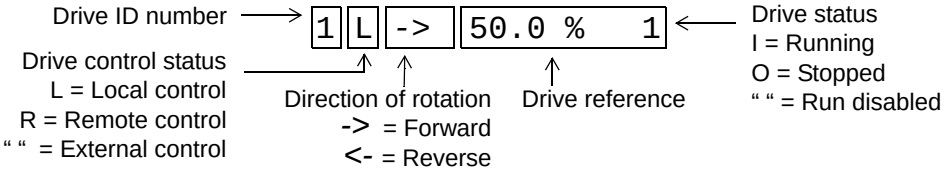
### Panel operation mode keys and displays

The figure below shows the mode selection keys of the panel, and the basic operations and displays in each mode.




### Status row

The figure below describes the status row digits.



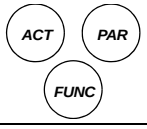
## Drive control with the panel

The user can control the drive with the panel as follows:

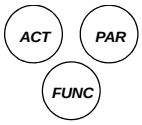
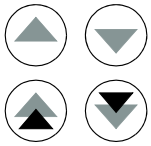
- start, stop, and change direction of the motor.
- give the motor speed reference.
- reset the fault and warning messages.
- change between local and external drive control.

The panel can be used for control of the drive control always when the drive is under local control and the status row is visible on the display.

### How to start, stop and change direction

| Step | Action | Press Key | Display |
|---|---|---|---|
| 1. | To show the status row. |  | 1 -> 50 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 2. | To switch to local control.<br>(only if the drive is not under local control, i.e. there is no L on the first row of the display.) |  | 1 L -> 50 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 3. | To stop |  | 1 L -> 50 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 4. | To start |  | 1 L -> 50 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 5. | To change the direction to reverse. |  | 1 L <- 50 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 6. | To change the direction to forward. |  | 1 L -> 50 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |

## How to set speed reference

| Step | Action | Press Key | Display |
|---|---|---|---|
| 1. | To show the status row. |  | 1 -> 50.0 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 2. | To switch to local control.<br>(Only if the drive is not under local control, i.e. there is no L on the first row of the display.) |  | 1 L -> 50.0 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 3. | To enter the Reference Setting function. |  | 1 L -> 50.0 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 4. | To change the reference.<br>(slow change)<br><br>(fast change) |  | 1 L -> 75.0 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 5. | To save the reference.<br>(The value is stored in the permanent memory; it is restored automatically after power switch-off.) | ***ENTER*** | 1 L -> 75.0 % 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |

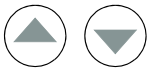
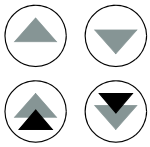
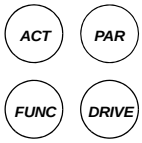
## Actual signal display mode

In the Actual Signal Display Mode, the user can:

- show three actual signals on the display at a time
- select the actual signals to display
- view the fault history
- reset the fault history.

The panel enters the Actual Signal Display Mode when the user presses the ***ACT*** key, or if he does not press any key within one minute.

### How to select actual signals to the display

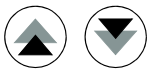
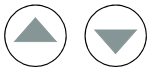
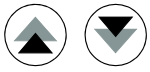
| Step | Action | Press key | Display |
|---|---|---|---|
| 1. | To enter the Actual Signal Display Mode. |  | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 2. | To select a row (a blinking cursor indicates the selected row). |  | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 3. | To enter the actual signal selection function. | ***ENTER*** | 1 L -> 50.0% 1<br>1 ACTUAL SIGNALS<br>5 TOURQE 50 % |
| 4. | To select an actual signal.<br><br>To change the actual signal group. |  | 1 L -> 50.0 % 1<br>1 ACTUAL SIGNALS<br>6 POWER 75.00 % |
| 5.a | To accept the selection and to return to the Actual Signal Display Mode. | ***ENTER*** | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>POWER 70.00 %<br>CURRENT 40 A |
| 5.b | To cancel the selection and keep the original selection.<br><br>The selected keypad mode is entered. |  | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |

### How to display the full name of the actual signals

| Step | Action | Press key | Display |
|---|---|---|---|
| 1. | To display the full name of the three actual signals. | **Hold**<br>  | 1 L -> 50.0% 1<br>MOTOR SPEED FILT<br>MOTOR TORQUE FILT<br>MOTOR CURRENT |
| 2. | To return to the Actual Signal Display Mode. | **Release**<br>  | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |

### How to view and reset the fault history

**Note:** The fault history cannot be reset if there are active faults or warnings.

| Step | Action | Press key | Display |
|---|---|---|---|
| 1. | To enter the Actual Signal Display Mode. |  | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |
| 2. | To enter the Fault History Display. |  | 1 L -> 50.0% 1<br>1 LAST FAULT<br>+OVERCURRENT r<br>6451 H 21 MIN 23 S |
| 3. | To select the previous (UP) or the next fault/warning (DOWN).<br><br>To clear the Fault History. |  <br>  | 1 L -> 50.0% 1<br>2 LAST FAULT<br>+OVERVOLTAGE r<br>1121 H 1 MIN 23 S<br>1 L -> 50.0% 1<br>2 LAST FAULT<br><br>H MIN S |
| 4. | To return to the Actual Signal Display Mode. |  | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |

### How to display and reset an active fault

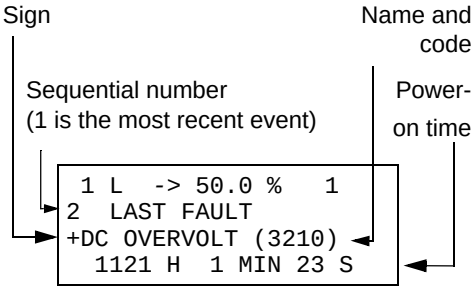
**WARNING!** If an external source for start command is selected and it is ON, the drive will start immediately after fault reset. If the cause of the fault has not been removed, the drive will trip again.

| Step | Action | Press Key | Display |
|---|---|---|---|
| 1. | To display an active fault. | ACT | 1 L -> 50.0% 1<br>ACS800 75 kW<br>** FAULT **<br>ACS800 TEMP |
| 2. | To reset the fault. | RESET | 1 L -> 0.0% 1<br>SPEED 0 rpm<br>TORQUE 0 %<br>CURRENT 0 A |

### About the fault history

The fault history restores information on the latest events (faults, warnings and resets) of the drive. The table below shows how the events are stored in the fault history.

**A Fault History View**




| Event | Information on display |
|---|---|
| Drive detects a fault and generates a fault message | Sequential number of the event and LAST FAULT text.<br>Name of the fault and a “+” sign in front of the name.<br>Total power-on time. |
| User resets the fault message. | Sequential number of the event and LAST FAULT text.<br>-RESET FAULT text.<br>Total power-on time. |
| Drive generates a warning message. | Sequential number of the event and LAST WARNING text.<br>Name of the warning and a “+” sign in front of the name.<br>Total power-on time. |
| Drive deactivates the warning message. | Sequential number of the event and LAST WARNING text.<br>Name of the warning and a “-” sign in front of the name.<br>Total power-on time. |

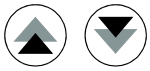
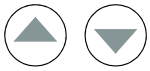
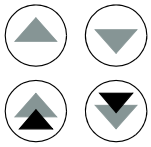
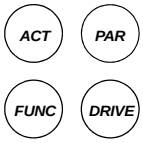
## Parameter mode

In the Parameter Mode, the user can:

- view the parameter values
- change the parameter settings.

The panel enters the Parameter Mode when the user presses the ***PAR*** key.

### How to select a parameter and change the value

| Step | Action | Press key | Display |
|---|---|---|---|
| 1. | To enter the Parameter Mode. |   | 1 L -> 50.0% 1<br>13 ANALOGUE INPUTS<br>1 SCALE AI1<br>1.000 |
| 2. | To select a group. |  | 1 L -> 50.0% 1<br>13 ANALOGUE INPUTS<br>1 SCALE AI1<br>1.000 |
| | | | 1 L -> 50.0% 1<br>14 RELAY OUPUTS<br>1 RELAY RO1 OUTPUT<br>BRAKE LIFT |
| 3. | To select an index. |  | 1 L -> 50.0% 1<br>14 RELAY OUPUTS<br>3 RELAY RO3 OUTPUT<br>FAULT-N |
| 4. | To enter the parameter setting function. | ***ENTER*** | 1 L -> 50.0% 1<br>14 RELAY OUPUTS<br>3 RELAY RO3 OUTPUT<br>[FAULT-N] |
| 5. | To change the parameter value.<br>- (slow change for numbers and text)<br>- (fast change for numbers only) |  | 1 L -> 50.0% 1<br>14 RELAY OUPUTS<br>3 RELAY RO3 OUTPUT<br>[CONTROL LOC] |
| 6a. | To save the new value. | ***ENTER*** | 1 L -> 50.0% 1<br>14 RELAY OUPUTS<br>3 RELAY RO3 OUTPUT<br>CONTROL LOC |
| 6b. | To cancel the new setting and keep the original value, press any of the mode selection keys.<br>The selected mode is entered. |   | 1 L -> 50.0% 1<br>13 ANALOGUE INPUTS<br>1 SCALE AI1<br>1.000 |

## Function mode

In the Function Mode, the user can:

- save the drive parameter values and motor data from the drive to the panel.
- load group 1 to 97 parameter values from the panel to the drive. [1)]
- adjust the contrast of the display.

The panel enters the Function Mode when the user presses the ***FUNC*** key.

**NOTE!**
Saving data from the drive to the panel is also referred to as *upload*
Loading data to the drive is also referred to as *download*

### How to upload data from a drive to the panel

---

**Note:**

- Always upload to the panel before downloading to the drive.
- Ensure the firmware of the destination drive is the same (e.g. standard firmware).
- Before removing the panel from a drive, ensure the panel is in remote operating mode (change with the LOC/REM key).
- Stop the drive before downloading data to it.

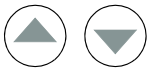
---

Before download, repeat the following steps in each drive:

- Setup the motors.
- Activate the communication to the optional equipment. (See parameter group 98 OPTION MODULES)

Before upload, do the following in the drive from which the data is to be taken:

- Set the parameters in groups 10 to 97 as preferred.
- Proceed to the save sequence (below).

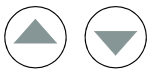
| Step | Action | Press Key | Display |
|---|---|---|---|
| 1. | Enter the Function Mode. |   | 1 L -> 0.0% 0<br>UPLOAD <=<=<br>DOWNLOAD =>=><br>CONTRAST 4 |
| 2. | Enter the page that contains the upload, download and contrast functions. |  | 1 L -> 0.0% 0<br>UPLOAD <=<=<br>DOWNLOAD =>=><br>CONTRAST 4 |
| 3. | Select the upload function (a flashing cursor indicates the selected function). |  | 1 L -> 0.0% 0<br>UPLOAD <=<=<br>DOWNLOAD =>=><br>CONTRAST 4 |

[1)] The parameter groups 98, 99 and the results of the motor identification are not included by default. The restriction prevents downloading of unfit motor data. In special cases it is, however, possible to download all. For more information, please contact your local ABB representative.

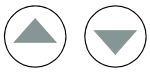
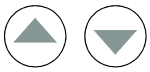
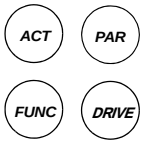
| Step | Action | Press Key | Display |
|---|---|---|---|
| 4. | Enter the upload function. | ***ENTER*** | `1 L ->  0.0%  0`<br>`UPLOAD  <=<=` |
| 5. | Switch to external control.<br>(No L on the first row of the display.) |  | `1 L ->  0.0%  0`<br>`UPLOAD  <=<=`<br>`DOWNLOAD  =>=>`<br>`CONTRAST  4` |
| 6. | Disconnect the panel and reconnect it to the drive into which the data will be downloaded. | | |

### How to download data from the panel to a drive

Consider the notes in section *How to upload data from a drive to the panel* on page *27*.

| Step | Action | Press Key | Display |
|---|---|---|---|
| 1. | Connect the panel containing the uploaded data to the drive. | | |
| 2. | Ensure the drive is in local control (L shown on the first row of the display). If necessary, press the ***LOC/REM*** key to change to local control. |  | `1 L ->  50.0%  1`<br>`SPEED  470 rpm`<br>`TORQUE  50 %`<br>`CURRENT  40 A` |
| 3. | Enter the Function Mode. |  | `1 L ->  50.0%  1`<br>`Motor Setup`<br>`Application Macro`<br>`Speed Control EXT1` |
| 4. | Enter the page that contains the upload, download and contrast functions. |  | `1 L ->  50.0%  0`<br>`UPLOAD  <=<=`<br>`DOWNLOAD  =>=>`<br>`CONTRAST  4` |
| 5. | Select the download function (a flashing cursor indicates the selected function). |  | `1 L ->  50.0%  0`<br>`UPLOAD  <=<=`<br>`DOWNLOAD  =>=>`<br>`CONTRAST  4` |
| 6. | Start the download. | ***ENTER*** | `1 L ->  50.0%  0`<br>`DOWNLOAD  =>=>` |

## How to set the contrast of the display

| Step | Action | Press Key | Display |
|---|---|---|---|
| 1. | Enter the Function Mode. |   | 1 L -> 50.0% 1<br>Motor Setup<br>Application Macro<br>Speed Control EXT1 |
| 2. | Enter the page that contains the upload, download and contrast functions. |  | 1 L -> 50.0% 1<br>UPLOAD <=<=<br>DOWNLOAD =>=><br>CONTRAST 4 |
| 3. | Select a function (a flashing cursor indicates the selected function). |  | 1 L -> 50.0% 1<br>UPLOAD <=<=<br>DOWNLOAD =>=><br>CONTRAST 4 |
| 4. | Enter the contrast setting function. | ***ENTER*** | 1 L -> 50.0% 1<br>CONTRAST [4] |
| 5. | Adjust the contrast. |  | 1 L -> 50.0% 1<br>CONTRAST [6] |
| 6.a | Accept the selected value. | ***ENTER*** | 1 L -> 50.0% 1<br>UPLOAD <=<=<br>DOWNLOAD =>=><br>CONTRAST 6 |
| 6.b | Cancel the new setting and retain the original value by pressing any of the mode selection keys.<br><br>The selected mode is entered. |   | 1 L -> 50.0% 1<br>SPEED 470 rpm<br>TORQUE 50 %<br>CURRENT 40 A |

## Drive selection mode

In normal use the features available in the Drive Selection Mode are not needed; the features are reserved for applications where several drives are connected to one panel link. (For more information, see the *Installation and Start-up Guide for the Panel Bus Connection Interface Module, NBCI*, [3AFY58919748 (English)].

In the Drive Selection Mode, the user can:

- Select the drive with which the panel communicates through the panel link.
- Change the identification number of a drive connected to the panel link.
- View the status of the drives connected on the panel link.

The panel enters the Drive Selection Mode when the user presses the ***DRIVE*** key.

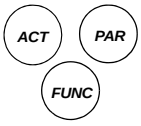
Each on-line station must have an individual identification number (ID). By default, the ID number of the drive is 1.

---

**Note:** The default ID number setting of the drive should not be changed unless the drive is to be connected to the panel link with other drives on-line.

---

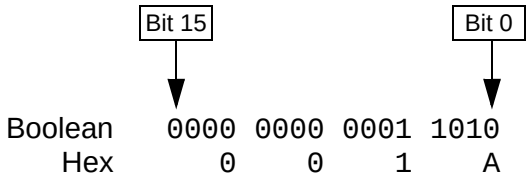
### How to select a drive and change its panel link ID number

| Step | Action | Press key | Display |
|---|---|---|---|
| 1. | To enter the Drive Selection Mode. |  | ACS800<br><br>ASAAA5000 xxxxxx<br>ID NUMBER 1 |
| 2. | To select the next drive/view.<br>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.<br>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 the double-arrow up to view the rest of them. |  | ACS800<br><br>ASAAA5000 xxxxxx<br>ID NUMBER 1<br><br>1ơ<br><br>Status Display Symbols:<br>ơ = Drive stopped, direction forward<br>↑= Drive running, direction reverse<br>F = Drive tripped on a fault |
| 3. | To connect to the last displayed drive and to enter another mode, press one of the mode selection keys.<br><br>The selected mode is entered. |  | 1 L -> 1242.0 rpm I<br>FREQ 45.00 Hz<br>CURRENT 80.00 A<br>POWER 75.00 % |

## Reading and entering packed boolean values on the display

Some actual values and parameters are packed boolean, i.e. each individual bit has a defined meaning (explained at the corresponding signal or parameter). On the control panel, packed boolean values are read and entered in hexadecimal format.

In this example, bits 1, 3 and 4 of the packed boolean value are ON:



# Control Operation

## Overview

This chapter describes the Actual Signals, the Fault History and explains Keypad and External control.

---

**Note:** The ACS800 is a speed controlled device. If you need to change frequency to speed use the following formula:

$$\text{SPEED (rpm)} = \frac{\text{FREQUENCY (Hz)}}{\text{NUMBER OF POLES}} \times 120$$

Pole pairs = 1, 2, 3,..
Number of poles = 2, 4, 6,...

---

## Actual Signals

Actual Signals monitor CraneDrive functions. They do not affect the performance of the CraneDrive. Actual Signal values are measured or calculated by the drive and they cannot be set by the user

The Actual Signal Display Mode of the Control Panel continuously displays three actual signals. When the ACT key is pressed, the full name of the three Actual Signals will be displayed. When the key is released, the short name (8 characters) and the value are displayed.

```
1L ->  50 %      1
SPEED         470 rpm
TORQUE         50 %
CURRENT        40 A
```

The next page lists the Actual Signals: selected or monitored values, and functions.

To select the actual values to be displayed follow the procedure described in chapter *Control panel*.

*Group 1, Actual signals*

| Actual Signal (Group 1) | Short name | Range/Unit | Description |
|---|---|---|---|
| 1 SPEED ESTIMATED | SP ESTIM | rpm | The estimated motor speed value, in rpm. |
| 2 MOTOR SPEED FILT | SPEED | rpm | Filtered motor speed value, in rpm. |
| 3 FREQUENCY | FREQ | Hz | Frequency to motor |
| 4 MOTOR CURRENT | CURRENT | A | Motor current |
| 5 MOTOR TORQUE FILT | TORQUE | % | Calculated motor torque. 100 is the motor nominal torque rating. |
| 6 POWER | POWER | % | Motor power. 100 is the nominal power rating. |
| 7 DC BUS VOLTAGE V | DC BUS V | V | Intermediate circuit voltage displayed in VDC. |
| 8 MAINS VOLTAGE | MAINS V | V | Calculated supply voltage at power on. |
| 9 OUTPUT VOLTAGE | OUT VOLT | V | Calculated motor voltage. |
| 10 ACS800 TEMP | ACS TEMP | % | Relative temperature of the heatsink of maximum. |
| 11 APPLICATION MACRO | MACRO | CRANE; M/F CTRL; USER 1 LOAD; USER 2 LOAD | |
| 12 SPEED REF | SPEED REF | rpm | Speed reference before ramp. |
| 13 CTRL LOCATION | CTRL LOC | LOCAL; I/O CTRL 1; FIELDBUS; M/F CTRL; I/O CTRL 2 | Active control location. |
| 14 OP HOUR COUNTER | OP HOURS | h (hours) | Elapsed power-on time meter. |
| 15 KILOWATT HOURS | kW HOURS | kWh | kWh meter. |
| 16 IDENTIF RUN DONE | ID RUN | True; False | Motor ID Run is done. |
| 17 DI7-1 STATUS | DI7-1 | | Status of RMIO digital inputs. |
| 18 AI1 (V) | AI1 (V) | V | Value of RMIO analogue input 1. |
| 19 AI2 (mA) | AI2 (mA) | mA | Value of RMIO analogue input 2. |
| 20 EXT AI1 (V) | EXT AI1 | V | Value of RAIO-01 input 1. |
| 21 RO3-1 STATUS | RO3-1 | | Status of RMIO relay outputs. |
| 22 AO1 (mA) | AO1 (mA) | mA | Value of RMIO analogue output 1. |
| 23 AO2 (mA) | AO2 (mA) | mA | Value of RMIO analogue output 2. |
| 24 INERTIA | INERTIA | $kgm^2$ | Calculated inertia from power optimization autotune |
| 25 EXT DI6-1 STATUS | EX DI6-1 | | Status of RDIO digital inputs. |
| 26 EXT RO4-1 STATUS | EX RO4-1 | | Status of RDIO digital outputs. |
| 27 MOTOR RUN-TIME | RUN-TIME | h (hours) | Elapsed motor run-time meter. |
| 28 MOTOR TEMP EST | MOT TEMP | C (deg Celcius) | Estimated motor temperature. |
| 29 CTRL BOARD TEMP | CTRL B T | C (deg Celcius) | Temperature of RMIO board |
| 30 FAN ON TIME | FAN TIME | h (hours) | Accumulated fan operating hours. |
| 31 AI3 (mA) | AI3 (mA) | mA | Value of RMIO analogue input 3. |

| Actual Signal (Group 1) | Short name | Range/Unit | Description |
|---|---|---|---|
| 32 TOTAL OPER TIME | TOTAL OP | h (hours) | Elapsed run-time with brake open |
| 33 LOAD TORQUE ton | LOAD ton | t (ton) | The calculated hoist load in tons. |
| 34 LOAD SPEC FACT Km | FACT Km | | Load spectrum factor Km. |
| 35 LIFETIME LEFT % | LIFETIME | % | Crane lifetime left % |
| 36 MOTOR SELECTED | MOT SEL | MOTOR 1; MOTOR 2 | Shared Motion parameter set is selected. |

## Signal Selection - Description of the Actual Signals, Groups 1 and 2

**1 SPEED ESTIMATED**

Displays the estimated speed of the motor, as calculated by the CraneDrive (shows estimated speed also if encoder is enabled). The speed is displayed in rpm.

**2 MOTSPEED FILT**

Displays a filtered value of the actual speed of the motor, as calculated or measured by the CraneDrive.The speed is displayed in rpm.

**3 FREQUENCY**

Displays the CraneDrive frequency (Hz) applied to the motor, as calculated by the CraneDrive.

**4 CURRENT**

Displays the motor current, as measured by the CraneDrive.

**5 MOTOR TORQUE**

Displays the motor torque in per cent of the rated motor torque, as calculated by the CraneDrive.

**6 POWER**

Displays the motor power in per cent of the rated motor power.

**7 DC BUS VOLTAGE V**

Displays the DC bus voltage, as measured in the CraneDrive. The voltage is displayed in Volts DC.

**8 MAINS VOLTAGE**

Displays the mains voltage, as calculated by the CraneDrive. The voltage is displayed in Volts. **NOTE:** Calculation only done at power on.

**9 OUTPUT VOLTAGE**

Displays the motor voltage, as calculated by the CraneDrive.

**10 ACS800 TEMP**

Displays the temperature of the heatsink in degrees centigrade.

**11 APPLICATION MACRO**

Indicates application or user macro selected (=parameter 99.2).

**12 SPEED REF**

Displays the value of the total speed reference before ramp in %. 100 % corresponds to SPEED SCALING RPM, parameter 69.1.

**13 CTRL LOCATION**

Displays the active control location. Alternatives are: LOCAL, I/O CTRL 1, FIELDBUS, M/F CTRL and I/O CTRL 2. Refer to Keypad vs. External Control in this chapter.

**14 OP HOUR COUNTER**

This Actual Signal is an elapsed-time indicator. It counts the time that the RMIO board has been powered. The counted time cannot be reset.

**15 KILOWATT HOURS**

This Actual Signal counts the kilowatt hours of CraneDrive in operation.

**16 IDENTIFICATION**

This signal indicates if the motor ID Run is completed OK. RUN DONE

**17 DI7-1 STATUS**

Status of the RMIO digital inputs DI1-6 + DI_IL (DI_IL here called "DI7"). If the input is connected to +24 VDC, the display will indicate 1. If the input is not connected, the display will be 0. Example: 1000010 = DI_IL is on, DI6 to DI3 is off, DI2 is on and DI1 is off.

**18 AI1 (V)**

Value of RMIO analogue input 1 displayed in volts.

**19 AI2 (mA)**

Value of RMIO analogue input 2 displayed in milliamperes.

**20 EXT AI1 (V)**

Value of RAIO-01 analogue input 1 displayed in volts.

**21 RO3-1 STATUS**

Status of the RMIO three relay outputs. 1 indicates that the relay is energised and 0 indicates that the relay is de-energised.

**22 AO1 (mA)**

Value of RMIO analogue output 1 signal in milliamperes.

**23 AO2 (mA)**

Value of RMIO analogue output 2 signal in milliamperes.

**24 INERTIA**

This actual signal is giving the calculated inertia value from running the Power optimization Autotune and has to be set in parameter 68.4 INERTIA TOTAL UP and 68.5 INERTIA TOTAL DWN.

**25 EXT DI6-1 STATUS**

Status of the six (3+3) RDIO digital inputs. If the input is connected to voltage, the display will indicate 1. If the input is not connected, the display will be 0.

**26 EXT RO4-1 STATUS**

Status of the four (2+2) RDIO relay outputs. 1 indicates that the relay is energised and 0 indicates that the relay is de-energised.

**27 MOTOR RUN-TIME**

This signal is an elapsed motor run-time meter. It counts the time, in hours, that the motor has been running with current. The counted time can be reset with parameter 97.10 RESET MOTOR RUNTIME.

**28 MOTOR TEMP EST**

This signal is displaying the estimated motor temperature in degrees Centigrade.

**Note:** The estimated motor temperature calculation starts at 30 ºC after a RMIO power on (init).

**29 CTRL BOARD TEMP**

This signal is displaying the measured temperature on the RMIO board in degrees Centigrade.

**30 FAN ON TIME**

This signal is displaying the accumulated operating hours for the cooling fan.

**NOTE:** Using DriveWindow tool, this signals value can be reset to zero if replacing fan unit.

If replacing the RMIO board, please restore (copy) the value for this signal from old to new board (read value before replacing board).

**31 AI3 (mA)**

Value of RMIO analogue input 3 displayed in milliamperes. See description of parameter 20.10 for details.

**32 TOTAL OPER TIME**

Total operating time of drive, in hours, with brake open. Backed up in non-volatile memory.

**33 LOAD TORQUE ton**

Load torque signal scaled in ton using parameters 68.12–13 and 74.1

**34 LOAD SPEC FACT Km**

Load spectrum factor Km (value between 0.0 and 1.0) is the degree of utilization over the lifetime for the hoist mechanics. Calculated by the Crane lifetime monitor function (par. group 74).

**35 LIFETIME LEFT %**

The calculated mechanical lifetime left of hoist. In percent of lifetime set in parameter 74.2

**36 MOTOR SELECTED**

Signal indicates the selected motor parameter set, Motor 1 or Motor 2, when shared Motion function is activated. See section *Shared Motion (80, 81, 82)* on page *117* for details on Shared Motion.

*Group 2, Internal Signals*

| INT SIGNALS (Group 2) | Range/Unit | Description |
|---|---|---|
| 1 SPEED REF 2 | rpm | Ramp input reference limited by speed limits (parameters 20.1 & 20.2) |
| 2 SPEED REF 3 | rpm | Ramp output reference |
| 3 SPEED REF 4 | rpm | Total speed reference = ramp output reference + speed correction reference |
| 4 SPEED ERROR NEG | rpm | Actual speed - total speed reference |
| 5 TORQUE PROP REF | % | Speed controller proportional part output |
| 6 TORQUE INTEG REF | % | Speed controller integration part output |
| 7 TORQUE DER REF | % | Speed controller derivative part output |
| 8 TORQ ACC COMP REF | % | Acceleration compensation reference |
| 9 TORQUE REF 1 | % | Torque reference input to drive (torque ramp output) |
| 10 TORQUE REF 2 | % | Speed controller total output + acceleration compensation reference. Limited with parameters 20.4 & 20.5 |
| 11 TORQUE REF 3 | % | Output of "Torque Selector", see parameter 72.2 |
| 12 TORQUE REF 4 | % | Torque ref 3 + Load compensation |
| 13 TORQUE REF 5 | % | Torque ref 4 + Torque step |
| 14 TORQ USED REF | % | Final torque reference used by torque controller (Torque ref 5 with limits) |
| 15 MOTOR TORQUE | % | Actual motor torque |
| 16 FLUX ACT | % | Actual motor flux |
| 17 SPEED MEASURED | rpm | Measured (RTAC) motor speed |
| 18 POS ACT PPU | +/- 32767 | Position measurement value (scaled with par. 70.1) |
| 19 START | True; False | Start-order given |
| 20 RUNNING | True; False | Drive running (producing torque) acknowledgment |
| 21 BRAKE LIFT | True; False | Brake lift order |
| 22 FAULT | True; False | Drive fault indication (tripped) |
| 24 SPEED CORR | rpm | Speed correction reference |
| 25 POWOP SPEEDREF | % | Power optimization calculated speed reference |
| 26 ELSHAFT POS ERROR | | Electric shaft control position error in Slave drive |
| 27 LIMIT WORD 1 | 0 - FFFF Packed boolean (Hex) | Limit word indicating if drive is running in any limitation, For bit details see table 4-3 below |
| 28 FAULTED INT INFO | 0 - FFFF Packed boolean (Hex) | INT board fault info, For bit details see table 4-4 below |

| INT SIGNALS (Group 2) | Range/Unit | Description |
|---|---|---|
| 29 TORQUE SELECTOR | 0 - 5 | Torque reference (2.11) mode active:<br>0 = Zero control (=speed control in CraneDrive)<br>1 = Speed control (Torq ref 2)<br>2 = Torque control (Torq ref 1)<br>3 = Minimum control (min of Torq ref 1 and 2)<br>4 = Maximum control (sum of Torg ref 1 and 2)<br>5 = Add control (sum of Torq ref 1 and 2) |
| 30 dV/dt | rpm/s | Derivative of speed reference ramp output, Speed ref 3. That is, rate of change (with sign) in rpm per sec |
| 31 LOAD TORQUE % | % | Calculated load torque in % of motor nominal torque. Signal is filtered with parameter 68.10 . |
| 32 LIMIT WORD INV | 0 - FFFF (Hex) | Indicating details if 2.27 bit 4 Torq_inv_cur_lim is set. See table 4-5 below for details. |
| 33 INT SC INFO | 0 - FFFF (Hex) | Info on short circuit location. See table 4-6 below. |
| 34 INT CONFIG WORD | 0 - FFFF (Hex) | Info on available parallel connected R8i modules. |

*Signal 2.27* ***LIMIT WORD 1***

| Bit | Name | Active Limit |
|---|---|---|
| 0 | TORQ MOTOR LIM | Motor pull-out torque limit reached. |
| 1 | SPD_TOR_MIN_LIM | Speed control torque min. limit |
| 2 | SPD_TOR_MAX_LIM | Speed control torque max. limit. |
| 3 | TORQ_USER_CUR_LIM | User-defined current limit |
| 4 | TORQ_INV_CUR_LIM | Internal current limit. |
| 5 | TORQ_MIN_LIM | Any torque min. limit. |
| 6 | TORQ_MAX_LIM | Any torque max. limit |
| 7 | TREF_TORQ_MIN_LIM | Torque reference min. limit. |
| 8 | TREF_TORQ_MAX_LIM | Torque reference max. limit. |
| 9 | FLUX_MIN_LIM | Flux reference min. limit |
| 10 | FREQ_MIN_LIMIT | Speed/Frequency min. limit. |
| 11 | FREQ_MAX_LIMIT | Speed/Frequency max. limit |
| 12 | DC_UNDERVOLT | DC undervoltage limit. |
| 13 | DC_OVERVOLT | DC overvoltage limit. |
| 14 | TORQUE LIMIT | Any torque limit. |
| 15 | FREQ_LIMIT | Any speed/frequency limit. |

**Note:** Bit 4 TORQ_INV_CUR_LIM is activated if thermal overload from inverter or braking chopper is detected. See details in 2.32 LIMIT WORD INV

*Signal 2.28* ***FAULTED INT INFO***

This word includes information on the location of faults: PPCC LINK, OVERCURRENT, EARTH FAULT, SHORT CIRCUIT, ACS800 TEMP, TEMP DIF and POWERF INT.

| Bit | Name | Description |
|---|---|---|
| 0 | INT 1 FLT | INT 1 board fault (R8i module #1) |
| 1 | INT 2 FLT | INT 2 board fault * (R8i module #2) |
| 2 | INT 3 FLT | INT 3 board fault * (R8i module #3) |
| 3 | INT 4 FLT | INT 4 board fault * (R8i module #4) a.s.o. |
| 4 | INT 5 FLT | INT 5 board fault * |
| 5 | INT 6 FLT | INT 6 board fault * |
| 6 | INT 7 FLT | INT 7 board fault * |
| 7 | INT 8 FLT | INT 8 board fault * |
| 8 | INT 9 FLT | INT 9 board fault * |
| 9 | INT 10 FLT | INT 10 board fault * |
| 10 | INT 11 FLT | INT 11 board fault * |
| 11 | INT 12 FLT | INT 12 board fault * |
| 12…14 | Not in use | |
| 15 | PBU FLT | PBU board fault |

* In use only with parallel inverters. INT 1 is connected to PBU CH1, INT 2 to CH2 a.s.o.

*Signal 2.32* ***LIMIT WORD INV***

This word gives more detailed information when the TORQ INV CUR LIM (bit 4 in 2.27 LIMIT WORD 1) is active, indicating that output current limit of the drive is exceeded. The current limitation protects the drive in various cases, e.g. integrator overload, high IGBT temperature etc.

| Bit | Name | Description |
|---|---|---|
| 0 | INTEGRAT 200 | Current limit at 200% integrator overload. *<br>Temperature model is not active. |
| 1 | INTEGRAT 150 | Current limit at 150% integrator overload. *<br>Temperature model is not active. |
| 2 | INT LOW FREQ | Current limit at high IGBT temperature with low output frequency (<10 Hz). *<br>Temperature model is not active. |
| 3 | INTG PP TEMP | Current limit at high IGBT temperature. *<br>Temperature model is not active |
| 4 | PP OVER TEMP | Current limit at high IGBT temperature.<br>Temperature model is active. |

| Bit | Name | Description |
|---|---|---|
| 5 | PP OVERLOAD | Current limit at high IGBT junction to case temperature. Temperature model is active.<br>If the IGBT junction to case temperature continues to rise in spite of the current limitation, PP OVERLOAD alarm or fault occurs. |
| 6 | INV POW LIM | Current limit at inverter output power limit (at chopper power limit if during braking with chopper). |
| 7 | INV TRIP CUR | Current limit at inverter overcurrent trip limit |
| 8 | OVERLOAD CUR | At maximum inverter current limit Imax. See par. 20.03 . |
| 9 | CONT DC CUR | Continuous dc-current limit. |
| 10 | CONT OUT CUR | Continuous output current limit ($I_{cont.max}$). |
| 11…15 | Not in use | |

* Only active with ACS600 type inverters (with NINT board)

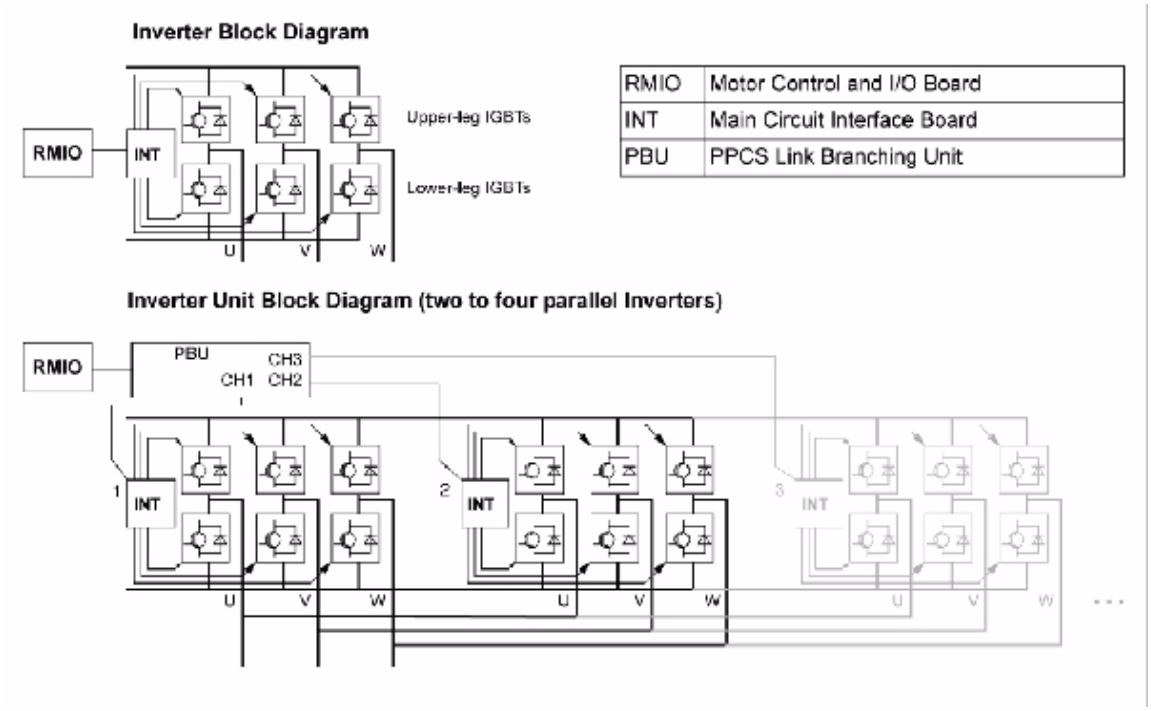
*Signal 2.33* ***INT SC INFO***

This word includes info on the location of the SHORT CIRCUIT fault

| Bit | Name | Description |
|---|---|---|
| 0 | U-PH SC U | Phase U upper-leg IGBT(s) short circuit |
| 1 | U-PH SC L | Phase U lower-leg IGBT(s) short circuit |
| 2 | V-PH SC U | Phase V upper-leg IGBT(s) short circuit |
| 3 | V-PH SC L | Phase V lower-leg IGBT(s) short circuit |
| 4 | W-PH SC U | Phase W upper-leg IGBT(s) short circuit |
| 5 | W-PH SC L | Phase W lower-leg IGBT(s) short circuit |
| 6…15 | Not in use | |

*Signal 2.34* ***INT CONFIG WORD***

| Bit | Description |
|---|---|
| 0 | 1 = ACS800 Inverter module 1 is available, 0 = Inverter module 1 is missing |
| 1 | 1 = ACS800 Inverter module 2 is available, 0 = Inverter module 2 is missing |
| 2 | 1 = ACS800 Inverter module 3 is available, 0 = Inverter module 3 is missing |
| 3 | 1 = ACS800 Inverter module 4 is available, 0 = Inverter module 4 is missing |
| 4 | 1 = ACS800 Inverter module 5 is available, 0 = Inverter module 5 is missing |
| 5 | 1 = ACS800 Inverter module 6 is available, 0 = Inverter module 6 is missing |
| 6 | 1 = ACS800 Inverter module 7 is available, 0 = Inverter module 7 is missing |
| 7 | 1 = ACS800 Inverter module 8 is available, 0 = Inverter module 8 is missing |
| 8 | 1 = ACS800 Inverter module 9 is available, 0 = Inverter module 9 is missing |
| 9 | 1 = ACS800 Inverter module 10 is available, 0 = Inverter module 10 is missing |
| 10 | 1 = ACS800 Inverter module 11 is available, 0 = Inverter module 11 is missing |
| 11 | 1 = ACS800 Inverter module 12 is available, 0 = Inverter module 12 is missing |
| 12…15 | Not in use |




**Note:** For information on Group 3 (FB REC WORDS) and Group 4 (FB TRA WORDS) signals, see *Appendix A - Complete Parameter and Default Settings*.

## Fault History

The Fault History includes information on the fifteen most recent faults and warnings that occurred in the CraneDrive. The description of the fault and the total power-on time are available. The power-on time is calculated always when the RMIO board of the CraneDrive is powered.

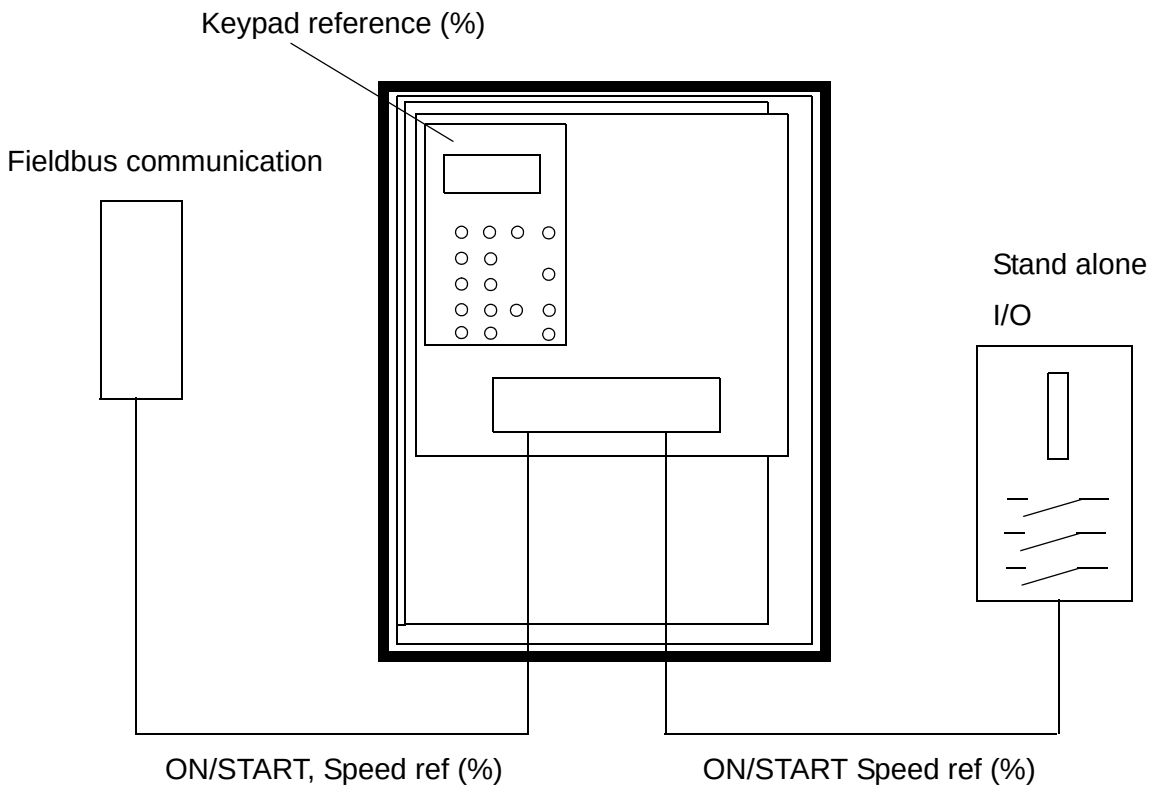
Chapter *Control panel* describes how to display and clear the Fault History from the Control Panel.

## Local Control vs. External Control

The CraneDrive can be controlled (i.e. reference, ON/OFF and Start commands can be given) from an external control location or from Local control (Control Panel Keypad or a DrivesWindow PC tool). Figure 4 2 below shows the CraneDrive control locations.

The selection between Keypad control and External control can be done with the LOC REM key on the Control Panel keypad.

*Control Locations*




If the device controlling the CraneDrive stops communicating, the operation defined by Parameter 30.12 MASTER FAULT FUNC, or 30.2 PANEL LOSS is executed.

**Keypad Control**

The control commands are given from the Control Panel keypad when CraneDrive is in Keypad Control. This is indicated by L (Local) on the Control Panel display.

```
0    L          52.3 %
```

If operational commands and reference cannot be given from this Control Panel, it displays a blank character as shown below.

```
               52.3 %
```

---

**Note:** All references are always given in % of SPEED SCALING RPM (Parameter 69.1)

---

## External Control

When the CraneDrive is in External Control, the commands are given either from Fieldbus or I/O (Stand Alone mode). Selection is done with parameter 64.1 Stand Alone Sel.

### Stand alone

If par. Stand Alone Sel (parameter 64.1) is set True (default value) the Stand Alone mode is selected.

In external control the digital inputs DI 1– DI 6 and Ext DI1– DI4 as well as analog inputs AI1 & AI2 wired directly from joystick and limit switches, are connected to a CRANE function module (except in FB JOYSTICK control mode where joystick signals are sent via fieldbus to CRANE function module, see end of section *Crane (64)* in chapter *Crane Program Description* for details).

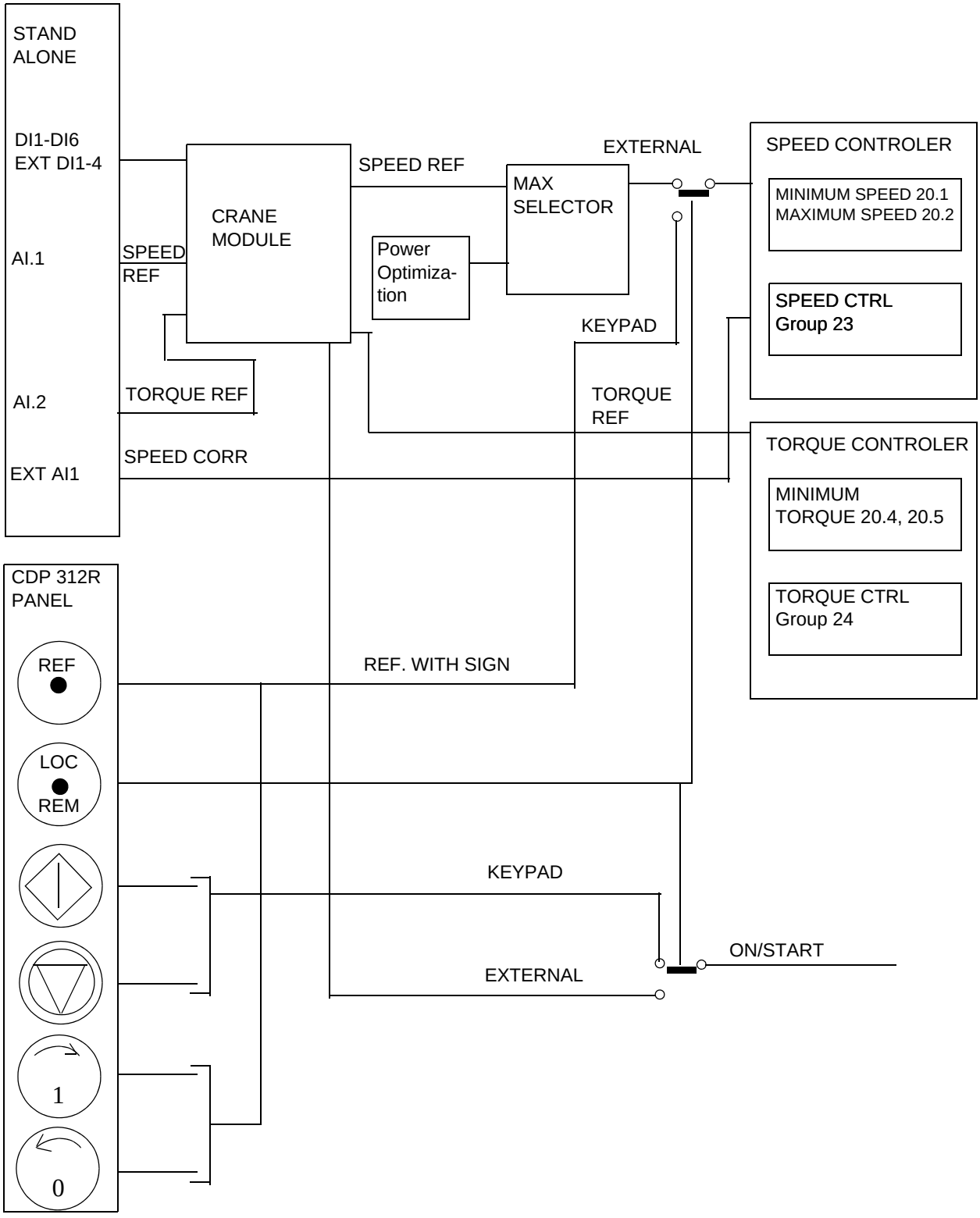
The CRANE function module is producing the references and commands like ON/OFF, START and so on.

### Fieldbus

When the CraneDrive is in Fieldbus mode (64.1 Stand Alone Sel=False) the commands are given from the supervisory system and received over the fieldbus communication link (see section *Function Module Description* in chapter *Crane Program Description*).

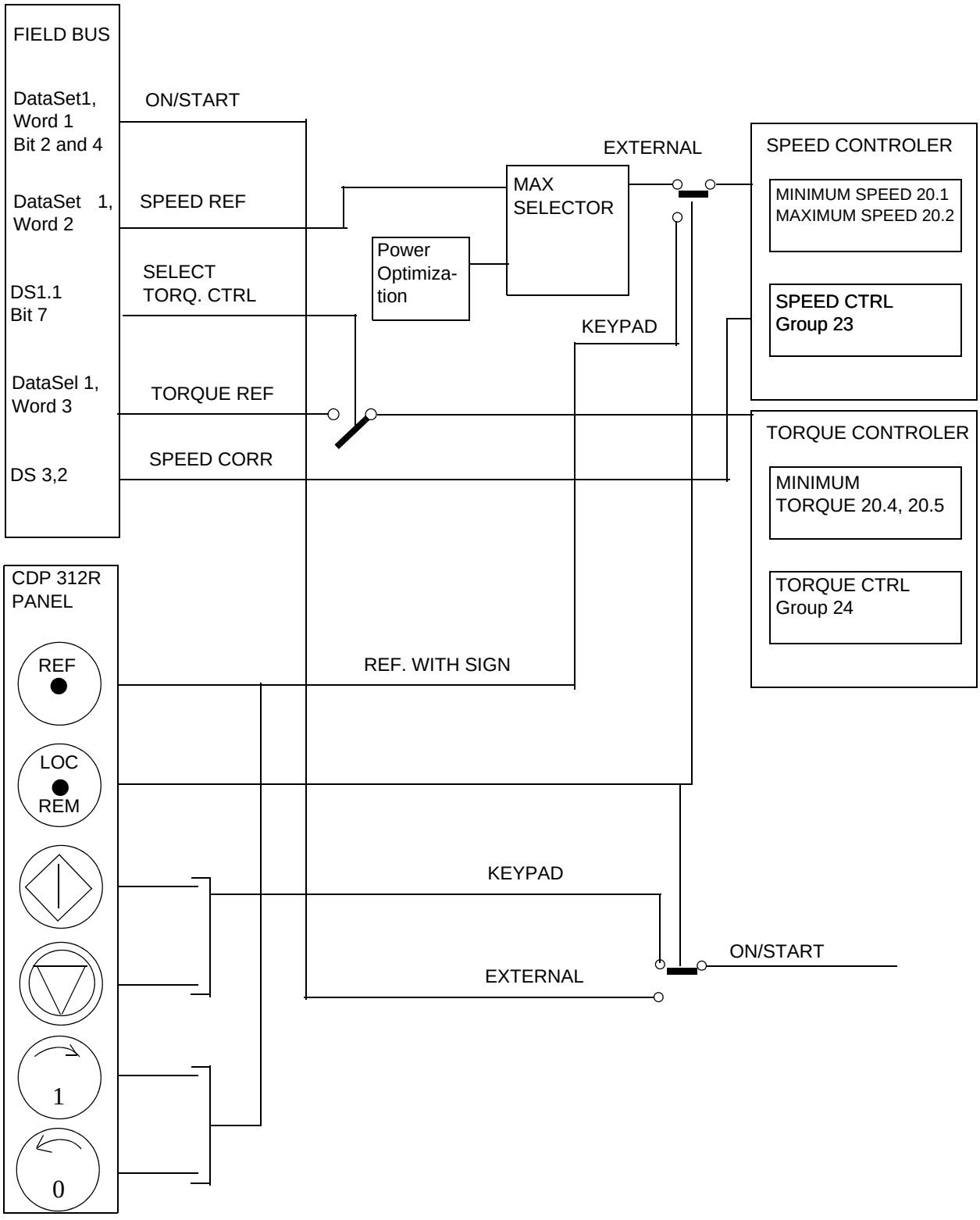
## Control Signals Connection Stand Alone mode

Selecting control and location and control source



## Control Signals Connection in Fieldbus mode

Selecting control location and control source.



## External 24V supply of RMIO board

To keep the control panel and the RMIO board active when the mains supply is switched off, a separate 24 Vdc supply can be connected. See ACS800 Hardware manual for details.

## Power On Acknowledge input signal

If the CraneDrive is equipped with an external 24 V supply to RMIO board, it is recommended to connect a NO (Normally Open) auxiliary contact of AC power contactor to digital input for signal "Power On Ackn", e.g. DI2. Input is selected with parameter 10.5. Drive is automatically reset at power on using the Power On Ackn input signal. Also a proper masking of Chopper fault and PPCC Link fault during power off, is achieved using the Power On Ackn signal.

A "0" on Power On Ackn input will generate an "Off" command of the CraneDrive, that is: coast stop plus closing of mechanical brake.

No operation of CraneDrive is possible if Power On Ackn input is "0"!

**NOTE:** If using ACS800 Multidrive, parameter 10.5 POWER ON ACKN SEL should be set = DI2 !.

# Crane Program Description

## Overview

This chapter describes the functionality of the Crane program with its two Application Macros: CRANE and M/F CTRL, and the two external control modes: Field bus mode and Stand Alone mode.

The chapter also describes how to use the two User Macros.

- The chapter contains the following information:
- Application Macro information
- Operation, Fieldbus and Stand alone mode
- External I/O Connections
- Parameter Settings
- Functional Block diagram of program
- Function module descriptions

The Parameter Settings tables in this chapter indicate parameters you may have to modify. These parameters are indicated in the tables with an arrow (-->) symbol.

Refer to *Appendix A - Complete Parameter and Default Settings* for the alternative settings for each parameter.

## Application Macros

There are two application macros: **CRANE** and **M/F CTRL.** Selection is done with parameter 99.2 Application macro. Default setting is CRANE macro.

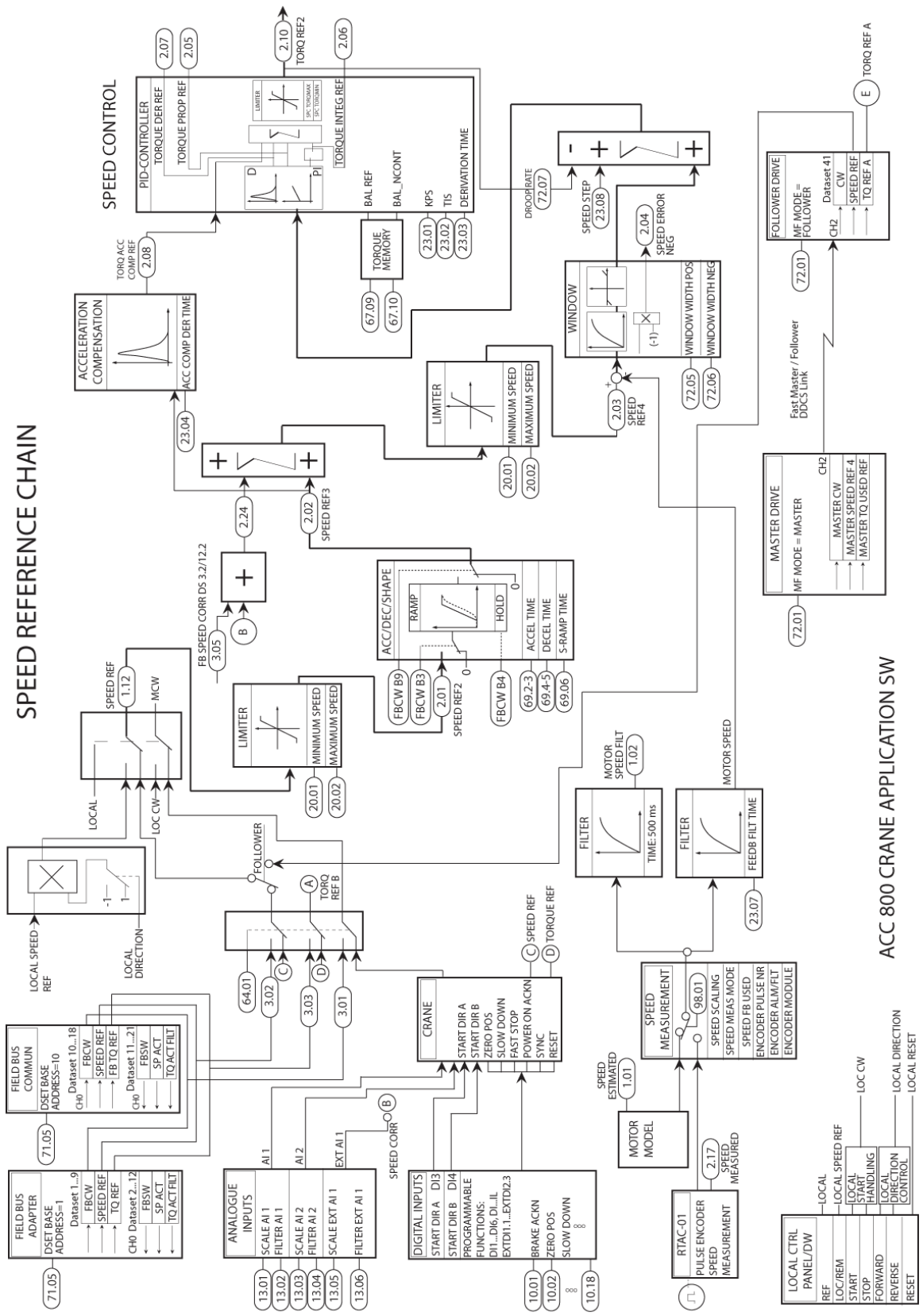
CRANE macro includes all the crane software functions except the Master/Follower bus functionality.

M/F CTRL macro includes all functions of the CRANE macro **plus** Master/Follower bus functionality (see description of function module "Master/Follower (72)").

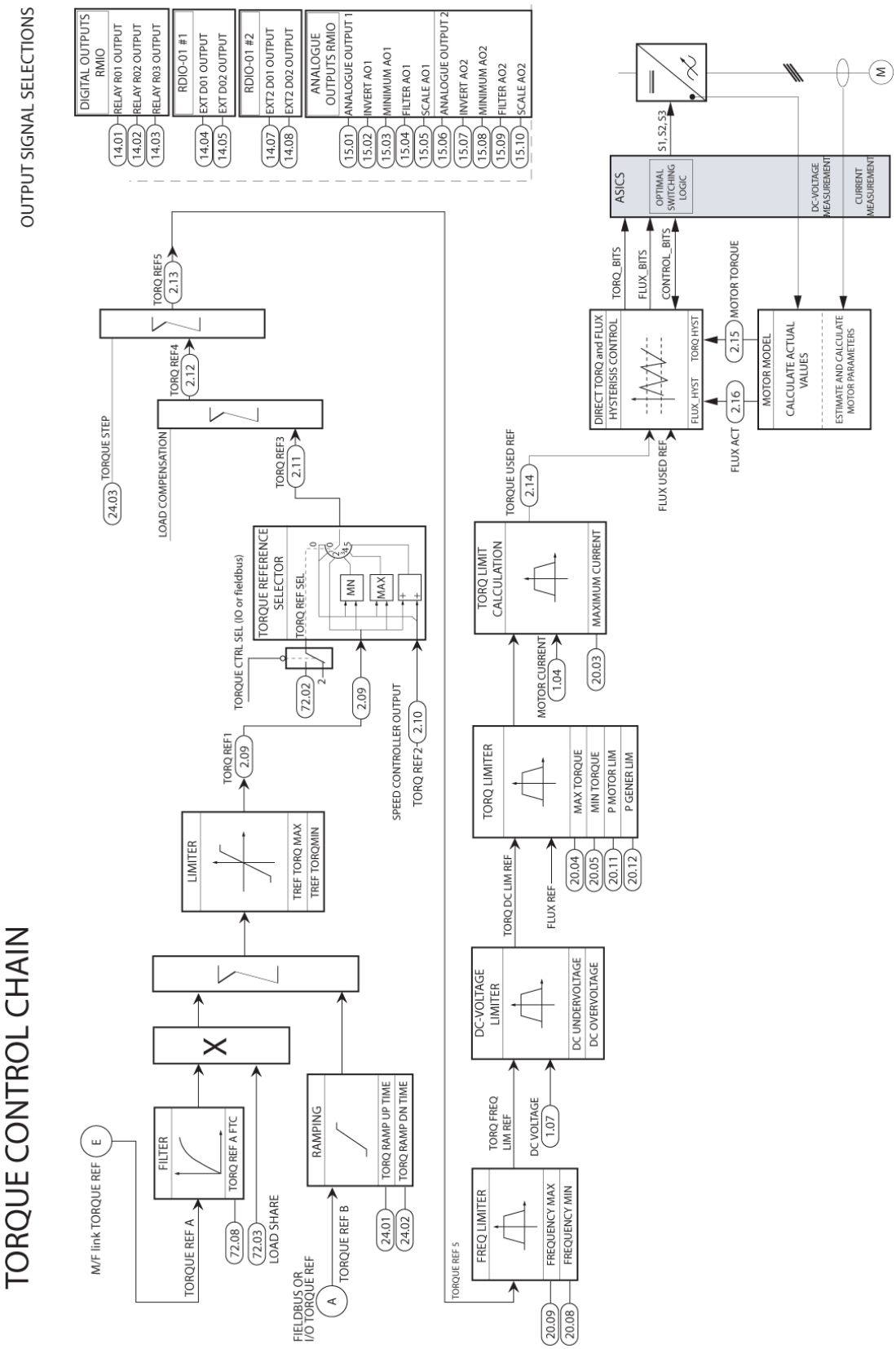
**NOTE:** A change of application macro will reset all parameter settings to default, except for parameter group 99 and motor ID Run data stored.

Therefore macro selection should be done before making the application parameter settings.

## Speed Reference chain



## Torque control chain



## Stand alone mode operation

All drive commands and reference settings can be given from the Control Panel keypad or selectively from an external control location.

The active control location is selected with the LOC REM key on the Control Panel keypad. The drive is speed controlled.

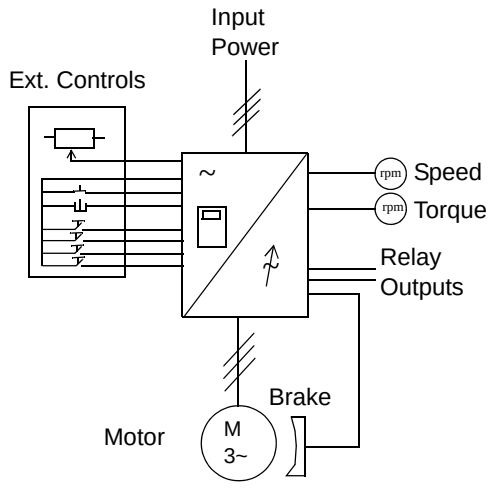
In External Control the control location is the basic I/O. The reference signal is connected to analogue input AI1 and On/Start and Direction signals are generated from digital inputs DI2 ... DI4 on terminal block X21.

DI5 is used for connecting slowdown limit switches in series, and DI6 for Fast Stop order from mechanical overload and slack rope indications.

The mechanical brake is controlled from DO1 and the acknowledgement is connected to DI1.

Two analogue and three relay output signals are available on terminal blocks. Default signals for the Actual Signal Display Mode of the Control Panel are SPEED, TORQUE and CURRENT.

The feedback data through Fieldbus communication: drive -> PLC is available also in stand alone mode (by enabling Comm module; parameter 98.2).




```
1 L ->    50.0%   1
SPEED          470 rpm
TORQUE          50 %
CURRENT         40 A
```

Reference and Start/Stop and Direction commands are given from the Control Panel. To change to External ctrl, press LOC REM key at standstill.

```
1              50.0%   1
SPEED          470 rpm
TORQUE          50 %
CURRENT         40 A
```

Speed reference is read from analogue input AI1 (Terminal Block X21). On/Start and Direction commands are generated from digital inputs DI2, DI3 and DI4.

*Operation Diagram for Stand Alone Mode*

### Input and Output I/O Signals

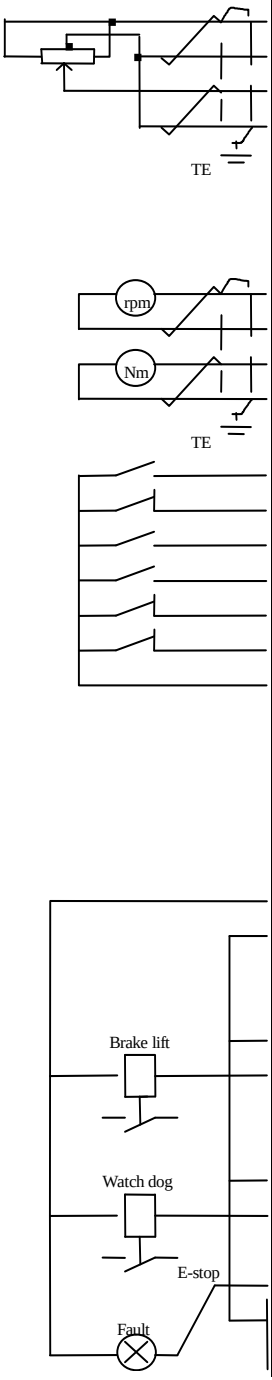
Input and Output I/O Signals as default ("Joystick" control type) assigned by the Crane program. (For more details see Crane module (64) description in page 75)

| Input Signals | Output Signals |
|---|---|
| Brake Ackn: (DI1)<br>Zero Pos: (DI2)<br>Start Dir A: (DI3)<br>Start Dir B: (DI4)<br>Slow Down-N: (DI5)<br>Fast Stop-N: (DI6)<br>Speed Ref: (AI1)<br>Torque Ref: (AI2)<br>Speed Corr: (Ext AI1) | Analogue Output AO1: Speed<br>Analogue Output AO2: Torque<br>Relay Output RO1: Brake lift<br>Relay Output RO2: Watch dog-N<br>Relay Output RO3: Fault-N |

## External Connections

The following connection example is applicable when the Crane program with Stand Alone control mode and Joystick control is used.

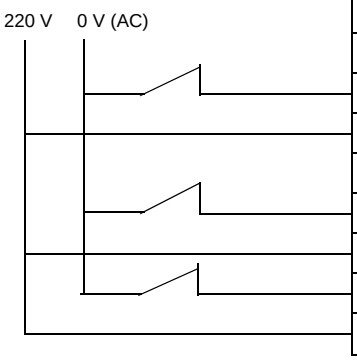
*External connections to RMIO board in Stand Alone mode, Joystick control*.




| **Terminal Block X20** | | ***Function*** |
|---|---|---|
| 1 | VREF - | Reference voltage -10 V |
| 2 | GND | max 10 mA |
| **Terminal Block X21** | | ***Function*** |
| 1 | VREF + | Reference voltage 10 V |
| 2 | GND | max 10 mA |
| 3 | AI1+ | Speed reference |
| 4 | AI1- | 0 ... 10V |
| 5 | AI2+ | Torque reference |
| 6 | AI2- | 0 ... 20 mA |
| 7 | AI3+ | Not used |
| 8 | AI3- | 0 ... 20 mA |
| 9 | AO1+ | Speed actual |
| 10 | AO1- | 0 ... 20mA <-> 0 100 % |
| 11 | AO2+ | Torque actual |
| 12 | AO2- | 0 ... 20mA <-> 0 ... TN |
| **Terminal Block X22** | | |
| 1 | DI1 | BRAKE ACKN |
| 2 | DI2 | ZERO |
| 3 | DI3 | START DIR A |
| 4 | DI4 | START DIR B |
| 5 | DI5 | SLOWDOWN-N |
| 6 | DI6 | FAST STOP- |
| 7 | +24DVDC | +24 VDC max 100 mA |
| 8 | +24DVDC | Not connected |
| 9 | DGND1 | Digital ground 1 |
| 10 | DGND2 | Digital ground 2 |
| 11 | DI_IL | Digital input DI_IL (programmable) |
| **Terminal Block X23** | | |
| 1 | +24DVDC | Auxiliary voltage output 24 VDC |
| 2 | GND | 0 V |
| **Terminal Block X25** | | |
| 1 | RO11 | Relay output 1 |
| 2 | RO12 | Brake lift |
| 3 | RO13 | |
| **Terminal Block X26** | | |
| 1 | RO21 | Relay output 2 |
| 2 | RO22 | Watch dog -N |
| 3 | RO23 | |
| **Terminal Block X27** | | |
| 1 | RO31 | Relay output 3 |
| 2 | RO32 | Fault -N |
| 3 | RO33 | |

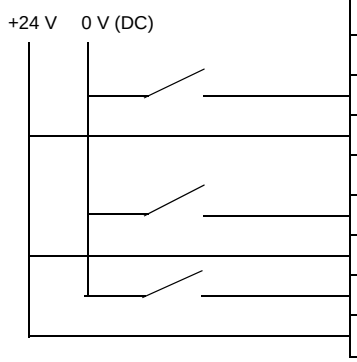
*External connections to extended I/O modules RDIO-01 and RAIO-01, in Stand Alone mode, Step joystick control .*

*RDIO-01, DI/O Ext module no. 1*



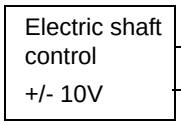

| Terminal block (24 - 250 V) | | Function (example) |
|---|---|---|
| X11: | | |
| 1 | DI1A | **Stop Lim A -N** |
| 2 | DI1B | |
| X12: | | |
| 1 | DI2A | **Stop Lim B -N** |
| 2 | DI2B | |
| 3 | DI3A | Fast stop -N |
| 4 | DI3B | |

*RDIO-01, DI/O Ext module no. 2*



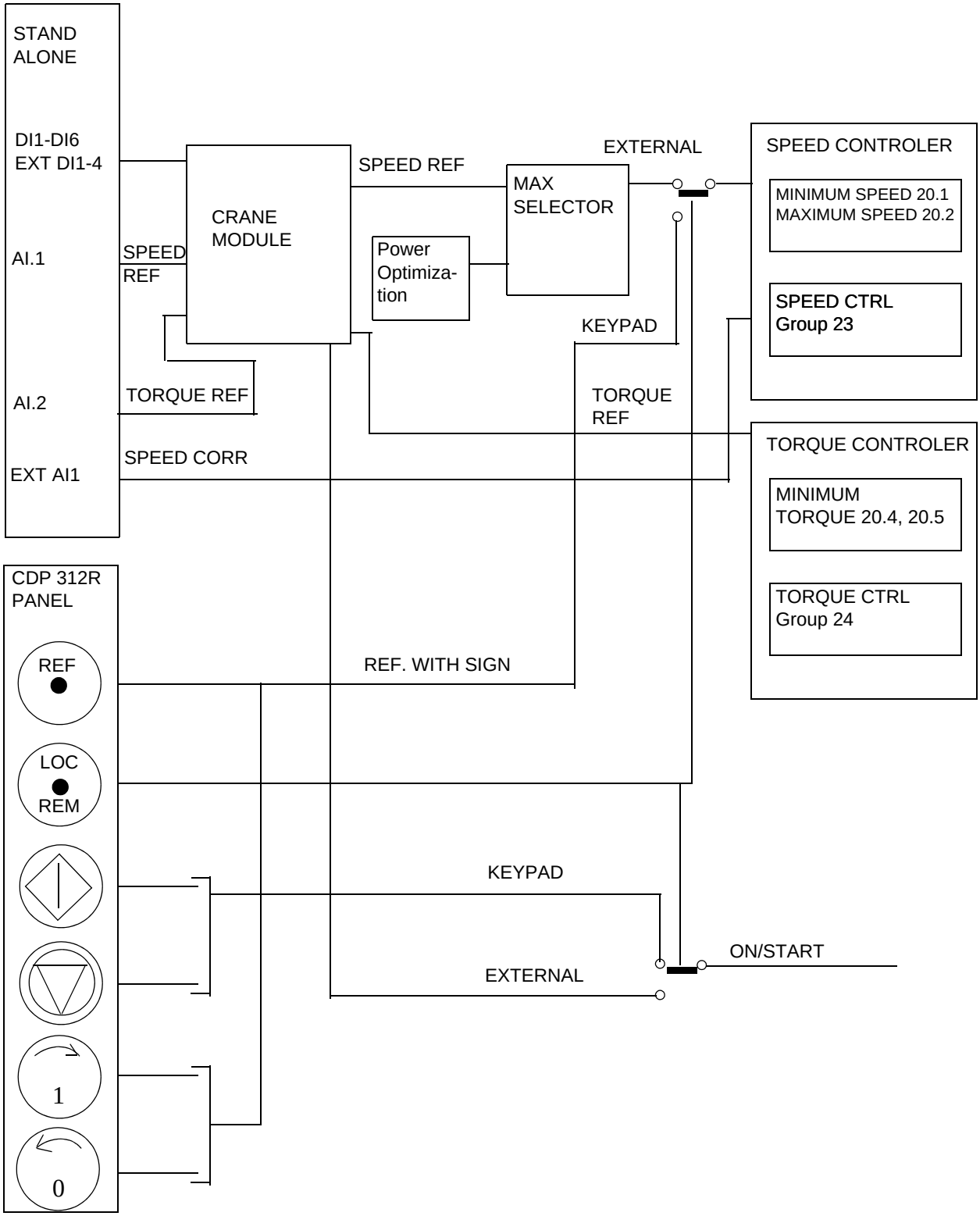

| Terminal block (24 - 250 V) | | Function (example) |
|---|---|---|
| X11: | | |
| 1 | DI1A | **Step Ref 2** |
| 2 | DI1B | |
| X12: | | |
| 1 | DI2A | **Step Ref 3** |
| 2 | DI2B | |
| 3 | DI3A | **Step Ref 4** |
| 4 | DI3B | |

*RAIO-01, AI/O Ext module*




| Terminal block X1 | | Function |
|---|---|---|
| 1 | AI1- | **Speed Correction** |
| 2 | AI1+ | |
| 3 | AI2- | **“not used”** |
| 4 | AI2+ | |
| 5 | SHLD | |
| 6 | SHLD | |

## Control Signals Connection Stand Alone mode



### Parameter Settings for the Stand alone mode

Listing of parameters typically requiring changes during start-up. Stand alone mode.

| **Parameter settings, Stand alone mode** | | DEFAULT VALUE |
|---|---|---|
| **99 START-UP DATA** | | |
| 99.2 APPLICATION MACRO | | CRANE |
| 99.3 APPLIC RESTORE | | NO |
| 99.4 MOTOR CTRL MODE | → | DTC |
| 99.5 MOT NOM VOLTAGE | → | 0 V |
| 99.6 MOTOR NOM CURRENT | → | 0.0 A |
| 99.7 MOTOR NOM FREQ | → | 50.0 Hz |
| 99.8 MOTOR NOM SPEED | → | 1 rpm |
| 99.9 MOTOR NOM POWER | → | 0.0 kW |
| 99.10 MOTOR ID RUN | → | ID MAGN |
| 99.11 DEVICE NAME | → | |
| | | |
| **10 DIGITAL INPUTS** | | |
| 10.1 BRAKE ACKN SEL | | DI1 |
| 10.2 ZERO POS SEL | **!** → | DI2 |
| 10.3 SLOWDOWN-N SEL | **!** → | DI5 |
| 10.4 FAST STOP-N SEL | **!** → | DI6 |
| 10.5 POWER ON ACKN SEL | | NOT SEL |
| 10.6 SYNC SEL | | NOT SEL |
| 10.7 CHOPPER FLT-N SEL | | NOT SEL |
| 10.8 STEP REF2 SEL | | NOT SEL |
| 10.9 STEP REF3 SEL | | NOT SEL |
| 10.10 STEP REF4 SEL | | NOT SEL |
| 10.11 HIGH SPEED SEL | | NOT SEL |
| 10.12 SNAG LOAD-N SEL | | NOT SEL |
| 10.13 ACCELERATE SEL | | NOT SEL |
| 10.14 FB STOPLIM SEL | | NOT SEL |
| 10.15 ELSHAFT ON SEL | | NOT SEL |
| 10.16 FAULT RESET SELECT | | NOT SEL |
| 10.17 USER MACRO CH SRC | | NOT SEL |
| 10.18 EXTERNAL FAULT | | NOT SEL |
| 10.19 SECOND REMP SEL | | NORMAL RAMP |
| 10.20 SECOND CTRL SEL | | NOT SEL |
| 10.21 RUN ENABLE | | NOT SEL |
| | | |

| **Parameter settings, Stand alone mode** | | DEFAULT VALUE |
|---|---|---|
| **20 LIMITS** | | |
| 20.1 MINIMUM SPEED | → | (calculated) |
| 20.2 MAXIMUM SPEED | → | (calculated) |
| 20.3 MAXIMUM CURRENT A | → | 200 % $I_{hd}$ (A) |
| 20.4 MAXIMUM TORQUE | → | 200 % |
| 20.5 MINIMUM TORQUE | → | -200 % |
| 20.6 OVERVOLTAGE CTRL | | OFF |
| 20.7 UNDERVOLTAGE CTRL | | ON |
| 20.10 SPEED LIMIT AI3 | | 100% |
| 20.11 P MOTORING LIM | | 300% |
| 20.12 P GENERATING LIM | | -300% |
| | | |
| **21 START/STOP** | | |
| 21.1 START FUNCTION | → | CONST DC-MAGN |
| 21.2 CONST MAGN TIME | | 500 ms |
| 21.4 DC HOLD | | NO |
| 21.5 DC HOLD SPEED | | 3.0% |
| 21.6 DC HOLD CURRENT | | 30 % |
| | | |
| **23 SPEED CTRL** | | |
| 23.1 GAIN | → | 10.0 |
| 23.2 INTEGRATION TIME | → | 2.50 s |
| 23.3 DERIVATION TIME | | 0.0 ms |
| 23.4 ACC COMPENSATION | | 0.00 s |
| 23.5 SLIP GAIN | | 100.0 % |
| 23.6 AUTOTUNE RUN ? | | NO |
| 23.7 FEEDB FILTER TIME | | 4 ms |
| 23.8 SPEED STEP | | 0.0 rpm |
| | | |
| **27 BRAKE CHOPPER** | | |
| 27.1 BRAKE CHOPPER CTL | → | OFF (R2&R3=ON) |
| 27.2 BR OVERLOAD FUNC | → | NO |
| 27.3 BR RESISTANCE | → | 100.00 ohm |
| 27.4 BR THERM TCONST | → | 0.000 s |
| 27.5 MAX CONT BR POWER | → | 0.00 kW |
| 27.6 BC CTRL MODE | | AS GENERATOR |
| | | |

| **Parameter settings, Stand alone mode** | | DEFAULT VALUE |
|---|---|---|
| **50 PULSE-ENCODER** (visible when 98.1 is activated) | | 98.5 DI/O EXT MODULE 1 |
| 50.1 ENCODER PULSE NR | → | 1024 |
| 50.2 SPEED MEAS MODE | | A_-_B_-_ |
| 50.3 ENCODER ALM/FLT | | FAULT |
| 50.4 eNCODER DELAY | | 1000 ms |
| 50.5 SPEED FEEDB USED | | True |
| 50.7 ENC CABLE CHECK | | DISABLED |
| | | |
| **62 TORQUE MONITOR** | | |
| 62.1 TORQ MON SEL | | TRUE |
| 62.2 SP DEV LEV | | 10 % |
| 62.3 TORQ FLT TD | | 600 ms |
| 62.4 SP DER BLK LEV | → | 13 % /s *) |
| | | |
| **63 FAST STOP** | | |
| 63.1 FAST STOP TYPE 11 | | NOT USED |
| 63.2 FAST STOP TYPE 12 | | NOT USED |
| | | |
| **64 CRANE** | | |
| 64.1 STAND ALONE SEL | | TRUE |
| 64.2 CONTIN GEAR | | FALSE |
| 64.3 HIGH SPEED LEVEL 1 | | 98 % |
| 64.4 DEADZONE A | → | 0 % |
| 64.5 DEADZONE B | → | 0 % |
| 64.6 REF SHAPE | | 20 |
| 64.7 SLOWDOWN SPEEDREF | → | 25 % |
| 64.8 ZERO POS OK TD | | 0.3 s |
| 64.9 TORQUE REF SCALE | | 1.00 |
| 64.10 CONTROL TYPE | → | JOYSTICK |
| 64.11 MINIMUM REF | | 0.0 % |
| 64.12 JOYSTICK WARN TD | | 400 ms |
| 64.13 STEP REF LEVEL 1 | | 10 % |
| 64.14 STEP REF LEVEL 2 | | 25 % |
| 64.15 STEP REF LEVEL 3 | | 50 % |
| 64.16 STEP REF LEVEL 4 | | 100 % |
| 64.17 SECOND CTRL MODE | | JOYSTICK |
| 64.18 SPEED/TORQ CTRL | | SPEED/TORQUE |

***) Calculate as: 100 / (RT x 1.5) %/s where RT = longest ramptime in sec.**

| **Parameter settings, Stand alone mode** | | DEFAULT VALUE |
|---|---|---|
| **66 TORQUE PROVING** | | |
| 66.1 TORQ PROV SEL | → | FALSE |
| 66.2 TORQ PROV FLT TD | | 0.5 s |
| 66.3 TORQ PROV REF | | 20 % |
| | | |
| 67 MECH BRAKE CONT | | |
| 67.1 BRAKE FALL TIME | 0.00 s ... 60.0 s | 1.0 s |
| 67.2 BRAKE FLT TD | 0.00 s ... 60.0 s | 1.0 s |
| 67.4 BRAKE REOPEN TD | 0.00 s ... 60.0 s | 0.0 s |
| 67.5 BRAKE LONG FT TD | 0.00 s ... 60.0 s | 0.5 s |
| 67.6 ZERO SPEED LEV | 0.0 % ... 100.0 % → | 1.0 % |
| 67.7 ZERO SPEED TIME | 0 ... 1000 ms → | 200 ms |
| 67.8 SPEED REF TD | 0.00 s ... 10.00 s → | 0.20 s |
| 67.9 START TORQ SEL | NOT USED; AUTO TQ MEM; LOAD MEAS; PAR67.10 → | NOT USED |
| 67.10MIN START TQ REF | 0 ... 300 % | 0 % (1 = 1%) |
| 67.11 MOTOR TYPE | STANDARD; CONICAL | STANDARD |
| | | |
| **68 POWER OPTIMIZATION** | | |
| 68.1 POWOP SELECT | | FALSE |
| 68.2 BASE SPEED | → | 100 % |
| 68.3 POWOP AUTOTUNE SEL | → | FALSE |
| 68.4 INERTIA TOTAL UP | → | 3 $KGM^2$ |
| 68.5 INERTIA TOTAL DWN | → | 30 $KGM^2$ |
| 68.6 TQLIM UP | | 100 % |
| 68.7 TQLIM DWN | | 75 % |
| 68.8 POWOP RESET LEV | | 12 % |
| 68.9 T MAX | | 500 % |
| 68.10 LOAD TORQ FILT TC | | 150ms |
| 68.11 SALCK ROPE TQ LEV | | -400% |
| 68.12 LOADCORR FACT UP | | 0.90 |
| 68.13 LOADCORRFACT DWN | | 1.10 |
| 68.14 RAMP RATE POWOP | | 1.00 |
| 68.15 RAMP CHANGE SPEED | | 100% |
| | | |

| **Parameter settings, Stand alone mode** | | DEFAULT VALUE |
|---|---|---|
| **69 REFERENCE HANDLER** | | |
| 69.1 SPEED SCALING RPM | | 1500 rpm |
| 69.2 ACC TIME FORW | | 5.0 s |
| 69.3 ACC TIME REV | | 5.0 s |
| 69.4 DEC TIME FORW | | 5.0 s |
| 69.5 DEC TIME REV | | 5.0 s |
| 69.6 S-RAMP TC | | 0.0 s |
| 69.7 RAMP SCALE LOCAL | | 2.0 |
| 69.10 RAMP RATE=1 | | TRUE |
| 69.11 SECOND RAMP SCALE | | 100% |
| | | |
| **98 OPTION MODULES** | | |
| 98.1 ENCODER MODULE | | NO |
| 98.2 COMM. MODULE | | NO |
| 98.3 CH3 NODE ADDR | | 1 |
| 98.4 CH0 NODE ADDR | | 1 |
| 98.5 DI/O EXT MODULE 1 | | NO |
| 98.6 DI/O EXT MODULE 2 | | NO |
| 98.7 AI/O EXT MODULE 1 | | NO |
| | | |

→ Typical parameter values to check during start-up. If required, alter the values to meet the needs of your application. A complete parameter list is provided in Appendix A.

**!** Parameter value different from default setting

## Fieldbus mode operation

All drive commands and reference settings can be given from the Control Panel keypad or selectively from an external control location.

The active control location is selected with the LOC REM key on the Control Panel keypad. The drive is normally speed controlled.

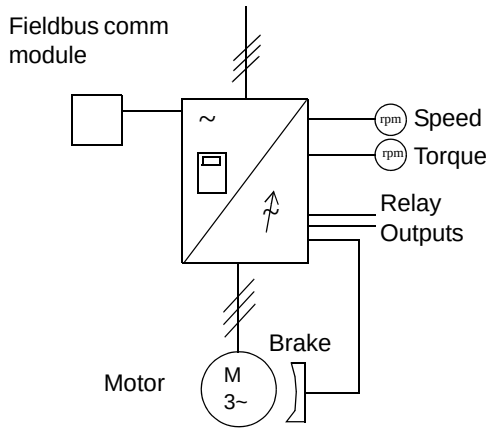
In External Control the control location is from the Fieldbus communication. The reference signal, On/Start a.s.o. are connected to corresponding datasets, see Fieldbus Receive description for details.

The mechanical brake is controlled from DO1 and the acknowledgement is connected to DI1 as a default.

Example of digital input connections:

DI2 Power On Ackn, is connected to an auxiliary contact of the incoming power breaker. DI3 Sync, is position measurement synchronisation. DI4 Chopper Fault-N, is connected to the braking chopper fault contact.

Two analogue and three relay output signals are available on terminal blocks. Default signals for the Actual Signal Display Mode of the Control Panel are SPEED, TORQUE and CURRENT.




```
1 L ->    50.0%   1
SPEED          470 rpm
TORQUE          50 %
CURRENT         40 A
```

Reference and Start/Stop and Direction commands are given from the Control Panel. To change to External ctrl, press LOC REM key at standstill.

```
1              50.0%   1
SPEED          470 rpm
TORQUE          50 %
CURRENT         40 A
```

SStart/Stop commands and References are received through the Fieldbus communication

*Operation Diagram for Fieldbus Mode*

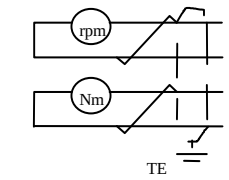
### Input and Output I/O Signals

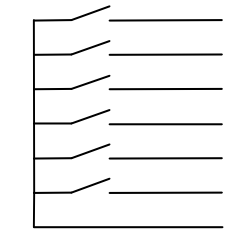
Example of Input and Output I/O Signals selected when Fieldbus mode is selected i.e. supervisory controller (PLC) is used:

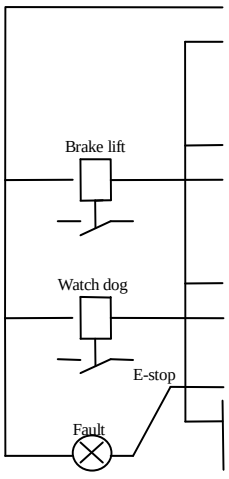
| Input Signals | Output Signals |
|---|---|
| Brake Ackn: (DI1)<br>Power On Ackn: (DI2)<br>Sync: (DI3)<br>Chopper Flt-N: (DI4) | Analogue Output AO1: Speed<br>Analogue Output AO2: Torque<br>Relay Output RO1: Brake lift<br>Relay Output RO2: Watchdog-N<br>Relay Output RO3: Fault-N |

## External Connection

The following connection example is applicable when the Crane program is used in Fieldbus mode.

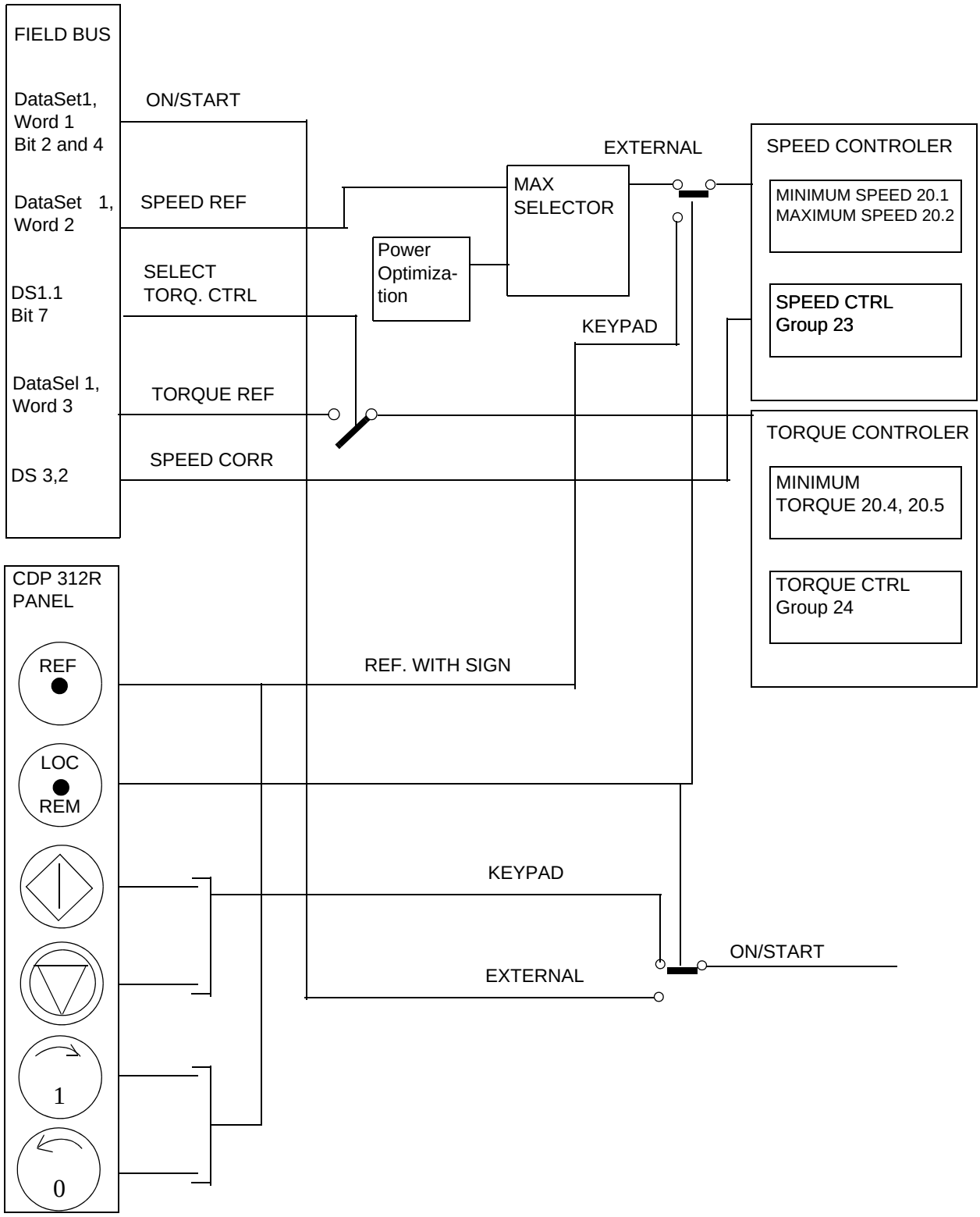





| **Terminal Block X20** | | ***Function*** |
|---|---|---|
| 1 | VREF - | Reference voltage -10 V |
| 2 | GND | max 10 mA |
| **Terminal Block X21** | | ***Function*** |
| 1 | VREF + | Reference voltage 10 V |
| 2 | GND | max 10 mA |
| 3 | AI1+ | Speed reference |
| 4 | AI1- | 0 ... 10V |
| 5 | AI2+ | Torque reference |
| 6 | AI2- | 0 ... 20 mA |
| 7 | AI3+ | Not used |
| 8 | AI3- | 0 ... 20 mA |
| 9 | AO1+ | Speed actual |
| 10 | AO1- | 0 ... 20mA <-> 0 100 % |
| 11 | AO2+ | Torque actual |
| 12 | AO2- | 0 ... 20mA <-> 0 ... TN |
| **Terminal Block X22** | | |
| 1 | DI1 | BRAKE ACKN |
| 2 | DI2 | POWER ON ACKN |
| 3 | DI3 | SYNCH |
| 4 | DI4 | CHOPPER FLT-N |
| 5 | DI5 | |
| 6 | DI6 | |
| 7 | +24DVDC | +24 VDC max 100 mA |
| 8 | +24DVDC | Not connected |
| 9 | DGND1 | Digital ground 1 |
| 10 | DGND2 | Digital ground 2 |
| 11 | DI_IL | Digital input DI_IL (programmable) |
| **Terminal Block X23** | | |
| 1 | +24DVDC | Auxiliary voltage output 24 VDC |
| 2 | GND | 0 V |
| **Terminal Block X25** | | |
| 1 | RO11 | Relay output 1 |
| 2 | RO12 | Brake lift |
| 3 | RO13 | |
| **Terminal Block X26** | | |
| 1 | RO21 | Relay output 2 |
| 2 | RO22 | Watch dog -N |
| 3 | RO23 | |
| **Terminal Block X27** | | |
| 1 | RO31 | Relay output 3 |
| 2 | RO32 | Fault -N |
| 3 | RO33 | |

## Control Signals Connection in Field Bus mode



### Speed correction in Fieldbus mode

In Fieldbus mode there is a possibility to send a speed correction reference ("non-ramped" reference added to ramp unit output), to the drive:

In the Fieldbus communication interface: DataSet 3, Word 2 is connected as a Speed Correction input signal (8 ms updating time in ACC 800 application software).

The speed correction reference is limited so that the sum of the normal "ramped" speed reference and the speed correction reference cannot exceed Maximum/ Minimum Speed setting (parameters 20.1 & 20.2).

### External Chopper monitoring (available in both Fieldbus and Standalone mode)

If using an external braking chopper, the braking chopper fault contact (use the "normally open" contact; closed contact when DC voltage is on and no fault), can be monitored by the drive if connected to a digital input (Parameter 10.7 Chopper Flt-N Sel). If open contact ("0") to the digital input, the drive will trip and indicate CHOPPER FAULT to panel, faultlogger and Fieldbus faultword. Also the Watchdog signal (DO2) will indicate.

---

**WARNING!** If a braking chopper fault occurs, the incoming AC voltage to the drive must be disconnected! (This is the only way to stop the current in the braking resistor if the fault is a short circuit in the braking chopper) This is done by connecting the Watchdog-N output DO2 to the drive emergency stop circuit.

---

During power on of drive (Power On Ackn ,e.g. DI2, changing from "0" to "1") the Chopper fault monitoring is blocked during the time Chopper Monit Td, parameter 71.3, to avoid false indications.

Parameter value must be kept as low as possible (approx. 1000 ms). This is to avoid burning out the charging resistor in the drive, if switching on power to the drive when there is a short circuit in the braking chopper.

### Parameter Settings for the Field bus mode

Listing of parameters typically requiring changes during start-up. Field bus mode.

| **Parameter settings for the Fieldbus mode** | | |
|---|---|---|
| **99 START-UP DATA** | | |
| 99.2 APPLICATION MACRO | | CRANE |
| 99.3 APPLIC RESTORE | | NO |
| 99.4 MOTOR CTRL MODE | → | DTC |
| 99.5 MOT NOM VOLTAGE | → | 0 V |
| 99.6 MOTOR NOM CURRENT | → | 0.0 A |
| 99.7 MOTOR NOM FREQ | → | 50.0 Hz |
| 99.8 MOTOR NOM SPEED | → | 1 rpm |
| 99.9 MOTOR NOM POWER | → | 0.0 kW |
| 99.10 MOTOR ID RUN | → | ID MAGN |
| 99.11 DEVICE NAME | → | |
| | | |
| **10 DIGITAL INPUTS** | | |
| 10.1 BRAKE ACKN SEL | | DI1 |
| 10.2 ZERO POS SEL | ! | NOT SEL |
| 10.3 SLOWDOWN-N SEL | ! | NOT SEL |
| 10.4 FAST STOP-N SEL | ! | NOT SEL |
| 10.5 POWER ON ACKN SEL | → | NOT SEL |
| 10.6 SYNC SEL | | NOT SEL |
| 10.7 CHOPPER FLT-N SEL | → | NOT SEL |
| 10.8 STEP REF2 SEL | | NOT SEL |
| 10.9 STEP REF3 SEL | | NOT SEL |
| 10.10 STEP REF4 SEL | | NOT SEL |
| 10.11 HIGH SPEED SEL | | NOT SEL |
| 10.12 SNAG LOAD-N SEL | | NOT SEL |
| 10.13 ACCELERATE SEL | | NOT SEL |
| 10.14 FB STOPLIM SEL | → | NOT SEL |
| 10.15 ELSHAFT ON SEL | | NOT SEL |
| 10.16 FAULT RESET SELECT | | NOT SEL |
| 10.17 USER MACRO CH SRC | | NOT SEL |
| 10.18 EXTERNAL FAULT | | NOT SEL |
| 10.19 SECOND REMP SEL | | NORMAL RAMP |
| 10.20 SECOND CTRL SEL | | NOT SEL |
| 10.21 RUN ENABLE | | NOT SEL |
| | | |

| **Parameter settings for the Fieldbus mode** | | |
|---|---|---|
| **20 LIMITS** | | |
| 20.1 MINIMUM SPEED | → | (calculated) |
| 20.2 MAXIMUM SPEED | → | (calculated) |
| 20.3 MAXIMUM CURRENT A | → | 2 * Ihd (A) |
| 20.4 MAXIMUM TORQUE | → | 200 % |
| 20.5 MINIMUM TORQUE | → | -200 % |
| 20.6 OVERVOLTAGE CTRL | | OFF |
| 20.7 UNDERVOLTAGE CTRL | | ON |
| 20.10 SPEED LIMIT AI3 | | 100% |
| 20.11 P MOTORING LIM | | 300% |
| 20.12 P GENERATING LIM | | -300% |
| | | |
| **21 START/STOP** | | |
| 21.1 START FUNCTION | | CONST DC-MAGN |
| 21.2 CONST MAGN TIME | → | 500 ms |
| 21.4 DC HOLD | | NO |
| 21.5 DC HOLD SPEED | | 3.0% |
| 21.6 DC HOLD CURRENT | | 30 % |
| | | |
| **23 SPEED CTRL** | | |
| 23.1 GAIN | → | 15.0 |
| 23.2 INTEGRATION TIME | → | 0.50 s |
| 23.3 DERIVATION TIME | | 0.0 ms |
| 23.4 ACC COMPENSATION | | 0.00 s |
| 23.5 SLIP GAIN | | 100.0 % |
| 23.6 AUTOTUNE RUN ? | | NO |
| 23.7 FEEDB FILTER TIME | | 4 ms |
| 23.8 SPEED STEP | | 0.0 rpm |
| | | |
| **50 PULSE-ENCODER** (visible when 98.1 = yes) | | |
| 50.1 ENCODER PULSE NR | → | 1024 |
| 50.2 SPEED MEAS MODE | | A_-_B_-_ |
| 50.3 ENCODER ALM/FLT | | FAULT |
| 50.4 ENCODER DELAY | | 1000 ms |
| 50.5 SPEED FEEDB USED | | TRUE |
| 50.7 ENC CABLE CHECK | | DISABLED |
| | | |

| **Parameter settings for the Fieldbus mode** | | |
|---|---|---|
| **51 COMM MODULE** (visible when 98.2 = yes) | | |
| 51.1 MODULE TYPE | | |
| 51.2…51.15 (See manual for fieldbus module used) | | |
| | | |
| **62 TORQUE MONITOR** | | |
| 62.1 TORQ MON SEL | | TRUE |
| 62.2 SP DEV LEV | | 10 % |
| 62.3 TORQ FLT TD | | 600 ms |
| 62.4 SP DER BLK LEV | → | 13 % /s *) |
| | | |
| **63 FAST STOP** | | |
| 63.1 FAST STOP TYPE 11 | → | NOT USED |
| 63.2 FAST STOP TYPE 12 | | NOT USED |
| | | |
| **64 CRANE** | | |
| 64.1 STAND ALONE SEL | **!** | FALSE |
| 64.2 CONTIN GEAR | | FALSE |
| 64.3 HIGH SPEED LEVEL 1 | | 98 % |
| 64.4 DEADZONE A | | 0 % |
| 64.5 DEADZONE B | | 0 % |
| 64.6 REF SHAPE | | 20 |
| 64.7 SLOWDOWN SPEEDREF | | 25 % |
| 64.8 ZERO POS OK TD | | 0.3 s |
| 64.9 TORQUE REF SCALE | | 1.00 |
| 64.10 CONTROL TYPE | | JOYSTICK |
| 64.11 MINIMUM REF | | 0.0 % |
| 64.12 JOYSTICK WARN TD | | 400 ms |
| 64.13 STEP REF LEVEL 1 | | 10 % |
| 64.14 STEP REF LEVEL 2 | | 25 % |
| 64.15 STEP REF LEVEL 3 | | 50 % |
| 64.16 STEP REF LEVEL 4 | | 100 % |
| 64.17 SECOND CTRL MODE | | JOYSTICK |
| 64.18 SPEED/TORQ CTRL | | AI1&2 LEVEL |
| | | |
| **66 TORQUE PROVING** | | |
| 66.1 TORQ PROV SEL | → | FALSE |
| 66.2 TORQ PROV FLT TD | | 0.5 s |
| 66.3 TORQ PROV REF | | 20 % |
| | | |

| Parameter settings for the Fieldbus mode | | |
|---|---|---|
| **67 MECH BRAKE CONT** | | |
| 67.1 BRAKE FALL TIME | 0.00 s ... 60.0 s | 1.0 s |
| 67.2 BRAKE FLT TD | 0.00 s ... 60.0 s | 1.0 s |
| | | |
| 67.4 BRAKE REOPEN TD | 0.00 s ... 60.0 s | 0.0 s |
| 67.5 BRAKE LONG FT TD | 0.00 s ... 60.0 s → | 0.5 s |
| 67.6 ZERO SPEED LEV | 0.0 % ... 100.0 % → | 1.0 % |
| 67.7 ZERO SPEED TIME | 0 ... 1000 ms → | 200 ms |
| 67.8 SPEED REF TD | 0.00 s ... 10.00 s → | 0.20 s |
| 67.9 START TORQ SEL | NOT USED; AUTO TQ MEM; LOAD MEAS; PAR67.10 → | NOT USED |
| 67.10MIN START TQ REF | 0 ... 300 % | 0 % |
| 67.11 MOTOR TYPE | STANDARD; CONICAL | STANDARD |
| | | |
| **68 POWER OPTIMIZATION** | | |
| 68.1 POWOP SELECT | → | FALSE |
| 68.2 BASE SPEED | → | 100 % |
| 68.3 POWOP AUTOTUNE SEL | | FALSE |
| 68.4 INERTIA TOTAL UP | → | 3 KGM2 |
| 68.5 INERTIA TOTAL DWN | → | 30 KGM2 |
| 68.6 TQLIM UP | → | 100 % |
| 68.7 TQLIM DWN | → | 75 % |
| 68.8 POWOP RESET LEV | | 12 % |
| 68.9 T MAX | → | 500 % |
| 68.10 LOAD TORQ FILT TC | | 150ms |
| 68.11 SALCK ROPE TQ LEV | | -400% |
| 68.12 LOADCORR FACT UP | | 0.90 |
| 68.13 LOADCORRFACT DWN | | 1.10 |
| 68.14 RAMP RATE POWOP | | 1.00 |
| 68.15 RAMP CHANGE SPEED | | 100% |

***) Calculate as: 100 / (RT x 1.5) %/s where RT = longest ramptime in sec.**

| **Parameter settings for the Fieldbus mode** | | |
|---|---|---|
| **69 REFERENCE HANDLER** | | |
| 69.1 SPEED SCALING RPM | → | 1500 rpm |
| 69.2 ACC TIME FORW | → | 5.0 s |
| 69.3 ACC TIME REV | → | 5.0 s |
| 69.4 DEC TIME FORW | → | 5.0 s |
| 69.5 DEC TIME REV | → | 5.0 s |
| 69.6 S-RAMP TC | | 0.0 s |
| 69.7 RAMP SCALE LOCAL | | 2.0 |
| 69.10 RAMP RATE=1 | | TRUE |
| 69.11 SECOND RAMP SCALE | | 100% |
| | | |
| **98 OPTION MODULES** | | |
| 98.1 ENCODER MODULE | → | NO |
| 98.2 COMM. MODULE | | NO |
| 98.3 CH3 NODE ADDR | | 1 |
| 98.4 CH0 NODE ADDR | → | 1 |
| 98.5 DI/O EXT MODULE 1 | | NO |
| 98.6 DI/O EXT MODULE 2 | | NO |
| 98.7 AI/O EXT MODULE | | NO |
| | | |

→ Typical parameter values to check during start-up. If required, alter the values to meet the needs of your application. A complete parameter list is provided in Appendix A.

**!** Parameter value different from default setting

## Function Block Diagram

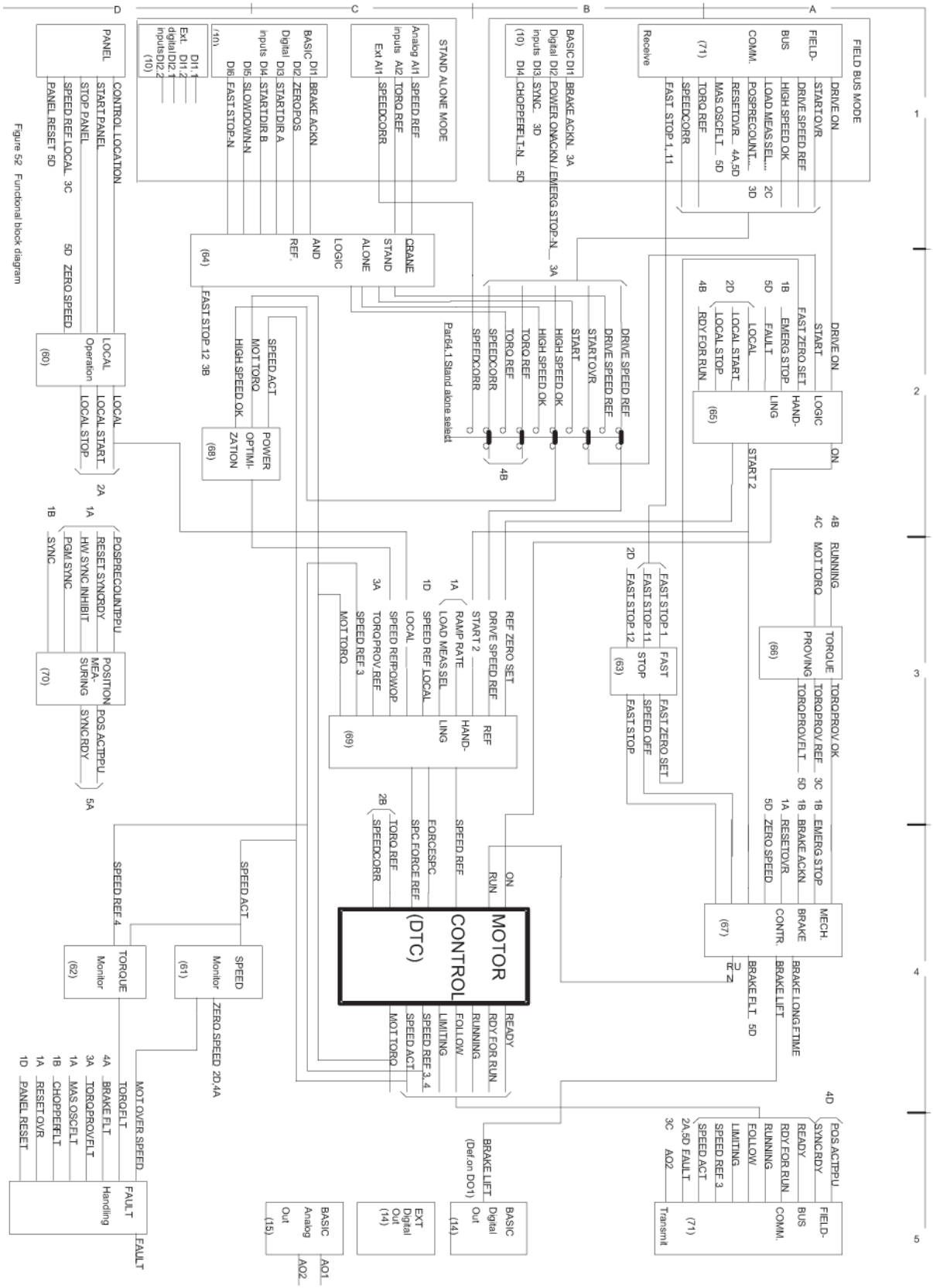



Figure 52 Functional block diagram

# Function Module Description

### Local operation (60)

This function module contains the necessary logic for Local mode operation by the operator's panel on the front of the frequency converter. Normally used only for commissioning and maintenance. The unit is-receives commands: Start/stop, Speed ref local, Local/remote and Reset from the panel. All crane drive functions (such as mechanical brake control) are active also in Local control mode (except power optimization).

Please note that inputs for Slowdown limits, Stop limits and Fast stop are NOT active when running in Local control mode. Speed correction references are active when running in Local mode.

Parameter (60.1) LOC OPER INH = " true " will force the drive to external control mode (LOCAL = " 0 "). The drive is then only controlled from the Field Bus communication or in Stand alone mode from I/O signals.

To be able to change the mode from External control to Local control or reverse the motor has to be stopped with brakes set, that is: ZERO SPEED = "1" and RUNNING = "0".

Local running is performed from the operators panel which contains push-buttons for START PANEL, STOP PANEL of the converter, and for controlling the speed of the motor up and down with the REF plus Up and Down Arrow push-buttons for Fast and Slow reference change respectively. Ramp times (par. 69.2 - 5) are in Local multiplied with a scaling factor: RAMP SCALE LOCAL (parameter 69.7, default = 2.0).

The direction of the drive is changed with the push buttons Forward and Reverse.

Pressing Start push-button will give both ON = Magnetising and Start-order, ramping up per given speed reference.

If pressing Start on panel but no reference higher then ZERO SPEED LEV (67.6) given within the time LOC ZERO SPEED TD (60.3), then the drive will switch off again.

Pressing Stop push-button while running will ramp motor to zero speed, and switch motor magnetising off after the time OFF TD (65.2) if CONTIN ON (65.1) = False.

If pressing Stop push-button (a second time) when at zero speed the magnetising will be switched off = converter switched off.

**NOTE:** If using input signal Power On Ackn (parameter 10.5), the drive cannot be started in Local (or External) mode unless input selected for POWER ON ACKN = "1".

### Speed monitor (61)

The function module is used to supervise overspeed of the motor, to give tripping signal at motor overspeed.

If the motor speed exceeds the level determined by MOT OVERSPEED LEV (61.3) then the drive is tripped instantanuously (converter Off + brakes set) via the signal MOT OVER SPEED, indicating fault on panel, to Fieldbus and faultlogger.

### Torque monitor (62)

The function module is used to supervise the torque of the motor by checking that the motor is following the speed reference in terms of direction of change during accel-/deceleration and without excessive speed error during accel-/deceleration and normal running.

For the supervision to be active TORQ MON SEL (62.1) has to be set "True".

If the absolute value of the speed error (SPEED REF4 - SPEED ACT) is higher than SP DEV LEV (Parameter 62.2) for a time longer than TORQ FLT TD (Parameter 62.3), then the drive trips by torque fault; TORQ FLT, indicating fault to panel, Fieldbus and faultlogger.

Parameter SP DER BLK LEV (62.4), rate of actual speed change in % per second, can be set so that it blocks the protection during acceleration and deceleration. As long as the actual rate of change (derivative) of the motor speed during acceleration or deceleration is higher than the setting of parameter SP DER BLK LEV, the torque fault protection is blocked.

Example: Acceleration ramp times set to e.g. 5 seconds. With SP DER BLK LEV set to 8 %/s, the drive will not trip for torque fault if reaching torque limit during acceleration, as long as the actual acceleration time (0-100%) is below 12.5 seconds (100% / 8%/s = 12.5 s).

### Fast stop (63)

The module contains logic for fast stopping the drive.
Three different types of fast stop can be obtained with this module.
They are:

- With torque limit only = fast stop 1
- With torque limit and mechanical braking = fast stop 2
- With mechanical braking only = fast stop 3

Note that fast stop is not to be mixed up with emergency stop.
**NOTE: Fast stop functions are not active when in Local control!**

The module has three output signals to achieve the different fast stops.

FAST ZERO SET is set to " 1 " when fast stop 1 is ordered, i. e. fast stop with torque limit only (brake is applied at zero speed).

All three signals FAST ZERO SET, SPEED OFF and FAST STOP are set to " 1 " when fast stop 2 is ordered, i. e. stop with both current limit and mechanical breaking.

FAST STOP is set to "1" when fast stop 3 is ordered, i.e. fast stop with mechanical braking only.

To run the drive again after reaching zero speed, the START-signal must be reset before accepting a new start-order.

There are two input signals from the Fieldbus Command Word (DS1.1), FAST STOP 1 and FAST STOP 11 to order fast stop (active in both Fieldbus and Stand alone mode):

-FAST STOP 1 = " 1 " gives fast stop 1
-FAST STOP 11 = " 1 " gives a fast stop per selection parameter 63.1
-FAST STOP TYPE 11

**Please note that drive cannot be started from External control place, if any of FAST STOP 1 or FAST STOP 11 (if activated in 63.1) control bits are active ="1". Local start (from e.g. CDP panel) is possible.**

To use FAST STOP 11 for:
Fast stop 1: set FAST STOP TYPE 11 (63.1) = FAST STOP 1

Fast stop 2: set FAST STOP TYPE 11 (63.1) = FAST STOP 2

Fast stop 3: set FAST STOP TYPE 11 (63.1) = FAST STOP 3

When using Stand alone modes there is also a signal FAST STOP 12, activated by digital input e.g. DI6 (FAST STOP-N) = "0" (see function module CRANE (64) for more details), which can be programmed to give anyone of the three types of fast stop. This is done with parameter 63.2 FAST STOP TYPE 12.

For settings of FAST STOP TYPE 12 see FAST STOP TYPE 11 above.

Note: If in Stand alone mode selecting the Control type (parameter 64.10) = FB JOYSTICK, then both FAST STOP 12 through digital input as well as FAST STOP 1 and FAST STOP 11 through the Fieldbus Command Word are available to use.

Any active Fast stop is indicated in signal 4.5 FB AUX STATUSWORD bit 11.

## Crane (64)

**NOTE: Stand Alone mode is active if parameter 64.1 STAND ALONE SEL is set equal to "True".**

*Stand Alone default I/O signal interface and functions.*

| **Signal** | **Input** (DI set in Group10) | **Function** |
|---|---|---|
| BRAKE ACKN | DI1 | Brake acknowledge from aux. contact on brake contactor (and from brake) |
| ZERO POS | DI2 | Zero position contact from joystick |
| START DIR A | DI3 (fixed) | Direction A (pos.=up) from joystick, to be connected in series with Stop Lim A and contact from mechanical overload protection equipment |
| START DIR B | DI4 (fixed) | Direction B (neg.=down) from joystick, to be connected in series with Stop Lim B and contact from slack rope protection equipment |
| SLOWDOWN-N | DI5 | Slow down lim A and B. Direction from START DIR inputs. After a power down (main contactor off) only slow speed is possible until this input is "1". |
| FAST STOP-N | DI6 | Fast stop signal to the converter |
| SPEED REF | AI1 (fixed) | Speed reference signal from joystick. 0-10 V (or "par. 13.7"-10V) for 0-100 % |
| TORQ REF | AI2 (fixed) | Torque reference signal from joystick. 0-20 mA for 0 to maximum torque reference (maximum set with Parameter 64.9 TORQ REF SCALE). |
| SPEED CORR | Ext AI1 (fixed) | Speed Correction signal from e.g. electric shaft control unit. 0 - (+/-)10V for 0 - (+/-)100% speed correction signal. |
| BRAKE LIFT | DO1 | Output to brake contactor |
| WATCHDOG-N | DO2 | Closed contact indicates "healthy" drive. Open contact makes hardwired emergency stop; main contactor(s) off and brakes on. |
| FAULT-N | DO3 | Fault (trip) signal indication |
| MEAS VALUE 1 | AO1 | Default selection: Motor speed |
| MEAS VALUE 2 | AO2 | Default selection: Motor torque |

*Joystick control mode ( 64.10 or 64.17 = JOYSTICK)*

When connecting a joystick directly to the drive I/O, then parameter 64.10 CONTROL TYPE (or 64.17) should be selected to "JOYSTICK" (= default).

**ANALOGUE REF INPUTS:** The analogue reference signal (0 - max. reference) is connected to Analogue input 1 for speed reference, and to Analogue input 2 for torque reference. The sign for the reference, speed as well as torque reference is given by inputs DI3 (Start Dir A) for positive reference (=up for hoist) and DI4 (Start Dir B) for negative reference (=down for hoist). With parameter 13.7 "AI1 0% REF LEV" the minimum AI1 voltage level corresponding to 0% speed reference is set (used for instance with 4-20mA signal).

**REFERENCE CURVE:** The joystick for giving reference has parameters for setting of the deadzone in direction A and B (64.4 and 64.5).
REF SHAPE (64.6) is for giving the reference a parabolic shape.
Parameter set to "0" = straight line, "20" = X2 and "100" = X3 curve.

**JOYSTICK CHECKS:** The drive is stopped (normal deceleration ramp if speed control) and prevented from a new start until the joystick is moved back to the neutral position, that is, Zero Position (ZERO POS: e.g. DI2 = "1", DIR A: DI3 = "0" & DIR B: DI4 = "0") indicated longer than time ZERO POS OK TD (64.8), if any of following conditions (joystick or wiring problems) occur for a duration longer than JOYSTICK WARN TD (64.12):
- START DIR A= "1" **and** START DIR B="1" at the same time.
- SPEED REF is > 1V or TORQUE REF is > 2mA when joystick is in the neutral position (ZERO POS = "1", DIR A = "0" and DIR B = "0"). Indicates a possible loose ground connection.
Panel also indicates this with an alarm text: "WARNING JOYSTICK".

**START:** The drive is started when one of the signals START DIR A or START DIR B is "1" and ZERO POS is "0", unless any of the above listed fault conditions occur. The sequence starts with a magnetising phase = ON (unless already magnetised) which is immediately followed by the reference ramp-up.

At a normal stop the switching off of the magnetising current is off-delayed by an adjustable time (parameter 65.2 OFF TD).

Power-up: Start order is not accepted after READY signal is active, until joystick is first in zero position.

**SLOWDOWN:** The speed is limited by a preset level (parameter SLOWDOWN SPEEDREF 64.7) if the SLOWDOWN-N input e.g. DI5 is zero-set. The converter remembers the direction of movement and allows full speed in the opposite direction as long as the supply voltage (AMC board supply) is not switched off. If the voltage has been switched off and the input SLOWDOWN-N = "0", or input opens during standstill, then only slow speed is allowed in both directions.

By setting parameter 10.3 SLOWDOWN-N SEL = DI5 + DI6, separate inputs are available for wiring of slowdown limit switches to the drive. Slowdown direction A is wired to digital input 5 and slowdown direction B is wired to digital input 6. If input 5 is open, speed is limited to slowdown reference level in positive (A) speed direction (e.g. upwards), but no limitation for negative speed (e.g. downwards) operation. And vice versa if input 6 is open. If both inputs 5 and 6 are closed ("1"), there is no slowdown speed limitation active - full speed allowed.

Slowdown selection "DI5 + DI6" is also possible to use when operating in Fieldbus mode.

**FAST STOP:** When the FAST STOP-N input e.g. DI6 changes to "0" (activates on a negative edge) while running, the drive is fast stopped (active in both speed and torque control). Three alternatives Fast Stop 1 = Torque limit braking, Fast Stop 2 = Torque limit and mechanical braking or Fast stop 3 = Mechanical braking can be selected from by parameter FAST STOP TYPE 12 (63.2).

After reaching zero speed and the "ZEROPOS" input has been set to "1", with a positive edge required for reset of fast stop condition, for a time longer than parameter ZERO POS OK TD, start of the drive is allowed. That is: the joystick must be returned to the neutral position for a minimum of 0.3 seconds (default value) before starting in other direction is possible.

To avoid running in the same direction (hoisting after overload indication or lowering after slack rope indication) the appropriate direction input must be wired in series with an additional contact from the protection equipment. These contacts must be of "NO" type and are closed when the protection equipment is energised and opens when a fault occurs.

**TORQUE CONTROL** The selection of speed control or torque control can be set by using parameter 64.18, SPEED/TORQCTRL.

In *Torque* mode, torque control is controlled with AI2 TORQ REF.
In *SPEED/TORQUE* mode, torque control is activated when the current level on input AI2 TORQ REF the first time (after each power on) passes the level 2 mA, and if the speed reference level on AI1 is below 1V.

Speed reference is activated the first time AI1 passes the level 1V (and after each power on = default). If both inputs are above the limit, then speed control is active. Updating time for speed and torque references are 32 ms.

*For both torque control modes:* If a slowdown limit switch is activated when in torque control, the drive will change to speed control and limit speed to the set slowdown speed reference level.

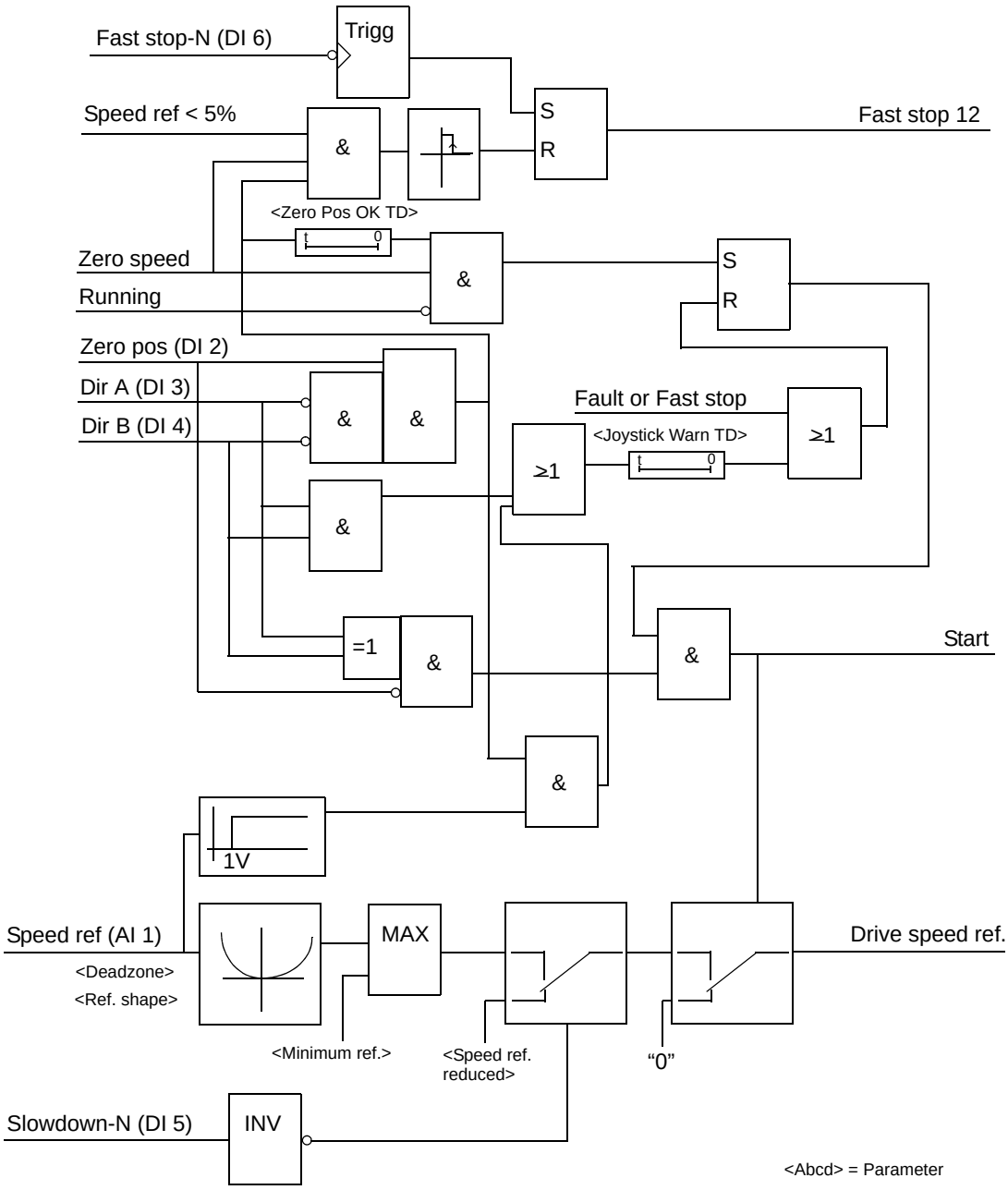
**SPEED CORRECTION:** The additional speed reference input Speed Correction (Ext AI1 = RAIO input AI1) is a reference **without any ramp** that is added to the output of the normal speed reference ramp generator. Can be used as a correction input from a "electric shaft" control unit. Updating time is 8 ms for the speed correction input.

0 V signal is 0 % reference level and the 0 - (+)10 V range corresponds to 0 - (+)100 % speed. 0 - (-) 10 V range corresponds to 0 - (-)100 % speed. Additionally the fieldbus Speed correction signal (DS3.2) can also be used (added to Ext AI1 signal) in Stand alone mode.

The speed correction reference is limited so that the sum of the normal "ramped" speed reference and the speed correction reference cannot exceed Maximum/ Minimum Speed setting (parameters 20.1 & 20.2).

**WATCHDOG:** The signal WATCHDOG-N (digital output 2 as default) is used to indicate a healthy drive. This output is zero-set if the software detects any of the following faults:
- Fieldbus communications fault (MAS OSC FLT)
- Master/Follower bus (Ch2) communication fault
- Brake long falling time
- Chopper fault (e.g. short circuit or overload)
- External fault - CPU stalls out

If this relay output contact opens, the supply contactor to the converter must immediately be opened and mechanical the brakes applied by removing power from the brake contactor = emergency stop of the crane drive



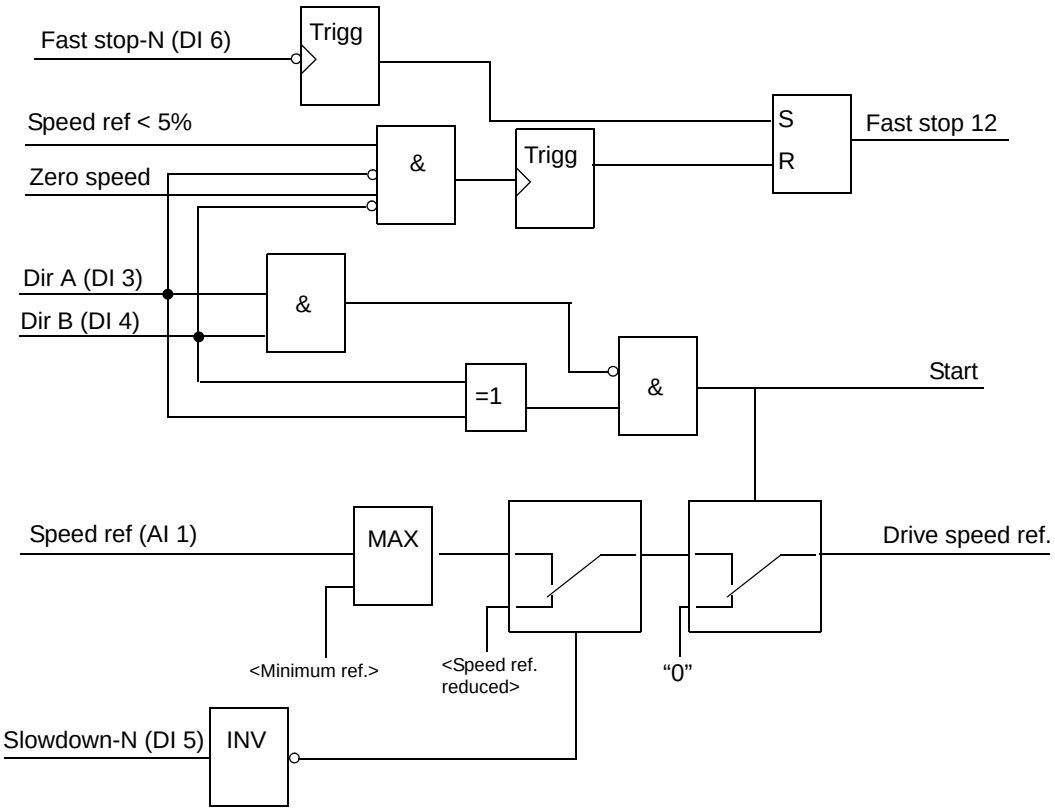

*Crane stand alone logic using Joystick Control type.*

*Radio control mode (64.10 or 64.17 = RADIO CTRL)*

If the joystick is connected to **and monitored** by an external unit such as a Radio controller or PLC, then Control type "Radio Control" (parameter 64.10 or 64.17) can be used. The differences from "Joystick" control are:

- The "Zero Pos" input signal (e.g. DI2) is not used/required.
- If receiving both direction orders "Start Dir A" and "Start Dir B" at the same time, the start order and reference are interlocked while the error occurs, but no indication is given to the panel nor any requirement for both signals to be zero before releasing the interlock
- No check of reference level is made before responding to the start order.
- Deadzone (64.4 and 64.5) and Ref Shape (64.6) parameters are inactive.

Reference inputs for speed, torque and speed correction reference (AI1-Ext AI1) have the same scaling and functions as in "Joystick" control mode.




*CRANE stand alone logic in Radio Control mode*

*Motorised Potentiometer control mode (64.10 or 64.17 = MOTOR POT)*

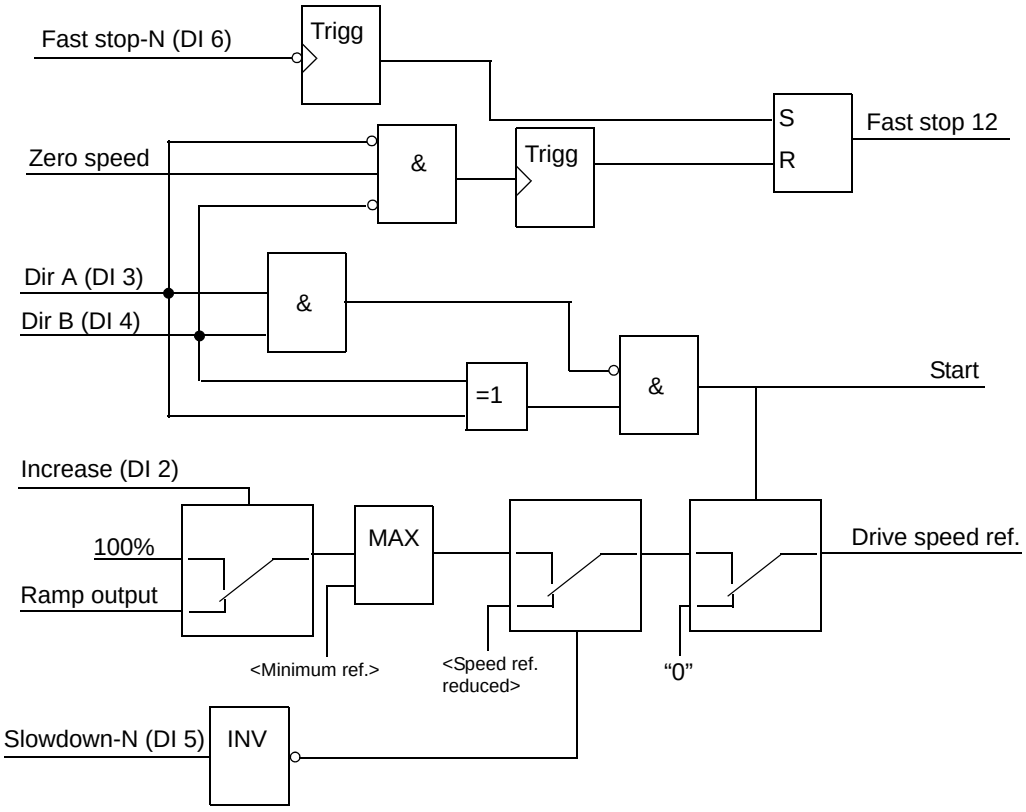
If using (for example) a pendant controller with push-buttons for start and increase speed, then Control Type (parameter 64.10 or 64.17) should be set to "Motor Pot".

"Start Dir A" and "Start Dir B" contacts connects to DI3 & DI4. "Increase" contacts should be connected in parallel to DI2 (activated by setting parameter 10.13 ACCELERATE SEL = DI2).

The Drive will start and accelerate on ramp towards (+ or -) 100 % speed if both direction and increase inputs are activated (= closed). If increase order is removed before reaching 100 % speed, drive will stop accelerating and run with the speed level reached. With a new increase order the drive will continue to accelerate towards 100 %.

If direction order is removed, the drive will decelerate on ramp towards 0 % speed. Reclosing the direction contact before reaching 0 % speed will stop deceleration and hold speed at the level reached.

Inputs AI1 and AI2 are inactive in this control mode. Other inputs have normal functions.




*Crane Stand Alone logic in Motorised Potentiometer*

*Step joystick reference mode (64.10 or 64.17 = STEP JOYST)*

When using a step type joystick having reference contacts instead of an analogue potentiometer, the control mode STEP JOYST (parameter 64.10 or 64.17) should be used. Up to 4 different speed levels are supported, direction order giving first speed level + 3 more contacts for different speed levels. Contacts can be connected to selectable digital inputs (including extended I/O modules), see parameters 10.8 STEP REF2 SEL, 10.9 STEP REF3 SEL and 10.10 STEP REF4 SEL. The corresponding speed reference levels are set with parameters 64.13 SPEED REF LEVEL 1 up to 64.16 SPEED REF LEVEL 4.

All lower step reference contacts must remain closed for next level to be active.

Example: when closing contact corresponding to Step reference level 4, contacts for level 2 and level 3 must still be closed.

Note that Zero Pos signal from joystick is required in this mode, similar to control mode JOYSTICK. Joystick monitoring function is active.

*Step radio reference mode (64.10 or 64.17 = STEP RADIO)*

When using a radio controller or PLC having step reference output contacts, the control mode STEP RADIO (parameter 64.10 or 64.17) can be used. Maximum 4 different speed levels available.

Digital inputs and speed reference levels are selected as described above with Step Joystick mode.

Zero Pos input signal is not required in this control mode. Joystick monitoring is not active.

*FB JOYSTICK control mode (64.10 or 64.17 = FB JOYSTICK & 64.1 = True)*

This mode is used if the joystick I/O is wired to a PLC which has fieldbus communication to the CraneDrive drive, and we still want to use the Stand alone mode (CRANE module).

When FB Joystick mode is selected, the drive is reading signals START DIR A, START DIR B, ZERO POS and the Reference from the fieldbus datasets instead of the digital inputs DI2, DI3, DI4, and analog input AI1.

Dataset 5 word 1 from PLC is used with the following bit mapping:

Dataset 5 Word 1: Aux Command word

| Bit number | Signal | Range | Description |
|---|---|---|---|
| 0 = Bit 0, LSB | FB ZERO POS | "1", "0" | Joystick Zero Position signal |
| 1 | FB START DIR A | "1", "0" | Joystick direction A signal (pos.=up) |
| 2 | FB START DIR B | "1", "0" | Joystick direction B signal (neg.=down) |
| 3 | FB JOYST TQ CTRL | "1", "0" | Joystick torque control enable |
| 4 | FB ELSHAFT ON | "1", "0" | Electric shaft control on |

Bits 0–2 are used for sending the joystick signals from the PLC. Dataset 1 word 2 – DRIVE SPEED REF (see section *Field bus communication (71)* on page *102* for scaling information) – is used for sending the joystick analog reference (without sign) in FB JOYSTICK mode.

The speed/torque control mode is depending on the setting of parameter SPEED/ TORQUE (64.18). Set dataset 5, word 1, bit 3 to "1" when using torque control. The torque reference (without sign) is then sent with dataset 1 word 3 TORQ REF (see section *Field bus communication (71)* on page *102* for scaling information).

Bit 4 FB ELSHAFT ON is only used with Electric shaft control, see section 5.5.14 for details.

Slowdown limit switches can still be wired to the drive digital input(s), selections per parameter 10.3 SLOWDOWN-N SEL.

End limit switches can be wired to drive digital inputs DI3 + DI4, see parameter 10.14 FB STOPLIM SEL, when FB JOYSTICK mode is used (also available in Fieldbus mode).

When using FB JOYSTICK mode the fieldbus Command word, dataset 1 word 1 (see section *Field bus communication (71)* on page *102*) can be used except for the following bits that are not active: START OVR and TORQ CTRL.

Please note that the fieldbus communication supervision is active: Comtest toggle bit in Command word + Status word must be connected in the PLC program (see section *Field bus communication (71)* on page *102*) to avoid communication fault in drive!

*Bipolar reference control mode (64.10 or 64.17 = BIPOLAR REF)*

If using a joystick (or PLC) that is not providing any direction contacts but with a bipolar speed reference signal (e.g. +/-10 V), then control mode BIPOLAR REF can be used. Torque control is not supported.

The +/-10 V analog speed reference signal should be connected to AI1. A start order contact should be connected to both digital inputs DI3 and DI4 (fixed, not programmable).

The sign of analog input signal is used as sign (direction) for the speed reference. No zero position contact is required.

Drive is started and using a positive speed reference only when receiving a positive analog input signal together with input DI3 being activated ("1").

Drive is started and using a negative speed reference only when receiving a negative analog input signal together with input DI4 being activated ("1").

Any offset error of analog signal (if non-zero in stop position) can be compensated by setting parameter 13.07 AI1 0% REF LEV (range +/-10V) to the level of offset error.

Any stop limit (endlimits) contacts (normally closed) can be connected in series with start signal to DI3 resp. DI4. That is, positive direction stop limit contact to be connected in series with start signal to DI3 and negative stop limit contact to be connected in series with start signal to DI4.

*Possibility for two selectable Standalone control modes*

Selection between two different control modes, e.g. Joystick and Motor Pot, can be done using a digital input selected with parameter 10.20 SECOND CTRL SEL.

The first control mode type is set with parameter 64.10 CONTROL TYPE. Second control mode type is set with parameter 64.17 SECOND CTRL MODE.

With digital input not set ("0") the first control mode, set in 64.10, is active. If the digital input is set ("1") the second control mode, set in 64.17, is active.

Note: The change of control mode is only done with drive stopped (Running=0 & Zero speed=1).

**Logic handler (65)**

Contains logic for on-, off- and start order.

On is the motor magnetising command and start command releases speed and torque controllers. To get an On order to the converter the signal ON must become "1". This can only be obtained if no off order is issued which means if:
- Power On Ackn (e.g. DI2) = "1".
- Converter is not tripped (FAULT = " 0 ")
- The button " 0 " at the panel is not pushed (LOCAL STOP = " 0 ")

When an "On signal" is given either in local mode with the panel LOCAL START or in remote mode with the signal DRIVE ON (field bus mode) or START DIR A/ START DIR B (stand-alone mode) to get the signal ON, then a signal Ready For Run is awaited, acknowledging that the motor is magnetised. If this acknowledgement is not received within 5 seconds the ON-order signal is reset to zero.

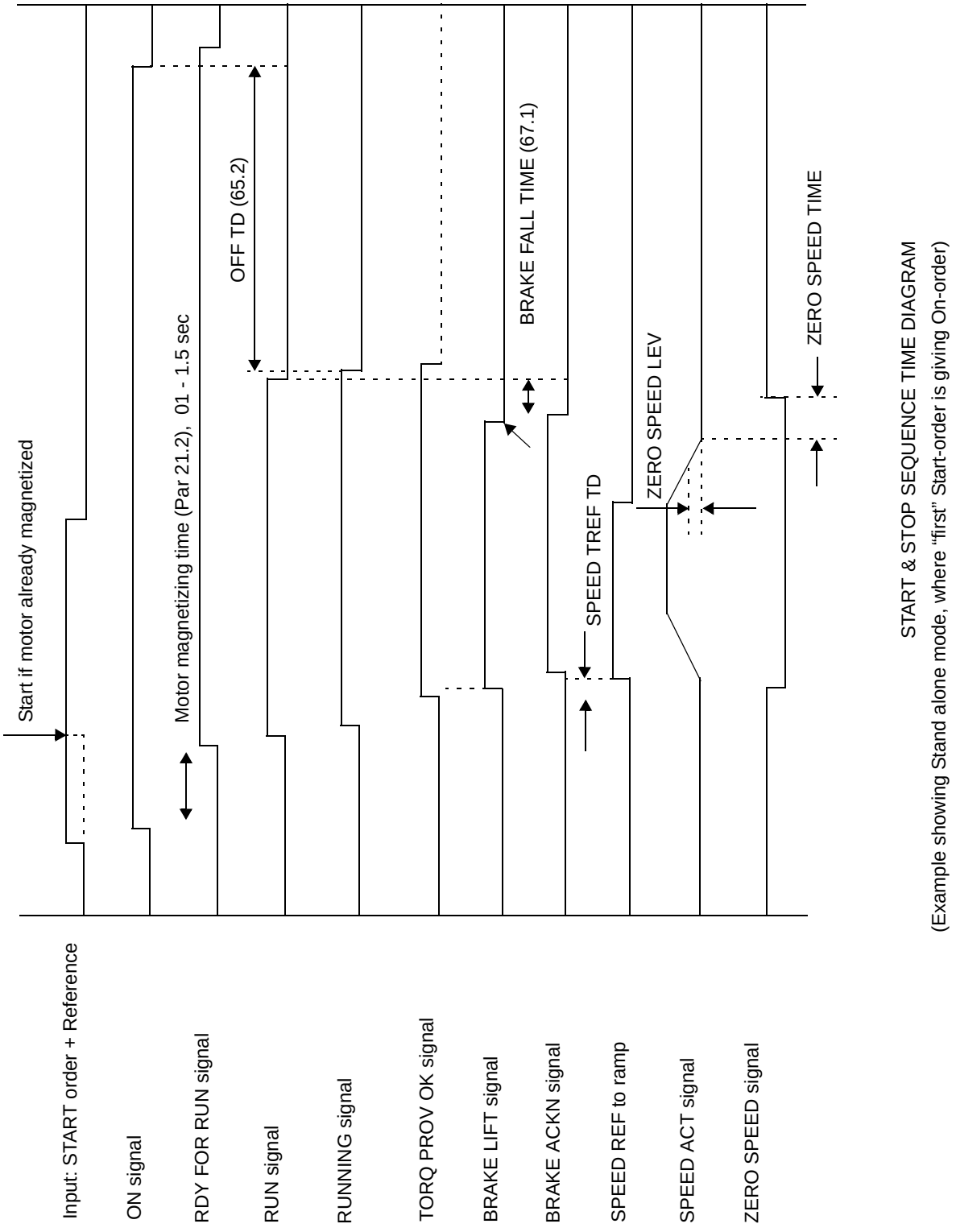
Off order is given by the panel LOCAL STOP at zero speed (stop push-button on panel) or in external control when signal DRIVE ON is set to "0" (field bus mode ).

If parameter CONTIN ON (65.1) = " false " and running becomes " 0 " the ON signal will be reset to " 0 " after expired time OFF TD ( 65.2 ). This is a " magnetising shut-off" function if the drive is not operated within the last OFF TD seconds.

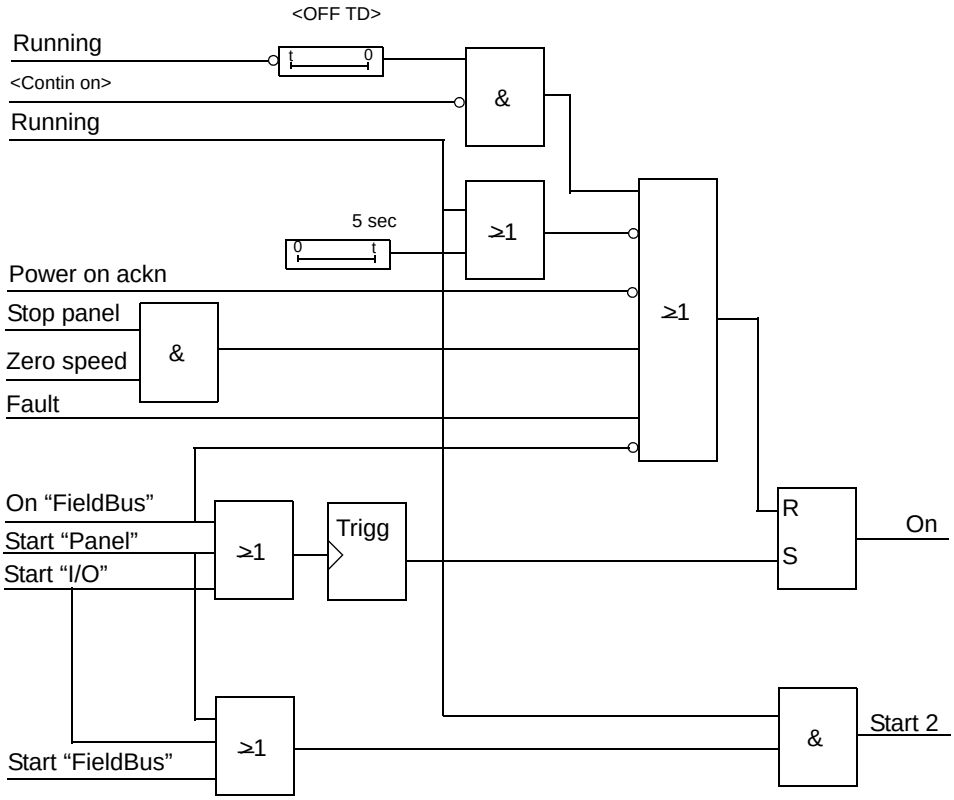
"Start order" is issued when START 2 = " 1 ". In remote mode the signal START OVR (Fieldbus mode) or START DIR A / START DIR B (stand-alone mode) is giving this (the start order). In local mode the start order is given with signal LOCAL START (start push-button on panel).

No start order can be given unless the converter is "On" = magnetised, acknowledged by the signal Ready For Run.

Signal REF ZERO SET will hold the speed reference to " 0 " when Fast Stop is ordered. See also timing and logic diagrams on the next 2 pages.




*Start and stop sequence time diagram*




*Logic Handler logic*

### Torque proving (66)

Torque proving is a function module included in the drive control to ensure, before releasing the brake and starting the crane operation, that the drive is able to produce torque, and that brakes are not slipping (signal "Zero speed"=1). The function module is mainly intended for hoist drives, but can also be used with other motions using encoder feedback.

Torque proving is performed by giving a positive torque reference with the brake applied. If torque proving is successful, that means torque reaches the correct level, the brake is lifted and the next step in the starting sequence is initiated.

The time to execute the torque proving sequence is so short (approximately 100 ms) that the operator does not experience any time delay in the starting sequence.

The torque proving is activated by setting:
- TORQ PROV SEL (66.1) = " True "

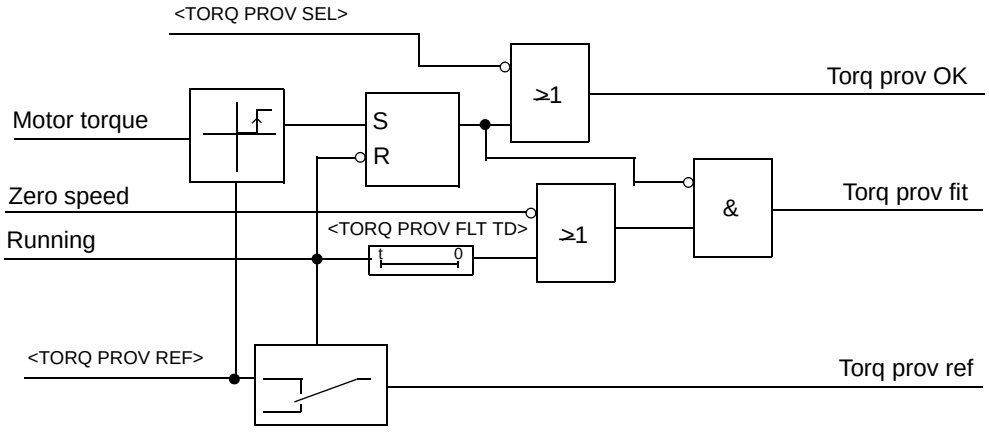
The torque proving reference, TORQ PROV REF (66.4) sets output signal TORQ PROV REF. The actual torque is read from signal MOT TORQ.

When the torque proving is activated but not yet performed, the output signal TORQ PROV OK is " 0 "

The torque proving sequence starts when the input signal RUNNING is " 1 ", i. e. when the converter is started. When the torque proving sequence is completed the output signal TORQ PROV OK is set to " 1 ".

If any fault is detected during the proving sequence, signal TORQ PROV OK does not go to " 1 " but output signal TORQ PROV FLT is set to " 1 " and the drive trips. A message is displayed on the drive panel and an indication given to the supervisory control.

NOTE: Torque proving is not active (even if selected with parameter 66.1) if the drive is in torque control mode.




*Torque proving logic*

### Mechanical brake control (67)

The program supports electrical and mechanical braking to stop the motor. Electrical braking gives a controlled and smooth braking which is the most common way to bring a motor to stop. Mechanical braking should only be used in critical situations and if so there are two possibilities:

- Emergency stop (category 0 stop)
- Fast stop

The function module contains logic for controlling the mechanical brake. Output signal BRAKE LIFT (2.21) is the brake lift order. Brake lift acknowledgement is received as input (e.g. DI1) BRAKE ACKN.

In the starting sequence it is possible to set a rampstart time delay related to the brake actual lifting time with parameter 67.8 SPEED REF TD.

After the motor has come to zero speed during a stop (by electrical braking) the mechanical brake should be applied without unnecessary delay.

**Detection of the motors zero speed rotation at stop**:
While running the motor the output signal ZERO SPEED (signal 4.1:4) is "0". When the speed is below the level ZERO SPEED LEV (67.6) and the time ZERO SPEED TIME ( 67.7) has elapsed the signal ZERO SPEED becomes "1", indicating zero speed on the motor and the mechanical brake will be set if no start order exist.

**Start sequence:**
A brake lift is initiated by a start order i. e. brake control input signal START 2 = "1". This will set output signal RUN = "1" releasing speed & torque controllers. After receiving TORQ PROV OK = "1" and no stop orders are active the BRAKE LIFT is set "1". With a slow brake, start of the speed ref. ramp can be delayed with par. 67.8 SPEED REF TD.

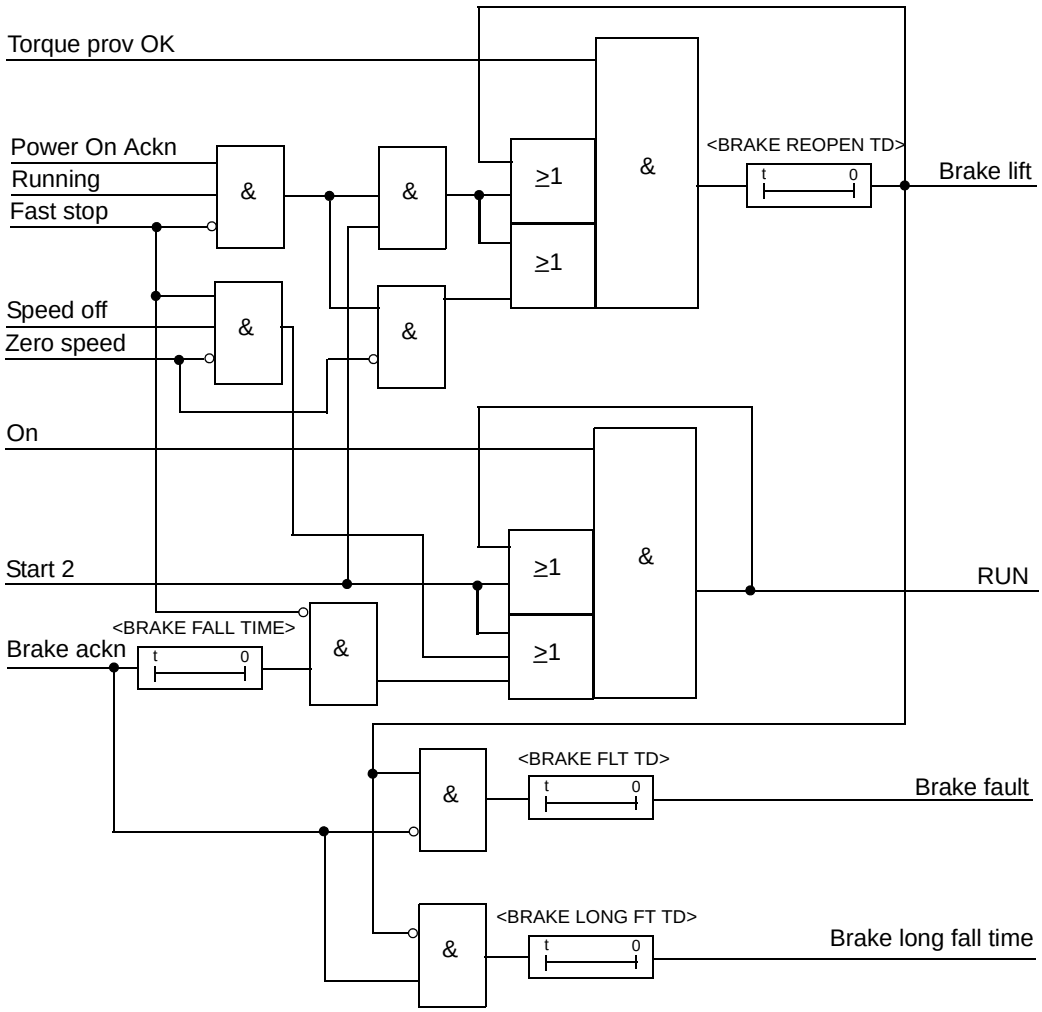
**Normal stop sequence:**
Removing the start order will set the reference to zero and the drive will, if speed controlled, ramp to zero speed (Reference handler). When the input signal ZERO SPEED = "1" then BRAKE LIFT is set to zero. When receiving acknowledgement BRAKE ACKN = "0" the RUN order is reset to "0" after delay time BRAKE FALL TIME (67.1). Except at emergency stop (EMERG STOP = "1" when Power On Ackn = 0 in Fieldbus mode) and fast stop (FAST STOP = "1") the brake module maintains the BRAKE LIFT and RUN order as long as ZERO SPEED is not detected.

With parameter 67.4 BRAKE REOPEN TD, a minimum time delay between a stop and next start, i.e. a "close brake order" (BRAKE LIFT=0) and next "brake lifting order" (BRAKE LIFT=1), can be set.

A brake fault, i.e. Brake Ackn (DI1) = 0 (during start or normal running) with a duration longer than setting of BRAKE FLT TD (67.2), activates an output signal BRAKE FLT that will trip the drive and indicate.

A long falling time at stop (Brake Ackn =1) with a duration longer than setting of BRAKE LONG FT TD (67.5), keeps torque on the motor and provides indication with an output signal BRAKE LONG FTIME to: panel, Fieldbus statusword and activates the Watchdog output contact (DO2) to make an emergency stop of the drive (brake and drive power off).

See also logic diagram below, and the *Start and stop sequence time diagram* on page *86*.




*Mechanical Brake Control logic*

**Torque memory**

Parameter START TORQ SEL (67.9) is used for selecting type of **torque memory function**, to avoid "roll-back" at start on a hoist drive:

- NOT USED = No extra starting torque
- AUTO TQ MEM = Automatic torque memory will store the load torque needed when stopping and apply the same torque reference when starting again. The value of parameter 67.10 START TORQ REF is used as a minimum value for the torque memory.
- LOAD MEAS = Starting torque reference is received from a PLC (DS5.2 LOAD MEAS REF) or from the extended RAIO analog input 2 (connected e.g. from a load cell). The "Ext AI2" input is filtered with parameter 13.6 (also used for Ext AI1) and scaling is done with par. 64.9 TORQUE REF SCALE. Parameter 64.9 = 2.0 gives following scaling: Ext AI2= 10V corresponds to 200% starting torque reference.

  **NOTE:** signal LOAD MEAS SEL from the Fieldbus command word must be set "true" to enable the fieldbus reference from DS5.2.

  The fieldbus DS5.2 reference and Ext AI2 reference are added together.

PAR 67.10 = Starting torque reference is set fixed equal to value given in parameter 67.10 START TORQ REF.

**Conical motor function**

This section describes how to handle the use of a conical motor (rotor displacement motor) with built-in brake instead of standard motor plus external mechanical brake. In a conical motor the rotor will move along it's length, thereby separating the brake disc mounted on the shaft from the counterpart mounted on the stator, as soon as magnetizing current is applied to the motor winding. When the current is switched off at stop, the rotor is pushed back closing the brake by spring force.

By setting parameter 67.11 MOTOR TYPE = CONICAL the conical motor function is activated. Following parameters will then automatically get the new default values below, suitable for use with conical motors (parameters are reset to normal defaults if par. 67.11 is set to STANDARD).

10.1 BRAKE ACKN SEL = INTERNAL ACK
21.2 CONST MAGN TIME = 30 ms
65.2 OFF TD = 0.0 s
67.1 BRAKE FALL TIME = 0.0 s
67.6 ZERO SPEED LEV = 3.0 %
67.7 ZERO SPEED TIME = 1000 ms

To minimize the "roll-back" (load dip) of a hoist conical motor when stopping, the flux is reduced during stop to a level set in parameter 67.12 RED FLUX LEVEL. Default value 75 % is sufficient for most conical motors, but for larger motors (30-40 kW) there can be a need to lower this value further to minimize the "roll-back". Note that during stopping when reducing the flux the motor current will increase proportional. Due to this there can be a need to check converter sizing to have enough current margin. Normally one size bigger converter is selected.

This flux reduction is only active if conical motor function is activated with parameter 67.11 (=CONICAL).

To minimize the "roll-back" (load dip) of a hoist conical motor at start, the flux level at start can be increased to a level set in parameter 67.13 START FLUX LEVEL (100 - 140 %) during a time set with parameter 67.14 START FLUX TIME.

With parameter 67.7 ZERO SPEED TIME it's possible to delay the closing of conical motor brake at stop. For example to get faster response to a new start order within this time.

**NOTE:** When making ID Run with a conical motor, the REDUCED type of ID Run must be selected in parameter 99.10 . The STANDARD type of ID Run cannot be used as it is making measurements with low flux levels, making conical motor stop.

Conical motors used on hoist applications must have an encoder speed feedback.

## Power optimization (68)

The power optimization function module can only be used in drives with an active (pulling) load, that is, in general only on hoist drives. Speed reference in hoisting direction must be positive value (Dir A).

When increasing the motor speed above motor nominal speed (base speed), field weakening is used. Field weakening, however reduces the maximum available torque of the motor. To ensure that the motor always is able to produce sufficient torque for controlling the load in the field weakening range, a maximum allowed speed is calculated. This function is called power optimization. This means that for a heavy load the maximum allowed speed is less than that of a light load.

When different acceleration rates for heavy and light load is required, a second ramp (“broken ramp”) my be defined.

### Speed reference, Fieldbus mode

The speed reference from the PLC (DS1.2) when accelerating the hoist drive must be limited to Base speed level (set in parameter 68.2, e.g. 50%). If maximum speed is requested by the driver, the signal HIGH SPEED, from the fieldbus Command word (DS1.1) bit 2, goes high. The power optimization then calculates the maximum speed reference in the field weakening area (above base speed) which is used as input to the ramp unit.

When the driver reduces the reference from maximum, the HIGH SPEED signal should be set to 0. The speed will now be below base speed unless PLC reference has been rescaled to be proportional to maximum reference (SPEED REF3 in DS4.1) reached during acceleration.

### Speed reference, Stand alone mode

Speed reference is received through I/O (e.g. AI1 if JOYSTICK control mode is selected) or from PLC (DS1.2) if FB JOYSTICK control mode is selected (parameter 64.10 CONTROL TYPE used for Stand alone control mode selection).
Speed reference is given as 0 - 100 % (% of parameter 69.1 SPEED SCALING RPM). The **minimum** of this requested reference and the reference calculated by power optimization is then used as input to the ramp unit. Note that parameter 64.3 HIGH SPEED LEVEL 1 should be set equal to the Base speed level (set in parameter 68.2) to get the HIGH SPEED signal correctly (this signal is created internally in Stand alone mode).

### Common

To be active the parameter POWOP SELECT(68.1) must be set " True ".

Parameters TQLIM UP (68.6) and TQLIM DWN (68.7) are maximum load torque (power limits) in positive/negative running directions.

When the speed, during acceleration towards base speed, has reached 90% of base speed the module makes a calculation (using speed and torque measurements during 250 ms before reaching 90% of base speed) of the maximum allowed speed by the formula:

$$\text{maximum speed} = \frac{\text{BASE SPEED} \times \text{TQLIM}}{\text{TORQ HOLD}}$$

TORQ HOLD is the torque needed to hold the load (this level is equal to the motor torque value you can see when reaching steady state = constant speed), and is calculated by the module during acceleration. If the module receives the order HIGH SPEED = "1", commonly given when the master switch is in its outermost position, output SPEED REF POWOP is set to the calculated maximum speed reference. The quality of the calculation depends on the measurements done before reaching 90% of base speed. The speed must have a linear acceleration and without excessive ripple.

The power optimization output speed reference SPEED REF POWOP is set to zero if the input signal HIGH SPEED is set to "0". The calculated maximum reference is reset to zero when the actual speed SPEED ACT has decreased to a speed corresponding to the parameter POWOP RESET LEV (parameter 68.8).

The calculated reference value (before the "HIGH SPEED switch") can be seen in signal 2.25 POWOP SPEEDREF.

The TORQUE HOLD value mentioned above is continuously calculated by the power optimization module. It's available as signal LOAD TORQUE % (2.31), in % of the motor nominal torque. This signal is filtered with a filter time constant set in parameter 68.10 LOAD TORQ FILT TC.

This LOAD TORQUE signal is used to detect a "Slack rope" situation, that is load torque dropping below the level set in par. 68.11 SLACK ROPE TQ LEV. SLACK ROPE is indicated in signal 4.05 FB AUX STATUSWORD (DS12.1) bit 10. A detected slack rope will make a Fast stop1 of the drive. This Fast stop can be disabled via signal DISABLE SLACKROPE in fieldbus Dataset 5 Word 1: FB AUX COMMAND WORD (signal 3.07) Bit 7. Also setting of parameter 68.11 = -400% (default) will disable the Fast stop.

**NOTE:** When dimensioning the hoist motor it must be ensured that the available motor breakdown torque (Tmax) in the frequency converter duty, is sufficient for the total torque required during acceleration (hoisting) and deceleration (lowering) in the field weakening area. The breakdown torque decreases proportionally to 1/n2 in the field weakening area!

Power optimising will during acceleration, using total torque measured (load + accel), calculate the maximum speed possible in field weakening without exceeding the motors stated breakdown torque TMAX (parameter 68.9).

This value is used to limit the SPEED REF POWOP reference.

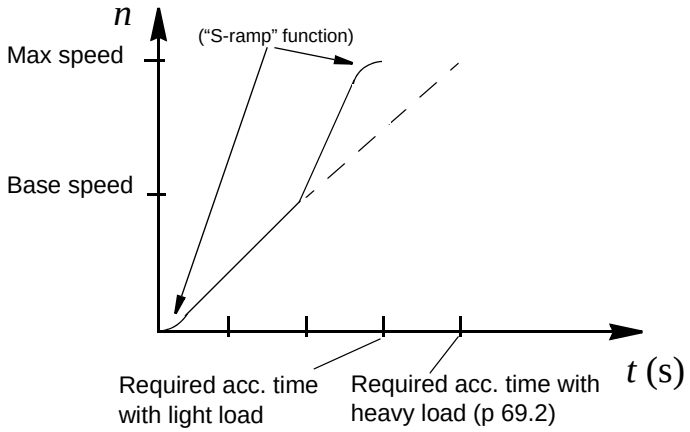
**Broken acceleration ramp**

A special case in power optimization is when two acceleration times are required for hoisting up; one with full load and one with light load.

The normal acceleration time (p 69.2) is set for full load and the acceleration then stops at base speed. With a light load it is possible to accelerate up to maximum speed. If the total acceleration time in this case is required to be shorter than what's set in 69.2, then the acceleration above base speed can be increased by using the parameters 68.14 and 68.15.

The ordinary acceleration parameter, 69.2 ACC TIME FORW, is multiplied with the value of the parameter 68.14, RAMP RATE POWOP. When the value of 68.14 is less than 100%, a shorter ramp time is applied above the speed set in parameter 68.15, RAMP CHANGE SPEED. This results in a "broken ramp" according to the figure below.

The S-ramp function (parameter 69.5) applies also to the broken acceleration ramp.



**Commissioning instructions for the power optimization.**

This is an instruction how to adjust the parameters INERTIA TOTAL UP (68.4) , INERTIA TOTAL DWN (68.5) , TQLIM UP (68.6), TQLIM DWN (68.7) and TMAX (68.9).

1. Set the parameter POWOP SELECT (68.1) to "True". Also temporarily set 68.9 to maximum = 500%.

2. Set the parameter TQLIM UP (68.6) to the rated torque of the motor (100%).

3. Temporarily set the parameter TQLIM DWN (68.7) to 75% of rated torque of the motor. The reason to set TQLIM DWN lower than TQLIM FLD WEAK UP is to get about same speed in positive and negative directions, with a certain load on the hoist.

4. The parameters INERTIA TOTAL UP and INERTIA TOTAL DWN are acceleration constants in positive and negative direction. Use a load that is 75 - 100% of full load.

5. Set parameter POWOP AUTOTUNE SEL (68.3) to " true ". The tuning part is now activated for one autotune cycle.

6. Start the drive with base speed reference (from Local or External control) in positive (respectively negative) direction, and the motor will accelerate up to base speed. The motor will keep at base speed for about 4 seconds for calculation to be completed. If giving start and reference from External control place it's required to disconnect HIGH SPEED OK signal during Autotune (in Standalone set par. 64.3=100%). Calculation is completed when actual signal no. 24 TOTAL INERTIA is showing a non-zero value. Stop the drive.

7. Read the actual signal no.24 TOTAL INERTIA on the panel.
Repeat this procedure 2-3 times in each direction and calculate the average value for parameter INERTIA TOTAL UP and INERTIA TOTAL DWN respectively.

8. Set this value to parameter INERTIA TOTAL UP (68.4) or INERTIA TOTAL DWN (68.5) depending upon the direction. Reconnect HIGH SPEED OK signal (i.e. in Standalone, set par. 64.3 back to 98%).

9. Adjusting TQLIM UP and TQLIM DWN:
Connect a load equal to the highest load specified to operate to max field weakening = 100% speed. Lower parameters TQLIM UP and TQLIM DWN to a low value, e.g. 40%. Testrun from joystick giving full reference up (resp. down). Check max speed reached. If not equal to 100%, then increase TQLIM UP (resp. TQLIM DWN) in steps of 5% until reaching 100% speed each time.

10. Now with this same load, decrease TMAX 68.9 step-by-step and test run up respectively down until you find the first value where the speed starts to be limited below 100%, in either up or down direction. Then slightly increase TMAX 68.9 to still reach 100 % speed both in hoisting and lowering direction.

*An alternative to points 4 - 8 above for finding the Inertia values is:*

Monitor the signal 2.31 LOAD TORQUE % with DrivesWindow while making start and stop test runs (acceleration, constant speed for a couple of seconds and deceleration) with different settings on the Inertia parameter. Any load 20 - 100% is possible to use. Do not run faster than base speed. First run in hoisting direction.

When you have found the correct value for parameter 68.4 INERTIA TOTAL UP, then signal 2.31 LOAD TORQUE % will show the same value during acceleration and deceleration as during constant speed. If the Load torque signal shows a higher value during the acceleration than during constant speed, then the INERTIA TOTAL UP parameter should be increased. If the Load torque signal shows a lower value during accelleration than during constant speed, then the Inertia should be lowered.

Next, make similar test runs in lowering direction to find correct value for parameter 68.5 INERTIA TOTAL DWN. If the Load torque signal now shows a higher value during acceleration than during constant speed, then the INERTIA TOTAL DWN parameter should instead be decreased (and increased if showing a lower value during acceleration).

### Reference handler (69)

The function module includes:
- Setting of ramp times
- Handling of speed references

#### Ramp

The ramp times can set differently for both acceleration and deceleration, and for forward and backward rotation of the motor, with parameters: 69.2 ACC TIME FORW; 69.3 ACC TIME REV; 69.4 DEC TIME FORW and 69.5 DEC TIME REV.

A "second ramp set" can be activated by multiplying a scaling factor to the normal ramp rates (69.2–69.5).

The possibility to use a scaling factor for the set ramp times is available in external and local control mode. In **external control mode** there are two possibilities:

- When using *fieldbus*, the scaling factor is set with signal RAMP RATE (DS3.1) from supervisory control. The scaling factor is applied when parameter 69.10 "RAMP RATE=1" is set to False.
- In stand alone applications, the scaling factor is set in parameter 69.11 SECOND RAMP SCALE. The scaling factor is applied when parameter 10.19 SECOND RAMP SEL is set to SECOND RAMP, or connected to a DI which is set to “1”.
- (In external mode it is also possible to apply both of these scaling methods simultaneously. This is however not recomended.)

When running in **local mode**, the parameter RAMP SCALE LOCAL (69.7) is used. The default setting is 2.0, which means that the actual ramp times in local control mode are double the settings of the ramp time parameters 69.2 - 69.5. (However, in the Master drive in Master/Follower macro operation, the setting is fixed at 1.0)

For "smoothing" both the beginning and the end of the ramp there is a S-curve function. The S-curve time constant is set with parameter 69.6 S-RAMP TC.

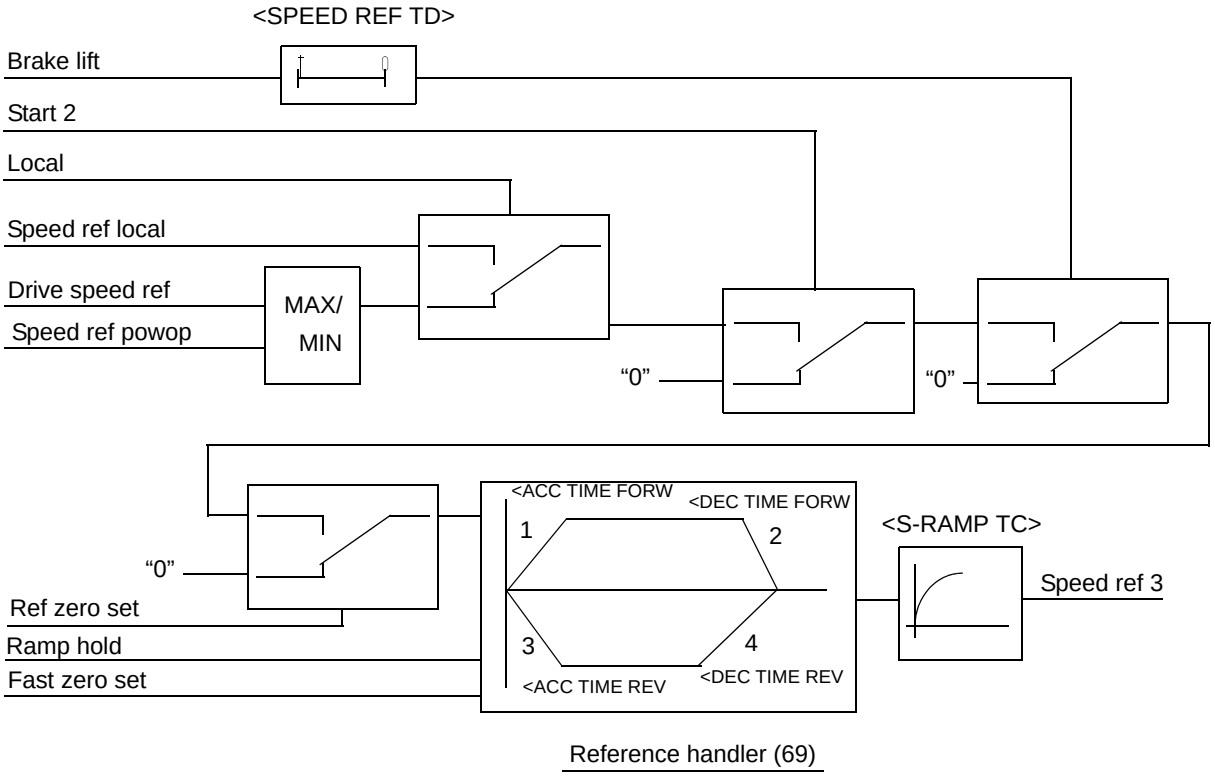
#### Speed ref

The Speed reference when running in external Fieldbus control mode (64.1=False):
The drive uses the *higher* of the values in DRIVE SPEED REF or SPEED REF POWOP. The DRIVE SPEED REF is a reference up to base speed at start. Then if the power optimization has calculated, for the actual load, that it is possible to run above base speed, it will use SPEED REF POWOP which brings the speed into the field weakening range. DRIVE SPEED REF should then normally be rescaled to "follow" the maximum speed reached to have a smooth behaviour when decreasing the reference from the joystick (continuous gear).

When running in Stand alone mode (64.1=True), the drive instead uses the lower value of driver reference given (via AI1 or the DRIVE SPEED REF from PLC, if FB Joystick mode) and the SPEED REF POWOP.

Speed reference when running in local control mode is SPEED REF LOCAL and the direction is chosen with the direction push-buttons on the panel.

The reference output to the speed controller can be delayed when using a slow acting brake (long lifting time) by using the time SPEED REF TD (67.8).




*Reference Handler logic*

### Position measurement (70)

The function module is used to give a position measurement from a pulse encoder input RTAC or NTAC. Position measurement can be used in both Fieldbus and Stand alone modes.

The measurement can be synchronised to the value POS PRECOUNT PPU sent from the supervisory controller, either by signal PGMSYNC from the fieldbus Command word or from digital input hw-sync (parameter 10.6 SYNC SEL).

**NOTE:** Hw-sync from digital input is blocked when drive is not running (2.20 RUNNING = 0).

Acknowledgement of synchronisation is done with the signal SYNC RDY to the supervisory controller. Reset of the acknowledgement is done with signal RESET SYNC RDY from the supervisory controller.

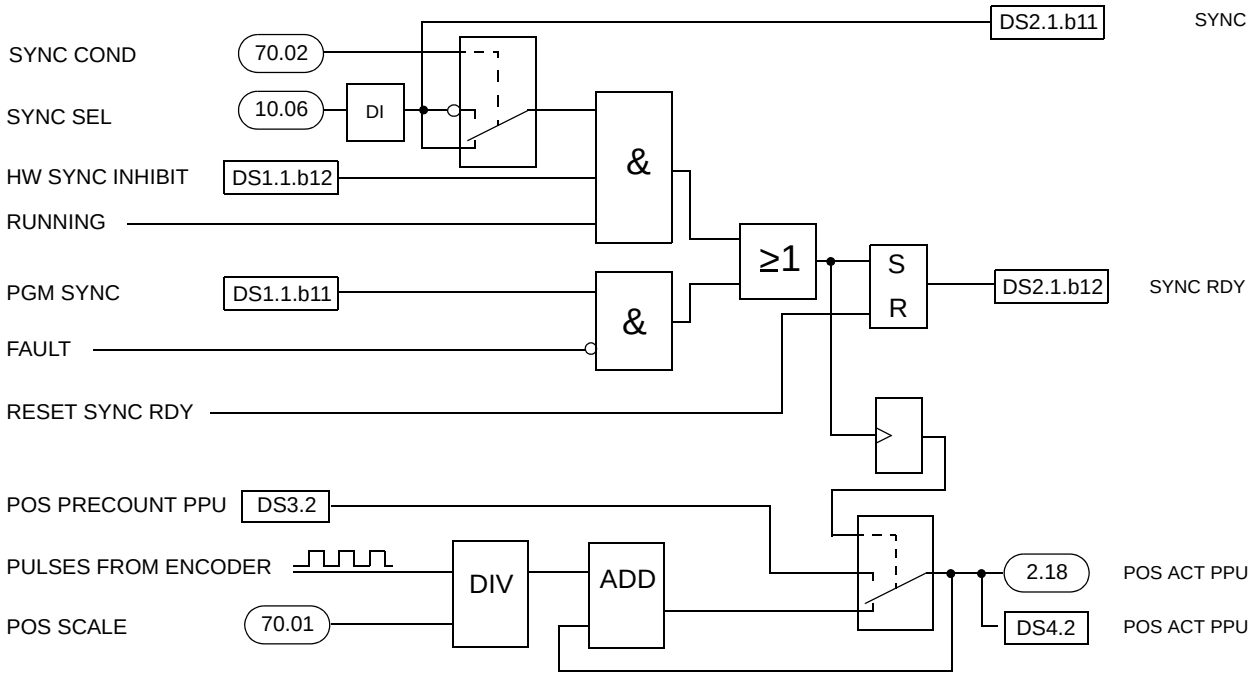
Hardware synchronisation through e.g. DI.3 can be blocked if HW SYNC INHIBIT from supervisory controller = " 1 ". Synchronising edge of DI.3 is selected with parameter SYNC COND (70.2).

Measurement value POS ACT PPU sent to the supervisory controller is the number of pulses counted divided with the value of parameter POS SCALE (70.1).

The number of pulses counted depends upon the settings of parameters 50.1 Pulse Nr and 50.2 Speed Meas Mode. Default setting of Speed Meas Mode parameter is that both positive and negative edges from both A and B signals are counted.

Example: If 50.1 is set to 1024 ppr and 50.2 is set to default: "A_-_B_-_", then a total of 4 × 1024 = 4096 pulses are added per revolution of the pulse encoder.

Position measurement can be used also if the pulse encoder is not mounted directly on the motor shaft (e.g. pulse encoder mounted on a separate measurement wheel). Parameter 50.5 SPEED FEEDB USED should then be set to "False", thereby not using the speed measurement signal from the pulse encoder (the drive then uses the calculated speed signal instead). The pulse encoder signals are now used only for position measurement.




*Position measurement logic*

### Field bus communication (71)

*Receive*

This part is used to receive signals from a superior controller via a high speed serial bus in the form of a Field Bus (e.g. Advant link, CS31 (max 8 words), Profibus (10 words), Modbus, Interbus-S, Devicenet. Please check the respective fieldbus adapter manual for limitations on the number of words possible for sending and receiving. The ACC receive signal interface is standardised as a block of 12 words where each signal has its specific position. The module also includes one element for unpacking the Command word signal to 16 Boolean signals. Updating interval for datasets 1, 3 & 5 is 32 ms, except FB SPEED REF, FB TORQ REF and FB SPEED CORR that are updated every 8 ms. For transmission of signals from drive to superior controller, see Fieldbus communication Transmit.

**NOTE**: If parameter 71.5 DSET BASE ADDRESS is set to 10 instead of the default 1, then add 9 to all dataset numbers below (e.g. DS1 -> DS10, DS3 -> DS12, ...)

*Receive dataset 1 (alt. 10) wWord 1*
*FB COMMAND WORD = DataSet 1 Word 1 (signal 3.1)*

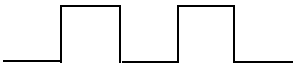
| Bit number | Signal | Range | Description |
|---|---|---|---|
| 0 = Bit 0, LSB | COMTEST REC | "1" "0 | "Comtest receive bit. |
| 1 | DRIVE ON | "1" "0" (1=active) | Drive On (magnetize) from PLC in Fieldbus mode |
| 2 | HIGH SPEED | "1" "0" (1=active) | High speed selected (Power optimization) |
| 3 | START OVR | "1" "0" (1=active) | Startorder from PLC in Fieldbus mode |
| 4 | RAMP HOLD | "1" "0" (1=active) | Speedramp hold signal |
| 5 | SEPARATE | "1" "0" (1=active) | Separate control select signal (only in M/F ctrl) |
| 6 | TORQ CTRL SEL | "1" "0" (1=active) | Torque control selected. (Torque ref = DS1.3) |
| 7 | LOAD MEAS SEL | "1" "0" (1=active) | Load measurement select (enable LOAD MEAS REF) |
| 8 | RESET OVR | "0 1" (edge) | Reset fault from overriding control (PLC) |
| 9 | FAST STOP 1 | "1" "0" (1=active) | Fast stop type 1 (torque limit stop) |
| 10 | FAST STOP 11 | "1" "0" (1=active) | Fast stop 11 type select (see par. 63.1) |
| 11 | PGM SYNC | "0 1" (edge) | Program synchronisation of position measurement |
| 12 | HW SYNC INHIBIT | "1" "0" (1=active) | Hardware (DI) sync. of pos. measurement blocked |
| 13 | RESET SYNC READY | "1" "0" (1=active) | Reset synchronisation ready |
| 14 | USER MACRO CHANGE | "1" "0" (0=User1) | User macro 1 or 2 change request |
| 15 = Bit 15, MSB | ENABLE FB CTRL | "1" "0" (1=active) | Enable fieldbus control in Stand alone Joystick mode (not FB Joystick mode). Used by SwayControl. |

*Receive DataSets 1, 3, 5 and 7 (alt. 10, 12, 14 and 16)*
*Example: DS1.2 = DataSet 1, Word 2*

| DataSet.Word | Signal | Range corresp. to +/- 32767 | Description |
|---|---|---|---|
| DS1.2 (DS10.2) | FB SPEED REF | -163.84-+163.84 | Drive speed reference, % (20000=100%) |
| DS1.3 (DS10.3) | FB TORQ REF | -327.67-+327.67 | Torque reference, % (10000=100%) |
| DS3.1 (DS12.1) | FB RAMP RATE | 0.00-32.767 (Integer 1000 equals a rate=1.0) | Ramp rate multiplying factor for the speed ramp times set in drive, normally=1.0 (1000=1.0) |
| DS3.2 (DS12.2) | FB SPEED CORR | -163.84-+163.84 | Speed correction signal, % (20000=100%) |
| DS3.3 (DS12.3) | FB POS PRECOUNT | -32767-+32767 | Preset value to position counter = sync value (1=1) |
| DS5.1 (DS14.1) | FB AUX COMM WORD | | Auxiliary Command Word (see Table 5-6 below for details) |
| DS5.2 (DS14.2) | FB LOAD MEAS REF | -327.67-+327.67 | Load measure reference, % (10000=100%) |
| DS5.3 (DS14.3) | "not used | | "DW signal 3.9 |
| DS7.1 (DS16.1) | PAR VALUE 1 | -32767-+32767 | Parameter value for parameter selected with parameter 90.1 |
| DS7.2 (DS16.2) | PAR VALUE 2 | -32767-+32767 | Parameter value for parameter selected with parameter 90.2 |
| DS7.3 (DS16.3) | PAR VALUE 3 | -32767-+32767 | Parameter value for parameter selected with parameter 90.3 |

"SPEED" signals have scaling: 20 000 corresponds to 100 %
"TORQUE" signals have scaling: 10 000 corresponds to 100 %.

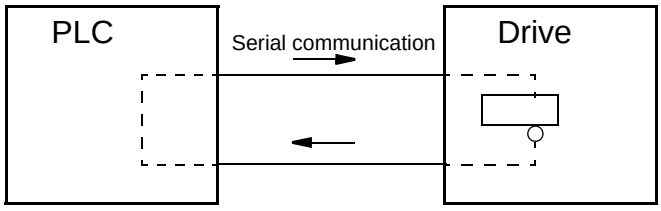
The communication is supervised continuously using a "toggle bit" received in FB STATUS WORD (DS1.1) bit 0 COMTEST REC:



If "next edge" is not received within a certain time COMTEST FLT TD (71.1), the MAS OSC FLT fault occurs and the drive trips.

The drive is inverting the bit received from the superior controller (PLC): COMTEST REC and sending it back in FB COMMAND WORD (DS2.1) Bit 14 COMTEST TRA.

**NOTE:** In the superior controller the received bit should be sent directly to the drive again without inverting and without delay. (Recommended udating time, maximum 100 ms.)



*FB AUX COMM WORD = DS5.1 (signal 3.7)*

| Bit number | Signal | Range | Description |
|---|---|---|---|
| **0 = Bit 0, LSB** | FB ZERO POS | "1" "0" (1=active) | FieldBus transmitted Zero Position signal from joystick (if par. 64.10 = FB JOYSTICK) |
| 1 | FB START DIR A | "1" "0" (1=active) | FieldBus transmitted Start Dir A signal from joystick (if par. 64.10 = FB JOYSTICK) |
| 2 | FB START DIR B | "1" "0" (1=active) | FieldBus transmitted Start Dir B signal from joystick (if par. 64.10 = FB JOYSTICK) |
| 3 | FB JOYST TQREF SEL | "1" "0" (1=active) | FieldBus Joystick mode Torque control enabling (if par. 64.10 = FB JOYSTICK) |
| 4 | FB ELSHAFT ON | "1" "0" (1=active) | FieldBus Electric Shaft control On (enabled) for Master or Slave drive |
| 5 | RESTART DLOG | "0 → 1" (edge) | Restart the drive DataLoggers |
| 6 | TRIGG LOGGER | "0 → 1" (edge) | Forced trigg (stop) of the drive DataLoggers |
| 7 | DISABLE SLACKROPE | "1" "0" (1=active) | Disable that Slack rope makes a Fast stop (stop on torque limit) |

*Transmit*

This part is used to transmit signals from the drive to a supervisory controller via high-speed serial bus in the form of a Field Bus (e.g. Advant link, CS31 (max 8 words), Profibus (10 words), Modbus, Interbus-S, Devicenet. Please check the respective fieldbus adapter manual for limitations on the number of words possible for sending and receiving. The ACC transmit signal interface is standardised as a block of 14 words where each signal has its specific position. The module also includes elements for packing 16 Boolean signals to word signals. Updating interval for datasets 2, 4 & 12 is 32 ms, except for signals SPEED ACT and POS ACT PPU that are updated every 8 ms. Updating interval for datasets 6 & 8 is 56 ms.

**Note: If parameter 71.5 DSET BASE ADDRESS is set to 10 instead of the default value 1, then add 9 to all dataset numbers below (e.g. DS2 -> DS11, DS4 -> DS13 aso). Transmit TataSet 2 (alt. DS11) Word 1**

*Transmit DataSet 2 (alt. DS11) Word 1*
*FB STATUS WORD = DataSet 2 Word 1 (signal 4.1)*

| Bit number | Signal | Range | Description |
|---|---|---|---|
| 0 = Bit 0, LSB | RDY FOR ON | "1" "0 | "Ready for on |
| 1 | POWER ON ACKN | "1" "0 | "Power on acknowledgement, e.g. DI_IL |
| 2 | RDY FOR RUN | "1" "0 | "Ready for run (magnetized) |
| 3 | RUNNING | "1" "0 | "Running (producing torque) |
| 4 | ZERO SPEED | "1" "0 | "At zero speed |
| 5 | REM LOC | "1" "0 | "Remote /Local (1= Remote) |
| 6 | TORQ PROV OK | "1" "0 | "Torque proving OK |
| 7 | USER 1 OR 2 | "1" "0 | "User macro 1 or 2 active |
| 8 | FAULT | "1" "0 | "Fault active |
| 9 | WARNING | "1" "0 | "Warning active |
| 10 | LIMIT | "1" "0 | "Drive in torque limit |
| 11 | SYNC | "1" "0 | "Sync input (e.g. DI3) status |
| 12 | SYNC RDY | "1" "0 | "Synchronisation ready |
| 13 | BRAKE LONG FTIME | "1" "0 | "Brake long falling time indication |
| 14 | COMTEST TRA | "1" "0 | "Communication test transmit bit |
| 15 = Bit 15, MSB | SNAG LOAD | "1" "0 | "Snag load indication |

*Transmit DataSets 2, 4, 6, 8 & 12 (alt. 11, 13, 15, 17 & 21)*
*Example: DS2.2 = DataSet 2, Word 2*

| DataSet.Word | Signal | Range corresp. to +/- 32767 | Description |
|---|---|---|---|
| DS2.2 (DS11.2) | SPEED ACT (fixed) | -163.84-+163.84 | Speed actual (%) (20000=100%) |
| DS2.3 (DS11.3) | MOTOR TORQUE FILT (fixed) | -327.67-+327.67 | Torque actual (%) (10000=100%) |
| DS4.1 (DS13.1) | SPEED REF 3 (p92.1 to select) | -163.84-+163.84 | Speed reference 3 = ramp output (%) (20000=100%) |
| DS4.2 (DS13.2) | POS ACT PPU (92.2) | -32767-+32767 | Position actual value (1=1) |
| DS4.3 (DS13.3) | MOTOR CURR (92.3) | -3276.7-+3276.7 | Motor current (A) (10=1A) |

| DataSet.Word | Signal | Range corresp. to +/- 32767 | Description |
|---|---|---|---|
| DS6.1 (DS15.1) | FB FAULT WORD 1 (92.4) | | Application faults |
| DS6.2 (DS15.2) | FB FAULT WORD 2 (92.5) | | Motor control faults |
| DS6.3 (DS15.3) | FB ALARM WORD (92.6) | | Warnings |
| DS8.1 (DS17.1) | MOTOR VOLT (92.7) | -32767-+32767 | Motor voltage (V) (1=1V) |
| DS8.2 (DS17.2) | DC VOLT (92.8) | -32767-+32767 | DC voltage (V) (1=1V) |
| DS8.3 (DS17.3) | POWER (92.9) | -3276.7-+3276.7 | Motor shaft power (%) (10=1%) |
| DS12.1 (DS21.1) | FB AUX STATUSWORD (fixed) | | Aux status word |
| DS12.2 (DS21.2) | AI1 REF (fixed) | -163.84-+163.84 | Standard analog input 1 speed reference value (%) (20000=100%) |

*Transmit Dataset 12 (alt. DS21) Word 1*
*FB AUX STATUSWORD = DS12.1 (signal 4.5)*

| Bit number | Signal | Range | Description |
|---|---|---|---|
| 0 = Bit 0, LSB | DIR A | “1” “0” | Stand alone direction A order |
| 1 | DIR B | “1” “0” | Stand alone direction B order |
| 2 | ZERO POS | “1” “0” | Stand alone zero position order |
| 3 | SLOWDOWN DIR A | “1” “0” | Stand alone slowdown dir A |
| 4 | SLOWDOWN DIR B | “1” “0” | Stand alone slowdown dir B |
| 5 | ELSHAFT ON ACKN | “1” “0” | Electric shaft control on acknowledge |
| 6 | BRAKE LIFT | “1” “0” | Brake lift order |
| 7 | FOLL SEP ACKN | “1” “0” | Follower Separate acknowledge |
| 8 | LOGG DATA READY | “1” “0” | Drive datalogger data ready (triggered) |
| 9 | AI3 LIMIT ACTIVE | “1” “0” | Analog input 3 speed limit is active (AI3<10mA) |
| 10 | SLACK ROPE | “1” “0” | Slack rope is detected |
| 11 | COMTEST MF | “1” “0” | Master/Folleower communication test |
| 12 | FAST STOP | “1” “0” | Fast stop is active |
| 13 | MOTOR1 | “1” “0” | Motor1 or user macro 1 is activated |
| 14 | MOTOR2 | “1” “0” | Motor2 or user macro 2 is activated |

*Fault Word 1 Dataset 6 (alt. DS15) Word 1*
*FB FAULT WORD 1 = Dataset 6, Word 1 (signal 4.2)*

| Bit number | Signal (panel Fault text) | Description |
|---|---|---|
| 0 = Bit 0, LSB | MOT OVERSP | Motor overspeed fault |
| 1 | TORQ FLT | Torque fault |
| 2 | BRAKE FLT | Mechanical brake fault |
| 3 | ELECTR SHAFT | Electrical shaft control fault |
| 4 | TORQ PR FLT | Torque proving fault |
| 5 | MAS OSC FLT | Fieldbus "oscillator" (toggle) bit fault |
| 6 | CHOPPER FLT | Braking chopper faults |
| 7 | INV OVERLO | Inverter overload |
| 8 | EXTERNAL FLT | External fault |
| 9 | MF COMM ERR | Master/Follower bus communication fault |
| 10 | PANEL LOSS | Panel communication fault |
| 11 | I/O COMM | I/O board communication fault |
| 12 | AMBIENT TEMP | ACS800 ambient over temperature |
| 13 | THERMISTOR | Thermistor fault (DI6) |
| 14 | MF RUN FLT | Master/Follower running fault |
| 15 = Bit 15, MSB | COMM MODULE | Comm module communication fault |

*FB Fault Word 2 DataSet 6 (alt. DS15) Word 2*
*FB FAULT WORD 2 = Dataset 6, Word 2 (signal 4.3)*

| Bit number | Signal (panel Fault text) | Description |
|---|---|---|
| 0 = Bit 0, LSB | DC OVERVOLT | DC-link over voltage |
| 1 | DC UNDERVOLT | DC-link under voltage |
| 2 | OVERCURRENT | Overcurrent fault |
| 3 | EARTH FAULT | Earth fault |
| 4 | MOTOR PHASE | Motor phase loss fault |
| 5 | USER MACRO | User macro requested is not saved, or shared motion change fault |
| 6 | ACS800 TEMP | Over temperature in IGBT Power plate |
| 7 | MOTOR TEMP | Motor over temperature (calculated) |
| 8 | OVERFREQ | Over frequency fault |
| 9 | START INHIBIT | Start inhibit fault ("Prevention of unexpected start" active) |
| 10 | SHORT CIRCUIT | Short circuit at output |
| 11 | PPCC LINK | Power Plate communication link fault (INT board) |
| 12 | SUPPLY PHASE | Supply phase missing (DC ripple) |
| 13 | ENCODER ERR | Encoder module / speed deviation fault |
| 14 | LINE CONV | Line converter fault (4Q drive) |
| 15 = Bit 15, MSB | THERMAL MODE | Thermal protection mode fault (30.5) |

*FB Alarm Word DataSet 6 (alt. DS15) Word 3*

*FB ALARM WORD = Dataset 6, Word 3 (signal 4.4)*

| Bit number | Signal (panel Warning text) | Description |
|---|---|---|
| 0 = Bit 0, LSB | MOTOR TEMP | Motor high (95%) temperature (calculated) |
| 1 | COMM MODULE | Comm module communication alarm |
| 2 | ID RUN FAIL | ID Run failed |
| 3 | ACS800 TEMP | High temperature in IGBT Power plate |
| 4 | ENCODER ERR | Encoder module speed deviation alarm |
| 5 | JOYSTICK | Joystick supervision alarm (Stand alone) |
| 6 | START INHIBIT | Start inhibit alarm ("Prevention of unexpected start" active) |
| 7 | "Not used | |
| 8 | THERMISTOR | Thermistor alarm (DI6) |
| 9 | NO MOT DATA | No motor data or too low nominal current entered |
| 10 | LIFETIME>90% | Crane hoist machinery lifetime exceeded 90% of total lifetime set in par. 74.2 |
| 11 | "Not used | |
| 12 | "Not used | |
| 13 | "Not used | |
| 14 | "Not used | |
| 15 = Bit 15, MSB | "Not used | |

**Master/Follower (72)**

*General*

The Master/Follower is a load sharing Application and is designed for applications in which the system is run by two CraneDrives and the motor shafts are coupled to each other via gearing, rail, shaft, etc.

The Master/Follower application is then controlling the load distribution between the drives. The Master drive is sending order signals and references (speed and torque) through the Master/Follower bus to the Follower drive. The Master is also reading back status information from the Follower drive to ensure a safe operation.

The Master/Follower application can be used for both hoist and travel motions, in both Fieldbus mode and Standalone mode.

The Master station shall always be speed controlled and the Follower station normally be Torque controlled.

**NOTE:** Both drives must be in DTC control mode (i.e. M/F ctrl does not work in Scalar mode).

To ensure correct Follower load sharing, the Follower speed limits 20.1 & 20.2 must be set 5 % higher than the setting of Master parameter 69.1 SPEED SCALING.

*Checklist for a Quick Start-up*

The installation and start-up procedure of the CraneDrive is explained in ACS800 Hardware manual. An additional checklist for the Master/Follower application is given below:

1. Switch off the power supplies to the CraneDrive units. Wait for five minutes to ensure that the intermediate circuits are discharged.
2. Build the M/F link, Master Ch2 to Follower Ch2.

   See Figure 5 17 Master/Follower configuration in Stand Alone mode.
   **NOTE:** Optical fibers for Master/Follower bus to be ordered separately!
3. Connect the external control signals to the Master.
4. Switch on the power supplies.
5. Activate M/F control Macro in both CraneDrives (Parameter 99.2 Application Macro = M/F CTRL)
6. Set parameters:
   a. Stand Alone Mode

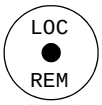
      In the Master, set parameter:
      - Stand Alone Sel (Parameter 64.1) to True
      - Master/Follower Mode (Parameter 72.1) to Master.

      In the Follower set parameter:
      - Stand Alone Sel (Parameter 64.1) to True
      - Master/Follower Mode (Parameter 72.1) to Follower.
      - Torque Selector (Parameter 72.2) to Torque
      - Brake Int Ackn (Parameter 67.3) to True

b. Fieldbus mode

In the Master, set parameter:
- Enable Comm module (Parameter 98.2)
- Stand Alone Sel (Parameter 64.1) to False
- Master/Follower Mode (Parameter 72.1) to Master.

In the Follower, set parameter:
- Enable Comm module if required (Parameter 98.2)
- Stand Alone Sel (Parameter 64.1) to False
- Master/Follower Mode (Parameter 72.1) to Follower.
- Torque Selector (Parameter 72.2) to Torque
- Brake Int Ackn (Parameter 67.3) to True

7. Set all application parameters in both drives
8. Switch the CraneDrive units to external control with the 

- key on the Control Panel (there should be no L on the first row of the display). Reset both drives.
9. Perform the test run with the motors still de-coupled from the driven machinery. For this test temporary set the Follower in speed control mode (Parameter 72.2, Torque Selector = Speed). Give the control signals both through the Master analogue/digital or through fieldbus inputs and from the master Control Panel.

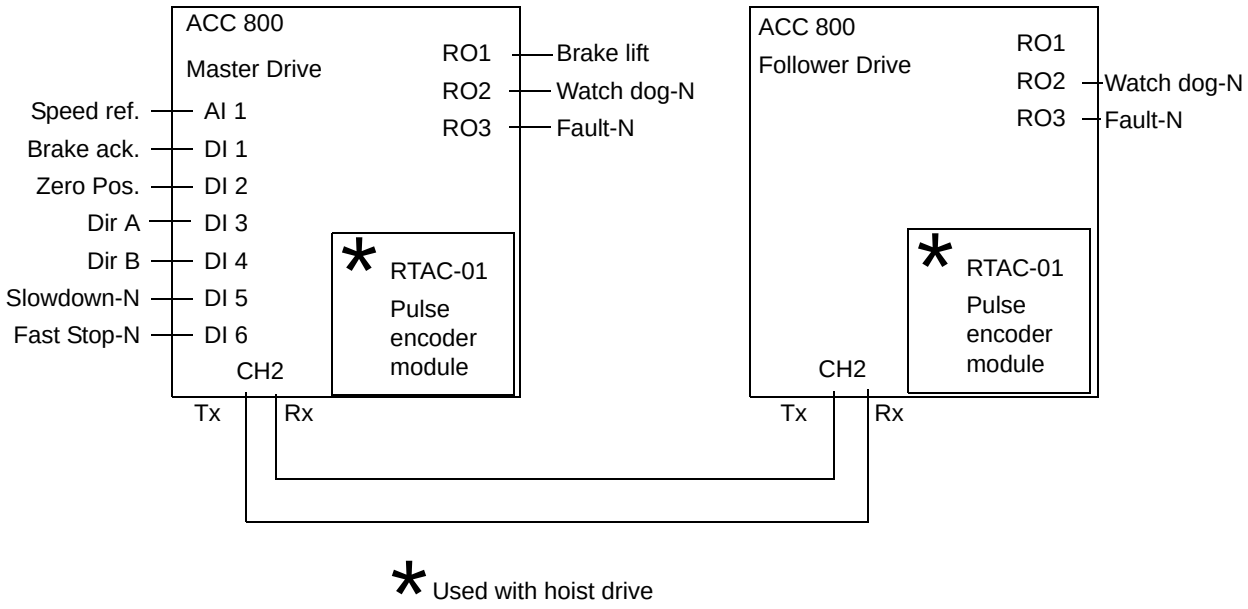
   Check the correct operation of the Master and Follower drives visually (motor & Control Panel display):

   - Start and Stop signals to the Master are received by the drives.
   - The Master follows the speed reference given
   - The Follower follows the master speed reference.
10. The Control Panel on the Follower is not active and can not control the drive.
11. Change Follower back to Torque mode (set Parameter 72.2 = Torque)
12. Switch off the power supplies.
13. Couple the motor shafts to the driven machinery and switch on the power supplies.

*Stand Alone mode*

The external control signals are connected to the drive concerned. The Master controls the Follower via a fiber optic serial communication link.

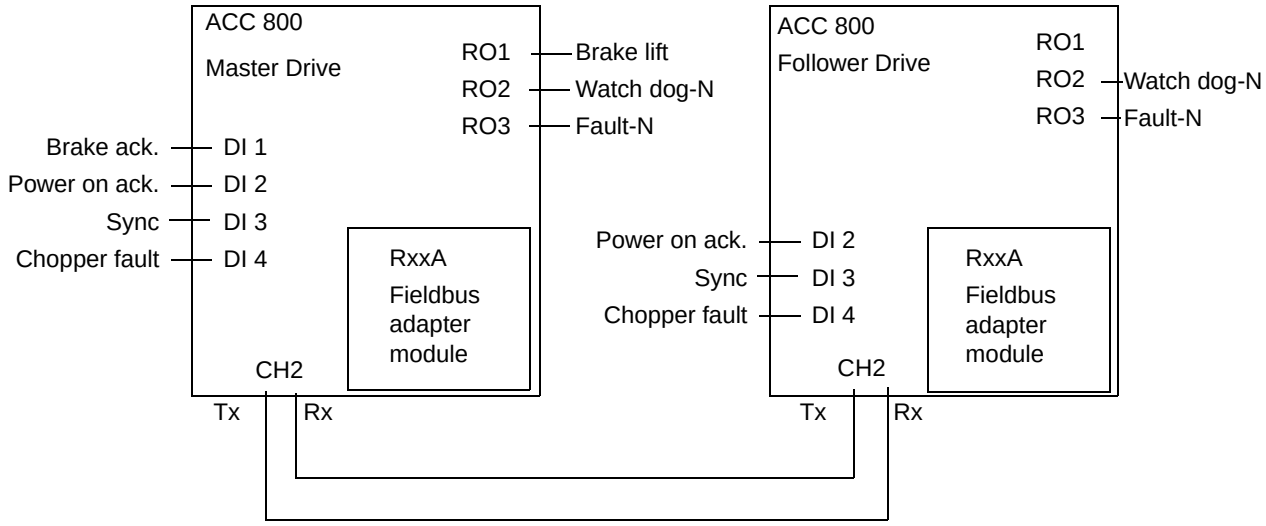
**NOTE:** For hoist applications pulse encoder and RTAC-01 (or NTAC-02) is compulsory on both drives.




*Master/Follower wiring information for Stand Alone application*

### *Fieldbus Mode*

The Master, which is controlled from the Fieldbus, controls the Follower via a fiber optic serial communication link. The external control signals are connected to the drive concerned. (DI1 - DI4)




*Master/Follower wiring information for Fieldbus application*

### *Operation*

**Master and Follower Stations**

The default settings of the Master/Follower Control macro parameters does not define the station as Master or Follower. The selection is done with parameter 72.1 MAST/FOLL MODE.

If Follower operation is selected the convertor can not be operated from the panel.

**Redundancy operation**

If one motion is driven by two mechanically coupled motors with separate drives in Master/Follower mode, then separate operation of Master or Follower drive can be used for redundancy operation (if one drive fails).

The drives can be run separately by User Macro 1 for normal Master/Follower operation. (Parameter 99.2 = M/F CTRL) and

User Macro 2 for redundancy operation (Parameter 99.2 = CRANE).

For changeover from User Macro 1 to User Macro 2 a digital input or bit 14 in fieldbus Command word can be used (see parameter 16.5).

Brakes need to be controlled by both drives if the motors are mechanically connected.

**Separate operation**

The signal SEPARATE in the fieldbus Command word (DS1.1 bit 5) can also be used for changing M/F drives from Master/Follower operation to normal, non-Master/ Follower operation. This is available in both Stand alone and Fieldbus modes.
For the Follower drive there is a "separate change acknowledge" signal available in fieldbus Aux status word (DS12.1 Bit 7), see also section *Field bus communication (71)* on page *102*.

**NOTE:** Changing of signal SEPARATE (0 to 1 or 1 to 0) can only be done if status signal RUNNING=0.

**Panel separate operation**

The Master and Follower drives can be operated separately from the Control Panel or DriveWindow, e.g. during maintenance, by setting parameter 72.1 MAST/FOLL MODE = OFF.

**Multiple Followers**

It is possible to connect more than one Follower drive in a Master/Follower configuration by activating the "Broadcast mode" (parameter 72.11=YES) in all drives. See also section *Group 71 Fieldbus Comm* on page *172*.

Master drive is on the Ch2 M/F bus sending the Torque and Speed references to any Follower connected. But in this mode there is no start order sent from Master to Followers. Neither is there any check of Followers status done by the Master drive. Start order and status check (e.g. any faulty Follower) must be done externally via I/O or fieldbus to all Master/Follower drives.

**Master/Follower link Specification**

*Size of the Link:* One Master and one Follower station can be connected.

*Transmission medium:* Fiber Optic Cable.

- Construction: Plastic core, diameter 1 mm, shielded with plastic jacket
- Attenuation: 0.31 dB/m
- Maximum length between Stations: 10 m
- Other:

| Parameter | Minimum | | Unit |
|---|---|---|---|
| Storage Temperature | -55 | +85 | °C |
| Installation Temperature | -20 | +70 | °C |
| Short Term Tensile Force | | 50 | N |
| Short Term Bend Radius | 25 | | mm |
| Long Term Bend Radius | 35 | | mm |
| Long Term tensile Load | | 1 | N |
| Flexing | | 1000 | cycles |

Various lengths of fiber optic cables are available as optional add-on kit for the CraneDrive.

| | |
|---|---|
| **Connectors on the RDCO-0x board:** | Blue - receiver (hp 9534, T-1521); grey - transmitter (hp 9534, R-2521) |
| **Serial Communication Type:** | Synchronous, full duplex |
| **Transmission Rate:** | 4 Mbit/s |
| **Transmission Interval:** | 4 ms |
| **Protocol:** | Distributed Drives Communication System, DDCS |

### Electric shaft (73)

The electric shaft control is used for synchronized operation of two drives. For example, two independent hoist machineries connected to the same load.

To use Electric shaft control both drives are required to have pulse encoder feedback. They are also required to have fiber optic connection between channel 2 in Master and Slave drive (RDCO-0x board needed).

Basic function is that position counter values from the Master and Slave drive are compared and the difference is controlled to zero by adding a speed correction reference (positive or negative) in Slave drive. This correction is limited to +/- 5 %. When stopping (startorder=0) the correction is disabled below a speed set in parameter 73.6 ELSH CTRL MIN SPD (but position difference is still measured and used for correction when new start order is given).

Correction P-controller is adjusted with parameter 73.2 ELSHAFT GAIN.

Electric shaft control can be used in both Stand alone and Fieldbus mode.

Electric shaft control can be switched on or off with an external signal ELSHAFT ON using a digital input, parameter 10.15 ELSHAFT ON SEL, or fieldbus Aux. command word (DS5.1:4) signal FB ELSHAFT ON. This external signal should be connected to both Master and Slave drive.

When Electric shaft control is switched on, start orders and reference are only required for Master drive. Master sends orders and reference to Slave drive via channel 2 Master/Follower bus. Ramp times in the Follower must be set equal to or shorter than in the Master.

When Electric shaft control is switched off, both drives work as two individual "normal" drives (similar to activating "Separate" with M/F drives).

If switching Electric shaft control on or off while motors are running, drives will make a ramp stop. New start is possible after returning joystick to zero position.

When any of the Master or Slave drive receives a Slowdown limit switch indication, both drives will be limited to this slowdown speed (if Electric shaft control is active).

Power optimization can be utilised on Electric shaft hoist drives. Both drives should have power optimization enabled. The lower reference value calculated by Master or Slave will be used by both drives.

When using different gear box ratios for Master and Slave drive, a speed ratio between Master and Slave can be set using parameters 73.3 GEAR NUMERATOR and 73.4 GEAR DENOMINATOR (see section *Group 72 Master/Follower* on page *174* for details).

If Master and Slave drive are set to have different 100 % speed (i.e. different setting of parameter 69.1 SPEED SCALING RPM), then parameter 70.1 POS SCALE must be adjusted accordingly in one of the drives e.g. Slave.

**Example:** If Slave speed scaling is 2 times Master speed scaling, then Slave Pos scale should be set 2 times Master drive Pos scale.

If electric shaft position error (signal 2.26 ELSHAFT POS ERROR) exceeds the level set in parameter 73.5 POS ERROR LIMIT, both drives will trip and the Slave indicates "ELECTR SHAFT" fault. Master will then also indicate "FOLL FAULT" (Follower fault).

*Configuring the Electric shaft control:*

Both drives, designated "Master" and "Slave", are to be set up with Ch2 Master/ Follower communication. This is done by selecting parameter 99.2 APPLICATION MACRO = M/F CTRL. Also fiber optic connection is required between Ch 2 in both drives.

To define communication master and slave: Set parameter 72.1 MAST/FOLL MODE = MASTER in the "Master" drive.

Set parameter 72.1 MAST/FOLL MODE = FOLLOWER and set 72.2 TORQUE SELECTOR = SPEED in the "Slave" drive.

Set parameter 73.1 ELSHAFT MODE SEL = MASTER in "Master" drive and to SLAVE in "Slave" drive.

If using drives in Stand alone mode (i.e. parameter 64.1 STANDALONE SEL = True), select what digital input is used for enabling the Electric shaft control. Set with parameter 10.15 ELSHAFT ON SEL.

Example: Selecting parameter 10.15 = EXT DI3 refers to extended NDIO module #2, digital input #1.

To be set in both "Master" and "Slave" drive.

If using Fieldbus mode (i.e. parameter 64.1 = False) or Stand alone FB Joystick mode, the enabling of Electric shaft control can also be done with bit number 4 (bit numbering 0…15) in dataset no. 5, word 1.

Other related parameters to be checked:
98.1 Encoder module = e.g. RTAC SLOT1
50.1 Encoder pulse nr
69.1 Speed scaling rpm = max. operating Speed
69.2 - 5 Acc/Dec ramp times forward and reverse
70.1 Pos scale (e.g. no. of pulses/mm)
20.1 - 2 Minimum/Maximum speed limits (to be 5% higher than parameter 69.1)
98.5 - 6 DI/O Ext modules 1 - 2 selection

### Crane lifetime monitor (74)

The main function of the Crane lifetime monitor is to indicate how much is left of the crane hoist mechanical lifetime, signal 1.35 LIFETIME LEFT %.

This is done with the help of the following signals:
- Total operating time (= brake open time) of the drive, signal 1.32 TOTAL OPER TIME. Signal is backed up in non-volatile memory.
- Continuously calculated actual hoist load, signal 1.33 LOAD TORQUE ton.
- Load spectrum factor Km (function of load and time), signal 1.34 LOAD SPEC FACT Km. Signal is backed up in non-volatile memory.

To get a correct load signal the Inertia parameters 68.4 and 68.5 must be tuned, see tuning instruction on page 5-34 (part of commissioning power optimization instruction).

NOTE: There is no requirement to set parameter 68.1 POWOP SELECT or 68.2 BASE SPEED in order to get the load torque signal to work.

For compensating the mechanical efficiency of hoist machinery to get equal load torque value in both hoisting and lowering direction, parameters 68.12 LOADCORR FACT UP and 68.13 LOADCORR FACT DWN should be adjusted.

These parameters are also used for scaling the motor utilization, i.e. the motor torque level (in per unit; % torque/100) when hoisting rated load.

The signal 1.33 "LOAD TORQUE ton" must to be scaled using parameter 74.1 NOMINAL LOAD.
The nominal speed for the lifetime monitor is set with parameter 74.4 LIFETIME NOM SPD.

The mechanical lifetime is set with parameter 74.3 CRANE LIFETIME.

When all settings are done the Crane lifetime calculation is started by setting parameter 74.3 START LIFETIMEMON = ON.

**Note:** This parameter cannot be reset with user parameters.

When the signal LIFETIME LEFT % has reached a level below 10%, the drive will give a warning: "LIFETIME>90%".

---

**NOTE:** To transfer the latest TOTAL OPER TIME and LOAD SPEC FACT Km signals values from an existing RMIO control board to a spare board in case of service repair, please contact ABB Service.

---

### Shared Motion (80, 81, 82)

Shared Motion is used with cranes when one converter is used to alternatively feed the motors for two different motions, e.g. hoist and long travel. In this manual these motions will be called Motor 1 and Motor 2. Normally hoist = Motor 1.

This function is a faster alternative to User Macro. The change of parameters is faster then with User Macro. The choice of Motor 1/Motor 2 is done with the same signals as with User Macros. More detailed description below.

In Shared Motion it is not possible to have different settings for all user parameters (groups 10-98). There is a set of 36 parameters available to have alternative settings between Motor 1 and Motor 2. For Motor 2 these parameters are collected in group 80. Example: Motor 2 is using parameter 80.2 BRAKE ACKN 2. Corresponding parameter for Motor 1 is 10.1 BRAKE ACKN.

In addition to user parameters, Shared motion also provides two sets of motor model data stored in parameter groups 81 and 82.

*Activate Shared Motion*

Set parameter 16.06 SHARED MOTION SEL to ON to activate the function.

If needed during commissioning or service set parameter 16.6 to FORCE MOT1 resp FORCE MOT2 to be able to force to the values of Motor 1 or Motor 2.

When the function Shared motion is activated parameter groups 80 to 82 will be visible for the user.

*Commissioning*

---

**NOTE:** The drive must be in LOCAL mode

---

Connect converter to Motor 1, set motor data in group 99 and run motor ID Run. After successful ID Run, set parameter 16.7 ID RUN DATA SAVE to MOTOR1-GRP81 and motor model 1 parameters are then saved in group 81. Next connect converter to second motor(s), set motor data in group 99 and make ID Run. After successful ID Run, set parameter 16.7 to MOTOR2-GRP82 and motor model 2 parameters are saved in group 82.

When this is completed, make a system restart by switching the 24 V control voltage supply OFF/ON. This is to activate the write protection of the motor data parameters in groups 81, 82 and 99.

*Changing motor models during operation*

The Motor 1/Motor 2 selection can be switched via digital inputs or fieldbus; selectable with Parameter 10.17 as described in chapter *Parameters*.

The Motor 1/Motor 2 selection can be changed via a digital input or fieldbus communication (edge triggered) only after the drive is off (magnetizing is off), that is, Rdy For Run = 0. During the change, the drive will not start. **NOTE:** Motor 1/Motor 2 selection restores also the motor settings of Start-up Data group and the results of the MOTOR ID RUN. Check that the settings correspond to the motor used.

Indication on selected motion can be obtained on relay output R01 and R03, by setting the parameters 80.4 and 80.5 to *MOTOR1 SEL* or to *MOTOR2 SEL*. The relay output then goes high when the change-over to the selected motion is completed.
(The indication can also be obtained with the value *USER 1 or 2* on one of the parameters. However, this indication does not guarantee that the change-over is completed.)

There is also a signal group 6 where the motor models actual parameters are shown.

To see the status, check signal 1.36 MOTOR SELECTED that shows the active parameter set.

*Changing motor data*

To change motor data in group 99, set parameter 16.5 MODIFY MOTOR DATA to YES. This will deactivate the write protection for parameters 99.5-99.9

### User Macros

User Macros allow the current parameter settings to be stored in memory. Two User Macros can be created. This can be used for Shared motion operation, i.e. two different motors using same converter via contactors.

To store your customised parameters:

1. Access the Start-up Data group as described in the table in section *Parameter mode* on page *26*.
2. Change Parameter 99.2 APPLICATION MACRO to USER1 SAVE or USER2 SAVE.

---

**Note:** It's recommended to keep parameter 10.17 "User macro ch srce" = NOT SEL until User macro saving is completed (10.17 is not saved in User macros).

---

3. Press ENTER to save.

The current settings are now stored in the User Macro. The storing will take a few minutes, please wait. The Parameter settings can be changed thereafter without loosing the settings saved to the User Macro. After power switch off, when you turn on the power again the original User Macro settings are valid. (With other Application Macros the parameter setting will be permanently saved when you press ENTER after changing the parameter value and during power up default values of the parameters are not restored.)

To recall the last saved parameters (User Macro):

1. Access the Start-up Data group as described in the table in section *Parameter mode* on page *26*.
2. Change Parameter 99.2 APPLICATION MACRO to USER1 LOAD or USER2 LOAD.
3. Press ENTER to load.

If no User Macro exists, and you try to load one, a fault indication is displayed

```
** FAULT **
USER MACRO
```

The User Macros can also be switched via digital inputs or Fieldbus, selectable with Parameter 10.17 as described in chapter *Parameters*.

The User Macro used can be changed via a digital input or Fieldbus communication (edge triggered) only after the drive is off (magnetising is off), that is, Rdy For Run = 0. During the change the drive can not start.

---

**NOTE:** User Macro load restores also the motor settings of Start-up Data group and the results of the Motor ID Run. Check that the settings correspond to the motor used.

---

Indication on selected macro can be obtained on relay output R01, R02, and/or R03, by setting the parameters 14.1, 14.2 and/or 14.3 to *MOTOR1 SEL* or to *MOTOR2 SEL*. The relay output then goes high when the change-over to the selected macro is completed.
(The indication can also be obtained with the value *USER 1 or 2* on one of the parameters. However, this indication does not guarantee that the change-over is completed.)

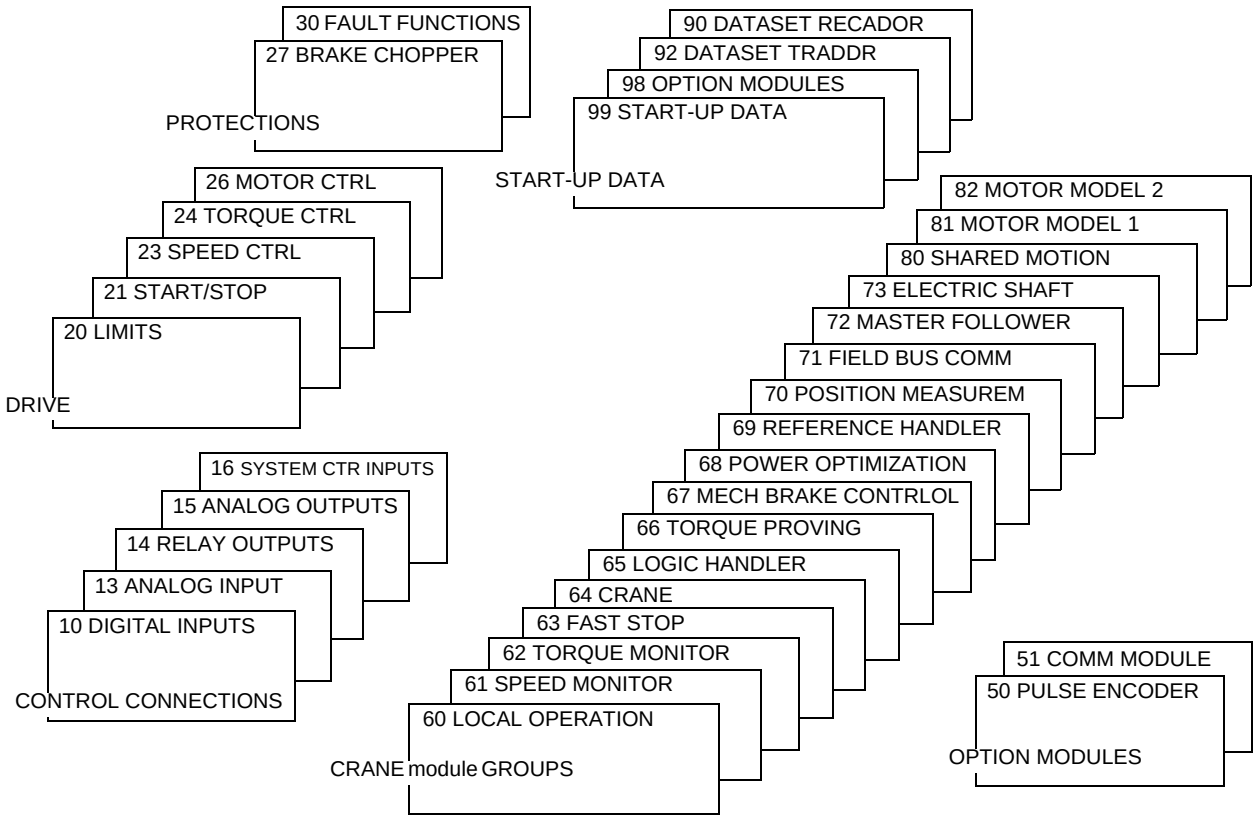
# Parameters

## Overview

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

## Parameter Groups

The CraneDrive parameters are arranged into groups by their function. The figure below illustrates the organisation of the parameter groups. Chapter *Control panel* explains how to select and set the parameters. Refer to chapter *Start-up* and chapter *Control Operation* for more information on the Start-up Data and Actual Signals. Some parameters that are not in use in the current application are hidden to simplify programming.




*Parameter groups*

**CAUTION!** When configuring I/O connections, it is possible to use one I/O connection to control several operations. If an I/O is programmed for one purpose, this setting remains, even if you select the I/O for another purpose with another parameter.

### Group 10 Digital Inputs

These parameter values can be altered with the Crane drive running,

The Range/Unit column below shows the allowable parameter values. The text following the table explains the parameters.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 BRAKE ACKN SEL | INTERNAL ACK; DI1; DI2; DI5; DI6; DI_IL | Brake acknowledge digital input |
| 2 ZERO POS SEL | NOT SEL; DI1; DI2; DI5; DI6; DI_IL | Zero position digital input (Stand alone) |
| 3 SLOWDOWN-N SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; DI5 + DI6; DI1.1+DI1.2; DI_IL | Slowdown digital input |
| 4 FAST STOP-N SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; DI_IL | Fast stop digital input (Stand alone) |
| 5 POWER ON ACKN SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | Power-On acknowledge digital input |
| 6 SYNC SEL. | NOT SEL; DI1 … DI6; EXT DI1.1 … EXT DI2.2; DI_IL | Synchronisation digital input |
| 7 CHOPPER FLT-N SEL | See parameter 10.6 | Chopper fault digital input |
| 8 STEP REF2 SEL | See parameter 10. 5 | Step reference 2 digital input (Stand alone) |
| 9 STEP REF3 SEL | See parameter 10. 5 | Step reference 3 digital input (Stand alone) |
| 10 STEP REF4 SEL | See parameter 10. 5 | Step reference 4 digital input (Stand alone) |
| 11 HIGH SPEED SEL | See parameter 10. 4 | High speed digital input (Stand alone) |
| 12 SNAG LOAD-N SEL | NOT SEL; DI1 … DI6; DI_IL | Snag load digital input |
| 13 ACCELERATE SEL | See parameter 10. 4 | Accelerate digital input (Stand alone) |
| 14 FB STOPLIM SEL | NOT SEL; DI3 + DI4; DI5+DI6; DI1.1+DI1.2 | Fieldbus stop limit digital inputs |
| 15 ELSHAFT ON SEL | NOT SEL; DI1; DI2; EXT DI1.1…EXT DI 2.2; EXT DI1.3; EXT DI2.3; DI5; DI6; DI_IL | Electric shaft control on digital input |
| 16 FAULT RESET SEL | NOT SEL; DI1 ... DI6; DI_IL | Fault reset digital input |
| 17 USER MACRO CH SRCE | NOT SEL; DI1 ... DI6, COMM MOD; DI_IL | Restores parameters to user macro setting values |
| 18 EXTERNAL FAULT | NOT SEL; DI1-DI6; DI_IL | External fault input |
| 19 SECOND RAMP SEL | NORMAL RAMP; SECOND RAMP; DI1; DI2; DI5; DI6; EXT DI1.1…EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | Selection of the second ramp, which is a scaling factor for normal ramptimes 69.2 -69.5 |
| 20 SECOND CTRL SEL | NOT SEL; DI1 … DI6; EXT DI1.1 … EXT DI2.2; DI_IL | Selection of input for second control mode activation. |
| 21 RUN ENABLE | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | Selection of input for the RUN ENABLE signal |

**1 BRAKE ACKN SEL**

Selection of digital input for signal BRAKE ACKN

*INTERNAL ACK; DI1; DI2; DI5; DI6; DI_IL*

INTERNAL ACK (internal acknowledge) setting is used if no brake acknowledge signal is available.

**2 ZERO POS SEL**

Selection of digital input for signal ZERO POS, used in Stand alone mode.

*NOT SEL; DI1; DI2; DI5; DI6; DI_IL*

**3 SLOWDOWN-N SEL**

Selection of digital input for signal SLOWDOWN-N, used in Stand alone mode. DI5 + DI6 or DI1.1+DI1.2 selected gives SLOWDOWN DIR A-N and SLOWDOWN DIR B-N signals. DI5 + DI6 and DI1.1+DI1,2 also work in Fieldbus mode.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; DI5 + DI6; DI1.1+DI1.2; DI_IL*

**4 FAST STOP-N SEL**

Selection of digital input for signal FAST STOP-N, used in Stand alone mode.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; DI_IL*

**5 POWER ON ACKN SEL**

Selection of digital input for signal POWER ON ACKN, used if separate 24V DC supply to control unit. Connected to aux contact (NO) on Main contactor.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL*

**6 SYNC SEL**

Selection of digital input for signal SYNC, used to make Hw synchronisation of position counter.

*NOT SEL; DI1 … DI6; EXT DI1.1 … EXT DI2.2; DI_IL*

**7 CHOPPER FLT-N SEL**

Selection of digital input for signal CHOPPER FLT-N, used to indicate fault in chopper unit. Wired from chopper fault contact (NO).

*NOT SEL; DI1 … DI6; EXT DI1.1 … EXT DI2.2; DI_IL*

**8 STEP REF 2 SEL**

Selection of digital input for signal STEP REF 2, used in Stand alone mode, with Step Joystick or Step Radio control.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL*

**9 STEP REF 3 SEL**

Selection of digital input for signal STEP REF 3, used in Stand alone mode, with Step Joystick or Step Radio control.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL*

**10 STEP REF 4 SEL**

Selection of digital input for signal STEP REF 4, used in Stand alone mode, with Step Joystick or Step Radio control.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL*

**11 HIGH SPEED SEL**

Selection of digital input for signal HIGH SPEED, used in Stand alone mode, to enable Power optimising speed ref.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; DI_IL*

**12 SNAG LOAD-N SEL**

Selection of digital input for signal SNAG LOAD-N, used in Fieldbus mode to activate Fast stop 2 during hoisting only.

*NOT SEL; DI1 … DI6; DI_IL*

**13 ACCELERATE SEL**

Selection of digital input for signal ACCELERATE, used in Stand alone mode, with Motor Pot control.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1 … EXT DI2.2; DI_IL*

**14 FB STOPLIM SEL**

Selection of digital inputs for STOPLIM A and STOPLIM B signals. Used in Fieldbus mode and Stand alone FB Joystick mode.

*NOT SEL; DI3+DI4; DI5+DI6; DI1.1+DI1.2*

**15 ELSHAFT ON SEL**

Selection of digital input for ELSHAFT ON signal, used in Electric shaft control.

*NOT SEL; DI1; DI2; EXT DI1.1 … EXT DI2.2; EXT DI1.3; EXT DI2.3; DI5; DI6; DI_IL*

**16 FAULT RESET SEL**

Selection of digital input for a fault reset signal.

*NOT SEL; DI1 ... DI6; DI_IL*

When selecting NOT SEL, fault reset can only be executed from the Control Panel keypad. If a digital input is selected, fault reset is executed from an external switch, if in External control mode, or from the Control Panel. Reset from a digital input is activated by opening a normally closed contact (negative edge on digital input).

**Note:** Reset from Fieldbus Command word is always available when in External control. Reset from Fieldbus Command word (RESET OVR) is activated on positive edge of signal.

**17 USER MACRO CH SRCE**

Selection of input channel for switching between different user macros.

*NOT SEL; DI1 ... DI6; COMM MODULE; DI_IL*

Selection takes place in the following way:
When the state of the specified digital input or Fieldbus signal changes from high to low (on negative edge) User Macro 1 is restored. When the state of the specified digital input or Fieldbus signal changes from low to high (on positive edge) User Macro 2 is restored.

If the required User Macro does not exist a fault indication is displayed:

```
** FAULT **
USER MACRO
```

The User Macro used can be changed via a digital input or Fieldbus communication (edge triggered) only after the drive is off (magnetising is off) i.e. Rdy For Run = 0. During the change the drive will not start. The acknowledgement signal USER 1 OR 2 (digital output or Fieldbus) indicates when the change is completed and the drive can be started again.

**18 EXTERNAL FAULT**

Selection of digital input used for an external fault signal

*NOT SEL, DI1-DI6, DI_IL*

If an external fault occurs, i.e. digital input drops to 0 VDC, the CraneDrive stops.

**19 SECOND RAMP SEL**

Selection of how to activate the second ramp scale, set in parameter 69.11.

*NORMAL RAMP*
The second ramp scaling factor, 69.11 SECOND RAMP SCALE is *not* active.

*SECOND RAMP*
*The second ramp scaling factor, 69.11 SECOND RAMP SCALE is always active.*

*DI1; DI2; DI5; DI6; EXT DI1… EXT DI3.3; DI_IL*
(External signal for activating the second ramp)

**20 SECOND CTRL SEL**

Selection of digital input used for activateing the second control mode, set in parameter 64.17.

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1… EXT DI3.3; DI_IL*

**21 RUN ENABLE**

Selection of digital input for the RUN ENABLE signal

*NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL*

Use the RUN ENABLED signal to temporary enable/disable the drive, when a fast enable is required. By default the POWER ON ACK signal is used, but this signal is rather slow.

When the signal go low, the drive closes the brakes and drops the signal RDY FOR RUN. (The same action with both POWER ON ACK and RUN ENABLED.)

The RUN ENABLE can be used together with POWER ON ACK.

## Group 13 Analogue Inputs

These parameter values can be altered with the CraneDrive running,

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

**NOTE:** Updating interval for AI1 and AI2 is 32 ms, and for EXT AI1 (Speed correction) the updating interval is 8 ms.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 SCALE AI1 | 0 … 4.000 | Scaling factor for AI1 |
| 2 FILTER AI1 | 0 s … 4.00 s | Filter time constant for AI1. |
| 3 SCALE AI2 | 0 … 4.000 | Scaling factor for AI2 |
| 4 FILTER AI2 | 0 s … 4.00 s | Filter time constant for AI12 |
| 5 SCALE EXT AI1 | 0 … 4.000 | Scaling factor for EXT AI1 (RAIO) |
| 6 FILTER EXT AI1 | 0 s … 4.00 s | Filter time constant for EXT AI1 (RAIO) |
| 7 AI1 0% REF LEV | -10.0 … 10.0 V | AI1 signal level corresponding to 0% speed reference |

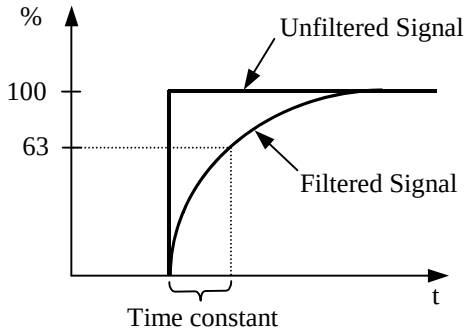
### 1 SCALE AI1

Scaling factor for analogue input AI1 signal.

### 2 FILTER AI1

Filter time constant for analogue input AI1

As the analogue input value changes, 63 % of the change takes place within the time specified by this parameter. If you select 0 sec. that equals the minimum value, the signal is filtered with a time constant of 10 ms.




*Filter time constant*

### 3 SCALE AI2

Refer to parameter 13.1.

### 4 FILTER AI2

Refer to parameter 13.2.

**5 SCALE EXT AI1**

Refer to parameter 13.1.

**6 FILTER EXT AI1**

Refer to parameter 13.2.

**7 AI1 0% REF LEV**

The minimum AI1 voltage level that should correspond to 0 % speed reference is adjustable with this parameter.

Can for example be used if a 4-20 mA reference signal is connected to AI1 (with 500 ohm resistor across AI1 input giving a 2-10V signal). Parameter is than set equal to 2.0 V. Input signal range of 2 -10 V than gives the 0 - 100 % speed reference with a linear relation (e.g. 6V=50%).

Any voltage on input AI1 below the level set in parameter gives 0 % speed reference.

Also used in BIPOLAR REF mode to set offset error of analog reference (zero point). Positive or negative value possible 0.0 – +/-10.0V .

## Group 14 Relay Outputs

The text following the table below explains the parameters in detail.
**NOTE:** Updating interval for Relay outputs is 32 ms.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 RELAY RO1 OUTPUT | Refer to the text below for the available selections. | Relay output 1 content. |
| 2 RELAY RO2 OUTPUT | | Relay output 2 content. |
| 3 RELAY RO3 OUTPUT | | Relay output 3 content. |
| 4 EXT1 DO1 OUTPUT | | #1 RDIO, DO1 content |
| 5 EXT1 DO2 OUTPUT | | #1 RDIO, DO2 content |
| 6 EXT2 DO1 OUTPUT | | #2 RDIO, DO1 content |
| 7 EXT2 DO2 OUTPUT | | #2 RDIO, DO2 content |

**1 RELAY RO1 OUTPUT**

This parameter allows you to select which information is indicated with relay output 1.

---

NOTE! The selection for RO01 can also be made with paramter 80.4. Be sure to avoid conflicts.

---

*NOT USED*

*READY*
The CraneDrive is ready for ON-order. The relay is not energized if: the "Power On Ackn" signal (e.g. DI2) is not present, or DC bus voltage is not OK, or "Prevention of unexpected start" circuit is open (Multidrive) or a fault exists.

*RUNNING*
The CraneDrive has been started with speed and torque controllers active.

*FAULT*
A fault has occurred. Refer to chapter *Fault Tracing and Maintenance* for more details.

*FAULT-N*
Relay energized when power is applied, and de-energized upon a fault trip.

*CONTROL LOC*
Control location. Indication if External or Local control mode is selected from panel. CONTROL LOC = False indicates Local control mode (panel control).

*BRAKE LIFT*
Signal for controlling the mechanical brake.

*WATCHDOG-N*
Indicates: Communication supervision (MAS OSC FLT or MF COMM ERR), Braking chopper faults (CHOPPER FLT, BC OVERHEAT, BC SHORT CIR or BR OVERHEAT), External fault (EXT FAULT) and Brake long falltime (BRAKE LONG FTIME) of the brake. Also indicating if CPU Stalls out. **This signal should be used to give Emergency Stop to crane drive.**

***NOTE:*** *Fieldbus communication supervision (MAS OSC FLT) only available in Fieldbus mode or Standalone FB Joystick mode.*

*USER 1 OR 2*
Indicates if User Macro 1/Shared motion 1 is loaded (=0), or
if User Macro 2/Shared motion 2 is loaded (=1).

*REVERSE*
Indicates if motor speed is negative.

*OVERSPEED*
Fault signal indication for motor overspeed trip (level set with parameter 61.3)

*RDY FOR RUN*
Indicates that motor is magnetized (ON) and ready for a start order.

*SPEED LIM 1*
*Activated if absolute value of motor speed is above level set in parameter 61.4 SPEED LIM 1.*

*LIFETIME>90%*
Activated if the Crane lifetime monitor signal 1.35 LIFETIME LEFT % is below 10% (percent of parameter 74.2 CRANE LIFETIME).

*MOTR1 SEL*
Indicates when User Macro 1/Shared Motion 1 is loaded.
(The output is always low during the change-over. Not until the change-over is completed the output goes high.)

*MOTR2 SEL*
Indicates when User Macro 2/Shared Motion 2 is loaded.
(The output is always low during the change-over. Not until the change-over is completed the output goes high.)

**2 RELAY RO2 OUTPUT**

Refer to Parameter 14.1 RELAY RO1 OUTPUT.

**3 RELAY RO3 OUTPUT**

Refer to Parameter 14.1 RELAY RO1 OUTPUT.

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**NOTE!** The selection for RO03 can also be made with paramter 80.5. Be sure to avoid conflicts.

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**4 EXT1 DO1 OUTPUT**

Refer to Parameter 14.1 RELAY RO1 OUTPUT.

**5 EXT1 DO2 OUTPUT**

Refer to Parameter 14.1 RELAY RO1 OUTPUT.

**6 EXT2 DO1 OUTPUT**

Refer to Parameter 14.1 RELAY RO1 OUTPUT.

**7 EXT2 DO2 OUTPUT**

Refer to Parameter 14.1 RELAY RO1 OUTPUT.

## Group 15 Analogue Outputs

These parameter values can be altered with the CraneDrive running. The Range/ Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail. **NOTE:** Updating interval for Analogue outputs is 32 ms.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 ANALOGUE OUTPUT 1 | Refer to the text below for the available selections | Analogue output 1 content. |
| 2 INVERT AO1 | NO; YES | Analogue output signal 1 inversion. |
| 3 MINIMUM AO1 | 0 mA; 4 mA | Analogue output signal 1 minimum. |
| 4 FILTER AO1 | 0.00 s ... 10.00 s | Filter time constant for AO1. |
| 5 SCALE AO1 | 10 % ... 1000 % | Analogue output signal 1 scaling factor. |
| 6 ANALOGUE OUTPUT 2 | Refer to the text below for the available selections | Analogue output 2 content. |
| 7 INVERT AO2 | NO; YES | Analogue output signal 2 inversion. |
| 8 MINIMUM AO2 | 0 mA; 4 mA | Analogue output signal 2 minimum. |
| 9 FILTER AO2 | 0.00 s ... 10.00 s | Filter time constant for AO2. |
| 10 SCALE AO2 | 10 % ... 1000 % | Analogue output signal 2 scaling factor |

**1 ANALOGUE OUTPUT 1**

This parameter allows you to select which output signal is connected to analogue output AO1 (current signal). The following list shows the full scale value with Parameter 15.5 SCALE AO1 set to 100 %.

*NOT USED*

*MEAS SPEED*
Measured (RTAC module) speed of the motor. 0mA = - 100 % motor maximum speed (Parameters 20.1 & 20.2), 10 mA = 0 % speed, 20 mA = + 100 % motor maximum speed.

*SPEED*
Motor speed. 20 mA = 100 % of motor nominal speed, absolute value.

*FREQUENCY*
*Output frequency. 20 mA = motor nominal frequency.*

*CURRENT*
Output current. 20 mA = motor nominal current.

*SIGN TORQUE*
*Motor torque with sign. 0 mA = TORQUE REF SCALE (Par 64.9) * -100 % of motor nominal rating, 10 mA = 0 % torque, 20 mA = TORQUE REF SCALE * +100% of motor nominal rating.*

*POWER*
Motor power. 20 mA = 100 % of motor nominal rating, absolute value.

*DC BUS VOLT*
DC bus voltage. 20 mA = 100 % of maximal nominal DC bus voltage. Max nominal DC = 675V if 500V unit and 560V if 400V unit.

*OUTPUT VOLT*
Motor voltage. 20 mA = motor rated voltage.

*SIGN POSACT*
Position counter (RTAC) measurement value (see signal 2.18) with sign. 0mA = -32767 units (scaling with parameter 70.1), 10 mA = 0 units, 20 mA = + 32767 units.

*SIGN SP REF*
Speed reference (Speed ref3 = output from ramp) with sign. 0mA = - 100 % of motor maximum speed (par. 20.1 & 20.2), 10 mA = 0 % speed, 20 mA = + 100 % of motor maximum speed.

**2 INVERT AO1**

If you select YES, the analogue output AO1 signal is inverted.

**3 MINIMUM AO1**

The minimum value of the analogue output signal can be set to either 0 mA or 4 mA.

**4 FILTER ON AO1**

Filter time constant for analogue output AO1.

As the analogue output value changes, 63 % of the change takes place within the time period specified by this parameter. If you select the minimum value 0 s, the signal is not filtered (See Figure 6 2, page 6-6).

**5 SCALE AO1**

This parameter is the scaling factor for the analogue output AO1 signal. If the selected value is 100 %, the nominal value of the output signal corresponds to 20 mA. If the maximum is less than full scale, increase the value of this parameter.

**6 ANALOGUE OUTPUT 2**

This parameter allows you to select which output signal is connected to analogue output AO2 (current signal). The following list shows the full scale value with Parameters 15.10 SCALE AO2 set to 100 %.

*NOT USED*

*SIGN SPEED*
*Motor speed with sign. 0mA = - 100 % motor maximum speed (par. 20.1 & 20.2), 10 mA = 0 % speed, 20 mA = + 100 % motor maximum speed.*

*SPEED*
Motor speed. 20 mA = 100 % of motor nominal speed, absolute value.

*FREQUENCY*
Output frequency. 20 mA = motor nominal frequency.

*CURRENT*
Output current. 20 mA = motor nominal current

*TORQUE*
Motor torque.  20 mA = 100% of motor nominal rating. Absolute value.

*POWER*
Motor power. 20 mA = 100 % of motor nominal rating, absolute value.

*DC BUS VOLT*
DC bus voltage. 20 mA = 100 % of maximal nominal DC bus voltage (see also parameter 15.1).

*OUTPUT VOLT*
Motor voltage. 20 mA = motor rated voltage.

*TORQUE REF*
Torque reference used by torque controller. 20 mA = 100 % of motor nominal torque, absolute value.

*SIGN SP REF*
Speed reference (Speed ref3 = output from ramp) with sign. 0mA = - 100 % of motor maximum speed (par. 20.1 & 20.2), 10 mA = 0 % speed, 20 mA = + 100 % of motor maximum speed.

**7 INVERT AO2**

Refer to Parameter 15.2.

**8 MINIMUM AO2**

Refer to Parameter 15.3.

**9 FILTER ON AO2**

Refer to Parameter 15.4.

**10 SCALE AO2**

Refer to Parameter 15.5.

## Group 16 System Ctr Inputs

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 2 PARAMETER LOCK | OPEN; LOCKED | Parameter lock input. |
| 3 PASS CODE | 0 ... 30 000 | Parameter lock pass code. |
| 5 MODIFY MOTOR DATA | NO; YES | Unprotect motor data par's. |
| 6 SHARED MOTION SEL | OFF; ON; FORCE MOT1; FORCE MOT2 | Activate Shared Motion tune. |
| 7 ID RUN DATA SAVE | NO; MOTOR1--GRP81; MOTOR2-GRP82 | Save ID Run if Shared Motion |
| 8 FAN SPD CTRL MODE | CONST 50HZ; RUN/STOP; CONTROLLED | Fan speed control mode |
| 9 FUSE SWITCH CNTR | OFF; ON | Fuse switch control |
| 10 INT CONFIG USER | 1 … 12 | Inverter module configuration |
| 11 FB SPEED/TQ CTRL | SPEED; SPEED/TORQUE | Enable/Disable torque selection. |

**2 PARAMETER LOCK**

This parameter selects the state of the Parameter Lock. With Parameter Lock you can inhibit unauthorised parameter changes.

*OPEN*
Parameter Lock is open. Parameters can be altered.

*LOCKED*
Parameter Lock is closed from the Control Panel. Parameters cannot be altered. Only entering the valid code at Parameter 16.3 PASS CODE can open the Parameter Lock.

*Note: This function is not available if User macros are used.*

**3 PASS CODE**

This parameter selects 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.

**5 MODIFY MOTOR DATA**

Enable changes to motor parameters.

*NO*
No action

*YES*
Release write protection for motor parameters 99.05-99.08 (protection is set after a completed ID magn or ID Run).

**6 SHARED MOTION SEL**

Activate Shared Motion function (see section *Shared Motion (80, 81, 82)* in chapter *Crane Program Description*).

*OFF*
Shared Motion not active

*ON*
Shared Motion activated

*FORCE MOT1*
Force parameter selection to MOTOR 1

*FORCE MOT2*
Force parameter selection to MOTOR 2.

**7 ID RUN DATA SAVE**

Saving of ID Run data when Shared Motion function is used.

*NO*
No action

*MOTOR1-GRP81*
Saves motor model data from ID Run to parameter group 81 for MOTOR 1.

*MOTOR2-GRP82*
Saves motor model data from ID Run to parameter group 82 for MOTOR 2.

**8 FAN SPD CRTL MODE**

Selection of control mode for the optional speed control of the inverter fan in ACS800 Multidrive.

*CONST 50HZ*
No fan speed control active. Fan is always running with constant nominal 50 or 60 Hz speed.

*RUN/STOP*
Fan is running with constant nominal speed when inverter is modulating and inverter temperature is above min limit.

*CONTROLLED*
Fan speed is controlled between 30 and 110% of nominal depending on inverter temperature.

**9 FUSE SWITCH CNTR**

Activation parameter for optional inverter DC fuse switch.

*OFF*
The charging logic for DC fuse switch control is disabled. This parameter must be set to OFF if no DC fuse switch is installed.

*ON*
The charging logic for DC fuse switch control is active. This parameter must be set to ON if an optional DC switch is installed.

**10 INT CONFIG USER**

Adjustable inverter module configuration for n*R8i size inverters. This parameter is user acceptance for Reduced Run (i.e. running with reduced power) function and the number must correspond to the active inverter configuration (number of connected modules) when there are R8i inverter modules removed, e.g. for service. If active inverter configuration is the same as original factory setup than this parameter has no meaning.

**11 FB SPEED/TQ CTRL**

In fieldbus control mode (Parameter 64.01 STAND ALONE = FALSE):

*SPEED/TORQUE*

When set to this value, torque control can be selected with the FB COMMAND WORD, bit 6 (TORQ CTRL SEL).

*SPEED*

When set to this value, the drive is forced to speed control, even if the FB COMMAND WORD, bit 6 (TORQ CTRL SEL) is set.

**12 RESET FAN ON TIME**

Resets FAN ON TIME after the fan has been replaced.

*NO*
No action

*YES*
Resets the fan on time to 0

## Group 20 Limits

These parameter values can be altered with the CraneDrive running. The Range/ Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 MINIMUM SPEED - | -10 000 … 0 rpm | Operating range minimum speed. Cannot be used in the SCALAR mode(see page 3-9). |
| 2 MAXIMUM SPEED - | 0 … 10 000 rpm | Operating range maximum speed. Cannot be used in the SCALAR mode |
| 3 MAXIMUM CURRENT | 0.0 ... Imax Amp | Maximum output current. |
| 4 MAXIMUM TORQUE | 0.00 ... 325.00 % | Maximum positive output torque. |
| 5 MINIMUM TORQUE | -325.00 … 0.00 % | Maximum negative output torque. |
| 6 OVERVOLTAGE CTRL | ON; OFF | DC over voltage controller |
| 7 UNDERVOLTAGE CTRL | ON; OFF | DC undervoltage controller |
| 8 MINIMUM FREQ | - 300.00 Hz ... MAXIMUM FREQ (value of par. 20.9) | Operating range minimum frequency. Visible in the SCALAR mode only |
| 9 MAXIMUM FREQ | MINIMUM FREQ (value of par. 20.8) ... 300.00 Hz | Operating range maximum frequency. Visible in the SCALAR mode only |
| 10 SPEED LIMIT AI3 | 0.0 % … 100.0 % | Speed limit AI3 activated |
| 11 P MOTORING LIM | 0.0 % … 600.0 % | Maximum motoring output power |
| 12 P GENERATING LIM | -600.0 % … 0.0% | Maximum generating output power |
| 13 TORQ RISE T LIM | 0 … "max" %/ms | Torque risetime limit |

#### 1 MINIMUM SPEED

Limitation of the minimum speed reference to speed controller. The default value depends on the selected motor and it is either -750, -1000, -1500 or -3000 rpm.

**WARNING: If this value is set positive the motor can not decelerate to zero speed and stop when removing start-order!**

This limit cannot be set in the SCALAR control mode.

#### 2 MAXIMUM SPEED

Limitation of the maximum speed reference to speed controller. The default value depends on the selected motor and it is either 750, 1000, 1500 or 3000 rpm.

**WARNING: If this value is set negative the motor can not decelerate to zero speed and stop when removing start-order!**

This limit cannot be set in the SCALAR control mode.

#### 3 MAXIMUM CURRENT A

The maximum output current, in Amps, that the CraneDrive will supply to the motor. The default value is the "Imax" current rating of the ACS800 CraneDrive. For ACS600 Multidrive inverters the default value is two times the catalogue value "200% Cycle load" base rating: "IAC 50/60s".

**4 MAXIMUM TORQUE**

This setting defines the momentarily allowed maximum positive torque of the motor. The motor control software of the CraneDrive limits the setting range of the maximum torque according to the inverter and motor data. The default value is 200 % of the nominal torque of the motor.

This limit has no function in the Scalar control mode.

**5 MINIMUM TORQUE**

This setting defines the momentarily allowed maximum negative torque of the motor. The motor control software of the CraneDrive limits the setting range of the maximum torque according to the inverter and motor data. The default value is -200 % of the nominal torque of the motor.

This limit has no function in the Scalar control mode.

**6 OVERVOLTAGE CTRL**

This parameter deactivates the DC over voltage controller.

The DC over voltage controller increases (if pos. speed) the torque if the DC bus voltage exceeds the limit - typically due to motor working in generator mode - to prevent an over voltage trip. Note: Controller should be deactivated if using braking chopper.

**7 UNDERVOLTAGE CTRL**

This parameter allows you to deactivate the undervoltage controller.

If the DC bus voltage drops due to loss of input power, the undervoltage controller will decrease the motor speed in order to keep the DC bus voltage above the lower limit. By decreasing the motor speed, the inertia of the load will cause regeneration back into the CraneDrive, keeping the DC bus charged, and preventing an undervoltage trip. This will increase power loss ride through on systems with a high inertia, such as a centrifuge or fan.

**8 MINIMUM FREQ**

Limitation of the minimum frequency reference used.

**Warning: If this value is set positive the motor can not decelerate to zero speed and stop when removing start-order!**

This limit can be set in the SCALAR control mode only.

**9 MAXIMUM FREQ**

Limitation of the maximum frequency reference used.

**Warning: If this value is set negative the motor can not decelerate to zero speed and stop when removing start-order!**

This limit can be set in the SCALAR control mode only.

**10 SPEED LIMIT AI3**

The speed reference to the drive is limited to the set value if analog input 3 input current is below 10 mA. If AI3 input current is above 10 mA, there is no speed limitation active (100% allowed). 100% is equal to the rpm set in parameter 69.1 SPEED SCALING RPM.

The function is available in both Stand alone and Fieldbus mode.

**11 P MOTORING LIM**

This parameter defines the momentarily allowed maximum power fed by the inverter to the motor. The value is in percent of the motor nominal power.

**12 P GENERATING LIM**

This parameter defines the momentarily allowed maximum power fed by the motor to the inverter. The value is in percent of the motor nominal power.

**13 TORQ RISE T LIM**

This parameter is used to limit the maximum allowed torque reference change per millisecond. Output of the limitation is 2.14 TORQ USED REF. Default (=maximum) value depends on the inverter and motor size combination.

**NOTE:** Motor data in group 99 must be set before accessing this parameter.

## Group 21 Start/Stop

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 START FUNCTION | CNST DCMAGN | Conditions during motor ON-order. |
| 2 CONST MAGN TIME | 30…10000 ms | Duration of pre-magnetising |
| 4 DC HOLD | NO; YES | Activate DC HOLD function |
| 5 DC HOLD SPEED | 0…10 % | DC Hold activation speed<br>(visible only if 21.4 = YES) |
| 6 DC HOLD CURRENT | 0…100 % | DC Hold current level<br>(visible only if 21.4 = YES) |

### 1 START FUNCTION

*CNST DC MAGN*
**This parameter cannot be altered**. Sets the constant magnetising mode. This is the fastest starting method if the motor is at a standstill.

The CraneDrive can provide full starting torque by pre-magnetising the motor. The optimal magnetising current is calculated on the basis of the parameters concerning the motor. The pre-magnetising time is defined by Parameter 21.2 CONST MAGN TIME

**Note:** This mode is always used with the ACC 800 Crane Control Software.

### 2 CONST MAGN TIME

Defines the duration of the pre-magnetising in the constant magnetising mode.

An approximate value for this can be calculated as the motor nominal power in kW multiplied by 4.

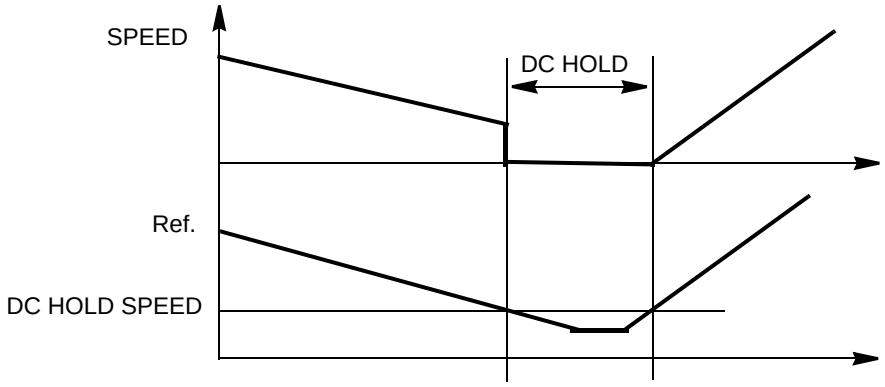
Example:

For a 100 kW motor, set parameter 21.2 CONST MAGN TIME = 4 * 100 = 400 ms.

**4 DC HOLD**

Activation of DC Hold function (not active in Scalar control mode).

When both the reference and the speed goes below the value of parameter 21.5, the drive stops generating sinusoidal current and starts to inject DC into the motor. The current is set in parameter 21.6 When the speed exceeds the value of 21.5, the drive retreives normal operation.




**Note!** DC Hold has no effect if the start signal is switched off.

**Note!** Injecting DC current into the motor causes the motor to heat up. In applications where long DC hold times are required, use externally ventilated motors. If the DC hold period is long, the DC hold cannot prevent the motor shaft from rotating if a constant load is applied to motor.

**5 DC HOLD SPEED**

Defines the DC Hold speed level.

*0-10%*

**6 DC HOLD CURRENT**

Defines the DC Hold current in percent of motor nominal current.

### Group 23 Speed Ctrl

These parameter values can be altered with the CraneDrive running. The Range/ Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail. These parameters are not visible in the SCALAR control mode.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 GAIN | 0.0 ... 200.0 | Gain for speed controller. **Typical value for cranes = 15.** |
| 2 INTEGRATION TIME | 0.01 ... 32.00 s | Integration time for speed controller. Typical value for cranes = 0.2 - 0.5 sec. |
| 3 DERIVATION TIME | 0.0 ... 9999.8 ms | Derivation time for speed controller |
| 4 ACC COMPENSATION | 0.00 s ... 100.00 s | Derivation time used in compensation of acceleration. **Note: Set to zero after ID Run** |
| 5 SLIP GAIN | 0.0% ... 400.0% | Gain for the slip of the motor. |
| 6 AUTOTUNE RUN | NO; YES | Autotuning of the speed controller |
| 7 FEEDB FILTER TIME | 0 ms … 100 ms | Filter time for actual speed |
| 8 SPEED STEP | -1500.00 rpm … 1500.00 rpm | Speed step input for DrivesWindow step gen. |

It is possible to tune the PID algorithm based speed controller of the CraneDrive by setting Parameters 1 to 5 in this group or by selecting the Autotune run by Parameter 6.

The values of these parameters define how the output of the Speed Controller changes when there is a difference (error value) between the actual speed and the reference. Figure 6 3 displays typical step responses of the Speed Controller.

Step responses can be seen by monitoring Actual Signal 1.1 SPEED ESTIMATED.

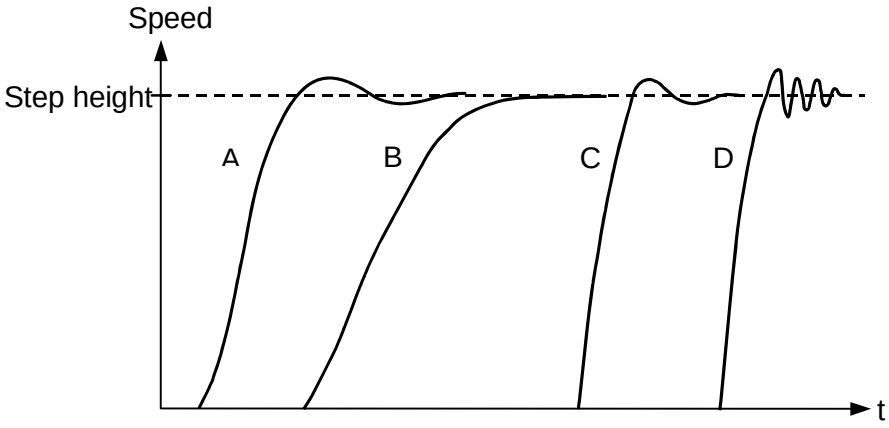
---

**NOTE:** The Standard Motor ID Run (refer to chapter *Start-up*) updates the values of Parameters 23.1, 23.2 and 23.4.
**Parameter 23.1 is set = 15, 23.2 is set = 0.5 sec and 23.4 is reset to 0.0 sec after ID Run by ACC application sw.**

---

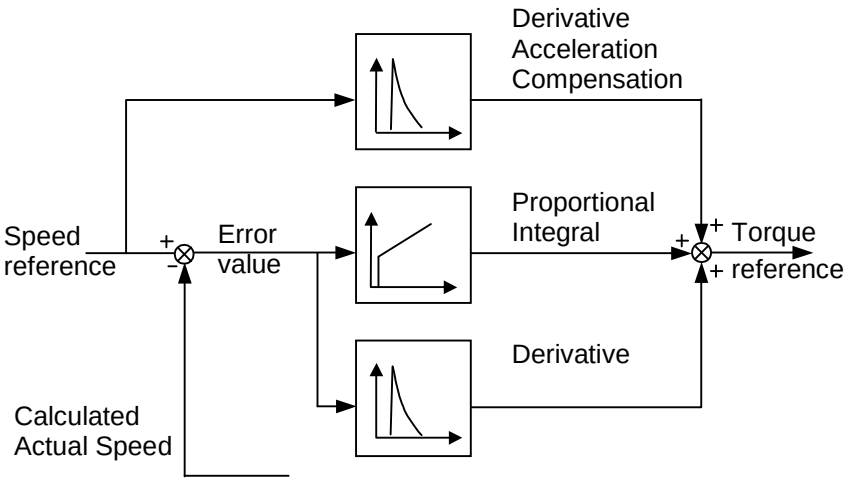
The dynamic performance of the speed control at low speeds can be improved by increasing the relative gain and decreasing the integration time.

Speed controller output is the reference for the torque controller. The torque reference is limited by Parameters 20.4 MAXIMUM TORQUE and 20.5 MINIMUM TORQUE




A: Undercompensated: 23.2 INTEGRATION TIME too short and 23.1 GAIN too low
B: Normally tuned, autotuning
C: Normally tuned, manual tuning. Better dynamic performance than with B
D: Overcompensated: 23.2 INTEGRATION TIME is too short, and 23.1 GAIN too high.

*Step responses of the Speed Controller with different settings. 1 to 10 % reference step is used.*

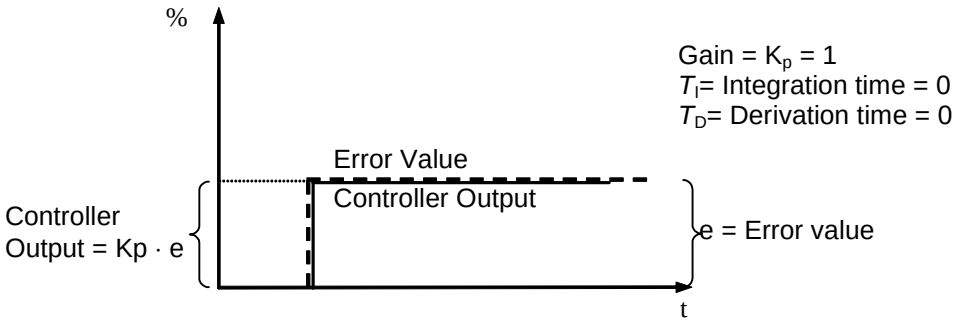



*Speed controller, a simplified block diagram*

**1 GAIN**

Relative gain for the speed controller. If you select 1, a 10 % change in error value (e.g. reference - actual value) causes the speed controller output to change by 10 % of the nominal torque

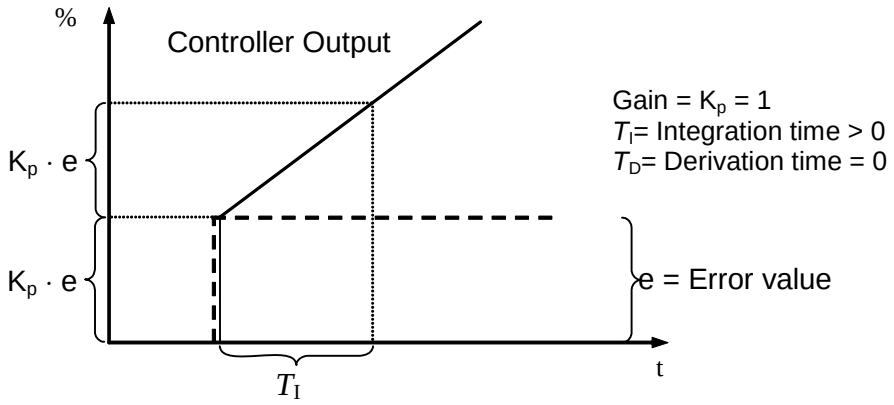
**Note:** Too high gain causes speed oscillation.




*Speed Controller output after an error step when the error remains constant*

**2 INTEGRATION TIME**

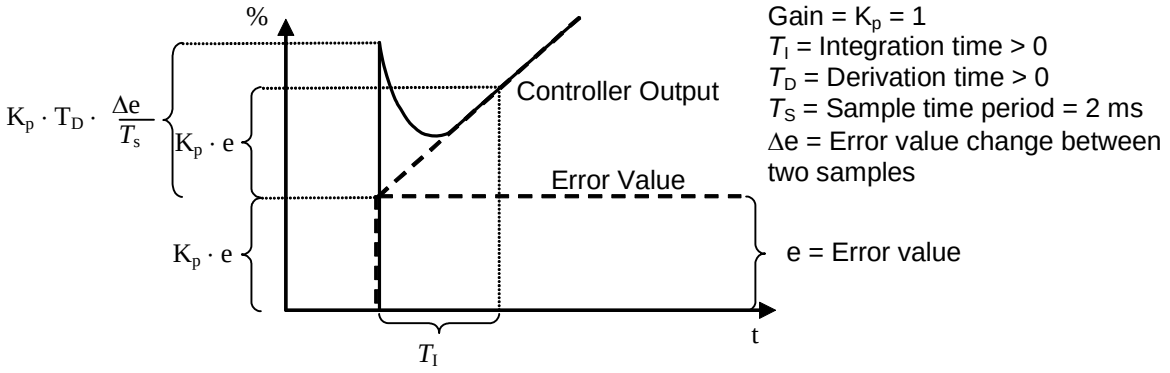
Integration time defines the rate at which the controller output changes when the error value is constant. The shorter the integration time, the faster the continuous error value is corrected. Too short integration time makes the control unstable.




*Speed Controller Output after an error step when the error remains constant*

**3 DERIVATION TIME**

Derivative action boosts the controller output if the error value changes. The longer the derivation time, the more the speed controller output is boosted during the change. The derivation makes the control more responsive for the disturbances. If derivation time is set to zero, the controller works as a PI controller, otherwise as a PID controller.




*Speed Controller Output after an error step when the error remains constant*

---

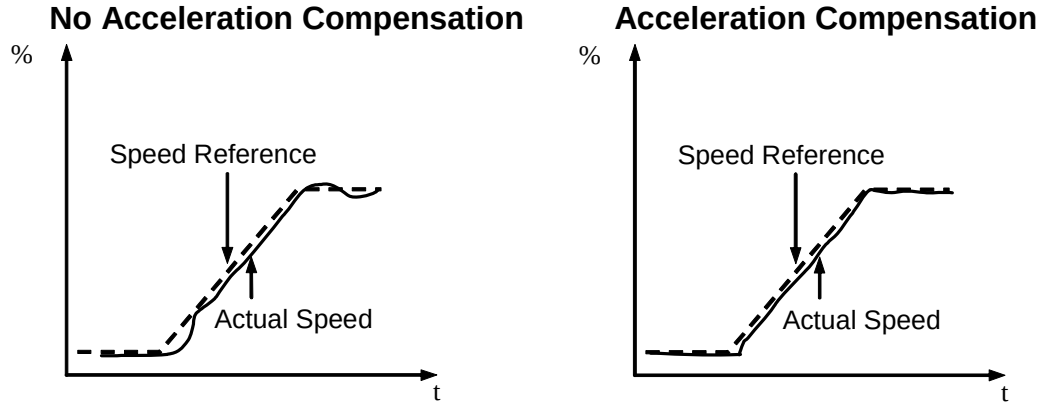
**NOTE**: Changing this parameter is recommended only if a pulse encoder is used.

---

**4 ACC COMPENSATION**

Derivation time for compensation of acceleration. In order to compensate inertia during acceleration the derivative of the reference is added to the output of the speed controller. The principle of a derivative action is described in section 3 DERIVATION TIME above.

As a general rule, set this parameter to a value from 50 to 100 % of the sum of the mechanical time constants of the motor and the driven machine.



**5 SLIP GAIN**

Defines the gain for the slip. 100 % means full slip compensation; 0 % means no slip compensation. The default value is 100 %. Other values can be used if static speed error is detected despite of the full slip compensation.

Example: 1000 rpm constant speed reference is given to the drive. Despite of the full slip compensation (SLIP GAIN = 100 %) a manual tachometer measurement from the motor axis gives speed value 998 rpm. The static speed error is 1000 rpm - 998 rpm = 2 rpm. To compensate the error, the slip gain should be increased. At 106 % gain value no static speed error exists.

**6 AUTOTUNE RUN**

The speed controller of the ACS800 can be tuned automatically by performing the Autotune Run. The mechanical inertia of the load is taken into consideration in GAIN, INTEGRATION, DERIVATION and ACC COMPENSATION parameters. The system is tuned to be undercompensated rather than overcompensated.

To perform the Autotune Run:

- Run the motor at a constant speed of 20 to 70 % of the rated speed.
- Change Parameter 23.6 AUTOTUNE RUN to YES.

After the Autotune Run is performed, this parameter value automatically reverts to NO.

---

**NOTE:** Autotune Run can be performed only while the CraneDrive is running. The motor load must be connected to the motor. The best result is achieved when the motor is run up to 20 ... 40 % of the rated speed before starting the autotune run.

---

---

**CAUTION!** The motor will be accelerated by 10 % of the rated speed with 10 ... 20 % torque step without any ramp during this procedure. BE SURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE AUTOTUNING!

---

**7 FEEDB FILTER TIME**

Filter time constant for the actual speed signal used. That is, normally the estimated speed signal, or if Encoder module (RTAC or NTAC-02) is enabled the measured speed signal from pulse encoder. If not using encoder measured speed (using estimated speed), typical filter time settings to use are 0 - 2 ms (parameter default = 4 ms).

**8 SPEED STEP**

Speed reference step input (without ramp). Only to be used with DrivesWindow step test generator.

## Group 24 Torque Ctrl

These parameter values can be altered with the CraneDrive running. The Range/ Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail. These parameters are not visible in Follower drive (with M/F CTRL macro).

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 TORQ RAMP UP | 0.00 s ... 120.00 s | Time for reference from 0 to the rated torque. |
| 2 TORQ RAMP DOWN | 0.00 s ... 120.00 s | Time for reference from the rated torque to 0. |
| 3 TORQ STEP | -300.00 % … 300.00 % | Torque step input for DrivesWindow step gen. |

### 1 TORQ RAMP UP

Defines the time required for the reference to increase from zero to the rated torque.

### 2 TORQ RAMP DOWN

Defines the time required for the reference to decrease from the rated torque to zero.

**Note:** These parameters do not effect the torque reference sent from master to follower drive in Master/Follower control mode (using Master/Follower bus).

### 3 TORQ STEP

Torque reference step input (without ramp). Only to be used with DrivesWindow step test generator.

## Group 26 Motor Control (visible only in SCALAR mode)

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

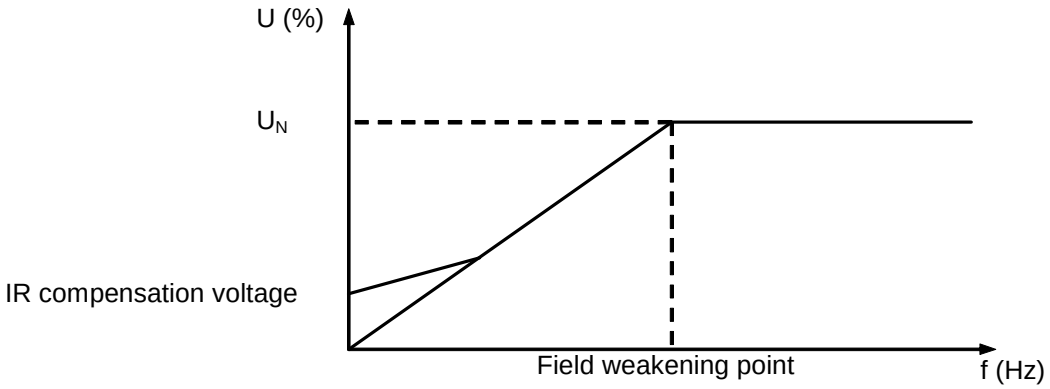
| Parameter | Range/Unit | Description |
|---|---|---|
| **3 IR COMPENSATION** | **0 % ... 30 %** | **Compensation voltage level. (Visible only in SCALAR mode.)** |

### 3 IR COMPENSATION

This parameter is adjustable in the SCALAR control mode only.

This parameter sets the extra relative voltage level that is given to the motor at zero frequency. The range is 0 ... 30 % of motor nominal voltage

IR Compensation is implemented by applying extra voltage to the motor. A percentage of motor voltage. $U_{max}$ maximum output voltage of the CraneDrive.




## Group 27 Brake Chopper

The Range/Unit column below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 BRAKE CHOPPER | OFF; ON | Brake chopper control |
| 2 BR OVERLOAD FUNC | NO; WARNING; FAULT | Brake resistor overload function |
| 3 BR RESISTANCE | 0.00 … 100.00 ohm | Brake resistor resistance value |
| 4 BR THERM TCONST | 0.000 … 10000.000 s | Brake resistor time constant |
| 5 MAX CONT BR POWER | 0.00 … 10000.00 kW | Maximum continuous brake resistor power |
| 6 BC CTRL MODE | AS GENERATOR; COMMON DC | Brake chopper control mode |

**1 BRAKE CHOPPER**

*Activates the brake chopper control.*

*OFF*
Brake chopper control is inactive.

*ON*
Brake chopper control is active. NOTE: Ensure that the brake chopper and resistor are installed and the overvoltage control is switched off (parameter 20.6)

**2 BR OVERLOAD FUNC**

Activates the overload protection of the brake resistor. The user-adjustable variables are parameters 27.03, 27.04 and 27.05.

*NO*
Overload protection is inactive.

*WARNING*
Overload protection is active. If the drive detects an overload, it generates a warning.

*FAULT*
Overload protection is active. If the drive detects an overload, it trips on a fault.

**3 BR RESISTANCE**

Defines the resistance value of the brake resistor. The value is used in the overload protection. See parameter 27.02.

**4 BR THERM TCONST**

Defines the thermal time constant of the brake resistor. The value is used in the overload protection. See parameter 27.02.

**5 MAX CONT BR POWER**

Defines the maximum continuous braking power which will raise the resistor temperature to the maximum allowed value. The value is used in the overload protection. See parameter 27.02.

**6 BC CTRL MODE**

Brake chopper control mode.

*AS GENERATOR*
Chopper operation is allowed when the DC voltage exceeds the braking limit, the inverter bridge modulates and motor generates power to the drive. The selection prevents the operation in case the intermediate circuit DC voltage rises due to abnormally high supply voltage level. Long term supply voltage rise would damage the chopper.

*COMMON DC*
Chopper operation is allowed always when the DC voltage exceeds the braking limit. The selection is to be used in applications where several inverters are connected to the same intermediate circuit (DC bus).

## Group 28 Motor Model

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 2 TR TUNE | -60 … +200 % | Rotor time constant tuning |
| 3 FS MTHOD | ON; OFF | Flux stabilization |

### 2 TR TUNE

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 full load speed. For example, if the real slip is 10% higher than the slip calculated from motor rating plate speed, a coefficient value of +10% is set into this parameter (e.g. if full load speed should be 989 rpm instead of rating plates 990 rpm, for a motor with 1000 rpm no-load speed. Meaning 11 rpm instead of 10 rpm slip).

**Note:** This parameter is effective only if a pulse encoder is used.

### 3 FS MTHOD

Select ON to activate the flux stabilisation function at low frequencies, <3 Hz, when torque exeeds 30%. Effective in motoring and generating modes.

## Group 30 Fault Functions

These parameter values can be altered with the CraneDrive running. The Range/ Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 2 PANEL LOSS | FAULT; NO | Operates when the Control Panel is selected as the active control location for the CraneDrive, and the panel stops communicating. |
| 4 MOTOR THERM PROT; | FAULT; WARNING NO | Operates when the motor is thermally overloaded. |
| 5 MOT THERM P MODE | DTC; USER MODE; THERMISTOR | Motor thermal protection mode selection. |
| 6 MOTOR THERM TIME | 256.0 s ... 9999.8 s | Time for 63 % temperature rise. |
| 7 MOTOR LOAD CURVE | 50.0 % ... 150.0 % | Motor current maximum limit. |
| 8 ZERO SPEED LOAD | 25.0 % ... 150.0 % | Motor load curve point at zero speed. |
| 9 BREAK POINT | 1.0 Hz ... 300.0 Hz | Break point of motor load curve. |
| 10 MOTOR PHASE LOSS; | NO; FAULT | Operates when a motor phase is lost. |
| 11 EARTH FAULT | NO; FAULT | Operates when there is an earth fault. |
| 12 MASTER FAULT FUNC | FAULT; NO; WARNING | Operates when there is a Fieldbus communication fault |
| 13 COMM FLT TIME-OUT | 0.10 s ... 60.00 s | Communication fault time delay |
| 14 WATCHDOG TEST | OFF; ON | Test of the watchdog circuit. |

### 2 PANEL LOSS

Defines the operation of the CraneDrive if the Control Panel selected as the control location for the CraneDrive stops communicating.

*FAULT*
Fault indication is displayed (if there are any Control Panels communicating on the link) and the CraneDrive stops (coast stop + set brake).

*NO*
No protection provided

---

**CAUTION:** If you select NO, make sure that it is safe to continue operation in case communication with the Control Panel fails.

---

**4 MOTOR THERM PROT**

This parameter defines the operation of the motor thermal protectionfunction which protects the motor from overheating.

*FAULT*
Displays a warning indication at the warning level. Displays a fault indication and stops the CraneDrive when the motor temperature reaches the 100 % level.

*WARNING*
Warning indication is displayed when the motor temperature reaches the warning level (95 % of the nominal value).

*NO*
No protection provided.

**Note:** Initialize the drive control board if changing parameter to NO after a Fault or Warning is indicated.

**5 MOT THERM P MODE**

Selects the thermal protection mode. The motor protection is made by means of the thermal model or thermistor measurement.

The CraneDrive calculates the temperature rise of the motor using the following assumptions:

- The motor is in ambient temperature (30 °C) when power is applied to the CraneDrive.
- Motor heating is calculated assuming a load curve (Figure 6 9). The motor will heat above nominal temperature if it operates in the region above the curve, and cool if it operates below the curve. The rate of heating and cooling is set by MOTOR THERM TIME.

Because of the simple thermal model used for calculating temperature rise, this technique of thermal protection may cause undesirable trips if the motor is run continuously at low speeds. If your application requires continuous running at speeds lower than BREAK POINT, you may need to provide external cooling.

---

**CAUTION:** Motor thermal protection will not protect the motor if the cooling of the motor is reduced due to dust and dirt.

---

*DTC*
The DTC (Direct Torque Control) load curve is used for calculating heating of the motor. Motor thermal time is approximated for standard self-ventilated squirrel-cage motors as a function of the current of the motor and the number of pole pairs.

It is possible to scale the DTC load curve with Parameter 30.7 MOTOR LOAD CURVE if the motor is used in conditions other than described above. Parameters 30.6 MOTOR THERM TIME, 30.8 ZERO SPEED LOAD and 30.9 BREAK POINT cannot be set.

Note: Automatically calculated model (DTC) cannot be applied when 99.6 MOTOR NOM CURRENT > 800 Amp. Instead use USER MODE.

*USER MODE*
In this mode the user can define the operation of thermal protection by setting Parameters 30.6 MOTOR THERM TIME, 30.7 MOTOR LOAD CURVE, 30.8 ZERO SPEED LOAD and 30.9 BREAK POINT.

*THERMISTOR*
Motor thermal protection is activated with an I/O signal based on a motor thermistor.

This mode requires a motor thermistor or break contact of a thermistor relay connected between digital input DI6 and +24 V d.c. If direct thermistor connection is used, digital input DI6 activates when resistance rises higher than 4 k . The drive stops if the Parameter 30.4 is preset as FAULT. DI6 is reset to zero when the resistance of the thermistor is between 0 and 1.5 k .

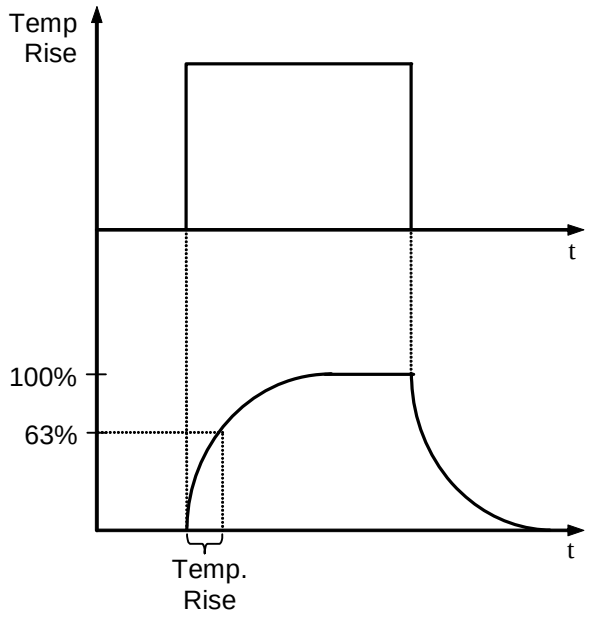
**WARNING!** According to IEC 664, the connection of the thermistor to the digital input 6 och ACS800 requires double or reinforced insulation between motor live parts and the thermistor. Reinforced insulation entails a clearance and creepage of 8 mm (400/500 VAC equipment). If the thermistor assembly does not fulfil the requirement, the other I/O terminals of ACS800 must be protected against contact, or a thermistor relay must be used to isolate the thermistor from the digital input.

**WARNING!** As the default in CraneDrive digital input 6 is selected as the source for Fast stop. Change this setting before selecting THERMISTOR for Parameter 30.5 MOT THERM P MODE. In other words, ensure that digital input 6 is not selected as signal source by any other parameter than 30.5 MOT THERM P MODE.

**6 MOTOR THERM TIME**

This is the time within which the motor temperature reaches 63 % of the final temperature rise. Figure 6 9 shows Motor Thermal Time definition. If the DTC mode is selected for motor thermal protection, motor thermal time can be read from this parameter. This parameter can be set only if Parameter 30.5 MOT THERM P MODE is set to USER MODE.

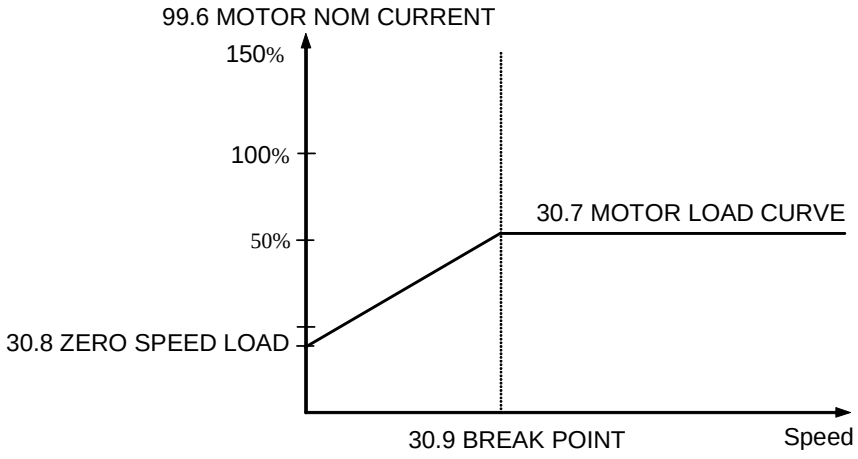
If thermal protection according to UL requirements for NEMA class motors is desired, use this rule of thumb - Motor Thermal Time equals 35 times t6 (t6 in seconds is the time that the motor can safely operate at six times its rated current, given by the motor manufacturer). The thermal time for a Class 10 trip curve is 350 s, for a Class 20 trip curve 700 s and for a Class 30 trip curve 1050 s.




*Motor Thermal Time*

**7 MOTOR LOAD CURVE**

The Motor Load Curve sets the maximum allowable operating load of the motor. When set to 100 %, the maximum allowable load is equal to the value of Start-up Data Parameter 99.5 MOTOR NOM CURRENT. The load curve level should be adjusted if the ambient temperature differs from the nominal value.




*Motor Load Curve*

**8 ZERO SPEED LOAD**

This parameter defines the maximum allowable current at zero speed to define the Motor Load Curve.

**9 BREAK POINT**

This parameter defines the point at which the motor load curve begins to decrease from the maximum value set by Parameter 30.7 MOTOR LOAD CURVE to the ZERO SPEED LOAD (Parameter 30.8). Refer to Figure 6 10 for an example of motor load curve.

**10 MOTOR PHASE LOSS**

This parameter defines the operation when one or more motor phases are lost.

*FAULT*
Fault indication is displayed and the CraneDrive stops (active when motor speed higher than +/- 40 rpm).

*NO*
No protection provided.

**11 EARTH FAULT**

This parameter defines the operation when an earth fault is detected in the motor or the motor cable.

*FAULT*
Fault indication is displayed and the CraneDrive stops.

*NO*
No protection provided.

**12 MASTER FAULT FUNC**

This parameter defines the operation when a fault is detected in the communication between the drive and the Fieldbus comm. module.

*FAULT*
Fault indication COMM MODULE is displayed and the CraneDrive trips.

*NO*
No activity wanted.

WARNING
Warning indication COMM MODULE is displayed.

**13 COMM FLT TIME-OUT**

This parameter defines the delay time before activating the fault (see par 30.12).

14 WATCHDOG TEST

Set the parameter to ON to activate the controlled watchdog test.

When activated, the test is performed when the signal POWER ON ACK goes high (positive edge). However, the test is performed only once per 8 hours, so even if the POWER ON ACK goes low shortly, and then up repetedly, the test is not repeated until 8 hours after the previous test.

## Group 50 Pulse Encoder

These parameters are visible, and need to be adjusted, only when a pulse encoder module RTAC or NTAC (optional) is installed and activated with Parameter 98.01 ENCODER MODULE.

The parameters in Group 50 define the encoder signal decoding and the operation of the ACS800 in encoder or RTAC/NTAC module fault conditions.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 PULSE NR | 1 … 29999 | Number of encoder pulses per Revolution. |
| 2 SPEED MEAS MODE | A_- B DIR; A_-_; A_-_ B DIR; A_-_ B_-_ | Calculation of encoder pulses. |
| 3 ENCODER FAULT | WARNING; FAULT | Operation of the CraneDrive if an Encoder failure or encoder Communication failure is Detected. |
| 4 ENCODER DELAY | 5 ... 50000 ms | Delay for the encoder Supervision function (See Parameter 50.03 ENCODER FAULT). |
| 5 SPEED FEEDB USED | TRUE; FALSE | Speed feedback used |
| 7 ENC CABLE CHECK | DISABLED; WARNING; FAULT | Define how the drive shall react upon a encoder falure. |

### 1 PULSE NR

This parameter states the number of the encoder pulses per one revolution.

### 2 SPEED MEAS MODE

This parameter defines how the encoder pulses are calculated.

*A_- B DIR*
Ch A: positive edges used for calculation of speed and position.
Ch B: direction.

*A_-_*
Ch A: positive and negative edges used for calculation of speed and position.
Ch B: not used.

*A_-_ B DIR*
Ch A: positive and negative edges used for calculation of speed and position.
Ch B: direction.

*A_-_ B_-_*
All edges of the signals A and B are used for calculation of speed and position.

**3 ENCODER FAULT**

This parameter defines the operation of the CraneDrive if a failure is detected in communication between the pulse encoder and the Pulse Encoder Interface Module (RTAC or NTAC) or in between the RTAC/NTAC module and the RMIO board.

Encoder supervision function activates if either of the following conditions is valid:

There is a 20 % difference (filtered) between the estimated speed and the measured speed received from the encoder. No pulses are received from the encoder at start within defined time (see Parameter 50.04 ENCODER DELAY), while the motor torque is at the limit value.

*WARNING*
Warning indication is generated. Drive will switch over to calculated speed.

*FAULT*
Fault indication is generated and the CraneDrive stops the motor.

**4 ENCODER DELAY**

This is the time delay for the encoder supervision function at start (See Parameter 50.03 ENCODER FAULT). If set = 0 ms, this start supervision is disabled.

**5 SPEED FEEDB USED**

*TRUE*
The actual speed feedback value from connected encoder module is used in speed & torque control.

*FALSE*
The actual speed feedback value from connected encoder module is not used in speed & torque control (RTAC or NTAC module only used for position measurement).

**7 ENC CABLE CHECK**

Select the desired parameter value depending on how the drive shall react upon encoder signal loss.

*DISABLED*
No action

*WARNING*
The drive generates the warning ENC CABLE

*FAULT*
The drive trips on fault ENC CABLE

## Group 51 Comm module

For information on these parameters see manual: ACS800 Fieldbus adapter RxxA-01 Installation & Start-up Guide for the respective type used.

**Note:** Fieldbus Command Word and Status word mapping is still as specified in section *Field bus communication (71)* in chapter *Crane Program Description* of this manual.

Only "Vendor specific mode" is supported by CraneDrive sw ("Generic mode" is not supported) for AnyBus modules, e.g. RPBA-01.

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**NOTE!** For RPBA-01 Profibus, only DPV0 is supported.

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## Group 60 Local operation

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 LOC OPER INH | True ; False | Local operation inhibit |
| 2 LOC SPEED MAX | 0-100% | Local speed maximum |
| 3 LOC ZERO SPEED TD | 0....300 s | Local zero speed time delay |

### 1 LOC OPER INH

*TRUE*
Only possible to run in External control.

Note: Panel will show "L" indication even though drive is in External control.

*FALSE*
Possible to run in LOCAL (panel) control and External control

### 2 LOC SPEED MAX

The maximum speed reference when running in LOCAL

### 3 LOC ZERO SPEED TD

After making a local START the ZERO SPEED signal has to become "0", that is motor start running, before the time LOC ZERO SPEED TD has expired otherwise the start order is removed and drive is switched off.

## Group 61 Speed monitor

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 3 MOT OVERSPEED LEV | 0....200 % | Motor overspeed level |
| 4 SPEED LIM 1 | 0....200 % | Speed limit 1 level |

### 3 MOT OVERSPEED LEV

If the motor speed exceeds the level determined by MOT OVERSPEED LEV the drive trips, indicating MOT OVERSP. 100 % setting corresponds to the motor speed set in parameter 69.1 SPEED SCALING RPM.

### 4 SPEED LIM 1

Relay output indication signal SPEED LIM 1 (selectable in group14) is activated if absolute value of motor speed is above this level.

## Group 62 Torque monitor

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 TORQ MON SEL | True ; False | Torque monitor select |
| 2 SP DEV LEV | 0...100 % | Speed deviation level |
| 3 TORQ FLT TD | 0...32767 ms | Torque fault time delay |
| 4 SP DER BLK LEV | 0...100 % / s | Speed derivative blocking level |

### 1 TORQ MON SEL

*TRUE*
Torque monitor is activated

*FALSE*
Torque monitor is blocked

### 2 SP DEV LEV

A level above SP DEV LEV means that the speed error is too high

### 3 TORQ FLT TD

If a speed error higher than SP DEV LEV occurs, and if it last longer than the time TORQ FLT TD the drive will trip, indicating TORQ FLT message.

### 4 SP DER BLK LEV

The protection is blocked during acceleration and deceleration if the sign of the speed error is OK and if the derivative of the actual speed is higher than the setting of SP DER BLK LEV.
Calculate as: 100 / (RT x 1.5) %/s , where RT = longest ramp time in seconds.

## Group 63 Fast stop

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 FAST STOP TYPE 11 | NOT USED; FAST STOP 1; FAST STOP 2; FAST STOP 3 | Fast stop type 11 |
| 2 FAST STOP TYPE 12 | NOT USED; FAST STOP 1; FAST STOP 2; FAST STOP 3 | Fast stop type 12 |

### 1 FAST STOP TYPE 11

Parameter for selecting type of fast stop action from PLC. Activated if signal FAST STOP 11 in Fieldbus communication Command word is set true.

*NOT USED*
No activity wanted.

*FAST STOP 1*
Fast stop by braking on torque limit.

*FAST STOP 2*
Fast stop by braking with both mechanical brake and on torque limit.

*FAST STOP 3*
Fast stop by braking with mechanical brake only.

### 2 FAST STOP TYPE 12

Parameter for selecting type of fast stop action in Stand alone mode. Activated by e.g. input DI6. Refer to Parameter 63.1 for settings

## Group 64 Crane

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

Note: Parameters 64.3 - 64.6 and 64.8 - 64.18 are only active in Stand alone mode (i.e. when 64.1 = True).

| Parameter | Range/unit | Description |
|---|---|---|
| 1 STAND ALONE SEL | True; False | Stand Alone Select |
| 2 CONTIN GEAR | True; False | "not used" |
| 3 HIGH SPEED LEVEL 1 | 0.0 ... 100.0 % | High speed level 1 |
| 4 DEADZONE A | 0 ... 100 % | Deadzone A |
| 5 DEADZONE B | 0 ... 100 % | Deadzone B |
| 6 REF SHAPE | 0 ... 100 | Reference shape |
| 7 SLOWDOWN SPEEDREF | 0 ... 100 % | Slowdown speed reference |
| 8 ZERO POS OK TD | 0.0 ... 60.0 s | Zero position OK time delay |
| 9 TORQUE REF SCALE | 0 ... 4.00 | Torque reference scaling. |
| 10 CONTROL TYPE | JOYSTICK; RADIO CTRL; MOTOR POT; STEP JOYST; STEP RADIO; FB JOYSTICK; BIPOLAR REF | Control type selection |
| 11 MINIMUM REF | 0.0 ... 100.0 % | Minimum reference |
| 12 JOYSTICK WARN TD | 0 ... 5000 ms | Joystick warning time delay |
| 13 STEP REF LEVEL1 | 0.0 … 100.0 % | Step reference level 1 |
| 14 STEP REF LEVEL2 | 0.0 … 100.0 % | Step reference level 2 |
| 15 STEP REF LEVEL3 | 0.0 … 100.0 % | Step reference level 3 |
| 16 STEP REF LEVEL4 | 0.0 … 100.0 % | Step reference level 4 |
| 17 SECOND CTRL MODE | JOYSTICK; RADIO CTRL; MOTOR POT; STEP JOYST; STEP RADIO; FB JOYSTICK; BIPOLAR REF | Control type selection 2 |
| 18 SPEED/TORQ CTRL | SPEED/TORQUE; SPEED; TORQUE | Speed or torque control selection |

### 1 STAND ALONE SEL

TRUE
Stand alone mode is selected.

FALSE
Fieldbus mode is selected.

### 2 CONTIN GEAR

This parameter is not used in ACC sw version 5.2 and later.

### 3 HIGH SPEED LEVEL 1

Joystick output (e.g. AI1) speed reference signal level to give HIGH SPEED signal for power optimization.

**4 DEADZONE A**

Deadzone on the joystick before it starts to give reference in direction A (positive, e.g. hoisting direction)

**5 DEADZONE B**

Deadzone on the joystick before it starts to give reference in direction B (negative, e.g. lowering direction)

**6 REF SHAPE**

Parameter for making a parabolic curve for the reference
0 = straight line
20 = X2 curve
100 = X3 curve

**7 SLOWDOWN SPEEDREF**

Reduced speed reference (if running in same direction) when slowdown function is activated (e.g. DI5=0).

**8 ZERO POS OK TD**

Time delay for the joystick to stay in zero position before a new start order can be given after a stop from: trip, fast stop or joystick warning.

**9 TORQUE REF SCALE**

Scaling of torque reference from joystick (AI.2). E.g. with TORQUE REF SCALE set to 2.0: a 100 % joystick reference will give 200 % torque reference to the torque controller.

**10 CONTROL TYPE**

*JOYSTICK*
External control of drive, in Stand alone mode, is done by using a joystick controller, with Zero Pos (e.g. DI2), Dir A (DI3) and Dir B (DI4) contacts connected to digital inputs and analogue reference connected to AI1 (speed control) or AI2 (torque control). Joystick supervision is active.

*RADIO CONTROL*
External control of drive, in Stand alone mode, is done by connecting signals from a radio controller or PLC to drive I/O. Dir A and Dir B orders connected to DI3 and DI4 (Zero Pos not required). Reference connected to AI1 (speed control) or AI2 (torque control).

*MOTOR POT*
External control of drive, in Stand alone mode, is done by using e.g. a pendant controller giving direction and increase orders. Increase orders connected to DI2, Dir A and Dir B connected to DI3 and DI4.

*STEP JOYST*
External control of drive, in Stand alone mode, is done by using a joystick controller, with Zero Pos (e.g. DI2), Dir A (DI3) and Dir B (DI4) contacts connected to digital inputs and Step type of speed reference connected to digital inputs selected with parameters 10.8 - 10.10. Joystick supervision is active.

*STEP RADIO*
External control of drive, in Stand alone mode, is done by connecting signals from a radio controller or PLC to drive I/O. Dir A and Dir B orders connected to DI3 and DI4. Step type of speed reference connected to digital inputs selected with parameters 10.8 - 10.10.

*FB JOYSTICK (=Fieldbus JOYSTICK)*
External control of drive, in Stand alone mode, is done by using a joystick controller connected to a PLC's I/O. Drive receives control signals for Dir A, Dir B, Zero Pos and Reference through fieldbus communication datasets (see end of section *Crane (64)* in chapter *Crane Program Description* for details).

*BIPOLAR REF*
External control of drive in Stand alone mode, is done by using a joystick controller with a bipolar (+/-10V) analog reference connected to AI1 and a single start order contact (connected to both DI3 and DI4). The sign of analog reference voltage is used as sign for the speed reference.

**11 MINIMUM REF**

Minimum speed reference in stand alone mode. Normally used with MOTOR POT control type.

**12 JOYSTICK WARN TD**

Time delay for joystick supervision.

**13 STEP REF LEVEL1**

First speed reference level applied with startorder, i.e. DirA or DirB, when using STEP JOYST or STEP RADIO control types.

**14 STEP REF LEVEL 2**

Second speed reference level applied when digital input, selected by parameter 10.8 STEP REF2 SEL, is activated (plus start order active).

**15 STEP REF LEVEL3**

Third speed reference level applied when digital input, selected by parameter 10.9 STEP REF3 SEL, is activated (plus step ref2 conditions still active).

**16 STEP REF LEVEL4**

Fourth speed reference level applied when digital input, selected by parameter 10.10 STEP REF4 SEL, is activated (plus step ref3 conditions still active).

**17 SECOND CTRL MODE**

A second alternative control mode activated with digital input signal set with parameter 10.20 SECOND CTRL SEL. Control mode selections are the same as with parameter 64.10, described above.

#### 18 SPEED/TORQ CTRL

The selection of speed control or torque control in stand alone modes can be done via analog input signal levels or fixed.

*SPEED*
Speed control is active independent of the AI1 and AI2 levels.

In FB JOYSTICK mode (64.17), speed control is always active.

*TORQUE*
Torque control is active independant of AI1 and AI2 levels.

In FB JOYSTICK mode (64.17), torque control is always active.

*SPEED/TORQUE*
Selection of speed or torque control is done by the AI1 and AI2 signal levels: Torque control is activated when the current level of input AI2 TORQ REF the first time (after each power on) passes the level 2 mA, and if the speed reference to AI1 is below 1V.

In FB JOYSTICK mode (64.17), torque control can be selected with dataset 5, word 1, bit 3. (FB JOYST TQ CTRL)

(See also section *Crane (64)* in chapter *Crane Program Description*.)

### Group 65 Logic handler

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 CONTIN ON | True ; False | Continuous on |
| 2 OFF TD | 0.0 ... 10000.0 s | Off time delay |

#### 1 CONTIN ON

Magnetization of the motor will remain on without time limit after the motor is stopped, if parameter CONTIN ON = True.

#### 2 OFF TD

The time for how long the Magnetization current shall remain on after the motor is stopped.

## Group 66 Torque proving

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 TORQ PROV SEL | True ; False | Torque proving select |
| 2 TORQ PROV FLT TD | 0.0 ... 100.0 s | Torque proving fault time delay |
| 3 TORQ PROV REF | 0.0 ... 200.0 % | Torque proving reference |

### 1 TORQ PROV SEL

*TRUE*
Torque proving active (requires pulse encoder).

*FALSE*
Torque proving not active.

### 2 TORQ PROV FLT TD

Time delay for fault signal TORQ PROV FLT

### 3 TORQ PROV REF

Torque proving reference level.

## Group 67 Mechanical brake contr.

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 BRAKE FALL TIME | 0.0 ... 60.0 s | Brake falling time |
| 2 BRAKE FLT TD | 0.0 ... 60.0 s | Brake fault time delay |
| 4 BRAKE REOPEN TD | 0.0 … 60.0 s | Brake reopen time delay |
| 5 BRAKE LONG FT TD | 0.0 ... 60.0 s | Brake long falling time delay |
| 6 ZERO SPEED LEV | 0 ...100 % | Zero speed level |
| 7 ZERO SPEED TIME | 0 ...1000 ms | Zero speed time |
| 8 SPEED REF TD | 0.01 ... 10.00 s | Speed reference time delay |
| 9 START TORQ SEL | NOT USED; AUTO TQ MEM; LOAD MEAS; PAR 67.10 | Starting torque selector |
| 10 START TORQ REF | 0 … 300 % | Start torque reference |
| 11 MOTOR TYPE | STANDARD; CONICAL | Conical motor function selector |
| 12 RED FLUX LEVEL | 25 ... 100 % | Reduced flux level |
| 13 START FLUX LEVEL | 100 ... 140 % | Start flux level |
| 14 START FLUX TIME | 0.0 ...10.0 s | Start flux duration |

**1 BRAKE FALL TIME**

Falling time for the mechanical brake. Time for brake to set and give full braking torque after brake close order (brake electrical supply disconnected).

**2 BRAKE FLT TD**

Time delay for the BRAKE FAULT signal.

**4 BRAKE REOPEN TD**

Minimum time between two brake lift orders. That is BRAKE LIFT must be "False" for at least this time before next start is giving a new BRAKE LIFT order issued. Used if mechanical brake is equipped with a "reduced holding voltage" circuit.

**5 BRAKE LONG FT TD**

Time delay for monitoring signal "brake long falltime"

**6 ZERO SPEED LEV**

Parameter for setting the speed level for ZERO SPEED indication. Warning: Do not set 0% level. Result would be that brake would never close.

**7 ZERO SPEED TIME**

Time delay before signal ZERO SPEED is set to "1" when the motor speed is below ZERO SPEED LEV.

If parameter 67.11 MOTOR TYPE is set to CONICAL, than this parameter is used to delay the stop sequence with reduced flux.

**8 SPEED REF TD**

Time delay at start before releasing speed reference to ramp unit.

**9 START TORQ SEL**

Set the desired value if an initial starting torque is required.

*NOT USED*
No extra starting torque.

*AUTO TQ MEM*
Automatic torque memory selected. Note: value set in parameter 67.10 is used as a minimum value for the torque memory.

*LOAD MEAS*
Starting torque reference is received from an superior controller (DS5.2) e.g. measurement from a load cell.

*PAR 67.10*
Starting torque reference is fixed using torque level set in parameter 67.10 MIN START TQ REF.

**10 MIN START TQ REF**

Starting torque reference level used if parameter 67.9 is set to: "PAR 67.10".

**11 MOTOR TYPE**

*CONICAL* = Conical motor function active. Reduced flux level at stop set with parameter 67.12 and possibility for increased flux at start (par 67.13 & 67.14). See section *Mechanical brake control (67)* on page *89*, for details on Conical motor function.

*STANDARD* = Conical motor function not active.

**12 RED FLUX LEVEL**

Reduced flux level used when stopping, if Conical motor function is activated in parameter 67.11 . For higher power conical motors on hoists, use a lower value than the default 75% if needed to further reduce "roll-back" when stopping.

**Note:** The reduced flux at stop will increase the motor current during stopping. Therefor it's normally needed to use one size bigger converter.

**13 START FLUX LEVEL**

Increased flux level used when starting, if Conical motor function is activated in parameter 67.11 . Increased flux level active during time set in parameter 67.14.

**14 START FLUX TIME**

The increased flux level at start (with level set in parameter 67.13) is active during a time set with START FLUX TIME.

## Group 68 Power optimization

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 POWOP SELECT | TRUE; FALSE | Power optimization select |
| 2 BASE SPEED | 1.0 ... 100.0 % | Base speed |
| 3 POWOP AUTOTUNE SEL | True ; False | Powop autotune select |
| 4 INERTIA TOTAL UP | 0.00 ... 100.00 KGM2 | Inertia total upwards |
| 5 INERTIA TOTAL DWN | 0.00 ... 100.00 KGM2 | Inertia total downwards |
| 6 TQLIM UP | 0.0 ... 200.0 % | Powop torque limit upwards |
| 7 TQLIM DWN | 0.0 ... 200.0 % | Powop torque limit downwards |
| 8 POWOP RESET LEV | 0 ... 100 % | Power optimization reset level |
| 9 T MAX | 0 … 2000 % | Motor maximum torque capacity |
| 10 LOAD TORQ FILT TC | 0 … 32000 ms | Load torque signal filter time constant |
| 11 SLACK ROPE TQ LEV | -400 % … 400 % | Slack rope torque indication level |
| 12 LOADCORR FACT UP | 0.00 … 100.00 | Loadcorrection factor upwards |
| 13 LOADCORR FACT DWN | 0.00 … 100.00 | Loadcorrection factor downwards |
| 14 RAMPE RATE POWOP | 0.00 ... 100.00% | Ramp rate for the power optimization area. |
| 15 RAMP CHANGE SPEED | 1.0 ... 100.00% | Speeed at which the ramp rate will change. |

### 1 POWOP SELECT

*TRUE*
Power optimization is active (only used on hoist drive).

*FALSE*
Power optimization not active.

### 2 BASE SPEED

Breakpoint for Power optimization calculation. Set in percent of parameter 69.1 SPEED SCALING RPM. Above this speed constant power, corresponding to level set in parameters 68.6 & 68.7 , is obtained.

Normally the speed where field weakening starts and the available RMS power of the motor is constant. Full load torque possible for mechanics up to this speed.

### 3 POWOP AUTOTUNE SEL

*TRUE*
Activates the tuning.

**Note:** The parameter is reset to FALSE after each calculated Total inertia value.

The value of the inertia can be read in actual signal no.1.24 TOTAL INERTIA

An average value after running 2-3 times in each direction should than be entered to parameters INERTIA TOTAL UP and INERTIA TOTAL DWN respectively

*FALSE*
Autotune mode not active

**4 INERTIA TOTAL UP**

Total inertia measured in upwards direction

**NOTE:** Calculation of Inertia parameters has changed compared to previous sw versions (crane application sw version ACAA7020 and earlier). For upgrading a drive with earlier sw versions use the following rescaling formula for Inertia parameters 68.4 and 68.5 .

**Inertia(new) = ((8363*Pnom) / (nmax * nnom)) * Inertia(old).** Where:
- "Pnom" is the value of parameter 99.9 MOTOR NOM POWER.
- "nmax" is the value of parameter 69.1 SPEED SCALING RPM
- "nnom" is the value of parameter 99.8 MOTOR NOM SPEED.

**5 INERTIA TOTAL DWN**

Total inertia measured in downwards direction

**6 TQLIM UP**

Maximum load torque allowed upwards (=field weakening power limit)

**7 TQLIM DWN**

Maximum load torque allowed downwards (=field weakening power limit)

**8 POWOP RESET LEV**

Speed level where the calculated power optimization reference will be reset to be prepared for a new calculation during the next acceleration.

**9 T MAX**

Motor maximum relative torque capacity (also called "Pull-out torque" or "Breakdown torque" level) per motor catalogue. Often given as e.g. Tmax/Tn = 2.5 (=250%).

**Note:** Enter motor Tmax value (as normally given in catalogues for sinusoidal supply = direct-on-line data), without subtracting the 30% "frequency converter supply reduction factor".

If instead having a Tmax/Tn value given as a part of "Inverter parameter settings" values in a motor data sheet, than value must be divided with 0.7 (and multiplied with 100 to get %) before set to parameter 68.9.

**10 LOAD TORQ FILT TC**

Filter time constant for calculated signal 2.31 LOAD TORQUE % (see also *Power optimization (68)* on page *93*).

**11 SLACK ROPE TQ LEV**

Detection level for "slack rope", (see page 5-33 for more details on "Slack rope" function). Load torque signal (2.31) dropping below this level is considered a "slack rope", making a Fast stop type 1 to the drive. Setting of -400% (default) will disable the Fast stop.

**12 LOADCORR FACT UP**

Load correction factor in hoisting direction for LOAD TORQUE % signal 2.31 . To include the mechanical efficiency (in p.u.) of hoist machinery driven by hoist motor as well as motor utilization when hoisting nominal load (i.e. motor torque in p.u. at full load). E.g.: Eff. 0.9 * Util. 1.0 = 0.90.

**13 LOADCORR FACT DWN**

Load correction factor in lowering direction. Note: efficiency part for lowering is calculated as 1/mech.eff.  E.g. 1/0.9=1.10 .

**14 RAMP RATE POWOP**

Only to be used when a different (usually faster) acceleration time (0 to maximum speed) is required when driving with light load

Set a value for the ramp rate in the power optimization area (above base speed). The value in 68.14 (0 ... 100%) is multplied with parameter 69.2, ACC TIME FORWARD. This results in faster acceleration in hoist up direction, in order to fulfill the requirement of different acceleration times to maximum speed with light and heavy load.

**15 RAMP CHANGE SPEED**

Set the speed - in percentage of maximum speed - at which the power optimization ramp rate is added, usually at base speed.

If the motor nominal speed is higher than the base speed, it may be better to select the nominal speed.

## Group 69 Reference Handler

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 SPEED SCALING RPM | 0 ... 10000 RPM | Maximum speed |
| 2 ACC TIME FORW | 0.1 ... 60.0 s | Acceleration time forward |
| 3 ACC TIME REV | 0.1 ... 60.0 s | Acceleration time reverse |
| 4 DEC TIME FORW | 0.1 ... 60.0 s | Deceleration time forward |
| 5 DEC TIME REV | 0.1 ... 60.0 s | Deceleration time reverse |
| 6 S-RAMP TC | 0.0 s...10.0 s | S-ramp time constant |
| 7 RAMP SCALE LOCAL | 0.5 ... 100.0 | Ramp scale local |
| 10 RAMP RATE=1 | TRUE; FALSE; AI3 | Ramp rate selection |
| 11 SECOND RAMP SCALE | 20.0 … 500.0 % | 2nd ramp time set scaling |

**1 SPEED SCALING RPM**

Setting of motor shaft rotational speed (rpm) corresponding to 100 % speed reference.

**2 ACC TIME FORW**

Setting of acceleration ramp time forward direction (up), 0 to +100 % speed (where 100% corresponds to parameter 69.1).

**3 ACC TIME REV**

Setting of acceleration ramp time reverse direction (down), 0 to -100 % speed (ref. Parameter 69.1).

**4 DEC TIME FORW**

Setting of deceleration ramp time forward direction, +100 to 0 % speed (ref. Parameter 69.1).

**5 DEC TIME REV**

Setting of deceleration ramp time reverse direction, -100 to 0 % speed (ref. Parameter 69.1).

**6 S-RAMP TC**

Setting of the s-curve time constant in the speed reference ramp unit.

**7 RAMP SCALE LOCAL**

Scaling (multiplying) factor for ramp times when running in local

**10 RAMP RATE=1**

Selection in Fieldbus mode if RAMP RATE signal from PLC controller is not required by drive. Alternatively to activate analog input 3 (AI3) as Ramp rate signal in Fieldbus or Standalone modes.

*TRUE*
The RAMP RATE signal available from Fieldbus communication is not active, set fixed to 1.0.

*FALSE*
The RAMP RATE signal from Fieldbus communication (DS3.1) is active.

*AI3*
The RAMP RATE multiplying factor signal is connected from analog input 3. Signal level at or below 4mA (0 - 4 mA) corresponds to a multiplying factor of 1.0 . Signal levels between 4mA and 20 mA corresponds to a multiplying factor between 1.0 and 10.0. Relation is linear, giving e.g. 12 mA = 5.5.

**11 SECOND RAMP SCALE**

Scaling factor for normal ramp times 69.2 – 69.5, if a second ramp is activated by digital input selected with parameter 10.19 SECOND RAMP SEL.

## Group 70 Position measurement

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 POS SCALE | 1.00 ... 32767.00 PPU | Position scaling |
| 2 SYNC COND | Pos; Neg | Synchronisation condition |

**1 POS SCALE**

Set position counter scaling factor, POS SCALE, as number of Pulses Per Unit, e.g. pulses/mm. (Position measurement value POSACT = Pulse counter / POS SCALE.)

Example how to calculate POS SCALE: Hoist operating speed 40 m/min (40.000 mm/min) corresponding to motor speed of 980 rpm. Pulse encoder with 1024 ppr (parameter 50.1). Speed measuring set to use all 4 edges (parameter 50.2=default). This gives us POS SCALE = (980 * 1024 * 4) / 40.000 = 100.35 pulses/mm.

**2 SYNC COND**

*POS*
The HW synchronisation acts on positive edge (0 -> 1) of e.g. DI3

*NEG*
*The HW sy*nchronisation acts on negative edge (1 -> 0) of e.g. DI3

## Group 71 Fieldbus Comm

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 COMTEST FLT TD | 0...32767 ms | Communication fault time delay |
| 2 RESET POWER ON TD | 0...32767 ms | Reset at power on time delay |
| 3 CHOPP/EXT MON TD | 0...4000 ms | Chopper & Ext fault monitoring time delay |
| 4 ADVANT COMM TYPE | ENG DRIVE; STD DRIVE | Advant controller communication type |
| 5 DSET BASE ADDRESS | 1; 10 | Dataset number of the first dataset used for fieldbus communication with PLC. |
| 6 FIELDBUS R-TYPE | NO; RPBA-01 | Fieldbus Anybus module selection |

### 1 COMTEST FLT TD

If the Fieldbus communication toggle bit, being sent between the drive and supervisory controller and back, is not changing within the time set in COMTEST FLT TD the drive trips, indicating MAS OSC FLT.

### 2 RESET POWER ON TD

After power on acknowledgement signal POWER ON ACKN (e.g. DI2="1") is received, a reset of the drive is done after the time RESET POWER ON TD.

### 3 CHOPP/EXT MON TD

Monitoring of external Chopper fault (selected with parameter 10.7, e.g. input DI4=0) and External fault (selected with parameter 10.18), is disabled at power on (POWER ON ACKN=1) during the time CHOPP/EXT MON TD.

### 4 ADVANT COMM TYPE

Selection of Advant controller communication type if communicating via Advant controller Module bus port (AC70, AC80, AC800M, AC410 with FCI or AC450 with FCI).

*ENG DRIVE*
"Engineered" type of Advant communication (e.g. Advant controller selections "ACS 600 Eng" or "DRIENG"). Maximum 10 datasets/direction possible i.e. all ACC 800 datasets (1 - 12) are accessable.

*STD DRIVE*
"Standard" type of Advant communication (e.g. Advant controller selections "ACS 600 Std" or "DRISTD"). Maximum 2 datasets/direction possible i.e. only ACC 800 datasets 1 - 4 are accessable.

**5 DSET BASE ADDRESS**

Dataset number of the first dataset used for fieldbus communication with the overriding control system (e.g. Advant controller). The dataset addressed by this parameter is the first dataset to the drive, while the next dataset is the first dataset from the drive, and so on.

*1*
Dataset range is: 1 … 12. Where dataset 1, 3, 5 & 7 is to the drive and datasets 2, 4, 6, 8 & 12 is from the drive to PLC. Used for example with AC800M ModuleBus if "ABB Standard Drive" type of drive unit is selected.

*10*
Dataset range is: 10 … 21. Where dataset 10, 12, 14 & 16 is to the drive and datasets 11, 13, 15, 17 & 21 is from the drive to PLC. Used for example with AC800M ModuleBus or Drive Bus card CI858 if an "ABB Engineered Drive" type of drive unit is selected.

**6 FIELDBUS R-TYPE**

Possibility to preset ACC800 default settings of Group51 fieldbus parameters if Anybus module ("R-type") used. Settings are done to configure fieldbus signals as described in section *Field bus communication (71)* on page *102*.

*RPBA-01*
Default settings for Profibus parameters in group 51 changed to:
51.05=3, 51.06=6, 51.07=7, 51.08=10, 51.09=8, 51.10=11, 51.11=9, 51.12=12, 51.13=13, 51.14=16, 51.15=14, 51.16=17, 51.17=15, 51.18=18, 51.19=19, 51.20=22 .

## Group 72 Master/Follower

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 MAST/FOLL MODE | OFF; MASTER; FOLLOWER (visible only if M/F CTRL macro selected) | Master/Follower mode selection |
| 2 TORQUE SELECTOR | ZERO; SPEED; TORQUE; MINIMUM; MAXIMUM; ADD | Torque selector setting |
| 3 LOAD SHARE | 0.0 % ... 400.0 % (visible only if M/F CTRL macro selected) | Load sharing |
| 4 WINDOW SEL | OFF; ON | Window ctrl selection on |
| 5 WINDOW WIDTH POS | 0.0 rpm...1500.0 rpm | Window width positive |
| 6 WINDOW WIDTH NEG | 0.0 rpm...1500.0 rpm | Window width negative |
| 7 DROOP RATE | 0.0 % ... 100.0 % | Droop rate |
| 8 TORQ REF A FTC | 0 ms ... 32767 ms (visible only if M/F CTRL macro selected) | Torque reference A filter time constant |
| 9 M/F FAULT TD | 0 ms ... 32767 ms (visible only if M/F CTRL macro selected) | Master/Follower fault time delay |
| 10 M/F COMM ERR TD | 0 ms ... 32767 ms (visible only if M/F CTRL macro selected) | Master/Follower communication error time delay |
| 11 MF BROADCAST MODE | NO; YES | Master/Follower broadcast mode |

### 1 MAST/FOLL MODE

Master and follower drive operating mode.

*OFF*
Master or Follower drive not activated, only separate control (or Local) available.

*MASTER*
Drive selected to be the Master drive in M/F control.

*FOLLOWER*
Drive selected to be the Follower drive in M/F control.

### 2 TORQUE SELECTOR

Mode selection for Follower drive.

*ZERO*
Torque selector parameter is not active. Speed or torque control selection is done with I/O or Fieldbus in normal way (default is speed control).

*SPEED*
Drive is speed controlled. Receiving speed reference (Speed_ref3 ramp output!) from Master drive if M/F ctrl macro active i.e. using M/F bus communication. Note: Follower speed ramp times should be set equal or lower than Master ramp time settings.

*TORQUE*
Drive is torque controlled. Receiving torque reference from Master drive if M/F ctrl macro active (Torq ref A), i.e. load sharing between Master and Follower.

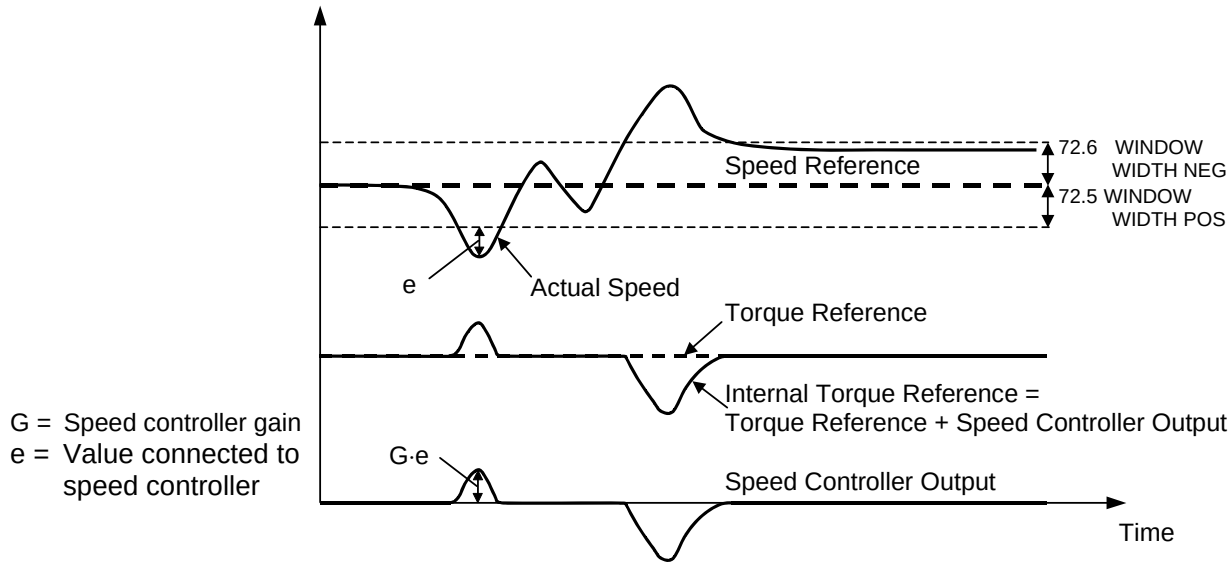
*MINIMUM*
Torque selector compares the torque reference and the output of the speed controller. The lower value is used as the reference for motor torque control. Receiving speed and torque references from Master drive if M/F ctrl macro active. This mode should normally not be used with a crane drive!

*MAXIMUM*
Torque selector compares the torque reference and the output of the speed controller. The higher value is used as the reference for motor torque control. Receiving speed and torque references from Master drive if M/F ctrl macro active. This mode should normally not be used with a crane drive!

*ADD*
Torque selector adds the speed controller output to torque reference. The drive is torque controlled in normal operating range.

The selection ADD together with the window control form a speed supervision function for a torque controlled Follower drive:

- In normal operating range, the Follower follows the torque reference (TORQ REF A).
- Window control keeps the speed controller input and output to zero as long as the speed error (speed reference - actual speed) remains within a certain window
- If the speed error goes out of the window, window control connects the error to the speed controller. The speed controller output increases or decreases the internal torque reference, stopping the rise or fall of the actual speed.




*Window control*

**3 LOAD SHARE**

Follower drive setting adjusts the load split between Master and Follower. 100% setting causes the Follower drive to produce the same percent of motor nominal torque as the Master drive, i.e. 50/50 load split.

**4 WINDOW SEL**

Window control together with the selection of ADD of Parameter 72.2 TORQUE SELECTOR form a speed supervision function for a torque controlled drive.

*OFF*
Window control is off.

*ON*
Window control is on. This selection should be used only when Parameter 72.2 TORQUE SELECTOR is set to ADD. Window control supervises the speed error value (Speed Reference - Actual Speed). In normal operating range the window control keeps the speed controller input at zero. The speed controller is evoked only if:

- the speed error exceeds the value of Parameter 72.5 WINDOW WIDTH POS or
- the absolute value of the negative speed error exceeds the value of Parameter 72.6 WINDOW WIDTH NEG.

When the speed error goes outside the window the exceeding part of the error value is connected to the speed controller. The speed controller produces a reference term relative to the input and gain of the speed controller (Parameter 23.1 GAIN) which the torque selector adds to the torque reference. The result is used as the internal torque reference for CraneDrive.

For example, in a load loss condition, the internal torque reference of the drive is decreased, preventing the excessive rise of motor speed. If the window control were inactivated, the motor speed would rise until a speed limit of the CraneDrive was reached. Parameters 20.1 MINIMUM SPEED and 20.2 MAXIMUM SPEED set the speed limits.

**5 WINDOW WIDTH POS**

This parameter value is considered only if the window control is on. The allowed setting range is from 0 to 1500 rpm.

The speed controller input is kept to zero until the positive speed error exceeds the value WINDOW WIDTH POS.

**6 WINDOW WIDTH NEG**

This parameter value is considered only if the window control is on. The allowed setting range is from 0 to 1500 rpm.

The speed controller input is kept to zero until the absolute value of the negative speed error exceeds WINDOW WIDTH NEG.

**7 DROOP RATE**

This parameter value needs to be changed only if both the Master and the Follower are speed controlled.

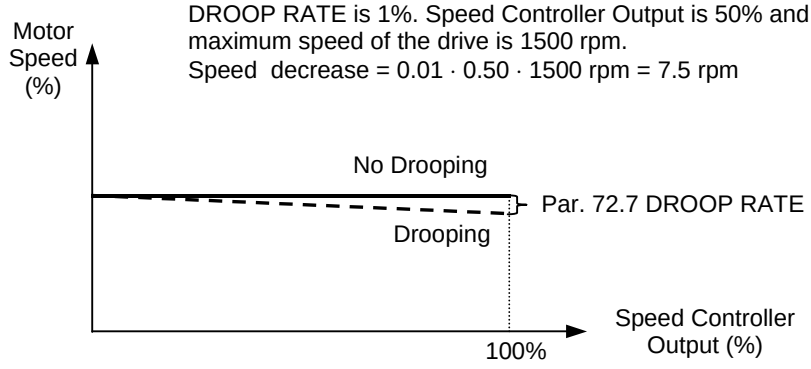
**CAUTION!** Follower speed control or drooping should not be used if the motor shafts of the Master and the Follower are solidly coupled together (e.g. gearbox or common rail).

Drooping slightly decreases the drive speed as the drive load increases in order to provide better load sharing between the Master and Follower drives. The correct droop rate for each installation needs to be determined case by case. If drooping is used it is recommended to set some droop rate both for the Follower and Master drives.

The droop rate is set as % of the drive maximum speed. The actual speed decrease in a certain operating point depends on the droop rate setting and the internal torque reference of the drive (speed controller output).

Speed Decrease =
Drooping · Speed Controller Output · Max. Speed

Calculation Example:
DROOP RATE is 1%. Speed Controller Output is 50% and maximum speed of the drive is 1500 rpm.
Speed decrease = 0.01 · 0.50 · 1500 rpm = 7.5 rpm




At 100 % speed controller output, drooping is at its maximum level i.e. equal to the value of the DROOP RATE. The drooping effect decreases linearly to zero along with the decreasing load.

**8 TORQ REF A FTC**

Filtering time constant for torque reference TORQ REF A in Follower drive, received from Master drive.

**9 M/F FAULT TD**

When the Follower drive have received start-order from Master drive, both drives check that they have signal RUNNING=1 within the time M/F FAULT TD. If not the drive will trip, indicating MF RUN FLT. NOTE: Master drive will trip as a result of a Follower drive tripping.

**10 M/F COMM ERR TD**

As soon as the Master and the Follower are activated (Parameter 72.1 MAST/FOLL MODE), they start to monitor a bus communication toggle bit that is sent between the two drives. If the toggle bit stops longer than the time M/F COMM ERR TD the drive trips, indicating MF COMM ERR. NOTE: This delay for MF COMM ERR is not active if using Master/Follower Broadcast mode.

**11 MF BROADCAST MODE**

Enable Master/Follower broadcast mode if multiple Follower drives are required. Set = YES in both broadcast Master and Followers. If broadcast mode is selected, Master drive will send only Speed and Torque reference to all drives set as Followers (par. 72.1). Master and Followers to have channel 2 connected together in a closed optical ring. On and Start orders must be connected via I/O or Fieldbus (Standalone or Fieldbus mode used, par. 64.1) directly to each drive in Master as well as Followers. Also monitoring of e.g. Running signal from all drives must be done externally.

*NO*
Master/Follower Broadcast mode disabled. Normal point-to-point

*YES*
Master/Follower Broadcast mode is enabled.

## Group 73 Electric Shaft

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 ELSHAFT MODE SEL | OFF; MASTER; SLAVE | Electric shaft mode selection |
| 2 ELSHAFT GAIN | 0.0 …100.0 | Electric shaft control gain |
| 3 GEAR NUMERATOR | 1 …32000 | Gear scaling numerator |
| 4 GEAR DENOMINATOR | 1 …32000 | Gear scaling denominator |
| 5 POS ERROR LIMIT | 0 …1000 "pos units | "Position error fault limit |
| 6 ELSH CTRL MIN SPD | 0 … 100 % | Electric shaft control minimum speed |

**1 ELSHAFT MODE SEL**

Electric shaft drive mode selection.

*OFF*
Master or Slave drive not activated for Electric Shaft control.

*MASTER*
Drive selected to be the Master drive in Electric shaft control. Required also to set parameter 99.2. Application macro = M/F CTRL and to set 72.1 Mast/Foll mode = MASTER.

*SLAVE*
Drive selected to be the Slave drive in Electric shaft control. Required also to set parameter 99.2. Application macro = M/F CTRL, parameter 72.1 Mast/Foll mode = FOLLOWER and 72.2 Torque selector = SPEED.

**2 ELSHAFT GAIN**

Electric shaft controller (P-controller) gain. Only active in Slave drive. With Elshaft Gain = 0.1 there is a -0.1% speed correction used for Slave drive if the position error (Slave signal 2.26) between Master and Slave is 1 unit.

See also section *Electric shaft (73)* on page *114* for the description of Electric shaft control.

**3 GEAR NUMERATOR**

This parameter is, together with parameter 73.4 Gear Denominator, used for giving the mechanical speed ratio between Master and Slave.

Speed ratio Master/Slave = Gear Numerator/Gear Denominator. This ratio factor is multiplied with the speed reference and position value in Slave drive only when Electric shaft control is active (On).

Example: Hoist with Master and Slave drive having equal setting for the maximum operating speed (100%) parameter 69.1 Speed scaling rpm.

Gear boxes are selected with different ratio so that full speed of Master drive corresponds to a rope speed of 3.6 m/min and full speed of Slave drive corresponds to a rope speed of 6.4 m/min; meaning we have a speed ratio = 3.6/6.4 = 0.5625 between Master and Slave.

To run the two drives together (Electric shaft control on) with the same rope speed (0 - (+/-)3.6 m/min) we should set parameter 73.3 Gear Numerator = 36 and parameter 73.4 Gear Denominator = 64

(36/64 = 0.5625). Parameter 70.1 POS SCALE should be set to same value in both drives. **NOTE:** Parameter only active in Slave drive.

**4 GEAR DENOMINATOR**

See the description above for parameter 73.3.

**5 POS ERROR LIMIT**

If position error (signal 2.26) between Master and Slave drive, when Electric shaft control is on, exceeds this value, drives will trip and the Slave indicate "ELECTR SHAFT" fault. Master will then also indicate "FOLL FAULT" (Follower fault). A Reset command to Master drive will reset both drives. Unit is "pos units" (e.g. mm) according to scaling done in parameter 70.1 POS SCALE.

The parameter is only active in Slave drive.

**6 ELSH CTRL MIN SPD**

Electric shaft control is only active at motor speeds (without sign) above this minimum speed level. Meaning controller is inactive around zero speed e.g. during start and stop. When passing this speed limit the controllers output is gradually released respectively removed ( i.e. ramped up during start resp. ramped to zero during stop) to make a smooth change. Any accumulated position error when running below this speed limit (e.g. when motors stopped) will be controlled to zero as soon as motor is running above the minimum speed limit ELSH CTRL MIN SPD again. The parameter is only active in Slave drive.

## Group 74 Crane Lifetime

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 1 NOMINAL LOAD | 0.00 ... 32767.00 ton | Nominal hoist load |
| 2 CRANE LIFETIME | 0 … 12500 hrs | Crane lifetime |
| 3 START LIFETIMEMON | OFF; ON | Start crane lifetime monitor |
| 4 LIFETIME NOM SPD | 0.0% ... 100.0% | Nominal speed for lifetime monitor |

### 1 NOMINAL LOAD

Nominal (full) load for crane hoist in tons, corresponding to 100% Load torque (signal 2.31).

### 2 CRANE LIFETIME

The designed mechanical lifetime of crane hoist in hours. When the calculated LIFETIME LEFT signal 1.35 is below 10% the drive will give a warning "LIFETIME>90%".

### 3 START LIFETIMEMON

The Crane Lifetime monitor calculation of the "Load spectrum factor Km" (signal 1.34) is started by setting parameter START LIFETIMEMON=ON. Note: parameter cannot be reset with user parameters once set to ON during drive commissioning.

### 4 LIFETIME NOM SPEED

Usually, for the hoist drive,  this shall be set to the base speed

### Group 80 Shared Motion

The Range/Unit column shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/unit | Description |
|---|---|---|
| 2 BRAKE ACKN SEL 2 | INTERNAL ACK; DI1; DI2; DI5; DI6; DI_IL | Brake acknowledge digital output |
| 3 SYNC SEL 2 | NOT SEL; DI1…DI6; EXT DI1.1…EXT DI2.2; DI_IL | Synchronisation digital input |
| 4 RELAY RO1 OUTPUT2 | See descriptions below. | Relay output 1 content |
| 5 RELAY RO3 OUTPUT2 | See descriptions below. | Relay output 3 content |
| 6 MINIMUM SPEED 2 | -10000 … 0 rpm | Operating range minimum speed. Cannot be used in the SCALAR mode. |
| 7 MAXIMUM SPEED 2 | 0…10000 rpm | Operating range maximum speed. Cannot be used in the SCALAR mode. |
| 8 MAXIMUM CURRENT 2 | 0.0 … Imax A | Maximum output current |
| 9 MAXIMUM TORQUE 2 | 0,50 … 325.00 % | Maximum positive output torque |
| 10 MINIMUM TORQUE 2 | -325.00 … -1.00 % | Maximum negative output torque |
| 11 CONST MAGN TIME 2 | 30.0 … 10000.0 ms | Duration of pre-magnetising |
| 12 GAIN 2 | 0.0 … 325.0 | Gain for speed controller<br>***Typical value for cranes = 15*** |
| 13 INTEGRATION TIME2 | 0.00 … 32767.00 s | Integration time for speed controller.<br>***Typical value for cranes = 0,2 - 0,5 s*** |
| 15 TR TUNE 2 | -60.0 … 200.0 % | Rotor time constant tuning |
| 16 MOT THERM PMODE 2 | DTC; USER MODE; THERMISTOR | Motor thermal protection mode selection |
| 17 MOT THERM TIME2 | 256.0 ... 10000.0 s | Motor thermal time constant (63% temp) |
| 18 ZERO SPEED LOAD 2 | 25.0% ... 150% | Motor load curve point at zero speed. |
| 19 BREAK POINT 2 | 1.0 Hz ... 300.0 Hz | Motor load curve break point |
| 20 SPEED FEEDB USED2 | TRUE; FALSE | Speed feedback used |
| 21 SP DEV LEV 2 | 0 … 100 % | Speed deviation level |
| 22 TORQ FLT TD 2 | 0 … 32767 ms | Torque fault time delay |
| 23 SP DER BLK LEV 2 | 0 … 100 %/s | Speed derivative blocking level |
| 24 OFF TD 2 | 0 … 10000 s | Off time delay |
| 25 TORQ PROV SEL 2 | TRUE; FALSE | Torque proving select |
| 26 BRAKE FALL TIME 2 | 0.0 … 60.0 s | Brake falling time |
| 27 ZERO SPEED LEV 2 | 0.0 … 100.0 % | Zero speed level |
| 28 ZERO SPEED TIME 2 | 0 … 1000 ms | Zero speed time |
| 29 SPEED REF TD 2 | 0.00 … 10.00 s | Speed reference time delay |
| 30 START TORQ SEL 2 | NOT USED; AUTO TQ MEM; LOAD MEAS; PAR 67.10 | Starting torque selector |
| 31 POWOP SELECT 2 | TRUE; FALSE | Power optimization select |
| 32 BASE SPEED 2 | 1.0 … 100.0 % | Base speed |
| 33 SPEED SCALE RPM 2 | 0 … 10000 rpm | Maximum speed |

| Parameter | Range/unit | Description |
|---|---|---|
| 34 ACC TIME FORW 2 | 0.1 … 60.0 s | Acceleration time forward |
| 35 ACC TIME REV 2 | 0.1 … 60.0 s | Acceleration time reverse |
| 36 DEC TIME FORW 2 | 0.1 … 60.0 s | Deceleration time forward |
| 37 DEC TIME REV 2 | 0.1 … 60.0 s | Deceleration time reverse |
| 38 RAMP RATE=1 2 | TRUE; FALSE; AI3 | Ramp rate selection |
| 39 POS SCALE 2 | 1.00 … 32767.00 PPU | Position scaling |
| 40 ENCODER MODULE 2 | NTAC; NO; RTAC-SLOT1; RTAC-SLOT2; RTAC-DDCS | Pulse encoder option module selection. |
| 41 TORQUE SELECTOR 2 | ZERO; SPEED; TORQUE; MINIMUM; MAXIMUM; ADD | Torque selector setting |

**2 BRAKE ACKN SEL 2**

Selection of digital input for signal BRAKE ACKN

*INTERNAL ACK; DI1; DI2; DI5; DI6; DI_IL*
INTERNAL ACK (internal acknowledge) setting is used if no brake acknowledge signal is available.

**3 SYNC SEL 2**

Selection of digital input for signal SYNC, used to make Hw synchronisation of position counter.

*NOT SEL; DI1 … DI6; EXT DI1.1 … EXT DI2.2; DI_IL*

**4 RELAY RO1 OUTPUT 2**

This parameter allows you to select which information to indicat with relay output 1.

---

NOTE! The selection for RO01 can also be made with paramter 14.1. Be sure to avoid conflicts.

---

*NOT USED*

*READY*
The CraneDrive is ready for ON-order. The relay is not energized if: the "Power On Ackn" signal (e.g. DI2) is not present, or DC bus voltage is not OK, or "Prevention of unexpected start" circuit is open (Multidrive) or a fault exists.

*RUNNING*
The CraneDrive has been started with speed and torque controllers active.

*FAULT*
A fault has occurred. Refer to chapter *Fault Tracing and Maintenance* for more details.

*FAULT-N*
Relay energized when power is applied, and de-energized upon a fault trip.

*CONTROL LOC*
Control location. Indication if External or Local control mode is selected from panel. CONTROL LOC = False indicates Local control mode (panel control).

*BRAKE LIFT*
Signal for controlling the mechanical brake.

*WATCHDOG-N*
Indicates: Communication supervision (MAS OSC FLT or MF COMM ERR), Braking chopper faults (CHOPPER FLT, BC OVERHEAT, BC SHORT CIR or BR OVERHEAT), External fault (EXT FAULT) and Brake long falltime (BRAKE LONG FTIME) of the brake. Also indicating if CPU Stalls out. **This signal should be used to give Emergency Stop to crane drive.**

***NOTE:*** *Fieldbus communication supervision (MAS OSC FLT) only available in Fieldbus mode or Standalone FB Joystick mode.*

*USER 1 OR 2*
Indicates if User Macro 1 is loaded (=0), or if User Macro 2 is loaded (=1).

*REVERSE*
Indicates if motor speed is negative.

*OVERSPEED*
Fault signal indication for motor overspeed trip (level set with parameter 61.3)

*RDY FOR RUN*
Indicates that motor is magnetized (ON) and ready for a start order.

*SPEED LIM 1*
*Activated if absolute value of motor speed is above level set in parameter 61.4 SPEED LIM 1.*

*LIFETIME>90%*
Activated if the Crane lifetime monitor signal 1.35 LIFETIME LEFT % is below 10% (percent of parameter 74.2 CRANE LIFETIME).

*MOTR1 SEL*
Indicates when User Macro 1/Shared Motion 1 is loaded.
(The output is always low during the change over. Not until the change over is completed the output goes high.)

*MOTR2 SEL*
Indicates when User Macro 2/Shared Motion 2 is loaded.
(The output is always low during the change over. Not until the change over is completed the output goes high.)

**5 RELAY RO3 OUTPUT 2**

This parameter allows you to select which information to indicat with relay output 3.

Refer to Parameter 80.4 RELAY RO1 OUTPUT for descriptions.

---

NOTE! The selection for RO03 can also be made with paramter 14.3. Be sure to avoid conflicts.

---

**6 MINIMUM SPEED 2**

Limitation of the minimum speed reference to speed controller. The default value depends on the selected motor and it is either -750, -1000, -1500 or -3000 rpm.

**WARNING:** If this value is set positive, the motor can not decelerate to zero speed and stop when removing start-order! This limit cannot be set in the SCALAR control mode.

**7 MAXIMUM SPEED 2**

Limitation of the maximum speed reference to speed controller. The default value depends on the selected motor and it is either 750, 1000, 1500 or 3000 rpm.

**WARNING:** If this value is set negative the motor can not decelerate to zero speed and stop when removing start-order!

This limit cannot be set in the SCALAR control mode.

**8 MAXIMUM CURRENT 2**

The maximum output current, in Amps, that the CraneDrive will supply to the motor. The default value is the **"Imax"** current rating of the ACS800 CraneDrive. For ACS600 Multidrive inverters the default value is two times the catalogue value "200% Cycle load" base rating: "IAC 50/60s".

**9 MAXIMUM TORQUE 2**

This setting defines the momentarily allowed maximum positive torque of the motor. The motor control software of the CraneDrive limits the setting range of the maximum torque according to the inverter and motor data. The default value is 200 % of the nominal torque of the motor. This limit has no function in the Scalar control mode.

**10 MINIMUM TORQUE 2**

This setting defines the momentarily allowed maximum negative torque of the motor. The motor control software of the CraneDrive limits the setting range of the maximum torque according to the inverter and motor data. The default value is -200 % of the nominal torque of the motor. This limit has no function in the Scalar control mode.

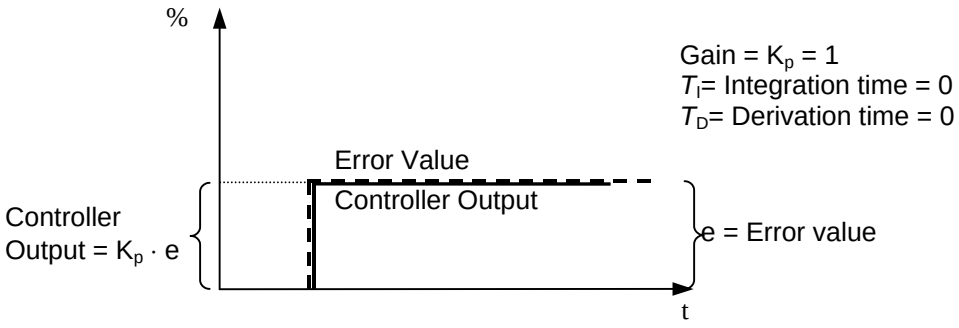
**11 CONST MAGN TIME 2**

Defines the duration of the pre-magnetising in the constant magnetising mode. An approximate value for this can be calculated as the motor nominal power in kW multiplied by 4. Example: For a 100 kW motor, set parameter 21.2 CONST MAGN TIME = 4 * 100 = 400 ms.

**12 GAIN 2**

Relative gain for the speed controller. If you select 1, a 10 % change in error value (e.g. reference - actually value) causes the speed controller output to change by 10 % of the nominal torque.

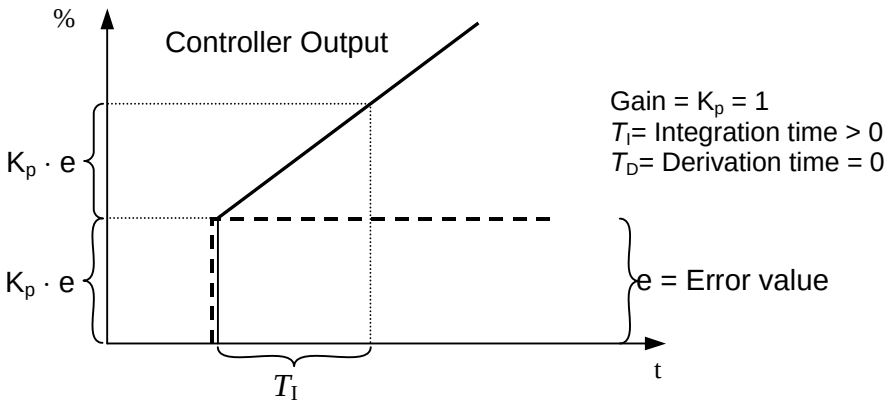
**Note:** Too high gain causes speed oscillation.




*Speed Controller output after an error step when the error remains constant.*

**13 INTEGRATION TIME 2**

Integration time defines the rate at which the controller output changes when the error value is constant. The shorter the integration time, the faster the continous error value is corrected. Too short integration time makes the control unstable.




*Speed Controller Output after an error step when the error remains constant.*

**15 TR TUNE 2**

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 full load speed. For example, if the real slip is 10 % higher than the slip calculated from motor rating plate speed, a coefficient value of +10 % is set into this parameter (e.g. if full load speed should be 989 rpm instead of rating plates 990 rpm, for a motor with 1000 rpm no-load speed. Meaning 11 rpm instead of 10 rpm slip.)

**Note:** This parameter is effective only if a pulse encoder is used.

**16 MOT THERM PMODE 2**

Selects the thermal protection mode. The motor protection is made by means of the thermal model or thermistor measurement.

The CraneDrive calculates the temperature rise of the motor using the following assumptions:

- The motor is in ambient temperature (30 °C) when power is applied to the CraneDrive.
- Motor heating is calculated assuming a load curve (Figure 6 9). The motor will heat above nominal temperature if it operates in the region above the curve, and cool if it operates below the curve. The rate of heating and cooling is set by MOTOR THERM TIME.

Because of the simple thermal model used for calculating temperature rise, this technique of thermal protection may cause undesirable trips if the motor is run continuously at low speeds. If your application requires continuous running at speeds lower than BREAK POINT, you may need to provide external cooling.

---

**CAUTION:** Motor thermal protection will not protect the motor if the cooling of the motor is reduced due to dust and dirt.

---

*DTC*
The DTC (Direct Torque Control) load curve is used for calculating heating of the motor. Motor thermal time is approximated for standard self-ventilated squirrel-cage motors as a function of the current of the motor and the number of pole pairs.

It is possible to scale the DTC load curve with Parameter 30.7 MOTOR LOAD CURVE if the motor is used in conditions other than described above. Parameters 30.6 MOTOR THERM TIME, 30.8 ZERO SPEED LOAD and 30.9 BREAK POINT cannot be set.

Note: Automatically calculated model (DTC) cannot be applied when 99.6 MOTOR NOM CURRENT > 800 Amp. Instead use USER MODE.

*USER MODE*
In this mode the user can define the operation of thermal protection by setting Parameters 30.6 MOTOR THERM TIME, 30.7 MOTOR LOAD CURVE, 30.8 ZERO SPEED LOAD and 30.9 BREAK POINT.

*THERMISTOR*
Motor thermal protection is activated with an I/O signal based on a motor thermistor.

This mode requires a motor thermistor or break contact of a thermistor relay connected between digital input DI6 and +24 V d.c. If direct thermistor connection is used, digital input DI6 activates when resistance rises higher than 4 kΩ. The drive stops if the Parameter 30.4 is preset as FAULT. DI6 is reset to zero when the resistance of the thermistor is between 0 and 1.5 kΩ.

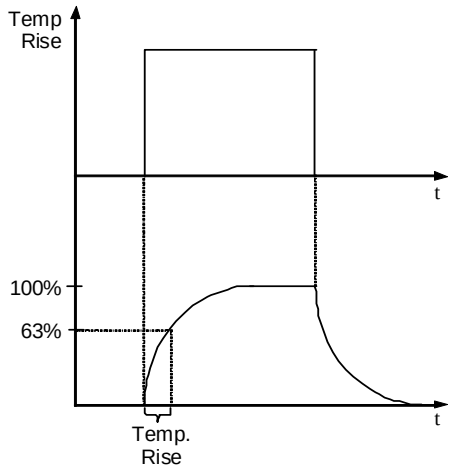
**WARNING!** According to IEC 664, the connection of the thermistor to the digital input 6 och ACS800 requires double or reinforced insulation between motor live parts and the thermistor. Reinforced insulation entails a clearance and creepage of 8 mm (400/500 VAC equipment). If the thermistor assembly does not fulfil the requirement, the other I/O terminals of ACS800 must be protected against contact, or a thermistor relay must be used to isolate the thermistor from the digital input.

**WARNING!** As the default in CraneDrive digital input 6 is selected as the source for Fast stop. Change this setting before selecting THERMISTOR for Parameter 30.5 MOT THERM P MODE. In other words, ensure that digital input 6 is not selected as signal source by any other parameter than 30.5 MOT THERM P MODE.

**17 MOTOR THERM TIME 2**

This is the time within which the motor temperature reaches 63 % of the final temperature rise. Figure 6 9 shows Motor Thermal Time definition. If the DTC mode is selected for motor thermal protection, motor thermal time can be read from this parameter. This parameter can be set only if Parameter 80.16 MOT THERM P MODE 2 is set to USER MODE.

If thermal protection according to UL requirements for NEMA class motors is desired, use this rule of thumb - Motor Thermal Time equals 35 times t6 (t6 in seconds is the time that the motor can safely operate at six times its rated current, given by the motor manufacturer). The thermal time for a Class 10 trip curve is 350 s, for a Class 20 trip curve 700 s and for a Class 30 trip curve 1050 s.




*Motor Thermal Time*

**18 ZERO SPEED LOAD 2**

This parameter defines the maximum allowable current at zero speed to define the Motor Load Curve. This parameter can be set only if Parameter 80.16 MOT THERM P MODE 2 is set to USER MODE.

**19 BREAK POINT 2**

This parameter defines the point at which the motor load curve begins to decrease from the maximum value set by Parameter 30.7 MOTOR LOAD CURVE to the ZERO SPEED LOAD (Parameter 80.18). Refer to Figure 6 10 for an example of motor load curve. This parameter can be set only if Parameter 80.16 MOT THERM P MODE 2 is set to USER MODE.

**20 SPEED FEEDB USED 2**

*TRUE*
The actual speed feedback value from connected encoder module is used in speed & torque control.

*FALSE*
*The actual sp*eed feedback value from connected encoder module is not used in speed & torque control (RTAC or NTAC module only used for position measurement).

**21 SP DEV LEV 2**

A level above SP DEV LEV means that the speed error is too high

**22 TORQ FLT TD 2**

If a speed error higher than SP DEV LEV occurs, and if it last longer than the time TORQ FLT TD the drive will trip, indicating TORQ FLT message.

**23 SP DER BLK LEV 2**

The protection is blocked during acceleration and deceleration if the sign of the speed error is OK and if the derivative of the actual speed is higher than the setting of SP DER BLK LEV. Calculate as: 100 / (RT x 1.5) %/s , where RT = longest ramp time in seconds.

**24 OFF TD 2**

The time for how long the Magnetization current shall remain on after the motor is stopped.

**25 TORQ PROV SEL 2**

*TRUE*
Torque proving active (requires pulse encoder).

*FALSE*
Torque proving not active.

**26 BRAKE FALL TIME 2**

Falling time for the mechanical brake. Time for brake to set and give full braking torque after brake close order (brake electrical supply disconnected).

**27 ZERO SPEED LEV 2**

Parameter for setting the speed level for ZERO SPEED indication. Warning: Do not set 0% level. Result would be that brake would never close.

**28 ZERO SPEED TIME 2**

Time delay before signal ZERO SPEED is set to "1" when the motor speed is below ZERO SPEED LEV.

If parameter 67.11 MOTOR TYPE is set to CONICAL, than this parameter is used to delay the stop sequence with reduced flux.

**29 SPEED REF TD 2**

Time delay at start before releasing speed reference to ramp unit.

**30 START TORQ SEL 2**

*NOT USED*
No extra starting torque.

*AUTO TQ MEM*
Automatic torque memory selected. Note: value set in parameter 67.10 is used as a minimum value for the torque memory.

*LOAD MEAS*
Starting torque reference is received from an superior controller (DS5.2) e.g. measurement from a load cell.

PAR 67.10 = Starting torque reference is fixed using torque level set in parameter 67.10 MIN START TQ REF.

**31 POWOP SELECT 2**

*TRUE*
Power optim*ization is active (only used on hoist drive).*

FALSE
Power optimization not active.

**32 BASE SPEED 2**

Breakpoint for Power optimization calculation. Set in percent of parameter 69.1 SPEED SCALING RPM. Above this speed constant power, corresponding to level set in parameters 68.6 & 68.7 , is obtained.

Normally the speed where field weakening starts and the available RMS power of the motor is constant. Full load torque possible for mechanics up to this speed.

**33 SPEED SCALING**

Setting of motor shaft rotational speed (rpm) corresponding to 100 % RPM speed 2 reference.

**34 ACC TIME FORW 2**

Setting of acceleration ramp time forward direction (up), 0 to +100 % speed (where 100% corresponds to parameter 69.1).

**35 ACC TIME REV 2**

Setting of acceleration ramp time reverse direction (down), 0 to -100 % speed (ref. Parameter 69.1).

**36 DEC TIME FORW 2**

Setting of deceleration ramp time forward direction, +100 to 0 % speed (ref. Parameter 69.1).

**37 DEC TIME REV 2**

Setting of deceleration ramp time reverse direction, -100 to 0 % speed (ref. Parameter 69.1).

**38 RAMP RATE=1 2**

Selection in Fieldbus mode if RAMP RATE signal from PLC controller is not required by drive. Alternatively to activate analog input 3 (AI3) as Ramp rate signal in Fieldbus or Standalone modes.

*TRUE*
The RAMP RATE signal available from Fieldbus communication is not active, set fixed to 1.0.

FALSE
The RAMP RATE signal from Fieldbus communication (DS3.1) is active.

*AI3*
The RAMP RATE multiplying factor signal is connected from analog input 3. Signal level at or below 4mA (0 - 4 mA) corresponds to a multiplying factor of 1.0. Signal levels between 4mA and 20 mA corresponds to a multiplying factor between 1.0 and 10.0 . Relation is linear, giving e.g. 12 mA = 5.5 .

**39 POS SCALE 2**

Set position counter scaling factor, POS SCALE, as number of Pulses Per Unit, e.g. pulses/mm. (Position measurement value POSACT = Pulse counter / POS SCALE.)

Example how to calculate POS SCALE: Hoist operating speed 40 m/min (40.000 mm/min) corresponding to motor speed of 980 rpm. Pulse encoder with 1024 ppr (parameter 50.1). Speed measuring set to use all 4 edges (parameter 50.2=default). This gives us POS SCALE = (980 * 1024 * 4) / 40.000 = 100.35 pulses/mm.

**40 ENCODER MODULE 2**

Activates the communication to the optional pulse encoder module. The drive will than use the measured speed signal instead of the calculated speed.

The parameters in group 50 ENCODER MODULE must be set before operation.

*NTAC*
Communication active. Module type: NTAC-02 module. Connection interface: Fiber optic DDCS link (connect to Ch1 on RDCO option module). Node address in NTAC-02 to be 16.

*NO*
Inactive

*RTAC-SLOT1*
Communication active. Module type: RTAC. Connection interface: Option slot 1 of the drive control unit (RMIO board).

*RTAC-SLOT2*
Communication active. Module type: RTAC. Connection interface: Option slot 2 of the drive control unit (RMIO board).

*RTAC-DDCS*
Communication active. Module type: RTAC. Connection interface: Optional I/O module adapter (AIMA) that communicates with the drive through a fiber optic DDCS link (via Ch1 on RDCO option module).

**Note**: Node ID selector (S1) on RTAC must be set to 0 (=default).

**41 TORQUE SELECTOR 2**

Mode selection for Shared motion.

*ZERO*
Torque selector parameter is not active. Speed or torque control selection is done with I/O or Fieldbus in normal way (default is speed control).

*SPEED*
Drive is speed controlled. Receiving speed reference (Speed_ref3 ramp output!) from Master drive if M/F ctrl macro active i.e. using M/F bus communication. Note: Follower speed ramp times should be set equal or lower than Master ramp time settings.

*TORQUE*
Drive is torque controlled. Receiving torque reference from Master drive if M/F ctrl macro active (Torq ref A), i.e. load sharing between Master and Follower.

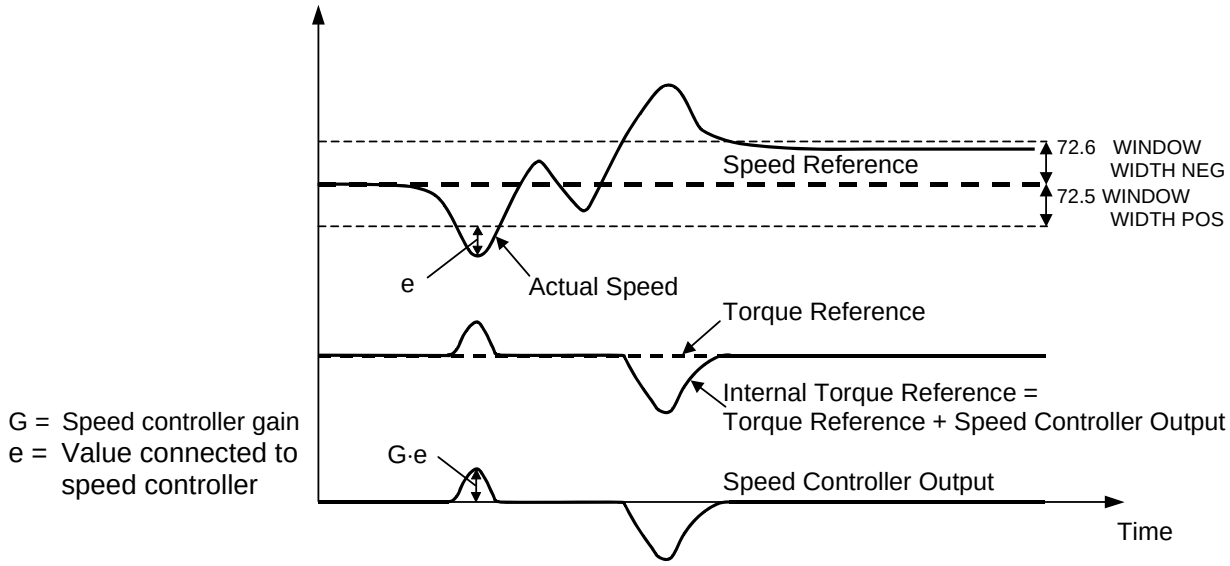
*MINIMUM*
Torque selector compares the torque reference and the output of the speed controller. The lower value is used as the reference for motor torque control. Receiving speed and torque references from Master drive if M/F ctrl macro active. This mode should normally not be used with a crane drive!

*MAXIMUM*
Torque selector compares the torque reference and the output of the speed controller. The higher value is used as the reference for motor torque control. Receiving speed and torque references from Master drive if M/F ctrl macro active. This mode should normally not be used with a crane drive!

*ADD*
Torque selector adds the speed controller output to torque reference. The drive is torque controlled in normal operating range.

The selection ADD together with the window control form a speed supervision function for a torque controlled Follower drive:

- In normal operating range, the Follower follows the torque reference (TORQ REF A).
- Window control keeps the speed controller input and output to zero as long as the speed error (speed reference - actual speed) remains within a certain window
- If the speed error goes out of the window, window control connects the error to the speed controller. The speed controller output increases or decreases the internal torque reference, stopping the rise or fall of the actual speed.




*Window control*

### Group 81 MOTOR MODEL 1

Group 81 is a saved copy of the motor model data for Motor 1. No changes allowed, values only for indications.

| Parameter | Description |
|---|---|
| 1 MOTOR NOM VOLT 1 | Nominal voltage from the motor rating plate |
| 2 MOTOR NOM CURR 1 | Rated motor current |
| 3 MOTOR NOM FREQ 1 | Nominal frequencey from the motor rating plate |
| 4 MOTOR NOM SPEED 1 | Nominal speed from the motor rating plate |
| 5 MOTOR NOM POWER 1 | Nominal power from the motor rating plate |
| 6 MOTOR NOM COSFI 1 | Calculated motor nominal power factor |
| 7 INV THRESHOLD V 1 | Inverter threshold voltage level |
| 8 RS_20 1 | Internal motor model parameter |
| 9 IMAGN 1 | Internal motor model parameter |
| 10 IREF_OFFS 1 | Internal motor model parameter |
| 11 SIGLS0 1 | Internal motor model parameter |
| 12 SIGLS2 1 | Internal motor model parameter |
| 13 SIGLS_SATF 1 | Internal motor model parameter |
| 14 LS_SIGLS 1 | Internal motor model parameter |
| 15 LS_SIGLS0 1 | Internal motor model parameter |
| 16 LS_SIGLS1 1 | Internal motor model parameter |
| 17 LS_SIGLS_SATF 1 | Internal motor model parameter |
| 18 LS_SIGLS_SATF1 1 | Internal motor model parameter |
| 19 LS_SIGLS_SATM 1 | Internal motor model parameter |
| 20 LS_SIGLS_SATM1 1 | Internal motor model parameter |
| 21 LS_SIGLS_SATM2 1 | Internal motor model parameter |
| 22 EFF_MOT_NOM 1 | Internal motor model parameter |
| 23 ZER_COEF1 1 | Internal motor model parameter |
| 24 ZER_GAIN 1 | Internal motor model parameter |
| 25 SYSSATT3 1 | Internal motor model parameter |
| 26 SYSSATT5 1 | Internal motor model parameter |
| 27 IA_GAIN_ER 1 | Internal motor model parameter |
| 28 IC_GAIN_ER 1 | Internal motor model parameter |
| 29 IA_OFFS_ER 1 | Internal motor model parameter |
| 30 IC_OFFS_ER 1 | Internal motor model parameter |

### Group 82 MOTOR MODEL 2

Group 82 is a saved copy of the motor model data for Motor 2. No changes allowed, values only for indications.

| Parameter | Description |
|---|---|
| 1 MOTOR NOM VOLT 2 | Nominal voltage from the motor rating plate |
| 2 MOTOR NOM CURR 2 | Rated motor current |
| 3 MOTOR NOM FREQ 2 | Nominal frequencey from the motor rating plate |
| 4 MOTOR NOM SPEED 2 | Nominal speed from the motor rating plate |
| 5 MOTOR NOM POWER 2 | Nominal power from the motor rating plate |
| 6 MOTOR NOM COSFI 2 | Calculated motor nominal power factor |
| 7 INV THRESHOLD V 2 | Inverter threshold voltage level |
| 8 RS_20 2 | Internal motor model parameter |
| 9 IMAGN 2 | Internal motor model parameter |
| 10 IREF_OFFS 2 | Internal motor model parameter |
| 11 SIGLS0 2 | Internal motor model parameter |
| 12 SIGLS2 2 | Internal motor model parameter |
| 13 SIGLS_SATF 2 | Internal motor model parameter |
| 14 LS_SIGLS 2 | Internal motor model parameter |
| 15 LS_SIGLS0 2 | Internal motor model parameter |
| 16 LS_SIGLS1 2 | Internal motor model parameter |
| 17 LS_SIGLS_SATF 2 | Internal motor model parameter |
| 18 LS_SIGLS_SATF1 2 | Internal motor model parameter |
| 19 LS_SIGLS_SATM 2 | Internal motor model parameter |
| 20 LS_SIGLS_SATM1 2 | Internal motor model parameter |
| 21 LS_SIGLS_SATM2 2 | Internal motor model parameter |
| 22 EFF_MOT_NOM 2 | Internal motor model parameter |
| 23 ZER_COEF1 2 | Internal motor model parameter |
| 24 ZER_GAIN 2 | Internal motor model parameter |
| 25 SYSSATT3 2 | Internal motor model parameter |
| 26 SYSSATT5 2 | Internal motor model parameter |
| 27 IA_GAIN_ER 2 | Internal motor model parameter |
| 28 IC_GAIN_ER 2 | Internal motor model parameter |
| 29 IA_OFFS_ER 2 | Internal motor model parameter |
| 30 IC_OFFS_ER 2 | Internal motor model parameter |

## Group 90 Dataset REC Addr

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 DATASET 7 WORD 1 | 0 ... 9999 | Address for Dataset 7 Word 1 |
| 2 DATASET 7 WORD 2 | 0 ... 9999 | Address for Dataset 7 Word 2 |
| 3 DATASET 7 WORD 3 | 0 ... 9999 | Address for Dataset 7 Word 3 |
| 4 DATASET 9 WORD | 0 ... 9999 | Address for Dataset 9 Word 1 |
| 5 DATASET 9 WORD | 0 ... 9999 | Address for Dataset 9 Word 2 |
| 6 DATASET 9 WORD | 0 ... 9999 | Address for Dataset 9 Word 3 |

Group 90 is used to define the drive parameters into which the values of Dataset 7 Words 1–3 and Dataset 9 Words 1–3 are written.

#### 1 DATASET 7 WORD 1

Drive parameter, group and index, to get value from fieldbus dataset 7 word 1 integer value. Integer scaling for "decimal parameters" given by number of decimals, e.g. parameter 69.2 = 5.0 sec equals integer value of 50.

Format: **xxyy**, where **xx** = Parameter Group (10 to 99), **yy** = Parameter Index (always using 2 digits, i.e. 1 = 01).

Example: Setting **2001** = Parameter 20.1 MINIMUM SPEED receives it's value from fieldbus dataset 7 word 1.

#### 2 DATASET 7 WORD 2

Refer to Parameter 90.1 DATASET 7 WORD 1

#### 3 DATASET 7 WORD 3

Refer to Parameter 90.1 DATASET 7 WORD 1

#### 4 DATASET 9 WORD 1

Drive parameter, group and index, to get value from fieldbus dataset 9 word 1 integer value. Integer scaling for "decimal parameters" given by number of decimals, e.g. parameter 69.2 = 5.0 sec equals integer value of 50.

Format: **xxyy**, where **xx** = Parameter Group (10 to 99), **yy** = Parameter Index (always using 2 digits, i.e. 1 = 01).

Example: Setting **2001** = Parameter 20.1 MINIMUM SPEED receives it's value from fieldbus dataset 9 word 1.

#### 5 DATASET 9 WORD 2

Refer to Parameter 90.4 DATASET 9 WORD 1

#### 6 DATASET 9 WORD 3

Refer to Parameter 90.4 DATASET 9 WORD 1

## Group 92 Dataset TR Addr

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 DATASET 4 WORD 1 | 0 … 9999 | Address of Dataset 4 Word 1 |
| 2 DATASET 4 WORD 2 | 0 … 9999 | Address of Dataset 4 Word 2 |
| 3 DATASET 4 WORD 3 | 0 … 9999 | Address of Dataset 4 Word 3 |
| 4 DATASET 6 WORD 1 | 0 … 9999 | Address of Dataset 6 Word 1 |
| 5 DATASET 6 WORD 2 | 0 … 9999 | Address of Dataset 6 Word 2 |
| 6 DATASET 6 WORD 3 | 0 … 9999 | Address of Dataset 6 Word 3 |
| 7 DATASET 8 WORD 1 | 0 … 9999 | Address of Dataset 8 Word 1 |
| 8 DATASET 8 WORD 2 | 0 … 9999 | Address of Dataset 8 Word 2 |
| 9 DATASET 8 WORD 3 | 0 … 9999 | Address of Dataset 8 Word 3 |

Group 92 is used as a signal "switchbox" to connect signals from Groups 1 - 5 to Fieldbus datasets 4, 6 & 8 words 1 - 3.

**1 DATASET 4 WORD 1**

Address selection, Group and Index, for Fieldbus dataset 4 word 1. Example: To connect signal SPEED REF3 for transmission in Dataset 4 Word 1, set parameter 92.1 = 202 . That is 202 = Group 2, Index 02.

**2 DATASET 4 WORD 2**

Refer to Parameter 92.1 DATASET 4 WORD 1

**3 DATASET 4 WORD 3**

Refer to Parameter 92.1 DATASET 4 WORD 1

**4 DATASET 6 WORD 1**

Refer to Parameter 92.1 DATASET 4 WORD 1

**5 DATASET 6 WORD 2**

Refer to Parameter 92.1 DATASET 4 WORD 1

**6 DATASET 6 WORD 3**

Refer to Parameter 92.1 DATASET 4 WORD 1

**7 DATASET 8 WORD 1**

Refer to Parameter 92.1 DATASET 4 WORD 1

**8 DATASET 8 WORD 2**

Refer to Parameter 92.1 DATASET 4 WORD 1

**9 DATASET 8 WORD 3**

Refer to Parameter 92.1 DATASET 4 WORD 1

## Group 98 Option modules

The Range/Unit column in the table below shows the allowable parameter values. The text following the table explains the parameters in detail.

| Parameter | Range/Unit | Description |
|---|---|---|
| 1 ENCODER MODULE | NTAC; NO; RTAC01-SLOT1; RTAC01-SLOT2; RTAC01-DDCS; RTAC03-SLOT1; RTAC03-SLOT2; RTAC03-DDCS | Pulse encoder option module selection. |
| 2 COMM. MODULE | NO; FIELDBUS; ADVANT | Communication option module selection. |
| 3 CH3 NODE ADDR | 1 ... 254 | Channel 3 node address |
| 4 CH0 NODE ADDR | 0 … 125 | Channel 0 node address |
| 5 DI/O EXT MODULE 1 | NDIO; NO; RDIO-SLOT1; RDIO-SLOT2; RDIO-DDCS | Digital I/O extension module 1 selection |
| 6 DI/O EXT MODULE 2 | NDIO; NO; RDIO-SLOT1; RDIO-SLOT2; RDIO-DDCS | Digital I/O extension module 2 selection |
| 7 AI/O EXT MODULE | NAIO; NO; RAIO-SLOT1; RAIO-SLOT2; RAIO-DDCS | Analogue I/O module selection |

The parameters for the option module group are set if an option module is installed. For more information on option module parameters refer to the option module manuals.

### 1 ENCODER MODULE

Activates the communication to the optional pulse encoder module. The drive will than use the measured speed signal instead of the calculated speed. Parameters in group 50 ENCODER MODULE must be set before operation.

*NTAC*
*Communication active. Module type: NTAC-02 module. Connection interface: Fiber optic DDCS link (connect to Ch1 on RDCO option module). Node address in NTAC-02 to be 16.*

*NO*
Inactive.

*RTAC01-SLOT1*
Communication active. Module type: RTAC. Connection interface: Option slot 1 of the drive control unit (RMIO board).

*RTAC01-SLOT2*
Communication active. Module type: RTAC. Connection interface: Option slot 2 of the drive control unit (RMIO board).

*RTAC01-DDCS*
Communication active. Module type: RTAC. Connection interface: Optional I/O module adapter (AIMA) that communicates with the drive through a fiber optic DDCS link (via Ch1 on RDCO option module). **Note:** Node ID selector (S1) on RTAC must be set to 0 (=default).

*RTAC03-SLOT1*
Communication active. Module type: RTAC03. Connection interface: Option slot 1 of the drive control unit (RMIO board).

*RTAC03-SLOT2*
Communication active. Module type: RTAC03. Connection interface: Option slot 2 of the drive control unit (RMIO board).

*RTAC03-DDCS*
Communication active. Module type: RTAC03. Connection interface: Optional I/O module adapter (AIMA) that communicates with the drive through a fiber optic DDCS link (via Ch1 on RDCO option module).

Note: Node ID selector (S1) on RTAC must be set to 0 (=default).

**2 COMM. MODULE**

Set to FIELDBUS if a communication option module, e.g. NMBA-01 is connected to channel 0 of CraneDrive. Parameters in group 51 must be set before operation.

Set to ADVANT if optical "Modulebus" of ABB ADVANT controllers AC70, AC80, AC410 (CI810), AC450 (CI810), AC800M or if AC80 "Drivebus" is connected to RDCO-01 channel 0 of CraneDrive.

**NOTE:** If changing parameter 98.2 from ADVANT to FIELDBUS, parameter 98.4 must be set = 1.

**3 CH3 NODE ADDR**

Set a different node address for DDCS channel 3 in each drive, if connecting multiple drives together to DriveWindow PC-tool communication (ring or star connection).

**4 CH 0 NODE ADDR**

Set node address for RDCO channel 0 if connected to Advant controller optical Modulebus or AC80 Drivebus (98.2 = ADVANT).

**NOTE:** If changing parameter 98.2 from ADVANT to FIELDBUS, parameter 98.4 must be set = 1.

The ch 0 node address is set according to the Module bus POSITION value used for this drive, by using the following conversion:

If POSITION = yzw, then calculate drive ch 0 node address 98.4 as y*16+zw.

Example: If POSITION = 101, then Par 98.4 = 1*16+01 = 17

101 → 17, 102 → 18, … 112 → 28

201 → 33, 202 → 34, … 212 → 44

:

701 → 113, 702 → 114, … 712 → 124

If using AC80 Drivebus, ch 0 node address is set equal to Drive Number setting on ACSRX function block in AC80.

If using Drive bus card CI858 in AC800M, CH0 node address is set equal to Drive number setting on the CI858 hardware definition. Usually the first drive is 1, the second is drive 2, and so on.

If connecting to AC800M Module bus, see also parameter 71.5 DSET BASE ADDRESS.

**5 DI/O EXT MODULE 1**

Activates the communication to the optional digital I/O extension module 1 and defines the type and connection interface of the module. This is used to extend the number of inputs and outputs. See parameter groups 10 and 14 for possible connections.

*NDIO*
Communication active. Module type: NDIO module. Connection interface: Fiber optic DDCS link (connect to Ch1 on RDCO option module). Set the module node address to 2 (for directions see module manual).

Signals available are: EXT DI1.1, EXT DI1.2, EXT1 DO1, EXT1 DO2.

*NO*
Inactive.

*RDIO-SLOT1*
Communication active. Module type: RDIO. Connection interface: Option slot 1 of the drive control unit (RMIO board).

Signals available are: EXT DI1.1, EXT DI1.2, EXT DI1.3, EXT1 DO1, EXT1 DO2.

*RDIO-SLOT2*
Communication active. Module type: RDIO. Connection interface: Option slot 2 of the drive control unit (RMIO board).

Signals available are: EXT DI1.1, EXT DI1.2, EXT DI1.3, EXT1 DO1, EXT1 DO2.

*RDIO-DDCS*
Communication active. Module type: RDIO. Connection interface: Optional I/O module adapter (AIMA) that communicates with the drive through a fiber optic DDCS link (via Ch1 on RDCO option module).

**Note:** Node ID selector (S1) on RDIO must be set to 2 (=default). Signals available are: EXT DI1.1, EXT DI1.2, EXT DI1.3, EXT1 DO1, EXT1 DO2.

**6 DI/O EXT MODULE 2**

Activates the communication to the optional digital I/O extension module 2 and defines the type and connection interface of the module. This is used to extend the number of inputs and outputs. See parameter groups 10 and 14 for possible connections.

*NDIO*
Communication active. Module type: NDIO module. Connection interface: Fiber optic DDCS link (connect to Ch1 on RDCO option module). Set the module node address to 3 (for directions see module manual).

Signals available are: EXT DI2.1, EXT DI2.2, EXT2 DO1, EXT2 DO2.

*NO*
Inactive.

*RDIO-SLOT1*
Communication active. Module type: RDIO. Connection interface: Option slot 1 of the drive control unit (RMIO board).

Signals available are: EXT DI2.1, EXT DI2.2, EXT DI2.3, EXT2 DO1, EXT2 DO2.

*RDIO-SLOT2*
Communication active. Module type: RDIO. Connection interface: Option slot 2 of the drive control unit (RMIO board).

Signals available are: EXT DI2.1, EXT DI2.2, EXT DI2.3, EXT2 DO1, EXT2 DO2.

*RDIO-DDCS*
Communication active. Module type: RDIO. Connection interface: Optional I/O module adapter (AIMA) that communicates with the drive through a fiber optic DDCS link (via Ch1 on RDCO option module).

**Note:** Node ID selector (S1) on RDIO must be set to 3. Signals available are: EXT DI2.1, EXT DI2.2, EXT DI2.3, EXT2 DO1, EXT2 DO2.

**7 AI/O EXT MODULE**

Activates the communication to the optional analog I/O extension module and defines the type and connection interface of the module. Used when connecting analogue +/- 10V Speed correction reference signal to Ext AI1 (available in both Stand alone and Fieldbus mode), and when connecting an analogue 0-10V Load measure reference to Ext AI2 (see also description for parameter 67.9 START TORQ SEL).

*NAIO*
Communication active. Module type: NAIO-02 module. Connection interface: Fiber optic DDCS link (connect to Ch1 on RDCO option module). Set the module node address to 5 (for directions see module manual)..

*NO*
Inactive.

*RAIO-SLOT1*
Communication active. Module type: RAIO. Connection interface: Option slot 1 of the drive control unit (RMIO board).

*RAIO-SLOT2*
Communication active. Module type: RAIO. Connection interface: Option slot 2 of the drive control unit (RMIO board).

*RAIO-DDCS*
Communication active. Module type: RAIO. Connection interface: Optional I/O module adapter (AIMA) that communicates with the drive through a fiber optic DDCS link (via Ch1 on RDCO option module).

**Note:** Node ID selector (S1) on RAIO must be set to 5.

### Group 99 Start-up Data

See chapter *Start-up Data* for information on these parameters.

# Fault Tracing and Maintenance

## Overview

The CraneDrive is equipped with advanced protection features that continuously guard the unit against damage and down time due to incorrect operating conditions and electrical and mechanical malfunctions. This chapter explains the CraneDrive fault tracing procedure with the CDP 312R Control Panel.

All Warning and Fault messages (including the ones from user definable Programmable Fault Functions) are presented in Table 7 1 and Table 7-3 with information on the cause and remedy for each case. Fault and Warning indications are displayed in the Actual Signal Display Mode as well as in the Parameter Mode. Warnings do not have a direct effect on operation. Faults terminate motor operation.

The standard maintenance measures are described in the latter part of this chapter.

Most Warning and Fault conditions can be identified and cured with the information in this manual. There are, however, some situations that can only be treated by an ABB service representative. The unit is fitted with complex circuitry, and measurements, parts replacements and service procedures not described in this manual are not allowed for the user.

Programmable Fault Functions are explained in detail in chapter *Parameters*, Group 30. Signal Group 5 (Information) shows software versions of the unit.

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**CAUTION!** Do not attempt any measurement, parts replacement or other service procedure not described in this manual. Such action will void guarantee, endanger correct operation, and increase downtime and expense.

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**WARNING!** All electrical installation and maintenance work described in this Chapter 7- Fault Tracing and Maintenance should only be undertaken by a qualified electrician. Disconnect mains power if fault tracing involves work inside the frame, the motor or the motor cable. For CraneDrive units with EMC Line Filter disconnect mains power at the distribution board. The fuse switch (with handle in the front door) of the enclosed ACS800 does not switch off power from the EMC Line Filter. Wait 5 minutes for the intermediate circuit capacitors to discharge. The ACS800 can contain dangerous voltages from external control circuits.  Exercise appropriate care when working on the unit. Neglecting these instructions can cause physical injury and death.

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**WARNING!** The printed circuit boards contain integrated circuits that are extremely sensitive to electrostatic discharge. Exercise appropriate care when working on the unit to avoid permanent damage to the circuits.

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## Warnings

The Control Panel enters the Fault Display when a Warning condition is detected. The Fault Display shows the cause of the Warning. The programmable warning messages are displayed when the value of the Parameter 30.4 and 30.12 is set as WARNING. The default settings of the Programmable Fault Functions are given in Appendix A - Complete Parameter and Default Settings Table 7 1 contains the Warning messages, their most likely causes and possible remedies.

An example of a Warning message:

```
1 L ->    50.0%    1
ACS800-01     75 kW
** WARNING **
ACS800 TEMP
```

The Warning does not have a direct effect on frequency converter operation. The message disappears when any of the Control Panel keys are pressed. The Warning will reappear in one minute if conditions remain unchanged.

In the most critical applications it might be practical to terminate the process in a controlled manner rather than running the risk of a Fault trip.

If a Warning remains despite the actions indicated in the remedy column, then contact an ABB service representative.

*The ACC Warning Messages*

| Warning | Cause | Remedy |
|---|---|---|
| ACS800 TEMP (4210) | The ACS800 internal temperature is excessive. A warning is given if inverter module temperature exceeds 125 °C. | Check ambient conditions.<br>Check air flow and fan operation<br>Check heatsink fins for dust pick-up<br>Check motor power against unit power. |
| BACKUP USED | PC stored backup of drive parameters is downloaded into use | Wait until download is completed. |
| BC OVERHEAT (7114) | Brake chopper overload | Stop drive. Let chopper cool down. Check parameter settings of resistor overload protection function (see parameter group 27 BRAKE CHOPPER)<br>Check that breaking cycle meets allowed limits.<br>Check that drive supply AC voltage is not excessive. |
| BRAKE L FT | Brake Falling Time at stop longer than time delay BRAKE LONG FT TD (Parameter 67.5) gives a warning signal that will not trip the drive but activate Watchdog output signal, to be used for Emergency stop of crane. | Check brake contactor.<br>Check wiring of brake acknowledgement to digital input 1. |
| BR OVERHEAT (7112) | Brake resistor overheated | Stop drive. Let resistor cool down. Check parameter settings of resistor overload protection function (see parameter group 27 BRAKE CHOPPER)<br>Check that braking cycle meets allowed limits. |
| COMM MODULE (7510) (programmable fault function) | Cyclical communication between drive and master is lost | Check status of fieldbus communication. See section 5.6.12 Fieldbus comm, or appropriate fieldbus adapter manual.<br>Check parameter settings in group 51 COMM MODULE (for fieldbus adapter)<br>Check cable connection<br>Check if master can communicate |
| CUR UNBAL xx (2330) | Drive has detected excessive output current unbalance in inverter unit of several parallel connected inverter modules. This can be caused by external fault (earth fault, motor, motor cabling, etc.) or internal fault (damaged inverter component). xx (2 … 12) refers to inverter module number. | Check motor<br>Check motor cable<br>Check there are no power factor correction capacitors or surge absorbers in motor cable |
| DRV ID CHG | The ID number of the drive has been changed from 1 in Drive Selection Mode (the change is not shown on the display). If the ID number is not changed back to 1 during the session, the panel will not be able to communicate with the drive after the next power-up. | Go to Drive Selection Mode by pressing **DRIVE**. Press **ENTER**. Set the ID number to 1. Press **ENTER**. If the panel does not communicate with the drive, set the ID number of the drive to 1 as explained in chapter 2. |

| | | |
|---|---|---|
| EARTH FAULT (2330) | Drive has detected load unbalance typically due to earth fault in motor or motor cable. | Check motor.<br>Check motor cable.<br>Check there are no power factor correction capacitors or surge absorbers in motor cable. |

| | | |
|---|---|---|
| ENCODER A<>B (7302) | Pulse encoder phasing is wrong: Phase A is connected to terminal of phase B and vice versa. | Interchange connection of pulse encoder phases A and B. |
| ENCODER ERR (7301) | Communication fault between pulse encoder and pulse encoder interface module and between module and drive. | Check pulse encoder and its wiring, pulse encoder interface module and its wiring, parameter group 50 PULSE ENCODER settings. |
| ID DONE | The drive has performed the motor identification of magnetisation and is ready for operation. This warning belongs to the normal start-up procedure. | Continue drive operation. |
| ID MAGN | Motor identification of magnetisation is ongoing. This warning belongs to the normal start-up procedure. | Wait until the drive indicates that |
| ID MAGN REQ | Motor identification is required. This warning belongs to normal start-up procedure. Drive expects user to select how motor identification should be performed: By Identification Magnetisation or by ID Run. | Start Identification Magnetisation by pressing Start key, or select ID Run and start (see parameter 99.10 MOTOR ID RUN) |
| ID N CHANGED | Drive ID number has been changed from 1. | Change ID number back to 1. See chapter Control panel. |
| ID RUN FAIL | The Motor ID Run is not completed successfully. | Check the maximum speed (Parameter 20.2) It should be at least 80 % of the nominal speed of the motor (Parameter 99.8). |
| ID RUN SEL | Motor Identification Run is selected, and drive is ready to start ID Run. This warning belongs to ID Run procedure. | Press start key to start Identification Run. |
| IN CHOKE TEMP (FF81) | Excessive input choke temperature | Stop drive. Let it cool down. Check ambient temperature. Check that fan rotates in correct direction and air flows freely.. |
| INV DISABLED | Optional DC switch has opened while unit was stopped. | Close DC switch.<br>Check AFSC-0x Fuse Switch Controller unit. |
| LIFETIME>90% | Calculated mechanical lifetime (in Crane Lifetime Monitor function) of hoist has exceeded 90% of the setting of parameter 74.3 CRANE LIFETIME. | Crane is in need of mechanical overhaul (reconditioning). Please contact crane builder. |
| MACRO CHANGE | Macro is restoring or User macro is being saved. | Wait until drive has finished task. |
| MOTOR STARTS | Motor Identification Run starts. This warning belongs to ID Run procedure. | Wait until drive indicates that motor identification is completed. |
| MOTOR TEMP (4310) (programmable Fault Function 30.4… 30.10) | Motor temperature is too high (or appears to be too high). This can be caused by excessive load, insufficient motor power, inadequate cooling or incorrect start-up data. | Check motor ratings, load and cooling.<br>Check start-up data<br>Check MOTOR TEMP Fault Function parameters (see chapter 6, group 30). |
| NO MOT DATA | Motor data is not given or motor data does not match with inverter data. | Check the motor data given by Parameters 99.4 ... 99.9. |
| PANEL LOSS (5300) (programmable Fault Function 30.02) | Control panel selected as active control location for drive has ceased communicating. | Check panel connection (see appropriate hardware manual).<br>Check control panel connector.<br>Replace control panel in mounting platform.<br>Check Fault Function parameters. |

| | | |
|---|---|---|
| PP OVERLOAD | 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). | Increase ramp time.<br>Reduce load |
| REPLACE FAN | Running time of inverter cooling fan has exceeded its estimated life time. | Replace fan.<br>Reset fan run time counter 1.27. |
| START INHIBI | Optional start inhibit hardware logic is activated. | Check start inhibit circuit (AGPS board). |
| SYNCRO SPEED | Value of motor nominal speed set to parameter 99.08 is not correct: Value is too near synchronous speed of motor. Tolerance is 0.1 %. This warning is active only in DTC mode. | Check nominal speed from motor plate and set parameter 99.08 exactly acconrdingly. |
| TEMP DIF xx y<br>(2.28 INT FAULT INFO) | Excessive temperature difference between several parallel connected inverter modules. xx (1 … 12) refers to inverter module number and y refers to phase (U, V, W).<br>Alarm is indicated when temperature difference is 15°C. Faults is indicated when temperature difference is 20°C<br>Excessive temperature can be caused e.g. by unequal current sharing between parallel connected inverters. | Check cooling fan.<br>Replace fan<br>Check air filters. |
| THERMISTOR<br>(4311) | Motor thermal protection mode selected as THERMISTOR and the temperature is excessive. | Check motor ratings and load.<br>Check start-up data.<br>Check thermistor connections for digital input DI6. |
| USER MACRO | User Macro is being saved. | Please wait. |
| WARNING JOYSTICK | The drive is stopped and prevented from start. If Stand Alone Sel (Parameter 64.1) is "True" and Control Type (Par 64.10) is "JOYSTICK"Conditions:- START DIR A= "1" and START DIR B="1" simultaneously- SPEED REF is > 1V or TORQUE REF is > 2Ma and ZERO POS ="1"<br>Or if Stand Alone Sel (Parameter 64.1) is "True", Control Type (Par 64.10) is not "FB JOYSTICK" and FB Stoplim Sel (Par 10.14) is set to "DI3+DI4". That is, DI3 & DI4 is incorrectly used for both Direction orders A & B as well as Stoplimits A & B. | Check joystick and wiring to digital inputs 2 - 4 and analogue inputs 1 or 2.<br>Check setting of parameter 64.1 (Stand Alone Sel) if using fieldbus control<br>Change selection of FB Stoplim Sel, parameter 10.14. |

*The ACC Warning Messages generated by the control panel*

| Warning | Cause | What to do |
|---|---|---|
| DOWNLOADING FAILED | Download function of panel has failed. No data has been copied from panel to drive. | Make sure panel is in local mode.<br>Retry (there might be interference on link)<br>Contact ABB representative. |
| DRIVE IS RUNNING DOWNLOADING NOT POSSIBLE | Downloading is not possible while motor is running. | Stop motor. Perform downloading. |
| NO COMMUNICATION (X) | Cabling problem or hardware malfunction on Panel Link | Check Panel Link connections.<br>Press RESET key. Panel reset may take up to half a minute, pleas wait. |
| | (4) = Panel type not compatible with drive application program version. | Check panel type and drive application program version. Panel type is printed on panel cover. Application program version is stored in Signal 5.02. |
| NO FREE ID<br>NUMBERS ID<br>NUMBER SETTING NOT POSSIBLE | Panel Link already includes 31 stations. | Disconnect another station from link to free ID number. |
| NOT UPLOADED DOWNLOADING NOT POSSIBLE | No upload function has been performed. | Perform upload function before downloading. See chapter Control Panel. |
| UPLOADING FAILED | Upload function of panel has failed. No data has been copied from drive to panel. | Retry (there might be interference on link). Contact ABB representative. |
| WRITE ACCESS DENIED<br>PARAMETER SETTING NOT POSSIBLE | Certain parameters do not allow changes while motor is running. If tried, no change is accepted, and warning is displayed.<br>Parameter lock is on. | Stop motor, then change parameter value.<br>Open parameter lock (see parameter 16.02) |

# Faults

The Control Panel enters the Fault Display when a Fault condition is detected. Motor operation is terminated. The Fault Display shows the cause for the Fault. The programmable Fault messages are displayed when the value of the Parameter is FAULT. The default setting of the Programmable Fault Functions are given in Appendix A - Complete Parameter and Default Settings.

If the frequency converter is operated with the Control Panel detached, the red LED in the Control Panel mounting platform indicates Fault condition. An example of a Fault message is displayed in Figure 7 2.

A Fault message.

```
1 L ->     60.0%    1
ACS800-01     75 kW
** FAULT **
DC OVERVOLT
```

The Fault message is acknowledged by pressing the RESET key or one of the Mode keys. After this the Control Panel operates in the normal way (operational commands on a tripped unit are disabled until the Fault is reset). The last 64 Faults can be viewed in the Fault History (in the Actual Signal Display Mode). Parameter values can be changed if the Fault is caused by incorrect parameter settings. Normal operation can be resumed after the Fault is reset with the RESET key (if not already reset) or from an external control location. After this, the motor can be started with (Start) key. If a Fault persists despite the actions indicated in the remedy column, contact an ABB service representative.

### Fault History

When a Fault is detected, it is stored in the Fault History for viewing at a later time. The last 16 Faults are stored in order of appearance along with the time the Fault was detected. The list is automatically updated at each Fault. The Fault History stores the information on all Preprogrammed, Programmable and automatically resetting Faults.

The Fault History does store the DC undervoltage Fault that would be encountered if mains power is shut off during running (e.g. E-stop) if separate supply 24 V is used for RMIO board without using Power On Ackn signal feedback.

The Fault History can be checked for trends that may be useful in preventing future Faults. For example, if there are several overvoltage Faults in the Fault History, there might be an overvoltage problem in the mains system.

The Fault History is entered from the Actual Signal Display Mode by pressing ⏫ or ⏬ . The Faults can then be scrolled with 🔼 and 🔽 . To exit the Fault History press ⏫ or ⏬ .

The Fault History can be cleared by pressing the RESET key.

The Fault History is cleared before shipment from factory. All Faults therein have occurred since shipment.

*The CraneDrive Fault messages*

| Fault | Cause | Remedy |
|---|---|---|
| ACS800 TEMP (4210) | The ACS800 internal temperature is excessive. The trip level of inverter module temperature is 140 °C | Check ambient conditions.<br>Check airflow and fan operation.<br>Check heatsink fins for dust pick-up.<br>Check motor power against unit power. |
| ACS TEMP xx y (4210) | Excessive internal temperature in inverter unit of several parallel connected inverter modules. xx (1 … 12) refers to inverter module number and y refers to phase (U, V, W) | Check ambient conditions.<br>Check airflow and fan operation.<br>Check heatsink fins for dust pick-up.<br>Check motor power against unit power. |
| BACKUP ERROR (FFA2) | Failure when restoring PC stored backup of drive parameters. | Retry.<br>Check connections.<br>Check that parameters are compatible with drive. |
| BC OVERHEAT (7114) | Brake chopper (internal) overload. | Stop drive. Allow chopper to cool down.<br>Check parameter settings of resistor overload protection function (see parameter group 27 BRAKE CHOPPER).<br>Check that braking cycle meets the allowed limits.<br>Check that the supply AC voltage of the drive is not excessive. |
| BC SHORT CIR (7113) | Short circuit in brake chopper (internal) IGBT(s). | Replace brake chopper. Ensure brake resistor is connected and not damaged. |
| BRAKE FLT, | A brake fault = missing acknowledgement (during brake release or at normal running) longer than time delay BRAKE FLT TD (Parameter 67.2) will trip the drive. | Check brake contactor operation.<br>Check wiring of digital output Brake Lift (DO1 = default) to contactor.<br>Check wiring of brake acknowledgement to digital input 1. |
| BR BROKEN (7110) | Brake resistor is not connected or it is damaged.<br>The resistance rating of the brake resistor is too high. | Check the resistor and the resistor connection.<br>Check that the resistance rating meets the specification. See the drive hardware manual. |
| BR OVERHEAT (7112) | Overload of the brake resistor. | Stop drive. Allow resistor to cool down.<br>Check parameter settings of resistor overload protection function (see parameter group 27 BRAKE CHOPPER).<br>Check that braking cycle meets the allowed limits.<br>Check that the supply AC voltage of the drive is not excessive. |
| BR WIRING (7111) | Wrong connection of brake resistor or too low resistance value used. | Check resistor connection and resistance value. Ensure brake resistor is not damaged. |

| Fault | Cause | Remedy |
|---|---|---|
| CHANGE MOTOR | Shared motion changeover is not performed correctly. | Make a motion change over (For instance gantry => boom) and press reset. |
| CHOPPER FLT | External chopper (NBRA) fault should always disconnect power to the converter.<br>A digital input e.g. DI4 ("1"=OK) can be connected to monitor the external braking chopper fault contact.<br>Faulty chopper will trip the drive, display fault on panel and give indication to the supervisory system. The chopper fault will also activate the Watchdog output signal, to be used for Emergency stop of crane | Check external braking chopper (NBRA type).<br>Check wiring from chopper (NO) fault contact to e.g. digital input 4.<br>Check inhibit input on braking chopper. (NC) |
| COMM MODULE (7510) | Communication between drive and Fieldbus adapter module not working properly longer than time delay COMM FLT TIME-OUT (Parameter 30.13). | Check Fieldbus adapter and it's connection fibers to RDCO-0x channel 0.<br>Check cable connections.<br>Check if master can communicate |
| CTRL B TEMP (4110) | RMIO control board temperature is lower than -5...0 °C or exceeds +73...82 °C | Check air flow and fan operation. |
| CURR MEAS (2211) | Current transformer failure in output current measurement circuit. | Check current transformer connections to Main Circuit Interface Board, INT. |
| CUR UNBAL xx (2330) | Drive has detected excessive output current unbalance in inverter unit of several parallel connected inverter modules. This can be caused by external fault (earth fault, motor, motor cabling, etc.) or internal fault (damaged inverter component). xx (2 … 12) refers to inverter module number. | Check motor.<br>Check motor cable.<br>Check that there are no power factor correction or surge absorbers in motor cable. |
| DC HIGH RUSH (FF80) | Drive supply voltage is excessive. 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, drive rated voltage and allowed voltage range of drive. |
| DC OVERVOLT (3210) | Intermediate circuit DC voltage is excessive. DC overvoltage trip limit is $1.3 \cdot U_{1max}$ , where $U_{1max}$ is the maximum value of the mains voltage range. For 400 V units, $U_{1max}$ is 415 V. For 500 V units, $U_{1max}$ is 500 V. The actual voltage in the intermediate circuit corresponding to the mains voltage trip level is 728 Vdc for 400 V units and 877 Vdc for 500 V units. | Check Braking Chopper and Resistor.<br>Check deceleration time parameters.<br>Check mains for static or transient overvoltages. |
| DC UNDERVOLT (3220) | Intermediate circuit DC voltage is not sufficient. This can be caused by a missing mains phase, a blown fuse or a rectifier bridge internal fault.<br>DC undervoltage trip limit is $0.65 \cdot U\ 1min$ , where U1min is the minimum value of the mains voltage range. For 400 V and 500 V units, U 1min is 380 V<br>The actual voltage in the intermediate circuit corresponding to the mains voltage trip level is 334 Vdc. | Check mains supply and fuses.<br>Check DC capacitors for leakage |

| Fault | Cause | Remedy |
|---|---|---|
| EARTH FAULT (2330) | Drive has detected load unbalance typically due to earth fault in motor or motor cable. | Check motor.<br>Check motor cable.<br>Check there are no power factor correction capacitors or surge absorbers in motor cable. |
| ELECTR SHAFT | The Slave drive in Electrical shaft control has detected a Master-Slave position counter difference above limit set in parameter 73.5 POS ERROR LIMIT. | In Slave drive check parameters 73.2-73.5 setting.<br>Check following settings in Master and Slave drive: 50.1, 69.1-69.5, 70.1<br>Check group 23 speed controller settings |
| ENCODER A<>B (7302) | Pulse encoder phasing is wrong. Phase A is connected to terminal of phase B and vice versa. | Interchange connection of pulse encoder phases A and B. |
| ENCODER ERR (7301) | Speed measurement fault detected. This can be caused by:<br>- Loose cable connection<br>- Communication timeout to RTAC or NTAC module<br>- Faulty pulse encoder<br>- Difference (filtered) between internal calculated and measured actual speed is greater than 20% of motor nominal speed<br>- No encoder pulses received (e.g. motor not rotating at start) within time set in par. 50.4 ENCODER DELAY while drive is in current or torque limit | Check settings of Parameter Group 50.<br>Check pulse encoder and it's cabling including Ch A and Ch B phasing. The sign of the signal 2.17 SPEED MEASURED must be the same as int. calculated speed 1.02 MOTOR SPEED when rotating the motor (set parameter 70.3 SPEED FEEDB USED = FALSE during this test). If not, exchange channels A and B.<br>Check connection between the RMIO board and the RTAC module.<br>Check for proper earthing of equipment.<br>Check for highly emissive components nearby. |
| EXTERNAL FLT (programmable Fault Function) | Fault in external device. (This information is configured through one of programmable digital inputs.) | Check external devices for faults.<br>Check parameter group 30 FAULT FUNCTIONS. |
| FOLL FLT | Follower drive is in faulty state (tripped).<br>Indication given in Master drive if M/F ctrl. Macro active. | Check fault text on Follower drive panel. |
| GD DISABLED X (FF7A) | AGPS power supply of R8i inverter module has been switched off during run. X (1…12) refers to inverter module number. | Check Prevention of Unexpected Start-up circuit with safety relay A40.<br>Replace AGPS board of inverter module. |
| ID RUN FAIL (FF84) | Motor ID Run is not completed successfully. | Check maximum speed (parameter 20.02). It should be at least 80 % of motor nominal speed (parameter 99.08). |

| Fault | Cause | Remedy |
|---|---|---|
| INT CONFIG (5410) | Number of inverter modules is not equal to original number of inverters. | Check status of inverters. See signal 2.34 INT FAULT INFO.<br>Check fibre optic cables between APBU and inverter modules.<br>If Reduced Run function is used, remove faulted inverter module from main circuit and write number of remaining inverter modules into parameter 16.10 INT CONFIG USER. Reset drive. |
| INV DISABLED (3200) | Optional DC switch has opened while unit was running or start command was given. | Close DC switch.<br>Check AFSC-0x Fuse Switch controller unit. |
| INV OVERLOAD | If running inverter in overload condition during braking i.e. IGBT overtemp alarm active + >10% braking power + speed >5% for more than 200 ms the drive will trip, display fault on panel and give indication to the supervisory system. | Check Torque and Current limit settings.<br>Check ramp time setting (69.2 - 5) and fieldbus RATE signal<br>Check pulse encoder connections (A and B) to RTAC or NTAC module (if used).<br>Check brake operation. |
| I/O COMM ERR (7000) | Communication error on the control board, channel CH1.<br>Electromagnetic interference. | Check connections of fiber optic cables on RDCO board channel CH1.<br>Check all I/O modules (if present) connected to channel CH1, e.g. their node ID selector switch S1 setting.<br>See I/O Extension Manuals. |
| LINE CONV (FF51) | Fault in the line side converter (only in ACC811 type drive). | Change the CDP panels monitored device from motor side converter to line side converter, by using DRIVE key on panel (see Table 2-9).<br>Read line side converter fault message. See line side converter manual for fault description. |
| MAS OSC FLT | If "next edge" of the communication test bit is not received within a certain time COMTEST FLT TD (Parameter 71.1 ), the drive will trip. | Check fieldbus adapter and its connection to RDCO-0x channel 0.<br>Check that PLC program connection comm. Test bit from input to output.<br>Check fieldbus wiring. |
| MF COMM ERR (Parameter 72.10) | Master/Follower bus communication not active. Communication test bit not received within time M/F COMM ERR TD<br>Or in Broadcast mode:<br>Follower has not received any message from Master within 100 ms timeout (can be due to Ch2 configuration change). | Check M/F bus connections and fibres between the Master drive channel 2 and the Follower drive channel 2.<br>Check setting of parameter 72.1 MAST/FOLL MODE:<br>Should be set to "MASTER" in Master drive and set to FOLLOWER" in Follower drive. |
| MF RUN FLT | Both Master and Follower drive receiving start-order, but only one of the drives are in "Running" state. | Check Setting of parameter 72.9 M/F FAULT TD.<br>Check M/F bus connections and fibres |

| Fault | Cause | Remedy |
|---|---|---|
| MOTOR PHASE (FF56) (programmable Fault Function 30.10) | 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. | Check motor and motor cable.<br>Check thermal relay (if used).<br>Check MOTOR PHASE Fault Function parameters (see chapter 6). Passivate this protection. |
| MOT OVERSP | If the speed exceeds the level determined by MOT OVERSPEED LEV ( 61.3) then the drive is tripped momentarily. | Check Torque and Current limit settings.<br>Check motor and motor cables.<br>Check pulse encoder connections (A and B) to RTAC module (if used). |
| MOTOR TEMP (4310) (programmable Fault Function 30.4... 30.9) | Motor temperature is too high (or appears to be too high). This can be caused by excessive load, insufficient motor power, inadequate cooling or incorrect start-up data. | Check motor ratings and load.<br>Check start-up data.<br>Check MOTOR TEMP Fault Function parameters (see chapter 6, group 30). |
| NO COMMUNICATION (X) | Panel comm. lost due to RMIO restarted (from 24V supply dip).<br>Or there is no Bus Administrator connected to the CDP panel link. | Press Reset. Check 24V supply quality.<br>Check from the Drive Selection Mode if there is a Bus Administrator connected. If not, see chapter 2, for further advice.<br>Check the cabling. |
| | The selected drive is not present on the panel link. The panel link does not work because of hardware malfunction or problem in cabling. | Go to Drive Selection Mode by pressing DRIVE. Press **ENTER**. Set the ID number to 1. Press **ENTER**.<br>If the panel does not communicate with the drive, set the ID number of the drive to 1 as explained in chapter 2. If the above remedies do not help, write down the code from the fault message and contact ABB Service. |
| NO MOT DATA (FF52) | Motor data is not given or motor data does not match with inverter data. | Check motor data parameters 99.04 … 99.09 |
| OVERCURR xx (2310) | Overcurrent fault in inverter unit of several parallel connected inverter modules. xx (2 … 12) refers to inverter module number. | Check motor load.<br>Check acceleration time.<br>Check motor and motor cable (including phasing)<br>Check encoder cable (including phasing).<br>Check motor nominal values from parameter group 99 START-UP DATA to confirm that motor model is correct.<br>Check that there are no power factor correction or surge absorbers in motor cable. |
| OVERCURRENT (2310) | Output current is excessive. The software overcurrent trip limit is 3.5 · Ihd . | Check motor load.<br>Check acceleration time.<br>Check the motor and motor cable.<br>Check there are no power factor correction capacitors or surge absorbers in the motor cable. |

| Fault | Cause | Remedy |
|---|---|---|
| OVERFREQ (7123) | Motor is turning faster than the highest allowed speed. This can be caused by an incorrectly set minimum/ maximum speed, insufficient braking torque or changes in the load when using torque reference.<br>The trip level is 40 Hz over the operating range absolute maximum speed limit (Direct Torque Control mode active) or frequency limit (Scalar Control active). The operating range limits are set by Parameters 20.1 and 20.2 (DTC mode active) or 20.8 and 20.9 (Scalar control active). | Check the minimum/maximum speed settings.<br>Check the adequacy of motor braking torque.<br>Check the applicability of torque control.<br>Check the need for a Braking Chopper and Braking Resistor.<br>Parameter 20.1 must be set to a value not greater than 3000/(number of pole pairs) rpm. |
| PANEL/DW COM (programmable Fault Function par. 30.2) | The Control Panel or DriveWindow selected as active Local control location for the CraneDrive has ceased communicating. | Check CDP312R Control Panel or DriveWindow-PC connection.<br>Replace Control Panel in the mounting platform. Restart DriveWindow tool.<br>Check PANEL LOSS Fault Function parameter (see chapter 6, parameter 30.2). |
| PANEL LOSS (5300) (programmable Fault Function) | Control panel or DriveWindow selected as active control location for drive has ceased communication | Check panel connection (see appropriate hardware manual.)<br>Check control panel connector.<br>Replace control panel in mounting platform.<br>Check Fault Function parameters.<br>Check DriveWindow connection. |
| POWERF INV xx (3381) | INT board powerfail in inverter unit of several parallel connected inverter modules. xx refers to inverter module number. | Check that INT board power cable is connected.<br>Check that POW board is working correctly.<br>Replace INT board. |
| PPCC LINK (5210) | INT board current measurement or communication fault between the RMIO and INT boards. This fault is masked when drive is off (no motor current).<br>This masking can be disabled by setting parameter 97.7=False (passcode=5600 to open group 97). | Check the fibre optic cables connected between RMIO and INT boards. In parallel connected inverters, check also cabling for aPBU board (+ signal 2.28). Check for short circuit in the power stage. This can cause overload of the INT auxiliary power and result in PPCC communication failure. |
| PPCC LINK xx | AINT board fibre optic connection fault in inverter unit of several parallel connected inverter modules. xx refers to inverter module number. | Check connection from inverter module Main Circuit Interface Board, AINT to PPCC Branching Unit, APBU or NPBU. (Inverter module 1 is connected to APBU INT 1 etc.) |
| PP OVERLOAD (5482) | Excessive IGBT junction to case temperature. This fault protects IGBT(s). It can be caused by excessive load at low frequencies (e.g. fast direction change with excessive load and inertia). It can also be activated by short circuit at output of long motor cables. | Check inverter cooling.<br>Check inverter dimensioning.<br>Increase speed reference ramp time.<br>Reduce load.<br>Check motor cables. |

| Fault | Cause | Remedy |
|---|---|---|
| SC INV xx y (2340) | Short circuit in inverter unit of several parallel connecte inverter modules. xx (1 … 12) refers to inverter module number and y refers to phase (U, V, W). | Check motor and motor cable.<br>Check power semiconductors (IGBTs) of inverter module. |
| SHORT CIRCUIT (2340) | There is a short-circuit in the motor cable(s) or motor. | Check the motor and motor cable.<br>Check there are no power factor correction capacitors or surge absorbers in the motor cable. |
| | The output bridge of the converter unit is faulty. | Check output semiconductors and current transducers. If detecting a faulty IGBT, replace also INT board. |
| START INHIBI | Optional start inhibit hardware logic is activated. | Check start inhibit circuit (AGPS board) |
| SUPPLY PHASE (3130) | Intermediate circuit DC voltage is oscillating due to missing mains phase, blown fuse or rectifier bridge internal fault.<br>Trip occurs when DC voltage ripple is 13 % of DC voltage. | Check main fuses.<br>Check for mains supply imbalance. |
| TEMP DIF xx y | Excessive temperature difference between several parallel connected inverter modules. xx (1 … 12) refers to inverter module number and y refers to phase (U, V, W).<br>Alarm is indicated when temperature difference is 15°C. Faults is indicated when temperature difference is 20°C.<br>Excessive temperature can be caused e.g. by unequal current sharing between parallel connected inverters. | Check cooling fan.<br>Replace fan.<br>Check air filters. |
| THERMAL MODE (FF50) | The motor thermal protection mode is incorrectly set to DTC for a high-power motor (> 800 A). | Change parameter 30.5 MOT THERM P MODE from DTC to USER MODE (also adjust parameter 30.6). |
| THERMISTOR (4311) (programmable Fault Function 30.4... 30.5) | Motor thermal protection mode selected as THERMISTOR and the temperature is excessive. | Check motor ratings and load.<br>Check start-up data.<br>Check thermistor connections for digital input DI6.<br>Check thermistor cabling. |
| TORQ FLT | If SPEED ERROR during constant speed is higher than SP DEV LEV (62.2 ) for a time longer than TORQ FLT TD (62.3 ) the drive will trip for TORQ FLT. | Check ramp times.<br>Check Torque and Current limit settings.<br>Check Torque monitoring (Group) parameter settings.<br>Check motor and motor cables.<br>Check pulse encoder connections (A and B) to RTAC module (if used). |
| TORQ PR FLT | If torque proving is not successful, that means torque does not reach the test level within the time TORQ PROV FLT TD (66.2), the drive will trip. (Normally only used if active load, e.g. hoist drive, with pulse encoder feedback. | Check motor and motor cables.<br>Check if setting of parameter 21.2 Control Magnetising time is to low. |
| USER MACRO (FFA1) | There is no User Macro saved or the file is defective. | Create the User Macro again. |

# Maintenance

The ACS800 requires minimum maintenance. It is recommended that the unit be kept under more close monitoring after the start-up. There is only need for the routine check-up once operations have stabilised.

The following safety instructions should be followed in the maintenance work.

**WARNING!** The maintenance work should only be undertaken by a qualified electrician. No measurements, parts replacements or other service procedures not described in this manual should be attempted. Disconnect mains power if fault tracing involves work inside the frame, the motor or the motor cable. Wait 5 minutes for the intermediate circuit capacitors to discharge. The ACS800 can contain dangerous voltages from external control circuits. Exercise appropriate care when working on the unit. Neglecting these instructions can cause physical injury and death.

**WARNING!** The printed circuit boards contain integrated circuits that are extremely sensitive to electrostatic discharge. Exercise propitiate care when working on the unit to avoid permanent damage to the circuits.

### Heatsink

The heatsink fins pick up dust from the cooling air. The rate of pick-up depends on the frequency converter usage and the amount and type of contamination in the ambient air. The heatsink needs regular cleaning to ensure heat dissipation. The ACS800 can run into overtemperature Warnings and Faults if the heatsink is not cleaned regularly.

In normal environment, the heatsink should be checked and cleaned annually. Frequency converters operating in extreme conditions will need to be cleaned more often. The best cleaning frequency must be tried out experimentally.

The dust should be removed gently with a soft brush if the cleaning is carried out in the same room where the unit is normally operated. Compressed air should not be used for cleaning unless the installation can be taken apart and the cleaning is carried out in another room (or outdoors). Fan rotation should be prevented (in order to prevent bearing wear) when using compressed air for heatsink cleaning.

### Fan

The cooling fan minimum lifetime is calculated at about 60 000 hours, but in an average installation the fan is likely to operate considerably longer. The actual lifetime depends on the frequency converter usage and ambient temperature.

The fan is completely sealed and its lifetime cannot be prolonged with cleaning or lubrication. Fan rotation must be prevented when compressed air is used for cleaning heatsink fins.

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heatsink temperature in spite of heatsink cleaning. If the frequency converter is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing.

Fan failure will be self-evident due to the overtemperature Warnings and Faults. After the heatsink has cooled it is possible to reset the Warning/Fault and briefly operate the motor in a critical application.

A replacement fan is available from ABB. Do not attempt operation with other than ABB specified spare parts. The fan can be withdrawn by removing the bottom of the frame.

### Capacitors

The ACS800 intermediate circuit employs several electrolytic capacitors. The minimum lifetime of these capacitors is calculated at about 100 000 hours, but in an average installation the capacitors are likely to operate considerably longer. The actual lifetime depends on the frequency converter loading and the ambient temperature.

Capacitor life can be prolonged by lowering the ambient temperature. It is not possible to predict capacitor failure.

Capacitor failure is usually followed by a mains fuse failure or a Fault trip. Contact ABB if capacitor failure is suspected. Replacements are available from ABB. Do not attempt operation with other than ABB specified spare parts.

Relays and Contactors Frames R2 and R3 are fitted with a relay and frame R4 employs a contactor as a part of the charging circuit. The minimum estimated life spans for the relays and contactors are 100,000 and 1,000,000 operations respectively, but in average applications they are likely to operate considerably longer. The need for renewal of these components depends directly on the frequency of charging cycles.

Relay and contactor replacements are available from ABB. Do not attempt operation with other than ABB specified spare parts.

# Appendix A - Complete Parameter and Default Settings

The tables in this appendix list all the actual signals, parameters, and alternative settings for the CraneDrive. Use these tables as reference when you are customizing macros for your CraneDrive application.

| Signal name | Short name | Range/Unit | Fieldbus scaling |
|---|---|---|---|
| ACTUAL SIGNALS (Group 1) | | | |
| 1 SPEED ESTIMATED | SP ESTIM | rpm | 20000 = par. 69.01 |
| 2 MOTOR SPEED FILT | SPEED | rpm | 20000 = par. 69.01 |
| 3 FREQUENCY | FREQ | Hz | 100 = 1 Hz |
| 4 MOTOR CURRENT | CURRENT | A | 10 = 1 A |
| 5 MOTOR TORQUE FILT | TORQUE | % | 10000 = 100 % of motor nominal torque |
| 6 POWER | POWER | % | 1000 = 100 % of motor nominal power (par..99.09) |
| 7 DC BUS VOLTAGE V | DC BUS V | V | 1 = 1 V |
| 8 MAINS VOLTAGE | MAINS V | V | 1 = 1 V |
| 9 OUTPUT VOLTAGE | OUT VOLT | V | 1 = 1 V |
| 10 ACS 800 TEMP | ACS TEMP | % | 10 = 1 % |
| 11 APPLICATION MACRO | MACRO | CRANE; M/F CTRL; USER 1 LOAD; USER 2 LOAD | 1 = 1<br>(1 … 6 acc. par. 99.02) |
| 12 SPEED REF | SPEEDREF | rpm | 20000 = par. 69.01 (or 80.33) |
| 13 CTRL LOCATION | CTRL LOC | LOCAL; I/O CTRL 1; FIELDBUS; M/F CTRL; I/O CTRL 2 | 1 … 4 |
| 14 OP HOUR COUNTER | OP HOUR | h | 1 = 1 h |
| 15 KILOWATT HOURS | KW HOURS | kWh | 1 = 100 kWh |
| 16 IDENTIF RUN DONE | ID RUN | True, False | 65535 = True, 0 = False |
| 17 DI7-1 STATUS | DI7-1 | | 1 = 1 (0 … 127) |
| 18 AI1 [V] | AI1 [V] | V | 10 = 1 V |
| 19 AI2 [mA] | AI2 [mA] | mA | 10 = 1 mA |
| 20 EXT AI1 [V] | EXT AI1 | V | 10 = 1 V |
| 21 RO3-1 STATUS | RO3-1 | | 1 = 1 (0 … 7) |
| 22 AO1 [mA] | AO1 [mA] | mA | 10 = 1 mA |
| 23 AO2 [mA] | AO2 [mA] | mA | 10 = 1 mA |
| 24 TOTAL INERTIA | INERTIA | kgm2 | 10 = 1 kgm2 |
| 25 EXT DI6-1 STATUS | EXT DI6-1 | | 1 = 1 (0 … 63) |
| 26 EXT RO4-1 STATUS | EXT RO4-1 | | 1 = 1 (0 … 15) |
| 27 MOTOR RUN-TIME | RUN-TIME | h (Hours) | 1 = 10 h |
| 28 MOTOR TEMP EST | MOT TEMP | C (deg Celcius) | 1 = 1 deg C |
| 29 CTRL BOARD TEMP | CTRL B T | C (deg Celcius) | 1 = 1 deg C |
| 30 FAN ON TIME | FAN TIME | h | 1 = 10 h |
| 31 AI3 [mA] | AI3 [mA] | mA | 10 = 1 mA |
| 32 TOTAL OPER TIME | OPERTIME | hrs | 10 = 1 h |
| 33 LOAD TORQUE ton | LOAD ton | ton | 100 = 1 ton |
| 34 LOAD SPEC FACT Km | FACT Km | | 100 = 1 |
| 35 LIFETIME LEFT % | LIFETIME | % | 1 = 1 % |
| 36 MOTOR SELECTED | MOT SEL | NONE; MOTOR 1; MOTOR 2 | 1 ... 3 |

| Signal name | Range/Unit | Description | Fieldbus scaling |
|---|---|---|---|
| INT SIGNALS (Group 2) | | | |
| 1 SPEED REF 2 | rpm | Ramp input reference limited by speed limits (parameters 20.1 & 20.2) | 20000 = par. 69.01 |
| 2 SPEED REF 3 | rpm | Ramp output reference | 20000 = par. 69.01 |
| 3 SPEED REF 4 | rpm | Total speed reference = ramp output reference + speed correction reference | 20000 = par. 69.01 |
| 4 SPEED ERROR NEG | rpm | Actual speed - total speed reference | 20000 = par. 69.01 |
| 5 TORQUE PROP REF | % | Speed controller proportional part output | 10000 = 100 % of motor nominal torque |
| 6 TORQUE INTEG REF | % | Speed controller integration part output | 10000 = 100 % of motor nominal torque |
| 7 TORQUE DER REF | % | Speed controller derivative part output | 10000 = 100 % of motor nominal torque |
| 8 TORQ ACC COMP REF | % | Acceleration compensation reference | 10000 = 100 % of motor nominal torque |
| 9 TORQUE REF1 | % | Torque reference input to drive (torque ramp output) | 10000 = 100 % of motor nominal torque |
| 10 TORQUE REF2 | % | Speed controller total output + acceleration compensation reference.<br>Limited with parameters 20.4 & 20.5 (or 80.9 & 80.10) | 10000 = 100 % of motor nominal torque |
| 11 TORQUE REF3 | % | Output of "Torque Selector", see parameter 72.2 | 10000 = 100 % of motor nominal torque |
| 12 TORQUE REF4 | % | Torque ref 3 + Load compensation | 10000 = 100 % of motor nominal torque |
| 13 TORQUE REF | % | Torque ref 4 + Torque step | 10000 = 100 % of motor nominal torque |
| 14 TORQ USED REF | % | Final torque reference used by torque controller (Torque ref 5 with limits) | 10000 = 100 % of motor nominal torque |
| 15 MOTOR TORQUE | % | Actual motor torque | 10000 = 100 % of motor nominal torque |
| 16 FLUX ACT | % | Actual motor flux | 1000 = 100 % |
| 17 SPEED MEASURED | Rpm | Measured (RTAC or NTAC) motor speed | 20000 = par. 69.01 |
| 18 POS ACT PPU | +/- 32767 | Position measurement value (scaled with parameter 70.1) | 1 = 1 |
| 19 START | True; False | Start-order (Local or External) | 65535 = True, 0 = False |
| 20 RUNNING | True; False | Drive running acknowledgment | 65535 = True, 0 = False |
| 21 BRAKE LIFT | True; False | Brake lift order | 65535 = True, 0 = False |
| 22 FAULT | True; False | Drive fault indication (tripped) | 65535 = True, 0 = False |
| 23 "not used | | | " |
| 24 SPEED CORR | Rpm | Speed correction reference | 1 = 1 rpm |
| 25 POWOP SPEEDREF | % | Power optimization calculated speed reference (enabled with "High speed" signal) | 1000 = 100 % |
| 26 ELSHAFT POS ERROR | | Electric Shaft control position error in Slave drive (Slave Posact - Master Posact). Scaling according to parameter 70.1 POS SCALE setting (or 80.39). | 1 = 1 |
| 27 LIMIT WORD 1 | 0 - FFFF Packed boolean (Hex) | Limit word indicating if drive is running in any limitation, For bit details see section 4.3 | 1 = 1 (0 … 65535) |
| 28 FAULTED INT INFO | 0 - FFFF Packed boolean (Hex) | INT board fault info, For bit details see section 4.3 | 1 = 1 (0 … 65535) |
| 29 TORQUE SELECTOR | ZERO; SPEED; TORQUE; MIN; MAX; ADD | Torque reference (2.11) selector setting used:<br>0 = Zero control (not used in CraneDrive)<br>1 = Speed control (Torq ref 2)<br>2 = Torque control (Torq ref 1)<br>3 = Minimum control (min of Torq ref 1 and 2)<br>4 = Maximum control (max of Torq ref 1 and 2)<br>5 = Add control (sum of Torq ref 1 and 2) | 1 = 1 (0 … 5) |
| 30 dV/dt | rpm/s | Speed reference ramp derivative | 20000 = par. 69.01 |
| 31 LOAD TORQUE % | % Tn (Integer scaling: 10=1%) | Calculated load torque in % of motor nominal torque (filtered with par. 68.10) | 1000 = 100 % |
| 32 LIMIT WORD INV | 0 - FFFF Packed boolean (Hex) | Limit word indicating details if bit 4 in TORQ INV CUR LIM of 2.27 Limit Word 1 is set. For bit details see section 4.3 | 1 = 1 (0 … 65535) |
| 33 INT SC INFO | 0 - FFFF Packed boolean (Hex) | Information word on location of Short circuit fault. For bit details see section 4.3 | 1 = 1 (0 … 65535) |
| 34 INT CONFIG WORD | INT CONF | Information word on available parallel connected R8i modules. For bit details, see section 4.3. | 1 = 1 (0 … 65535) |

| Signal name | Range/Unit | Description | Fieldbus scaling |
|---|---|---|---|
| FB REC WORDS (Group 3) | | | |
| 1 FB COMMAND WORD | 0 - FFFF Packed boolean (Hex) | Fieldbus Command Word, Dataset 1 Word 1, For bit details see section 5.6.12 | 1 = 1 (0 … 65535) |
| 2 FB SPEED REF | % | Fieldbus Speed Reference, Dataset 1 Word 2 | 10000 = 100 % |
| 3 FB TORQ REF | % | Fieldbus Torque Reference, Dataset 1 Word 3 | 10000 = 100 % |
| 4 FB RAMP RATE | | Fieldbus Ramp rate, Dataset 3 Word 1, see table 5-5 for details. | 1000 = 1 |
| 5 FB SPEED CORR | % | Fieldbus Speed Correction reference, Dataset 3 Word 2 | 10000 = 100 % |
| 6 FB POS PRECOUNT | (mm) | Fieldbus Position Precount value, Dataset 3 Word 3 | 1 = 1 |
| 7 FB AUX COMM WORD | 0 - FFFF Packed boolean (Hex) | Fieldbus Aux Command Word, Dataset 5 Word 1, For bit details see section 5.6.12 | 1 = 1 (0 … 65535) |
| 8 FB LOAD MEAS REF | % | Fieldbus Load Measure Reference, Dataset 5 Word 2 (or PLC signal to DW) | 10000 = 100 % |
| 9 FB DS5 WORD3 | 0 - FFFF Packed boolean (Hex) | Fieldbus Dataset 5 Word 3 (For boolean PLC signals to DriveWindow, 8 ms updating time) | 1 = 1 (0 … 65535) |
| 10 FB DS7 WORD1 | Integer +/- 32767 | Fieldbus Dataset 7 Word 1, see section 6.2.34 for details (or PLC signal to DW) | 1 = 1 (-32768 … 32767) |
| 11 FB DS7 WORD2 | Integer +/- 32767 | Fieldbus Dataset 7 Word 2, see section 6.2. 34 for details (or PLC signal to DW) | 1 = 1 (-32768 … 32767) |
| 12 FB DS7 WORD3 | Integer +/- 32767 | Fieldbus Dataset 7 Word 3, see section 6.2. 34 for details (or PLC signal to DW) | 1 = 1 (-32768 … 32767) |
| 13 FB DS9 WORD1 | Integer +/- 32767 | Fieldbus Dataset 9 Word 1, see section 6.2. 34 for details (or PLC signal to DW) | 1 = 1 (-32768 … 32767) |
| 14 FB DS9 WORD2 | Integer +/- 32767 | Fieldbus Dataset 9 Word 2, see section 6.2. 34 for details (or PLC signal to DW) | 1 = 1 (-32768 … 32767) |
| 15 FB DS9 WORD3 | Integer +/- 32767 | Fieldbus Dataset 9 Word 3, see section 6.2. 34 for details (or PLC signal to DW) | 1 = 1 (-32768 … 32767) |

| Signal name | Range/Unit | Description | Fieldbus scaling |
|---|---|---|---|
| FB TRA WORDS (Group 4) | | | |
| 1 FB STATUS WORD | 0 - FFFF Packed boolean (Hex) | Fieldbus Status Word, Dataset 2 Word 1, For bit details see section 5.6.12 | 1 = 1 (0 … 65535) |
| 2 FB FAULT WORD 1 | 0 - FFFF Packed boolean (Hex) | Fieldbus Fault Word 1, Dataset 6 Word 1, For bit details see section 5.6.12 | 1 = 1 (0 … 65535) |
| 3 FB FAULT WORD 2 | 0 - FFFF Packed boolean (Hex) | Fieldbus Fault Word 2, Dataset 6 Word 2, For bit details see section 5.6.12 | 1 = 1 (0 … 65535) |
| 4 FB ALARM WORD | 0 - FFFF Packed boolean (Hex) | Fieldbus Alarm Word, Dataset 6 Word 3, For bit details see section 5.6.12 | 1 = 1 (0 … 65535) |
| 5 FB AUX STATUSWORD | 0 - FFFF Packed boolean (Hex) | Fieldbus Aux Status Word, Dataset 12 Word 1, For bit details see section 5.6.12 | 1 = 1 (0 … 65535) |

| Signal name | Range/Unit | Description |
|---|---|---|
| INFORMATION (Group 5) | | |
| 1 SW PACKAGE VER | e.g. ACXR7400 | Version of the complete ACC 800 software package |
| 2 APPLIC SW VERSION | e.g. ACAR7400 | Version of the ACC 800 application software |
| 3 TEST DATE | ddmmyy (Day Month Year) | Converter factory test date |
| 4 INVERTER TYPE | e.g. SR0040_3 | ACS800 Converter type |
| 5 ACS800 - | CraneDrive | ACS800 Application type |

| Signal name | Description |
|---|---|
| ID RUN DATA (Group 6) | The group shows the actual used motor model data from group 81 or 82 |
| 1 MOTOR NOM COS FII | 8*.06 MOTOR NOM COS FII * |
| 2 INV NOM VOLTAGE | 8*.07 INV NOM VOLTAGE * |
| 3 I NOM HEAVY DUTY | 8*.08 I NOM HEAVY DUTY * |
| 4 INV THRESHOLD VOLT | 8*.09 INV THRESHOLD VOLT * |
| 5 "Blank | "8*.10 RS_20 * |
| 6 "Blank | "8*.11 IMAGN * |
| 7 "Blank | "8*.12 IREF_OFFS * |
| 8 "Blank | "8*.13 SIGLS * |
| 9 "Blank | "8*.14 SIGLS0 * |
| 10 "Blank | "8*.15 SIGLS2 * |
| 11 "Blank | "8*.16 SIGLS_SATF * |
| 12 "Blank | "8*.17 LS_SIGLS * |
| 13 "Blank | "8*.18 LS_SIGLS0 * |
| 14 "Blank | "8*.19 LS_SIGLS1 * |
| 15 "Blank | "8*.20 LS_SIGLS_SATF1 * |
| 16 "Blank | "8*.21 LS_SIGLS_SATM * |
| 17 "Blank | "8*.22 LS_SIGLS_SATM1 * |
| 18 "Blank | "8*.23 LS_SIGLS_SATM2 * |
| 19 "Blank | "8*.24 EFF_MOT_NOM * |
| 20 ZER_COEF1 | 8*.25 ZER_COEF1 * |
| 21 ZER_GAIN | 8*.26 ZER_GAIN * |
| 22 "Blank | "8*.27 SYSSAT3 * |
| 23 "Blank | "8*.28 SYSSAT5 * |
| 24 "Blank | "8*.29 IA_GAIN * |
| 25 "Blank | "8*.30 IC_GAIN_ER * |
| 26 "Blank | "8*.31 IA_OFFS_ER * |
| 27 "Blank | "8*.32 IC_ OFFS_ ER * |
| 28 MOTOR THERM TIME | 8*.33 MOTOR THERM TIME * |

## Parameter Settings

| Parameter | Alternative Settings | Default setting | Fieldbus scaling |
|---|---|---|---|
| **99 START-UP DATA** | | | |
| 99.1 LANGUAGE | ENGLISH; ENGLISH AM; DEUTSCH; ITALIANO; ESPANOL; PORTUGUES; NEDERLANDS; FRANCAIS; DANSK; SUOMI; SVENSKA; CESKY; POLSKI; PO-RUSSKI | ENGLISH | 1 = 1 (0 … 13) |
| 99.2 APPLICATION MACRO | CRANE; M/F CTRL; USER 1 LOAD; USER 1 SAVE; USER 2 LOAD; USER 2 SAVE | CRANE | 1 = 1 (1 … 6) |
| 99.3 APPLIC RESTORE | NO; YES | NO | 0 = NO<br>65535 = YES |
| 99.4 MOTOR CTRL MODE | DTC; SCALAR | DTC | 0 = DTC<br>65535=SCALAR |
| 99.5 MOTOR NOM VOLTAGE | ½ * UN of ACS 800 ... 2 * UN of ACS 800 (printed on the motor nameplate) | 0 V | 1 = 1 V |
| 99.6 MOTOR NOM CURRENT | 1/6 * Ihd of ACS 800 ... 2 * Ihd of ACS 800 (printed on the motor nameplate) | 0.0 A | 10 = 1 A |
| 99.7 MOTOR NOM FREQ | 8 Hz ... 300 Hz (printed on the motor nameplate) | 50.0 Hz | 100 = 1 Hz |
| 99.8 MOTOR NOM SPEED | 1 rpm ... 18 000 rpm (printed on the motor nameplate) | 1 rpm | 1 = 1 rpm |
| 99.9 MOTOR NOM POWER | 0 kW ... 9000 kW (printed on the motor nameplate) | 0.0 kW | 10 = 1 kW |
| 99.10 MOTOR ID RUN | ID MAGN; STANDARD; REDUCED | ID MAGN | 1 = 1 (1 … 3) |
| 99.11 DEVICE NAME | Drive section name, e.g. "Main Hoist | | " |
| | | | |
| **10 DIGITAL INPUTS** | | | |
| 10.1 BRAKE ACKN SEL | INTERNAL ACK; DI1; DI2; DI5; DI6; DI_IL | DI1 | 1 = 1 (1 … 6) |
| 10.2 ZERO POS SEL | NOT SEL; DI1; DI2; DI5; DI6; DI_IL | DI2 | 1 = 1 (1 … 6) |
| 10.3 SLOWDOWN-N SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; DI5+DI6; DI1.1+DI1.2; DI_IL | DI5 | 1 = 1 (1 … 12) |
| 10.4 FAST STOP-N SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; DI_IL | DI6 | 1 = 1 (1 … 10) |
| 10.5 POWER ON ACKN SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | NOT SEL | 1 = 1 (1 … 12) |
| 10.6 SYNC SEL | NOT SEL; DI1; DI2; DI3; DI4; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; DI_IL | NOT SEL | 1 = 1 (1 … 12) |
| 10.7 CHOPPER FLT-N SEL | NOT SEL; DI1; DI2; DI3; DI4; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; DI_IL | NOT SEL | 1 = 1 (1 … 12) |
| 10.8 STEP REF2 SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | NOT SEL | 1 = 1 (1 … 12) |
| 10.9 STEP REF3 SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | NOT SEL | 1 = 1 (1 … 12) |
| 10.10 STEP REF4 SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | NOT SEL | 1 = 1 (1 … 12) |
| 10.11 HIGH SPEED SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; DI_IL | NOT SEL | 1 = 1 (1 … 10) |
| 10.12 SNAG LOAD-N SEL | NOT SEL; DI1; DI2; DI3; DI4; DI5; DI6; DI_IL | NOT SEL | 1 = 1 (1 … 8) |
| 10.13 ACCELERATE SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; DI_IL | NOT SEL | 1 = 1 (1 … 10) |
| 10.14 FB STOPLIM SEL | NOT SEL; DI3+DI4; DI5+DI6; DI1.1+DI1.2 | NOT SEL | 1 = 1 (1 … 4) |
| 10.15 ELSHAFT ON SEL | NOT SEL; DI1; DI2; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI5; DI6; DI_IL | NOT SEL | 1 = 1 (1 … 12) |
| 10.16 FAULT RESET SEL | NOT SEL; DI1; DI2; DI3; DI4; DI5; DI6; DI_IL | NOT SEL | 1 = 1 (1 … 8) |
| 10.17 USER MACRO CH SRC | NOT SEL; DI1; DI2; DI3; DI4; DI5; DI6; COMM MODULE; DI_IL | NOT SEL | 1 = 1 (1 … 9) |
| 10.18 EXTERNAL FAULT | NOT SEL; DI1; DI2; DI3; DI4; DI5; DI6; DI_IL | NOT SEL | 1 = 1 (1 … 8) |
| 10.19 SECOND RAMP SEL | NORMAL RAMP; SECOND RAMP; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | NORMAL RAMP | 1 = 1 (1 ... 13) |
| 10.20 SECOND CTRL SEL | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | NOT SEL | 1 = 1 (1 ... 12) |
| 10.21 RUN ENABLE | NOT SEL; DI1; DI2; DI5; DI6; EXT DI1.1; EXT DI1.2; EXT DI2.1; EXT DI2.2; EXT DI1.3; EXT DI2.3; DI_IL | NOT SEL | 1 = 1 (1 ... 12) |
| | | | |

| | | | |
|---|---|---|---|
| **13 ANALOGUE INPUTS** | | | |
| 13.1 SCALE AI1 | 0 ... 4.000 | 1.000 | 1000 = 1 |
| 13.2 FILTER AI1 | 0 s ... 4.00 s | 0.02 s | 100 = 1 s |
| 13.3 SCALE AI2 | 0 ... 4.000 | 1.000 | 1000 = 1 |
| 13.4 FILTER AI2 | 0 s ... 4.00 s | 0.02 s | 100 = 1 s |
| 13.5 SCALE EXT AI1 | 0 ... 4.000 | 0.000 | 1000 = 1 |
| 13.6 FILTER EXT AI1 | 0 s ... 4.00 s | 0.02 s | 100 = 1 s |
| 13.7 AI1 0% REF LEV | -10.0 ... +10.0 V | 0.0 V | 10 = 1 V |
| | | | |
| **14 RELAY OUTPUTS** | | | |
| 14.1 RELAY RO1 OUTPUT | NOT USED; READY; RUNNING; FAULT; FAULT-N; CONTROL LOC; BRAKE LIFT; WATCHDOG-N; USER 1 OR 2; REVERSE; OVERSPEED; RDY FOR RUN; SPEED LIM 1; LIFETIME>90%; MOTOR1 SEL; MOTOR2 SEL | BRAKE LIFT | 1 = 1 (1 … 16) |
| 14.2 RELAY RO2 OUTPUT | See 14.1 | WATCHDOG-N | 1 = 1 (1 … 14) |
| 14.3 RELAY RO3 OUTPUT | See 14.1 | FAULT-N | 1 = 1 (1 … 14) |
| 14.4 EXT1 DO1 OUTPUT | See 14.1 | NOT USED | 1 = 1 (1 … 14) |
| 14.5 EXT1 DO2 OUTPUT | See 14.1 | NOT USED | 1 = 1 (1 … 14) |
| 14.6 EXT2 DO1 OUTPUT | See 14.1 | NOT USED | 1 = 1 (1 … 14) |
| 14.7 EXT2 DO2 OUTPUT | See 14.1 | NOT USED | 1 = 1 (1 … 14) |
| | | | |
| **15 ANALOGUE OUTPUTS** | | | |
| 15.1 ANALOGUE OUTPUT1 | NOT USED; MEAS SPEED; SPEED; FREQUENCY; CURRENT; SIGN TORQUE; POWER; DC BUS VOLT; OUTPUT VOLT; SIGN POSACT; SIGN SP REF | SPEED | 1 = 1 (1 … 11) |
| 15.2 INVERT AO1 | NO; YES | NO | 0 = NO; 65535 = YES |
| 15.3 MINIMUM AO1 | 0 mA; 4 mA | 0 mA | 1 = 0 mA; 2 = 4 mA |
| 15.4 FILTER ON AO1 | 0.00 s ... 10.00 s | 0.10 s | 100 = 1 s |
| 15.5 SCALE AO1 | 10 % ... 1000 % | 100% | 1 = 1 % |
| 15.6 ANALOGUE OUTPUT2 | NOT USED; SIGN SPEED; SPEED; FREQUENCY; CURRENT; TORQUE; POWER; DC BUS VOLT; OUTPUT VOLT; TORQUE REF; SIGN SP REF | TORQUE | 1 = 1 (1 … 11) |
| 15.7 INVERT AO2 | NO; YES | NO | 0 = NO; 65535 = YES |
| 15.8 MINIMUM AO2 | 0 mA; 4 Ma | 0 mA | 1 = 0 mA; 2 = 4 mA |
| 15.9 FILTER ON AO2 | 0.00 s ... 10.00 s | 2.00 s | 100 = 1 s |
| 15.10 SCALE AO2 | 10 % ... 1000 % | 100% | 1 = 1 % |
| | | | |
| **16 SYST CTR INPUTS** | | | |
| 16.2 PARAMETER LOCK | OPEN; LOCKED | OPEN | 0 = OPEN<br>65535 = LOCKED |
| 16.3 PASS CODE | 0 ... 30 000 | 0 | 1 = 1 |
| 16.5 MODIFY MOTOR DATA | NO; YES | NO | 0=NO; 65535= YES |
| 16.6 SHARED MOTION SEL | OFF; ON; FORCE MOT 1; FORCE MOT 2 | OFF | 1=1 (1…4) |
| 16.7 ID RUN DATA SAVE | NO; MOTOR1-GRP81; MOTOR2-GRP82 | NO | 1=1 (1…3) |
| 16.8 FAN SPD CTRL MODE | CONST 50HZ; RUN/STOP; CONTROLLED | CONST 50HZ | 1 = 1 (0 … 2) |
| 16.9 FUSE SWITCH CNTR | OFF; ON | OFF | 0 = OFF; 65535 = ON |
| 16.10 INT CONFIG USER | 0 … Int config (number of R8i modules configured in drive) | "Int config | "1 = 1 (0 … 12) |
| 16.11 FB SPEED/TQ CTRL | SPEED; SPEED/TORQUE | SPEED/TORQUE | 0 = SPEED;<br>65535 = SPEED/TORQUE |
| 16.12 RESET FAN ON TIME | NO; YES | NO | 0= NO; 65535= YES |
| | | | |
| **20 LIMITS** | | | |
| 20.1 MINIMUM SPEED | -10000 … 0 rpm | -1500 rpm | 1=1 rpm |
| 20.2 MAXIMUM SPEED | 0 … 10000 | 1500 rpm | 1=1 rpm |
| 20.3 MAXIMUM CURRENT A | 0.0 Amp ... Imax Amp | 1000.0 Amp | 10 = 1.0 A |
| 20.4 MAXIMUM TORQUE | 0.00 % ... 325.00 % | 200.00 % | 100 = 1.00 % |
| 20.5 MINIMUM TORQUE | -325.00 % … 0.00 % | -200.00 % | 100 = 1.00 % |
| 20.6 OVERVOLTAGE CTRL | ON; OFF | OFF | 0 = OFF; 65535 = ON |
| 20.7 UNDERVOLTAGE CTRL | ON; OFF | ON | 0 = OFF; 65535 = ON |
| 20.8 MINIMUM FREQ | - 300.00 Hz ... MAXIMUM FREQ Hz (value of par 20.9) (Visible if Scalar mode) | -50.00 Hz | 100 = 1 Hz |

| | | | |
|---|---|---|---|
| 20.9 MAXIMUM FREQ | MINIMUM FREQ Hz (value of par 20.8) ... 300.00 HZ<br>(Visible if Scalar mode) | 50.00 Hz | 100 = 1 Hz |
| 20.10 SPEED LIMIT AI3 | 0.0 % ... 100.0 % | 100.0 % | 10 = 1.0 % |
| 20.11 P MOTORING LIM | 0.0 % ... 600.0 % | 300.0 % | 100 = 1.0 % |
| 20.12 P GENERATING LIM | -600.0 % … 0.0 % | -300.0 % | 100 = 1.0 % |
| | | | |
| **21 START/STOP** | | | |
| 21.1 START FUNCTION | CNST DC MAGN | CNST DC MAGN | 3 = CONST DC MAGN |
| 21.2 CONST MAGN TIME | 30 ms ... 10000 ms | 500 ms | 1 = 1 ms |
| 21.4 DC HOLD | NO; YES | NO | 0 = NO; 65535 = YES |
| 21.5 DC HOLD SPEED | 0.0 … 10.0 % (visible only when 21.4 DC HOLD = YES) | 3.0 % | 10 = 1.0 % |
| 21.6 DC HOLD CURRENT | 0.0 … 100.0 % (visible only when 21.4 DC HOLD = YES) | 30.0 % | 1 = 1.0 % |
| | | | |
| **23 SPEED CTRL** | | | |
| 23.1 GAIN | 0.0 ... 200.0 | 15.0 | 100 = 1.0 |
| 23.2 INTEGRATION TIME | 0.01 ... 32.00 s | 0.50 s | 1000 = 1 s |
| 23.3 DERIVATION TIME | 0.0 ms ... 9999.8 ms | 0.0 ms | 1 = 1 ms |
| 23.4 ACC COMPENSATION | 0.00 s ... 1000.00 s | 0.00 s | 10 = 1 s |
| 23.5 SLIP GAIN | 0.0 % ... 400.0 % | 100.0% | 1 = 1 % |
| 23.6 AUTOTUNE RUN ? | NO; YES | NO | 0 = NO; 65535 = YES |
| 23.7 FEEDB FILTER TIME | 0.0 ... 999.9 ms | 4.0 ms | 1 = 1 ms |
| 23.8 SPEED STEP (only for DW) | -1500.00 … 1500.00 rpm | 0.00 rpm | 20000 = p.69.1 |
| | | | |
| **24 TORQUE CTRL** | (not visible if par 72.1 MAST/FOLL MODE = FOLLOWER) | | |
| 24.1 TORQ RAMP UP | 0.00 s ... 120.00 s | 0.00 s | 100 = 1 s |
| 24.2 TORQ RAMP DOWN | 0.00 s ... 120.00 s | 0.00 s | 100 = 1 s |
| 24.3 TORQ STEP (only for DW) | -300.00 … 300.00 % | 0.00 % | 100 = 1 % |
| | | | |
| **26 MOTOR CONTROL** | (visible only when the "SCALAR motor control mode" is selected) | | |
| 26.3 IR COMPENSATION | 0 % ... 30 % (visible only when the "SCALAR motor control mode" is selected) | 0% | 100 = 1 % |
| | | | |
| **27 BRAKE CHOPPER** | | | |
| 27.1 BRAKE CHOPPER CTL | OFF; ON | OFF (R2&R3=ON) | 0 = OFF<br>65535 = ON |
| 27.2 BR OVERLOAD FUNC | NO; WARNING; FAULT | NO | 1 = 1 (0 … 2) |
| 27.3 BR RESISTANCE | 0.01 … 100.00 ohm | 100.00 ohm | 1 = 1 ohm |
| 27.4 BR THERM TCONST | 0.000 … 10000.000 s | 0.000 s | 1 = 1 s |
| 27.5 MAX CONT BR POWER | 0.00 … 10000.00 kW | 0.00 kW | 1 = 1 Kw |
| 27.6 BC CTRL MODE | AS GENERATOR; COMMON DC | COMMON DC | 0 = AS GENERATOR<br>65535 = COMMON DC |
| | | | |
| **28 MOTOR MODEL** | | | |
| 28.2 TR TUNE | -60.0 % … +200.0 % | 0.0 % | 1 = 1 % |
| 28.3 FS METHOD | ON; OFF | ON | 0 = ON; 65535 = YES |
| | | | |
| **30 FAULT FUNCTIONS** | | | |
| 30.2 PANEL LOSS | FAULT; NO | FAULT | 1 = 1 (1 … 2) |
| 30.4 MOTOR THERM PROT | FAULT; WARNING; NO | FAULT | 1 = 1 (1 … 3) |
| 30.5 MOT THERM P MODE | DTC; USER MODE; THERMISTOR | DTC | 1 = 1 (1 … 3) |
| 30.6 MOTOR THERM TIME | 256.0 s ... 9999.8 s | (calculated) | 1 = 1 s |
| 30.7 MOTOR LOAD CURVE | 50.0 % ... 150.0 % | 100.0 % | 1 = 1 % |
| 30.8 ZERO SPEED LOAD | 25.0 % ... 150.0 % | 74.0 % | 1 = 1 % |
| 30.9 BREAK POINT | 1.0 Hz ... 300.0 Hz | 45.0 Hz | 100 = 1 Hz |
| 30.10 MOTOR PHASE LOSS | NO; FAULT | FAULT | 0 = NO<br>65535 = FAULT |
| 30.11 EARTH FAULT | NO; FAULT | FAULT | 0 = NO<br>65535 = FAULT |
| 30.12 MASTER FAULT FUNC | FAULT; NO; WARNING (visible only when COMM MODULE is selected) | FAULT | 1 = 1 (1 … 3) |
| 30.13 COMM FLT TIME-OUT | 0.10 ... 60.00 s (visible only when COMM MODULE is selected) | 1.00 s | 100 = 1 s |

| | | | |
|---|---|---|---|
| 30.14 WATCHDOG TEST | ON; OFF | OFF | 0 = NO; 65535 = YES |
| | | | |
| **50 PULSE-ENCODER** | (Only visible when ENCODER MODULE is selected, par. 98.1) | | |
| 50.1 ENCODER PULSE NR | 1000 - 4096 | 1024 | 1 = 1 |
| 50.2 SPEED MEAS MODE | A_-B DIR; A_-_; A_-_B DIR; A_-_ B_-_ | A_-_ B_-_ | 1 = 1 (0 … 3) |
| 50.3 ENCODER ALM/FLT | WARNING; FAULT | FAULT | 0 = WARNING<br>65535 = FAULT |
| 50.4 ENCODER DELAY | 5 ms ... 50000 ms | 1000 ms | 1 = 1 ms |
| 50.5 SPEED FEEDB USED | True; False | True | 0 = False 65535 = True |
| 50.7 ENABLE CABLE CHECK | DISABLED; WARNING; FAULT | DISABLED | 1 = 1 (1 ... 3) |
| | | | |
| **51 COMM MODULE** | (Only visible when par. 98.2 selected to FIELDBUS) | | |
| 51.1 MODULE TYPE | (Fieldbus module type connected) | (module type) | See module manual |
| 51.2 ... 51.33 | (Fieldbus module parameters per connected type of module) | | See module manual |
| | | | |
| **60 LOCAL OPERATION** | | | |
| 60.1 LOC OPER INH | True; False | False | 0 = False<br>65535 = True |
| 60.2 LOC SPEED MAX | 0.0 % ... 100.0 % | 10.0 % | 10 = 1 % |
| 60.3 LOC ZERO SPEED TD | 0.0 s ... 300.0 s | 120.0 s | 10 = 1 s |
| | | | |
| **61 SPEED MONITOR** | | | |
| 61.3 MOT OVERSPEED LEV | 0 ... 200 % | 110 % | 1 = 1 % |
| 61.4 SPEED LIM 1 | 0.0 ... 200.0 % | 20.0 % | 10 = 1 % |
| | | | |
| **62 TORQUE MONITOR** | | | |
| 62.1 TORQ MON SEL | True; False | True | 0 = False<br>65535 = True |
| 62.2 SP DEV LEV | 0...100 % | 10 % | 1 = 1 % |
| 62.3 TORQ FLT TD | 0...60000 ms | 600 ms | 1 = 1 ms |
| 62.4 SP DER BLK LEV | 0...100 %/s | 13 %/s | 1 = 1 %/s |
| | | | |
| **63 FAST STOP** | | | |
| 63.1 FAST STOP TYPE 11 | NOT USED; FAST STOP 1; FAST STOP 2; FAST STOP 3 | NOT USED | 1 = 1 (1 … 4) |
| 63.2 FAST STOP TYPE 12 | NOT USED; FAST STOP 1; FAST STOP 2; FAST STOP 3 | NOT USED | 1 = 1 (1 … 4) |
| | | | |
| **64 CRANE** | | | |
| 64.1 STAND ALONE SEL | True; False | True | 0 = False<br>65535 = True |
| 64.2 CONTIN GEAR | True; False | False | 0 = False<br>65535 = True |
| 64.3 HIGH SPEED LEVEL 1 | 0.0 % ... 100.0 % | 98.0 % | 10 = 1 % |
| 64.4 DEADZONE A | 0.0 % ... 100.0 % | 0.0 % | 10 = 1 % |
| 64.5 DEADZONE B | 0.0 % ... 100.0 % | 0.0 % | 10 = 1 % |
| 64.6 REF SHAPE | 0 ... 100 | 20 | 1 = 1 |
| 64.7 SLOWDOWN SPEEDREF | 0 % ... 100 % | 25 % | 1 = 1 % |
| 64.8 ZERO POS OK TD | 0.0 s ... 60.0 s | 0.3 s | 10 = 1 s |
| 64.9 TORQUE REF SCALE | 0 ... 4.00 | 1.00 | 100 = 1.0 |
| 64.10 CONTROL TYPE | JOYSTICK; RADIO CTRL; MOTOR POT; STEP JOYST; STEP RADIO; FB JOYSTICK; BIPOLAR REF | JOYSTICK | 1 = 1 (1 … 7) |
| 64.11 MINIMUM REF | 0.0 % ... 100.0 % | 0.0 % | 10 = 1 % |
| 64.12 JOYSTICK WARN TD | 0 ms ... 5000 ms | 400 ms | 1 = 1 ms |
| 64.13 STEP REF LEVEL 1 | 0.0 % ... 100.0 % | 10.0 % | 10 = 1 % |
| 64.14 STEP REF LEVEL 2 | 0.0 % ... 100.0 % | 25.0 % | 10 = 1 % |
| 64.15 STEP REF LEVEL 3 | 0.0 % ... 100.0 % | 50.0 % | 10 = 1 % |
| 64.16 STEP REF LEVEL 4 | 0.0 % ... 100.0 % | 100.0 % | 10 = 1 % |
| 64.17 SECOND CTRL MODE | JOYSTICK; RADIO CTRL; MOTOR POT; STEP JOYST; STEP RADIO; FB JOYSTICK; BIPOLAR REF | JOYSTICK | 1 = 1 (1 … 7) |

| | | | |
|---|---|---|---|
| 64.18 SPEED/TORQ CTRL | SPEED/TORQUE; SPEED; TORQUE | SPEED/TORQUE | 1 = 1 (1 … 3) |
| | | | |
| **65 LOGIC HANDLER** | | | |
| 65.1 CONTIN ON | True; False | False | 0 = False<br>65535 = True |
| 65.2 OFF TD | 0.0 s ... 10000.0 s | 180.0 s | 10 = 1 s |
| | | | |
| **66 TORQUE PROVING** | | | |
| 66.1 TORQ PROV SEL | True; False | False | 0 = False<br>65535 = True |
| 66.2 TORQ PROV FLT TD | 0.0 s ...100.0 s | 0.5 s | 10 = 1 s |
| 66.3 TORQ PROV REF | 0.0 % ... 200.0 % | 20.0 % | 10 = 1 % |
| | | | |
| **67 MECH BRAKE CONT** | | | |
| 67.1 BRAKE FALL TIME | 0.0 s ... 60.0 s | 1.0 s | 10 = 1 s |
| 67.2 BRAKE FLT TD | 0.0 s ... 60.0 s | 1.0 s | 10 = 1 s |
| 67.4 BRAKE REOPEN TD | 0.0 s ... 60.0 s | 0.0 s | 10 = 1 s |
| 67.5 BRAKE LONG FT TD | 0.0 s ... 60.0 s | 0.5 s | 10 = 1 s |
| 67.6 ZERO SPEED LEV | 0.0 % ... 100.0 % | 1.0 % | 10 = 1 % |
| 67.7 ZERO SPEED TIME | 0 ... 1000 ms | 200 ms | 1 = 1 ms |
| 67.8 SPEED REF TD | 0.00 s ... 10.00 s | 0.20 s | 100 = 1 s |
| 67.9 START TORQ SEL | NOT USED; AUTO TQ MEM; LOAD MEAS; PAR 67.10 | NOT USED | 1 = 1 (1 … 4) |
| 67.10 MIN START TQ REF | 0 … 300 % | 0 % | 1 = 1 % |
| 67.11 MOTOR TYPE | STANDARD; CONICAL | STANDARD | 0 = STANDARD<br>65535 = CONICAL |
| 67.12 RED FLUX LEVEL | 25 ... 100 % (visible only if par. 67.11 selected to CONICAL) | 75 % | 1 = 1 % |
| 67.13 START FLUX LEVEL | 100 ... 140 % (visible only if par. 67.11 selected to CONICAL) | 100 % | 1 = 1 % |
| 67.14 START FLUX TIME | 0.0 ... 10.0 s (visible only if par. 67.11 selected to CONICAL) | 1.0 s | 10= 1 s |
| | | | |
| **68 POWER OPTIMIZE** | | | |
| 68.1 POWOP SELECT | True; False | False | 0 = False<br>65535 = True |
| 68.2 BASE SPEED | 1.0 % ... 100.0 % | 100.0 % | 10 = 1 % |
| 68.3 POWOP AUTOTUNE SEL | True; False | False | 0 = False<br>65535 = True |
| 68.4 INERTIA TOTAL UP | 0.00 kgm2 ... 100.00 kgm2 | 3.00 kgm2 | 100 = 1 kgm2 |
| 68.5 INERTIA TOTAL DWN | 0.00 kgm2 ... 100.00 kgm2 | 30.00 kgm2 | 100 = 1 kgm2 |
| 68.6 TQLIM UP | 0.0 % ... 200.0 % | 100.0 % | 10 = 1 % |
| 68.7 TQLIM DWN | 0.0 % ... 200.0 % | 75.0 % | 10 = 1 % |
| 68.8 POWOP RESET LEV | 0 % ... 100 % | 12 % | 1 = 1 % |
| 68.9 T MAX | 0% … 2000% | 500 % | 1 = 1 % |
| 68.10 LOAD TORQ FILT TC | 0 ms ... 32000 ms | 150 ms | 1 = 1 ms |
| 68.11 SLACK ROPE TQ LEV | -400 % ... 400 % | -400 % | 1 = 1 % |
| 68.12 LOADCORR FACT UP | 0.00 ... 100.00 | 0.90 | 100 = 1.0 |
| 68.13 LOADCORR FACT DWN | 0.00 ... 100.00 | 1.10 | 100 = 1.0 |
| 68.14 RAMP RATE POWOP | 0.00 ... 100.00 | 1.0 | 100 = 1 |
| 68.15 RAMP CHANGE SPEED | 1% ... 100% | 100% | 10 = 1 |
| | | | |
| **69 REFERENCE HANDLER** | | | |
| 69.1 SPEED SCALING RPM | 0 rpm ... 10000 rpm | 1500 rpm | 1 = 1 rpm |
| 69.2 ACC TIME FORW | 0.1 s ... 60.0 s | 5.0 s | 10 = 1 s |
| 69.3 ACC TIME REV | 0.1 s ... 60.0 s | 5.0 s | 10 = 1 s |
| 69.4 DEC TIME FORW | 0.1 s ... 60.0 s | 5.0 s | 10 = 1 s |
| 69.5 DEC TIME REV | 0.1 s ... 60.0 s | 5.0 s | 10 = 1 s |
| 69.6 S-RAMP TC | 0.0 s ... 10.0 s | 0.0 s | 10 = 1 s |
| 69.7 RAMP SCALE LOCAL | 0.5 ... 100.0 | 2 .0 | 10 = 1.0 |
| 69.10 RAMP RATE=1 | True; False; AI3 | True | 1 = 1 (1 … 3) |

| | | | |
|---|---|---|---|
| 69.11 SECOND RAMP SCALE | 20 … 500 % | 100 % | 1 = 1 % |
| | | | |
| **70 POS MEASURE** | | | |
| 70.1 POS SCALE | 1.00 ... 32767.00 PPU | 100.00 PPU | 100 = 1 ppu |
| 70.2 SYNC COND | Pos; Neg | Pos | 0 = Pos<br>65535 = Neg |
| | | | |
| **71 FIELD BUS COMM** | | | |
| 71.1 COMTEST FLT TD | 0 ms ... 32767 ms | 300 ms | 1 = 1 ms |
| 71.2 RESET POWER ON TD | 0 ms ... 32767 ms | 2000 ms | 1 = 1 ms |
| 71.3 CHOPP/EXT MON TD | 0 ms ... 4000 ms | 1000 ms | 1 = 1 ms |
| 71.4 ADVANT COMM TYPE | ENG DRIVE; STD DRIVE | ENG DRIVE | 0 = ENG DRIVE<br>65535 = STD DRIVE |
| 71.5 DSET BASE ADDRESS | 1; 10 | 1 | 0 = 1<br>65535 = 10 |
| 71.6 FIELDBUS R-TYPE | NO; RPBA-01 | NO | 1 = 1 (1 … 2) |
| | | | |
| **72 MASTER / FOLLOWER** | | | |
| 72.1 MAST/ FOLL MODE | OFF; MASTER; FOLLOWER (visible only if M/F CTRL macro selected) | OFF | 1 = 1 (1 … 3) |
| 72.2 TORQUE SELECTOR | ZERO; SPEED; TORQUE; MINIMUM; MAXIMUM; ADD | ZERO | 1 = 1 (1 … 6) |
| 72.3 LOAD SHARE | 0.0 % ... 400.0 % (visible only if M/F CTRL macro selected) | 100.0 % | 10 = 1 % |
| 72.4 WINDOW SEL ON | OFF; ON | OFF | 0 = OFF<br>65535 = ON |
| 72.5 WINDOW WIDTH POS | 0.0 rpm ... 1500.0 rpm | 0.0 rpm | 20000 = p.69.1 |
| 72.6 WINDOW WIDTH NEG | 0.0 rpm ... 1500.0 rpm | 0.0 rpm | 20000 = p.69.1 |
| 72.7 DROOP RATE | 0.0 % ... 100.0 % | 0.0 % | 10 = 1 % |
| 72.8 TORQ REF A FTC | 0 ms ... 32767 ms (visible only if M/F CTRL macro selected) | 0 ms | 1 = 1 ms |
| 72.9 M/F FAULT TD | 0 ms ... 32767 ms (visible only if M/F CTRL macro selected) | 200 ms | 1 = 1 ms |
| 72.10 M/F COMM ERR TD | 0 ms ... 32767 ms (visible only if M/F CTRL macro selected) | 200 ms | 1 = 1 ms |
| 72.11 MF BROADCAST MODE | NO; YES | NO | 0 = NO<br>65535 = YES |
| | | | |
| **73 ELECTRIC SHAFT** | | | |
| 73.1 ELSHAFT MODE SEL | OFF; MASTER; SLAVE | OFF | 1 = 1 (1 … 3) |
| 73.2 ELSHAFT GAIN | 0.0 … 100.0 (only used in Slave) | 0.1 | 100 = 1.0 |
| 73.3 GEAR NUMERATOR | 1 … 32000 (only used in Slave) | 1 | 1 = 1 |
| 73.4 GEAR DENOMINATOR | 1 … 32000 (only used in Slave) | 1 | 1 = 1 |
| 73.5 POS ERROR LIMIT | 0 … 1000 (only used in Slave) | 10 | 1 = 1 |
| 73.6 ELSH CTRL MIN SPD | 0 … 100 % (only used in Slave) | 20 % | 1 = 1 % |
| | | | |
| **74 CRANE LIFETIME** | | | |
| 74.1 NOMINAL LOAD | 0.00 … 32767.00 ton | 0.00 ton | 100 = 1 ton |
| 74.2 CRANE LIFETIME | 0 … 12500 hrs | 100 hrs | 1 = 1 hr |
| 74.3 START LIFETIMEMON | OFF; ON | OFF | 0 = OFF; 65535 = ON |
| 74.4 LIFETIME NOM SPEED | 0% ... 100% | 100% | 10 = 1% |
| | | | |
| **80 SHARED MOTION** | (Not visible if parameter 16.06 is not set) | | |
| 80.2 BRAKE ACKN SEL 2 | INTERNAL ACK; DI1; DI2; DI5; DI6; DI_IL | DI6 | 1=1 (1 … 6) |
| 80.3 SYNC SEL 2 | NOT SEL; DI1…DI6; EXT DI1.1…EXT DI2.2; DI_IL | NOT SEL | 1=1 (1 … 12) |
| 80.4 RELAY RO1 OUTPUT2 | NOT USED; READY; RUNNING; FAULT; FAULT-N; CONTROL LOC; BRAKE LIFT; WATCHDOG-N; USER 1 OR 2; REVERSE; OVERSPEED; RDY FOR RUN; SPEED LIM 1; LIFETIME>90%; MOTOR1 SEL; MOTOR2 SEL | NOT USED | 1=1 (1 ... 16) |
| 80.5 RELAY RO3 OUTPUT2 | Same as 80.4 | BRAKE LIFT | 0=NOT USED,<br>65535=BRAKE LIFT |
| 80.6 MINIMUM SPEED 2 | -10000 … 0 rpm | -1500 rpm | 1=1 rpm |
| 80.7 MAXIMUM SPEED 2 | 0…10000 rpm | 1500 rpm | 1=1 rpm |
| 80.8 MAXIMUM CURRENT 2 | 0.0 … Imax A | 1000.0 A | 10=1.0 A |

| | | | |
|---|---|---|---|
| 80.9 MAXIMUM TORQUE 2 | 0,50 … 325.00 % | 200.00 % | 100=1.00 % |
| 80.10 MINIMUM TORQUE 2 | -325.00 … -1.00 % | -200.00 % | 100=1.00 % |
| 80.11 CONST MAGN TIME 2 | 30.0 … 10000.0 ms | 500.0 ms | 10=1.0 ms |
| 80.12 GAIN 2 | 0.0 … 325 | 15 | 100=1 |
| 80.13 INTEGRATION TIME2 | 0.00 s … 32767.00 s | 0.50 s | 1000=1.00 s |
| 80.15 TR TUNE 2 | -60.0 … 200.0 % | 0.0 % | 1=1.0 % |
| 80.16 MOT THERM PMODE 2 | DTC; USER MODE; THERMISTOR | DTC | 1=1 (1 … 3) |
| 80.17 MOT THERM TIME 2 | 256.0 … 10000.0 s | 256.0 s | 10=1.0 s |
| 80.18 ZERO SPEED LOAD 2 | 25.0 % ... 150.0 % | 74% | 1=1.0% |
| 80.19 BREAK POINT 2 | 1.00 … 300.00 Hz | 45 Hz | 100=1.0 Hz |
| 80.20 SPEED FEEDB USED2 | TRUE; FALSE | TRUE | 0=FALSE<br>65535=TRUE |
| 80.21 SP DEV LEV 2 | 0 … 100 % | 10 % | 1=1 % |
| 80.22 TORQ FLT TD 2 | 0 … 32767 ms | 600 ms | 1=1 ms |
| 80.23 SP DER BLK LEV 2 | 0 … 100 %/s | 13 %/s | 1=1 %/s |
| 80.24 OFF TD 2 | 0 … 10000 s | 180 s | 1=1 s |
| 80.25 TORQ PROV SEL 2 | TRUE; FALSE | FALSE | 0=FALSE; 65535=TRUE |
| 80.26 BRAKE FALL TIME 2 | 0.0 … 60.0 s | 0.5 s | 10=1.0 s |
| 80.27 ZERO SPEED LEV 2 | 0.0 … 100.0 % | 1.0 % | 10=1.0 % |
| 80.28 ZERO SPEED TIME 2 | 0 … 1000 ms | 200 ms | 1=1 ms |
| 80.29 SPEED REF TD 2 | 0.00 … 10.00 s | 0.20 s | 100=1.0 s |
| 80.30 START TORQ SEL 2 | NOT USED; AUTO TQ MEM; LOAD MEAS; PAR 67.10 | NOT USED | 1=1 (1 … 4) |
| 80.31 POWOP SELECT 2 | TRUE; FALSE | FALSE | 0=FALSE<br>65535=TRUE |
| 80.32 BASE SPEED 2 | 1.0 … 100.0 % | 100.0 % | 10=1.0 % |
| 80.33 SPEED SCALE RPM 2 | 0 … 10000 rpm | 1500 rpm | 1=1 rpm |
| 80.34 ACC TIME FORW 2 | 0.1 … 60.0 s | 5.0 s | 10=1.0 s |
| 80.35 ACC TIME REV 2 | 0.1 … 60.0 s | 5.0 s | 10=1.0 s |
| 80.36 DEC TIME FORW 2 | 0.1 … 60.0 s | 5.0 s | 10=1.0 s |
| 80.37 DEC TIME REV 2 | 0.1 … 60.0 s | 5.0 s | 10=1.0 s |
| 80.38 RAMP RATE=1 2 | TRUE; FALSE; AI3 | FALSE | 0=FALSE<br>65535=TRUE |
| 80.39 POS SCALE 2 | 1.00 … 32767.00 PPU | 100.00 PPU | 100=1.00 PPU |
| 80.40 ENCODER MODULE 2 | NTAC; NO; RTAC-SLOT1; RTAC-SLOT2; RTAC-DDCS | NO | 1=1 (1 … 5) |
| 80.41 TORQUE SELECTOR 2 | ZERO; SPEED; TORQUE; MINIMUM; MAXIMUM; ADD | ZERO | 1 =1 (1 ...6) |
| | | | |
| **81 MOTOR MODEL 1** | (Not visible if parameter 16.06 is not set. Parameter for information only) | | |
| **81.**1 MOTOR NOM VOLT 1 | 0 … 1400 V | 0 V | 1=1 V |
| **81.**2 MOTOR NOM CURR 1 | 0.0 … 10000.0 A | 0.0 A | 10=1.0 A |
| **81.**3 MOTOR NOM FREQ 1 | 8.00 … 300.00 Hz | 50.00 HZ | 100=1.00 Hz |
| **81.**4 MOTOR NOM SPEED 1 | 1 … 18000 rpm | 1 rpm | 1=1 rpm |
| **81.**5 MOTOR NOM POWER 1 | 0.0 … 9000.0 kW | 0.0 kW | 10=1.0 kW |
| **81.**6 MOTOR NOM COSFI 1 | 0.00 … 1.00 | 0.30 | 100=1.00 |
| **81.**7 INV THRESHOLD V 1 | 0.0 … 5.0 V | 0.0 V | 1=1.0 V |
| **81.**8 RS_20 1 | Internal motor model parameter | 0 | |
| **81.**9 IMAGN 1 | Internal motor model parameter | 0 | |
| **81.**10 IREF_OFFS 1 | Internal motor model parameter | 0 | |
| **81.**11 SIGLS0 1 | Internal motor model parameter | 0 | |
| **81.**12 SIGLS2 1 | Internal motor model parameter | 0 | |
| **81.**13 SIGLS_SATF 1 | Internal motor model parameter | 0 | |
| **81.**14 LS_SIGLS 1 | Internal motor model parameter | 0 | |
| **81.**15 LS_SIGLS0 1 | Internal motor model parameter | 0 | |
| **81.**16 LS_SIGLS1 1 | Internal motor model parameter | 0 | |
| **81.**17 LS_SIGLS_SATF 1 | Internal motor model parameter | 0 | |
| **81.**18 LS_SIGLS_SATF1 1 | Internal motor model parameter | 0 | |
| **81.**19 LS_SIGLS_SATM 1 | Internal motor model parameter | 0 | |
| **81.**20 LS_SIGLS_SATM1 1 | Internal motor model parameter | 0 | |
| **81.**21 LS_SIGLS_SATM2 1 | Internal motor model parameter | 0 | |
| **81.**22 EFF_MOT_NOM 1 | Internal motor model parameter | 0 | |

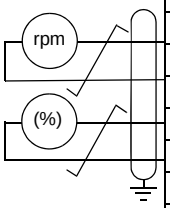
| | | | |
|---|---|---|---|
| **81.**23 ZER_COEF1 1 | 0.00 ... 100.00 % | 10.00 % | 1=1.00 % |
| **81.**24 ZER_GAIN 1 | 0.00 ... 100.00 % | 0.00 % | 1=1.00 % |
| **81.**25 SYSSATT3 1 | Internal motor model parameter | 0 | |
| **81.**26 SYSSATT5 1 | Internal motor model parameter | 0 | |
| **81.**27 IA_GAIN_ER 1 | Internal motor model parameter | 0 | |
| **81.**28 IC_GAIN_ER 1 | Internal motor model parameter | 0 | |
| **81.**29 IA_OFFS_ER 1 | Internal motor model parameter | 0 | |
| **81.**30 IC_OFFS_ER 1 | Internal motor model parameter | 0 | |
| | | | |
| **82 MOTOR MODEL 2** | (Not visible if parameter 16.06 is not set. Parameter for information only) | | |
| **82.**1 MOTOR NOM VOLT 2 | 0 … 1400 V | 0 V | 1=1 V |
| **82.**2 MOTOR NOM CURR 2 | 0.0 … 10000.0 A | 0.0 A | 10=1.0 A |
| **82.**3 MOTOR NOM FREQ 2 | 8.00 … 300.00 Hz | 50.00 HZ | 100=1.00 Hz |
| **82.**4 MOTOR NOM SPEED 2 | 1 … 18000 rpm | 1 rpm | 1=1 rpm |
| **82.**5 MOTOR NOM POWER 2 | 0.0 … 9000.0 kW | 0.0 kW | 10=1.0 kW |
| **82.**6 MOTOR NOM COSFI 2 | 0.00 … 1.00 | 0.30 | 100=1.00 |
| **82.**7 INV THRESHOLD 2 | 0.0 … 5.0 V | 0.0 V | 1=1.0 V |
| **82.**8 RS_20 2 | Internal motor model parameter | 0 | |
| **82.**9 IMAGN 2 | Internal motor model parameter | 0 | |
| **82.**10 IREF_OFFS 2 | Internal motor model parameter | 0 | |
| **82.**11 SIGLS0 2 | Internal motor model parameter | 0 | |
| **82.**12 SIGLS2 2 | Internal motor model parameter | 0 | |
| **82.**13 SIGLS_SATF 2 | Internal motor model parameter | 0 | |
| **82.**14 LS_SIGLS 2 | Internal motor model parameter | 0 | |
| **82.**15 LS_SIGLS0 2 | Internal motor model parameter | 0 | |
| **82.**16 LS_SIGLS1 2 | Internal motor model parameter | 0 | |
| **82.**17 LS_SIGLS_SATF 2 | Internal motor model parameter | 0 | |
| **82.**18 LS_SIGLS_SATF1 2 | Internal motor model parameter | 0 | |
| **82.**19 LS_SIGLS_SATM 2 | Internal motor model parameter | 0 | |
| **82.**20 LS_SIGLS_SATM1 2 | Internal motor model parameter | 0 | |
| **82.**21 LS_SIGLS_SATM2 2 | Internal motor model parameter | 0 | |
| **82.**22 EFF_MOT_NOM 2 | Internal motor model parameter | 0 | |
| **82.**23 ZER_COEF1 2 | 0.00 ... 100.00 % | 10.00 % | 1=1.00 % |
| **82.**24 ZER_GAIN 2 | 0.00 ... 100.00 % | 0.00 % | 1=1.00 % |
| **82.**25 SYSSATT3 2 | Internal motor model parameter | 0 | |
| **82.**26 SYSSATT5 2 | Internal motor model parameter | 0 | |
| **82.**27 IA_GAIN_ER 2 | Internal motor model parameter | 0 | |
| **82.**28 IC_GAIN_ER 2 | Internal motor model parameter | 0 | |
| **82.**29 IA_OFFS_ER 2 | Internal motor model parameter | 0 | |
| **82.**30 IC_OFFS_ER 2 | Internal motor model parameter | 0 | |
| | | | |
| **90 DATASET REC ADDR** | | | |
| 90.1 DATASET 7 WORD 1 | 0 … 9999 | 0 | 1 = 1 |
| 90.2 DATASET 7 WORD 2 | 0 … 9999 | 0 | 1 = 1 |
| 90.3 DATASET 7 WORD 3 | 0 … 9999 | 0 | 1 = 1 |
| 90.4 DATASET 9 WORD 1 | 0 … 9999 | 0 | 1 = 1 |
| 90.5 DATASET 9 WORD 2 | 0 … 9999 | 0 | 1 = 1 |
| 90.6 DATASET 9 WORD 3 | 0 … 9999 | 0 | 1 = 1 |
| | | | |
| **92 DATASET TR ADDR** | | | |
| 92.1 DATASET 4 WORD 1 | 0 … 9999 | 202 | 1 = 1 |
| 92.2 DATASET 4 WORD 2 | 0 … 9999 | 218 | 1 = 1 |
| 92.3 DATASET 4 WORD 3 | 0 … 9999 | 104 | 1 = 1 |

| | | | |
|---|---|---|---|
| 92.4 DATASET 6 WORD 1 | 0 … 9999 | 402 | 1 = 1 |
| 92.5 DATASET 6 WORD 2 | 0 … 9999 | 403 | 1 = 1 |
| 92.6 DATASET 6 WORD 3 | 0 … 9999 | 404 | 1 = 1 |
| 92.7 DATASET 8 WORD 1 | 0 … 9999 | 109 | 1 = 1 |
| 92.8 DATASET 8 WORD 2 | 0 … 9999 | 107 | 1 = 1 |
| 92.9 DATASET 8 WORD 3 | 0 … 9999 | 106 | 1 = 1 |
| | | | |
| **98 OPTION MODULES** | | | |
| 98.1 ENCODER MODULE | NTAC; NO; RTAC01-SLOT1; RTAC01-SLOT2; RTAC01-DDCS; RTAC03-SLOT1; RTAC03-SLOT2; RTAC03-DDCS | NO | 1 = 1 (0 … 4) |
| 98.2 COMM. MODULE | NO; FIELDBUS; ADVANT | NO | 1 = 1 (1 … 3) |
| 98.3 CH3 NODE ADDR | 1 ... 254 | 1 | 1 = 1 |
| 98.4 CH0 NODE ADDR | 0 … 125 | 1 | 1 = 1 |
| 98.5 DI/O EXT MODULE 1 | NDIO; NO; RDIO-SLOT1; RDIO-SLOT2; RDIO-DDCS | NO | 1 = 1 (1 … 5) |
| 98.6 DI/O EXT MODULE 2 | NDIO; NO; RDIO-SLOT1; RDIO-SLOT2; RDIO-DDCS | NO | 1 = 1 (1 … 5) |
| 98.7 AI/O EXT MODULE | NAIO; NO; RAIO-SLOT1; RAIO-SLOT2; RAIO-DDCS | NO | 1 = 1 (1 … 5) |

# Appendix B - User I/O Interface diagrams

The Figures in this appendix shows typical signal connections at the RMIO board I/O, for the different control modes.

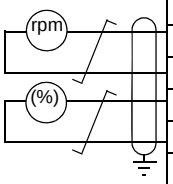
*Connections at the RMIO board in Stand Alone mode, Joystick control*.




| Terminal Block **X16** | | **RMIO board** |
|---|---|---|
| 1 | -REF | Negative reference voltage -10V, max. 10 mA |
| 2 | AI GND | |
| Terminal Block **X21** | | ***Analogue signals*** |
| 1 | VREF | Positive reference voltage +10V, max. 10 mA |
| 2 | GND | |
| 3 | AI1+ | Speed Reference (voltage 0(2)…+10V) |
| 4 | AI1- | |
| 5 | AI2+ | Torque Reference (current 0…20 mA) |
| 6 | AI2- | |
| 7 | AI3+ | Speed Limit, par. 20.10 (current 0(4)…20 mA) |
| 8 | AI3- | |
| 9 | AO1+ | Motor Speed |
| 10 | AO1- | 0…20 mA == 0…100 % Motor speed |
| 11 | AO2+ | Motor Torque |
| 12 | AO2- | 0…20 mA == 0…Motor Nominal Torque |
| Terminal Block **X22** | | ***Digital Inputs*** |
| 1 | DI1 | Brake Acknowledge (default) |
| 2 | DI2 | Zero Position (default) |
| 3 | DI3 | Start Direction A = Up or Forward |
| 4 | DI4 | Start Direction B = Down or Backward |
| 5 | DI5 | Slowdown-N (default) |
| 6 | DI6 | Fast Stop-N (default) |
| 7 | +24 VDC | +24 VDC max. 100 mA |
| 8 | +24 VDC | |
| 9 | DGND | Digital ground |
| 10 | DGND | Digital ground |
| 11 | DI_IL (DI7) | programmable input, see Group10 |
| Terminal Block **X23** | | |
| 1 | +24 V DC | Aux. voltage output 24V 250 mA |
| 2 | GND | |
| Terminal Block **X25** | | ***Digital Outputs*** |
| 1 | RO11 | ***Relay Output 1*** |
| 2 | RO12 | ***Brake Lift (default)*** |
| 3 | RO13 | |
| Terminal Block **X26** | | |
| 5 | RO21 | ***Relay Output 2*** |
| 6 | RO22 | ***Watchdog-N (default)*** |
| 7 | RO23 | |
| Terminal Block **X27** | | |
| 5 | RO31 | ***Relay Output 3*** |
| 6 | RO32 | ***Fault-N (default)*** |
| 7 | RO33 | |

Use external power supply, if the total current consumption exceeds 250 mA

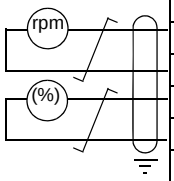
*Connections at the RMIO board in Stand Alone mode, Motor Pot control*.




| Terminal Block **X16** | | **RMIO board** |
|---|---|---|
| 1 | -REF | Negative reference voltage -10V, max. 10 mA |
| 2 | AI GND | |
| Terminal Block **X21** | | ***Analogue signals*** |
| 1 | VREF | Positive reference voltage +10V, max. 10 mA |
| 2 | GND | |
| 3 | AI1+ | Not used |
| 4 | AI1- | |
| 5 | AI2+ | Not used |
| 6 | AI2- | |
| 7 | AI3+ | Speed Limit, par. 20.10 (current 0(4)…20 mA) |
| 8 | AI3- | |
| 9 | AO1+ | Motor Speed |
| 10 | AO1- | 0…20 mA == 0…100 % Motor speed |
| 11 | AO2+ | Motor Torque |
| 12 | AO2- | 0…20 mA == 0…Motor Nominal Torque |
| Terminal Block **X22** | | ***Digital Inputs*** |
| 1 | DI1 | Brake Acknowledge (default) |
| 2 | DI2 | Zero Position (default) |
| 3 | DI3 | Start Direction A = Up or Forward |
| 4 | DI4 | Start Direction B = Down or Backward |
| 5 | DI5 | Slowdown-N (default) |
| 6 | DI6 | Fast Stop-N (default) |
| 7 | +24 VDC | +24 VDC max. 100 mA |
| 8 | +24 VDC | |
| 9 | DGND | Digital ground |
| 10 | DGND | Digital ground |
| 11 | DI_IL (DI7) | programmable input, see Group10 |
| Terminal Block **X23** | | |
| 1 | +24 V DC | Aux. voltage output 24V 250 mA |
| 2 | GND | |
| Terminal Block **X25** | | ***Digital Outputs*** |
| 1 | RO11 | ***Relay Output 1*** |
| 2 | RO12 | ***Brake Lift (default)*** |
| 3 | RO13 | |
| Terminal Block **X26** | | |
| 5 | RO21 | ***Relay Output 2*** |
| 6 | RO22 | ***Watchdog-N (default)*** |
| 7 | RO23 | |
| Terminal Block **X27** | | |
| 5 | RO31 | ***Relay Output 3*** |
| 6 | RO32 | ***Fault-N (default)*** |
| 7 | RO33 | |

Use external power supply, if the total current consumption exceeds 250 mA

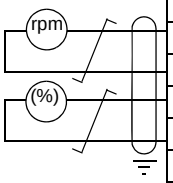
*Connections at the RMIO board in Stand Alone mode, Radio Control.*




Use external power supply, if the total current consumption exceeds 250 mA

| Terminal Block **X16** | | **RMIO board** |
|---|---|---|
| 1 | -REF | Negative reference voltage -10V, max. 10 mA |
| 2 | AI GND | |
| Terminal Block **X21** | | ***Analogue signals*** |
| 1 | VREF | Positive reference voltage +10V, max. 10 mA |
| 2 | GND | |
| 3 | AI1+ | Not used |
| 4 | AI1- | |
| 5 | AI2+ | Not used |
| 6 | AI2- | |
| 7 | AI3+ | Speed Limit, par. 20.10 (current 0(4)…20 mA) |
| 8 | AI3- | |
| 9 | AO1+ | Motor Speed |
| 10 | AO1- | 0…20 mA == 0…100 % Motor speed |
| 11 | AO2+ | Motor Torque |
| 12 | AO2- | 0…20 mA == 0…Motor Nominal Torque |
| Terminal Block **X22** | | ***Digital Inputs*** |
| 1 | DI1 | Brake Acknowledge (default) |
| 2 | DI2 | *programmable input, see Group10* |
| 3 | DI3 | Start Direction A = Up or Forward |
| 4 | DI4 | Start Direction B = Down or Backward |
| 5 | DI5 | Slowdown-N (default) |
| 6 | DI6 | Fast Stop-N (default) |
| 7 | +24 VDC | +24 VDC max. 100 mA |
| 8 | +24 VDC | |
| 9 | DGND | Digital ground |
| 10 | DGND | Digital ground |
| 11 | DI_IL (DI7) | *programmable input, see Group10* |
| Terminal Block **X23** | | |
| 1 | +24 V DC | Aux. voltage output 24V 250 mA |
| 2 | GND | |
| Terminal Block **X25** | | ***Digital Outputs*** |
| 1 | RO11 | ***Relay Output 1*** |
| 2 | RO12 | ***Brake Lift (default)*** |
| 3 | RO13 | |
| Terminal Block **X26** | | |
| 5 | RO21 | ***Relay Output 2*** |
| 6 | RO22 | ***Watchdog-N (default)*** |
| 7 | RO23 | |
| Terminal Block **X27** | | |
| 5 | RO31 | ***Relay Output 3*** |
| 6 | RO32 | ***Fault-N (default)*** |
| 7 | RO33 | |

*Connections at the RMIO board in Fieldbus mode.*




| Terminal Block **X16** | | **RMIO board** |
|---|---|---|
| 1 | -REF | Negative reference voltage -10V, max. 10 mA |
| 2 | AI GND | |
| Terminal Block **X21** | | ***Analogue signals*** |
| 1 | VREF | Positive reference voltage +10V, max. 10 mA |
| 2 | GND | |
| 3 | AI1+ | Not used |
| 4 | AI1- | |
| 5 | AI2+ | Not used |
| 6 | AI2- | |
| 7 | AI3+ | Speed Limit, par. 20.10 (current 0(4)…20 mA) |
| 8 | AI3- | |
| 9 | AO1+ | Motor Speed |
| 10 | AO1- | 0…20 mA == 0…100 % Motor speed |
| 11 | AO2+ | Motor Torque |
| 12 | AO2- | 0…20 mA == 0…Motor Nominal Torque |
| Terminal Block **X22** | | ***Digital Inputs*** |
| 1 | DI1 | Brake Acknowledge (default) |
| 2 | DI2 | Power on Ackn (programmable input) |
| 3 | DI3 | Sync (programmable inbut) |
| 4 | DI4 | *programmable input, see Group10* |
| 5 | DI5 | *programmable input, see Group10* |
| 6 | DI6 | *programmable input, see Group10* |
| 7 | +24 VDC | +24 VDC max. 100 mA |
| 8 | +24 VDC | |
| 9 | DGND | Digital ground |
| 10 | DGND | Digital ground |
| 11 | DI_IL (DI7) | *programmable input, see Group10* |
| Terminal Block **X23** | | |
| 1 | +24 V DC | Aux. voltage output 24V 250 mA |
| 2 | GND | |
| Terminal Block **X25** | | ***Digital Outputs*** |
| 1 | RO11 | ***Relay Output 1*** |
| 2 | RO12 | ***Brake Lift (default)*** |
| 3 | RO13 | |
| Terminal Block **X26** | | |
| 5 | RO21 | ***Relay Output 2*** |
| 6 | RO22 | ***Watchdog-N (default)*** |
| 7 | RO23 | |
| Terminal Block **X27** | | |
| 5 | RO31 | ***Relay Output 3*** |
| 6 | RO32 | ***Fault-N (default)*** |
| 7 | RO33 | |

Use external power supply, if the total current consumption exceeds 250 mA

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